PART IV Appendices

- A Earthworks and Remediation Plan
- B Highways plans
- Scheme of Investigations
- D Landscaping plans

C Archaeological Specification and Written

APPENDIX A Earthworks and Remediation Plan approved under the Southern Infrastructure Works submission

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King's Cross Central

Goods Way and Boulevard: Earthworks & Remediation Plan

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This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

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Glossary

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CIEH	Chartered Institute of Environmental Health
CLEA	Contaminated Land Exposure Assessment
CoC	Contaminants of Concern
CoCP	Code of Construction Practice
CSM	Conceptual Site Model
DEFRA	Department for Environment, Food & Rural Affairs
DRO	Diesel Range Organics
DWS	Drinking Water Standard
EA	Environment Agency
EGY	Eastern Goods Yard
EPA	Environmental Protection Act
EQS	Environmental Quality Standard
ES	Environmental Statement
EWC	European Waste Catalogue
GAC	Generic Assessment Criteria
HWR	Hazardous Waste Regulations
LoWR	List of Waste Regulations
LQM	Land Quality Management Ltd
mbgl	Metres below ground level
MDL	Method Detection Limit
PAHs	Polyaromatic Hydrocarbons
PPE	Personal Protective Equipment
PRO	Petrol Range Organics
SGV	Soil Guideline Value
SHW	Specification for Highway Works
SPR	Source Pathway Receptor
TPH	Total Petroleum Hydrocarbons
UXO	Unexploded Ordnance
WAC	Waste Acceptance Criteria

1 Introduction

Scope and Objectives 1.1

This Plan describes the earthworks and remediation proposals for the Goods Way and Boulevard (GW&B) works to the south of the Regents Canal.

This Earthworks and Remediation Plan has been prepared by Ove Arup & Partners Ltd (Arup) at the instruction of Argent (King's Cross Central) Ltd (Argent). The report should be read in conjunction with the following documents:

- "King's Cross Central Environmental Statement Volume 4: Part 16 Soils and Contamination Specialist Report" (ES), Arup (May 2004)
- "King's Cross Central Environmental Statement Volume 5: Supplement", (September 2005)
- "King's Cross Central Revised Code of Construction Practice" (CoCP), RPS (September 2005)
- Design details and material specification drawings for Goods Way and the proposed • Boulevard

Where appropriate, this Plan incorporates and/or refers to information presented in the earlier ES and CoCP documents. This Plan has been prepared to meet the requirements of Condition 18 of the outline planning permission for King's Cross Central.

1.2 Previous and Existing Land Uses

Historically, the western footprint of Goods Way and the proposed Boulevard was beneath the gasworks retort houses from the 1860s until its closure in the 1900s. The eastern section of Goods Way was underlain by a basin and former mills. During the 1910s the gasworks and mill structures were demolished. Goods Way was constructed during the 1930s and has remained as a road since with only minor layout adjustments until the mid 1990s. By the late 1930s the basin below the proposed Boulevard footprint had been infilled. Limited changes occurred to the GW&B footprint in the 1940s and 1950s. By the 1960s a depot was present above the proposed footprint of the Boulevard and remains on the present site.

From the mid 1990s works were undertaken at the King's Cross Central site as part of the Channel Tunnel Rail Link/High Speed 1works. As part of these works, the western section of Goods Way was aligned with the eastern section forming a new crossroads with Pancras Road and Camley Street.

1.3 **Existing Site Levels**

The GW&B site (not including Zone B) is approximately 2.1ha in area and is, at its widest points, 340m long and 390m wide.

The elevation of Goods Way ranges from 16.8mAOD in the west to 24.5mAOD in the east. The proposed final elevation of the Boulevard is 14.8mAOD in the west to 24.5mAOD in the east.

1.4 **Description of Proposed Development**

A plan of the proposed development is shown in Figure 1.

The GW&B proposals relate to highways and landscaping works. The key elements of the proposed works include:

- The relocation of the existing Gas Governor (currently located to the north-east of Pancras Road), to a plot on the north side of Goods Way. Gas mains (low and medium pressure) will be upgraded as a result of this.
- Goods Way will be raised by a maximum of 1.7m to allow it to tie-in to the proposed Road Bridge (which forms part of the Eastern Goods Yard [EGY] works).
- Existing utilities will be diverted and realigned. In addition, proposed utilities will be installed.
- proposed Boulevard.
- The proposed Boulevard will be constructed. This will involve raising the levels in some areas by up to 5m. Temporary works (not covered in this report) will be required to support the highway.
- A subway ('link passage') leading from King's Cross underground station to the proposed Boulevard will be installed.
- The junction with York Way will be upgraded and permanent traffic lights installed.
- A new canal walkway will be created to the north of Goods Way, which will be for private access to residential moorings in the Regents Canal.
- Limited soft landscaping is incorporated into the GW&B design. Tree pits are located along the western edge of the proposed Boulevard and the north-east of Goods Way. The tree pits will be backfilled with suitable imported growing media. Similarly, the areas of shrub planting adjacent to the south bank of the Regent's Canal walkway will be backfilled with suitable imported growing media.

Regulator Consultation 1.5

and detailed risk assessment.

A piled retaining wall will be installed along the eastern and western edges of the

- It should be noted that the redevelopment of the BP garage (known as Zone F) does not form part of this application. In addition the remediation of Zone B basements (and associated excavation of the former gas holder site) is not covered in this plan. A separate Earthworks and Remediation Plan will be produced for Zone B/the gasholder area.
- Consultation was undertaken with the Environment Agency and Camden Council to discuss the remediation methodology for the site. It was agreed that outline remediation proposals would be included in the Reserved Matters application, and that a detailed remediation strategy would be submitted following the completion of proposed site investigation works

2 Ground Conditions

2.1 Site Investigations

2.1.1 Previous

Channel Tunnel Rail Link (CTRL) ground investigation reports reviewed during the environmental impact assessment (Table 16.1, Volume 4 Part 16 of the ES) and again subsequently in the preparation of this plan, provide significant information about ground conditions at the site. Several phases of ground investigation completed for the CTRL works included exploration points within the GW&B site. In total 30 borehole and trial pit locations lie within the GW&B footprint. These provide an average sample location density of 27m grid centres. This sample location density is similar to a main investigation under the BS 10175:2001¹ guidance. It should be noted that the exploration locations are concentrated to the west of Goods Way and the south of the proposed Boulevard. Limited information is available from the east of Goods Way and the north of the proposed Boulevard (however, these locations are in areas of limited cut or proposed fill). A total of 62 soil samples were collected from 23 of these locations and were analysed for a range of determinands. Borehole logs and laboratory testing data from these locations have been used in the preparation of this Plan.

The CTRL exploratory locations in the GW&B site are shown on Figure 2 of this report.

2.1.2 Proposed

A geotechnical and environmental ground investigation is proposed for summer 2008 at the GW&B site by Peter Brett Associates (PBA) on behalf of Edmund Nuttal Limited (ENL). The purpose of the investigation is to determine current ground conditions below the site footprint in order to inform the foundation design and detailed remediation strategy. The scope of works includes the drilling of 19 boreholes to a maximum depth of 45m below ground surface and their installation as groundwater monitoring standpipes. In addition, 30 trial pits are proposed to be excavated by mechanical excavator to maximum depth of 4.5m below ground surface. In total, 90 soil samples are proposed to be collected and analysed for a range of determinands. Thirty soil samples are proposed to be analysed for leachability in line with the Waste Acceptance Criteria. Nineteen groundwater samples are proposed to be collected in one monitoring round and scheduled for the analyses of a range of determinands. Six ground gas and groundwater elevation monitoring rounds are proposed to be undertaken from the standpipes.

