C156 Plumstead Portal Site-Specific Archaeological Written Scheme of Investigation

Document Number: *C156-CSY-T-RGN-CR148_PT005-00028*

Document History:

Version:	Date:	Prepared By:	Checked by:	Approved by:	Reason for Issue:
1.0	24/09/10	[redacted] (MOLA/Capita)	–	–	Draft for Capita comment
1.1	51/10/10	[redacted] (MOLA/Capita)	–	–	Draft for Consultation
2.0	14/12/10	[redacted] (MOLA/Capita)			Revised for inclusion with RIBA Stage F
3.0	20.04.11	[redacted] (MOLA/Capita)			Revised from PDP Comments
4.0	13.07.11	[redacted]	[redacted]	[redacted]	For Crossrail Approval
		[redacted]	[redacted]		

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1 Executive Summary

This document forms an archaeological Site-Specific Written Scheme of Investigation (SS-WSI) for the proposed Crossrail railway portal at Plumstead. (Above-ground features within the curtilage of the Grade II listed White Hart Goods Depot are covered by separate procedures).

The site has high potential for palaeo-environmental and topographic evidence within the alluvium. There is moderate potential for prehistoric activity and for other post-medieval remains, including railway archaeology; there is a low potential for Roman, and medieval activity. Any well-preserved prehistoric structures, such as timber trackways, could be of high importance. Other remains are likely to be of low or moderate importance.

Works consist of the construction of the portal ramp and head house, incorporating the TBM launch chamber (there is no separate shaft in the current design). Works also include temporary construction compounds (worksites), utility diversion and diversion of the North Kent Line.

The overall mitigation strategy for the site is preservation by record. A Non-Listed Built Heritage (NLBH) assessment by the design archaeologists will be used to identify historic structures within the Goods Yard (western) Worksite and determine their importance, so that appropriate recording can be carried out by the C263 archaeological contractor before worksite establishment.

The results of recent GI packages will be used (with other data) by the design archaeologists to produce a revised geoarchaeological deposit model. This will then be used to focus archaeological excavation trenches on a selection of the different areas and horizons within the archaeological sequence. This archaeological contractor with the main works contractor will undertake the sample archaeological excavation trenches *prior to portal construction* (within the northern half of the portal footprint, just north of the existing railway embankment).

Ground reduction in areas of the portal outside the archaeological excavation trenches will be subject to a Targeted Watching Brief by the archaeological contractor (subject to excavation results).

General Watching Briefs will be carried out during the excavation for the guide walls and capping beams for the diaphragm walling from 3rd Quarter 2011. A Targeted Watching Brief will be conducted on the diversion of the Marmadon Sewer summer 2011. Localised works within the worksites will also require General Watching Briefs from September 2011.

Further Non-Listed Built Heritage assessment should take place *as soon as possible*, (in the critical phase, prior to the enabling works), in order that the NLBH recording can take place before the demolitions during set-up of the west worksite (Plumstead Goods Yard) in 2011.

An updated deposit model has been produced and has been used to revise the mitigation design and locate the archaeological excavation trenches. The sample excavation is programmed from September 2011.

The targeted watching brief on ground reduction within the portal will take place from the 3rd quarter 2012. A general watching brief on an attenuation tank will take place in 2015.

Works to the North Kent Line are being designed and constructed by Network Rail. The Network Rail archaeologist will complete this WSI for those works.

2 Project Background

2.1 Project Background and Site Location

Crossrail is a new cross London rail link project which will provide transport routes in the south east and across London. The line will provide a range of both new and improved rail journeys across London and its immediate surroundings. The proposed development will include the construction of stations within central London which will have interchange with other public transport modes including the London Underground, National Rail and the London Bus service; the development will also include the renewal and/or upgrade of existing stations outside central London. The route itself will link Maidenhead and Heathrow in the west with Shenfield in the north-east and Abbey Wood in the south-east. As part of these works a portal at Plumstead will be required.

The Plumstead site lies within the London Borough (LB) of Greenwich. The Plumstead worksites comprises two construction compounds (worksites) to the north of the existing North Kent Line (NIL), one west and one east of the White Hart Road. The worksite to the west of White Hart Road is referred to as 'West Worksite', also known as the Plumstead/Old Goods Yard worksite. The worksite to the east of White Hart Road is the main portal worksite, in the White Hart Depot Worksite, and is referred to as the 'East Worksite'. The portal site is located within the East Worksite, to the north of the existing railway line, between White Hart Road and Church Manor Way. The portal site centres approximately on National Grid Reference (NGR) 545546 178885, see Figure 1.

The eastern White Hart Goods Yard has a Grade II listed incinerator/electricity generating station, known as White Hart Depot, within its boundaries. The White Hart Depot Building, and associated above-ground features within its curtilage, are outside of the remit of this report, and are covered by separate procedures and documentation. Part of the ramp and the cobble surface of the road may possibly need to be removed before commencement of works for construction of Crossrail Plumstead Portal and, use of the building as a construction compound. If so, they would be reinstated afterwards. There should be no impacts below *c* 0.5m below ground level, and therefore no impacts on below-ground remains.

There are no scheduled ancient monuments within the site, and it does not fall within any designated archaeological priority area.

The enabling works comprise diversion of the Marmadon Road Sewer. The main works comprise temporary construction compounds (worksites), construction of the portal, servicing of the tunnel drive to North Woolwich.

2.2 Proposed Development Summary

The cut-and-cover box for the Plumstead portal will be below ground level, with the bored tunnel commencing at a point approximately opposite Barth Mews. The end of the portal will be at a point approximately opposite 155 Marmadon Road. The approach ramp will continue eastwards until the Crossrail tracks have risen to ground level, and then run between the eastbound and westbound NKL, which will be reconfigured to accommodate the Crossrail tracks and provide a four track arrangement from here to Abbey Wood station. The diversion of services also be required for the construction of the Plumstead portal, including a sewer diversion.

2.3 Summary of Previous Assessment Work

The 'Crossrail Generic WSI' (v2, doc no. CR-PN-LWS-EN-SY-00001) outlines how the arrangements and controls for managing archaeology will be met in designing and constructing

Crossrail. It also provides a common framework for archaeology which will ensure that the works conform to a common project standard.

The ES and Supporting Specialist Technical Reports (STR): 'Assessment of Archaeology Impacts' (Crossrail, 2005) presents the outcomes of the archaeological studies undertaken as part of the Environmental Impact Assessment (EIA). The archaeological assessment has included an assessment of the likelihood of archaeological resources being present in land affected by the project, their importance and the extent to which they will be physically affected by the construction and operation of Crossrail.

A Detailed Desk Based Assessment (DDBA) has also been carried out for the Plumstead portal site titled 'Detailed Desk Based Assessment (DDBA) for Plumstead Portal' (doc no. CR-SD-PRW-X-IS-00003). DDBAs were undertaken on sites that require additional information to enable decisions regarding an appropriate mitigation strategy.

In 2008 it was considered that there was insufficient data to construct a full digital deposit model for this site, and therefore a basic deposit model in the form of sections was produced from borehole data supplied by Crossrail (Martin Bates, Lampeter University) (see Figure 2. The digital deposit model has been constructed with the additional results from archaeological monitoring of GI Package 20, geoarchaeological boreholes and utilities trial trenches (see **Error! Reference source not found.**).

A brief report on the archaeological monitoring of selected geotechnical boreholes undertaken for Crossrail Package 20 was produced in 2009 (see 2.4).

2.4 Summary of Previous Crossrail Studies

Information on the existing borehole information including historic third party boreholes and boreholes carried out as part of the Crossrail ground investigation packages can be found in 'MDC4 Geotechnical Design Note — Plumstead Portal' (doc no. CR-DV-THV-X-DG-00002).

Previous Crossrail studies, relevant to the Plumstead portal site include:

Crossrail, Environmental Statement — February 2005

Crossrail, Assessment Of Archaeology Impacts, Technical Report. Part 4 of 6, South-East Route Section, 1E0318-E2E00-00001, February 2005 Specialist Technical Report (STR)

Crossrail, Supplementary Environmental Statement 2 (SES2) — January 2006

Crossrail, Assessment Of Archaeology Impacts, Technical Report. Additional Provisions — January 2006

Crossrail, Amendment Of Provisions 2 Environmental Statement — May 2006

Crossrail, Amendment Of Provisions 4 Environmental Statement — May 2007

Crossrail, Archaeology Programming Assessment, November 2006

Crossrail, Archaeological Monitoring of Ground Investigations, Borehole Package 10, Plumstead, Crossrail Doc No. 1e0418-E2e00-00002, 2006

Crossrail, MDC4 Archaeology Updated Baseline Assessment, January 2008; Crossrail, MDC4 Archaeology Overview Of Ground Levels And Land Raising Around The Docks In The MDC4 Area, January 2008

Crossrail, MDC4 Archaeology DDBA Plumstead Portal Package Specific WSI Deliverable — 2008.

Crossrail (Martin Bates), 2008, Geoarchaeological Deposit Model (Untitled)

Crossrail, MDC4 Archaeology Monitoring Of Ground Investigations, Borehole Package 20, February 2009

Crossrail (MOLA), Enabling Works, Plumstead Portal, Geoarchaeological Monitoring of Utilities Trial Trenches at White Hart Depot, June 2010

2.5 Fieldwork completed to date

Boreholes and trial pits in GI Packages 10 and 20, and utilities trial trenches at the location of the portal headhouse, have been monitored by MOLA geoarchaeologists (Crossrail 2006b, 2009a, 2010). The results have been used in this WSI, and will be used to update the deposit model (**Error! Reference source not found.**).

Preliminary NLBH assessment has been conducted by MDC4, but did not include determining the level of recording required for various structures (see 5.2)

2.6 Consultation and monitoring

2.6.1 Consultation to date

The external consultees for this WSI are the GLAAS (Greater London Archaeology Advisory Service) Archaeology Advisor for the LB of Greenwich, currently (October 2010) Mark Stevenson, and the English Heritage Regional Science Advisor, currently Rachael Ballantyne. They were consulted over the content of this WSI on 22 October 2010, and were satisfied with the mitigation.

2.6.2 Future consultation

Following (or during, see below) the NLBH Assessment, the GLAAS Archaeology Advisor will be consulted over the mitigation methods to be determined during that visit. Given the critical timing of the Assessment and subsequent recording, Archaeology Advisor Mark Stevenson has kindly offered to accompany the visit, in order that the mitigation can be determined and consulted on at the same time, saving programme time. This will be arranged if at all possible.

Following the updating of the geoarchaeological deposit model with the results of recent GI monitoring (see **Error! Reference source not found.** and 5.3.1), the external consultees have been consulted over the detailed layout and design of the archaeological excavation trenches. Mark Stephenson of Greater London Archaeological Advisory Service (GLAAS) has approved the approach (email 11 July 2011).

The external consultees shall be informed in writing at least one week in advance of commencement of fieldwork.

The Project Archaeologist shall arrange and convene monitoring site visits by the external consultees, as appropriate. There shall be no unauthorised access to the works in any other circumstances. Any visits to the works shall be in accordance with the Principal Contractor's health and safety, site access and security requirements. Arrangements for GLAAS monitoring of the archaeological works will be made following the above consultation.

Periodic updates on the progress of the Crossrail archaeology programme shall be submitted to the external consultees by the Project Archaeologist. The Archaeology Contractor shall provide information to the Project Archaeologist as requested to inform this reporting.

2.7 Geology and Topographical Setting

The Plumstead portal site is situated on the alluvial floodplain of the River Thames, close to its southern edge. The floodplain sands and gravels deposited during the Pleistocene, approximately 2,000,000 to 10,000BP, during which the Thames was a fast flowing braided river, formed of interconnected channels interspersed with higher sand and gravel bars. These floodplain gravels form the 'Holocene Template' on which Mesolithic activity would have taken place, the areas around channels and lakes providing resources attracting a hunter-gatherer population.

During the early Holocene sea levels rose and lower lying areas were inundated. By the time of the Mesolithic/Neolithic transition, approximately 4,000BC, the level of the Thames is likely to have risen to approximately 97m ATD. From the Later Neolithic the braided channels gradually silted up and, combined with the rising sea levels, the conditions were conducive to peat formation. The landscape became predominantly marshland, which was crossed by the Thames as a single meandering channel. These changing conditions have resulted in a deep sequence of alluvial deposits overlying the floodplain gravels.

The current (2006) revision of BGS digital mapping does not show Head deposits (which have potential to contain Palaeolithic remains) extending to the Plumstead Portal site, unlike earlier versions. This is confirmed by geoarchaeological monitoring of Crossrail ground investigations (Packages 10 & 20, Crossrail 2006 & 2009a).

The topography and likely depth of deposits of archaeological interest in the location of the works is considered below. For deposits lying above the later alluvium and recorded in the boreholes as made ground, it is not possible to accurately predict what depth of this may be of archaeological interest and what is modern material. However, in locations where levels suggest there has not been land-raising associated with the construction of the railway embankment and the White Hart Depot, it is assumed that in general there is at least approximately 0.5m of modern disturbance lying above any earlier deposits.

2.7.1 Plumstead Portal

The railway runs along an embankment up to 3.5m high, at the eastern end of the portal, at *c* 103.5 to 104.0m ATD. At the western end of the portal the embankment is approximately 1.5m higher than the ground to the south of the railway and approximately 3.5 higher than the ground to the north. The ground level prior to any land-raising associated with the construction of the railway embankment is likely to have lain at approximately 100 to 101m ATD.

At the western end of the portal, in the vicinity of the TBM launch chamber, it is predicted that the base of archaeological deposits, represented by the floodplain gravels, lies at approximately 99 to 100m ATD, representing a higher gravel 'island' within the floodplain which is likely to have been dry land throughout much of prehistory. Across the remainder of the portal gravel was generally recorded at levels between 97 and 98m ATD, overlain by a depth of up to 3m of peat and alluvial deposits. These lower areas are likely to have become inundated by approximately 3,600BC. To the east of White Hart Road, borehole data is relatively sparse, and further topographic features such as unrecorded gravel islands may exist in this area.

2.7.2 Plumstead/Old Goods Yard

The main Plumstead Portal worksite/compound (Plumstead/Old Goods Yard) is an existing railway depot to the west of White Hart Road. Existing ground levels lie at approximately 102.5 to 103.5m ATD, but fall to approximately 101m ATD in the east, adjacent to White Hart Road. The western part of the railway depot appears to have been raised up to the same level as the railway, by at least approximately 1m, and up to 2 to 2.5m. The underlying deposits in the west of the compound are likely to be similar to those in the west of the portal. The extreme west of

the worksite may begin to encroach into a marginal zone adjacent to the higher ground at the edge of the floodplain. In the east of the worksite the floodplain gravel has been recorded at approximately 98.7m ATD, possibly representing the western edge of a high gravel island within the floodplain.

2.7.3 White Hart Depot Worksite

The White Hart Depot Worksite forms the east worksite/compound, to the east of White Hart Road. Existing ground level within the worksite lies at approximately 100.5 to 101m ATD adjacent to White Hart Road, but rises to the east across the White Hart Depot Worksite area, to a maximum of approximately 103.8m at the eastern limit of the compound. It is possible that land in the eastern part of the compound has been raised to bring it level with the railway embankment. To the west of the White Hart Depot and adjacent to the railway, floodplain gravel was recorded at approximately 99 to 100m ATD and alluvial deposits at approximately 100 to 100.5m ATD, overlain by *c.* 0.5m of made ground. Towards the eastern end of the compound floodplain gravel was recorded at approximately 97.5m ATD, overlain by 3m of alluvium and peat. Elsewhere the underlying deposits cannot be predicted in detail, but are likely to be similar to those described for the portal.

2.8 Archaeological and Historical Development of the Site

This section provides a brief overview of the archaeological background of the study area, and presents a summary of the results of the Detailed Desk Based Assessments (DDBA), submitted in January 2008, which should be referred to for further details; 'Detailed Desk Based Assessments (DDBA) for Plumstead Portal' (doc no. CR-SD-PRW-X-IS-00003 Version 1.0).

The site lies outside a designated Area of Archaeological Potential, which is located approximately 160m to the south of the works. No scheduled ancient monuments are situated within the site, although it does contain a listed building: the White Hart Depot, which is beyond the remit of this report.

2.8.1 Prehistoric Period (*c* 500,000 BP to AD 50)

The site is no longer considered to have potential for Palaeolithic remains, see section 2.7.

Within the floodplain, Mesolithic peat deposits have been recorded approximately 1km to the north of the site, and a small number of Mesolithic flint tools have been found in the Woolwich area. Mesolithic occupation such as makeshift camps may have existed on the higher sand and gravel islands, with fishing and other activities being carried out adjacent to and within the surrounding stream channels.

A high gravel island appears to extend from the eastern half of the main worksite, construction compound, to the western boundary approximately 150m from the portal/TBM launch chamber. This has the potential for dry-ground Mesolithic activity, such as lithic scatters. In other areas of the portal, further refinement of the geoarchaeological deposit model is necessary in order to assess likely locations for Mesolithic activity, such as areas adjacent to stream channels. Alluvium of Mesolithic date was also recorded in boreholes in the vicinity of the portal. Remains such as fish traps, weirs and boats may survive within these deposits in the river channels.

During the Neolithic the area became marshland, and although little evidence for Neolithic and Bronze Age occupation has previously been identified in the vicinity of the site, there is potential for occupation of the higher, drier areas within the marsh, such as potential for earlier Neolithic activity on the 'island' identified within the western approximately 100m of the portal/TBM launch chamber. These would have been linked by timber trackways across the surrounding marshy

areas. Two phases of Neolithic timber platforms (or possibly trackway) have recently been excavated at Belmarsh Prison West, *c* 300m north of the portal site (Hart 2010), confirming the presence of prehistoric activity in the vicinity of the site.

2.8.2 Roman Period (AD 50 to 450)

Any evidence for Roman activity is likely to be limited to evidence for land-reclamation land/water-management. Roman activity and occupation appear to have been concentrated on the higher, drier ground further to the south of the Crossrail route.

2.8.3 Medieval Period (AD 450 to 1540)

Potential medieval remains within the Plumstead portal sites include land reclamation and agricultural features, such as drainage ditches, embankments and field systems. Such features may be associated with the late Saxon and medieval village of Plumstead, which lay approximately 400m to the south of the Crossrail route. However, a recent watching brief on utilities trial trenches at the location of the western end of the portal recorded alluvial deposits as high as 0.5m below current ground level, suggesting limited potential for remains post-dating reclamation of the area.

2.8.4 Post-medieval (AD 1540 to 1900)

The Crossrail route passes through what was, until the nineteenth century, open land between Plumstead Village and the marshes to the north. Therefore there is potential for features relating to this rural landscape such as embankments, drainage ditches, and field systems. Industrial features such as gravel quarry pits and evidence for brick making may also be present. The NKL was opened in 1849, and is therefore to be regarded as railway archaeology, should any original features survive, however this appears unlikely.

2.8.5 Modern (AD 1900+)

Situated within the Plumstead portal east worksite, the Grade II listed White Hart Depot was opened as an incinerator/electricity generating station in 1903 and later used as a council depot. Features associated with the building such as cobbled surfaces, a gatehouse and narrow-gauge railway tracks are not included in the listing description, but are included in this document.

2.9 Past Impacts

In general, there is likely to have been few past impacts on archaeological remains within the Plumstead portal site. Predicted past impacts include:

- possible topsoil removal beneath the existing railway embankment and White Hart Depot, and beneath a disused twentieth century railway to the east of the White Hart Depot;
- although considered to be industrial archaeology in their own right, structures and surfaces associated with the White Hart Depot, and the listed building itself, may have had an impact on earlier remains; and

- late nineteenth and twentieth century housing to the south of the railway may have had an impact on earlier remains in areas where service diversions may take place.

There is likely to have been very little past impact on archaeological remains north of the railway and to the east of the White Hart Depot, which had been open land into the Twentieth Century. In this area there is probably only approximately 0.5m of disturbance overlying archaeological remains.

2.10 Deposit Survival

The deposit model has refined the interpretations of the deposit sequence within the portal footprint gathered from earlier monitoring work and the previous model. The model has determined that the portal lies within an area that could be considered an ecotonal zone of the floodplain. The majority of the portal covers a large palaeochannel (LZ3) flanked either side by the extensive wetlands of the Thames floodplain (LZ2). Possible tidal creeks may be cutting through these peat wetlands at the far eastern and western ends of the portal. The ecotonal landscape position is determined by the close proximity of the elevated Tertiary deposits (LZ1) which appear to occur towards the west and south of the portal.

Although the possibility of dryland occupation is generally low within the area of the portal footprint itself, the large watercourse would have been a dominant feature in the prehistoric landscape and provided an important route of access into the outer wetlands and into the wider Thames basin, especially given the close proximity of the valley sides that provided dry areas of ground suitable for occupation and settlement. Therefore the probability of encountering timber structures and artefacts constructed to utilise, exploit and manage this watercourse should be regarded as significantly higher than in other wetland and channel areas located further out into the wetlands. For a detailed assessment of the geoarchaeological potential please refer to the Geoarchaeological deposit Model.

2.11 Archaeological Potential

The site is no longer considered to have potential for Palaeolithic remains, see section 2.7.

There is a moderate potential for prehistoric activity as follows:

- for Mesolithic activity in areas of the floodplain adjacent to stream channels or lakes, and for remains such as fish traps and possibly boats within the alluvium deposited at the base of the channels;
- for Mesolithic and early Neolithic activity on high gravel ‘islands’; and
- for Neolithic/Bronze Age wetland remains such as timber trackways or platforms preserved within peat deposits, see Section 2.8.1 for locations where such deposits are expected.

There is a high potential for supporting palaeo-environmental sequences across the site.

There is a low potential for evidence of Roman activity, land reclamation/management, and for medieval land reclamation and agricultural features.

There is moderate potential for post-medieval activity, particularly for agricultural and land/water management, and for gravel and brick quarry pits, and possibly railway archaeology features associated with the NKL.

The known above-ground industrial archaeology remains associated with White Hart Depot form part of the curtilage of that Grade II Listed building, and are covered by separate procedures and documentation.

2.12 Importance

Any well preserved evidence of prehistoric occupation, such as timber trackways, would be of high importance, but preservation by record is considered appropriate mitigation (consultation meeting with English Heritage (EH) and Greater London Archaeology Advisory Service (GLAAS), 28 July 2004).

The majority of the potential archaeological remains within the site are likely to be of moderate importance if extensive, well-preserved remains are present. Less well preserved, or less extensive remains, and the remains of any post-medieval quarry pits, are likely to be of low importance.

3 Construction Impact Summary and Outline Mitigation Design

3.1 Crossrail contract numbers

- C156 Plumstead Portal design: Capita Symonds
- C122 Bored tunnels design, including ground treatment at Plumstead Portal: ARUP/Atkins
- C310 Plumstead Portal Construction – Portal site preparation, portal and tunnel construction
- C335 Plumstead Fit-Out
- C263 Archaeology Late East (archaeological contractor)

3.2 Construction Impact Summary

The following sections describe the impacts of the detailed design at RIBA Stages F.

The proposed portal works consist principally of the tunnel entrance (eye), including the TBM launch chamber, approached by the tunnel ramp. There will also be two construction compounds (worksites), comprising two main areas service diversions and diversion of the NKL (the latter undertaken by Network Rail).

3.2.1 The Portal

The main potential impact of these works is the excavation for the portal, which consists of a *c* 430m-long, *c* 15m to 20m wide portal ramp sloping down from ground/embankment level at the eastern end.

The main elements of the portal structure are (from west to east): an attenuation tank, a headhouse structure located over the TBM launch chamber and partly extending west of the portal headwall, and a cut and cover ramp section (comprising diaphragm/secant piled walls, also tension piles, roof and base slabs), and 60m-long flood walls.

The portal structure comprises two principal forms of construction: the deeper western cut and cover section (*c* 193m long, incorporating the TBM launch chamber and headhouse), uses diaphragm walling, and the eastern, shallower covered retained cut uses secant pile walls (*c* 179m long, including part of the flood walls). The remaining 60m of the floodwalls is constructed on CFA piling.

