

# Appendix A. Remediation Planning Conditions

## A.1. LCS Planning Conditions (Remediation)

- **LCS0.91 Discharge of Remediation Conditions Protocol.** The discharge of all site remediation Conditions shall be undertaken in accordance with the Discharge of Remediation Conditions Protocol.
- **LCS0.92 Validation of Olympic Consents Remediation Works.** The development within each relevant PDZ, or other such area as agreed in writing by the Planning Authority, shall not be commenced unless and until:
  - validation of the remediation works as required by Conditions SP.0.32 to SP.0.36 of planning permissions 07/90011/FUMODA and OD.0.36 to OD.0.38 and LTD.16 of planning permission 07/90010/OUMODA and 11/90313/VARODA which relate to the whole of the relevant PDZ have been submitted to and approved by the Local Planning Authority;
  - the consolidated validation reports for such remediation works for that relevant PDZ have been submitted, validated and approved by the Local Planning Authority; and
  - there are no outstanding actions or ongoing requirements under Conditions SP.0.32 to SP.0.36 of planning permission 07/90011/FUMODA and OD.0.36 to OD.0.38 and LTD.16 of planning permission 07/90010/OUMODA and 11/90313/VARODA in the relevant PDZ save for ongoing monitoring required to enable the full discharge of those conditions.
- **LCS0.93 Global Remediation Strategy.** The development shall not be commenced until a global remediation strategy, which shall be in general in accordance with the Draft Global Remediation Strategy, has been submitted to and approved by the Local Planning Authority.
- **LCS0.94 Global Remediation Strategy.** The development, including all Remediation Works, shall be undertaken in accordance with the approved global remediation strategy.
- **LCS0.95 Remediation Statement.** Each application for approval of Reserved Matters shall be accompanied by a remediation statement and no Development shall be commenced pursuant to the Reserved Matters approval until the remediation statement has been approved by the Local Planning Authority. The remediation statement shall relate to the whole of the Planning Delivery Zone in which the site of the Reserved Matters is located (or such other area as may be agreed with the Local Planning Authority in writing). The remediation statement shall include as a minimum the following:
  - consideration of the consolidated validation reports for the Olympic Consents within the relevant Planning Delivery Zone (or such other area as may have agreed with the Local Planning Authority);
  - consideration and confirmation of the measures and controls needed to maintain the integrity of the remediation works undertaken under the Olympic Consents within the relevant Planning Delivery Zone (or such other area as may have been agreed with the Local Planning Authority);
  - an assessment of the Global Conceptual Site Model against the land uses proposed in the Reserved Matters application based on the validation checklist set out in Annexure 5 which should be read in conjunction with the approved global remediation strategy;
  - the use of a technical methodology and analytical model which are in accordance with the statutory requirements, UK guidance and best practice current at the time of the Reserved Matters application.
- **LCS0.96 Remediation Protection Method Statement.** Where the Global Conceptual Site Model is validated by the remediation statement submitted for approval pursuant to Condition LCS0.95 a remediation protection method statement ("RPMS") for the relevant PDZ (or such other area as may be agreed with the Local Planning Authority in writing) shall be submitted to the Local Planning Authority for approval and no Development shall be Commenced pursuant to the Reserved Matters approval until the RPMS is approved. The Remediation Works identified in the RPMS shall be carried out, completed and validated in accordance with the approved RPMS. Each RPMS shall contain as a minimum:
  - an outline of general work methodology, including details of proposed plant and equipment to be used;
  - measures and controls to protect the integrity of existing remediation works carried out under the Olympic Consents including in particular the Protection Layer in accordance with statutory requirements, UK guidance and best practice current at the time of submission;
  - the location of the proposed operations;
  - a programme for implementing the proposed Remediation Works and operations;
  - general health and safety and environmental controls;
  - details of any required environmental authorisations; and
  - details of how the Remediation Works will be validated.

- **LCS0.97 Remediation Protection Method Statement.** Where the Global Conceptual Site Model is not validated by the remediation statement submitted for approval pursuant to Condition LCS0.95, no Development shall be Commenced pursuant to the Reserved Matters approval unless and until:
  - a site specific remediation strategy has been submitted to and approved by the Local Planning Authority pursuant to Condition LCS0.98; and
  - a remediation method statement has been submitted to and approved by the Local Planning Authority pursuant to Condition LCS0.99.

and the Remediation Works identified in the approved site specific remediation strategy and remediation method statement shall be carried out, completed and validated in accordance with those approved documents.

- **LCS0.98 Site Specific Remediation Strategy.** Where the Global Conceptual Site Model is not validated by a remediation statement submitted for approval pursuant to Condition LCS0.95, a site specific remediation strategy ("SSRS") for the relevant Planning Delivery Zone (or such other area as may be agreed with the Local Planning Authority in writing) shall be submitted to the Local Planning Authority for approval. Each SSRS shall contain as a minimum:
  - details of the precise location of the Remediation Works proposed, including earth movements, earthworks filling, licensing and regulatory liaison, health, safety and environmental controls, controls on the quality of imported materials and any validation requirements;
  - a position statement on the available and previously completed site investigation information including all consolidated validation reports, enabling works reports, follow-on projects and validation data (including validation chemical dataset from enabling works and follow-on projects) submitted under the Olympic Consents;
  - details as to maintaining the integrity of the Protection Layer and the integrity of other remediation works undertaken under the Olympic Consents;
  - a rationale for the further site investigations required, including details of the locations of such investigations, the methodologies, sampling and monitoring proposed;
  - the proposed GAC and GWAC to be used in the SSRS;
  - an assessment of data against GAC and GWAC and if potential, and previously unidentified, risks are identified then detailed quantitative risk assessment (as identified in the global remediation strategy) is to be undertaken to generate site specific assessment criteria;
  - where the Remediation Works are in or are in the vicinity of Planning Delivery Zone 4 any SSRS shall also include details of any effect on the exempt naturally occurring radiological materials which were moved to a disposal cell in this area as part of the Olympic Consents and the controls to be applied in this respect; and
  - a programme for implementing the Remediation Works.
- **LCS0.99 Remediation Method Statement.** Where the Global Conceptual Site Model is not validated by a remediation statement submitted for approval pursuant to Condition LCS0.95, a remediation method statement ("RMS") for the relevant Planning Delivery Zone (or such other area as may be agreed with the Local Planning Authority in writing) shall be submitted to the Local Planning Authority for approval. Each remediation method statement shall contain as a minimum:
  - a remediation options appraisal;
  - details of remedial techniques to be employed (including if required any soil treatment/process centres and an appropriate marker layer) in accordance with statutory requirements, UK guidance and best practice current at the date of submission;
  - the locations where those techniques will be used;
  - the type and areas of contaminated material to be remediated;
  - plant and equipment to be used;
  - emissions and control measures and any required environmental authorisations;
  - a programme for implementing the Remediation Works; and
  - details of how the Remediation Works will be validated (e.g. sampling frequencies, chemical testing suites and the generic assessment criteria and site specific assessment criteria to be used to validate the works).
- **LCS0.100 Remediation Works.** Unless otherwise agreed in writing with the Local Planning Authority, monthly progress reports shall be submitted to the Local Planning Authority during the Remediation Works.

- **LCS0.101 Remediation Works.** Within 12 weeks of the Remediation Works set out in the approved RPMS, SSRS and RMS commencing within the relevant Planning Delivery Zone (or such other area as may be agreed in advance with the Local Planning Authority in writing), any additional site investigations undertaken during the Remediation Works are to be reported as an addendum to the relevant RPMS, SSRS or RMS which shall be submitted to the Local Planning Authority for approval.
- **LCS0.102 Remediation Validation and Protection.** Validation of the Remediation Works to show they have been undertaken in accordance with the approved RPMS, SSRS and RMS for the purposes of human health protection and for the protection of controlled waters shall be undertaken on completion of the relevant Remediation Works and a Validation Report shall be submitted within two months of completion of the relevant Remediation Works to the Local Planning Authority and other stakeholders notified by the Local Planning Authority for approval by the Local Planning Authority. When all Remediation Works necessary for the protection of controlled waters and for the protection of human health are completed within a Planning Delivery Zone, a consolidated Validation Report drawing together the Planning Delivery Zone validations shall be submitted to the Local Planning Authority. This consolidated Validation Report shall include detailed topographic mapping of the as-built ground levels.
- **LCS0.103 Remediation Validation and Protection.** Approved post-remediation monitoring and maintenance of the remediated land shall continue, as set out in the Validation Reports, until such dates or events as are approved by the Local Planning Authority.
- **LCS0.104 Foundation Details.** Before the construction of each building or other structure requiring foundations or the installation of any technology which may require piling is commenced, details of the foundations and piling and a piling risk assessment, which shall include as a minimum:
  - a method statement for any piling;
  - the means by which previously installed remediation measures, including in particular and without limitation the Protection Layer, are to be safeguarded (and in particular where relevant the exempt naturally occurring radiological materials located in or in the vicinity of Planning Delivery Zone 4) and the integrity maintained;
  - a gas/vapour assessment to identify any measures necessary to prevent ingress of gaseous contaminants into that building or structure or the contamination of controlled waters; and
  - demonstration that there is no resultant unacceptable risk to groundwater or increase in the risk of near-surface pollutants migrating into deeper geological formations and aquifers.

shall be submitted and to and approved by the Local Planning Authority. The approved details shall thereafter be implemented during the construction of the Development (or relevant part thereof).

- **LCS0.105 Unexpected Contamination.** If at any time during the construction of the Development and/or the Remediation Works, including demolition, re-profiling, removal of structures, breaking up of roads and hard standing and utilities drainage, contamination is encountered in a Planning Delivery Zone (including any contaminants of concern not previously identified) which was not previously identified or treated in the course of site investigation or has been brought to the surface by construction activity or is wholly or partly derived from a different source or is of a different type to that identified, no further development in that Planning Delivery Zone shall take place (except to the extent that it has been agreed with the Local Planning Authority in writing that specified works would not further disturb that contamination) until a Remediation Change Note (which shall be an amendment to the relevant SSRS) and/or a revised RPMS or a revised RMS, containing an assessment of that contamination and a scheme and timetable to contain, treat or remove it, has been submitted to and approved by the Local Planning Authority and any necessary remediation has been carried out. A Remediation Change Note and/or revised RPMS, revised SSRS or revised RMS shall be submitted to the Local Planning Authority within 7 days of any unexpected contamination being encountered.
- **LCS0.106 Quality of Imported Fill.** No soils or infill materials (including silt dredged from watercourses), shall be imported onto the Site or from one Planning Delivery Zone or Development Parcel to another until it has been satisfactorily demonstrated to the Local Planning Authority that they present no risk to human health, planting and the environment. Material import requirements including control levels and validation details are to be included within each RPMS, SSRS and RMS. Documentary evidence to confirm the origin of all imported soils and infill materials, supported by appropriate chemical analysis test results, shall be submitted to and approved by the Local Planning Authority prior to that import. The import onto the Site or from one Planning Delivery Zone or Development Parcel to another of material classified as 'waste' is only acceptable with the prior approval of the Local Planning Authority and subject always to the obtaining of any required permits in accordance with environmental permitting regulations current at the time, including the duty of care and any transportation requirements by an appropriately registered carrier.

- **LCS0.107 Treatment Centres.** A specific treatment remediation method statement ("STRMS") shall be prepared for each soil treatment process that is to be operated on the Site, including any central treatment centre, and the STRMS shall be submitted to and approved by the Local Planning Authority prior to the commencement of operation of the relevant soil treatment process.
- **LCS0.108 Annual Reporting.** A report detailing all the consolidated Validation Reports issued at that date and including a plan of the Site showing the status and progress of the Remediation Works shall be submitted to the Local Planning Authority on each anniversary of the Commencement of Development until Completion of the Development.