2.2 Soil Conditions

Local ground conditions across the GW&B site have been interpreted from ground investigation information contained in Table 16.1 of the ES, as referred to in Section 2.1 above. The general geological sequence underlying the GW&B site is Made Ground overlying approximately 20m thickness of London Clay. Below the London Clay lie, in turn, the Lambeth Group, Thanet Sands and Upper Chalk, as detailed in paragraph 16.4.12 of the ES. Further details on the strata encountered, together with the available logs, are provided in Appendix A.

2.3 Groundwater

2.3.1 Perched Groundwater

Perched groundwater was encountered in some locations during the previous CTRL site investigations. This groundwater was not found at all locations and is therefore inferred to

be discontinuous. No observations of a sheen or contaminant odour from perched groundwater were noted on investigation logs. Perched groundwaters are not 'controlled waters' and therefore are not water environment receptors under the EPA 1990² and current water legislation.

2.3.2 Underlying Aquifers

The Upper Chalk occurs at more than 30m depth beneath the site. Across the whole of the London Basin it is classified by the Environment Agency (EA) as a major aquifer due to its regional importance for potable water supply. Overlying the Upper Chalk is a thin layer of Thanet Sands (minor aquifer) and sandy layers within the Lambeth Group. Separating these water bearing strata from the surface and perched groundwater is the London Clay.

The London Clay is classified as a non-aquifer (aquitard) by the EA due to its impermeable nature. At the locality of the King's Cross Central site, the London Clay is approximately 20m thick and therefore provides a significant hydraulic barrier to any potential migration of perched groundwater in the Made Ground and Alluvium to the underlying Lambeth Group, Thanet Sands and Upper Chalk.

The Lambeth Group contains the Woolwich and Reading Beds. The Woolwich Beds are typically dark grey, laminated clays of low permeability. The Reading Beds generally comprise more sandy horizons and are likely to be in limited hydraulic connection with the underlying Thanet Sands. The Thanet Sands comprise very dense, permeable, greenish-grey fine sand and are likely to be in hydraulic continuity with the underlying Upper Chalk in the King's Cross area.

The piezometric head below the King's Cross Central site is at approximately -23mOD within the Lambeth Group (approximately 40m below ground level). The regional flow direction in the Chalk is interpreted by the EA to be southwards towards the River Thames.

¹ British Standard BS 10175:2001 "Investigation of potentially contaminated sites - Code of practice"

3 **Earthworks Proposals**

Extent of Earthworks 3.1

The proposed earthworks will be carried out within the area shown in Figure 1.

The Culross Buildings are located within the site. These have been previously approved for demolition and removal from the site. Temporary buildings which currently occupy the site will be relocated as required.

The required earthworks are as follows:

- Excavation of existing hard pavement surfaces for re-use or removal. •
- Earthworks required to change the vertical and horizontal alignment of Goods Way from Pancras Road (west) to York Way (east).
- Excavation for new retaining wall along the southern edge of Regents Canal from the existing Regents Canal Bridge to the east.
- Excavation for south side bridge abutments of proposed Regents Canal Bridge (BR1).
- Excavation of trenches for utility services within the proposed highway and footway corridors, including provision for electricity, telecoms, storm and foul drainage, gas, potable water and district heating.
- Excavation of tree pits and landscape/pedestrian pavements. •
- Removal of existing asphalt surface along York Way and replace with new wearing ٠ course as part of related Section 278 Highway Works.
- Raising of levels to form the Boulevard (up to 5m). ٠
- Excavation of the subway 'link passage' to King's Cross underground station.
- Piling of the continuous retaining walls along the east and west of the proposed Boulevard.

This plan does not describe the earthworks associated with any small holes required for temporary works such as traffic signals. Such earthwork quantities would be insignificant.

3.2 **Cut and Fill Quantities and Types**

Bulk excavations required for realignment of Goods Way and construction of the proposed Boulevard range between +4.5m (FILL) and -0.6m (CUT) from existing site levels. The maximum fill depth is located within the proposed Boulevard corridor. The deepest area of cut is located mid way along the proposed Boulevard. Both these areas are identified in Figures 3 and 4.

Made Ground is anticipated to comprise the bulk of the excavated material from the site. Deeper excavations (eg for the Regents Canal bridge abutment and 'link passage') may enter the London Clay.

An assessment of the volumes of materials that will be excavated for the works is shown in Table 3-1.

Approximately 12,450m³ of cut will be produced as a result of the works. There may be potential to re-use this material as General Fill to raise levels under the proposed Boulevard. However, this is based on suitable moisture content and the detailed sequencing of the works. If the moisture content is unacceptably high for it to be re-used the material may be taken off-site.

The fill required for the levels raising is proposed to come from the Pancras Road arisings, currently stockpiled in Zones S and T. This material has been classified as suitable for capping (6F1 and 6F2) and therefore should be suitable for levels raising (subject to frost heave checks if within 450mm of the surface). Approximately 20,000m³ is available for use. Alternatively any non-hazardous material is generated by other King's Cross Central projects running in parallel to GW&B, such as Zone B remediation works, could also be potentially used as General Fill.

At most, 12,450m³ (excluding material bulking) of material may be removed from the site, if the material proves to be unacceptable. The total number of truck loads that would be required to remove this material off-site is calculated to be approximately 1,465 during the period of construction (approximately 18 months). This figure is based on 8.5m³ truck loads of un-bulked material (consistent with Appendix 16A of the ES) and includes a contingency allowance for any smaller loads.

Description

Total Estimated Excavation (Cut) Volum Comprising of:

- Plane off 160m of Goods Way ends)
- Excavate full road construction of the proposed Boulevard (sou
- Regents Canal Bridge abutmer

Utility trenches

- Tree pits within pavement area
- Cut to form new tow-path (and Goods Way)

Link passage

TOTAL CUT VOLUME

Total Estimated Fill Volume

1. Fill to raise site levels in the propos

and Goods Way to formation level

TOTAL FILL VOLUME

TOTAL SURPLUS FILL REQ

Table 3-1 - Estimate of earthworks volumes for GW&B

Notes:

	Volume (m ³)	Material type
e ^[1]		
at east and west	500	Asphalt
at southern end thern most 40m)	600	Made ground
ts – south side	400	Made ground & London Clay
	2,750	Made ground
s (33 trees)	300	Made ground
other cut in	3,700	Made ground & London Clay
	4,700	London Clay
	12,450	
sed Boulevard	21,000	Suitable general fill (Class 2)
	21,000	
UIRED	8,550 to 21,000	The excavated cut material could potentially be reused, subject to acceptable moisture content, and construction sequencing

- [1] Estimated volume does not include for material bulking. All volumes are outline estimates only. It should be noted that bulking of earthworks can vary significantly, often between 5-30% of the excavated volume.
- [2] Volume of fill is based on assumed capping depth. This will be confirmed only once the CBR of the bulk fill is confirmed.

3.3 **Suitable Material**

3.3.1 Definition

Excavated material from the site is expected to be predominantly Made Ground. London Clay soils are located approximately 2m below existing ground levels (see Appendix A1 for Site Investigation data).

Suitable material is defined as excavated material that, by its chemical and physical properties, is suitable for use in the development. It is proposed to re-use as much suitable excavated material on site as practicable within the GW&B.

3.3.2 Treatment and Re-use of Existing Pavement Material

The existing site is currently predominantly hard surfacing (concrete and asphalt)

Concrete and asphalt pavement surfaces will be excavated, crushed and processed for application as granular fill within GW&B site.