Construction of the portal will consist of diaphragm walling (constructed using guide walls and capping beams) and sheet pile walls, followed by excavation of portal ramp.

See the following plans in Annex 2:

- portal plan and headhouse structure and profile: dwg nos C156-CSY-S-DDL-CR148_PT005-00051 and C156-CSY-S-DDL-CR148_PT005-00052
- portal cross section : C156-CSY-A-DDB-CR148_PT005-20206 Rev. P04
- head house cross-section and plan: C156-CSY-A-DDB-CR148_PT005-18012 Rev P03

The works likely to have an impact on possible archaeological remains comprise:

- Guide wall trenches (*c* 1.5m deep) and capping beams (*c* 1.3m deep) for the diaphragm walls
- Excavation for the diaphragm walls
- Piling, including the secant piled walls, CFA piles for the flood walls, and tension piles within the base of the portal/ramp
- Excavations for the portal ramp and headhouse within the diaphragm and secant walling (see below)
- Ground treatment (grouting) for a distance of approximately 15m to the west of the portal, which will involve rotary coring with mixing grouting into the soils
- Excavation for the attenuation tank to the west of the headhouse extension

The portal will completely remove archaeological remains within its footprint, including the TBM launch chamber, except for the eastern *c* 75m where it rises above the pre-railway embankment ground level; see section 2.7 for predicted deposits. Excavation for the attenuation tank will partially remove archaeological remains within its footprint.

The headhouse extension west of the portal is located in the area that will have previously been disturbed by grouting (and the TBM launch chamber), and will have no additional impact.

3.2.2 Utilities Diversions

The Marmadon Road surface water sewer (west of Church Manor Way, at the rear of 101 Marmadon Road), will be diverted. This has potential to partially or completely remove archaeological remains, see dwg no C156-CSY-S-DDA-CR148_PT005-00021 Rev P01 in Annex 2.

Power supply diversions for the TBM will be less than 1.0m deep, and are therefore unlikely to have an impact on potential archaeological remains.

There are no other utilities diversions.

3.2.3 Worksites

The worksites (construction compounds) are comprise two areas located either side of White Hart Road:

- the Plumstead Portal East Worksite (east of White Hart Road, and containing the listed White Hart Depot, and therefore known as the White Hart Depot Worksite), and
- the Plumstead Portal West Worksite (west of White Hart Road, also known as Plumstead/Old Goods Yard).

The location of the worksites are shown on dwg nos C156-CSY-A-DDB-CR148_PT005-10601 Rev P04, C156-CSY-A-DDB-CR148_PT005-01602 Rev P04 and C156-CSY-A-DDB-CR148_PT005-01607 Rev P04 in Annex 2.

Works such as footings for the slurry handling plant in the West Worksite, and other structures in both construction compounds, have potential to partially remove potential archaeological remains in the made ground , depending on their depth and the depth of modern made ground

at their location. This will have to be re-assessed from the contractor's final design and methodology.

Impacts at the work sites may result from works requiring excavation more than approximately 1m below the existing ground level, and considerably more where works take place on the artificially raised areas of the West Worksite. However, the works involve general ground reduction (assumed *c* 0.5m) penetrating more than approximately 1m below the existing ground level footings, eg those for compound accommodation (assumed *c* 0.4 to 0.8m), and Bentonite plant (currently assumed *c* 0.5 to 0.9m deep). None of these works are likely to remove potential archaeological remains.

The East Worksite, White Hart Depot, is the site of a Grade II listed electricity generating station, which was converted into a council depot and is currently unoccupied. It is proposed that the depot is not used by the contractor. An area to the east of the council depot will be used for site offices, parking, storage, fabrication and material handling facilities. In accordance with the Crossrail Generic WSI, listed buildings are assumed to be excluded from the scope of the site-specific WSIs since they are the subject of separate agreements with the Local Planning Authority (LPA)/English Heritage.

3.2.4 Diversion of the North Kent Line

Diversion of the NKL is designed and will be undertaken by Network Rail. It, and any associated embankment widening, may have an impact on archaeological remains. It is considered likely that excavations off the existing embankment may have an impact, such as track drainage or widening of the embankment.

To the north of the portal, between approximate chainages 91985 to 92050, transition structures will be required where the NKL approaches and then passes over the portal structure. The transition structures are piled slab structures and are tied into the portal structure.

[*Potential impacts to be determined by the Network Rail Design Archaeologist*].

3.3 Outline Mitigation Design

The overall mitigation strategy for the site is preservation by record. However, preservation in situ is the preferred strategy for features associated with the Grade II listed White Hart Depot (the subject of a separate mitigation design and listed building agreement with the local authority). It may also be possible for any other localised historic features within the construction compounds, in particular, the West Worksite (Old Goods Yard). Wherever possible, permanent impacts to heritage resources from temporary works should be avoided.

A **non-listed built heritage assessment** will be carried out by the Contract Archaeologist (C263), to complete the existing part-survey by assessing and identifying the appropriate level of **NLBH recording** to be conducted (see 5.2).

Further works by the Archaeological Contractor (C263) include:

Archaeological **excavation of three sample areas** in advance of construction, based on the results of the revised deposit model, within the portal footprint (see figure 3).

The areas of the portal outside the archaeological excavation areas will require a **Targeted Watching Brief (**subject to excavation results).

General Watching Briefs will take place during the construction of the guide walls and capping beams, for utility diversions, and for any works with potential for impacts within the construction

compounds. A **Targeted Watching Brief** will be required for works associated with the Marmadon Road Sewer.

The mitigation for impacts from the NKL diversion is *to be determined by the Network Rail archaeologist*.

4 Research Design Objectives of the Investigation and Research Aims

4.1 Aims of Proposed Investigation

The purpose of the Non-Listed Built Heritage Survey was to identify historic structures within the Goods Yard (west worksite), to determine appropriate mitigation measures where impacts have been identified.

The overall aims of the sample excavation will be to investigate, record, and take environmental and geoarchaeological samples from, a proportion of the portal. These sample areas will be targeted on a selection of the different horizons within the deep alluvial sequence, see section 5.3.1.

The aims of the watching briefs will be to investigate, record, and where appropriate sample, any archaeological remains encountered by works where the extent of the impact is limited, and/or there is only a low potential for the works to encounter archaeological remains. Watching briefs will also be used for areas of the portal not included in the sample excavations. Foci for the targeted watching brief are listed in section 5.3.4. The watching briefs may include geoarchaeological recording and sampling.

4.2 Site-specific Research Aims

The following site-specific research aims can be outlined for the proposed investigations at the Plumstead portal site:

- What is the development of the local landscape and topography of the Thames floodplain from prehistory to the medieval period? At what level are any peat deposits present and at what date did they form? Is there evidence for stream channels, lakes, etc in the flood plain gravel surface?
- Is there any evidence for prehistoric activity? if prehistoric remains are present, what is their character and what can be learned about the exploitation of the floodplain by prehistoric groups? In particular, is there any evidence for Mesolithic activity at the base of the alluvium/surface of the gravels? Is there any evidence for timber trackways or other structures of later prehistoric date?
- Is there any evidence for Roman activity? If so, is this confined to stray finds or is there evidence for occupation and land reclamation/land management?
- What can be learned about the processes of medieval land reclamation and land management? Can any evidence for medieval activity be associated with the village of Plumstead to the south?
- What is the nature of any evidence for post-medieval activity? Is there any evidence for industrial activities, such as quarry pits?
- Are any remains of early railway infrastructure present, associated with the construction of the NKL in the 1840s?

4.3 Relevant Regional Research Aims

In addition to the site-specific research aims, the site has potential to address several regional research aims identified in the regional research agenda: 'A Research Framework for London Archaeology' Museum of London, 2002. These have been generally identified in the technical note on the Assessment of Archaeological Impacts, 2005. The regional research themes considered relevant (page numbers in brackets) are:

- Understanding the relationship between landscape, river and settlement, and the influences of the Thames in particular on communication and social interaction (79);
- understanding the significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetation and faunal development, on human lives (79);
- understanding London's hydrology, river systems and tributaries particularly the role of the Thames (as boundary, communication route, resource, ritual focus etc) in shaping London's history, and the relationships between rivers and floodplains (79);
- Understanding the relationship between the Bronze Age wooden trackways and the settlement to which they presumably led, and what the trackways represent in terms of woodcraft and woodland management (81);
- Understanding the nature and meaning of the deposition of metalwork in the Thames and at the headwaters of river tributaries (79); and
- Identifying the industries that especially represented London (74).

5 Scope of the Investigations

The construction tasks, archaeological mitigation, and programming details are summarised in Table 3 at the end of this section. The location of archaeological trenches are shown in Figure 3 and the archaeological watching brief areas are shown on Figure 4.

The overall mitigation strategy for the site is preservation by record. However, preservation *in situ* is the preferred strategy for features associated with the Grade II listed White Hart Depot. It may also be possible for any other localised historic features within the construction compounds (eg in the West Worksite).

5.1 Introduction

The overall mitigation strategy for the Plumstead portal site is preservation by record. However, if historic structures are identified within the construction compounds by the non-listed built heritage assessment, preservation in situ may be appropriate for individual features, for instance, if individual works can be relocated away from localised structures.

The new digital geoarchaeological deposit model (see 2.3), has been used to locate the mitigation trenches (see 5.3) and focus the sample excavations.

Trench evaluation will take place in two phases. The first phase will take place before construction of the diaphragm walls in order to allow progress of the Portal. Two sheet boxed trenches will be dug by the principal Contractor (C310) under supervision of the Contract Archaeologist (C263). Following completion of these trenches, and in the event of significant archaeological deposits being located, these deposits will be investigated at a later date after the construction of the diaphragm wall.

A third trench will be dug in a second phase of archaeological evaluation, following construction of the diaphragm wall due to practical and safety issues involved with shoring of this deeper trench.

5.2 Non-listed Built Heritage (NLBH) Assessment and Recording

Non-listed built heritage (NLBH) assessment and recording forms part of the archaeological mitigation strategy for Crossrail. The definition of non-listed built heritage adopted follows Information Paper D22 Archaeology and Crossrail Generic WSI (doc. No. CR-PN-LWS-EN-SY-00001), and includes:

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

NB buildings or infrastructure associated with the listed White Hart Depot are considered to part of its curtilage, and therefore fall under the separate listed building documentation.

Preliminary Non-Listed Built Heritage and Street Furniture assessment was undertaken by MDC4 in order to identify any non-listed built heritage which could be affected by the Enabling Works at the Plumstead worksites. Photographs of the features within the Plumstead worksites are shown in Table 1 and Table 2. The preliminary assessment has identified, as appropriate, where further assessment is required to determine the need for, and where possible the likely level of, mitigation works in advance of demolition (levels of recording are to be determined in further NLBH Assessment, see below).

The results of the preliminary Non-Listed Built Heritage assessment are reproduced in Table 1 and Non-listed Street Furniture including Railway Infrastructure in Table 2. Some buildings and structures have been included that lie adjacent to the worksites and where there remains a question as to impacts upon them. The White Hart Depot and adjacent former railway sidings were both fully accessed for site inspection. For the Old Goods Yard to the west of White Hart Road, significant views were afforded from the top of the southern outfall sewers running on the embankment adjacent to the northern boundary of the Old Goods Yard. Significant views of this site were also afforded from White Hart Road itself.

Mitigation was recommended in a number of cases (where required), and has entailed suggestions for preservation by record.

Where possible, extra photographs have been made by the Contract Archaeologist (C263) during the NLBH Assessment visit, in order to constitute an EH Photographic Record or Level 1 record for features for which this is considered the appropriate level of mitigation. This has completed the fieldwork required for recording. Such records can subsequently be used by the archaeological contractor to contribute to the fieldwork report required for the NLBH recording.

Wherever possible, preservation in-situ would normally be preferable, eg any impacts on discrete localised features within the temporary construction compounds could be removed by redesign of the local layout, and appropriate protective measures, to form preservation in situ.

Table 1 Non-listed Built Heritage (NLBH) at Plumstead Portal worksites

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
Network Rail electricity sub-station on west side of White Hart Road		Rectangular (in plan and elevation) red brick-built structure with double window bays on east and west elevations and triple bays on north and south elevations. Large roller door on west side of the building. Some stone included in fabric on window ledges. Situated within own curtilage and not physically associated with White Hart Depot.	Not listed. The building is of interest owing to its civil industrial heritage, and its likely relationship with the listed White Hart Depot on the opposite side of the road. Of likely local heritage value	Not to be included in worksite. This is an operational Network Rail substation and is retained. There will be possible impacts during construction from vibration, to be assessed by main contractor	Not required as no impact.
Building adjacent to North Kent Line (NKL) to the west of White Hart Road, within the Old Goods Yard.		Flat-roofed brick-built structure associated with the electricity substation above. Only partially visible from road. Architecture reminiscent of industrial buildings in late 19th and early 20th centuries. Unknown function.	Non-listed structure. Of likely local heritage value, given industrial/ transport associations	Lies along proposed Crossrail route. This building is to be retained.	Not required as no impact.

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
Within the Old Goods Yard.		Late 20th century brick and concrete construction. Bricks laid in regular alternate header-stretcher courses (English bond). Commercial workshops/loading bays on the west side of the building.	Non-listed building of little architectural or historic merit	Uncertain. Possibly to be cleared in advance of worksite establishment	None merited
Within the Old Goods Yard.		Composed chiefly of corrugated iron sheeting over a steel frame. The base of the walls are composed of red brick.	Non-listed industrial building – potentially railway related and of 20th century date – possible former engine shed. Of little architectural merit but possible local industrial/historical significance due to railway association	Likely to be cleared in advance of worksite establishment	If affected: Standing building recording required prior to establishment of worksite. Further closer inspection (including internal) required prior to deciding level of work necessary. [*Level of recording to be determined in further NLBH Assessment*]

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
At the west end of proposed worksite west of White Hart Road		Rectangular building chiefly composed of corrugated iron sheeting over a concrete frame. Lower walls composed of orange brick.	Likely railway engine/ wagon shed of 20th century date. Of little architectural merit but possible local industrial/ historical significance	Likely to be cleared in advance of worksite establishment	Standing building recording required prior to establishment of worksite. Would warrant a basic level of building recording (Level 1 or 2) to English Heritage standards. [*Level of recording to be determined in further NLBH Assessment*]
Pavilion on Sports Ground adjacent to White Hart Depot Worksite railway sidings.		Sports pavilion situated over 20m from the edge of the former railway sidings. Structure seems mounted on a low brick wall and is composed of black and white boarding on the exterior with a sloping felt roof, possibly over an internal timber frame.	Of local value as a recreational building serving a social value.	Not to be impacted by the works, but possible temporary impact on its setting during duration of Crossrail works.	None required.

Name	Image	Description	Significance	Impact	Mitigation/Further Investigation
Stands near south west corner of sports ground. Abuts northern edge of former railway sidings.		Rectangular (in plan) corrugated iron shed with the walls painted black and white to give the appearance of wooden construction. Roof inclined in one direction with single entrance on eastern side. Possible former doorway on north wall which has been blocked up with 'chicken wire' fencing.	Of no architectural merit. Possible local historical merit through its social function and 'pre-fab' build.	Unlikely to be any, considering it lies outside of former railway sidings.	None [but if worksite activity impacts on the structure a basic photographic and written record would be appropriate].

Table 2 Non-listed street furniture including railway infrastructure at Plumstead Portal worksites

Name	Image	Description	Significance	Impact	Mitigation/ Further Investigation
Underneath NKL railway bridge on White Hart Road		Stepped stone kerbstones dividing highway from pavement. Longer and larger kerbstones set in a single course and are raised approximately 3 cm above the surface of the road. This course surmounted by a single course of smaller kerbstones, the top of which are level with the surface of the pavement. The kerbstones appear rather worn in places.	Possible local heritage significance	Possible adverse impacts (increased wear and tear) from contact with increased traffic and heavy plant along section of road. Partial removal of a section of them in advance of Crossrail construction	A basic level of building recording to preserve these features by record. [*Level of recording to be determined in further NLBH Assessment*]
Disused railway tracks by the southern boundary of White Hart Depot Worksite		A short, truncated, section of railway lines mounted on a concrete platform. Partially overgrown. Date uncertain.	Locally significant railway heritage. *Located within the curtilage of the Grade II listed White Hart Depot*	Removal during enabling works	Recommend appropriate level of building recording prior to removal in order to preserve the features by record. [*Level of recording to be determined in separate listed building documentation*]

Name	Image	Description	Significance	Impact	Mitigation/ Further Investigation
South side of White Hart Depot		Remnants of upright steel posts set in concrete. They are likely to have formed part of the structures present on the south side of the proposed worksite at White Hart Depot.	Negligible significance – no architectural and little historic merit	Likely removal as part of enabling works	None
South side of White Hart Depot		Concrete pad footing for demolished structure at southern side of White Hart Depot. Rectangular in shape and protruding above the existing ground surface by approximately 5cms at west end. Tile/carpet impressions on the surface of the concrete denoting what was once an internal floor surface.	Negligible significance owing to current form.	Likely removal as part of enabling works	None

Name	Image	Description	Significance	Impact	Mitigation/ Further Investigation
Southern edge of White Hart Depot.		Small square structure composed of regular 'stretcher' courses of orange brick with a flat concrete roof. Wooden doorframe present but no door. Internal features comprise metal box fittings to the rear wall and associated wiring. Appears to be a redundant feature.	No architectural merit but within curtilage of listed building. Possible local significance with likely association with White Hart Depot or the NKL	Likely removal as part of enabling works	Basic photographic and written recording prior to removal in order to preserve by record. [*Level of recording to be determined in separate listed building documentation*]
Located at far eastern end of White Hart Depot within former railway sidings.		Collection of large concrete blocks presumably marking the limit of the former railway sidings. Rectangular in plan and chiefly (though not exclusively) composed of five concrete segments. Iron hoops, hooks and bars are set within the concrete.	Little aesthetic or architectural merit, but minor significance can be attached to these structures as they form part of the historic NKL railway sidings	Likely removal as part of enabling works	Basic photographic and written recording prior to removal in order to preserve by record [*Level of recording to be determined in separate listed building documentation*]

Name	Image	Description	Significance	Impact	Mitigation/ Further Investigation
West end of Old Goods Yard.		Located just outside of Old Goods Yard. Timber telegraph pole with affixed metal 'hooped' ladder running up its eastern side. Other small metal fittings present along with a cable. Does not appear to carry any overhead cables from other poles and is presumed to be currently redundant. Unknown date.	Of local heritage value given its association with the Old Goods Yard.	Not likely to be affected by the worksite given its position	None [but if worksite activity impacts negatively on the structure a basic photographic and written recording would be appropriate, prior to removal]
Just outside Old Goods Yard on southern side of southern outfall sewer.		Iron railings, chiefly composed of pointed metal uprights slotted through metal cross-piece. Larger steel uprights present at northern end and in the middle. Appears to have been truncated, perhaps to open up Ridgeway public footpath. There are gaps in the railings in the remaining section. These could be of 19th/early 20th century date	Of local heritage value – civic/industrial associations	To be removed as part of Crossrail construction	Basic photographic and written record prior to removal in order to preserve by record. [*Level of recording to be determined in further NLBH Assessment*]

Name	Image	Description	Significance	Impact	Mitigation/ Further Investigation
Heavily vegetated portion of Old Goods Yard.		Timber telegraph pole with metal 'hooped' ladder running up its eastern side. Metal fittings present at top of the pole intended to convey wires. Presently appears redundant	Some minor local heritage significance through association with railway at the Old Goods Yard	Likely to be removed during worksite establishment	Basic photographic and written record prior to removal in order to preserve by record
West end of the Old Goods Yard.		A series of disused railway lines at the west end of the Old Goods Yard	Minor local heritage value in connection with railway heritage. Possibly date to 20th century	Likely removal during enabling works	Basic photographic and written record prior to removal in order to preserve by record

5.3 The Portal

Mitigation for the portal will comprise four phases of archaeological work:

- C263 Archaeological excavation of sample areas prior to portal construction
- C263 General Watching Brief on the guide walls and capping beams for the diaphragm walls
- C263 Targeted Watching Brief on excavation of the remaining areas of the portal
- C263 General Watching Brief on excavations for the attenuation tank

The areas of the watching briefs are shown on Figure 4 in Annex 1. The locations of the archaeological excavation trenches are located on figure 3 in Annex 1.

This mitigation is considered to mitigate the potential impacts of all portal construction, including grouting and piling. This includes the *c* 15m-long area of grout mixing immediately west of the portal, for which no mitigation is practicable, because of the methodology (see 3.2.1). Similarly, piling (tension piles and secant pile walling etc) will not be monitored or otherwise mitigated separately from the overall portal construction; the arisings are unlikely to produce any useful archaeological data additional to that which will be obtained from the guide walls and capping beams and main portal excavations.

No mitigation measures are proposed for any potential dewatering effects. Within the portal, the majority of any remains will be excavated or removed with the alluvial sequence (except at the shallower western end), and it would not be possible to access any areas of deeply buried deposits outside the portal.

5.3.1 Archaeological excavation of sample areas prior to Portal construction

Given the length of the portal it is not proposed to excavate the entire footprint of the portal archaeologically. Instead, the revised geoarchaeological deposit model has been used to target archaeological excavation trenches in areas of the portal footprint with higher archaeological potential for differing archaeological horizons. This has also taken into account the practicalities of the site (eg the archaeological excavation areas is restricted to the northern side of the portal, as the southern part will lie beneath the NKL embankment). These will be required to be excavated while the NKL is still running.

The remainder of the portal (including any strata *below* the designated horizons within the sample areas) would be covered by Targeted Watching Brief (TWB).

The archaeological excavation of sample areas will comprise three trenches with two sheet boxed trenches being dug initially. The diameters of both will be 20 x 4 with the first being dug to a depth of 3 metres. The second will be dug to a depth of 4 metres (see figure 3 in Annex 1).

These are situated to target:

- The area of higher gravel at western end of portal, with potential for activity and occupation from the Mesolithic and early Neolithic periods. (surface 1.4–3.0m below ground level)
- The Neolithic/Bronze Age peat horizons around interface with LZ2 and LZ3, which have potential for timber structures such as jetties or trackways, such as that recently reported *c* 300m north of the portal site (see 2.8.1). (Peat: surface *c* 1–2m below ground level, base *c* 3–4m below ground level).

- Potential floodplain gravels and base of the alluvium adjacent to any Mesolithic channels, however these deeply buried horizons lie where the portal works are shallow at the eastern part of the ramp and this will be confirmed from the revised digital deposit model.
    - NB modern GL *c* 1.0–2.0m OD.

5.3.2 General Watching Brief on Guide walls and Capping Beams

A General Watching Brief by C263 will monitor and record archaeological remains exposed by the grubbing out of obstructions, the excavation of the *c* 1.5m deep guide wall trenches for the diaphragm walls, and the *c* 1.3m-deep capping beams by C310. Parts of these works will not require monitoring, where they will be excavated from embankment levels high enough to prevent them disturbing levels more than *c* 1m below adjacent, unmodified, ground levels, see Figure 4 (eg the southern side of the portal west of approximately CH92000). The precise extent will depend on minor variations in the local topography, and will have to be determined on site. Secant walling for the eastern part of the portal does not require mitigation.

The subsequent excavation of the diaphragm wall trench will be conducted beneath Bentonite (clay slurry to temporarily support the trench). No mitigation is possible for the diaphragm walls, as the Bentonite will prevent observation of any archaeological deposits. However, the same deposits will be seen over much larger areas during the archaeological excavation of sample areas and the TWB during main ground reduction for the portal, and the loss of information is likely to be minimal.

5.3.3 Trenched archaeological evaluation after installation of Diaphragm walls

The final evaluation trench will be dug in the western area predicted to be the interface between LZ2 and LZ3. This trench will need to be shored due to its depth and nature of the buried geology in the area. Dimensions are proposed to be 20 x 4 x 6m, depth will be limited to the depth of the portal construction. (see figure 3).