## A.2. GCSM Validation Checklist

Item	Check	Yes	No
<b>The relevant Consolidated Validation Reports and associated documents should be reviewed to support the completion of the Validation Checklist.</b>			
1	<p>Are there any outstanding remediation actions that have not been completed as part of the enabling and / or follow on projects?</p> <p><i>Full remediation scope was completed during ODA/LOCOG/LTP works. However, hard standing was used in the place of HHSL in some areas where hardstanding may not be present at the LCS end use.</i></p>	Yes	
2	<p>Is there a significant change in land use (i.e. more sensitive) between the LCS scheme design and the 2007 Permissions Olympic scheme?</p> <p><i>The Sweetwater scheme design includes residential properties in the north eastern corner of PDZ4, which was previous scheduled as soft and hard landscaping.</i></p>	Yes	
3	<p>Is there a change to remediation formation levels between the LCS and the 2007 Permissions Olympic scheme?</p> <p><i>Proposed finish levels across the wider Sweetwater scheme are yet to be finalised. However, a reduction in levels will occur around Bridge abutments. To achieve the required level, HHSL and ML will be removed, with HHSL materials stockpiled for reuse and levels reduced via the excavation of general fill soils. Validation testing will be undertaken at the revised remediation formation level in accordance with the Revised GRS and the relevant SSRS/RMS where existing validation data is not considered sufficient/where reassurance testing is required. HHSL/ML will be reinstated according to the proposed final land uses and in accordance with the 2007 Permissions Olympic scheme and phase-specific SSRS/RMS.</i></p>	Yes	
4	<p>Will the existing Human Health Separation Layer be compromised by the LCS works?</p> <p><i>Yes, as detailed in Item 3 and where existing hard standing will be replaced with HHSL and ML.</i></p>	Yes	
5	<p>Does the proposed LCS have the potential to compromise groundwater remediation measures?</p> <p><i>The proposed LCS design does not introduce measures with the potential to compromise groundwater remediation. Groundwater remediation was not previously undertaken within the Sweetwater development area and infiltration is not likely to increase significantly as part of the scheme design. Piling will be undertaken as part of the construction activities, with any potential risks to groundwater identified in a site specific Foundation Details Report as per LCS0.104.</i></p>	No	
6	<p>Is there potential for additional contaminants to have been introduced to the land since the 2007 Permissions Olympic scheme?</p> <p><i>As a result of the implementation of the Code of Construction Practice and associated environmental management plans during the ODA Follow-on Projects and LTP works, the potential for the introduction of additional contaminants during these works is very low.</i></p>	No	
7	<p>Is there potential for exposure to existing contaminants at unacceptable concentrations as a result of the proposed scheme (including areas of residual ACM and radiological materials)?</p> <p><i>Relevant validation reports have been approved by the Planning Authority and further reviewed by the project team. In addition, the majority of the LCS works will be undertaken within previously validated fill materials. However, there remains a risk of encountering previously unidentified sources of contamination including ACM wherever excavations are undertaken in to the original in situ soils. The RMS will include details of the procedures to be implemented to deal with unforeseen contamination and the requirements for validation.</i></p> <p><i>Radiological materials were deposited in the bridge abutments within PDZ4, the waste cell is covered on its sides and top with an orange geotextile marker layer and variable thicknesses of soil. If excavation works in and around the radiological depository are undertaken, it is recommended that this work is undertaken under the supervision of a Radiation Protection Advisor (RPA). The RPA would be responsible for producing method statements and risk assessments associated with the work as well as supervising the monitoring that will be undertaken as part of these works. If the area is used for housing, radon ingress mitigation measures should be employed.</i></p>	Yes	
8	<p>Does the LCS introduce additional pathways (excluding construction related issues such as piling which will be addressed by the Code of Construction or similar document)?</p> <p><i>Additional pathways may be introduced via uptake in home grown produce following construction of private gardens if scheduled in the final masterplan.</i></p>	Yes	
9	<p>Does the LCS introduce additional receptor(s) including a change in sensitivity of existing receptors?</p> <p><i>The potential introduction of private gardens increase sensitivity of human health receptors.</i></p>	Yes	
10	<p>Have any additional pollutant linkages been created by the proposed scheme?</p> <p><i>Consumption of home-grown produce via private gardens may result in an additional pollutant linkage, although it is noted that this could be mitigated during design/construction of the private gardens.</i></p>	Yes	
<b>Outcome</b>			

**Action Required:** If the answer to **any** of the above is Yes then new pollutant linkages are likely to be introduced. As such consideration to undertaking additional investigation, risk assessment, and/or remediation design works in support of the LCS. Any such additional works should be reported in accordance with the framework detailed in within the GRS

**Action Not Required:** If the answer is **no** to all of the above then significant new pollutant linkages are unlikely to be introduced through the LCS. As such additional investigation, risk assessment, or remediation design works are unlikely to be required. Standard construction controls and method statements should be adopted in accordance with the Code of Construction or similar documents.



# Appendix B. PDZ4 Relevant Approved Documentation

## B.1. Site Wide Documents

### **Capita Symonds. MST-CSP-CM-ZZZ-OLP-XXX-E-0040. Intrusive Investigation Method Statement (IIMS). November 2006 (ODA Ref: 07/90216/AODODA)**

The IIMS presents a framework and provides a generic specification for undertaking contamination intrusive investigations across the Olympic Park to gather sufficient information to support planning applications and scheme design. It was prepared with reference to the Environment Agency Model Procedures for the Management of Land Contamination CLR 11.

The intrusive investigation works outlined in this document gathered sufficient information to inform production of SSRs to support planning application requirements and detailed design.

In particular the intrusive investigation works provided sufficient information to:

- assess the nature, extent and source of soil and groundwater contamination;
- assess the ground gas generation potential;
- prepare site conceptual model;
- undertake generic and detailed quantitative risk assessment; and
- identify of areas requiring remediation.

### **Capita Symonds. REP-CSP-VZ-ZZZ-OLP-XXX-E-0076. Global Remediation Strategy, (Version 2.0, Rev B), January 2007 (ODA Ref.: 07/90011/FUMODA)**

Given the scale and the strict delivery requirements of the Olympic Project, the GRS was prepared to provide a common resource for remediation strategy related work, thus minimising duplication of design, regulatory requirements and programme risk. To this end the GRS sets out site wide principles and procedures for taking forward the SSRs, which are, and have been, prepared for individual Construction Zones/Sub Zones. Specifically the following principles and technical resources have been established:

(i) a 'Global Conceptual Site Model' (GCSM) for the Olympic Park identifying the major potential contamination related risks; and

(ii) a wide range of soil and groundwater 'Generic Assessment Criteria' (GAC) for screening of chemical testing results to identify potential contamination risks.

With regard to (ii) above computer based generic quantitative risk assessment (GQRA) has been undertaken to derive generic screening values for areas potentially requiring remediation.

The DEFRA and Environment Agency document 'Model Procedures for the Management of Land Contamination' (CLR11) was consulted in production of this document. In this respect this document broadly represents the Generic Quantitative Risk Assessment process outlined within CLR 11.

### **Atkins. ENW-ATK-LET-00269. Site Wide RMS Addendum (Use of Hardcover as a Substitute to the Separation Layer). February 2009. (ODA Ref.: 08/90292/AODODA)**

Under this site wide RMS addendum the remedial designers developed a framework for reducing the thickness of the HHSL under suitably robust hardstanding. The basic premise behind this design change was that hardstanding would act as a suitable barrier to certain pollution pathways (namely ingestion, dermal contact and dust inhalation) and reduce the requirement for a full-thickness HHSL.

### **Nuttall. MST-ENL-CE-ZZZ-OLP-SP1-E-0159 Rev 05. Site Wide RMS Addendum (Asbestos in the Sub-grade & General Fill), March 2009. (ODA Refs: 08/90083/AODODA, 08/90181/AODODA, 08/90216/AODODA, 08/90217/AODODA, 08/90218/AODODA, 08/90219/AODODA, 08/90220/AODODA, 08/90221/AODODA, 08/90222/AODODA 08/90223/AODODA, 08/90281/AODODA and 08/90326/AODODA)**

The SSACs and methodology for assessing asbestos in the HHSL and below marker layer materials was further developed as the works progressed as set out in the Site Wide SSR Addendum - Criteria for Asbestos

in Fill Material (0241-ENW-ATK-LET-00276) detailed below. In addition, this RMS details the sampling strategy to be utilised when an asbestos value of >0.1 % w/w is encountered within emplaced materials.

**Atkins. MEM-ATK-CM-ZZZ-OLP-ZZZ-0004 Rev 2. Site Wide SSRS Addendum (Justification of Deviation from the GRS in the Derivation of SSAC). September 2009. (ODA Ref.: 09/90233/AODODA)**

This document details the changes applied in the derivation of SSAC from the methodology or data sources presented in the GRS along with justification for the changes.

This memo has been produced to support any deviations from the GRS specifically in relation to TPH and PAH. It documents the changes Atkins has applied in the derivation of the SSAC from the methodology or data sources presented in the GRS. Where changes have been made from the GRS, these have been justified. Updated versions of the TPH and PAH criteria summary tables are appended to this document and in the case of TPH is based on differing FOC.

## **B.2. PDZ4 Site-Specific Documents**

**Capita Symonds. REP-CSP-VZ-04Z-OLP-XXX-E-0048. PDZ4 Outline Site Specific Remediation Strategy (Version 1.0), January 2007 (ODA Ref.: 07/90221/AODODA)**

Outline design for CZ4 primarily comprises the possible requirement for localised shallow soil hotspot excavation and the possible need for remediation of perched water to protect proposed residential end users. Groundwater remediation was not considered necessary at this stage, however, given the paucity of data, this outline SSRS specifies further investigation to refine the Conceptual Site Model and inform on the specific remedial requirements. In addition, this SSRS derives Site Specific Assessment Criteria and specified placement of chemically and geotechnically compliant materials to the EWFL.

**Capita Symonds. REP-CSP-CM-ZZZ-OLP-XXX-E-0840. PDZ4/5-Proposed Earthworks and Remediation for Bridge L03 and E031 Position Paper. November 2007 (ODA Ref.: 07/90247/AODODA)**

This document specifies the remediation requirements in advance of the preparation of the full SSRS to allow the construction of the bridge abutments to commence. The report requires the remediation of one soil hotspot for the protection of controlled waters (River Lea). Ammoniacal nitrogen in groundwater was identified to be elevated, although it is considered to be a regional exceedance that will be further discussed in the CZ4 Full SSRS.

**Capita Symonds. REP-CSP-VZ-04Z-OLP-XXX-E-0048. PDZ4 Full Site Specific Remediation Strategy (Version 1.1), December 2007 (ODA Ref.: 07/90221/AODODA)**

This report updates the Outline SSRS and incorporates the findings of the additional site investigation works. The report outlines eleven hotspots requiring remediation for the protection of human health (one) and controlled waters (ten), which includes the single hotspot identified in the L03/E031 Position Paper. The findings also identified site wide exceedances in the RTD groundwater for ammoniacal nitrogen and recommended further investigation and assessment. In addition, the SSRS derived the SSAC and specified placement of chemically and geotechnically compliant materials to the EWFL.

**Capita Symonds. LET-CSP-CM-04Z-OLP-XXX-E-0895 SSRS Addendum – Park and Public Realm (Scenario 10). November 2008 (ODA Ref.: 09/90128/AODODA)**

This report reviewed the proposed topographical design changes to determine any potential implications for remediation. The report concludes with the Designer confirming no significant impact on the requirement for site remediation with respect to Human Health or Controlled Waters and the recommendations in the SSRS Version 1.1 remain valid.

**Capita Symonds. 0241-ENW-ATK-LET-00181. SSRS Groundwater Addendum, November 2008 (ODA Ref.: 08/90352/AODODA)**

Following the collection of additional groundwater data (presented in the Capita Symonds Global Groundwater Model), this report updates the CZ4 SSRS regarding groundwater remediation. In summary, the significant changes comprise a new compliance point (Waterworks River rather than the River Lea) and revised Soil Leaching Potential SSAC which in turn revised the RTD groundwater SSAC. These changes establish that there is no requirement for remediation to protect controlled waters (by the way of excavating the unsaturated

zone and treatment of the underlying RTD) given the identified flat hydraulic gradient coupled with a compliance point located much further from the site that previously modeled.

**Atkins. 0241-ENW-ATK-LET-00276. Site Wide SSRS Addendum - Criteria for Asbestos in Fill Material. March 2009 (ODA Refs: 08/90083/AODODA, 08/90181/AODODA, 08/90216/AODODA, 08/90217/AODODA, 08/90218/AODODA, 08/90219/AODODA, 08/90220/AODODA, 08/90221/AODODA, 08/90222/AODODA 08/90223/AODODA, 08/90281/AODODA and 08/90326/AODODA)**

The SSACs and methodology for assessing asbestos in the HHSL and below marker layer materials was further developed as the works progressed. This resulted in the following changes:

**Separation Layer:** The material for the upper section of the separation layer has a maximum concentration of potentially asbestos fibres of 0.001% w/w [dry weight]. The lower section will have an arithmetical average (mean) concentration of asbestos fibres of 0.005% w/w [dry weight].

**Below Marker Layer:** The asbestos acceptance criteria for materials below the marker layer are not based on potential risk to Legacy end user human health as the presence of a minimum 600 mm thick separation layer eliminates the inhalation and other pathways between source and receptor for the exposure of end users of the site. The below marker layer SSAC for placed material (general fill) is based on the EA Hazardous Waste guidance, which is set at 0.1%w/w [wet weight]. This criterion is based on pre-classification of material rather than in-situ testing.

The sub-grade criterion is solely based on potential landowner liabilities. Therefore, as this material is not considered a 'waste', it is not bound by the Hazardous Waste Regulations. However, the landowner is conscious of the classification of these materials in the future, should they be excavated for disposal, and so uses the waste criterion as a screening measure to inform them on the need for further action.

The risks to construction and future maintenance workers are not addressed by remediation, as they are expected to be dealt with by risk assessment and subsequent mitigating actions.

**Capita Symonds. CS023786/CZ4Topo/14Oct10/AR - SSRS Addendum for CZ4 (Scenario 13), October 2010 (ODA Ref.: 10/90563/AODODA)**

This report reviewed the proposed topographical design change (Scenario 13) to a discrete portion (north western corner) of the CZ4 site to determine any potential implications for remediation. The report concludes with the Designer confirming no significant impact on the requirement for site remediation with respect to Human Health or Controlled Waters and the recommendations in the SSRS (as amended) remain appropriate.

