

King's Cross Central General Partner
Ltd

**Re-erection of Gasholder No 8
guide frames**

Earthworks and remediation plan

ERP/67940/EF




Issue 3 | 16 October 2012

This report takes into account the particular
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It is not intended for and should not be relied
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Abbreviations

CFA	Continuous Flight Auger
CLEA	Contaminated Land Exposure Assessment
CM	Conceptual model
CoCP	Code of Construction Practice
CTRL	Channel Tunnel Rail Link
EA	Environment Agency
ERP	Earthworks and Remediation Plan
ES	Environmental Statement
FES	Foundation and Exploration Services
GAC	Generic Assessment Criteria
GQRA	Generic Quantitative Risk Assessment
GTS	Ground Technology Services
ISR	Interim Service Road
KCCGPL	King’s Cross Central General Partners Limited
KXC	King’s Cross Central
mAOD	Metres above Ordnance Datum
mbgl	metres below ground level
PAH	Poly aromatic hydrocarbons
PPE	Personal protective equipment
PPL	Plausible pollutant linkage
SPR	Source – Pathway – Receptor
SSY	Shared Service Yard
TPH	Total petroleum hydrocarbons
UXO	Unexploded Ordnance

1 Introduction

1.1 Scope

This Earthworks and Remediation Plan (ERP) has been prepared by Ove Arup and Partners Ltd (Arup) at the instruction of King’s Cross Central General Partner Ltd (KCCGPL). It describes the enabling earthworks and remediation proposals for the area designated for the relocation of the former Gasholder No 8 guide frames (GH8), in Zone N of the Kings’ Cross Central (KXC) development site.

A plan showing the location of GH8 in the context of the KXC development zones is provided as Figure 1. The footprint of GH8 is shown as Zone N2 and the footprint of the neighbouring gasholder ‘triplet’ guide frames is shown as Zone N1. The GH8 planning application submission boundary is shown in Figure 2. It encompasses a strip of land to the west of GH8, GH8 and the western section of the site for the gasholder ‘triplet’ guide frames.

The proposed GH8 works are ‘Enabling Works’ under the Outline Planning Permission and therefore are submitted for approval pursuant to Condition 25 of that permission¹. This ERP has also been prepared in relation to the GH8 site to meet the requirements of Conditions 64 and of the KXC outline planning permission, dated 22 December 2006 with reference 2004/2307/P (the ‘Outline Planning Permission’). These conditions set limits on soil removal and lorry movements from the KXC Site.

The proposed works are Enabling Works, therefore the condition of requirements for an Earthworks and Remediation Plan do not formally apply. This document nevertheless meets the scope of conditions and explains how appropriate site levels and ground conditions will be achieved.

This report should be read in conjunction with the following documents:

- King’s Cross Central Environmental Statement (ES) Volume 4: Part 16 Soils and Contamination Specialist Report, Arup (May 2004);
- King’s Cross Central ES Volume 2: Part 9 Cultural Heritage and Townscape Specialist Report and Part 10 Archaeology Specialist Report, Arup (May 2004);
- King’s Cross Central ES Volume 5: Supplement, RPS Planning Transport & Environment (September 2005); and
- King’s Cross Central Revised Code of Construction Practice (CoCP), RPS (September 2005).

Where appropriate, this document incorporates and/or refers to information presented in the earlier ES and CoCP documents.

¹ Details of Enabling Works are submitted pursuant to Condition 25 of the KXC Outline Planning Permission and do not constitute Reserved Matters for the purposes of that permission. Enabling Works are defined under the Outline Planning Permission as including “(i) the re-erection of Gasholder and Guideframes” and “(a) site preparation works”.

1.2 The site

The area within the submission boundary shown in Figure 2 will be referred to as ‘the site’ from herein. The site encompasses Zone N2, the western portion of Zone N1 and the surrounding land. The Regent’s Canal borders the southern boundary of the site, cleared derelict land lies to the north and west of the site and a disused goods shed borders the eastern edge. Train lines to St Pancras lie approximately 25m west of the site.

The site is currently cleared derelict land, with a temporary building located centrally on the site. Site levels range from approximately 27m to 25.15mAOD.

1.3 Description of works

The works comprise the excavation and backfilling of the site, which are required to install the frame of GH8 and thereafter enable the construction of the new public realm space.

The proposed enabling works for the relocation of GH8 will involve a site ‘strip’ to reduce ground levels to 24.50mAOD. These excavated materials will be removed from site. In order to reconstruct the gasholder frame, further excavation will be undertaken in the footprint of the frame to between 20.95m and 21.50mAOD. The area will be excavated and then backfilled with site-sourced materials, if found to be suitable for re-use, to an elevation of 25mAOD.

Once the earthworks are complete, the gasholder frame will be re-assembled and will form the centre-piece of the public realm in Zone N. A public park will be formed within GH8. The details of the park lie outside the scope of the current submission, however details of the park will come forward separately in due course.