This area contains a moderate to high potential for timber structures and artefacts associated with river management and exploitation and will also contain a high level of palaeoenvironmental potential. This location covers the Marmadon Road sewer so the trench will need to be large enough to capture untruncated and undisturbed buried surfaces in order to effectively record the archaeological and geoarchaeological sequence.

5.3.4 Targeted Watching Brief within Portal excavation

A Targeted Watching Brief by C263 will monitor the C310 Principal Contractor's ground reduction of areas and horizons of the portal not included in the archaeological excavation areas described in 5.3.1. (This requirement will be reviewed from the excavation results, but TWB currently appears appropriate given the potential for timber trackways etc in the alluvial sequence, similar to that recently reported *c* 300 yards north of the site).

TWB will be adopted as part of a programme of observation, investigation and recording of archaeological remains during construction, in this case utilised for areas not included in the archaeological excavation areas. The tasks which require TWB are specified in Table 3.

5.3.5 General Watching Brief on Attenuation Tank works

A GWB by C263 will monitor and record archaeological remains exposed by the excavation by C310 for the attenuation tank to the west of the headhouse extension to the portal. The location of the head house and attenuation tank is shown on dwg nos C156-CSY-S-DDB-CR148_PT005-01612 Rev P02 in Annex 2. The tank will not be constructed until late in the programme (currently scheduled for early 2015).

5.4 Utility Diversions

A Targeted Watching Brief will monitor and record archaeological remains exposed by the excavation for the diversion of the Marmadon Road sewer (similar archaeological potential to portal). The Targeted Watching Brief will be conducted as per section 5.3.4..

5.5 Worksites (Construction Compounds)

A General Watching Brief by C263 on worksite set-up will monitor individual works which have a potential impact on below-ground remains. The requirement for individual works to be included in the GWB will be assessed from the groundworks contractors' method of work and final design, taking into account the location and depth of the works, and the likely extent of any modern land-raising, see section 2.7. In general, works which require excavation deeper than the depth of modern made ground (minimum *c* 1.0m) will require mitigation.

See 5.2 for built heritage mitigation.

5.6 North Kent Line

To be assessed by the Network Rail Design archaeologist.

Realignment of the NKL and the construction of new embankments may also require mitigation where the works are off the existing embankment. They are likely to require a general watching brief during topsoil stripping and any other excavations deeper than the local depth of modern made ground, eg deeper track drainage and piled slab structures for transition structures.

Table 3 Summary of construction tasks and mitigation

WSI Task	PCS04 Task	Contract	Confirm Mitigation?	Programme Start Date	Programme finish date	Notes
ENABLING WORKS C310				To be Confirmed	**tbc**	
Utility/service diversions	TSPLUP0165 - Marmadon Rd Sewer diversion works	C310	TWB 'draw down' contingency of up to 10 days.	tbc	tbc	
NLBH Assessment and Recording				tbc	tbc	
NLBH Assessment		C263	1 day on site			
NLBH Recording		C263	Up to 3 days on site			
MAIN WORKS C310		C310		**14.03.11**	**30.04.15**	
Worksite preparation/ Portal site preparation – hoardings etc, Bentonite plant (East worksite only?)	A1400 Portal site preparation	C310	GWB if required	Provisionally 14.03.11	03.05.11	Only ground reduction of >1m to be monitored: determine from groundworks contractor design and MS
West Worksite Preparation	C156 (CP4-2, 15.11.10): PLUPSTMO0700	C310	GWB if required	11.03.11	23.05.11	as above
Setting out and excavation of sample excavation trenches		C310				
Sample archaeological excavation prior to portal construction		C263	Sheet boxed Trench 1 depth to 3m Trench 2 depth to 4m	28.02.11	10.05.11	**MUST occur before piling platform works commence**
Portal Obstruction removal, Guide walls (*c* 1.5m deep), and **Capping Beams** (*c* 1.3m deep) for				Overall: 23.05.11	Overall: 12.06.12	
	PLUPSTMO1220 grub out obstructions	C310	GWB	23.05.11	20.06.11	

WSI Task	PCS04 Task	Contract	Confirm Mitigation?	Programme Start Date	Programme finish date	Notes
the diaphragm walls	TSPLUP0272 - Portal Structure Ch 22553 - 22589 – Construct diaphragm walls and tension piles	C310	GWB guide walls and capping beams only	01.08.11	31.10.11	
	TSPLUP0412 - Portal Structure Ch 22590 - 22750 – Construct diaphragm walls and tension piles	C310	GWB guide walls and capping beams only	07.10.11	12.06.12	
	TSPLUP0492 - Portal Structure Ch 22751 - 22818 – Construct diaphragm walls and tension piles	C310	GWB guide walls and capping beams only	27.03.12	09.07.12	
Portal Excavation Excavations of portal ramp section within diaphragm and secant walling between Ch 22553 to 23065				Overall: 17.11.11	Overall: 18.09.12	
	TSPLUP0292 – Portal Structure Ch 22553 - 22589 – Excavation and temporary props	C310	TWB – draw down time contingency: up to 10 days for all ground reduction sub-tasks within the portal	17.11.11	14.03.12	
	TSPLUP0432 – Portal Structure Ch 22590 - 22750 – Excavation and temporary props	C310	Trench evaluation Dimensions of 20 x 4 x 6m, subject to confirmation of portal excavation depth	27.04.12	18.09.12	
	TSPLUP0572 – Portal Structure Ch 22751 - 22818 – Excavation and temporary props	C310	TWB	25.07.12	24.08.12	
	TSPLUP0512 – Portal Structure Ch 22819 - 22917 – Excavation and temporary props	C310	See above	03.04.12	11.06.12	

WSI Task	PCS04 Task	Contract	Confirm Mitigation?	Programme Start Date	Programme finish date	Notes
	TSPLUP0662 – Portal Structure Ch 22918 - 22953 – Excavation and temporary props	C310	See above	15..05.12	30.05.12	
	TSPLUP0762 – Portal Structure Ch 22954 - 23065 – Excavation	C310	See above	05.07.12	24.07.12	
West Worksite preparation hoardings, structures etc,	No PCS04 task reference C156 (CP4-2, 15.11.10): PLUPSTMO0700	C310	GWB if required	*c* January 2011	*c* February 2011	
Attenuation tank excavation	No PCS04 task reference C156 (CP4-2, 15.11.10): PLUPSTSA2960	C310	GWB	20.01.15	30.04.15	

6 Programme for the Investigation

6.1 Introduction

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

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

It should be noted that when works are soon to occur, the programmes become rapidly outdated. Programme information for individual tasks will need to be revised or confirmed close to the dates of commencement, by the archaeological contractor and design archaeologist.

The current programming information (see Annex 3) is based on extracts from Crossrail programme PCS05 (19.04.10), with a small number of revisions from C156 Capita Symonds.

6.2 Critical phase

6.2.1 Non-Listed Built Heritage and Street Assessment and Recording

Non listed built heritage assessment and recording has been completed of all areas.

6.3 Phase 1 - Enabling Works

6.3.1 Archaeological excavation of sample areas prior to portal construction

The sample archaeological excavations for the portal in the west (see 5.3.1) must take place prior to preparation for construction of the portal diaphragm walls (and any associated tasks that would clash with the excavation trenches), and will therefore have to be completed prior to when the piling platform works are scheduled to start (if not earlier). The third trench is not subject to these time constraints and so will occur after construction of the d-wall.

The excavation and recording of each of the trenches is estimated to take approximately two to three weeks, and therefore would have significant programming implications. This is based on an estimate up to one week machining and shoring each trench, plus archaeological investigation/excavation/recording: one week per trench (if little present) to two weeks (if major archaeological deposits are encountered).

6.3.2 Utility Diversions

See 5.4.

The Targeted Watching Brief on the Marmadon Road sewer diversion is currently under review pending owner inspection, and the actual date and method is being revised. It is currently programmed for July 2011.

6.4 Phase 2 - Main Works

6.4.1 Worksites

Watching briefs are currently programmed to take place on worksite set-up (see 5.5) during the main works:

- Plumstead Portal West Worksite (Plumstead/Old Goods Yard): 11 March to 23 May 2011
- Plumstead Portal East Worksite (White Hart Depot): 14 March to 3 May 2011

The General Watching Briefs are likely to have minimal programming implications.

6.4.2 Portal Construction

The third trench is programmed to be undertaken after construction of the diaphragm walling.

Only the grubbing out of obstructions, and excavation for the guide walls and capping beams will require archaeological general watching brief (see 5.3.2). The GWB should have little implication for the construction programme.

In addition to the archaeological excavation of sample area's, a Targeted Watching Brief will cover ground reduction in those parts of the portal which lie outside the sample areas/horizons (see 5.3.4). This will require a further draw down contingency in the programme for the archaeological contractor to investigate and record any significant finds: **up to 10 days**.

Excavations for the portal area are programmed to commence in November 2011 and continue until September 2012.

6.4.3 Attenuation Tank

Excavation for the attenuation tank (see 5.3.5) is currently scheduled to take place over 1 day in April 2015 and will be covered by GWB. The GWB should have little implication for the construction programme.

6.5 Summary Table

Table 4 Programming of archaeological fieldwork

Archaeological Task	**'draw down' contingency**	**Start**	**End**
TWB Utility diversion (Marmadon Road sewer)	up to 10 days [*to be revised when final method/programme of diversion is determined*]	11.03.11	12.07.11
Non-Listed Built Heritage Assessment	–	Completed: November 2010	Duration: 1 day
Non-Listed Built Heritage Recording	–	*As soon as possible*: ?December	Duration: up to 3 days: Following

		2010	assessment; before worksite set-up/demolitions
GWB East Worksite Set-up	–	14.03.11	03.05.11
Archaeological excavation of two sample areas prior to Portal Construction trench-boxed 20 x 4m Trench 1- 3m deep Trench 2- 4m deep	–	28.02.11	Up to 20 days Before pile platform works commence 12.08.11
GWB Portal Obstruction removal, Guide walls and Capping Beams	–	23.05.11	09.07.12
Archaeological Excavation of third sample area Trench 3 Shored 20 x 4m to 6m* depth			
TWB during Portal excavation	–	07.12.11	01.06.12 or 01.08.12
GWB West Worksite Set-up	–	11.03.11	23.05.11
GWB Attenuation Tank works	–	02.04.15	Duration: 1 day 02.04.15

*subject to max excavation depth for portal construction

7 Specification for Evaluation & Mitigation (including Watching Brief)

7.1 Generic Standards

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

- Those listed in Crossrail *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* section 7.A.1 (Crossrail, 2009b, Doc. No. CR-PN-LWS-EN-SP-00001 Ver. 0.3)
- GLAAS *Standards for Archaeological Work, London Region, External Consultation Draft (*English Heritage 2009*)*
- English Heritage *Understanding historic buildings: a guide to good recording practice* (English Heritage 2006c)

7.1.1 Potentially nationally important remains

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

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

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

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

NB whilst any extensive and well-preserved timber structures such as trackways (if present) might potentially be considered to be of national importance, in a consultation meeting on 28.7.04, EH and GLAAS agreed that preservation by record was suitable for prehistoric timber trackways.

7.1.2 Human Remains

Human remains are unlikely to be present on the Plumstead Portal site.

If any human remains were to be found, they will be treated in accordance with the procedures in section 7.A.6 to 7.A.15 of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b). Crossrail procedures for dealing with discoveries of human remains shall identify any specific individual roles or actions that are relevant to the works.

If removal of human remains were to be required, an Exhumation Licence would be required from the Coroner's Office of the Ministry of Justice, under the terms of the 1857 Burial Act. This would be obtained by the archaeological contractor, unless otherwise required by the Project Archaeologist.

7.1.3 Treasure Act

If any items falling within the scope of the Treasure Act 1996 were found on site, the procedures in section 7.A.16 to 7.A.22 of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b) will be enacted. This currently appears unlikely.

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

7.2 Health and safety

Health and Safety will be addressed in accordance with section 7.B of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

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

In addition to the general issues arising from conducting watching briefs on a major construction site, the archaeological contractor, in conjunction with the Principal contractor, will need to address:

- Excavating deep sample trenches.
- Excavation of sample trenches adjacent to the embankment where the NKL will be running.
- Conducting GWB and TWB on deep, potentially confined, utility shafts and trenches.
- Conducting TWB within the restricted areas of ground reduction within the diaphragm walls of the portal.

7.3 Location and ground elevation of interventions and survey grids

The archaeological contractor will survey the site in accordance with section 7.C of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

7.4 Specification for C263 archaeological excavation of sample areas (investigation)

The archaeological excavation of sample areas will be conducted in accordance with section 7.I of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

The C263 Archaeology Contractor shall undertake archaeological excavation of sample areas and horizons during the C310 Principal Contractor's ground reduction within the diaphragm walls of the portal, the scope of which is described in section 5.3.1 of this document.

Archaeological excavation trenches will be located on the north side of the portal area to the north of the existing railway that lies on the embankment. These will be required to be excavated while the NKL is still in commission.

Three trenches have been planned for the Plumstead Portal area (see figure 3). Trenches 1 and 2 will be sheet boxed and will measure 20m x 4m. Trench 1 will be dug to 3m depth and Trench 2 will be dug to 4m depth, both by the C310 Principal Contractor using a smooth bladed ditching bucket.

The modern overburden will be removed by the C310 Principal Contractor, who will continue ground reduction in the archaeological excavation areas using machines with a smooth-bladed ditching bucket, under archaeological supervision from C263 until the specified horizons (or any significant archaeological remains at a higher level) are reached, as a targeted watching brief (TWB).

The machines will be used to clean to the target archaeological horizon under close archaeological supervision. The sample archaeological excavation areas, with a suitable safe working area around them, will be separated from the remainder of the portal worksite and the NKL by robust barriers. A safe method of working in the circumstances of the portal worksite/adjacent to the live railway will be devised by the principal contractor and archaeological contractor and previously specified in their method statements.

Shoring in archaeological excavation trenches will be installed in accordance with safety regulations and maintained throughout the occupancy of the site by the C310 contractor. Where mechanical or electric hoists are to be used C263 staff working in shored shafts of less than 4m x 4m to leave the shaft before hoisting of buckets takes place and not to re-enter until the bucket is lowered back into position. Beyond a depth of 3m within such excavations gas monitoring equipment will be required to ensure appropriate air quality for those working there. Where mechanical or electrical hoists are in use in excavation trenches, the area in which the hoist is in use must be clearly demarcated and no staff will enter this area while the hoist is being raised or lowered.

The C263 archaeological contractor will then clean, record, sample, and where required excavate the specified archaeological remains, within the timescales specified in section 6. Further excavation may be required by hand (C263), or using machines (C310) under instruction and close supervision from the supervising archaeologist(s). This will include geoarchaeological recording and sampling of the alluvial sequence(s), in conjunction with similar work during the targeted watching brief (see 5.3.4).

Except where the specified archaeological horizon is at the base of the geoarchaeological sequence (eg the gravel eyot or lower areas of the floodplain gravels), archaeological excavation/investigation will cease at the base of the specified horizon. From that point, the C310 principal contractor will continue ground reduction under the targeted watching brief (see 5.3.4).

In particular, the C310 Principal Contractor will facilitate the archaeological excavation of sample areas by providing:

- Trench support and other temporary works for the archaeological excavation trenches.
- In co-operation with the archaeological contractor, a safe method of working for the deep archaeological excavation trenches. To include safe access for the archaeological team to the working area.
- Water extraction/disposal and, spoil removal, from the archaeological excavation areas.
- Ensuring that there are no live services within the areas of excavation, and that Unexploded Ordnance (UXO) risks have been mitigated.

- Machining (under archaeological supervision), using a mechanical excavator with a smooth-bladed ditching bucket and banksman for ground reduction to expose and initially clean the sample excavation area and horizon, and any subsequent machine excavation requested by the archaeological contractor.
- Providing a health and safety regime, accommodation, welfare, and other facilities to enable the archaeological team to carry out the archaeological excavation of sample areas .

Particular responsibilities of the C263 archaeological contractor include:

- To provide a suitably qualified and experienced team of archaeologist and appropriate specialists (in particular geoarchaeologists) to carry out the archaeological excavation of sample areas and associated off-site works.
- In co-operation with the Principal Contractor, to produce a safe method of working for the archaeological excavation of sample areas areas.
- To comply with, and contribute to, the Principal Contractor's health and safety regime, Environmental Management Plan, and other requirements, and reflect this in their Method Statement.
- To record, excavate, and sample the archaeological remains (if present) in the specified sample areas and horizons, within the draw-down time noted in section 6.5. Archaeological excavation of sample areas will normally cease at the base of the specified horizon or features, unless varied by the Project Archaeologist.
- Co-ordinating the geoarchaeological recording and sampling between the archaeological excavation areas and the subsequent TWB elsewhere in the portal, in order to produce a geoarchaeological record which covers the extent of the portal site.

7.5 Specification for C263 watching brief

The watching briefs will be conducted by C263 in accordance with section 7.H of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

In particular, Targeted Watching Briefs are described generically as follows:

- A TWB shall comprise observation and recording of the Principal Contractor's works with specific operations carried out under the supervision of the Archaeology Contractor. Under TWB, the Archaeology Contractor may impose constraints on, or require changes to, the Principal Contractors' or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works (7.H.4).
- In archaeologically sensitive areas, where the need for a TWB has been identified in the SS-WSI, the Principal Contractor will strip soils (which may include modern made ground, topsoil, subsoil, alluvium and colluvium) using a 360 degree excavator and **smooth-bladed ditching bucket** under the supervision of the Archaeology Contractor. The Principal Contractor will limit their tracking of vehicles and plant within areas specified in the SS-WSI and/or as instructed by the Project Archaeologist. The Principal Contractor will facilitate mapping and sampling of deposits by the Archaeology Contractor through use of agreed plant, a site share agreement and careful liaison between the Archaeology Contractor's supervising archaeologist and the Principal Contractor's site supervisor (7.H.9).

Site-specific requirements for the watching briefs at Plumstead Portal are described below.

For the Plumstead Portal, TWB will involve initial ground reduction of modern made ground or overburden being conducted by the C310 ground works contractors under archaeological supervision by C263, using a flat-bladed ditching bucket (unless ground conditions prevent this). This will be followed, if necessary, by localised hand inspection, and assessment by C263 archaeologists.

If no significant or extensive archaeological remains are revealed, the alluvial sequence will be **rapidly** recorded (and if appropriate sampled) by C263, then the next alluvial horizon will be removed by machine by C310, using a smooth-bladed ditching bucket, in spits of 0.2–0.5m depth (as advised by the C263 supervising archaeologist). This process will be repeated for each successive alluvial horizon, until either:

- significant or extensive archaeological remains are uncovered, or:
- a depth of 0.5m below the surface of the floodplain gravels is reached (not just any sandy deposits that may overlie them, which are form part of the alluvial sequence).

Selected cross sections through the portal construction also showing the predicted level of geological deposits from west to east and are shown on dwg nos C156-CSY-S-DDB-CR148_PT005-01501 Rev P01, C156-CSY-S-DDB-CR148_PT005-00701 Rev P01, C156-CSY-S-DDB-CR148_PT005-00704 Rev P01, C156-CSY-S-DDB-CR148_PT005-00707 Rev P01, C156-CSY-S-DDB-CR148_PT005-00708 Rev P01 in Annex 2.

If, however, significant or extensive archaeological remains are uncovered, the C263 archaeological contractor will notify the C310 Principal Contractor and Project Archaeologist, and mobilise their on-call archaeological support team, and any specialists required (eg geoarchaeologists or surveyors), to rapidly excavate and record the remains. This requires a ‘draw down’ contingency in the construction programme for such work, to be called on if required. The contingency times are noted in

Table 3 above. Note that this contingency time may not necessarily mean a delay to construction work for the whole of that period, as archaeologists may be able to work in different areas from construction teams, depending on circumstances and safety issues.

This will include geoarchaeological recording and sampling of the alluvial sequence(s), in conjunction with similar work during the archaeological excavation of sample areas (see 5.3.1). This will require co-ordination between the two tasks to ensure recording of complete alluvial sequences, and conversely, to avoid duplication of effort.

The C263 Archaeology Contractor shall undertake TWBs and GWBs during Enabling Works and Main Works at the site, for the construction tasks referred to in. Figure 4 shows the areas of TWBs and GWB proposed for the site.

In particular, the C310 Principal Contractor will facilitate the Targeted Watching Brief by:

- Providing, in co-operation with the C263 archaeological contractor, a safe method of working for both archaeologists supervising ground reduction, and teams conducting any excavation/recording/sampling required (for any *significant* archaeological remains). The latter will require designated safe working areas with robust barriers.
- Ensuring that there are no live services within the areas of excavation, and that Unexploded Ordnance (UXO) risks have been mitigated.
- To facilitate the Targeted Watching Brief as per section 5.3.4.
- Spoil removal, and water extraction/disposal if required for any excavation/recording/sampling required.
- Providing a health and safety regime, accommodation, welfare, and other facilities to enable the archaeological team to carry out the Targeted Watching Brief.

Particular responsibilities of the C263 archaeological contractor include:

- To provide a suitably qualified and experienced team of archaeologist and appropriate specialists (in particular geoarchaeologists) to carry out the watching briefs and associated off-site works.
- In co-operation with the C310 Principal Contractor, to produce a safe method of working for the archaeological excavation areas.
- To comply with, and contribute to, the C310 Principal Contractor's health and safety regime, Environmental Management Plan, and other requirements, and reflect this in their Method Statement.
- For TWB: C263 to record, excavate, and sample any *significant* archaeological remains (if present), and to record and sample important geoarchaeological sequences. The latter to be co-ordinated with similar work in the archaeological excavation areas, in order to produce a geoarchaeological record which covers the extent of the portal site. This work to be conducted within the draw-down time noted in section 6.

7.6 Archaeological science

Investigation and sampling of archaeological, geoarchaeological, and palaeo-environmental deposits will be conducted following the site-specific sampling strategy and in accordance with section 7.H of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

At North Woolwich Portal such methods are potentially required for all of the below-ground archaeological fieldwork, but in particular for the archaeological excavation of sample areas and targeted watching brief for the portal.

Absolute dating (eg Radiocarbon or OSL) may be required for alluvial deposits; samples for dating should be taken where appropriate. Multiple samples may be required from each major unit within selected stratigraphic sequences. Multiple determinations from contemporary samples or stratigraphic sequences should be considered for Bayesian analysis of the results, where appropriate.

8 Deliverables

The Archaeology contractor shall produce method statements, reports, site archives, digital data in accordance with section 8 of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b). Additional and site-specific considerations are listed below.

8.1 Archaeological Contractors Method Statement

The Archaeology Contractor's Method Statement(s) will include details of how they will conduct the targeted watching briefs, agreed with the Principal Contractor. It will also include a preliminary geoarchaeological and environmental sampling strategy for the site, to be developed, if required, when deposits which require it are encountered.

8.2 Fieldwork Reporting

Each fieldwork event requires:

- An Interim Statement
- A Survey Report
- A Fieldwork Report – in this case watching brief reports incorporating a SMR/HER Summary Sheet (OASIS form)
- Summary Reports (Annual summaries for *London Archaeologist*, and for period journals such as *Post-Medieval Archaeology* where appropriate) submitted o the Project Archaeologist. These should conform to the guidance on submission dates and vocabulary at: http://www.museumoflondonarchaeology.org.uk/English/ArchiveResearch/Fieldwork-Roundup/ .

The individual fieldwork events requiring reporting are currently defined below, and shown on the programme in Table 3. They may be revised by the Project Archaeologist in the light of archaeological results or project requirements.

- NLBH recording
- TWB and GWB Plumstead Portal Enabling Works 2010–2011
- Sample archaeological excavation trenches
- Portal and worksite set-up GWB and TWB 2011–2012
- GWB Plumstead Portal Main Works monitoring east worksite set-up 2012
- GWB Plumstead Portal Main Works monitoring attenuation tank works 2015

Where a fieldwork event is of sufficient duration, Summary Reports will be submitted to the Project Archaeologist for each event (site code) annually at the start of January. The signed-off summaries will be sent to LAARC (for *London Archaeologist*) by the annual submission date: the end of February each year (period journals differ).