**Atkins. REP-ATK-CM-03a-OLP-SP1-E-0001. CZ3a Remediation Change Note - Discovery of Radioactive Substances, June 2010 (ODA Ref.: 08/90363/AODODA)**

This report presents a summary of the issues and consequences of the finding of Very Low-Level and some Low Level Radioactive waste at CZ3a. Following assaying in CZ6a, the radionuclides dispersed in excavated spoils in discrete locations around the Site were determined to be 'exempt' under the relevant radioactive waste legislation. These materials were appropriately deposited in a specially constructed disposal cell beneath the L03B bridge abutment in CZ4.

**Atkins. REP-ATK-CM-06a-OLP-SP1-E-0003. CZ6a Remediation Change Note - Discovery of Radioactive Substances, June 2010 (ODA Ref.: 09/90048/AODODA)**

This report presents a summary of the issues and consequences of finding of radioactive contamination within CZ6a and 6d (PDZ6). The purpose of this report was to present a summary of the occurrence, the evaluation of the potential impact this could have on the prevailing SSRSs and to specify the methodology to be applied for its management, storage and appropriate disposal.

**Atkins. 0241-ENW-ATK-LET-00854. Remediation Change Note Addendum, May 2011 (ODA Ref.: 11/90386/AODODA)**

The report sets out the identification, recording and controls put in place to appropriately manage and mitigate the risks associated with the presence of NORM found during the Enabling Works phase of the redevelopment. This report specifically refers to the appropriate disposal/deposition of these NORM wastes and thus the

surrender of the Radioactive Substances Authorisation following its accumulation and storage on-site during the Enabling Works phase of works. The radionuclides identified in excavated spoils in discrete locations across the Site were determined to be 'exempt' under the relevant radioactive waste legislation. These materials were appropriately deposited in a specially constructed disposal cell beneath the L03B bridge abutment in CZ4. This addendum includes a report that updates the pre-deposition risk assessment (version 3) and assesses the as-built residual risk associated with the burial of radiological 'exempt' waste beneath L03B bridge abutment in CZ4. This radiological risk assessment determines the impacts of the deposition of this radiological impacted site derived arisings. The assessment addresses potential radiation exposures to current and future human health receptors, who will occupy the site. Whilst there are restrictions, the report concludes that the disposal cell is fully fit for the purpose of disposing of NORM waste arisings from the redevelopment works.

In addition, this report also confirms the appropriate removal off-site of the four drums containing radioactive artefacts. These drums were individually assayed on-site prior to its transfer from Site on the 29th September 2010 by a licensed contractor for processing at the Winfrith facility in Dorset. The transfer was in accordance with the granted Environment Agency Radioactive Substances Authorisation [Ref.: CB9916/CE0419]. Please note that these artefacts were not excavated from, transferred to or deposited in, CZ4 but is referred to in this summary for completeness.

### **B.3. PDZ4 Remediation Method Statements**

#### **Nuttall. MST-ENL-CK-04Z-OLP-SP1-E-0147 - Addendum to the CZ4 Ground Contamination Remediation Method Statement, May 2009 (ODA Ref.: 09/90133/AODODA)**

This addendum was prepared to take into account the Design changes following the issuance of the main RMS in September 2008. The key elements captured in this RMS addendum are revised SSACs as a result of several design changes relating to a revised controlled waters compliance point, site-wide remodeling of Human Health SSACs and the withdrawal of the hotspot at BHCZ4-060. This resulted in there being no Designer defined hotspots in the unsaturated zone. In addition, this RMS discusses the deposition (and risk assessment) of radioactive contaminated waste [classified as Exempt under the Phosphatics Substances and Rare Earths Exemption Order under the Radioactive Substances Act of 1993] in a dedicated purpose-built disposal cell beneath the proposed L03 Bridge.

#### **Nuttall. REP-ENL-CE-04Z-OLP-SP1-E-0198 - L03 & E031 Bridge Abutments (CZ4 and 5a) Human Health Validation Report, January 2009 (ODA Ref.: 08/90030/AODODA)**

This report validates the remedial works carried out within a sub-section of CZ4 in relation to Human Health only. The works comprised delivery of the EWFL, removal of the Designer defined hotspot for the protection of Controlled Waters (note the physical works were completed prior to submittal of the SSRS Groundwater Addendum (0241-EWN-ATK-LET-00181) and the use of geotechnically and chemically suitable materials, with the exception of one sample in the separation layer that exceeded the prevailing asbestos criteria.

#### **Nuttall. REP-ENL-CK-04Z-OLP-SP1-E-0263 – Addendum to L03 & E031 Bridge Abutments (CZ4 and 5a) Human Health Validation Report, February 2009 (ODA Ref.: 08/90030/AODODA)**

The asbestos exceedance identified in the separation layer was further investigated. It was noted that the material represented by this sample will be filled with approximately 9.5 m of acceptable fill associated with the L03B Bridge approach embankments and reinforced soil retaining structures i.e. re-classified as 'general fill'. It is on this basis that the mean concentrations of asbestos detected do not present an unacceptable risk to human health or exceed the Waste Management Regulations.

#### **Nuttall. REP-ENL-CE-04Z-OLP-SP1-E-0191 - CZ4 - Energy Centre (Kings Yard) Human Health Validation Report, September 2008 (ODA Ref.: 08/90186/AODODA)**

This report validates the remedial works carried out within a sub-section of CZ4 in relation to Human Health only. The works comprised delivery of the EWFL, excavation, backfilling with suitable materials and the validation of two cyanide hotspots exceedances (please note these do not relate to the Designer defined hotspots).



**Nuttall. REP-ENL-CE-04Z-OLP-SP1-E-0197 – CZ4 - EDF Sub-Station Site (CZ4) Human Health Validation Report, September 2008 (ODA Ref.: 08/90270/AODODA)**

This report validates the remedial works carried out within a sub-section of CZ4 in relation to Human Health only. The works comprised delivery of the EWFL and the use of geotechnically and chemically suitable materials. No hotspots were identified in the SSRS, RMS or during the implementation phase respectively.

**Nuttall. MST-ENL-CM-04Z-OLP-SP1-E-0083 – Kings Yard Remediation Method Statement, January 2008 (ODA Ref.: 08/90062/AODODA)**

This RMS was prepared to facilitate the early handover of Kings Yard to enable construction of the Energy Centre and specifies how the remedial design will be implemented in this discrete portion within CZ4. In addition to the delivery of the earthworks to EWFL and backfilling with compliant materials, BNL also reassessed the dataset and identified two cyanide exceedances within the unsaturated zone representing a risk to both human health and controlled waters.

**Nuttall. LET-ATK-TZ-04Z-OLP-SP1-0003 Site Specific Remediation Method Statement for Soil Treatment Centres, July 2008 (ODA Ref.: 08/90173/AODODA)**

This report was prepared to outline the remediation treatment processes being utilised within PDZ4 (the South Park 'Soil Hospital'). The treatment processes discussed are: soil washing, bioremediation and stabilisation.

**Nuttall. MST-ENL-CE-04Z-OLP-SP1-E-0115 - CZ4 Ground Contamination Remediation Method Statement, September 2008 (ODA Ref.: 08/90289/AODODA)**

This report specifies how the remedial design will be implemented. In addition to the earthworks and its delivery to the EWFL with compliant backfill materials, the RMS also discusses subsequent (to the SSRS) Designer changes that have resulted in revised SSACs due to the setting of a new controlled waters compliance point (see 0241-EWN-ATK-LET-00181). This has resulted in the identification of three unsaturated zone hotspots (two for Human Health purposes and one for controlled waters) that require removal. However, given the lag between the SSRS and this RMS, BNL had already removed three of the (withdrawn) hotspots identified in the Main SSRS.

**Nuttall. MST-ENL-CM-04Z-OLP-SP1-E-0068 – L03 & E31 Bridge Abutments Remediation Method Statement, December 2007 (ODA Ref.: 07/90247/AODODA)**

This report specifies how the remedial design will be implemented with particular reference to creating the landform for the bridge abutments, the area between the abutments and the approach to each bridge. These earthworks were undertaken in compliance with the prevailing SSACs and include installation of general fill, marker layer and separation layer and the removal of one soil hotspot for the protection of controlled waters.

**Lagan Construction Limited. 7075-SBH-F06-W-ADD-0001. Central Park Bridge F06. Addendum to: MST-ENL-CK-02a-OLP-SP1-E-0055 Rev.3 & MST-ENL-CK-04-OLP-XXX-E-0048 Ground Contamination Remediation Method Statements Construction Zones 2a and 4. October 2010. (Decision Notice Ref: 10/90491/AODODA)**

No sub-grade verification was required because no excavations (except piling) were expected to extend beneath the Enabling Works sub-grade. No Marker Layer or HHSL was present on the site at handover; however, it was intended that these features would be installed by Lagan. In areas of permanent hard landscaping it was agreed that the hard cover would provide an effective substitute for the HHSL, with the Marker Layer being placed below the sub-base of the hard standing. In addition post Games works were identified including the removal of temporary fill in the western 'bowl' and subsequent completion of the remedial cover system to form part of Legacy / Transformation works. These works are to be reported at a subsequent stage during Transformation / Legacy.

**Skanska Infrastructure Services. 7170-LPR-SPK-L-RMS-0001 C04. Olympic Park Planning Delivery Zones 1, 2, 4 & 8: Remediation Method Statement Addendum – Landscape & Public Realm South. September 2011. (Decision Notice Ref: 11/90079/AODODA)**

Sub-grade verification sampling was only considered to be required in areas previously undisturbed by Enabling Works, within excavations extending >500 mm below the Enabling Works sub-grade level (except linear excavations with adjacent Enabling Works sub-grade validation data) and within linear excavations

where visual / olfactory indicators of potential contamination were identified. As-dug fill material previously verified by Enabling Works and virgin fill material did not require in-situ validation testing. While not the standard approach, it was agreed with PDT that in areas of permanent hard landscaping it was agreed that the hard cover would provide an effective substitute for the HHSL, as outlined in the following scenarios:

- where Marker Layer and HHSL were installed by Enabling Works, general fill would be installed on top of this up to the underside of the Type 1 layer, then if necessary a secondary Marker Layer would be placed on top of this and the remainder of the hardstanding installed; and
- where no Marker Layer or HHSL was installed by Enabling Works, general fill would be installed to the underside of the Type 1 layer, then if necessary a Marker Layer would be placed on top of this and the remainder of the hardstanding installed.

**BAM Nuttall. 7040-SBH-SPK-W-REP-0027-02 & 7080-SBH-NPK-W-REP-0017-02. Olympic Park Lot 2 (PDZ1, PDZ2, PDZ3, PDZ4, PDZ8) and Lot 5 (PDZ5 & PDZ6) Remediation Method Statement Addendum – Structures, Bridges and Highways. October 2010. (Decision Notice Ref: 10/90343/AODODA).**

Sub-grade verification sampling was only considered to be required in areas previously undisturbed by Enabling Works and where excavations extended to a depth >0.5 m below the Enabling Works sub-grade level. As-dug fill material previously verified by Enabling Works and virgin fill material did not require *in-situ* validation testing. In areas of permanent hard landscaping it was agreed that the hard cover would provide an effective substitute for the HHSL, as outlined in the following scenarios:

- for the south loop road the Marker Layer would be placed between the road capping and sub-base layers; and
- for the concrete barriers between the loop road and perimeter fence line a concrete blinding layer would be placed beneath the barriers and the Marker Layer installed beneath the concrete blinding.

**CLM Logistics and Security. 0009-TPI-EWK-CM-PRO-0001 P06. Remediation Method Statement Addendum. March 2011. (Decision Notice Ref: 10/90492/AODODA)**

The works undertaken by CLM Logistics and Security (L&S) were initially understood to be temporary in nature and typically comprised small scale earthworks. However, many of the CLM L&S works have subsequently remained in place and have been incorporated into works completed by subsequent FoPs. In these cases CLM L&S has produced verification reports for all unbound material placed that will remain for Games time scope. Virgin and WRAP fill material did not require *in-situ* validation testing. Above Marker Layer material that had been previously validated by Enabling Works was also considered suitable for reuse on site without further testing, providing the excavated material was replaced in the works from which it was excavated. In the majority of cases, material excavated from below the Marker Layer was exported directly to the Soil Hospital. However, in the case of shallow earthworks less than 1 m in depth, it was considered that the remediation carried out by Enabling Works was maintained. In these cases the as-dug below Marker Layer material could be re-used, provided it was re-used within the excavation from which it originated and the material did not exhibit visual or olfactory indicators of contamination over and above the general level of contamination present in below Marker Layer material. In areas where CLM L&S were tasked with completing the FFL, Marker Layer was installed providing it had not been previously placed by Enabling Works or another FoP. Marker Layer and HHSL were reinstated or installed where absent, except in areas where the CLM L&S scope did not cover their placement. In these cases Marker Layer and HHSL were listed as residual items in the relevant validation reports, for installation by subsequent FoPs. The Marker Layer was raised beneath areas of permanent hard cover, as the hard cover was accepted as a suitable substitute for HHSL.