3.3.3 Engineering Fill Material (below roads and hard landscaping)

Engineering Fill material is defined as material that is suitable for fill to structures or for application within carriageways, pedestrian pavements and hard landscape areas. It is anticipated that a proportion of excavated material from the site (e.g. excavation from existing roads and crushed demolition material) will be suitable for application as Engineering Fill for general fill and capping material below pavement areas. However moisture content (which varies given the weather) will govern whether the material can be reused.

The following Specification for Highway Works classifications would be used for suitable engineering fill.

- General Fill: Class 1 or Class 2
- Capping: Class 6F or 7F ٠
- Sub-base: Type 1

3.4 **Unsuitable Materials**

Unsuitable excavated material is defined as material that is unsuitable for use in the development and must be removed from site to a suitably licensed landfill site. Excavated material will be removed off site if the following classification applies:

Definition

Unsuitable material would be categorised as Classes U1A, U1B or U2 in accordance with Specification for Highway Works.

Classification

Unsuitable materials which may arise could be:

 soft cohesive material, not suitable for fill within carriageway, pedestrian pavement or hard landscape areas;

 unexpected localised contamination encountered during the works, which will be temporarily stockpiled on plastic sheeting (type to be determined by the contractor) on site for testing prior to disposal off-site;

· Made Ground with unsuitable engineering properties (e.g. high fines content, high moisture content, significant quantities of organic matter); or

 other unsuitable material designated as such due to lack non-compliance with particular Engineering fill parameters for either pavements or landscape areas.

Temporary Stockpiling & Materials Handling 3.5

3.5.1 Stockpiling for re-use on-site Based on current understanding of the proposed site works, indicative estimates show that up to 35% of fill requirements may provided from within the GW & B site boundary. This material would be stockpiled within the site .Excavated suitable material will be allocated for either direct placement as fill or crushing and re-use on site as appropriate. Any surplus suitable material is to be temporarily stockpiled for future potential use on the wider King's Cross site.

Stockpilling will be undertaken in areas adjacent to the site (such as in the Zone B area).

3.5.2 Contaminated Material Stockpiling

Excavated soils from designated areas of contamination shall be temporarily stockpiled on plastic sheeting or hard standing areas where appropriate. Measures shall be taken to restrict dust and surface water run-off from the temporary stockpiling in order to reduce the potential for contaminant migration.

3.5.3 Material Haulage Off Site

The total number of road transport movements required to remove all material off site is guantified in Section 3.2.

3.6 Method and Sequencing of Works

3.6.1 General

The sequence of excavating and relocating material for re-use will be co-ordinated to ensure that the following objectives are met:

- Transportation and double handling is kept to a minimum; and

3.6.2 Sequencing

The anticipated sequencing would be as follows:

- i)
- ii)
- material as required;
- iii)
- iv) buildings);
- preparation of ground works. V)

• An area is provided for temporarily stockpiling material for use during the works.

Site clearance and enabling works. This includes the following where required:

relocation of existing temporary site accommodation;

demolition of existing Culross Buildings and processing of demolition

abandonment and diversion of identified existing services;

demolition of existing obstructions (e.g. existing brick walls and site

- Breaking out and removal of surface hard pavements: Existing hard surfaces on site are to be either:
 - stockpiled and crushed/processed for placement on site where appropriate (e.g. highway surface planing material to be reused); or
 - ii) removed directly off site.
- **Remediation earthworks:** No areas of significant contamination have been identified by the ground investigations to date which require excavation in advance of the construction earthworks or beyond the limit of those works. However, a watching brief is to be undertaken during construction earthworks as described in Chapter 4 of this report.
- Bulk earthworks:
 - <u>Goods Way</u> Removal of existing asphalt highway surface for processing and re-use on site where appropriate. Removal of existing footpath construction for processing and re-use as fill where required. Excavation of carriageway and pedestrian pavement to subgrade level. Excavated material to be either stockpiled and crushed/processed for future placement on site where appropriate or disposed directly off site (depending on engineering classification of Made Ground). Levels raising as requried using suitable engineering material.
 - ii) <u>Proposed Boulevard</u> fill to subgrade level with suitable material sourced from the wider Kings Cross site. Some excavation required in areas where proposed Boulevard does not require raising.
 - iii) <u>Regents Canal Bridge abutments</u> Removal of existing retaining wall and excavation for new proposed bridge abutments adjacent to existing Regents Canal Bridge, including bridge abutments, building basements and feature steps to Regents Canal walkway. Excavated Made Ground from this area may be reused as capping and sub base material beneath carriageways and hard landscape areas on site, depending on engineering properties, processing requirements and chemical suitability.
- **Foundation piling.** The foundations for the proposed Gas Governor Station complex will be sheet piles. Existing obstructions will be removed from the site prior to commencement of the sheet piling.
- **Retaining wall piling.** Contiguous piles to the base of the London Clay are proposed at either 750mm or 900mm diameter and 900mm or 1050mm spacing. It is anticipated that pile arisings will be directly removed from site. This is due to the presence of support fluids within the pile arisings and anticipated low grade engineering classification and suitability as fill elsewhere on site. However, this is to be confirmed by the Construction Manager and Piling Contractor.

3.6.3 Drainage of Excavated Areas

Historical site investigations show that rest groundwater levels are generally below the maximum depth of excavation on site. However, perched water may be present in Made Ground across the site footprint.

Excavations will be kept free of standing water in order to minimise the health and safety risk and minimise access difficulties. This will be achieved by use of a localised drainage sump and pump discharging to the existing combined sewer. A discharge licence for this will be required prior to commencement of earthworks on site.

Remediation Plan 4

Introduction 4.1

This Earthworks and Remediation Plan is in accordance with the remediation strategy set out in Volume 4 Part 16 of the ES.

The ground investigation data available from works completed within the GW&B footprint have been reviewed and assessed to determine any specific remediation requirements. A conceptual site model (CSM) has been established from field observations, investigation data and details of the works. From the CSM, all plausible pollutant linkages remaining following the highways and landscaping works have been identified. The requirements for outline remediation measures associated with any plausible pollutant linkages have then been considered.

During the construction phase, mitigation measures to prevent risk of harm to human health and risk of pollution of controlled waters will be implemented as detailed in the ES (paragraph 16.6.10) and the CoCP.

4.2 **Conceptual Site Model**

In accordance with the current UK (and European) approach to contaminated land assessment and in line with the ES (paragraph 16.6.9), the potential environmental risks have been considered in the context of a conceptual source-pathway-receptor (SPR) model of the site. For the future development, the conceptual model is as follows:

Sources	Possible localised contamination of the overlying layer of Made Ground and/or localised contaminated perched groundwater.
Receptors	 The general public users of the future GW&B as pedestrians, cyclists and motorists.
	Future maintenance workers for services repairs and new installations.
	3. Materials used in underground services.
	4. Regent's Canal.
	[No groundwater controlled waters receptors are included as the London Clay provides a hydraulic barrier above the Upper Chalk major aquifer.]
Pathway Linkages	 There are no direct pathways to the general public future users of the road from contaminated Made Ground or groundwater due to the hard paving capping layer across almost all of the site and the clean imported growing media capping present in isolated tree pits.
	2. There are potential direct pathways of dermal contact, ingestion and inhalation for future maintenance workers.
	 New services will be placed in selected, clean backfill materials. However, lateral migration of contaminated perched groundwater may potentially cause this backfill to become contaminated.
	 Lateral migration of perched groundwater into Regent's Canal, depending on the presence and integrity of the canal lining in this area.