9 Site Monitoring & Progress Reports

Weekly progress reports, other reporting, and site monitoring by the statutory consultees (eg GLAAS) will be conducted in accordance with section 9 of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

10 Personnel requirements

The Archaeology Contractor shall provide project personnel in accordance with section 10 of *Archaeology, Specification for Evaluation & Mitigation (including Watching Brief)* (Crossrail, 2009b).

11 References and glossary of terms

11.1 References

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11.2 Glossary

BP	Before Present
BP	Years before present, conventionally taken to be 1950
Bronze Age	*c* 2000–650 BC
CDM	Construction (Design and Management) Regulations
DDBA	Detailed desk-based assessment(s)
Devensian	Geological era from 70,000 to 10,000 BP
DLR	Docklands Light Railway
EMR	Environmental Minimum Requirements
ES	Environmental Statement
Eyot	A small island (in this work, one within the existing or former courses of the Thames or its tributaries)
GLAAS	Greater London Archaeology Advisory Service (an English Heritage department providing archaeological advice to the planning departments of the London boroughs (excepting the City and Southwark)
LB	London Borough

m OD	Metres above Ordnance Datum (Newlyn). To obtain Tunnel Datum heights (m TD) add 100m to OD heights.
m TD	Tunnel Datum (Crossrail project datum, see above)
Medieval	AD 1066–1485
NR	Network Rail
OHLE	Overhead Line Equipment
OLE	Overhead Line Electrification
Palaeochannel	Deposits representing a former stream channel
Post-medieval	AD 1485–present
Roman (Romano-British)	AD 43–*c* 410
Saxon (early-medieval)	AD 410–1066
TBM	Tunnel boring machine.
TfL	Transport for London

Annex 1 – Figures

Annex 2 – Engineering Plans and Drawings

Plumstead Portal - Portal Plan and profile, sheet 1 of 2 (dwg. no. C156-CSY-S-DDL-CR148_PT0005-00051 Rev. P02)

Plumstead Portal - Portal Plan and profile, sheet 2 of 2 (dwg. no. C156-CSY-S-DDL-CR148_PT0005-00052 Rev. P02)

Plumstead Portal - Portal Plan and profile, sheet 3 of 3 (dwg. no. C156-CSY-S-DDH-CR148_PT005-18012 Rev PO3)

Plumstead Portal – Longitudinal Section G-G (dwg. no.C156-CSY-A-DDB-CR148_PT005-20206 Rev. P04)

Plumstead Portal - Demolition worksite clearance (and location of Marmadon Road sewer diversion) (dwg. no. C156-CSY-S-DDA-CR148_PT0005-0021 Rev. P02)

Plumstead Portal – Worksite layout – Stage 1 (dwg. no.C156-CSY-A-DDB-CR148_PT005-01601 Rev. P04)

Plumstead Portal – Worksite layout – Stage 2 (dwg. no.C156-CSY-A-DDB-CR148_PT005-01602 Rev. P04)

Plumstead Portal – Worksite layout – Stage 7 (dwg. no.C156-CSY-A-DDB-CR148_PT005-01607 Rev. P04)

Plumstead Portal – Worksite layout – Stage 12 (dwg. no.C156-CSY-A-DDB-CR148_PT005-01612 Rev. P02)

Plumstead Portal – Construction Sequence TBM chamber (dwg no.C156-CSY-R5-DDB-CR148_PT005-01501 Rev. P01)

Plumstead Portal - Section A-A Chainage 91820 (dwg no.C156-CSY-S-DDB-CR148_PT005-00701 Rev. P02)

Plumstead Portal - Section D-D Chainage 91988 (dwg no.C156-CSY-S-DDB-CR148_PT005-00704 Rev. P02)

Plumstead Portal - Section G-G Chainage 92100 (dwg no.C156-CSY-S-DDB-CR148_PT005-00707 Section G-G Rev. P02)

Plumstead Portal - Section H-H Chainage 92200 dwg no.C156-CSY-S-DDB-CR148_PT005-00708 Section H-H Rev. P02)

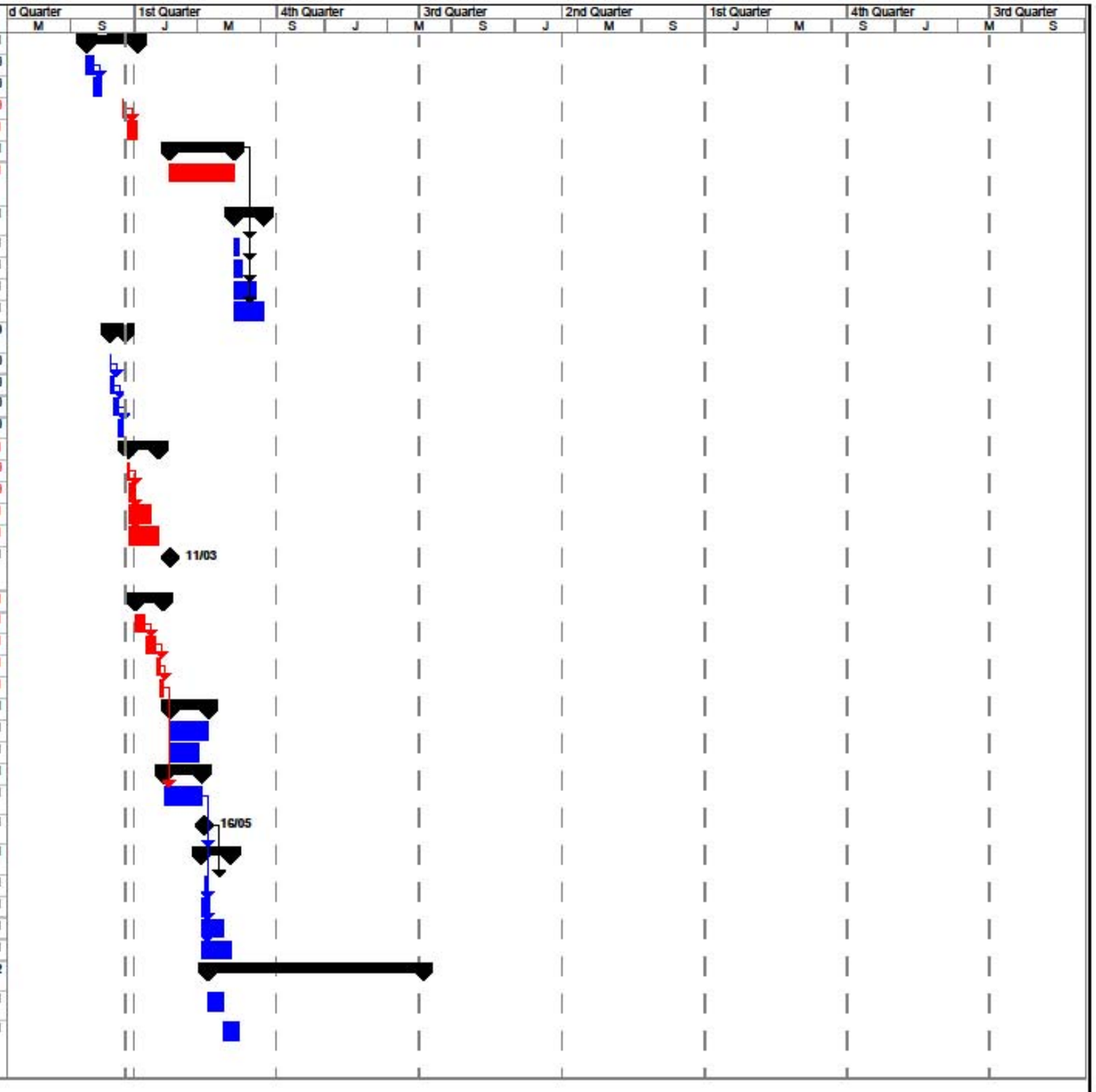
Annex 3 – Programme

NB This programme is best read as the separate PDF file: Annex_3_PLU_programme_14-12-10.pdf

Tasks and information in Red are either to be confirmed or revised when further programming or design work is carried out, eg by a contractor.

Durations of watching briefs are for the whole of the construction task, as per the currently available programmes; they will be refined and monitoring requirements determined in conjunction with the contractors closer to the date of the works.

ID	Task Name	Draw down	Duration	Start	Finish
1	**C156 Design**		**70 days**	**01/10/10**	**06/01/11**
2	Complete design & reissue WSI	-	10 days	01/10/10	14/10/10
3	Consultation with GLAAS & EH	-	10 days	15/10/10	28/10/10
4	PDP Review & Accept WSI	-	5 days	10/12/10	16/12/10
5	??? Issue PMI to C263	-	15 days	17/12/10	06/01/11
6	**C263 GWB Enabling works (tbd)**	-	**88 days**	**11/03/11**	**12/07/11**
7	Utility diversions- Marmadon Sewer (tbd) DATES TO BE CONFIRMED	-	88 days	11/03/11	12/07/11
8	**C263 Reporting GWB Enabling Works**	-	**40 days**	**13/07/11**	**06/09/11**
9	Interim Statement	-	5 days	13/07/11	19/07/11
10	Survey Report	-	10 days	13/07/11	26/07/11
11	WB (fieldwork) report	-	30 days	13/07/11	23/08/11
12	Summary Report	-	40 days	13/07/11	06/09/11
13	**C263 NLBH Assessment (completed)**	-	**21 days**	**16/11/10**	**14/12/10**
14	Assessment	-	1 day	16/11/10	16/11/10
15	Revise WSI	-	5 days	17/11/10	23/11/10
16	Consultation	-	5 days	24/11/10	30/11/10
17	PDP Review and Accept WSI	-	10 days	01/12/10	14/12/10
18	**C263 NLBH Recording**	-	**43 days**	**20/12/10**	**16/02/11**
19	Recording fieldwork		3 days	20/12/10	22/12/10
20	Interim Statement	-	5 days	23/12/10	29/12/10
21	NLBH (Fieldwork) Report	-	30 days	23/12/10	02/02/11
22	Summary Report	-	40 days	23/12/10	16/02/11
23	***Set up West worksite (Plumstead Goods Yard) (NLBH Recording fieldwork to finish before)***		0 days	11/03/11	11/03/11
24	**C156 Revise mitigation design**	-	**39 days**	**04/01/11**	**25/02/11**
25	Produce deposit model	-	14 days	04/01/11	21/01/11
26	Revise Mitigation Design/WSI	-	3 wks	24/01/11	11/02/11
27	Consultation		5 days	14/02/11	18/02/11
28	PDP Review and Accept WSI	-	5 days	21/02/11	25/02/11
29	**C263 GWB Site Set-up (C310)**	-	**52 days?**	**11/03/11**	**23/05/11**
30	West (Plumstead Goods Yard) Works!	-	52 days?	11/03/11	23/05/11
31	A1400 Portal site preparation		37 days?	14/03/11	03/05/11
32	**C263 Sample Excavation**		**52 days**	**28/02/11**	**10/05/11**
33	Sample archaeological excavation pre-construction	45 days	52 days	28/02/11	10/05/11
34	***C310 Start piling platform tasks (excavation to finish before)***		0 days	16/05/11	16/05/11
35	**C263 Excavation (Fieldwork) Report**	-	**40 days**	**11/05/11**	**05/07/11**
36	Interim Statement	-	5 days	16/05/11	20/05/11
37	Survey Report	-	10 days	11/05/11	24/05/11
38	Excavation (Fieldwork) Report	-	30 days	11/05/11	21/06/11
39	Summary Report	-	40 days	11/05/11	05/07/11
40	**C263 GWB Portal Obstructions, Guide Walls & Capping Beams ONLY (C310)**	-	**296 days?**	**23/05/11**	**09/07/12**
41	PLUPSTMO1220 grub out obstructions		21 days?	23/05/11	20/06/11
42	TSPLUP0272- Portal Structure Ch 22553- 22589- Construct Diaphragm walls and tension piles	-	20 days	22/06/11	19/07/11

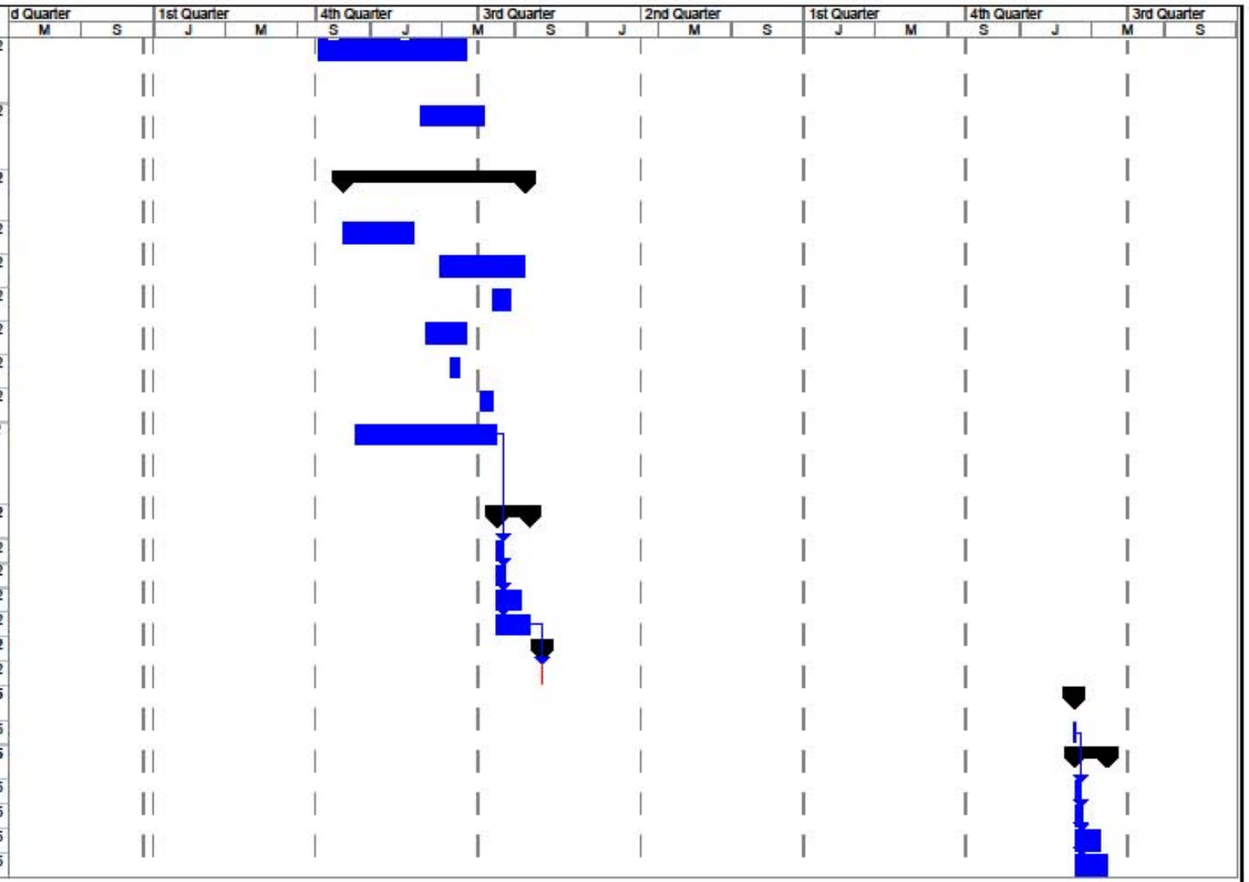


Project: PLU_Programme_14-12-10
Date: 14/12/10
RED = To be determined/revised

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Page 1

ID	Task Name	Draw down	Duration	Start	Finish
43	TSPLU0412- Portal Structure Ch 22590- 22750- Construct diaphragm walls and tension plies	-	178 days	07/10/11	12/06/12
44	TSPLUP0492- Portal Structure Ch 22751- 22818- Construct diaphragm walls and tension plies	-	75 days?	27/03/12	09/07/12
45	**C263 TWB Portal Excavation (within diaphragm & secant walling - C310)**	**10 days total**	**219 days?**	**17/11/11**	**18/09/12**
46	TSPLUP0292- Portal Structure Ch 22553- 22589	see above	85 days	17/11/11	14/03/12
47	TSPLUP0432- Portal Structure Ch 22590- 22750	see above	103 days	27/04/12	18/09/12
48	TSPLUP0572- Portal Structure Ch 22751- 22818	see above	23 days	25/07/12	24/08/12
49	TSPLUP0512- Portal Structure Ch 22819- 22917	see above	50 days	03/04/12	11/06/12
50	TSPLUP0662- Portal Structure Ch 22918- 22953	see above	12 days	15/05/12	30/05/12
51	TSPLUP0762- Portal Structure Ch 22954- 23065	see above	14 days	05/07/12	24/07/12
52	*The above tasks are the same as PLUPSTSA0400, -A0430, -B0400, -B0430 (If req), -B0460 (If req), -D0400, -D0430 (If req), -E0400, -E0430*		*171 days?*	*07/12/11*	*01/08/12*
53	**C263 Reporting Portal WBs**	-	**40 days**	**02/08/12**	**26/09/12**
54	Interim Statement	-	5 days	02/08/12	08/08/12
55	Survey Report	-	10 days	02/08/12	15/08/12
56	WB (Fieldwork) Report	-	30 days	02/08/12	12/09/12
57	Summary Report	-	40 days	02/08/12	26/09/12
58	**C263 Post-Excavation Assessment**		**1 day?**	**17/10/12**	**17/10/12**
59	PXA [start/duration TBD; Attenuation T	-	1 day?	17/10/12	17/10/12
60	**C263 GWB Attenuation tank excavation (C310)**		**1 day?**	**02/04/15**	**02/04/15**
61	GWB Attenuation tank	-	1 day?	02/04/15	02/04/15
62	**C263 Reporting GWB Attenuation Tank**		**40 days**	**03/04/15**	**28/05/15**
63	Interim Statement	-	5 days	03/04/15	09/04/15
64	Survey Report	-	10 days	03/04/15	16/04/15
65	WB (Fieldwork) Report	-	30 days	03/04/15	14/05/15
66	Summary Report	-	40 days	03/04/15	28/05/15



Project: PLU_Programme_14-12-10
Date: 14/12/10
RED = To be determined/revised

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Page 2

Annex 4 – Health & Safety Requirements

- Designer's Risk Assessment
- CDM requirements
- Archaeological Contractors risk assessments and Health and Safety Plans
- Archaeological Contractor's Safety Audits, Safety Inspections, Reporting of Accidents
- Personal Protective Equipment (PPE)
- Labelling of Hazardous Substances, Contaminated Land
- Crossrail Health and Safety Management System, Crossrail Drugs and Alcohol Policy
- Crossrail Policy for work on Network Rail Land

Designer's overall Risk Assessment

Assessment assumes standard good practice procedures are adhered to by experienced and competent contractors carrying out the work using an approved safe method of working													
				Inherent Risk Level						Residual Risk			
Location	**Activity**	**Hazard**	**Risk**	**Likelihood**	**Consequence**	**Index**	**Risk Owner**	**Review date**	**Control Action**	**Likelihood**	**Consequence**	**Index**	**Anticipated future control measures**
Plumstead Portal	Built Heritage Assessment visit	Site assessment visit	Lone person has accident and is unable to call for help, or attack by humans or animals	2	4	8	Design archaeologist	N/A	No lone visits or working	1	1	1	None required
Plumstead Portal	Built Heritage Assessment and recording visits	Small part of Goods Yard (western) Worksite is currently operational railway sidings	Person struck by train	3	5	10	Design archaeologist	N/A	Assessment visit to be conducted solely from non-operation areas; recording to be carried out after sidings have been decommissioned	1	1	1	None required
Plumstead Portal	Archaeological excavation of sample areas or trial trenches	Excavation of trenches c. 4-5m deep in advance of portal construction, in narrow constricted site, flanked by public roads, with single entrance, and high water table	excavation and water extraction from archaeological trenches could lead to collapse or contraction of adjacent alluvium (especially peat) and subsidence of the public roads	3	5	15	Design archaeologist	N/A	Shallow archaeological excavation trenches within the Diaphragm walls and during ground reduction within them, substituted for trenches pre-construction - no evaluation trenches	1	1	1	None required
Plumstead Portal	Archaeological excavation of sample areas in advance of construction	Archaeological excavation areas on site with deep alluvial sequences	Collapse of deep unsupported or unstable trench edges	5	5	25	Design archaeologist during mitigation design, passing to Archaeological contractor supervisor for fieldwork	Detailed design of archaeological excavation areas	Principal contractor to design and produce temporary works to support excavation areas. Detailed design of sample excavation to be produced in collaboration with design engineers and, if appointed, principal contractor and archaeological contractor	1	5	5	As control actions

Plumstead Portal	Targeted Watching Brief during portal construction	Machinery and vehicles working within portal	Staff injured by machinery or vehicles	3	5	15	Archaeological contractor supervisor	Production of archaeological contractor's and principal contractor's method statements for ground reduction within portal and TWB	WSI specifies: Principal contractor and archaeological contractor to devise safe method of work, previously specified in their approved Method Statements. To include designated safe working areas, separated from the remainder of the portal worksite by robust barriers, and traffic management in the surrounding area, to prevent accidental machine/traffic entry. Also safe access for archaeological team to working area.	2	5	10	As control actions

Likelihood
1 - Improbable, extremely unlikely to occur in relevant period

2 - Remote, unlikely to occur in relevant period

3 - Occasional, likely to occur in relevant period

4 - Probable, likely to occur in relevant period

Consequence

5 - Very High, fatality

4 - High, major injury or illness with long term effects / long absence from work

3 - Medium, lost time injury or illness

2 - Low, minor injury (not long term), first aid treatment required and operative ceases work

Index - Likelihood x Consequence (see CIRIA SP125)

15 - 25 High risk, apply further mitigation measures, reduce risk further

4 - 14 Medium risk, acceptable if as low as reasonably practical

0 - 3 Low risk, acceptable if all control measures are in place

5 - Frequent, likely regular occurrence in relevant period			1 - Very low, minor injury / inconvenience (no long term effects), operative can continue to work

Prepared by :	Nicholas Elsden	Date	14.10.10
Reviewed by :	Dawn Jackson	Date	15.10.10

CDM requirements

The archaeological contractor for the watching briefs will be working under and reporting to the Principal Contractor and to the Crossrail Project Archaeologist and CDM Co-ordinator. The archaeological contractor will review and comply with the Principal Contractor's Construction Phase Plan under the CDM Regulations 2007.

For other requirements see the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Archaeological Contractors risk assessments and Health and Safety Plans

The archaeological contractor will prepare method statements, site-specific risk assessments and a health and safety plan to be approved by the Principal Contractor.

For other requirements see the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

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

See the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Personal Protective Equipment (PPE)

The minimum requirement is: hard hat, safety boots with toe and mid-sole protection (no rigger boots), gloves, safety goggles or glasses, and hi-visibility jacket or vest. Where necessary or required: ear defenders, flame-retardant overalls, and any other protection required for specific tasks.

For other requirements see the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Labelling of Hazardous Substances, Contaminated Land

See the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

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

See the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Crossrail Policy for work on Network Rail Land

See the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Annex 5 – Environmental protection requirements

See the C263 Works Information forming part of the Crossrail contract for C263 Archaeology Late East.

Annex 6 – Enabling and temporary works design requirements, attendances and implementation

The Principal Contractor will provide Technical services and attendances to the archaeologists as set out below. This may require the installation of temporary works or other attendances such as pumping out, in order that the archaeologists may enter the works excavations safely.