1.4 Site history

The site has a history of industrial use from the mid 1800s, predominantly associated with rail. A series of historical map extracts are provided in Appendix B. A description of the historical features shown on the maps is provided in Table 1 below.

Table 1 Summary of site history

Map date	GH8 area (N2) and eastern area of gasholder triplet (N1)
1746 - 1834	The Regent’s Canal is shown to be constructed by 1834. No developments are present shown to the east of the canal or within the site area.
1873	N1 sits within the railway track at the end of the line, adjacent to a goods shed, on what appear to be low rise structures covering the track. Plot N2 sits partially on the end of a separate track directly east of the canal and partially over an unmarked building. The Wharf Road follows the canal on the east side, passing directly beneath the south western edge of the footprint of Plot N2.
1894-95	A basin is shown to exist under the footprint of eastern area of Plot N1 and rail tracks are present in the western area of Plot N1. The basin does not appear to be directly connected to the canal but it may be related to transfer of goods between canal vessels and trains. Otherwise the site is predominantly unchanged.

Map date	GH8 area (N2) and eastern area of gasholder triplet (N1)
1914	<p>A substantial structure has been constructed over the majority of the eastern side of Plot N1 where a body of water was previously shown. This building would have been part of the Western Goods Yard, which was used mostly for the distribution of coal that arrived by train from the north to the rest of London. Railways tracks shown beneath the western area of Plot N1 remain in place</p> <p>The building, Wharf Road and railway track in the area of Plot N2 remain the same, although there now appears to be an embankment intercepting the eastern edge of the plot.</p>
1940	<p>There is little change to the composition of the area beneath Plot N2 And N1, although Wharf Road has been renamed as Goods Way.</p>
1965 - 68	<p>The building located in the area of Plot N2 has been dismantled, and railway tracks are shown in its place. Diesel locomotives were introduced to Kings Cross in the early 1960s and according to previous studies this area was used as a diesel locomotive refuelling area from the 1960s to 1980s, known as the Former Cambridge Street Diesel Depot.</p> <p>Goods Way appears to be renamed back to the original Wharf Road. There is little change to the area of Plot N1.</p>
1989 - 94	<p>The railway lines, and presumably the diesel depot, in Plot N2 have been removed and there appears to be some small unmarked buildings in its place. Plot N1 remains unchanged.</p>
Current use (2012)	<p>Both Plots N2 and N1 have been cleared of historic rail tracks and buildings. There are temporary buildings located centrally of the two plots site, a cleared area of land in the west of Plot N2 and what appears to be a temporary access road located in south-eastern area of Plot N1.</p>

The principal historical activities that might have caused ground contamination within the site are those associated with railway tracks/sidings and locomotive refuelling activities that took place in the southern corner of Cambridge Street Diesel Depot on site and in adjacent areas to the site.

2 Ground conditions

2.1 Geology

The underlying geology has been interpreted from ground investigation information contained in Table 16.1 of the ES and the subsequent ground investigations. The general geological sequence underlying the site is Made Ground overlying approximately 20m thickness of London Clay. Below the London Clay lie, in turn, the Lambeth Group (mainly stiff clays), Thanet Sands and Upper Chalk.

2.2 Ground investigations

2.2.1 Previous

Several phases of ground investigation have been undertaken within and in the vicinity of the site. There are eight exploratory holes located within the site boundary from four different ground investigations as detailed in Table 2 below:

Table 2 Summary of historic exploratory hole locations

Contractor	Ground investigation	Exploratory hole type & number
Foundation and exploration services (FES) (May 1993)	Kings Cross Site Investigation, Contract 2	One rotary borehole (KX69A)
Foundation and exploration services (FES) (February, 1996)	Contract L for Phase 3, Ground Investigations at Kings Cross, Geotechnical Format	One cable percussion borehole (SA3876) One observation pit (OP3782)
Soil Mechanics (October, 1997)	Contract 2 for Phase 4, Ground Investigation in Project Area 100	Three cable percussion boreholes (SA7368, SA7344 and SA7377). One Trial pit (TP7361). One Dynamic probe (DS7377A)

Borehole logs are held for all of these locations except for KX69A and are provided in Appendix B. Historic exploratory hole locations are shown on Figure 3.

Arup does not hold chemical test data for any of the locations listed in Table 2. The following information regarding contaminated land testing is provided in the AMEC, GH8 Relocation, Investigation Interpretive Report [1]:

“Contaminated land test results are available for soil and groundwater samples at SA7377 and DS7377A. Diesel range organics were present in both soil samples, with a maximum concentration of 309mg/kg in DS7377A and at 1m bgl. Organic compounds and volatile organic compounds were generally low or below detection limit. Groundwater test results detected diesel range organics in SA7377 at a maximum concentration of 15mg/l.”