Evaluation of the plausible pollutant source pathway receptor linkages is given below.

4.2.1 Sources

4.2.1.1 Soil

In order to assess the type and degree of any actual contamination at the site, a hazard screening assessment of the soil chemical testing results from the 23 investigation locations outlined in Section 2.1 has been undertaken. This used the commercial/industrial end-use screening criteria, in line with the Contaminated Land Exposure Assessment (CLEA) methodology. The full soil chemical results, screening criteria and details of the assessment are presented in Appendix B of this Plan. The assessment is based on the laboratory results from 62 soil samples collected from within the GW&B footprint (Figure 2).

The results of the hazard screening assessment indicate that 18 samples (30%) had a lead concentration above the screening criterion. Four samples (12%) contained elevated petroleum hydrocarbon results above the Arup General Assessment Criterion (GAC) for aromatic petroleum hydrocarbons from C_{10} to C_{12} of 641mg/kg. The significance of these results has been further considered, as follows:

Lead

Although 18 samples contained lead concentrations above the screening criterion³ of 750mg/kg, the lead US95 mean concentration (the mean concentration with a 95 percentile upper confidence limit) is lower than the criterion. Consequently it is assessed that the lead concentrations are within acceptable limits for the proposed end-use.

Petroleum Hydrocarbons

Two shallow Made Ground samples (taken from TP7425 at 0.1mbgl and TP7424 at 0.2mbgl) located in the south of the site contained elevated diesel range organics (DRO) concentrations of 947mg/kg and 1,400mg/kg. Both these samples lie in an area of cut and will therefore be excavated as part of the proposed Boulevard earthworks. Two Made Ground samples taken from TP3842 and KXTP65 (at 2.5mbgl and 0.75mbgl) in the north of the site contained elevated polyaromatic hydrocarbon (PAH) results of 2,208mg/kg and 6,600mg/kg. In addition, the sample taken from TP3842 contained elevated concentrations of mineral oils (1,539mg/kg). KXTP65 is located in an area of cut and the ground in this area will be excavated as part of the earthworks. TP3842 lies in an area of fill. As such the in situ soils from which the sample was collected will lie around 4.5m below the finished level of Goods Way.

4.2.1.2 Groundwater

Four groundwater samples were taken from locations within the GW&B site and analysed for a range of determinands. A hazard screening assessment of these results has been undertaken (Appendix B). The assessment outputs indicate that in general concentrations of heavy metals and inorganics are low and below the relevant screening criteria. However, concentrations of total petroleum hydrocarbons (TPH), copper, lead, zinc, ammonia and sulphate are elevated within some of the samples above Environmental Quality Standards (EQS) or Drinking Water Standards (DWS) criteria.

4.2.2 Pathways

The following pathways are relevant to the conceptual model:

- Human Health: Ingestion, inhalation and dermal contact
- Impacts on Buried Services: Groundwater dissolved phase migration
- Impacts on Surface Water: Groundwater dissolved phase migration

³ CLEA Soil Guideline Value for commercial/industrial end-use is 750mg/kg

Ingestion and inhalation of Soils or Dust

During construction and maintenance activities that require intrusive works, workers engaged with excavation and excavated material may come into contact with potentially impacted material through ingestion and inhalation of soils or dust or vapour. In addition, dust could be generated by excavation works and stockpiling of excavated materials. These pathways will be removed by implementing appropriate dust suppression working measures and using correct personal protective equipment (PPE) (as detailed in Part C of the CoCP).

Dermal Contact with Soils or Dust

During intrusive construction and maintenance works, workers who are dealing closely with excavation and excavated material may come into contact with impacted material through dermal contact. This pathway will be removed by implementing appropriate working measures and normal use of correct PPE (as detailed in Part C of the CoCP).

Lateral Migration of Dissolved Phase Contamination

Perched groundwater containing dissolved phase contamination may move off-site or onsite within the Made Ground.

4.2.3 Receptors

Future Site Users

Future site users who could come into contact with potentially contaminated soil or groundwater, or inhale elevated concentrations of ground gases.

Construction and Maintenance Workers

Construction workers during development works and maintenance workers postdevelopment, who undertake intrusive works beneath the site surface.

Groundwater

The site is underlain by Made Ground which contains discontinuous perched groundwater. As perched groundwater is not classified as a controlled water, it is not considered to be a sensitive receptor. Controlled waters contained within the Upper Chalk major aquifer are assessed to be hydraulically separated by the impermeable London Clay from any potentially contaminated perched groundwater.

Surface Water

It is considered likely that migration of perched water from the site into the adjacent Regent's Canal would be restricted by the presence of the canal lining and therefore it is not considered to be a sensitive receptor.

Building Materials and Services

Building materials that are potentially at risk from contaminated soils are utilities pipes (particularly water pipes) and cables installed beneath the GW&B footprint.

4.3 **Plausible Pollutant Linkages**

4.3.1 Future Site Users

The available information indicates no plausible pollutant linkages. As such, it is assessed that there is no risk of harm to human health of future site users from potential soil and groundwater contamination. This is due to the hard cover present over almost all of the development and the clean soil capping layer in the location of tree pits which breaks the pathway between the source and receptor.

4.3.2 Construction and Maintenance Workers

The risk of harm to the health of workers undertaking intrusive works below the road surface will be mitigated by the use of appropriate working methods and use of correct PPE, as required by Health and Safety legislation and the CoCP. Taking these mitigation measures into account, there are assessed to be no plausible pollutant linkages and therefore negligible risk of harm to the human health of these receptors.

4.3.3 Controlled Waters

Any perched groundwater located beneath the footprint of the redeveloped site is unlikely to migrate significant lateral distances. In addition, it is hydraulically separated from groundwater in the underlying Lambeth Group and Upper Chalk aquifers by the London Clay. Assessment of the laboratory results of the perched groundwater indicated that it is not significantly contaminated or that significant leachable contaminants are present in soils at the site. Therefore, any migration of perched water, eg into Regent's Canal, is unlikely to impact water quality. There is therefore assessed to be a negligible risk of pollution of controlled waters.

4.3.4 Building Materials and Services Building materials and services will be placed in clean, inert soils below the proposed trenches and other excavations. The designer's specification includes service installation details and states that all services will be laid in clean, inert soils and a clay liner where necessary. Therefore, there are assessed to be no plausible pollutant linkages and no risk of harm to building materials and services.

4.4 **Remediation Works**

The site-wide remediation strategy for the King's Cross Central development is described within the Volume 4 Part 16 of the ES (paragraphs 16.6.7 to 16.6.9). Paragraph 16.6.8 addresses the strategy for various sub-areas within the development site.

This Earthworks and Remediation Plan has considered the site investigation information from the CTRL works. The earthworks for the proposed development comprise the excavation of 7.750m³ of soils that will predominantly comprise Made Ground. In general, between 1.0m and 1.7m of cut will be excavated along the west of Goods Way and the southern end of the proposed Boulevard. The proposed Boulevard will require between up to 5.0m depth of fill along the majority of its length (Figures 3 and 4). Where suitable, material excavated during the works will be reused as fill in other parts of the site under hard-standing.

The two areas where samples of Made Ground were found to contain elevated concentrations of petroleum hydrocarbons will be excavated as part of the earthworks or will remain in situ at a depth greater than 4m below the final road surface. Special precautions will be taken in accordance with all relevant legal standards and current industry good practice for construction on brownfield sites (paragraph 16.6.9 of the ES) when excavating and stockpiling potentially contaminated ground.