The Principal Contractor will be responsible for supplying the necessary support items on site, to allow the archaeological investigations to be carried out safely. Those items in bold will be required – others may be required, depending on site conditions:

- ***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 the archaeological contractor *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 archaeological supervisor will inform both their project manager and the Principal Contractor and, when appropriate, call the relevant emergency number.
- ***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.
- ***accreditation and supervision of operatives, plant and equipment***, including supply of sufficient qualified banksmen to control plant movements
- ***temporary support***: design, installation and maintenance of appropriate temporary support to excavations, where deeper than *c* 1.2m. Where such temporary support is not provided, archaeologists will not be able to enter the excavations, and will have to make observations and records from the surface, reducing the effectiveness and validity of that work as mitigation.
- ***other safety measures in deep excavations*** monitoring of air quality and provision of rescue facilities and equipment in any areas defined by the Principal Contractor as a confined space. Where hoists are used in shored shafts less than 4m x 4m size the archaeological contractor's staff will leave the shaft before hoisting of buckets takes place. Beyond a depth of 3m within such shafts gas monitoring equipment will be required to ensure appropriate air quality for those working there. Where mechanical or electrical hoists are in use in larger excavation trenches, the area in which the hoist is in use must be clearly demarcated and no staff will enter this area while the hoist is being raised or lowered.

- ***pumping-out*** : a suitable method to keep the trenches dry, e.g. pumping into a previously investigated trench, to create a sump.
- ***managerial services*** – nominated points of contact for Principal Contractor and other key members of development team.
- *technical advice* to be available if required (e.g. via client or Principal Contractor's consulting engineer) re: protection of adjacent streets and buildings, removal of obstructions, depth of excavation, live services etc.
- ***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 e.g. via a robust physical barrier.
- adequate *ventilation and protection from noise, fumes and dust* where plant is in use, especially within standing buildings.
- ***site accommodation*** and welfare facilities with electricity and water. To include furnished main base cabin as work space; separate male/female changing areas, toilets and washing facilities; plus additional steel cabin for storing tools and finds.
- If required: *110v. site lighting* for access routes to excavations, plus individual task lighting within trenches (e.g. tripod-mounted spotlights). The need for lighting depends on the depth, season and weather conditions.
- ***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.
- *specific site security:* it may be necessary to separately secure individual archaeological trenches via a physical barrier (such as Heras fencing) eg if there are public areas nearby or human remains are encountered.

Annex 7 – Security requirements

The archaeological contractor will comply with the Principal Contractor's Security Plan.

Human remains are not likely to be present on the Plumstead Portal site. However, if they should be present, the Principal Contractor will need to provide secure storage on site for human remains, in advance of them being removed by the archaeological contractor.

See also general and specific site security in Annex 6.

Annex 8 – Need for screening or other protective works

Human remains are not likely to be present on the Plumstead Portal site. However, if they should be present, the Principal Contractor will be required to screen them from public view, including buildings overlooking the site.

Such screening may include semi-opaque roofing if the public may see the relevant area(s) from above.

Annex 9 – Procedure for notification of the Discovery of Human Remains

In the case of unexpected discoveries the Crossrail procedures will be adhered to. The Project Archaeologist shall be informed immediately and the remains left in situ, covered and protected pending a decision on exhumation. If removal is essential, it should be undertaken under appropriate Ministry of Justice (Coroner's Division) licence and environmental health regulations. It will be necessary for the Principal Contractor to provide adequate site security, and screening (see Annex 8).

Annex 10 – Procedure for notification of the Discovery material falling under the Treasure Act 1996

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, the archaeological contractor shall record the finds and remove them to a safe place. Where recording and removal is not feasible or appropriate on the day of discovery, the archaeological contractor shall ensure, in liaison with the Project Archaeologist, that adequate site security is provided by the Principal Contractor.

Annex 11 – Procedure for notification of major unexpected discoveries

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.

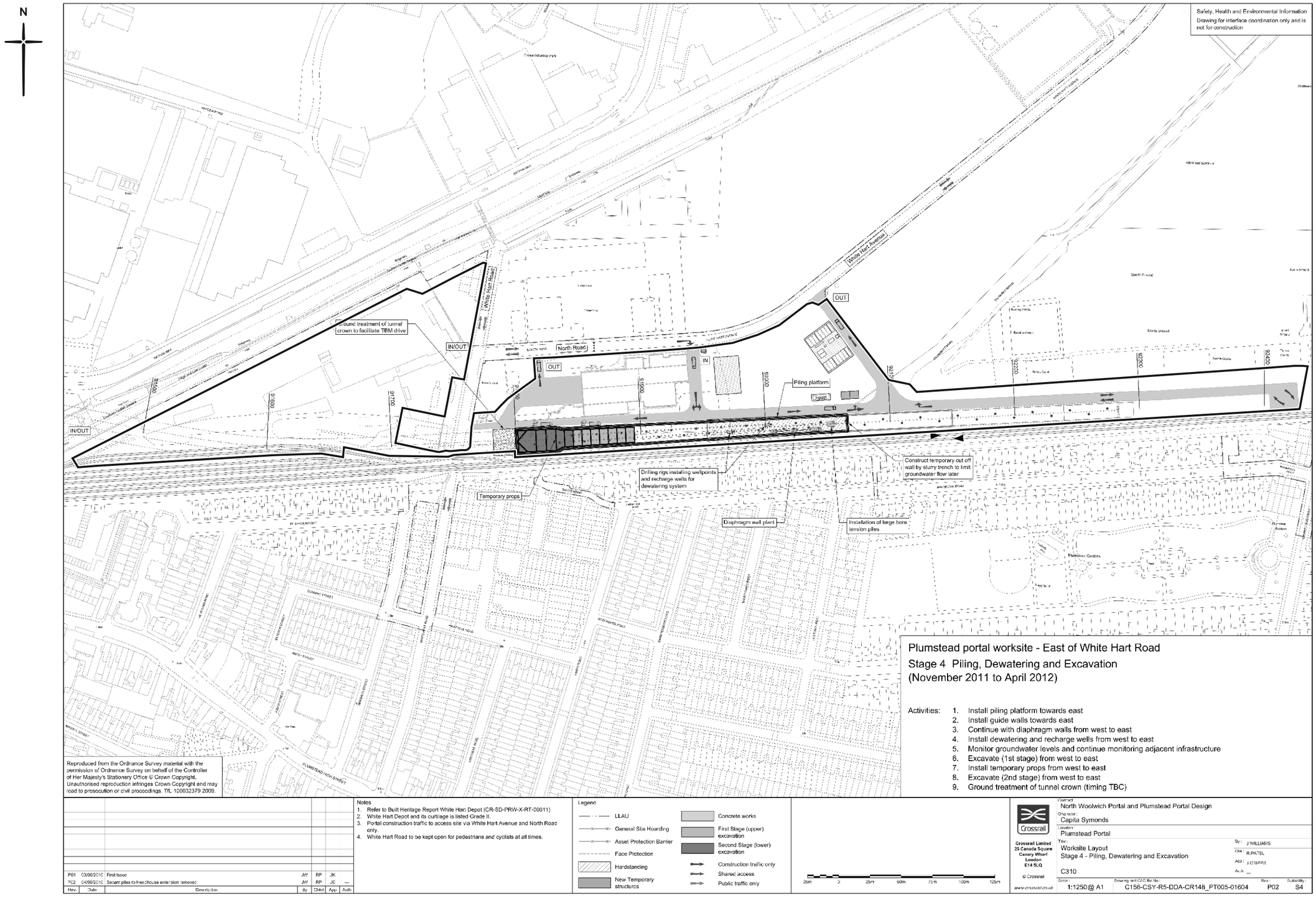


Figure 1 Site location plan

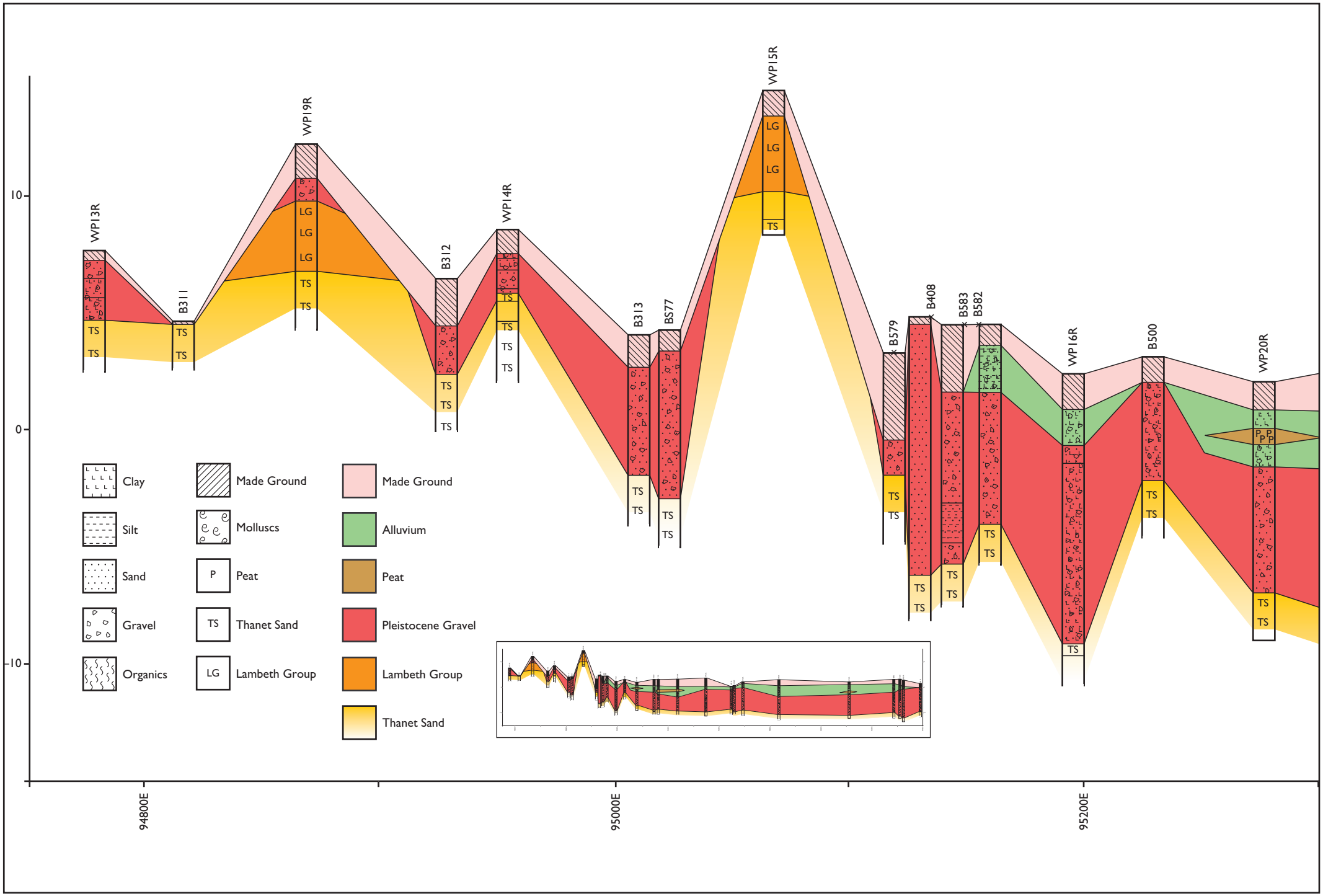


Figure 2 Existing deposit model (long section), 2008 (sheet 1 of 3)

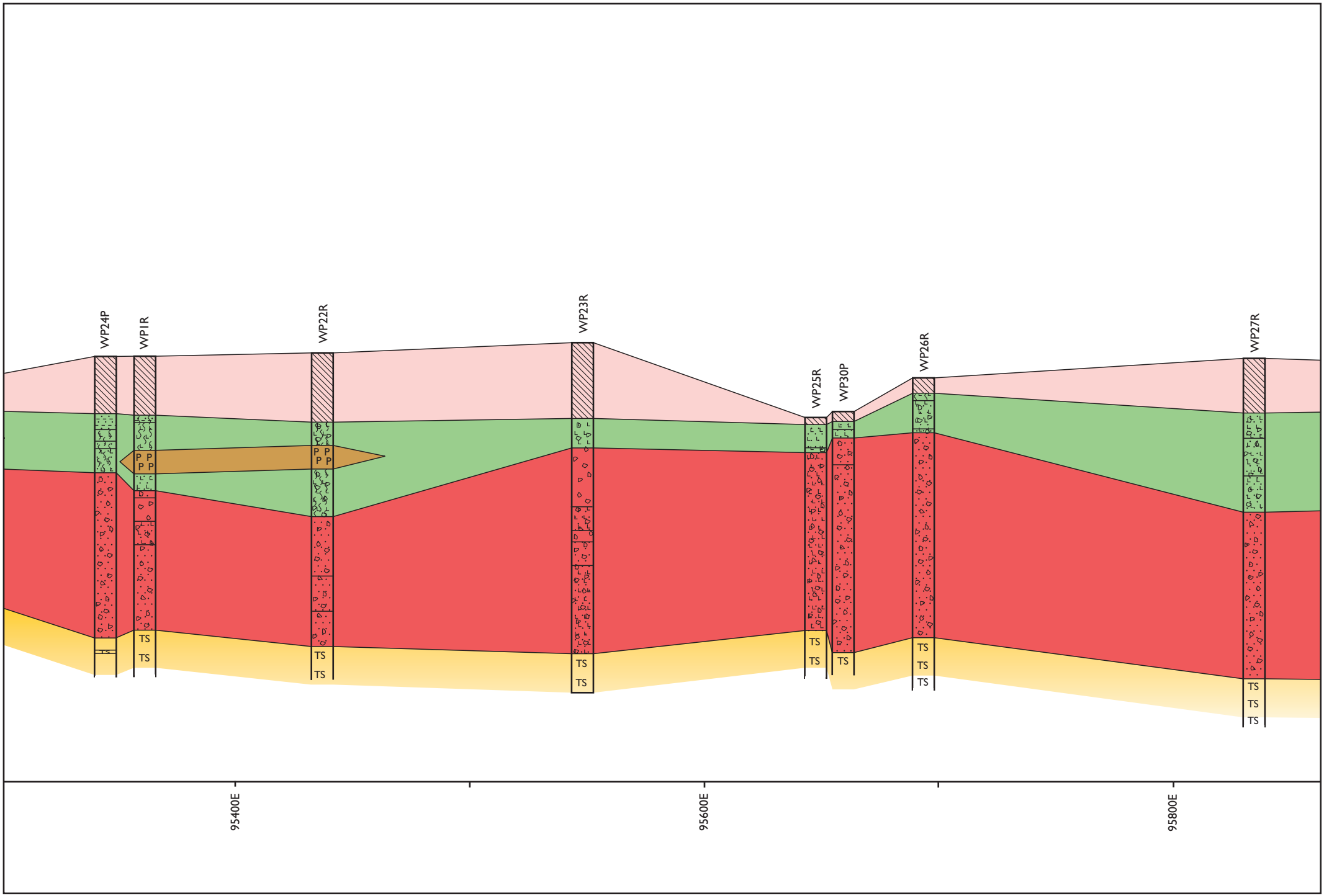


Figure 2 Existing deposit model (long section), 2008 (sheet 2 of 3)

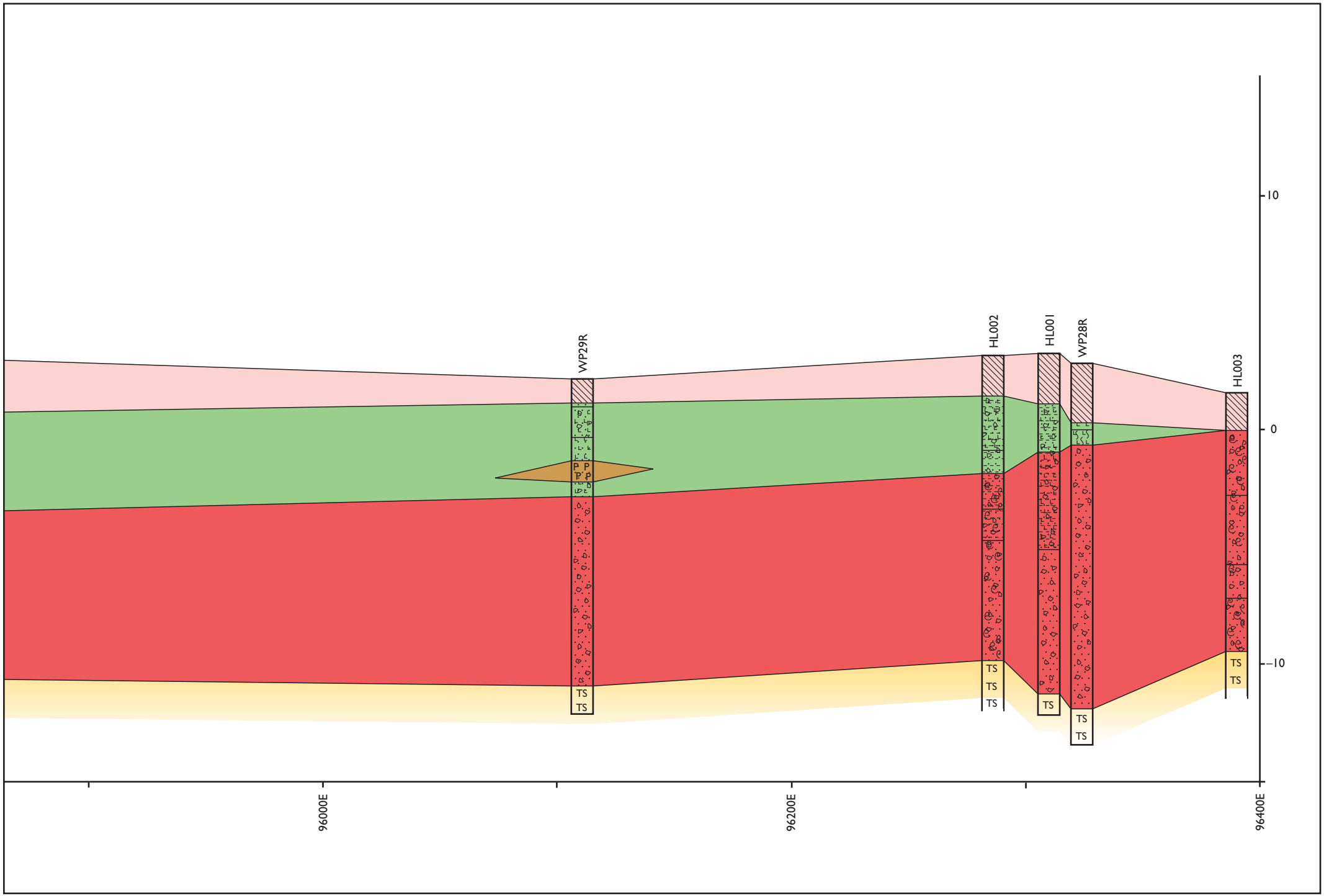


Figure 2 Existing deposit model (long section), 2008 (sheet 3 of 3)

Figure 3 *Not used in this version of the WSI*

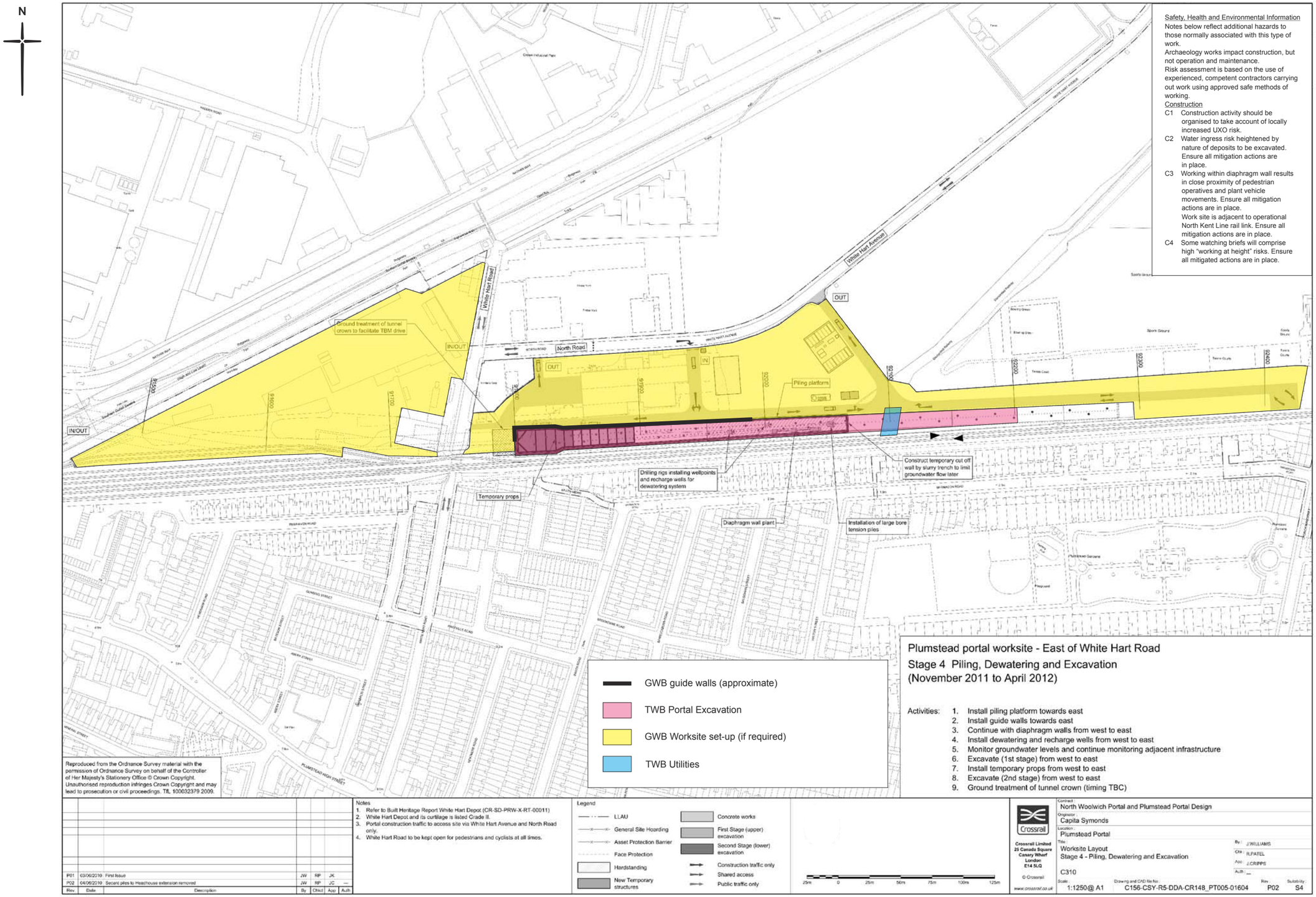
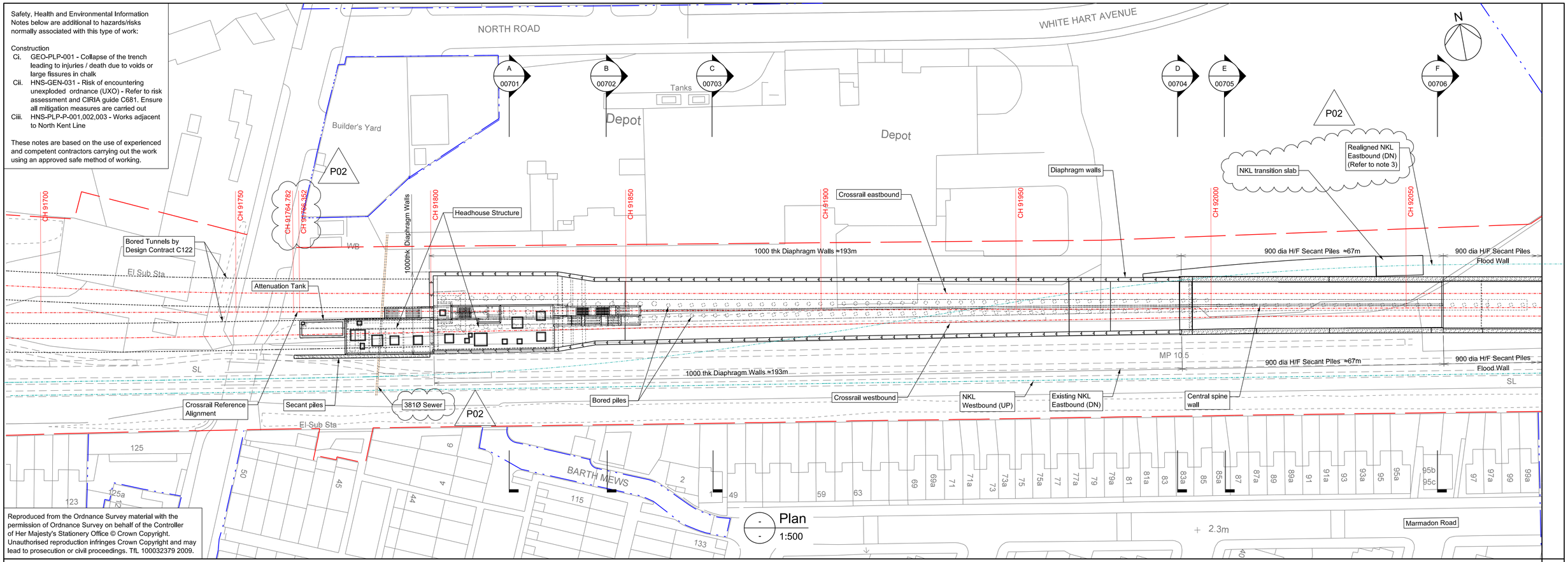