**Skanska. 7030-SBH-ZZZ-LET-01576. Change of notice for areas of hard standing – separation layer. June 2010. (Decision Notice Ref: 10/90258/AODODA)**

It was proposed that hard cover would provide a sufficient substitute for HHSL. Hard cover materials would comprise surface course, binder course and base material, and would be 200 to 360 mm thick.

**Skanska. 7030-SBH-ZZZ-LET-01577. Change of notice for validation of soils protective of controlled waters against leachates criteria only. June 2010. (Decision Notice Ref: 10/90258/AODODA)**

It was proposed that applying controlled waters leachate SSAC for non volatile contaminants would sufficiently demonstrate that soils did not pose a risk to controlled waters receptors on the basis that leachate analysis represents the mobile component of the soil that has the potential to reach the receptors.

**Skanska. 7030-SBH-ZZZ-LET-2218. Omission of dioxin testing from validation testing of backfill material. June 2010. (Decision Notice Ref: 10/90258/AODODA)**

It was proposed to omit dioxin from the validation testing suite due for the following reasons:

- In areas of hard standing there would be no applicable pathway.
- Dioxin is not soluble in water and is therefore are not a relevant controlled waters contaminant.

Only virgin aggregate material imported from outside the Olympic Park (with no indication of a dioxin source) would be used as HHSL.

**Buro Happold. 021563. London 2012 Media Centre Design Note, Media Centre Site Verification Criteria. July 2009. (Approved by PDT email dated 27/08/2009) and subsequent statement from Savills / Buro Happold, entitled Catering Village Slot-in Planning Application – Application to Discharge Condition 25, 26 and 28 (Remediation Addendum). January 2012. (Decision Notice Ref: 12/90003/AODODA)**

RMS and subsequent statement pursuant to the RMS, SSRS and IIMS Planning Conditions for the Media Centre and Catering Village. The document was designed to address issues arising from the construction of the three Media Centre buildings as they were written by the Enabling Works contractor primarily for the Enabling Works project. In addition, the operational process (e.g. permit to proceed / Soil Hospital processes) was noted as having evolved significantly since the publication of the RMS documents and some remedial elements were excluded from the RMS. The Design Note confirmed the approach with regards to chemical testing of above and below Marker Layer soils and set out the different scenarios of Marker Layer placement, the key aspect of which was omission from beneath permanent hard standing and the building footprints. In addition, the Design Note set out the approach to hotspot remediation, building protection from ground gases and validation of the remedial works.

**McNicholas Construction Services Limited. 8526-UNN-ECW-U-MST-0070 C03 (8514-UNN-UCW-U-MST-0001). Design Note for McNicholas Works in the Olympic Park, Planning Delivery Zones 1, 2, 3, 4, 5, 6, 7 and 8. March 2011. (Decision Notice Ref: 10/90523/AODODA)**

McNicholas did not consider it necessary to undertake further sub-grade validation beyond Enabling Works sub-grade, as the risks to controlled waters and human health associated with pre deposit materials at the Park had already been identified during design stages and, with the exception of any identified residual risks / outstanding actions identified by the Enabling Works Contractor, these SSRS hotspots and exposed subgrade surfaces were excavated, remediated and validated as part of the Enabling Works. As-dug fill material previously verified by Enabling Works and virgin fill material did not require *in-situ* validation testing. Where materials excavated from below the Enabling Works sub-grade level were mixed with previously validated as-dug materials and used as backfill, appropriate Enabling Works sub-grade validation data and / or pre-existing site investigation data was reviewed against the relevant fill criteria to prove compliance. McNicholas did not intend to complete their works to FFL unless specifically instructed and where utility installations did not breach the Marker Layer only a nominal quantity of HHSL would be placed over the installation prior to handover. In areas of permanent hard landscaping it was agreed that the hard cover would provide an effective substitute for the HHSL. However it was not expected that McNicholas would be responsible for placing the permanent hard cover and associated raised Marker Layer.

## **B.4. PDZ4 Validation Reports**

**Nuttall. REP-ENL-CK-04Z-OLP-SP1-E-0527 – Corrigendum to the L03 & E031 Bridge Abutments (CZ4 and 5a) Human Health Validation Report, November 2009 (ODA Ref.: 09/90326/AODODA)**

This report was prepared to clarify the remedial works carried out along the site boundary with Carpenters Road in relation to the areas of concern in this area. This report confirms that a relatively low permeability 'wall' was installed at the practicable extent of the excavation adjacent to the Carpenter's Road to mitigate potential contaminant migration and for similar materials to remain beyond the Enabling Works subgrade level.



**Nuttall. REP-ENL-CK-04Z-OLP-SP1-E-0278 - CZ4 Human Health Validation Report (excluding Late Access Areas), May 2010 (ODA Ref.: 09/90414/AODODA)**

This report validates the site in relation to Human Health only. Following site clearance and demolition across the site, the main excavation works comprised excavation and validation of one human health hotspot and four Controlled Waters hotspots all subsequently withdrawn by the Designer. In addition, the excavation to facilitate the deposition of naturally occurring radioactive material from elsewhere in the Olympic Park (classified as Exempt under the Radioactive Substances (Phosphatic Substances, Rare Earths etc) Exemption Order 1962 made pursuant to the Radioactive Substances Act 1993), the dedicated purpose-built disposal cell beneath the proposed L03 Bridge embankment.

**Nuttall. REP-ENL-CE-04Z-OLP-SP1-E-0205 – CZ4 Unsaturated Zone Validation Report, March 2011 (ODA Ref.: 09/90587/AODODA)**

This report validates the unsaturated zone across CZ4 in relation to human health (discrete areas not previously validated) and controlled waters and delivery of the EWFL. Prior to the hotspots being withdrawn, seven controlled waters and one human health hotspot were excavated and validated. In addition to the earthworks and remediation as specified in the SSRS, approximately 7,600 tonnes of material was placed within a cell for the disposal of naturally occurring radioactive material [NORM] encountered elsewhere on the Olympic Park and classified as exempt in accordance with the *Radioactive Substances (Phosphatic Substances, Rare Earths etc) Exemption Order 1962* made pursuant to the *Radioactive Substances Act 1993*. It is noted that the *Radioactive Substances Act 1993* has since been subsumed by the *Environmental Permitting Regulations 2010*. The disposal was undertaken by Morrison and the radiological aspects of the works were supervised by Nuvia.

**Nuttall. 7040-SBH-SCW-W-REP-0022 02. Validation Report for CZ4 Surface Water Drainage and Loop Road. January 2011. (Decision Notice Ref: 10/90561/AODODA)**

Enabling Works did not place Marker Layer or HHSL across the site. Works commenced with excavations for surface water drainage, where limestone shingle was used as pipe bedding and the trenches were backfilled with as dug material. Ducts for road lighting and communications were also installed beneath the road. Following drainage installation, construction of the loop road involved five different configurations with varying thicknesses of tarmac, sub-base and capping layer. The Marker Layer was placed between the capping and sub-base, or between the existing tarmac and new tarmac where an existing road surface was incorporated into the loop road. Marker Layer was omitted in one section of the loop road in the south of PDZ4, which will be highlighted in subsequent handover documentation. The hard cover installed as part of the loop road construction provides an effective substitute for the HHSL in terms of addressing the risks to site occupier from dermal contact and indigestion. The capping layer and sub-base were constructed using Class 6F2 from the soil hospital and crushed limestone, respectively. The Loop Road was completed to FFL; however the road verges were terminated below FFL and were completed by LPR (Ref. 7170-LPR-SPK-W-REP-0053).

**Lagan Construction Limited. 7075-SBH-F06-W-XXX-0002 D05. Project Specific Validation Report for: PDZ 4 & CZ4 (Part Only). Location: F06 Central Park Bridge West Bank. May 2011. (Decision Notice Ref: 11/90111/AODODA)**

No Marker Layer or HHSL was placed at the site by Enabling Works. A piling mat consisting of crushed concrete was placed on the handover surface, following which CFA piles, VCCs and sheet piles were installed, and the bridge abutment foundations were constructed. The piling mat was then re-excavated, general fill was placed, and reinforced earthworks, gabion baskets and a load transfer platform were constructed. For the temporary configuration the 'bowl-shaped' earthworks on either bank have been backfilled with temporary fill and covered with a temporary rubber surface. Backfill materials used within these works comprised Class 6I (virgin limestone aggregate), Class 6G (crushed concrete) and general fill (Soil Hospital). In all areas except the temporary bowl surface the site was finished to 450 to 600 mm below FFL and in variation to the Lagan RMS, the Marker Layer and HHSL were omitted by Lagan, to be installed during LPR works (Ref. 7170-LPR-SPK-W-REP-0010). Marker Layer and HHSL will be placed in the 'bowl area' following removal of temporary fill during Legacy Transformation works.

**Nuttall. 7040-SBH-H17-W-REP-0007 P01. Validation Report for H17 North Bridge Abutment in LA10070. August 2010. (Decision Notice Ref. 10/90366/AODODA)**

Enabling Works did not place Marker Layer or HHSL in the area of the abutment. A piling platform was constructed, CFA piles were installed and then the piling platform and some of the underlying Made Ground

were excavated and removed. The bridge abutment and retaining walls clad with gabion baskets were then constructed. Fill materials used to construct these features comprised: Type 1 (crushed limestone), Class 6I (crushed limestone), Class 6P2 (borrow pit sand), and Class 6G (crushed concrete). No Marker Layer or HHSL was placed as part of these works and none of the site was completed to FFL and Marker Layer were placed and completed during construction of the Southern Loop Road by Nuttall SBH (refer to report 7040-SBH-SCW-W-REP-0022).

**Balfour Beatty Civil Engineering. 7050-SBH-SPK-CM-REP-9001 Rev00. Validation Report for Zone: PDZ4. Sub Area: Permanent Bridges F07, F17, L03A South & L03B North. Temporary Bridges F07, F17, L03 South. Reinforced Earth Structures Walls L03-W2 & W3, L03-E2 & E4 CZ4-R1, R3 & R4, F17-S1 & S2 and S5A. October 2010. (Decision Notice Ref: 10/90473/AODODA)**

Piling mat material was placed, following which CFA piles were installed, general fill was placed and reinforced earthworks clad with gabion baskets were constructed. In addition, VCCs and a load transfer platform were installed at Bridge L03. Backfill material comprised: Class 4S1 (as-dug sand), Class 6N (recycled), Class 6F2 (recycled), Class 6C (recycled), Type 1 (crushed limestone), SP2 (marine sand), 505A (crushed limestone), topsoil and Class 6N (crushed limestone). No surfaces were completed by Balfour Beatty to FFL and no Marker Layer or HHSL was placed on the bridge approaches, completion of these works were carried out at a later date by LPR. The areas surrounding the bridges were completed with Marker Layer and 300 to 550 mm HHSL.

**Sisk. 7016-SBH-H14-W-REP-0001 Bridge H14 Validation Report for Lea Navigation Bridges H14 Rev C05 September 2012. (Decision Notice Ref: 12/90200/AODODA)**

Sisk constructed Bridge H14 over the River Lea Navigation, which is a steel box-girder bridge of half-through construction. The twin steel box-girders taper in height from one end to the other and from opposite directions. The bridge is fully integrated with reinforced concrete abutments, with a deck width 4.0 m. The bridge structure and abutments are supported by means of piling to depths of between -16.510 m AOD and -17.084 m AOD and reinforced concrete foundations. The steel bridge deck is supported at either side of the Lea Navigation by means of reinforced concrete abutments and accessed from the west via an access stairway. The excavation to the sub grade level necessitated the excavation and removal via the soil hospital protocol of approximately 1m depth of Made Ground. A Marker Layer was placed by Sisk over the whole site. Only imported fill material was used by Sisk across the site. No exceedances of the SSACs were identified during assessment of these imported materials.

**Nuttall 7040-SBH-SCW-W-REP-0034, Rev 01. Validation Report for Outfall S04-01. February 2012. (Decision Notice Ref. 12/90099/AODODA).**

Nuttall SBH constructed surface water drainage in the in the north-eastern area of CZ4. The drainage connects to Outfall S04-01 which drains into the River Lea. The outfall was constructed within a sheet-piled cofferdam. Soils within the cofferdam were excavated to the top of the River Terrace Deposits. The Nuttall SBH report demonstrated these works did not represent a new contamination pathway into groundwater because the cofferdam remains in-situ around the outfall and mass concrete has been placed within the structure to provide an impermeable replacement to the removed Alluvium. An existing 900 mm drainage pipe, located to the south of the site, was connected through the southern face of the cofferdam at an invert level of 2.37 m AOD. The connection was sealed with mass concrete and shear stud connectors. An opening in the river wall was created connecting the outfall culvert with the Water Works River at an invert level of 1.17 m AOD. Class 6N/6P virgin material (imported from Yeoman Aggregates) was backfilled around the outfall culvert to an elevation of 6.7 m AOD. The crane mat material placed at the site, surrounding the outfall chamber and culvert cofferdams, was removed and a new Marker Layer was placed across the site, surrounding the outfall chamber, at an elevation of 6.7 m AOD. The stockpiled crane mat material was placed above the Marker Layer. In the area above the outfall culvert cofferdam only, Class 6N/6P virgin material (imported from Yeoman Aggregates) was placed above the Marker Layer to an elevation between 7.2 m AOD and 7.5 m AOD. LPR (Ref. 7170-LPR-SPK-REP-0008) placed the remaining 300 mm thickness of HHSL across this area to FFL.