It is possible that localised areas of contamination that were not identified during the ground investigation works exist at the site. Therefore a contamination watching brief will be maintained during the construction phase and any contaminated material identified during earthworks will be segregated and dealt with in line with paragraph 16.6.9 of the ES.

Following completion of the Peter Brett Associates site investigation work, an interpretative report will be produced. The report will include a generic quantitative risk assessment and if necessary further detailed quantitative risk assessment will be undertaken. The data and interpretative report will be submitted to Camden Council.

TABLES

- Table 1
 Soil Testing Results
- Table 2 Groundwater Chemical Testing Results
- Table 3 Leachate Chemical Testing Results

Sample Reference			DS7382	DS7382	DS7382	DS7382	OT3745A	OT3745A	SA3851	SA3851	SA3851	SA3851	SA7328	SA7328	SA7328	SA7328	SA7381	SA7381	SA7381	SA7381	SA7381	TP3842	TP3842	TP3842	TP3842 1	P3842	TP3853	TP3853	TP3854	TP3854	TP7394	TP7395	TP7395	KXTP05	KXTP05	KXTP05
Depth (m)			0.2	0.5	1	3.5	0.5	2	0.5	1.9	3	5	0.1	0.6	0.7	1.2	0.4	1	1.9	3.4	4.2	0.5	1	2	2.5	3	0.5	1	0.2	0.5	0.25	0.08	0.5	0.5	1	2
Elevation (mOD)			21.74 MG	21.44 MG	20.94 MG	18.44 I.C	16.57 ALV	15.07 I.C	16.28 MG	14.88 I.C.	13.78 I.C	11.78 I.C	16.12 MG	15.62 MG	15.52 MG	15.02 I.C	22.94 MG	22.34 MG	21.44 MG	19.94 I.C	19.14 I.C	20.67 MG	20.17 MG	19.17 MG	18.67 MG	18.17 HD	15.02 MG	14.52 I.C	15.23 MG	14.93 MG	16.74 MG	16.72 MG	16.3 MG			
Investigation			1997	1997	1997	1997	1995	1995	1995	1995	1995	1995	1997	1997	1997	1997	1997	1997	1997	1997	1997	1995	1995	1995	1995	1995	1995	1995	1995	1995	1997	1997	1997	1992	1992	1992
		Screening Criteria																																		
Metals																																				
Arsenic	mg/kg	500	14	16	22	25	13	36	9	16	14	20	25	414	58	25	35	17	42	22	25	27		19	24	18	26	13	28	34	23	22	26	9	9	2
Cadmium	mg/kg	1400	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	5	<1	<1	2	3	3	5.4	2.3	3
Chromium	mg/kg	5000	29	25	26	44	20	43	24	29	26	29	28	42	32	35	27	25	38	35	50	19		33	28	27	29	27	29	36	19	47	35	21	25	15
Copper	ma/ka	44800	39	35	97	41	17	17	29	30	27	31	89	377	293	36	83	174	459	95	31	52		20	16	23	29	26	84	29	174	54	173	<5 130	<5 98	<5 27
Lead	mg/kg	750	184	150	364	57	28	50	24	26	14	37	286	1910	1020	35	464	291	1140	193	55	556		18	3	16	19	10	211	43	945	355	3000	1000	370	340
Mercury	mg/kg	480	0.56	0.47	2.58	0.15	<1	<1	<1	<1	<1	<1	0.71	5.43	3.04	0.16	1.66	0.25	0.4	0.11	0.64	<1		<1	<1	<1	<1	<1	<1	<1	4.02	0.64	1.13	<5	<5	<5
Nickel	mg/kg	5000	22	24	33	42	8	24	7	35	38	33	0.45	34	24	33	28	24	47	33	43	14		49	24	32	32	36	25	24	22	34	30	34	9	12
Zinc	mg/kg	337000	110	106	83	72	39	90	60	86	71	82	330	1510	674	57	177	149	418	113	87	79		55	48	65	69	72	285	55	160	98	228	2000	220	92
Asbestos	, , , , , , , , , , , , , , , , , , ,																																			
Asbestos Screen	nc	nc	NFO	NFO					NONE				NFO	NFO			NFO	NFO	NFO	NFO		NONE					NONE				NFO		NFO			
Asbestos Asbestos Eibre Count	nc %	nc	<0.001						<0.001				<0.001	<0.001			<0.001	<0.001	<0.001	<0.001		0.00<1					NONE 0.00<1				<0.001		<0.001			
Miscellaneous	<i>,</i> °		(0.001											(0.001			40.001	40.001	40.001	40.001		0.00 (1					0.00 1						10.001			
Total Cyanide	mg/kg	nc	<1	1	<1				<5	<5							<1	<1	1	<1		290	260	5	5	5										
Free Cyanide	mg/kg	140	8.4	8.8	8.6	87	7.44	7.87	10.16	8 37	7.86	8 1/	10.2	10	0	8.2	10.0	11.6	11	0.4	86	<1	2	7 77	8.02	8.02	7 00	7.67	0.00	8.26	8.5	80	0.2	8.1	8	8.2
Thiocyanate	mg/kg	nc	0.4	0.0	0.0	0.7	7.44	7.07	10.10	0.57	7.00	0.14	10.2	10	3	0.2	10.5	11.0		3.4	0.0	7.71		1.11	0.02	0.02	1.55	7.07	3.03	0.20	0.5	0.5	3.2	0.1	0	0.2
Sulphate	%	nc	0.126	0.176	0.167	0.0494	<0.01						0.185	0.302	0.164	0.014	0.223	0.334	0.37	0.107	0.0542					0.02		0.62	0.1	0.07	0.139	0.12	0.171			
Sulphate Water Soluble	g/l	nc												0.04				0.3	0.41															0.79	0.7	0.36
Chloride	mg/kg	nc																																<0.05	<0.05	<0.05
Boron (water soluble)	g/itg	nc	1	1.6	0.6	0.7							0.6	0.9	0.6	1.4	0.9	0.7	1.6	0.8	0.8										0.4	1	1.2		.0	0
Hydrocarbons	-																																			
Total Phenol Ethylene Glycol	mg/kg	21900	<0.5	<0.5	<0.5				<1	<1							<0.5	<0.5	<0.5	<0.5		<1		<1	<1	<1			<u> </u>					<2	<2	<2
Givcerol	ma/ka	nc																																		