Figure 4 Archaeological watching brief areas

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

Construction
- Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissures in chalk
- Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out
- Ciii. HNS-PLP-P-001,002,003 - Works adjacent to North Kent Line

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



Plan
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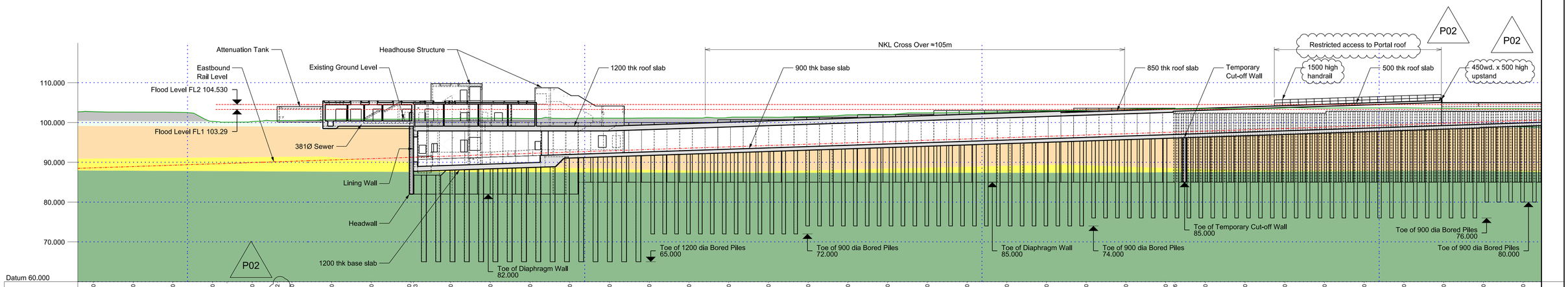


Reference Chainage	91720 91730 91740 91750 91760 91766.352 91770 91780 91790 91800 91800.613 91810 91820 91830 91840 91850 91860 91870 91880 91890 91900 91910 91920 91930 91940 91950 91960 91970 91980 91990 91992.396 92000 92010 92020 92030 92040 92050 92060 92070 92080
Eastbound Chainage	22460 22490 22500 22510 22520 22530 22540 22550 22560 22570 22580 22590 22600 22610 22620 22630 22640 22650 22660 22670 22680 22690 22700 22710 22720 22730 22740 22750 22760 22770 22780 22790 22800 22810 22820 22830 22840
Proposed Rail Level	88.728 89.058 89.388 89.718 90.048 90.378 90.708 91.038 91.368 91.698 92.028 92.358 92.688 93.018 93.348 93.678 94.008 94.338 94.668 94.998 95.328 95.658 95.988 96.318 96.648 96.978 97.308 97.638 97.968 98.298 98.628 98.958 99.288 99.618 99.948 100.278 100.608
Existing Ground Level	102.636 102.607 102.481 100.075 100.588 100.566 100.790 100.832 100.919 101.061 101.058 101.205 101.065 101.062 101.148 101.186 101.368 101.357 101.589 101.916 102.259 102.433 102.526 102.831 103.009 103.288 103.429 103.522 103.496 103.511 103.692 103.655 103.671 103.637 103.478 103.462 103.419

Continued on drawing no. C156-CSY-S-DDL-CR148_PT005-00052

Part Elevation on Portal Structure looking north from Crossrail Westbound Centreline
1:500

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JW	SM	JK	
P02	24/09/2010	Revisions as clouded	AJ	SM	JK	---

Notes
1. For general notes refer to drg no. C156-CSY-S-DDL-CR148_PT005-00001
2. Ground Strata shown is indicative. Refer to factual site investgation data in works information.
3. Proposed NKL eastbound (DN) is based on Option 10 refer to Drg No. C122-OVE-R4-DMA-CR001-11219, for details.

P02

Key
- LOD (Limits of Deviation)
- LLAU (Limit of land to be acquired or used)
- Made ground
- Alluvium
- Peat
- River Terrace Deposits
- Chalk
- Thanet Sand

10m 0 10m 20m 30m 40m 50m

Crossrail Limited
25 Canada Square
Canary Wharf
London
E14 5LQ

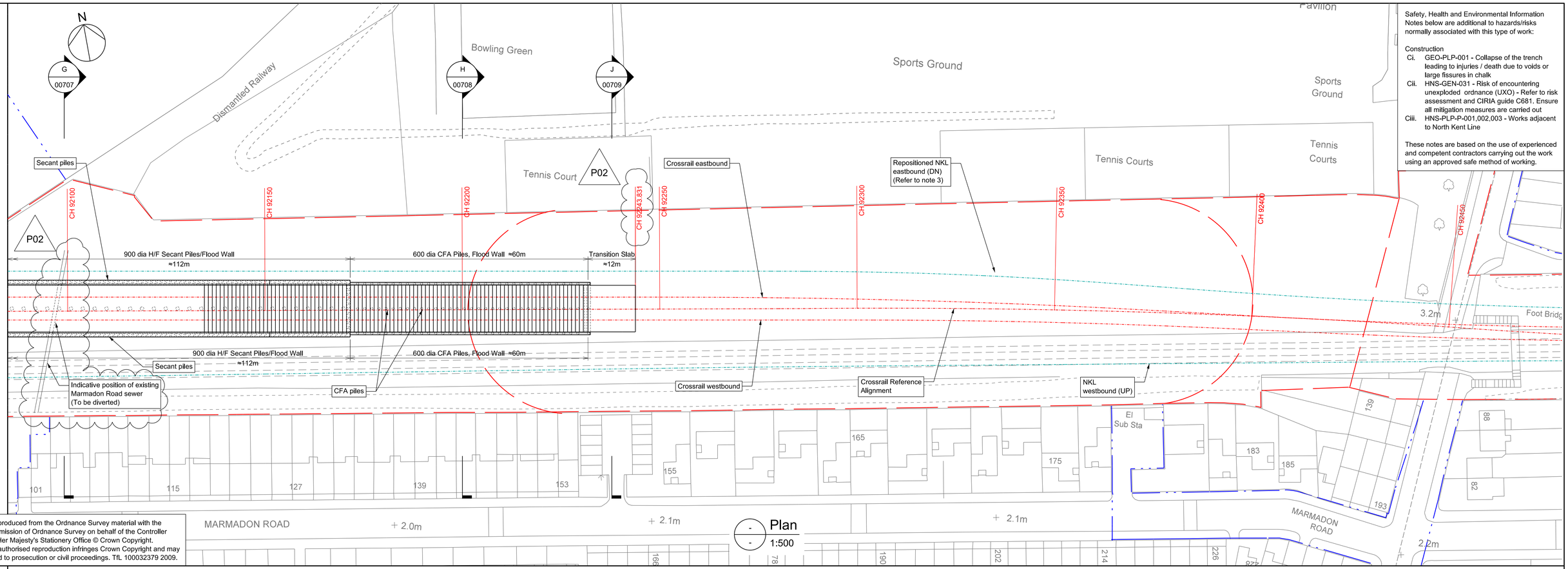
www.crossrail.co.uk

Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Plan and Profile Sheet 1
C310
By : A.JONES
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:500@ A1
Drawing and CAD file No : C156-CSY-S-DDL-CR148_PT005-00051
Rev : P02
Suitability : S4

RESTRICTED

Fit for authorisation

Copy Approved for Design - Created: 24-SEP-2010



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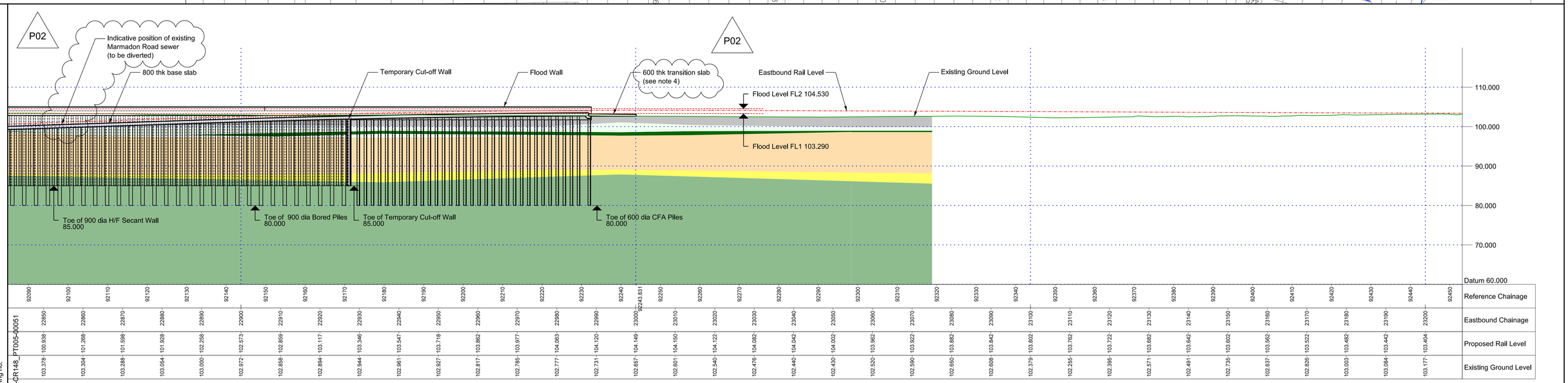
Plan
1:500

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

Construction

- Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissures in chalk
- Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out
- Ciii. HNS-PLP-P-001,002,003 - Works adjacent to North Kent Line

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



Part Elevation on Portal Structure looking north from Crossrail Westbound Centreline
1:500

Continued on drawing no. C156-CSY-S-DDL-CR148_PT005-00051

Notes
1. For general notes refer to drg no. C156-CSY-S-DDL-CR148_PT005-00001
2. Ground Strata shown is indicative. Refer to factual site investgation data in works information.
3. Proposed NKL eastbound (DN) is based on Option 10 refer to Drg no. C122-OVE-R4-DMA-CR001-11219 for details.
4. The proposed prepared subgrade, treatment to suit site condition in drg no. C122-OVE-R4-DDB-CR001_Z-72541 to be extended beneath transition slab. The design of the transition slab subject to review once the treatment is known.

P02

Key
- LOD (Limits of Deviation)
- LLAU (Limit of land to be acquired or used)
- Made ground
- Alluvium
- Peat
- River Terrace Deposits
- Chalk
- Thanet Sand

10m 0 10m 20m 30m 40m 50m

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JW	SM	JK	
P02	21/09/2010	Revisions as clouded	GI	SM	JK	---

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25 Canada Square
Canary Wharf
London
E14 5LQ
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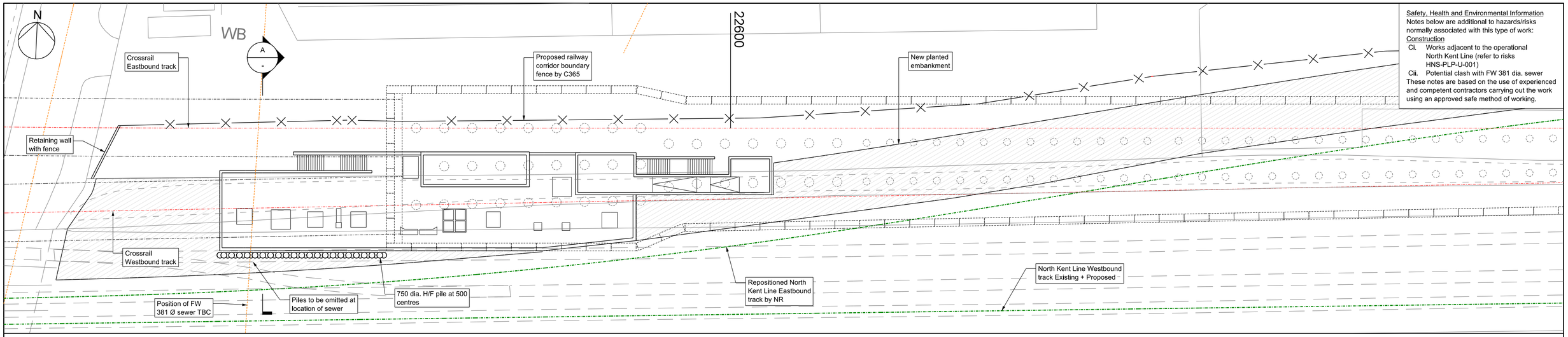
Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Plan and Profile Sheet 2
C310
By : G.IRELAND
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:500@ A1
Drawing and CAD file No : C156-CSY-S-DDL-CR148_PT005-00052
Rev : P02
Suitability : S4

Fit for authorisation
RESTRICTED
Copy Approved for Design - Created: 24-SEP-2010



Safety, Health and Environmental Information

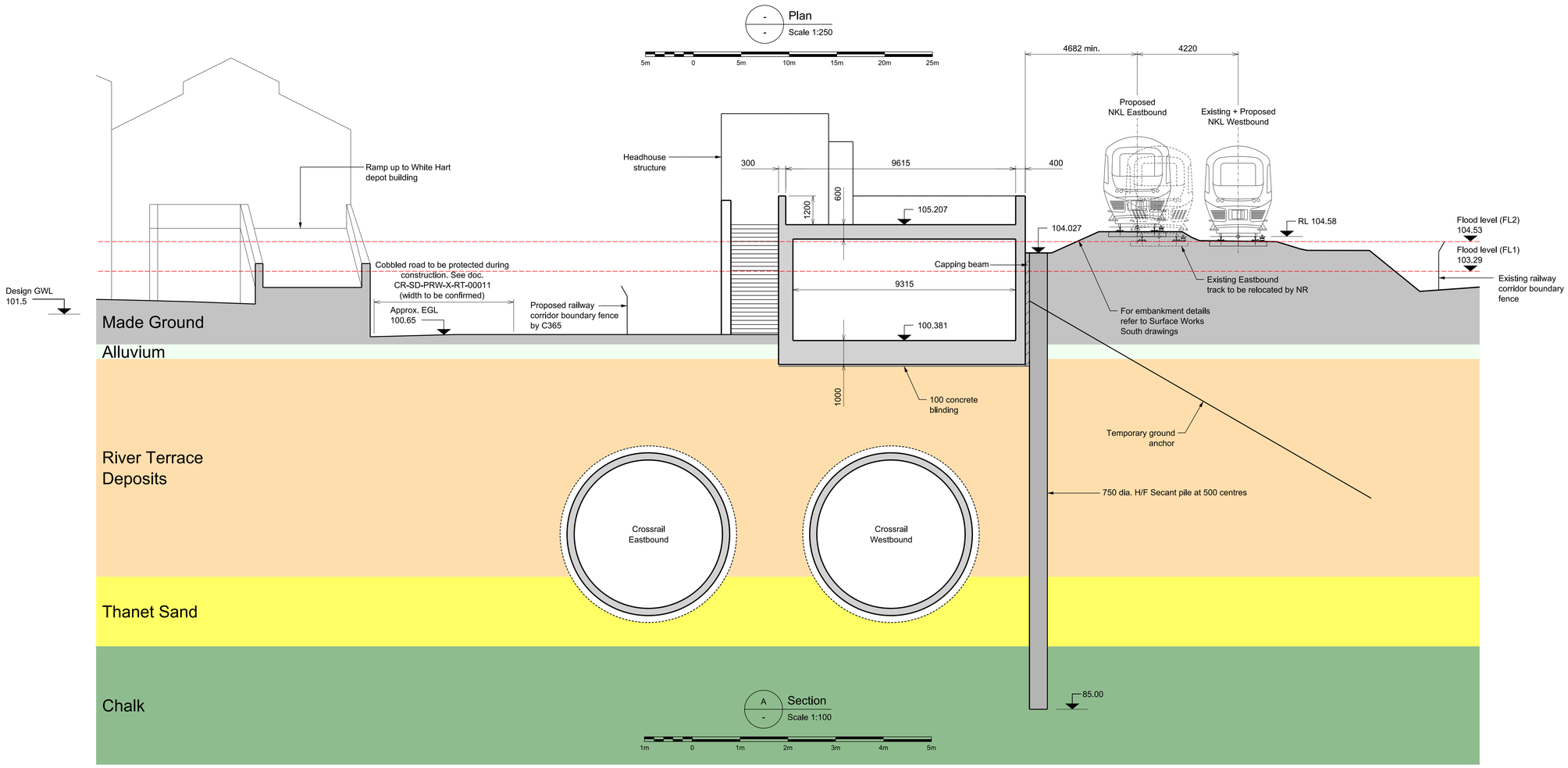
Notes below are additional to hazards/risks normally associated with this type of work:

Construction

Ci. Works adjacent to the operational North Kent Line (refer to risks HNS-PLP-U-001)

Cii. Potential clash with FW 381 dia. sewer

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



Rev.	Date	Description	By	Chkd	App	Auth
P01	08/04/2010	First Issue		JQ	RP	JC
P02	16/04/2010	---		JW	RP	JK
P03	08/06/2010	Issued for Stage D, ITT		AJ	SM	JC

Notes

1. All dimensions are in mm unless noted otherwise.
2. All levels are in metres Above Tunnel Datum (mATD) which is 100m below ordnance survey datum, unless stated otherwise.
3. Ground strata are indicative and are based on GDN_1.0 CR-DV-THV-X-DG-00002 dated March 07
4. Setting out based on Crossrail alignment revision S working and Combined Services drawings C156-CSY-S-DDH-CR148_PT005-58000 to 58003 inc.
5. Refer to utilities information drawings P40100-E2M00-U00-D-90015 & 90016
6. Planting by C365 & surface finishes.
7. Flood levels based on Civil Eng Design Standard CR-STD-303-10 Version 5.0

Key:

Crossrail alignment revision S working

NKL alignment

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London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design

Originator : Capita Symonds

Location : Plumstead Portal

Title : Plan and Profile Sheet 3 of 3

C310

By : A.JONES

Chk : S.MONDAL

App :

Auth : J.CRIPPS

Scale : Various @ A1

Drawing and CAD file No : C156-CSY-S-DDH-CR148_PT005-18012

Rev : P03

Suitability : S4

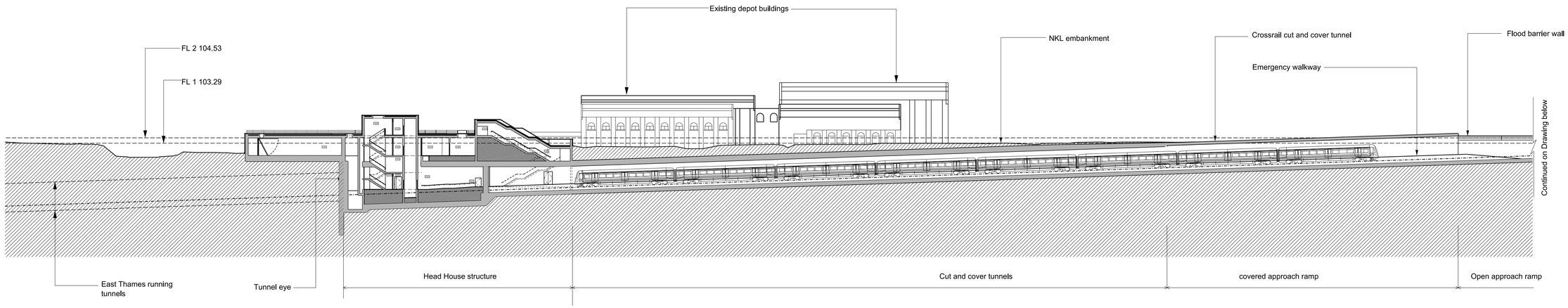
RESTRICTED

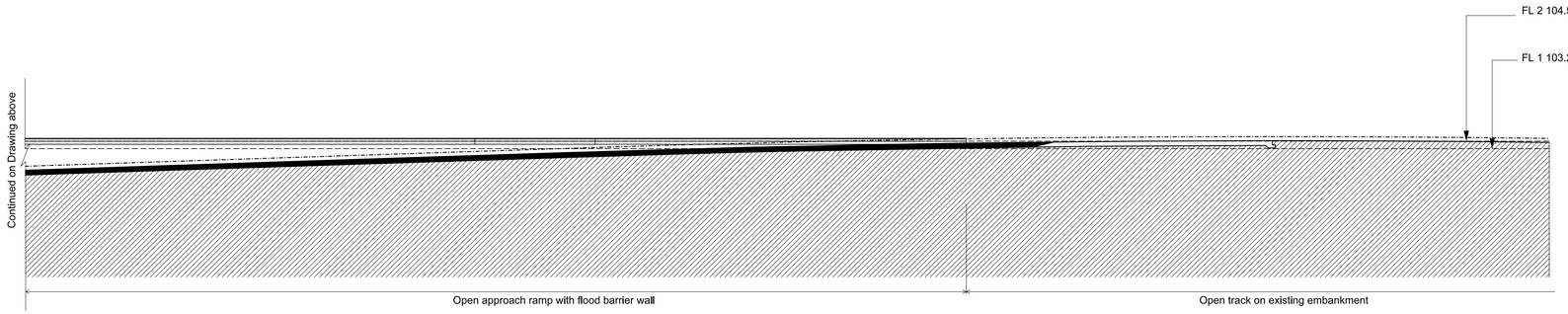
Fit for authorisation

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

No unusual risks.