**Nuttall. 7040-SBH-FEN-W-REP-0010 P03. Validation Report for Olympic Park Perimeter Fence Line, Planning Delivery Zones 1, 2, 3, 4 and 8. August 2011. (Decision Notice Ref: 10/90514/AODODA)**

No Marker Layer or HHSL was placed by Enabling Works along the path of the OPF due to third party stand-off areas and exclusion zones. Localised auguring was required and the fence posts were installed into the resulting excavations and backfilled with concrete at 25.7 m intervals. Placement of fill material was limited to a 300 mm thick layer of imported granite gravel between and around the fence posts along the length of the OPF. No Marker Layer or HHSL was placed along the OPF and validation was not deemed practicable at the

time of works due to the limited extent of excavations and the established easements and boundary agreements. Following the post-Games removal of the OPF these areas will require validation and potentially remediation by subsequent FoPs, including placement of Marker Layer and HHSL.

**BAM Nuttall SBH. 040-SBH-HWY-W-ADD-0003 PDZ4 Infrastructure Addendum Validation Report. (Decision Notice Ref: 12/90141/AODODA)**

The Infrastructure Addendum report covered BAM Nuttall SBH's works:

- Earthworks in White Area 25 (an area of soft landscaping between Carpenters Road and Kings Yard Road) to bring to FFL;
- Earthworks in the verges of Kings Yard Road and sections of Carpenters Road to FFL;
- Construction of Zone 4 Staging which serves as a drop-off carriageway and is connected to the Loop Road between Chainage LR 0+150 and 0+400; and
- Construction of Kings Yard bell-mouth leading into the Energy Centre.

The sampled sub-grade and the fill placed at the site as part of these works are not considered to present an unacceptable risk to the human health of site end-users or controlled waters based on the design SSRS, subsequent amendments and the current understanding of the Legacy Masterplan. Nuttall SBH installed a Marker Layer within its work areas and where it had not been previously placed by Enabling Works, A total of 980 m<sup>3</sup> General Fill material sourced from the Soil Hospital was placed by BAM Nuttall below the Marker Layer. The required sampling rate of 1 per 1000 m<sup>3</sup> was achieved and not exceedances of the SSAC were identified. A total of 985 m<sup>3</sup> Type 1 fill was placed above the Marker Layer, sourced from Yeoman Aggregates. The Type 1 material placed was virgin crushed limestone and was imported in accordance with Nuttall's PDT approved Quality of Imported Fill submission (Decision Notice 10/90343/AODODA) and Update of Material Quantities (Decision Notice 10/90579/AODODA). In line with this approved document and the Framework Agreement for the Quality of Imported Fill (Ref: 0241-ENW-ATKLET- 00328) testing of this placed virgin material was not required. A total of 375 m<sup>3</sup> Class 1 material from the Soil Hospital and 352 m<sup>3</sup> Class 5B/2 Topsoil from Freeland Horticulture was also placed above the Marker Layer. A sample rate of 1 per 145 m<sup>3</sup> was achieved and no exceedances of the SSAC were identified.

**Skanska Infrastructure Services. 7170-LPR-SPK-REP-0008 P02 (Final). ODA Landscape and Public Realm South Park Works. Validation Report for Construction of Soft Landscape in CZ4, Planning Delivery Zone 4. March 2012. (Decision Notice Ref: 11/90668/AODODA).**

Following a design change to include a frog pond it was necessary to excavate some general fill within Area SL4-4. The handover level of Area SL4-3 was slightly lower than the required Marker Layer level and as such a small amount of sand (Thanet Sand/Westfield PLUG) sourced from Soil Hospital was placed. Construction of soft landscape areas comprised the following materials from top to base: 300 mm multipurpose topsoil, 200 mm general purpose subsoil, and 300 mm subsoil underlain by Marker Layer. Construction of footpaths and other 'hard landscape areas' comprised the following materials from top to base: 80 mm blacktop and 150 to 200 mm Type 1 underlain by Marker Layer. All these materials were obtained from outside the Olympic Park. The Marker Layer was placed at a depth of 800 mm below FFL in soft landscape areas and 230 to 280 mm below FFL in footpath areas. All areas were completed to FFL.

**Skanska Infrastructure Services. 7170-LPR-SPK-W-REP-0053. Validation Report for Construction of Landscape in White Space Areas and South Loop Road Verges, Planning Delivery Zones 1, 3 and 4. (Decision Notice Ref: 12/90270/AODODA).**

The White Space Areas Validation Report covered completion of works in areas WSA52 and 24, in the western side of PDZ4.

Soft landscape area WSA 52 comprised placement of 150 mm topsoil along the southern and eastern boundary of the area, underlain by an orange geotextile Marker Layer. The remainder of the site comprised placement of 250 mm Type 1 limestone, underlain by an orange geotextile Marker Layer. A French drain was constructed crossing the site from west to west approximately which consists of a trench approximately 450 mm deep and 450 mm wide filled with 20 mm limestone gravel. WSA 52 is located in north western section of CZ4 and handover levels at the site ranged between 6.5 – 7.4 m AOD.

WSA24 is located in the western part of CZ4, along the SLR. The northern section of the area was de-scoped from Skanska IS and transferred to SBH Lot 2, as per the Combined Instruction and Compensation Event 00520. WSA 24 typically comprised placement of 150 mm topsoil underlain by existing ground, with the

exception of the southern section which comprised placement of 150 mm limestone 20 mm gravel. Handover levels at the site ranged between 7.4 – 9.6 m AOD.

A Marker Layer was placed at a depth of 150 mm (in topsoil area) or 250 mm (in the hard landscape area) in WSA 52. No Marker Layer was placed in WSA 24 as per design and as specified in CLM response to RFI 423.

**Skanska Infrastructure Services. 7170-LPR-SPK-W-REP-0010 P02 (Final). ODA Landscape and Public Realm South Park Works. Validation Report for Construction of Hard Landscape and Services in CZ4, Planning Delivery Zone 4. July 2012. (Decision Notice Ref: 11/90815/AODODA).**

Five different pavement designs (three permanent and two temporary) were constructed within PDZ4, incorporating Marker Layer and 370 to 790 mm of HHSL. Excavations were carried out for drainage, irrigation, LV power, closed circuit television, public announcement systems and tree pits. Fill materials used in the works comprised: Westfield PLUG (Soil Hospital), Type 1 (limestone), Class 5b (tree soil), RH37 sand, sharp sand and reject sand. All areas were completed to FFL with the exception of pavement design area POA which will be completed by LOCOG.

Concentrations of benzo(a)pyrene and lead above the Human Health SSAC were recorded in four locations (see Figure 10). These exceedances have been passed on to Legacy transformation as residual items to be reassessed and/or removed.

**CLM Logistics and Security. 0009-TPI-EWK-CM-REP-0006 Rev01. Remediation Completion and Validation Process: Project Specific Validation Report for SOC1, PDZ4. December 2011. (Decision Notice Ref: 11/90057/AODODA)**

Approximately 200 mm of Enabling Works HHSL was removed from the site, and 350 mm Type 1 (virgin limestone) was placed on top of the remaining HHSL. Temporary ducts were installed within the Type 1 fill, and asphalt surfacing and pavement were placed. Reinforced concrete slabs were constructed in order to provide a foundation for the buildings. Surface water drainage and ducts for power and communications were then installed. No excavation took place beneath the Marker Layer originally placed by Enabling Works. The SSRS stated that the risk from ground gas was very low, and any potential risk from ground gas was further mitigated by the 350 mm layer of Type 1 and 400 mm thick concrete slab beneath the SOC 1 building, which created an open void, encouraging passive venting. As such, there is no specific land gas linkage or direct pathway to the structure or occupants and the building construction ensured that gas protection measures over and above the standard design were not required. A residual action remains to re-assess the ground gas risk for use of the building in Olympic and Legacy modes, following handover from CLM Logistics and Security.

**CLM Logistics and Security. 0009-TPI-EWK-CM-REP-0003 Rev02. Remediation Completion and Verification – Handover Report for Temporary Utilities within PDZ4. May 2011. (Decision Notice Ref: 10/90571/AODODA)**

Enabling Works did not place Marker Layer or HHSL across the majority of the site. Works comprised trench excavation, installation and backfill for the following utilities (constructed in four separate runs): low voltage power, foul sewers and potable water. Repairs to utilities were completed where necessary. Marker Layer and HHSL were replaced where encountered. Although these utilities were initially installed for temporary use, in order to avoid unnecessary removal and to allow potential future use, the majority of the utilities will be left in place as permanent features. The utilities were installed in imported virgin bedding sand then backfilled with as-dug material. The following justification was provided for not collecting *in-situ* chemical data from the as-dug material:

- HHSL – sufficient Enabling Works validation data available and material management practices ensured no cross-contamination occurred.
- General fill – maximum depth of excavations within 0.5 m of the Enabling Works sub-formation level and sufficient Enabling Works validation data available.
- Unremediated areas – no visual or olfactory evidence of contamination observed during excavation, small material volumes involved and sufficient site investigation data available (no PID measurements were taken during the works, in a departure from the approach outlined within the CLM L&S RMS document).



In addition, a permanent transformer base was constructed. During excavation for the transformer base, cement bound corrugated asbestos sheeting was identified and as a precautionary measure the affected spoil was removed by a licensed contractor and disposed of to an appropriately licensed landfill. The excavation was then backfilled using concrete to construct the 1 m thick transformer base. Due to a miscommunication Marker Layer was not placed beneath the transformer base and this issue was highlighted as a residual item. The works formation levels remained the same as at handover from EW and none of the site was completed to FFL by Volker, these works were completed at a later date by both LPR (Ref. 7170-LPR-SPK-W-REP-0010) and LOCOG.

**CLM Logistics and Security. 0009-TPI-EWK-CM-REP-0011 Rev01. Remediation Completion and Verification Report – Project Specific Verification Report for Temporary Road 02 (TR02), PDZ4. July 2011. (Decision Notice Ref: 11/90050/AODODA)**

Prior to handover to CLM L&S, Balfour Beatty placed Marker Layer across the majority of the site and Enabling Works placed Marker Layer and partial HHSL in the south of the site. CLM works comprised placement of fill (imported virgin limestone Type 1) to raise levels, installation of tarmac road surface, and construction of a temporary surface water drainage system including manholes, gullies and pipework. The overall thickness of HHSL varied as it comprised 240 mm asphalt surface and either 550 mm sub-base (placed by Balfour Beatty), or 350 mm virgin Type 1 (placed by CLM L&S) overlying 300 mm of Enabling Works HHSL. None of the site was completed to FFL by CLM, these works were completed at a later date by LPR (Ref. 7170-LPR-SPK-W-REP-0010).

**CLM Logistics and Security. 0009-TPI-EWK-CM-REP-0001 Rev00. Remediation Completion and Verification Report – Project Specific Verification Report for Temporary Road 15 (TR15), PDZ4. April 2011. (Decision Notice Ref: 10/90639/AODODA)**

Volker Highways removed concrete slabs from the site then excavated around the Thames Water pipes and constructed a reinforced concrete protection slab over the pipes. Site contouring and construction of TR15 (including bus stop and roundabout) was then completed. Marker Layer was placed below the entire length of the road, followed by 350 mm Type 1 capping (virgin limestone) and 240 mm asphalt. None of the site was completed to FFL by Volker, these works were completed at a later date by LPR.

**Barhale Construction Plc. 8525-UNN-PSP-U-LAC-0005 C04. Validation Report for PDZ4: C24. Containing Shafts P5, P6, P7, P8, S6 & S7. October 2010. (Decision Notice Ref: 10/90137/AODODA)**

Primary Foul Drainage Shafts P5 to P8 and Secondary Foul Drainage Shafts S6 and S7 were sunk via caisson method, and the works included construction of tunnels linking the shafts and the drilling of seven boreholes in order to gather groundwater elevation data to assist construction. General Fill from the Soil Hospital was placed around the shafts to a maximum thickness of 1000 mm. Marker Layer was placed over the general fill and 500 to 600 mm HHSL (virgin aggregate) was placed leaving the final surface 200 to 300 mm below FFL. Completion of works to FFL was carried out by LPR (Ref. 7170-LPR-SPK-W-REP-0010).