Gasoline Range Organics	mg/kg	66	<0.1	<0.1	<0.1	<0.1							<0.1	<0.1	<0.1	<0.1	0.1	6.2	0.7	<0.1	<0.1										<0.1		<0.1			
Diesel Range Organics	mg/kg	641	50	22	25	5							193	544	139	24	<0.1	38	58	15	10				1500	100					138		146			
Mineral Oil TEM	mg/kg	641 nc																							1539	128	161							2960	180	310
Aromatic hydrocarbons	iiig/itg	641																							2208	373	58							48	10	5
Polyaromatic Hydrocarbons																																				
Acenaphthylene	mg/kg	nc	<1	<1	<1	<1							1	<1	<1	<1	<10	<1		<1	<1										<1		<1			
Acenaphinene	mg/kg	nc	1	<1	<1	<1							<1	2	<1	<1	<10	<1		<1	<1										<1		<1			
Benzo(a)anthracene	mg/kg	nc	2	2	3	<1							2	4	1	<1	<10	<1		<1	<1										1		<1			
Benzo(a)pyrene	mg/kg	29.6	2	2	3	<1							3	4	2	<1	<10	<1		<1	<1										<1		1			
Benzo(b)fluoranthene	mg/kg	nc	2	1	2	<1							1	3	<2	<1	<10	<2		<1	<1										<1		<1			
Benzo(k)fluoranthene	ma/ka	nc	2	2	2	<1							2	5	#	<1	<10	#		<1	<1										<1		<1			
Chrysene	mg/kg	nc	2	2	3	<1							2	5	1	<1	<10	1		<1	<1										1		<1			
Dibenzo(a,h)anthracene	mg/kg	29.7			4	4							1	1	4	4	.10	1		<1	4										4		.4			
Fluorene	mg/kg	59400 nc	5	<1	<1	<1							6	12	2	<1	<10	2		<1	<1										<1		<1			
Indeno(1,2,3-cd)pyrene	mg/kg	nc	3	2	2	<2							<2	3	<2	<2	<20	<2		<1	<2										<2		<2			
Naphthalene	mg/kg	293	<1	<1	1	<1								2	<1	2	<10	<1			<1										1		<1			
Phenanthrene	mg/kg	nc	4	3	4	<1							9	9	3	<1	<10	2		<1	<1										3		<1			
Pyrene Polvaromatics	mg/kg	nc	5	4	5	<1							5	11	2	<1	<10	2		<1	<1										1		I			
BTEX																																				
Benzene	mg/kg	2																< 0.001		< 0.001																
Ethylbenzene	mg/kg mg/kg	48000																0.014		<0.001																
m/p-Xylene	mg/kg	344																0.168		< 0.001																
o-Xylene	mg/kg	419																0.231		<0.001																
VOCs/SVOCs	ma/ka	nc																<0.001		<0.001																
trans 1,2 - Dichloroethene	mg/kg	nc																< 0.001		<0.001																
trans 1,3 - Dichloropropene	mg/kg	nc																< 0.001		<0.001																
CFC-11 tort Putulbenzone	mg/kg	nc																< 0.001		< 0.001																
Tetrachloromethene	ma/ka	nc																<0.001		<0.001																
Trichloroethene	mg/kg	6.42																< 0.001		< 0.001																
1,1,1 - Trichloroethane	mg/kg	551		L	L	<u> </u>	<u> </u>											< 0.001	<u> </u>	< 0.001																
1,1,2,2-Tetrachloroethane	ma/ka	150																<0.001		<0.001																
Trichloroethane	mg/kg	nc																																		
1,1-Dichloroethane	mg/kg	nc			<u> </u>													< 0.001	L	< 0.001																
1,1-Dichloroethene	mg/kg	nc																<0.001		<0.001																
1,2-Dichloroethane	mg/kg	0.536																< 0.001		<0.001																
cis 1,2 - Dichloroethene	mg/kg	nc																< 0.001		<0.001																
1,2 - Dibromethane	mg/kg	nc																< 0.001		< 0.001																
1,2 - Dichloropenzene	mg/kg mg/kg	nc																<0.001		<0.001																
1,3-Dichloropropane	mg/kg	nc																< 0.001		< 0.001																
1,4-Dichlorobenzene	mg/kg	nc																< 0.001		<0.001																
2,2-Dichloropropane Bromobenzene	mg/kg	nc																<0.001		<0.001									<u> </u>							
Tribromomethane	mg/kg	nc		1	1	-										1	1	<0.001	1	<0.001																
Bromomethane	mg/kg	nc		1	1											1	1	< 0.001		< 0.001																
Bromodichloromethane	mg/kg	nc																< 0.001		<0.001																
Chlorobenzene	mg/kg	143000		l	l		l		┝──┤	-	├					I	I	<0.001		<0.001	├								┝───┤							
Chloroform	mg/kg	nc		ł	l	<u> </u>	<u> </u>		├							l	l	<0.001	 	<0.001				<u>├</u>					+							
Chloromethane	mg/kg	nc														<u> </u>	<u> </u>	<0.001		<0.001																
Carbon Tetrachloride	mg/kg	nc																< 0.001		< 0.001																
CFC-12 Chlorodibromomethano	mg/kg	nc					<u> </u>		┝──┤									<0.001	 	<0.001	├															
Hexachloro-1,3-Butadiene	mg/kg	1.98			-													0		0																
n - Butylbenzene	mg/kg	nc																0		0																
2-Phenylbutane	mg/kg	nc					<u> </u>											0.063	<u> </u>	< 0.001																
Hexylamine	mg/kg mg/kg	nc							┝──┤																											
Aniline	mg/kg	nc		1	1	1	1						1	1		1	1	1	1	1			1	1												