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





- / 20212 Longitudinal Section G-G
1:500

Rev.	Date	Description	By	Chkd	App	Auth
P01	08/04/2010	First Issue	ME	JB	JK	
P02	19/07/2010	Issued for Stage E	DC	JB	JK	
P03	16/08/2010	---	DC	TM	JC	
P04	07/09/2010	---	JB	JB	JK	---

Notes

10m 0 10m 20m 30m 40m 50m

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Canary Wharf
London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Longitudinal Site Section G-G
By : J.BARON
Chk : J.BARKMAN
App : J.KINNEAR
Auth : ---
Scale : 1:500@ A1
Drawing and CAD file No : C156-CSY-A-DDB-CR148_PT005-20206
Rev : P04
Suitability : S4

Fit for authorisation

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Existing buildings and structures may need to be demolished to provide worksite
Crossrail eastbound
Existing Grade II Listed ramp may need to be dismantled, placed in storage and reinstated at a later date, subject to English Heritage and any other necessary approvals
Existing Grade II Listed cobbled road to be protected
P02
CH 91700
CH 91750
CH 91764.782
CH 91766.352
CH 91800
CH 91850
CH 91900
CH 91950
CH 92000
CH 92050
CH 92100
CH 92150
CH 92200
CH 92243.831
CH 92250
CH 92300
CH 92350
CH 92400
Possible existing building foundations to be removed subject to surveys
Existing North Kent Line Eastbound (DN)
Marmadon Road sewer to be diverted
North Kent Line westbound (UP)
Crossrail Reference Alignment
Repositioned North Kent Line eastbound (DN)
Crossrail westbound
Works
NATHAN WAY
Community Centre
Factory
Timber Yard
NORTH ROAD
WHITE HART AVENUE
Depot
Allotment Gardens
Sports Ground
Bowling Green
Tennis Court
Tennis Courts
Pavilion
Dismantled Railway
BARTH MEWS
MARMADON ROAD
BROOKDENE ROAD
BANNOCKBURN ROAD
BALDOCK STREET
HYLTON STREET
HARTVILLE ROAD
WHITE HART ROAD
BARTH ROAD
Plumstead Gardens
Playground
Shelter
Pond
Gordon Memorial Hall
N

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

The risk references below relate to the CDM Risk Register Document Number CR-C156-CSY-03-RGN-CR148_PT005-00001

Construction
- Ci. Contaminated ground (Refer to HNS-PLP-W-004)
- Cii. Striking unexploded ordnance (Refer to HNS-GEN-031)
- Ciii. Works adjacent to NKL (Refer to HNS-PLP-P-001, 002, 003)
- Civ. Known ultilities with incomplete records (Refer to HNS-PLP-U-001)

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

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JW	SM	JK	
P02	22/09/2010	Revisions as clouded	JH	SM	JK	—

Notes

Key:

20m 0 20m 40m 60m 80m 100m

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London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Demolition Worksite Clearance
C310

By : J.HARRIS
Chk : S.MONDAL
App : J.KINNEAR
Auth : __

Scale :	Drawing and CAD file No :	Rev :	Suitability :
1:1000@ A1	C156-CSY-S-DDA-CR148_PT005-00021	P02	S4

Fit for authorisation

RESTRICTED

Safety, Health and Environmental Information

Drawing for interface coordination only and is not for construction

Primary site access via White Hart Avenue (private road)[3]

Construction traffic crossing White Hart Road
Temporary traffic lights at junction to facilitate crossing, used primarily during supply of tunnel lining segments during TBM tunnelling

Traffic Control in North Road
Barrier to prevent public vehicular access to private road.

Entrance to site area via Old Coal Yard and Access Maintained for Network Rail Road/Rail Access
IN/OUT

Crossrail Reference Chainages

Close gate
No access during construction except in an emergency

Face protection required

Timber Yard

White Hart Depot
Site office/Welfare/ Stores and workshops in Grade II listed building. Rooms shown available for use by Contractor

Security

OUT

IN

IN/OUT

Following diversion of existing sewer, sewer in this zone to be removed

Existing Marmadon Road sewer to be diverted prior to start of Portal construction works

Site Haul road

Crossrail Reference Chainages

Site vehicles turning area

Existing North Kent Line Eastbound track

North Kent Line Westbound track

North Kent Line Signal NK111

Temporary hoarding line until asset protection barrier constructed

Low headroom bridge 3.25m from bridge soffit to road crest

Possible existing building foundations to be demolished (removed) subject to surveys

TBM chamber

Removal of Grade II listed ramp and cobbled road to be agreed

Network Rail to remove existing siding during Advanced Works commencing September 2010

Proposed Plumstead Portal shown for information only

Asset Protection Barrier to be installed during possessions commencing October 2010 by Network Rail

Face protection required to existing guardhouse

Section of cobbles to be protected

Possible existing building foundations to be demolished (removed) subject to surveys

Plumstead portal worksite - East of White Hart Road

Stage 1 Enabling and Site Mobilisation (October 2010 to September 2011)

Note: Exit via Church Manor Way worksite for emergency use only

Activities:

1. C233 (Enabling Works contract) to undertake following early works activities:
   - Divert and remove services between portal and White Hart Depot buildings
   - Clear undergrowth and trees from between existing NKL boundary fences
   - Remove fences
2. Network Rail to undertake advance works including installation of asset protection barrier between Ch 91750 (White Hart Road bridge) and Ch 92450 (Church Manorway bridge) during series of track possessions commencing October 2010, diversion of existing cable duct, relocation of signal post and removal of East Neck as defined in the 'Scope of Work for Plumstead' document no. CRL1-PDP-Z4-RSW-C148_WS164-00001-P02

The following works to be undertaken by the main contractor, C310 (Thames Tunnels and Portals):

3. Arrange for diversion of Marmadon Road sewer
4. Set up local traffic management
5. Undertake condition surveys on adjacent structures and buildings. Carry out detailed condition and heritage surveys on the Grade 2 listed buildings of the White Hart Depot
6. Undertake agreed protection works to Grade II listed White Hart Depot buildings including protection to facade
7. Install and commission monitoring facilities for `NKL, WH Bridge, WH Depot, EDF substation.
8. Remove or protect cobbled road along southern facade of building
9. Dismantle ramp to Room 20 of southern depot building. Materials to be stored for reinstatement later
10. Install site hoarding and establish site access gates

Rev.	Date	Description	By	Chkd	App	Auth
P01	03/06/2010	First Issue	JW	RP	JK	
P02	04/06/2010	Secant piles to Headhouse extension removed	JW	RP	JC	
P03	16/07/2010	Issued for Stage E	JW	RP	JK	
P04	03/08/2010	Stage dates revised and Asset Protection Barrier extended	JW	RP	JK	---

Notes
1. Refer to Built Heritage Report White Hart Depot (CR-SD-PRW-X-RT-00011)
2. White Hart Depot and its curtilage is listed Grade II.
3. Portal construction traffic to access site via White Hart Avenue and North Road only.
4. White Hart Road to be kept open for pedestrians and cyclists at all times.

Legend
- LLAU
- General Site Hoarding
- Asset Protection Barrier
- Face Protection
- Hardstanding
- New Temporary structures
- Concrete works
- First Stage (upper) excavation
- Second Stage (lower) excavation
- Construction traffic only
- Shared access
- Public traffic only

N

25m 0 25m 50m 75m 100m 125m

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London
E14 5LQ
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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Worksite Layout
Stage 1 - Enabling and Site Mobilisation
C310
By : J.WILLIAMS
Chk : R.PATEL
App : J.KINNEAR
Auth : ---
Scale : 1:1250@ A1
Drawing and CAD file No : C156-CSY-R5-DDA-CR148_PT005-01601
Rev : P04
Suitability : S4

Fit for authorisation

RESTRICTED

Copy Approved for Design - Created: 03-AUG-2010

Safety, Health and Environmental Information

Drawing for interface coordination only and is not for construction

White Hart Avenue

Covered and bunded Fuel and Oil storage area with sloping floor and sump

Site office / Welfare / Stores in grade 2 listed building

Steel reinforcement cage assembly area

Ground treatment of tunnel crown to facilitate TBM drive

Bentonite Plant

OUT

IN

IN/OUT

North Road

Install guide walls and south diaphragm walls

Upper piling platform

Waste water treatment tanks

Diaphragm wall plant

Plumstead portal worksite - East of White Hart Road

Stage 2 Piling Preparation and Piling South Wall
(May 2011 to September 2011)

Activities:

1. Install and commission Bentonite plant for piling works
2. Install and commission waste water treatment plant
3. Ground treatment of tunnel crown (timing TBC)
4. Backfill Ch 91800 - Ch 91955 to existing embankment level
5. Construct upper piling platform for piling south wall
6. Construct guide walls
7. Mobilise piling plant and equipment
8. Construct diaphragm walls and part of headwall

Rev.	Date	Description	By	Chkd	App	Auth
P01	03/06/2010	First Issue	JW	RP	JK	
P02	04/06/2010	Secant piles to Headhouse extension removed	JW	RP	JC	
P03	16/07/2010	Issued for Stage E	JW	RP	JK	
P04	03/08/2010	Stage dates revised and ground treatment of tunnel crown added to activities	JW	RP	JK	---

Notes

1. Refer to Built Heritage Report White Hart Depot (CR-SD-PRW-X-RT-00011)
2. White Hart Depot and its curtilage is listed Grade II.
3. Portal construction traffic to access site via White Hart Avenue and North Road only.
4. White Hart Road to be kept open for pedestrians and cyclists at all times.

Legend

- LLAU
- General Site Hoarding
- Asset Protection Barrier
- Face Protection
- Hardstanding
- New Temporary structures
- Concrete works
- First Stage (upper) excavation
- Second Stage (lower) excavation
- Construction traffic only
- Shared access
- Public traffic only

N

25m 0 25m 50m 75m 100m 125m

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Contract : North Woolwich Portal and Plumstead Portal Design

Originator : Capita Symonds

Location : Plumstead Portal

Title : Worksite Layout
Stage 2 - Piling Preparartion and Piling South Wall

C310

By : J.WILLIAMS

Chk : R.PATEL

App : J.KINNEAR

Auth : ---

Scale : 1:1250@ A1

Drawing and CAD file No : C156-CSY-R5-DDA-CR148_PT005-01602

Rev : P04

Suitability : S4

Fit for authorisation

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Copy Approved for Design - Created: 03-AUG-2010

Safety, Health and Environmental Information

Drawing for interface coordination only and is not for construction

Plumstead portal worksite - East of White Hart Road

Stage 7 Excavation and Floor Slab continued, Gantry Crane and Back-up Train for EB drive

(July 2012 to November 2012)

Activities:

1. Remove TBM crane from headwall
2. Progress excavation (1st stage) towards east
3. Progress temporary propping towards east
4. Progress excavation (2nd stage) towards east
5. Progress concreting base slab towards east
6. Install TBM servicing crane
7. Install grout plant
8. Set up site hoarding, security facilities, wheelwash, small stores, site offices, welfare, waste management, workshops, materials laydown areas

Rev.	Date	Description	By	Chkd	App	Auth
P01	03/06/2010	First Issue	JW	RP	JK	
P02	04/06/2010	Secant piles to Headhouse extension removed	JW	RP	JC	
P03	16/07/2010	Issued for Stage E	JW	RP	JK	
P04	03/08/2010	Stage dates revised and worksite set-up to west of White Hart Road added	JW	RP	JK	—

Notes

1. Refer to Built Heritage Report White Hart Depot (CR-SD-PRW-X-RT-00011)
2. White Hart Depot and its curtilage is listed Grade II.
3. Portal construction traffic to access site via White Hart Avenue and North Road only.
4. White Hart Road to be kept open for pedestrians and cyclists at all times.

Legend

- LLAU
- General Site Hoarding
- Asset Protection Barrier
- Face Protection
- Hardstanding
- New Temporary structures
- Concrete works
- First Stage (upper) excavation
- Second Stage (lower) excavation
- Construction traffic only
- Shared access
- Public traffic only

N

25m 0 25m 50m 75m 100m 125m

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E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design

Originator : Capita Symonds

Location : Plumstead Portal

Title : Worksite Layout
Stage 7 - Excavation and Floor Slab continued, Gantry Crane and Back-up Train for EB drive
C310

By : J.WILLIAMS

Chk : R.PATEL

App : J.KINNEAR

Auth : __

Scale : 1:1250@ A1

Drawing and CAD file No : C156-CSY-R5-DDA-CR148_PT005-01607

Rev : P04

Suitability : S4

Fit for authorisation

RESTRICTED

Safety, Health and Environmental Information

Drawing for interface coordination only and is not for construction

Plumstead portal worksite - East of White Hart Road

Stage 12 After TBM tunnelling of westbound complete construct Headhouse Extension and Attennuation Tank (January 2015 to April 2015)

Activities:
1. Modify points 2117
2. Modify asset protection barrier
3. Construct secant pile wall
4. Construct headhouse extension and attenuation tank
5. Backfill as necessary

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JW	RP	JK	
P02	03/08/2010	Stage dates revised and site boundary amended	JW	RP	JK	---

Notes
1. Refer to Built Heritage Report White Hart Depot (CR-SD-PRW-X-RT-00011)
2. White Hart Depot and its curtilage is listed Grade II.
3. Portal construction traffic to access site via White Hart Avenue and North Road only.
4. White Hart Road to be kept open for pedestrians and cyclists at all times.

Legend

- LLAU
- General Site Hoarding
- Asset Protection Barrier
- Face Protection
- ▨ Hardstanding
- 🟥 New Temporary structures
- ▨ Finished concrete
- ▨ Concrete works
- 🟧 First Stage (upper) excavation
- 🟫 Second Stage (lower) excavation
- → Construction traffic only
- → Shared access
- → Public traffic only

N

25m 0 25m 50m 75m 100m 125m

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Canary Wharf
London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design

Originator : Capita Symonds

Location : Plumstead Portal

Title : Worksite Layout
Stage 12 - After TBM tunnelling of Westbound complete construct Headhouse Extension and Attenuation Tank
C310

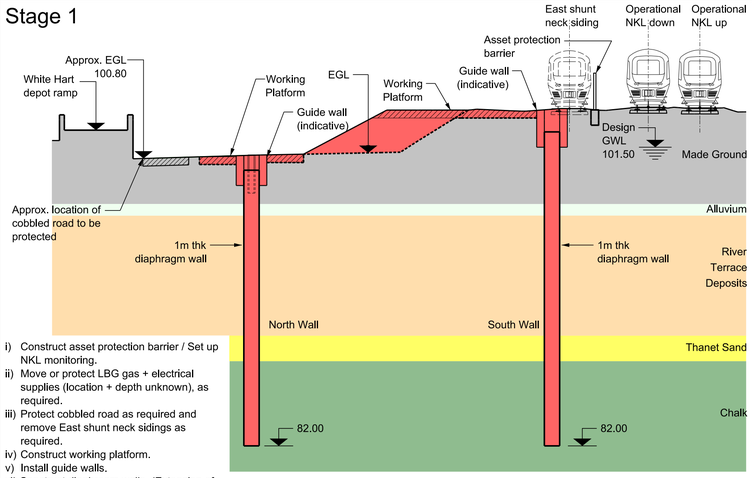
By : J.WILLIAMS
Chk : R.PATEL
App : J.KINNEAR
Auth : ---

Scale : 1:1250@ A1
Drawing and CAD file No : C156-CSY-R5-DDA-CR148_PT005-01612
Rev : P02
Suitability : S4

Fit for authorisation

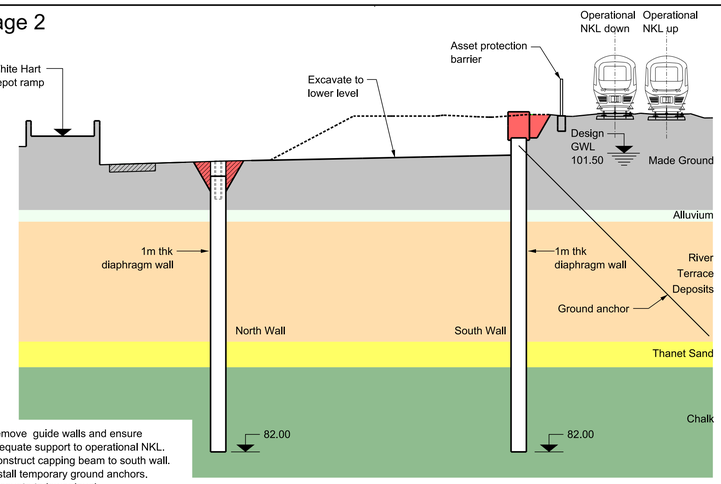
RESTRICTED

Stage 1



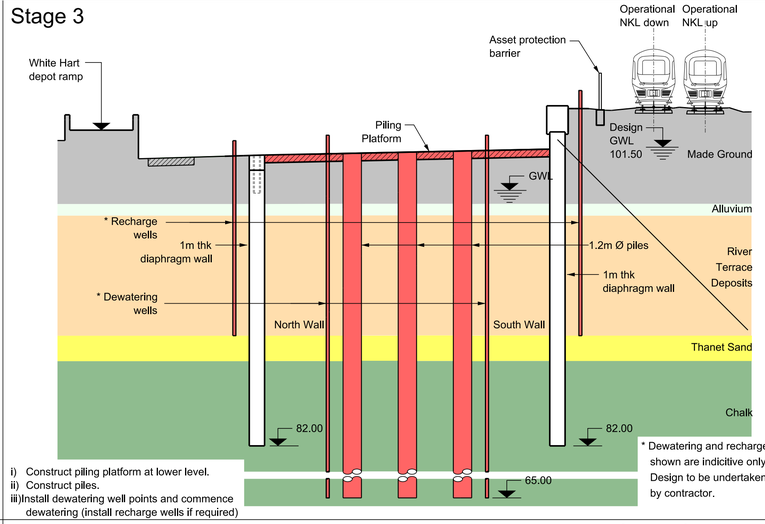
i) Construct asset protection barrier / Set up NKL monitoring.
ii) Move or protect LBG gas + electrical supplies (location + depth unknown), as required.
iii) Protect cobbled road as required and remove East shunt neck sidings as required.
iv) Construct working platform.
v) Install guide walls.
vi) Construct diaphragm walls. (Extension of embankment may be required to facilitate installation of South wall).

Stage 2



i) Remove guide walls and ensure adequate support to operational NKL.
ii) Construct capping beam to south wall.
iii) Install temporary ground anchors.
iv) Excavate to lower level.

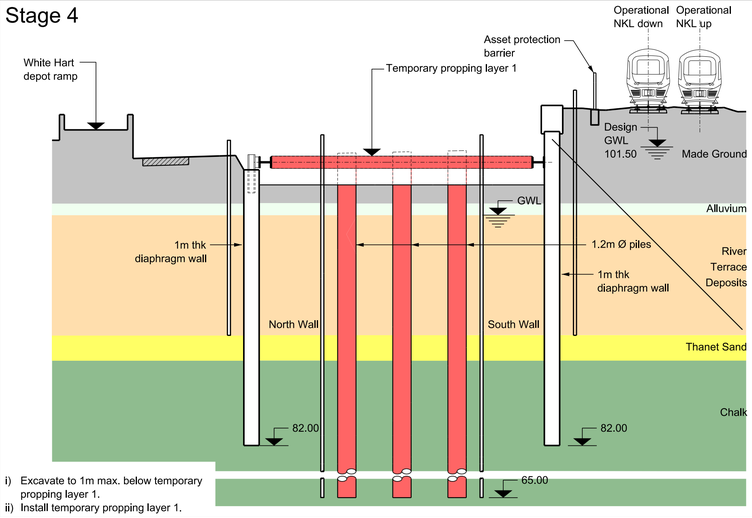
Stage 3



i) Construct piling platform at lower level.
ii) Construct piles.
iii)Install dewatering well points and commence dewatering (install recharge wells if required)

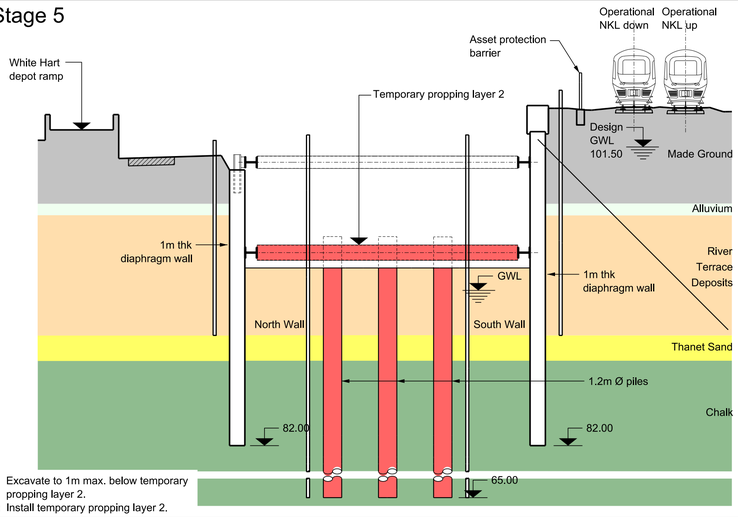
* Dewatering and recharge wells shown are indicitive only. Design to be undertaken by contractor.

Stage 4



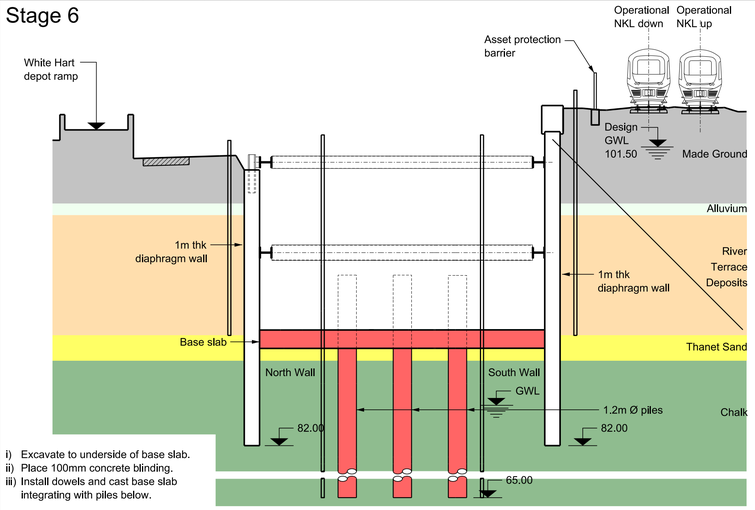
i) Excavate to 1m max. below temporary propping layer 1.
ii) Install temporary propping layer 1.

Stage 5



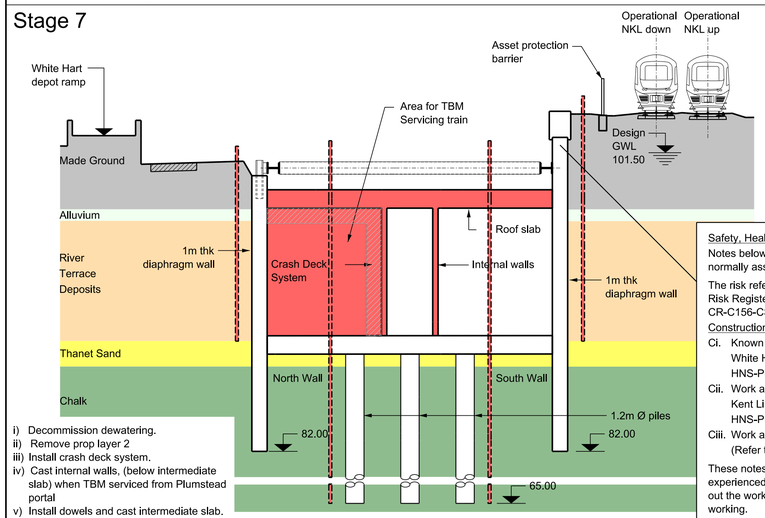
i) Excavate to 1m max. below temporary propping layer 2.
ii) Install temporary propping layer 2.

Stage 6



i) Excavate to underside of base slab.
ii) Place 100mm concrete blinding.
iii) Install dowels and cast base slab integrating with piles below.

Stage 7



i) Decommission dewatering.
ii) Remove prop layer 2
iii) Install crash deck system.
iv) Cast internal walls, (below intermediate slab) when TBM serviced from Plumstead portal
v) Install dowels and cast intermediate slab.