**Volker Highways. 0009-TPI-EWK-CM-REP-0015. Validation Report for the LOCOG Readily Connectables and LV Blakey Panels. May 2012 (Decision Notice Ref: 12/90243/AODODA)**

Works undertaken by Volker to install the underground utilities associated within PDZ4 were reported in the Site Wide Validation Report for the LOCOG Readily Connectables and LV Blakey Panels. Potable water excavations were carried out at various locations Park-wide. The excavations comprised a standard stepped trench battered down to a typical depth of 1.2 m bgl. In instances where Marker Layer was breached, this was reinstated to a typical overlapping detail at all locations. Works were not completed to FFL by Volker but were subsequently completed by LPR (Ref. 7170-LPR-SPK-W-REP-0010).and the LOCOG Common Domain contractor (ISG) – refer to the Stage 3 CVR for details.

**Atkins. 0241-UEG-ECN-U-REP-0001 Rev P03 Validation Report for Construction of Cofely Site Wide District Heating and Cooling Network. May, 2012. (Decision Notice Ref: 12/90104/AODODA)**

The District Heating and Cooling Network (DHC) runs along the east of PDZ4 in an approximately north-south alignment, from Bridge H17 in the south to Kings Yard Energy Centre in the north, with a branch crossing Bridge F06 in the east. Cofely are the Principal Contractor for the DHC; but McNicholas were instructed to construct the civil earthworks components (excavation and backfilling only) of the DHC on behalf of Cofely in March 2010. In addition McNicholas also completed the Bridge F06 section, a section adjacent to the Energy Centre and various small excavations to carry out repairs to the DHC. The earthworks associated with the

DHC were completed below FFL and were completed subsequently by LPR (Ref. 7170-LPR-SPK-W-REP-0010).

**PJ Carey (Construction). PJC-PJF-KYEC-VR-001 Rev01. Validation Report for the Kings Yard Energy Centre, Construction Zone 4, Planning Delivery Zone 4. November 2011. (Decision Notice Ref: 11/90762/AODODA)**

A piling mat was constructed from Class 6F2 crushed concrete fill from the Soil Hospital, followed by piling and pile cap construction. Excavations for the pile caps extended below the Marker Layer, but remained above Enabling Works sub grade. Some of the piling mat material was removed, and further Class 6F2 and 6F5 crushed concrete was placed as a crane mat for the steel building structure to be lifted into place. Drainage systems were then installed within above Marker Layer fill within the building footprint and the concrete floor slab was poured over the top of this. External utilities and drainage including two interceptor tanks were installed involving some excavations below the Marker Layer, and lastly reinforced concrete retaining walls were constructed on the south and west elevations and around the gas reduction kiosk. Fill materials used in construction included Type 1 (limestone) and recycled sand.

A ground gas membrane and passive venting system with perimeter vent trench was installed at the Kings Yard Energy Centre in line with design requirements. The on-site gas kiosk, which is a small unmanned structure, includes ventilation but was not deemed to require a membrane or other gas protection.

**McNicholas Construction Services Limited. 8526-UNN-ECW-CM-REP-0004 C05. Validation of McNicholas Utility Works in PDZ4. August 2011. (Decision Notice Ref: 11/90178/AODODA)**

McNicholas works comprised trench excavation, installation and backfill for the following utilities: potable water, non-potable water, low pressure gas, intermediate pressure gas, electrical and telecommunications networks, surface water and duct crossings, electrical junction boxes, communication boxes, transformer bases and the civil earthworks components of the district heating and cooling pipe network. Backfill materials comprised imported virgin aggregate, imported recycled aggregate, Soil Hospital material and as-dug material. The works included two variations to the McNicholas RMS: use of ex-situ data to validate Soil Hospital material, and use of pre-existing Enabling Works validation and site investigation data to validate as dug materials from 'unremediated areas'. McNicholas replaced Enabling Works Marker Layer where encountered or placed new Marker Layer where none had been previously installed. None of the site was completed to FFL by McNicholas, these works were carried out at a later date by LPR (Ref. 7170-LPR-SPK-W-REP-0010) and LOCOG.

**Atkins. 0241-UEG-ECN-U-REP-0002. Primary Substation Site CZ4, Validation Report. July, 2012. (Decision Notice 12/90196/AODODA)**

Kier constructed the Primary Substation, which will distribute electricity at 11 kV to the Olympic Park, Stratford City and Legacy Developments both during and after the Games. Earthworks included piling, installation of drainage and utilities, excavation and installation of two under track crossing reception pits, construction of the reinforced concrete substructure and basement and the building, backfill of the basement perimeter and surface paving installation to FFL. During construction, Marker Layer was omitted below hardstanding surrounding the Primary Substation building. The Marker Layer omission in this portion of the site was an oversight with placement not established until post construction works. The Primary Substation and surrounding area, is permanent through Legacy. In the areas within the Primary Substation Site where the Marker Layer was not placed, separation layer was not placed either. As per a subsequent agreement with PDT, the hard standing in these areas will act as an adequate substitute, as defined in the Site Wide RMS Addendum (Use of Hard Cover as a Substitute to the Separation Layer). The omission of Marker Layer and separation layer is highlighted as a restriction to future works, should the land use change in the future.

**Murphys. LVU-8524-SUD-000308 Multi Zonal LV Validation Report. (Decision Notice Ref: 12/90267/AODODA)**

J Murphy and Sons Ltd (Murphys) on behalf of Lea Valley Utilities (LVU) completed the electrical network which included site-wide excavations at joint, substation & link boxes to install cabling. These excavations were limited in extent and depth to an average of 2 m in length x 1 m width x 0.5 m deep to facilitate installation through existing validated materials. No LVU excavations extended beneath the Enabling sub-grade. In locations where the Marker Layer was penetrated both the excavated material above and below the Marker Layer was removed from site and disposed to a suitably licensed landfill.

The LVU works consisted of the installation 11,000v High Voltage network & a 415v Low Voltage network throughout the Olympic Park. This was installed in a provided duct system, installed by others. The High Voltage network was also constructed with purpose made Salmore pits, again constructed by others, at any location where cables left the main “spine” or where joints were located. This was different to the LV network, where joints and routes away from the spine were direct buried before re-entering the duct system. The LV network installation consisted of limited excavations, completed by Murphys, over the pre-installed third party duct banks to enable the installation of LV cables and connection to street furniture through its entirety at pre-determined locations

## B.5. PDZ4 Transformation Phase Validation Reports

**Lagan Construction Limited, October 2013. Validation Report F06 Central Park Bridge, East and West Bank. ODA Ref. LC406-HSP-F06-CB-REP-0002, C01. (Decision Notice Ref. 13/00426/AOD).**

Lagan completed the works for Bridge F06 which comprised removing the Games Mode temporary bridge deck, leaving only the permanent Z-shaped bridge deck in place, and reconstructing the earthwork bowl features either side of Carpenters Lock. The western abutment of F06 falls within PDZ4, and the eastern side falls within PDZ2. Within PDZ4 the works included; removal of temporary bridge decking and associated infrastructure; excavation and profiling of west bowl and dismantling of Bowl Infill Retaining Wall (BIRW); and construction of gabion whisksers to abutments 1 and 3. All excess excavated materials were sent to an onsite facility for reuse by other projects on the QEOP. Excavation works did not extend beyond the Enabling Works sub-grade levels and as a result all excavation and construction works used previously validated materials. As a result no additional chemical sampling / testing was undertaken by Lagan, other than the waste classification and disposal of excavated materials. Lagan’s works were completed to 700 mm below FFL, Marker Layer or HHSL have not been placed within their F06 site, this will be completed by Skanska as a part of their Landscaping works (LC404-HSP-SPK-W-REP-0005).

**Capita (on behalf of BAM Nuttall), January 2014. Queen Elizabeth Olympic Park Legacy Transformation Validation Report for PDZ4 (SC1, SC2, SC11, SC13, SC14, SC15). ODA Ref. LC402-LCI-SPK-CM-REP-0054, Rev P0. (Decision Notice Ref. 13/00599/AOD). Report not yet submitted to PPDT.**

Within PDZ4 BAM Nuttall’s scope included the creation of soft landscaping areas, preparation of areas for future residential development and deconstruction of temporary Bridge L03B.

Following the removal of hard standing finishes in areas of soft landscaping a Marker Layer and HHSL was placed where required across the site. The HHSL comprised the import of material from above the Marker Layer from PDZ3 and PDZ8. In addition to a suitability for use assessment, in-situ reassurance samples were taken to provide further verification to the initial assessment.

Subsoil and topsoil was placed within tree pits and in localised areas of planting in soft landscaping areas to complete the area to final finished level. General fill material excavated from the bridge abutments during the deconstruction of the temporary Bridge L03B was replaced within Area SC14 following localised reprofiling of the slope batter. A total of 2No. reassurance samples were taken in-situ of this replaced material. In-situ validation samples were also collected from topsoil material placed in PDZ4 (SC2, SC11, SC13 & SC14). None of the results exceeded the HHSL assessment Criteria for PDZ4 confirming that the imported topsoil does not pose a risk to human health or controlled water receptors

The LOCOG Bump-Out Works in PDZ4 involved the removal and capping of temporary shallow utilities and comprised 12No. discrete excavations involving the removal of the ‘readily connectable’ services and reinstatement with Type 1. The existing HHSL was reused in these discrete areas as backfill and in instances where there was a requirement for additional material to bring the levels up to existing ground level, virgin-sourced material was imported. Given the discrete nature of the works and use of excavated material as backfill, no chemical testing was deemed necessary.

Supplementary validation samples were collected to support the PtP applications and verify that earthworks undertaken provide protection and enhancement of the remediation works previously carried out as part of the QEOP Enabling Works. The results were compared to the applicable PDZ4 SSACs and confirmed that any

material placed as part of the Transformation works in PDZ4 by BAM Nuttall do not pose a risk to human health and controlled water receptors.

In addition to the above Skanska are to prepare a South Park Landscaping Validation Report for submission to PPDT.



# Appendix C. Gas Protection Measures

## C.1. PDZ4

A ground gas protection membrane was specified by the designer as a requirement under the footprint of the Energy Centre building. A PAGEotechnical gas protection system membrane was installed below the ground floor slab of the Kings Yard Energy Centre building. In accordance with the design such a system was not deemed necessary under the slab installed for the incoming gas reduction kiosk, given that the structure is unoccupied, people only needing access to perform routine maintenance or take readings. Gas protection pathways are maintained at the edge of the King's Yard Building, the membrane vents into a pea shingle gully which in turn vents any land gas to atmosphere. The gas vapour protection system installed under the ground floor slab at the King's Yard Energy Centre does not rely on positive or negative pressure and is totally passive with no moving parts.

It should be noted that similar protection measures may be need for other buildings constructed across the Sweetwater development, but an assessment of the current ground gas and vapour conditions will need to be undertaken across the proposed development area.

# **Appendix D. Works for Incoming Projects and Restrictions on Future Works**

## Works for Incoming Projects and Restrictions on Future Works

No.	Title	Required Action	Action By
<b>PDZ4</b>			
3.1	No excavation of Exempt Radioactive Waste material beneath the L03B South bridge approach embankment	No excavation or disturbance of the 'Exempt' Radioactive cell comprising Exempt Waste material and 300 mm non-active capping layer is to occur under any circumstances without preparation of a suitable risk assessment and consultation with relevant regulatory authorities and stakeholders.	Future land owners and developers/LLDC
3.2	Abstraction of RTD groundwater within 50 m of the Exempt Radioactive Waste Disposal Cell	The technical note entitled CZ4 Radioactive Defined Area for Deposit Controlled Water Assessment recommends adopting a "precautionary approach" such that groundwater abstraction from the RTD should not be allowed within 50 m of the 'Exempt' waste disposal cell (1 & 2).	Future land owners and developers/LLDC
3.3	Review of radon control measures overlying Exempt Radioactive Waste Disposal Cell	Modelling by Nuvia has indicated that should the area overlying the 'Exempt' Waste disposal cell ever be used for residential or commercial development, radon control measures are recommended to ensure that total radon doses to human health are always below the public dose limit of 1 mSv/a. The need for such protection measures must be reviewed should the Legacy land use above the disposal cell change from the current land use of hard and soft landscaping. The legacy land use for the site cannot be altered without a reassessment of the soil conditions regarding any contamination with the potential to present a risk to identified human health and controlled waters receptors.	Future land owners and developers/LLDC
3.4	Minimise impact on low permeability wall	During ODA remediation works undertaken to the northern side of Carpenters Road a low permeability wall was placed along this portion of the road (see PDZ 4 Stage 1 CVR). It is recommended that any future designs in this area minimise interaction with the wall wherever possible in order to maintain its integrity and reduce potential contamination migration.	Future land owners and developers/LLDC
3.5	FoP SSAC exceedances removal	Removal of benzo(a)pyrene and lead exceedances within the separation layer as reported by the FoP. The identified exceedances are located in an area of hard standing during the Games and the hard cover is considered to provide an effective barrier against dermal contact and ingestion pathways so there is minimal risk during Games time. However future land owners would need to consider these exceedances as part of the development of the site. Further information regarding these exceedances is provided in the PDZ4 Stage 2 CVR <sup>(2)</sup> .	Future land owners and developers/LLDC
3.6	Water Main	The 40" Thames Water Utilities Limited main runs along the western boundary of PDZ4 and future land owners and developers shall take appropriate measures when working in close proximity.	Future land owners and developers/LLDC