Sample Reference	9		KXTP06	KXTP06	KXTP06	KXTP07	KXTP07	KXTP07	SMKX48	SMKX48	SMKX48	TP7424	TP7424	TP7424	TP7424	TP7424	TP7425	TP7425	TP7425	TP7425	KXTP65	KXTP65	KXTP66	KXTP66	KXTP67	KXTP68	KXTP68	КХТ
Depth (m) Elevation (mOD))		0.5	1	2	0.5	1	2	0.1	0.25	0.5	0.1 14.65	0.2	0.5 14.25	1 13.75	3.3 11.45	0.1	0.2	0.5	2 12.63	0.75	1.4	0.75	1.75	1	1	2.2	0.7
Strata	1		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	TG	TG	MG	MG	MG	MG								
Investigation	1	Screening Criteria	1992	1992	1992	1992	1992	1992	1993	1993	1993	1997	1997	1997	1997	1997	1997	1997	1997	1997	1993	1993	1993	1993	1993	1993	1993	19
		ourcening ontena																										
Metals	malka	500	66	02	10	50	62	50	1.6	1.6	6.5		41	24	15		20		16	01	50	24	60	10	16	24	14	1
Cadmium	mg/kg	1400	7.5	12	6.6	10	13	9.8	<0.5	<0.5	0.7		<1	<1	<1		<1		<1	<1	7	4	6	5	3	4	6	4
Chromium	mg/kg	5000	62	120	44	97	170	68	5	5	8		20	37	22		40		31	37	33	34	25	46	20	15	53	2
Copper	mg/kg	44800	580	1300	570	1350	1700	910	22	29	142		39	122	60		104		47	58	1000	125	140	45	83	290	29	13
Lead	mg/kg	750	2200	4400	3900	3700	7800	3300	191	111	215		65	413	112		354		161	213	2560	910	760	130	390	1810	36	52
Nickel	mg/kg	5000	93	140	71	100	150	120	4	4	6		36	23	14		30		28	29	53	27	34	38	14	27	44	2
Selenium	mg/kg	8000	000	0000	000	4000	0500	4.400	<0.5	< 0.5	0.8		1.17	0.98	0.45		0.89		0.13	0.76	<5	<5	<5	<5	<5	<5	<5	<
Zinc Asbestos	mg/kg	337000	980	2600	930	1900	2500	1400	49	38	46		80	437	49		258		58	89	840	200	430	120	135	1/0	100	11
Asbestos Screen	nc	nc										NFO	NFO				NFO	NFO										
Asbestos Asbestos Fibre Count	nc %	nc							<0.05	<0.05	<0.05	<0.001	<0.001				<0.001	<0.001						'			──	
Miscellaneous	70									10.00																		
Total Cyanide	mg/kg	nc 140																	1		<10	<10	<10	<10	<10	<10	<10	
pH	pH Units	nc	8.2	8	8.1	7.7	8.1	7.8	9.9	10.4	10.5		8.3	8.1	7		9.1		8.1	8	6.4	6.7	6.4	6.8	6.5	6.8	7.2	7.
Thiocyanate	mg/kg	nc							0.17	0.10	0.54								0.0170		<2	<2	<2	<2	<2	<2	<2	<
Sulphate Water Soluble	-% g/l	nc	0.15	0.61	0.26	0.228	0.42	0.137	0.17	0.19	1.15								0.0176		0.21	0.246	0.273	1.2	1.2	2.92	0.33	2.
Sulphide	mg/kg	nc	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	500												<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	<0
Chloride Boron (water soluble)	mg/kg	nc	8	14	14	1/	12		<0.5	400 <0.5	400	-	0.6	1.2	0.5		0.6		0.2	0.6	6.9	10.2	145	35.2	/2.9	85 <1	46.2	10
Hydrocarbons																												
Total Phenol Ethylong Chroal	mg/kg	21900	<2	<2	<2	<2	<2	<2	<1	<1	<1	-					2.7		0.5		2.5	0.37	0.35	0.29	0.34	0.32	0.3	0.3
Glycerol	mg/kg	nc							<25	<25	<25																	
Gasoline Range Organics	mg/kg	66											1400	200	155		047		227	170				└─── ′			—	
Mineral Oil	mg/kg	641											1400	200	100		347		237	170				'			<u> </u>	+
TEM	mg/kg	nc	620	660	880	3610	410	1500	2.9	2.6	2.6										12700	320	2710	20	450	160	<20	<2
Aromatic hydrocarbons Polyaromatic Hydrocarbons		641	17	15	20	42	23	35	30.6	113.1	33.3										6600	130	210	18	28	1	8	
Acenaphthylene	mg/kg	nc																										
Acenaphthene	mg/kg mg/kg	nc		-																				'			──	+
Benzo(a)anthracene	mg/kg	nc																										
Benzo(a)pyrene Benzo(b)fluoranthene	mg/kg	29.6										-												⊢−−− ′				+
Benzo(ghi)perylene	mg/kg	nc																										
Benzo(k)fluoranthene	mg/kg	nc																						'			<u> </u>	
Dibenzo(a,h)anthracene	mg/kg	29.7																						′			<u>+</u>	+
Fluorene	mg/kg	59400																										
Fluoranthene Indeno(1.2.3-cd)pyrene	mg/kg ma/ka	nc																						'				
Naphthalene	mg/kg	293							0.028	0.024	0.042																	
Phenanthrene Pyrene	mg/kg mg/kg	nc																						'			──	
Polyaromatics	mg/kg	nc																										
BTEX	ma/ka	2											0.004	0.012	0.009									'			──	
Ethylbenzene	mg/kg	48000											<0.001	0.001	< 0.003		0.024		0.004	<0.001							\square	
Toluene	mg/kg	150											0.004	0.012	0.012		0.193		0.003	0.003				'			<u> </u>	
o-Xylene	mg/kg	419											< 0.001	0.003	0.005		0.094		0.001	<0.001				′			<u>+</u>	+
VOCs/SVOCs																												
Styrene trans 1.2 - Dichloroethene	mg/kg ma/ka	nc										-	<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				·'				+
trans 1,3 - Dichloropropene	mg/kg	nc											< 0.001	<0.001	< 0.001		< 0.001		< 0.001	< 0.001								
CFC-11 tert-Butylbenzene	mg/kg mg/kg	nc											<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				'			<u> </u>	+
Tetrachloromethene	mg/kg	nc											< 0.001	< 0.001	< 0.001		< 0.001		<0.001	< 0.001								
Trichloroethene	mg/kg	6.42							0.0013	0.0046	<0.0001		<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				└─── ′			──	-
1,1,2,2-Tetrachloroethane	mg/kg	150											<0.001	<0.001	<0.001		<0.001		<0.001	<0.001								+
1,1,2-Trichloroethane	mg/kg	nc							0.00040	.0.0001	0.0001		<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				<u> </u>				—
1,1-Dichloroethane	mg/kg	nc		-					0.00046	<0.0001	<0.0001		<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				'		<u> </u>	<u> </u>	+
1,1-Dichloroethene	mg/kg	nc											< 0.001	< 0.001	< 0.001		< 0.001		<0.001	< 0.001								1
1,2-Dichlorobenzene 1,2-Dichloroethane	mg/kg ma/ka	nc 0.536		-									<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				′				+
cis 1,2 - Dichloroethene	mg/kg	nc											< 0.001	< 0.001	<0.001		<0.001		<0.001	<0.001								
1,2 - Dibromethane	mg/kg	nc											<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				'			──	
m-Dichlorobenzene	mg/kg	nc											<0.001	<0.001	<0.001		<0.001		< 0.001	< 0.001							\square	
1,3-Dichloropropane	mg/kg	nc											< 0.001	< 0.001	< 0.001		< 0.001		< 0.001	< 0.001				'			<u> </u>	
2,2-Dichloropropane	mg/kg	nc											<0.001	<0.001	<0.001		<0.001		<0.001	<0.001				′			<u>+</u>	+
Bromobenzene	mg/kg	nc											< 0.001	< 0.001	< 0.001		< 0.001		<0.001	<0.001								1
I ribromomethane Bromomethane	mg/kg	nc								<u> </u>			<0.001	<0.001	<0.001		<0.001	<u> </u>	<0.001	<0.001				'			──	+
Bromodichloromethane	mg/kg	nc		1	1						1	1	< 0.001	<0.001	< 0.001	1	< 0.001		< 0.001	< 0.001							1	1
Chlorobenzene	mg/kg	143000		+	<u> </u>	<u> </u>							<0.001	< 0.001	<0.001	+	<0.001		<0.001	<0.001]	<u> </u>			<u>+</u>	+
Chloroform	mg/kg	nc							<0.0001	<0.0001	<0.0001		<0.001	<0.001	<0.001		<0.001		<0.001	<0.001								
Chloromethane	mg/kg	nc							.0.000	-0.0001	.0.000		< 0.001	< 0.001	< 0.001		< 0.001		< 0.001	< 0.001							—	F
Carbon Tetrachioride CFC-12	mg/kg mg/kg	nc		+	1	-	-		<0.0001	<0.0001	<0.0001	1	<0.001	<0.001	<0.001	+	<0.001		<0.001	<0.001				'			<u> </u>	+
Chlorodibromomethane	mg/kg	nc											<0.001	<0.001	<0.001		<0.001		<0.001	<0.001							1	
Hexachloro-1,3-Butadiene	mg/kg ma/ka	1.98 nc		+						<u> </u>						<u> </u>		<u> </u>						<u> </u>			<u>+</u>	+
2-Phenylbutane	mg/kg	nc											<0.001	<0.001	<0.001		0.018		<0.001	<0.001								
Fluorinated Refridgerants	mg/kg	nc		+	<u> </u>	<u> </u>			0.0004	<0.0001	<0.0001					+]	<u> </u>			<u>+</u>	+
Aniline	mg/kg	nc		1	1	1	<u> </u>		0.1	0.07	0.03	1	1			1	1	<u> </u>						'			<u> </u>	