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work:

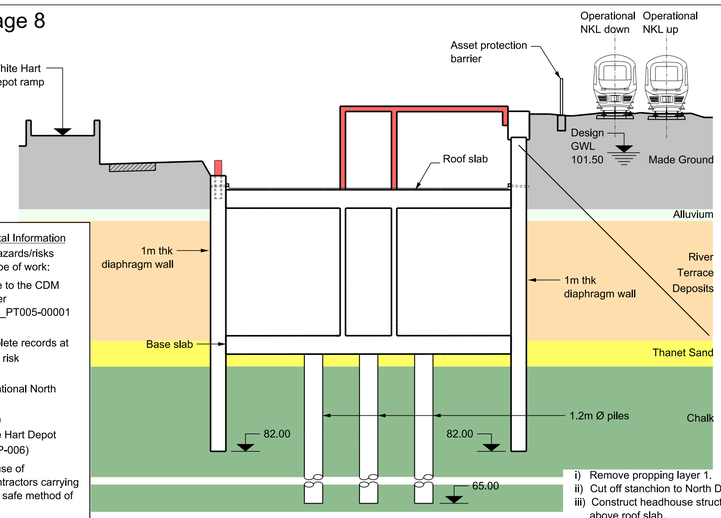
The risk references below relate to the CDM Risk Register Document Number CR-C156-CSY-03-RGN-CR148_PT005-00001

Construction

Ci. Known utilities with incomplete records at White Hart Depot (Refer to risk HNS-PLP-U-001)
Cii. Work adjacent to the operational North Kent Line (Refer to Risks HNS-PLP-P-001,002&003)
Ciii. Work adjacent to the White Hart Depot (Refer to Risks HNS-PLP-P-006)

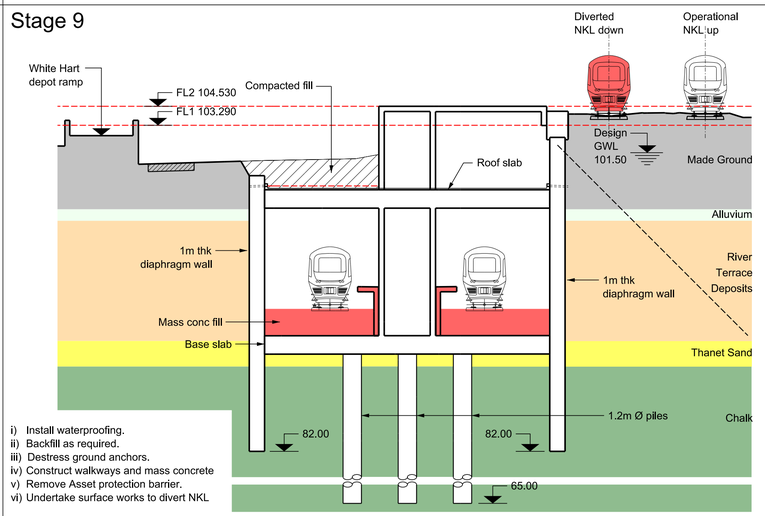
These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.

Stage 8



i) Remove propping layer 1.
ii) Cut off stanchion to North Dwall.
iii) Construct headhouse structure above roof slab.

Stage 9



i) Install waterproofing.
ii) Backfill as required.
iii) Destress ground anchors.
iv) Construct walkways and mass concrete
v) Remove Asset protection barrier.
vi) Undertake surface works to divert NKL

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	SH	RP	JK	

Notes

1. Ground strata and design ground water levels (GWL) are indicative and are based on GDN CR-DV-THV-X-DG-00002 V1 dated March 07.
2. All levels are in metres Above Tunnel Datum (mATD) which is 100m below ordnance survey datum, unless stated otherwise.
3. Construction loading to comply with latest standards requirements.
4. No plant or material to be sited within 1m of wall edge.
5. Settlement monitoring of the operational NKL to comply with NR requirements.
6. Construction plant type and movement to comply with NR requirements.
7. Refer to CDM Risk Register for construction risks identified.
8. Ground water levels outside box structure to be controlled as necessary by recharge to limit consolidation settlement.
9. Temporary works designed to allow for the accidental removal of a single prop.
10. Asset protection barrier design and construction by Network Rail.

Key:

Constructed at this stage

4m 0 4m 8m 12m 16m 20m

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25 Canada Square
Canary Wharf
London
E14 5LQ

www.crossrail.co.uk

Contract : North Woolwich Portal and Plumstead Portal Design

Originator : Capita Symonds

Location : Plumstead Portal

Title : Construction Sequence TBM Chamber

By : S.HOSKING
Chk : R.PATEL
App : J.KINNEAR
Auth : ---

Scale : 1:200@ A1

Drawing and CAD file No : C156-CSY-R5-DDB-CR148_PT005-01501

Rev : P01

Suitability : S4

Fit for authorisation

RESTRICTED

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

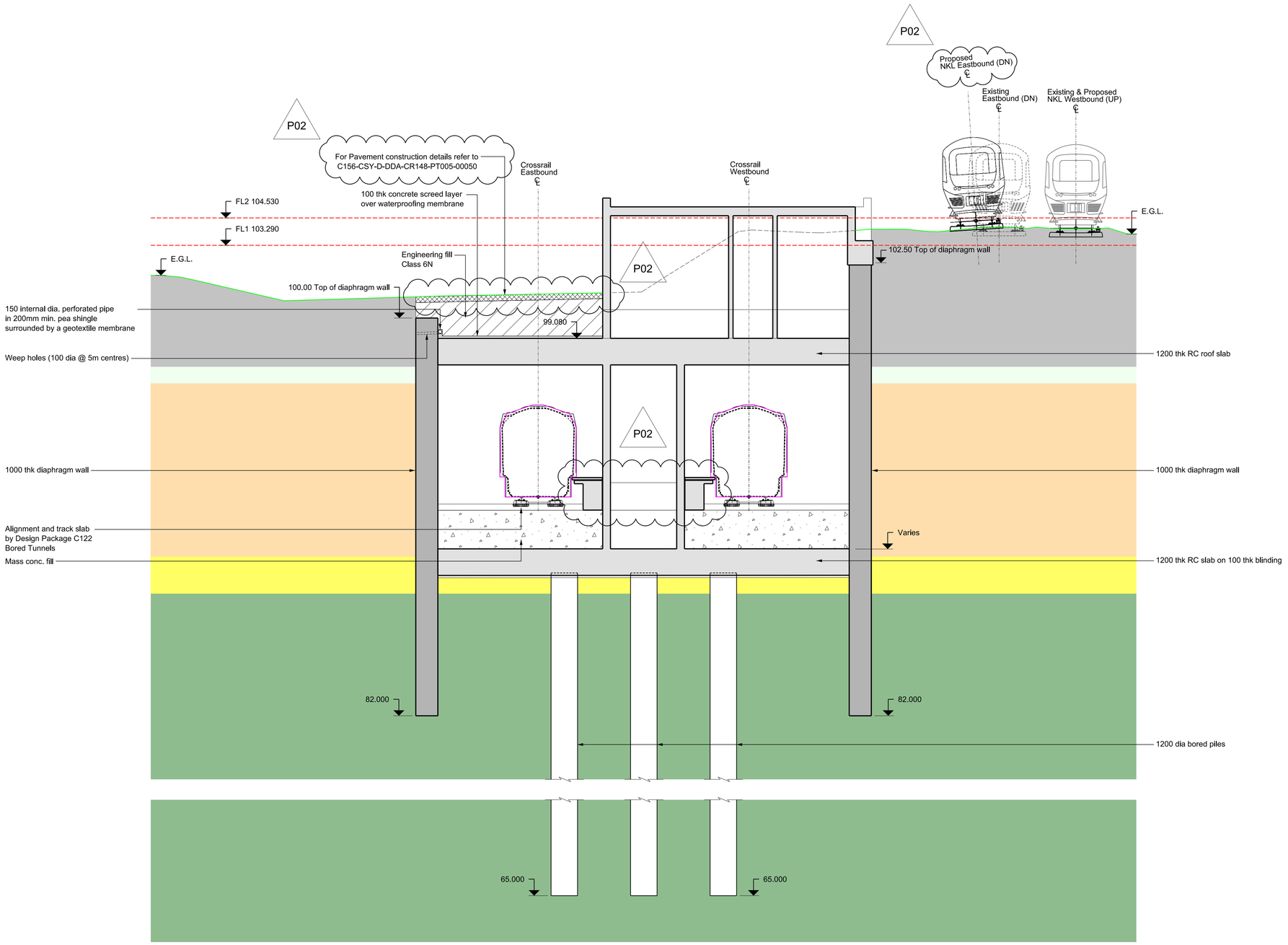
Construction

Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissures in chalk

Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out

Ciii. HNS-PLP-P-001,002,003 - Works adjacent to North Kent Line

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



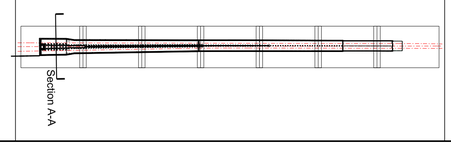
A 00051 Section
Scale 1:100

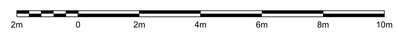
Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JG	SM	JK	
P02	21/09/2010	Revisions as clouded	GI	SM	JK	

Notes
1. For general notes refer to drg. no. C156-CSY-S-DDL-CR148_PT005-0000.
2. NKL Alignment is based on C122-OVE-R4-DMA-CR001-11219 (Option 10)

P02

Keyplan





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25 Canada Square
Canary Wharf
London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Section A-A
Chainage 91820
C310
By : G.IRELAND
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:100@ A1
Drawing and CAD file No : C156-CSY-S-DDB-CR148_PT005-00701
Rev : P02
Suitability : S4

RESTRICTED

Fit for authorisation

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

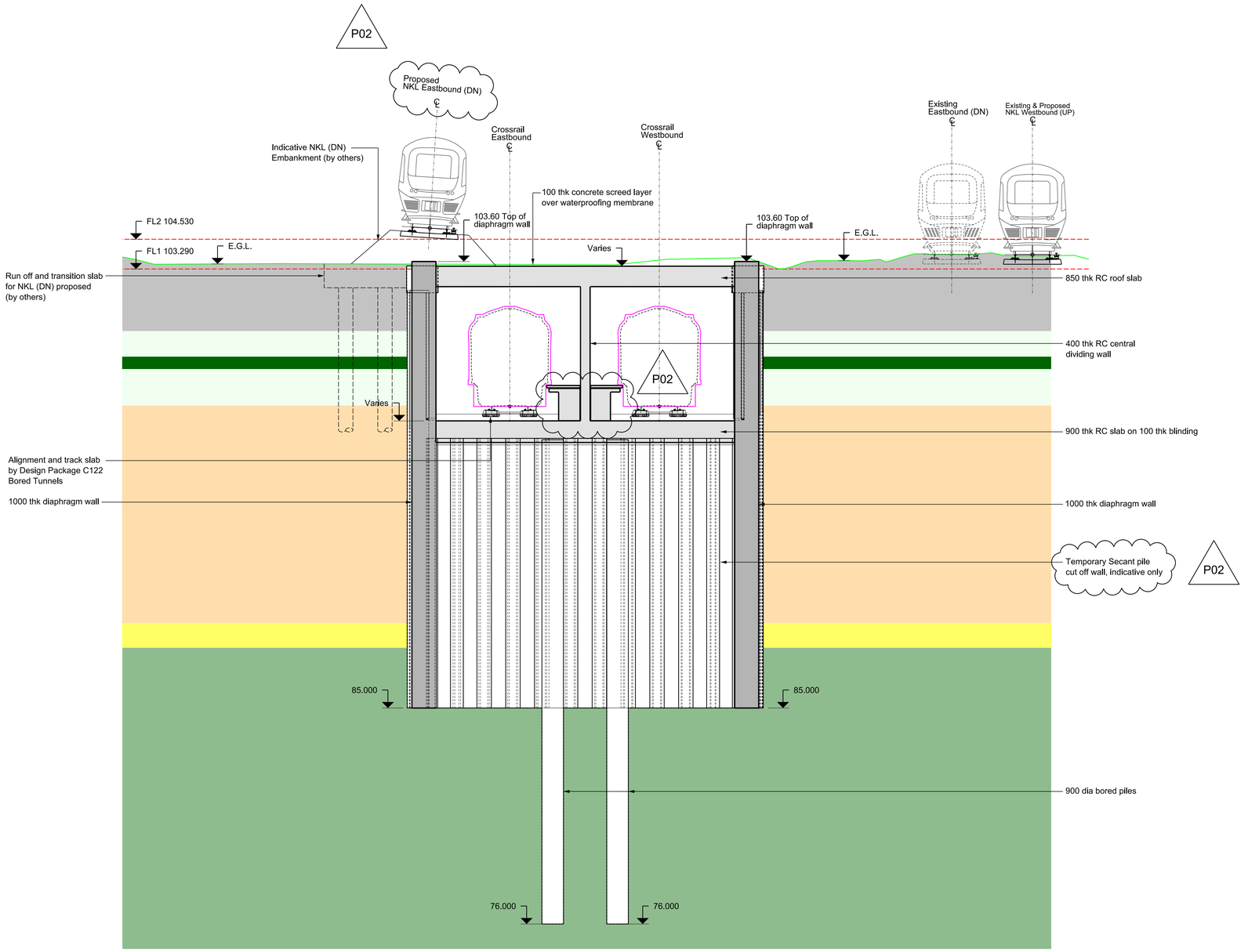
Construction

Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissures in chalk

Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out

Ciii. HNS-PLP-P-001, 002, 003 - Works adjacent to North Kent Line.

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



Made ground
Alluvium
Peat
River Terrace Deposits
Thanet Sand
Chalk

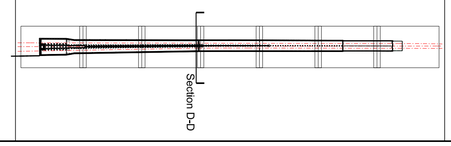
D 00051 Section
Scale 1:100

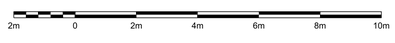
Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JG	SM	JK	
P02	16/09/2010	Revisions as clouded	GI	SM	JK	---

Notes
1. For general notes refer to drg. no. C156-CSY-S-DDL-CR148_PT005-00001
2. NKL alignment is based on drg. no. C122-OVE-R4-DMA-CR001-11219 (Option 10)

P02

Keyplan





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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Section D-D
Chainage 91988
C310
By : G.IRELAND
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:100@ A1
Drawing and CAD file No : C156-CSY-S-DDB-CR148_PT005-00704
Rev : P02
Suitability : S4

Fit for authorisation

RESTRICTED

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

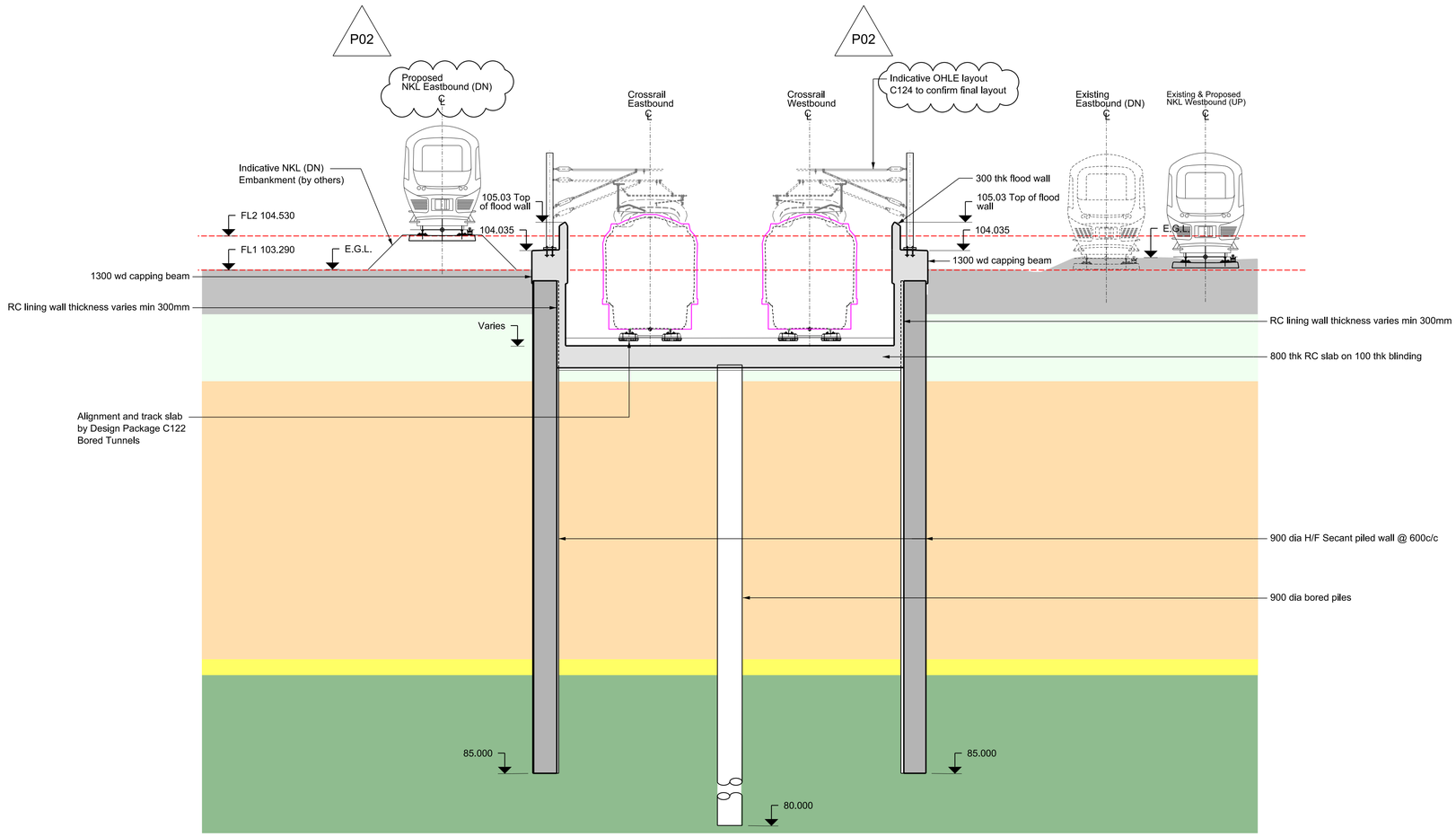
Construction

Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissures in chalk

Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out

Ciii. HNS-PLP-P-001, 002, 003 - Works adjacent to North Kent Line.

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



G / 00051 Section
Scale 1:100

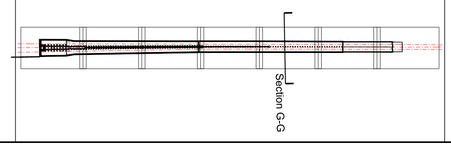
- Made ground
- Alluvium
- Peat
- River Terrace Deposits
- Thanet Sand
- Chalk

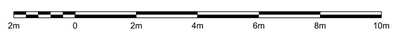
Notes
1. For general notes refer to drg. no. C156-CSY-S-DDL-CR148_PT005-00001.
2. NKL alignment is based on drg. no. C122-OVE-R4-DMA-CR001-11219 (Option 10)

P02

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JG	SM	JK	
P02	16/09/2010	Revisions as clouded	GI	SM	JK	---

Keyplan





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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Section G-G Chainage 92100
C310
By : G.IRELAND
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:100@ A1
Drawing and CAD file No : C156-CSY-S-DDB-CR148_PT005-00707
Rev : P02
Suitability : S4

RESTRICTED

Fit for authorisation

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

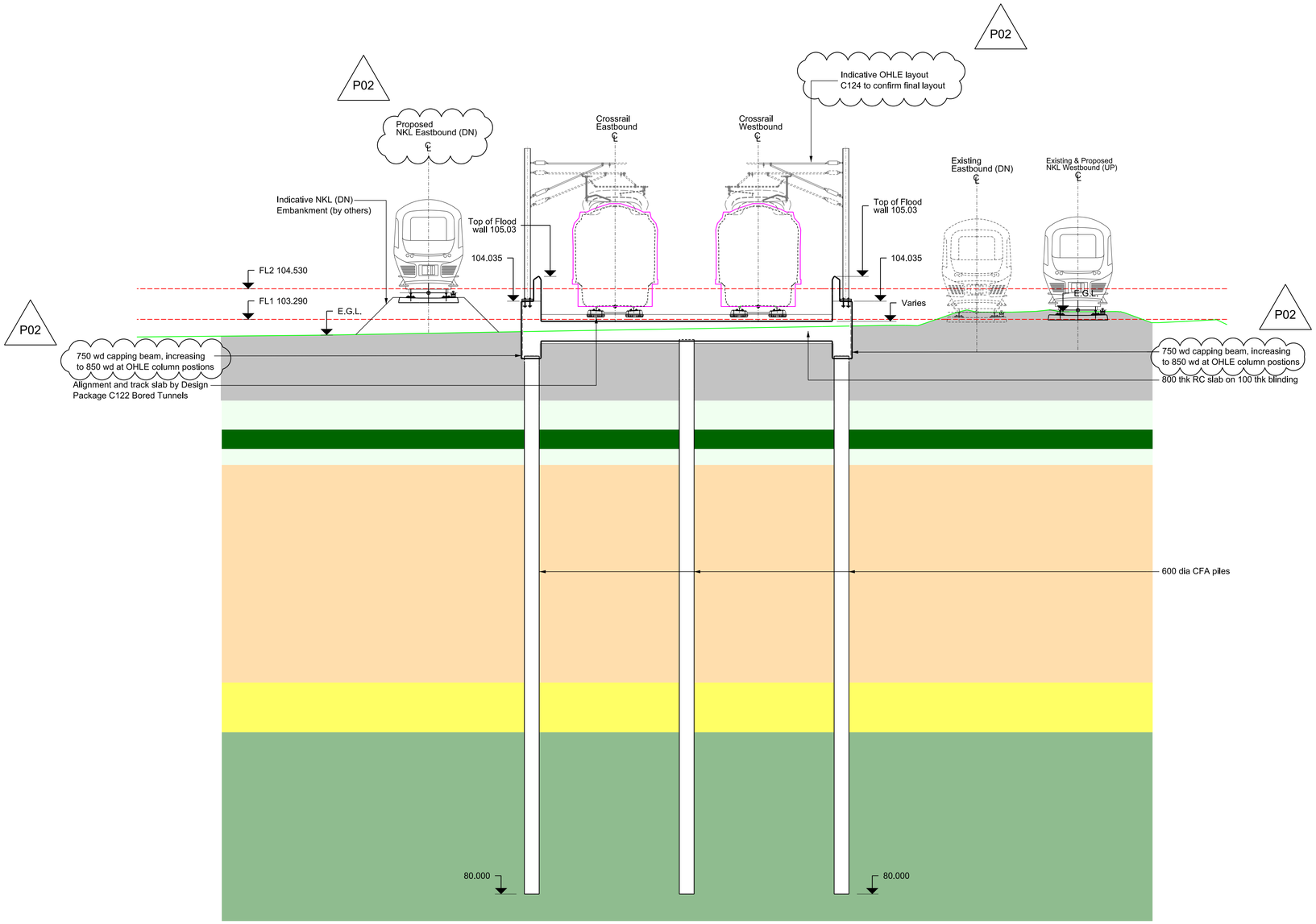
Construction

Ci. GEO-PLP-001 - Collapse of the trench leading to injuries / death due to voids or large fissuers in chalk

Cii. HNS-GEN-031 - Risk of encountering unexploded ordnance (UXO) - Refer to risk assessment and CIRIA guide C681. Ensure all mitigation measures are carried out

Ciii. HNS-PLP-P-001, 002, 003 - Works adjacent to North Kent Line.

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



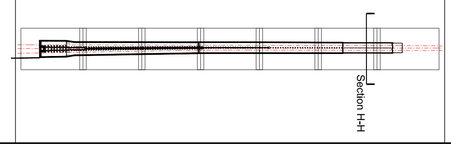
Made ground
Alluvium
Peat
River Terrace Deposits
Thanet Sand
Chalk

H / 00052 Section
Scale 1:100

P02

Notes
1. For general notes refer to drg. no. C156-CSY-S-DDL-CR148_PT005-00001
2. NKL alignment is based on drg. no. C122-OVE-R4-DMA-CR001-11219 (Option 10)

Keyplan



2m 0 2m 4m 6m 8m 10m

Rev.	Date	Description	By	Chkd	App	Auth
P01	16/07/2010	Issued for Stage E	JG	SM	JK	
P02	16/09/2010	Revisions as clouded	GI	SM	JK	---

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Canary Wharf
London
E14 5LQ

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Contract : North Woolwich Portal and Plumstead Portal Design
Originator : Capita Symonds
Location : Plumstead Portal
Title : Section H-H Chainage 92200
C310
By : G.IRELAND
Chk : S.MONDAL
App : J.KINNEAR
Auth : ---
Scale : 1:100@ A1
Drawing and CAD file No : C156-CSY-S-DDB-CR148_PT005-00708
Rev : P02
Suitability : S4

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Fit for authorisation

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