2.2.2 Recent

A geotechnical and contamination ground investigation was completed in the site in May to June 2012. The investigation was instructed by BAM Nuttall, who appointed Ground Technology Services (GTS) to undertake the drilling of boreholes, soil sampling and geotechnical testing. Technical supervision was provided by AMEC. The chemical laboratory testing was undertaken by i2 Analytical Ltd, under the technical supervision of AMEC. The purpose of the ground investigation was to obtain information on the geotechnical and chemical composition of the underlying soils and perched water at the GH8 site. The testing also provides waste classification data for the soils which will be excavated.

The ground investigation comprised:

- Four cable percussion boreholes, to the depth of between -4.39mAOD and 17.206mAOD, and groundwater monitoring standpipes installed in each; and
- Excavation of 10 trial pits, to depths of between 25.95mAOD and 21.23mAOD.

The exploratory holes are located within the GH8 boundary and the locations are shown in Figure 4. The logs of the boreholes and trial pits for this ground investigation are provided in Appendix B, and laboratory contamination test data for the same investigation is provided in Appendix C.

Geotechnical and chemical laboratory testing was also completed on recovered samples. Chemical testing included inorganics, polyaromatic hydrocarbons (PAHs), metals, asbestos and petroleum hydrocarbons. In total 17 soil samples were tested from 14 different locations. Samples were taken and tested from depths ranging between 27.06mAOD and 21.31mAOD, all from Made Ground.

The results of the various phases of ground investigation have been interpreted by AMEC and their assessment of the findings has been reproduced. In their interpretative report, AMEC completed carried out a generic quantitative risk assessment (GQRA), using residential and open space generic assessment criteria (GAC). The screening criteria and details of the assessment are presented in AMEC's interpretive report^[1] and the screening table is provided in Appendix D of this report. The findings of AMEC's assessment are provided below:

- Asbestos (chrysotile free fibres, 0.005%) from two samples of Made Ground from TPE6 at 24.43mAOD and TPD4 at 23.9mAOD;
- Elevated lead concentrations in three soil samples (740mg/kg in BH4 at 24.706mAOD, 490mg/kg in TPC7 at 22.074mAOD, 750mg/kg in TPD5 at 22.75mAOD);
- Elevated benzo(a)pyrene concentration of 3.4mg/kg in one soil sample from TPE6 at 25.23mAOD; and
- Elevated total petroleum hydrocarbon (aliphatic and aromatic >C12 – C35) concentrations in two samples of Made Ground from BH4 at 24.706mAOD and TPC3 at 24.16mAOD at concentrations of 3400mg/kg and 2400mg/kg respectively.

Groundwater sampling was proposed in all four boreholes however on completion there was insufficient water found in the installations to allow sampling. This confirms that perched water is inconsistent or absent.

2.3 Groundwater

2.3.1 Perched water

Groundwater seepage was observed in two of the ten trial pits in the south of the site, TPD05 and TPE06. The seepages were recorded at 23mAOD and 22.73mAOD respectively.

2.3.2 Local aquifers

The Upper Chalk surface lies at more than 35m depth beneath the site. Across the London Basin it is classified by the Environment Agency (EA) as a Principal Aquifer, due to its regional importance for potable water supply. Overlying the Upper Chalk are the Thanet Sands and Lambeth Group. Separating these water bearing strata from the ground surface, and from the discontinuous perched groundwater, is the London Clay. The London Clay is classified as Unproductive Strata (aquitard) by the EA due to its impermeable nature. At the locality of the site, the London Clay is approximately 30m thick.

The piezometric head below the site is at approximately +19mOD within the London Clay. The regional flow direction in the Chalk is interpreted by the EA to be southwards towards the River Thames.

Groundwater strikes were recorded during drilling in BH02 and BH03, at depths of 13.3mAOD and 13.88mAOD respectively.

2.3.3 Surface water

The Regent's Canal runs along the southern boundary of the site. The canal has a slow flow to the east and it is expected that the water in the canal is contained by a combination of a canal wall and a liner which will largely provide a hydraulic barrier between the surrounding Made Ground soils (and any perched water therein) and the surface water in the canal.

2.4 Obstructions

2.4.1 Thameslink Tunnels

The Thameslink-2000 Tunnels are currently being constructed and the southbound tunnel will pass directly below plot N2. The top of the tunnel is at an elevation of 5mAOD. The northbound tunnel passes the site to the north of the southbound tunnel.

Existing Thameslink Tunnels are located approximately 50m west of plot N2, in line with St Pancras's rail lines. The tunnel comprises a Victorian masonry structure according to the extract from Rail Engineering Limited.

2.4.2 Unexploded ordnance

RPS Planning and Development was commissioned by Argent in 2007 to undertake a desk study to determine the potential for historic unexploded ordnance (UXO) across the KXC site. The UXO Assessment for Area 7, this