TP69	KXTP69	KXTP70	KXTP70	KXTP71	KXTP71
.75	1.9	1	2	0.75	1.6
993	1993	1993	1993	1993	1993
18	14	19	19	160	19
4	5	3	4	13	4
21 <6	58	21	36	35	36
30	37	46	55	500	90
525	65	500	560	850	1130
<1	<1	<1	<1	<1	<1
26	46	19	31	150	39
<5	<5	<5	<5	<5	<5
15	120	100	105	475	110
:10	<10	<10	<10	<10	<10
7.1	7.2	7.5	8.3	7.2	7.6
<2	<2	<2	220	<2	28
10	0.0	0.00	0.40	0.04	4.00
0.1	U.8 <0.1	2.82	3.43 ∠0.1	∠.01 <01	1.69 ∠0.1
0.1	52.4	93.9	119	114	104
<1	<1	1	1	1	1
.34	0.3	0.31	0.33	0.31	0.31
:20	90	840	1700	90	2750
12	7	141	46	23	11
	-		-	-	
					<u> </u>

King's Cross Central

Vinyl Chloride

Sample Identity			OT3745A	SA7328	SA7381	TP7424
Date						
Strata			AI V	10	MG/LC	TG
Area	Units	Screening Criteria	1995	1997	1997	1997
Metals						
Arsenic	mg/l	0.05	<0.05	0.007	0.001	<0.001
Boron	mg/l	2	0.26	< 0.05	< 0.05	0.27
Cadmium	mg/l	0.005	<0.05	0.002	<0.001	<0.001
Copper	mg/l	0.028	<0.05	0.16	0.14	0.05
Lead	mg/l	0.25	< 0.05	0.88	0.1	0.07
Mercury	mg/l	0.001	< 0.05	0.0001	<0.0001	0.0002
Nickel	mg/l	0.15	<0.05	0.06	0.07	<0.02
Zinc	mg/l	0.25	<0.1	0.0005	0.0035	<0.001
Miscellaneous						
Total Cyanide	mg/l	0.05	< 0.05		<0.1	
Chloride	mg/l	250	56	242	120	87
0H Ammonia	pH units	0.015	7.78	1.2	21	6.6
Total Dissolved Solids	mg/l	nc		2330	1510	4.5
Total Organic Carbon	mg/l	nc		18	14	
Sulphate	mg/l	400	47	2370	1400	234
Free Sulphide	mg/l	0.00025		<0.2	<0.2	
Biochemical Oxygen Demand	mg/l	nc		<2	12000	<2
Chemical Oxygen Demand	mg/l	nc		23	14	61
Total Alkalinity as CaCO3	mg/l	nc				335
Hydrocarbons						
Total Phenol	mg/l	0.03	0.04	0.1	0.1	0.1
Petrol Range Organics	mg/l	0.01		0.1	<0.1	<0.1
BTEX	nig/i	0.01		1.1	0.30	0.0
Benzene	mg/l	0.03 (0.3)		< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/l	0.3		<0.001	<0.001	< 0.001
Toluene	mg/l	0.05 (0.5)		< 0.001	< 0.001	< 0.001
m/p-Xylene	mg/l	0.03		< 0.001	< 0.001	< 0.001
o-Xylene	mg/l	0.03		<0.001	<0.001	<0.001
1.1.1-Trichloroethane	ma/l	0.1 (1)		< 0.001	< 0.001	< 0.001
1,1,1,2-Tetrachloroethane	mg/l	nc		< 0.001	< 0.001	< 0.001
1,1,2-Trichloroethane	mg/l	0.4 (4)		<0.001	<0.001	<0.001
1,1-Dichloroethane	mg/l	nc		< 0.001	< 0.001	< 0.001
1,1-Dichloroethene	mg/l	0.03		<0.001	<0.001	<0.001
1,2-3-Trichloropropane	mg/l	nc		<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	mg/l	nc		<0.001	<0.001	< 0.001
1,2-Dichlorobenzene	mg/l	0		<0.001	< 0.001	< 0.001
1,2-Dichloroethane	mg/l	0.01		<0.001	<0.001	< 0.001
1,2-Dichloroethene	mg/l	0.05		< 0.001	< 0.001	< 0.001
1,2-Dibromoethane	mg/l	nc 0.0001		<0.001	<0.001	<0.001
1.3.5-Trimethylbenzene	mg/l	0.0001		< 0.001	<0.001	<0.001
m-Dichlorobenzene	mg/l	nc		< 0.001	<0.001	< 0.001
1,3-Dichloropropane	mg/l	nc		<0.001	<0.001	< 0.001
1,4-Dichlorobenzene	mg/l	0		< 0.001	< 0.001	< 0.001
2,2-Dichloropropane	mg/l	nc		<0.001	<0.001	<0.001
Bromochloromethane	mg/l	nc		< 0.001	<0.001	< 0.001
Tribromomethane	mg/l	nc		<0.001	<0.001	<0.001
Bromomethane	mg/l	nc		<0.001	<0.001	< 0.001
Bromodichloromethane	mg/l	nc		< 0.001	<0.001	< 0.001
Chlorobenzene	mg/l	0.3		<0.001	<0.001	<0.001
Chloroform	mg/i	nc 0.012		<0.001	<0.001	<0.001
Chloromethane	ma/l	nc		< 0.001	<0.001	< 0.001
Carbon Tetrachloride	mg/l	nc		<0.001	< 0.001	< 0.001
Dibromomethane	mg/l	nc		< 0.001	< 0.001	< 0.001
CFC-12	mg/l	nc		< 0.001	< 0.001	< 0.001
Dibromochloromethane	mg/l	nc		<0.001	<0.001	<0.001
su-riupyibenzene	mg/l	0		<0.001	<0.001	<0.001
Styrene	ma/l	nc		< 0.001	<0.001	<0.001
rans 1,2-Dichloroethene	mg/l	nc		< 0.001	< 0.001	< 0.001
rans 1,3-Dichloropropene	mg/l	nc		< 0.001	< 0.001	< 0.001
CFC-11	mg/l	nc		<0.001	<0.001	<0.001
ert-Butylbenzene	mg/l	nc		< 0.001	< 0.001	< 0.001
I etrachloromethane	mg/l	0.012		<0.001	<0.001	<0.001
Vinvl Chloride	mg/l	0.01 pc		<0.001	<0.001	<0.001
,						

OVE ARUP PARTNERS

King's Cross Central

Sample Identity			SA7328	SA7328	SA7381	TP7394	TP7395
Date			0.60	0.70	1.90	0.25	0.50
Strata			15.6	15.5	21.4	16.7	16.3
			MG	MG	MG	MG	MG
Area	Units	Screening Criteria	1997	1997	1997	1997	1997
Metals							
Arsenic	mg/l	0.05	0.014	0.004	0.005	0.004	0.006
Boron	mg/l	2	< 0.05	0.09	0.17	< 0.05	0.19
Cadmium	mg/l	0.005	< 0.001	< 0.001	< 0.001	< 0.001	<0.001
Calcium	mg/l	250					
Chromium	mg/l	025	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	0.028	0.01	0.01	0.02	<0.01	0.01
Iron	mg/l	1					
Lead	mg/l	0.25	< 0.03	0.03	< 0.03	0.05	0.04
Mercury	mg/l	0.001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	mg/l	0.2	< 0.02	< 0.02	< 0.02	< 0.02	<0.02
Potassium	mg/l	12					
Selenium	mg/l	0.01	0.0004	0.0002	0.001	0.0002	0.0008
Sodium	mg/l	170					
Zinc	mg/l	0.25	0.02	0.01	< 0.01	0.02	0.02

FIGURES

Figure 1 Goods Way Proposed Works

Figure 2 Site Location and Exploratory Locations

Figure 3 Cut and Fill Plan (1 of 2)

Figure 4 Cut and Fill Plan (2 of 2)



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Goods Wa Earthwork Boundary	ay and Boulevard (s + Remediation Plan	
Drawing Status Prelimina	ary	
Job No	Drawing No	Issue
67940	Figure 1	00