No.	Title	Required Action	Action By
3.7	Primary sub-station	Placement of Marker Layer and full thickness HHSL were omitted during construction of part of the PDZ4 primary substation <sup>(2)</sup> . Should the building be removed in the future (noting there are no current plans to remove the structure) then these elements would need to be installed.	Future land owners and developers/LLDC
3.8	Placement of marker layer and HHSL	Maintain HHSL and installation of marker layer during future works and install where omitted by Enabling Works/FoPs including the western bowl of Bridge F06. Transformation works associated with removal of bridge structures must also include for the reinstatement of a suitable thickness of HHSL and placement of the marker layer.	Future land owners and developers/LLDC
3.9	Suitable infrastructure design	Future land owners and developers need to consider ground conditions when designing infrastructure. Infrastructure installed beneath the Marker Layer should assume ground conditions are impacted by chemical contamination and appropriate mitigation measures should be taken (e.g. use of barrier pipes for potable water, sulphate resistant concrete etc).	Future land owners and developers/LLDC
3.10	Suitable methods to protect contamination pathways	In agreement with PPDT the remedial designers have completed a Park-wide assessment of risks to controlled waters from removal of Alluvium <sup>(2)</sup> . Future land owners and developers need to consider protection of contamination pathways as part of their earthworks design.	Remedial designers/future land owners and developers/LLDC
3.11	Ground gas/vapour assessment	Future land owners and developers need to review requirements for ground gas assessment and potentially protection measures as part of the design process.	Future land owners and developers/LLDC
3.12	Decommissioning/Protection of monitoring installations and facilities	Future land owners and developers will be responsible for the protection of any retained monitoring installations and facilities.	Future land owners and developers/LLDC
3.13	Completion of unremediated areas & Restrictions to remediation	An addendum to the Retained Areas Risk Assessment Report (RARAR) is being produced by the remedial designers for details of any areas not remediated as part of the ODA works <sup>(2)</sup> . Figure 9 of the ODA Stage 2 CVR shows Retained Areas within PDZ4. Future developers need to consider what additional information is required in these areas.	Remedial designers/Future land owners and developers/LLDC
3.14	Excavation of soils at the Site	Future land owners and developers shall take appropriate health and safety measures to protect workers involved in excavation of soils. It is likely that a permitting system shall be implemented within the Olympic Park in post-Games mode.	Future land owners and developers/LLDC
3.15	Risk assessments	Future land owners and developers shall complete appropriate risk assessments with respect to UXO, pathogens, asbestos, radiation and ground gas/vapours when undertaking excavations and/or construction activities during their work. In addition, future land owners and developers shall be responsible for invasive species management.	Future land owners and developers/LLDC

No.	Title	Required Action	Action By
3.16	Future land use	Future land owners and developers shall ensure that areas designated for different land uses are not amended without reassessment of the soil conditions and that the Site is not used for growing edible crops or for private gardens.	Future land owners and developers/LLDC
3.17	Changes in final level	Any works by future land owners and developers involving a reduction of FFL will require a reassessment of the underlying soil and potentially additional investigation or remediation. The design levels used for the ODA remediation assume that a minimum 600 mm thickness HHSL will be provided.	Future land owners and developers/LLDC

# Appendix E. Generic Assessment Criteria and Generic Water Assessment Criteria Summary Tables

The Generic Assessment Criteria (GAC) and Generic Water Assessment Criteria (GWAC) provided herein are as extracted from the LCS Revised Global Remediation Strategy (Ref. 17) and should be read in conjunction with it.

## GACs for Human Health 0.0 – 1.0 m bgl

Contaminant of Concern	Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
Arsenic	3.50E+01	3.24E+01	1.31E+02	NR	6.35E+02
Boron	1.03E+04	2.91E+02	3.99E+04	NR	1.92E+05
Cadmium	1.77E+01	5.17E+00	8.73E+01	NR	2.30E+02
Chromium (VI)	4.12E+00	3.38E+00	9.45E+01	NR	3.42E+01
Copper	6.20E+03	2.33E+03	3.75E+04	NR	7.17E+04
Lead <sup>^</sup>	2.75E+02	2.50E+02	1.12E+03	NR	4.88E+03
Mercury (Inorganic)	2.38E+02	1.69E+02	9.61E+02	NR	3.64E+03
Nickel	1.27E+02	1.27E+02	2.93E+03	NR	1.79E+03
Selenium	5.95E+02	3.50E+02	2.22E+03	NR	1.30E+04
Vanadium	1.88E+02	7.44E+01	8.34E+02	NR	3.16E+03
Zinc	4.04E+04	3.75E+03	1.50E+05	NR	6.65E+05
Inorganic Cyanide	1.59E+01	1.37E+01	6.03E+01	NR	4.45E+02
TPH – Ali 5-6	1.69E+01	1.69E+01	6.13E+04 (3.68E+02)	6.25E+04 (3.68E+02)	2.56E+03 (3.68E+02)
TPH – Ali 6-8	3.71E+01	3.70E+01	8.98E+04 (1.57E+02)	9.25E+04 (1.57E+02)	5.61E+03 (1.57E+02)
TPH – Ali 8-10	9.00E+00	8.99E+00	8.66E+03 (7.92E+01)	1.10E+04 (7.92E+01)	1.36E+03 (7.92E+01)
TPH – Ali 10-12	4.38E+01	4.38E+01	1.30E+04 (4.77E+01)	2.43E+04 (4.77E+01)	6.50E+03 (4.77E+01)
TPH – Ali 12-16	3.59E+02 (2.37E+01)	3.59E+02 (2.37E+01)	1.56E+04 (2.37E+01)	7.01E+04 (2.37E+01)	4.47E+04 (2.37E+01)
TPH – Ali 16-35	2.90E+04	2.90E+04	2.86E+05	NR	1.45E+06
TPH – Aro 5-7	1.09E+02	4.6E+01	4.64E+04 (1.11E+03)	1.23E+05 (1.11E+03)	1.57E+04 (1.11E+03)
TPH – Aro 7-8	2.58E+02	9.2E+01	5.38E+04 (8.5E+02)	1.95E+05 (8.5E+02)	3.50E+04 (8.5E+02)
TPH – Aro 8-10	1.55E+01	1.43E+01	4.42E+03 (6.10E+02)	6.57E+03 (6.10E+02)	2.30E+03 (6.10E+02)
TPH – Aro 10-12	8.41E+01	5.48E+01	5.81E+03 (3.62E+02)	1.54E+04 (3.62E+02)	1.14E+04 (3.62E+02)
TPH – Aro 12-16	8.00E+02 (1.68E+02)	1.35E+02	6.46E+03	5.16E+04 (1.68E+02)	3.51E+04 (1.68E+02)
TPH – Aro 16-21	1.26E+03	2.46E+02	4.88E+03	NR	2.81E+04
TPH – Aro 21-35	1.33E+03	8.88E+02	5.00E+03	NR	2.84E+04
Benzene	1.10E-01	5.40E-02	5.44E+01	1.24E+02	1.58E+01

Contaminant of Concern	Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
Chloroethene	2.61E-04	2.43E-04	2.99E+00	8.25E+00	4.03E-02
1,2-dichloroethane (1,2-DCA)	2.43E-03	2.23E-03	1.20E+01	1.71E+01	3.56E-01
Ethylbenzene	6.98E+01	4.20E+01	1.84E+04 (5.08E+02)	4.08E+04 (5.08E+02)	9.63E+03 (5.08E+02)
Tetrachloroethane, 1,1,2,2	1.11E+00	5.99E-01	1.11E+03	2.67E+03 (2.46+03)	1.56E+02
Tetrachloroethane, 1,1,1,2	4.42E-01	4.07E-01	8.93E+02	1.68E+03	6.27E+01
Tetrachloroethene (PCE)	4.25E-01	4.08E-01	2.28E+03 (4.15E+02)	4.60E+03 (4.15E+02)	7.22E+01
Tetrachloromethane	7.75E-03	7.73E-03	1.02E+02	1.16E+02	1.74E+00
Toluene	2.58E+02	9.24E+01	5.38E+04 (8.35E+02)	1.95E+05 (8.35E+02)	3.50E+04 (8.35E+02)
Trichloroethane, 1,1,1	2.65E+00	2.63E+00	3.37E+04 (1.38E+03)	4.04E+04 (1.38+03)	3.92E+02
Trichloroethene (TCE)	4.58E-02	4.08E-01	3.89E+02	5.00E+02	6.61E+00
Xylene*	2.21E+01	1.98E+01	9.49E+03 (5.64E+02)	1.13E+04 (5.64E+02)	3.46E+03 (5.64E+02)
Acenaphthene	1.37E+03 (5.67E+01)	1.95E+02 (5.67E+01)	1.74E+04	3.69E+05 (5.67E+01)	8.49E+04 (5.67E+01)
Acenaphthylene	1.39E+03 (8.55E+01)	1.62E+02	1.74E+04	3.70E+05 (8.55E+01)	8.43E+04 (8.55E+01)
Anthracene	1.92E+04 (1.17E+00)	2.25E+03	8.98E+04	5.67E+06 (1.17E+00)	5.25E+05
Benzo(a)anthracene	4.06E+00	3.34E+00	2.43E+01	6.38E+01 (1.71E+00)	9.10E+01
Benzo(a)pyrene	1.00E+00	8.28E-01	4.20E+00	1.60E+01 (9.1E-01)	1.43E+01
Benzo(b)fluoranthene	7.03E+00	5.58E+00	2.90E+01	1.04E+02 (1.22E+00)	1.02E+02
Benzo(g,h,i)perylene	4.69E+01	4.40E+01	2.16E+02	1.33E+03 (1.87E-02)	6.59E+02
Benzo(k)fluoranthene	1.01E+01	8.53E+00	4.28E+01	1.73E+02 (6.8E-01)	1.43E+02
Chrysene	8.95E+00	6.05E+00	3.64E+01	1.02E+02 (4.4E-01)	1.40E+02
Dibenzo(a,h)anthracene	8.74E-01	7.69E-01	3.95E+00	1.73E+01 (3.93E-03)	1.29E+01
Fluoranthene	9.76E+02	2.57E+02	3.77E+03	6.43E+05 (1.89E+01)	2.26E+04
Fluorene	1.51E+03 (3.08E+01)	1.60E+02	1.18E+04	3.67E+05 (3.08E+01)	6.35E+04 (3.08E+01)
Indeno(1,2,3-cd)pyrene	4.19E+00	3.20E+00	1.72E+01	5.76E+02 (6.14E-02)	6.10E+01
Naphthalene	6.96E-01 (7.5E+01)	6.78E-01 (7.5E+01)	6.62E+02 (7.5E+01)	7.45E+02 (7.5E+01)	1.14E+02 (7.5E+01)
Phenanthrene	8.24E+02 (3.59E+01)	9.15E+01	3.72E+03	2.57E+05 (3.59E+01)	2.19E+04
Pyrene	2.34E+03	5.64E+02	9.06E+03	1.50E+06 (2.18E+00)	5.43E+04
Phenol	3.09E+02	1.79E+02	2.36E+03	3.70E+04	3.08E+04
A <sub>2</sub> b <sub>es</sub> 0 – 0.15 m	0.001	0.001	0.001	0.001	0.001



Contaminant of Concern			Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
0.15 – 1 m	Mean		0.005	0.001	0.005	0.005	0.005
	Max		0.02	0.001	0.02	0.02	0.02

**Notes.**

^CLEA model has been used to derive an assessment criteria based on lead intake, using the withdrawn JECFA Provisional Tolerable Weekly Intake value of 25 ug/kg bw/day. In the absence of UK guidance CSL have used this as an *interim* approach, which may not be protective of risks posed to Human Health from lead in soils. The Risk Assessor using this document can consider using alternative methods (for example USEPA lead uptake models IEUBK or ALM) to assess the lead risks to Human Health from soils.

\* The lower value of m/p/o xylene derived in CLEA v1.06

NR – Not Required as contaminant or pathway not applicable

Values in bracket presents the theoretical soil saturation limit (lower of the solubility or vapour saturation limit). For GACs above the reported soil saturation value and where vapour pathway is an important contributor the CLEA Software Handbook (SC050021/SR4) states that the following should be considered:

- Free phase contamination may be present
- Exposure from the vapour pathways will be over predicted
- Where the vapour pathway dominates exposure (greater than 90 per cent) then it is unlikely that the relevant HCV will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV
- Where vapour pathways is only one of the exposure pathways considered then a manual calculation as set out in Chapter 4.12 of SC050021/SR4 could be considered

Where vapour pathway is the only exposure route then SC050021/SR4 states the following should be considered in cases where GAC is greater than the theoretical soil saturation limit:

- Exposure is unlikely to reach the relevant HCV and the risk based on the assumed conceptual model is likely to be negligible
- Vapour pathway exposure should be calculated using algorithms suitable for free phase or NAPL sources
- Screening could be considered using the lower saturation limit, which is the approach adopted by the USEPA. However, this may not be practical in many cases because of very low limits and is in any case highly conservative.

No material containing free-phase product is permitted

The reported GACs do not represent remediation validation criteria

**GACs for Human Health >1.0 m bgl**

Contaminant of Concern	Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
Arsenic	NR	NR	NR	NR	NR
Boron	NR	NR	NR	NR	NR
Cadmium	NR	NR	NR	NR	NR
Chromium VI	NR	NR	NR	NR	NR
Copper	NR	NR	NR	NR	NR
Lead	NR	NR	NR	NR	NR
Mercury, inorganic	NR	NR	NR	NR	NR
Nickel	NR	NR	NR	NR	NR
Selenium	NR	NR	NR	NR	NR
Vanadium	NR	NR	NR	NR	NR
Zinc	NR	NR	NR	NR	NR
Inorganic Cyanide	NR	NR	NR	NR	NR
TPH – Ali 5-6	2.19E+01	2.19E+01	4.94E+03 (3.68E+02)	4.94E+03 (3.68E+02)	2.86E+03 (3.68E+02)
TPH – Ali 6-8	4.79E+01	4.79E+01	1.08E+04 (1.57E+02)	1.08E+04 (1.57E+02)	6.26E+03 (1.57E+02)
TPH – Ali 8-10	1.16E+01	1.16E+01	2.63E+03 (7.92E+01)	2.63E+03 (7.92E+01)	1.52E+03 (7.92E+01)
TPH – Ali 10-12	5.68E+01 (4.77E+01)	5.68E+01 (4.77E+01)	1.28E+04 (4.77E+01)	1.28E+04 (4.77E+01)	7.42E+03 (4.77E+01)_
TPH – Ali 12-16	4.74E+02 (2.37E+01)	4.74E+02 (2.37E+01)	1.07E+05 (2.37E+01)	1.07E+05 (2.37E+01)	6.19E+04 (2.37E+01)
TPH – Ali 16-35	5.59E+04	5.59E+04	1.26E+07	1.26E+07	7.31E+06
TPH – Aro 5-7	5.59E+04	5.59E+04	1.26E+07	1.26E+07	7.31E+06
TPH – Aro 7-8	1.44E+02 (1.11E+03)	1.44E+02 (1.11E+03)	3.45E+04 (1.11E+03)	3.45E+04 (1.11E+03)	1.85E+04 (1.11E+03)
TPH – Aro 8-10	3.49E+02 (8.35E+02)	3.49E+02 (8.35E+02)	8.76E+04 (8.35E+02)	8.76E+04 (8.35E+02)	4.41E+04 (8.35E+02)
TPH – Aro 10-12	2.01E+01	2.01E+01	4.53E+03 (6.10E+02)	4.53E+03 (6.10E+02)	2.63E+03 (6.10E+02)
TPH – Aro 12-16	1.10E+02	1.10E+02	2.48E+04 (3.62E+02)	2.48E+04 (3.62E+02)	1.44E+04 (3.62E+02)
TPH – Aro 16-21	1.25E+03	1.25E+03	2.81E+05 (1.68E+02)	2.81E+05 (1.68E+02)	1.63E+05 (1.68E+02)
TPH – Aro 21-35	3.06E+04	3.06E+04	6.71E+06	6.71E+06	4.06E+06
TPH – Ali 5-6	5.06E+06	5.06E+06	6.12E+08	6.12E+08	7.78E+08
Benzene	1.46E-01	1.46E-01	3.48E+01	3.48E+01	1.85E+01
Chloroethene (vinyl chloride)	3.33E-04	3.33E-04	7.16E-01	7.16E-01	4.60E-02
1,2-Dichloroethane	3.20E-03	3.20E-03	7.69E+00	7.69E+00	4.17E-01
Ethylbenzene	9.52E+01	9.52E+01	2.48E+04 (5.08E+02)	2.48E+04 (5.08E+02)	1.19E+04 (5.08E+02)
1,1,2,2-Tetrachloroethane	1.51E+00	1.51E+00	3.97E+03 (2.46E+03)	3.97E+03 (2.46E+03)	1.90E+02 (2.46E+03)
1,1,1,2-Tetrachloroethane	6.01E-01	6.01E-01	1.57E+03	1.57E+03	7.58E+01

Contaminant of Concern	Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
Tetrachloroethene	5.75E-01	5.75E-01	1.49E+03 (4.15E+02)	1.49E+03 (4.15E+02)	8.66E+01 (4.15E+02)
Tetrachloromethane (Carbon Tetrachloride)	1.04E-02	1.04E-02	2.61E+01	2.61E+01	2.06E+00
Toluene	3.49E+02	3.49E+02	8.76E+04 (8.35E+02)	8.76E+04 (8.35E+02)	4.41E+04 (8.35E+02)
1,1,1-Trichloroethane	3.55E+00	3.55E+00	8.90E+03 (1.38E+03)	8.90E+03 (1.38E+03)	4.64E+02
Trichloroethene	6.11E-02	6.11E-02	1.52E+02	1.52E+02	7.82E+00
Xylene*	2.99E+01	2.99E+01	7.80E+03 (5.64E+02)	7.80E+03 (5.64E+02)	4.10E+03 (5.64E+02)
Acenaphthene	2.63E+03 (5.67E+01)	2.63E+03 (5.67E+01)	7.18E+06 (5.67E+01)	7.18E+06 (5.67E+01)	3.18E+05 (5.67E+01)
Acenaphthylene	2.67E+03 (8.55E+01)	2.67E+03 (8.55E+01)	7.21E+06 (8.55E+01)	7.21E+06 (8.55E+01)	3.26E+05 (8.55E+01)
Anthracene	1.26E+05 (1.17E+00)	1.26E+05 (1.17E+00)	3.38E+08 (1.17E+00)	3.38E+08 (1.17E+00)	1.55E+07 (1.17E+00)
Benz[a]anthracene	1.20E+01 (1.71E+00)	1.20E+01 (1.71E+00)	2.68E+04 (1.71E+00)	2.68E+04 (1.71E+00)	1.64E+03 (1.71E+00)
Benzo[a]pyrene	2.68E+01 (9.11E-01)	2.68E+01 (9.11E-01)	1.16E+04 (9.11E-01)	1.16E+04 (9.11E-01)	4.96E+03 (9.11E-01)
Benzo[b]fluoranthene	1.36E+02 (1.22E+00)	1.36E+02 (1.22E+00)	6.78E+04 (1.22E+00)	6.78E+04 (1.22E+00)	2.50E+04 (1.22E+00)
Benzo[ghi]perylene	3.07E+03 (1.87E-02)	3.07E+03 (1.87E-02)	1.74E+06 (1.87E-02)	1.74E+06 (1.87E-02)	5.59E+05 (1.87E-02)
Benzo[k]fluoranthene	3.12E+02 (6.86E-01)	3.12E+02 (6.86E-01)	1.35E+05 (6.86E-01)	1.35E+05 (6.86E-01)	5.76E+04 (6.86E-01)
Chrysene	6.80E+01 (4.4E-01)	6.80E+01 (4.4E-01)	4.66E+04 (4.4E-01)	4.66E+04 (4.4E-01)	1.22E+04 (4.4E-01)
Dibenzo[ah]anthracene	1.38E+01 (3.93E-03)	1.38E+01 (3.93E-03)	1.50E+04 (3.93E-03)	1.50E+04 (3.93E-03)	2.33E+03 (3.93E-03)
Fluoranthene	4.24E+04 (1.89E+01)	4.24E+04 (1.89E+01)	1.05E+08 (1.89E+01)	1.05E+08 (1.89E+01)	5.47E+06 (1.89E+01)
Fluorene	3.89E+03 (3.08E+01)	3.89E+03 (3.08E+01)	1.07E+07 (3.08E+01)	1.07E+07 (3.08E+01)	
Indeno[123-cd]pyrene	6.82E+01 (6.14E-02)	6.82E+01 (6.14E-02)	3.49E+04 (6.14E-02)	3.49E+04 (6.14E-02)	1.25E+04 (6.14E-02)
Naphthalene	9.51E-01	9.51E-01	2.54E+03 (7.50E+01)	2.54E+03 (7.50E+01)	1.39E+02 (7.50E+01)
Phenanthrene	6.32E+03 (3.5E+01)	6.32E+03 (3.5E+01)	1.67E+07 (3.59E+01)	1.67E+07 (3.59E+01)	7.83E+05 (3.59E+01)
Pyrene	9.85E+04 (2.18E+00)	9.85E+04 (2.18E+00)	2.38E+08 (2.18E+00)	2.38E+08 (2.18E+00)	1.28E+07 (2.18E+00)
Phenol	6.41E+02	6.41E+02	5.70E+05 (3.78E+04)	5.70E+05 (3.78E+04)	1.39E+05 (3.78E+04)
Asbestos %w/w (wet)	0.1	0.1	0.1	0.1	0.1

Contaminant of Concern	Residential (without gardens)	Residential (with gardens)	Public Open Space	Hardstanding	Commercial
<p><b>Notes.</b></p> <p>* The lower value of m/p/o xylene derived in CLEA v1.06</p> <p>NR – Not Required as contaminant or pathway not applicable</p> <p>(-) Values in bracket presents the theoretical soil saturation limit (lower of the solubility or vapour saturation limit). For GACs above the reported soil saturation value and where vapour pathway is an important contributor the CLEA Software Handbook (SC050021/SR4) states that the following should be considered:</p> <ul style="list-style-type: none"> <li>▪ Free phase contamination may be present</li> <li>▪ Exposure from the vapour pathways will be over predicted</li> <li>▪ Where the vapour pathway dominates exposure (greater than 90 per cent) then it is unlikely that the relevant HCV will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV</li> </ul> <p>Where vapour pathways is only one of the exposure pathways considered then a manual calculation as set out in Chapter 4.12 of SC050021/SR4 could be considered</p> <p>Where vapour pathway is the only exposure route then SC050021/SR4 states the following should be considered in cases where GAC is greater than the theoretical soil saturation limit:</p> <ul style="list-style-type: none"> <li>▪ Exposure is unlikely to reach the relevant HCV and the risk based on the assumed conceptual model is likely to be negligible</li> <li>▪ Vapour pathway exposure should be calculated using algorithms suitable for free phase or NAPL sources</li> <li>▪ Screening could be considered using the lower saturation limit, which is the approach adopted by the USEPA. However, this may not be practical in many cases because of very low limits and is in any case highly conservative.</li> </ul> <p>No material containing free-phase product is permitted</p> <p>The reported GACs do not represent remediation validation criteria</p>					

## Generic Water Assessment Criteria for Controlled Waters

Contaminant of Concern	Surface Waters <sup>1</sup>	Groundwater Aquifers <sup>2</sup>
Arsenic	50	10
Boron	2,000	1,000
Cadmium	0.08	5
Chromium	4.7	50
Copper	1	2,000
Iron	1,000	200
Lead (inorganic – dissolved)	7.2	10
Mercury	0.05	1
Nickel	20	20
Selenium	NA	10
Vanadium	20	NA
Zinc	8	5,000
Oils/Hydrocarbons	NA	10
Phenol	7.7	0.5
PAH	NA	0.1
Benzo(a)pyrene	0.05	0.01
Naphthalene	2.4	NA
Benzene	10	1
Ethylbenzene	NA	300
Toluene	50	NA
Xylene	30	NA
1,2-dichloroethane (1,2-DCA)	10	3
Cis-1,2dichloroethene (c-DCE)	NA	50 <sup>3</sup>
Tetrachloroethene (PCE)	10	10 <sup>4</sup>
Trichloroethene (TCE)	10	10 <sup>4</sup>
Vinyl Chloride	NA	0.5
Ammonia (NH <sub>3</sub> )	n/a	NA
Cyanide	1	50

### **Notes**

All units in µg/l.

NA - None Available

1. Surface waters GWAC freshwater Environmental Quality Standards (EQS) based upon:

- The Dangerous Substances Directive (76/464/EEC) and its 'daughter' directives; and,
- The water Framework Directive (2000-60-EC) and subsequent subordinate directives – The Groundwater Daughter Directive (2006-118-EC) and the priority Substances Directive (2008-105-EC) implemented via the Environmental Permitting Regulations (EPR) 2010 and DEFRA's River Basin Typology and Groundwater Threshold Values Water Framework directions, August 2010.

Most conservative assumption made for surface waters where GWAC is hardness related and/or maximum annual concentration.

2. Aquifer GWAC are UK Drinking Water Standards (DWS) based upon:

- Water Supply (Water Quality) Regulations 1989 (as amended); and,

- Water Supply (Water Quality) Regulations 2000 (as amended).
3. Where no UK DWS are available then the following standards are adopted in order of preference:
    - Council Directive 98/83/EC on the quality of water intended for human consumption; and,
    - World Health Organisation (WHO) Guidelines for Drinking Water Quality 1984.
  4. PCE and TCE combined.
  5. UKDWS for lead is 25 µg/l but planned change to 10 µg/l on 25 Dec 2013 is already in place and used for GWAC in anticipation as a conservative measure

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