

London 2012 Olympic Park

Enabling Works (Stage 1) Consolidated Validation Report - Planning Delivery Zone 2

July 2012

Notice

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Document History

JOB NUMBER: 5094113			DOCUMENT REF: REP-ATK-PM-ZZZ-ZZZ-ZZZ-E-0193			
8	For Approval	████	████	████	████	July 2012
7	For Approval	████	████	████	████	May 2012
6	For Approval	████	████	████	████	April 2012
5	For Approval	████	████	████	████	April 2012
4	For Approval	████	████	████	████	March 2012
3	For Approval	████	████	████	████	January 2012
2	For Approval	████	████	████	████	November 2011
1	For Approval	████	████	████	████	September 2011
0	For Approval	████	████	████	████	March 2011
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

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All figures are provided in .dwg format on CD only.

Shape files shall be presented in the Stage II CVR

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- ENW-ATK-2b-SP1-DR-Y-3-H11-0025 - CZ2b Controlled Waters Conceptual Site Model (reproduced from the SSRS)
- ENW-ATK-2-SP1-DR-Y-3-H11-0016: (CZ2a) Human Health Zoning (reproduced from the SSRS)
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PART I

1. Introduction

1.1 Scope

The aim of this Enabling Works Consolidated Validation Report (CVR) is to provide a high level commentary on the approved remediation related documentation pertaining to Planning Delivery Zone 2 (PDZ2). These remediation works were completed as part of the Olympic Delivery Authority (ODA) redevelopment of the London 2012 Olympic Park in Stratford, London. On the basis that the individual remediation reports have previously been approved by the Local Planning Authority (Olympic Delivery Authority Planning Decisions Team (PDT)) this Enabling Works CVR will not reproduce or re-evaluate any of the detailed testing, results, or assessments that have been previously reported and are contained therein.

This Enabling Works CVR has been prepared to gain PDT partial discharge as to the remediation carried out by the Enabling Works under Condition 35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application⁽¹⁾. However it is acknowledged that a further 12 month groundwater monitoring period is required across PDZ2 as it falls within the 'Southern Plume'. This groundwater monitoring will commence as soon as reasonably practicable post Games in order to establish long term trends in contaminant chemical concentrations. As a result this groundwater monitoring and any associated remedial actions represent a residual remediation item, which until its completion to satisfy the Regulator/PDT requirements, Condition 35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application⁽¹⁾ can only be partially discharged.

1.2 Report Objectives

The focus of this report is to gain PDT's approval to the remediation carried out by the Enabling Works under the relevant Planning Conditions in the following principal Planning Applications. The CVRs prepared by the ODA shall be issued to the PDT for approval in two stages to provide clarity and ensure progressive regulatory approval is achieved. This two stage process, which covers the ODA's work, is set out as follows, but it should be noted that additional reporting stages may be required should third parties, such as LOCOG, be required to validate their work:

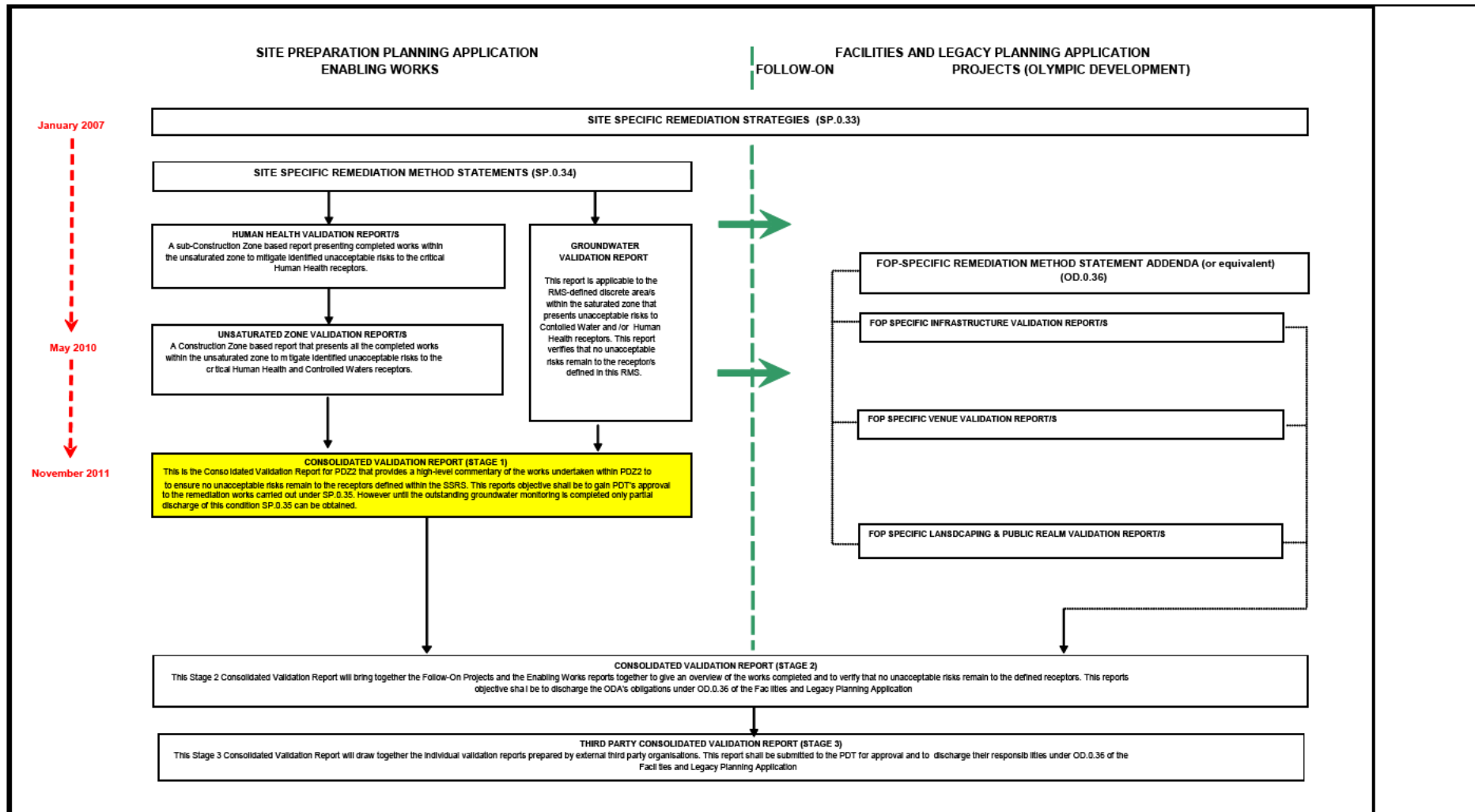
- **Stage 1** will comprise Part I (Background) and Part II (Implementation of Design – Site Preparation (Enabling Works)). Part I sets out the remediation works within the context of the preceding remedial design. Part II shall concisely discuss the implementation and validation works completed by the Enabling Works Team. The objective of this CVR (Stage 1) is to obtain a partial discharge from PDT's for the remediation work carried out under Condition 35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application⁽¹⁾. However it is acknowledged that a further 12 month groundwater monitoring period is required across PDZ2 as it falls within the 'Southern Plume'. Until this monitoring and any associated remedial action is completed to the satisfaction of the Regulator/PDT then full discharge of Condition 35 cannot be achieved.

- **Stage 2** will comprise only Part III (Implementation of Design – Olympic Development (Follow-on Projects)). Part III presents the completed construction and remediation works as required to facilitate the development aspects of the works i.e. infrastructure, venues and landscaping. The same CVR issued with completed Part III will be submitted to discharge the ODA's obligation under Condition 36 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Their Legacy Transformation Planning Application⁽²⁾ and subsequent applicable Slot-In Planning Conditions relating to construction variations.
- **Stage 3** may be required in instances where the Human Health Separation Layer and other overlay / completion works will be carried out by external third party organisations, most notably the London Organising Committee of the Olympic and Paralympic Games (LOCOG). In such circumstances, it will be the responsibility of these third parties to prepare, submit and obtain PDT approval of their works by way of separate Validation Reports. As a consequence of these separate validation reports, it is currently envisaged that another CVR (Stage 3) will require submittal under Condition 36 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Legacy Transformation Planning Application⁽²⁾. If such a Stage 3 CVR is required this will be prepared and submitted by a third party organisation.

Liaison will be undertaken with LOCOG to understand not only the areas of their work which require the production of a Stage 3 CVR, but also the timing of this report production. The findings from these discussions will be conveyed in the Stage 2 CVR.

The PDZ2 validation reporting sequence, presenting these three stages of Consolidated Validation Reporting, is illustrated in Table 1.1 below.

Table 1.1: PDZ2 Validation Reporting Structure



Note: Please refer to Appendix B for a summary of each report and the development of the remedial design, implementation and validation that is covered by this Stage 1 CVR.

1.3 Relevant Planning Conditions

The reporting boundary for this CVR is presented on Figure 1. The document is submitted to the PDT for partial discharge of the Planning Conditions listed in Table 1.2 below.

Table 1.2 - Validation Related Planning Conditions to be approved by this Report

<u>Site Preparation Planning Application (No. 07/90011/FUMODA)</u>		
SP.0.35	Remediation Validation	Stage 1 submitted for Approval
SP.0.35	<p>Remediation validation Validation of the Remediation Works for the purposes of human health protection must be provided within one month of completion of the Enabling Works Protection Layer within any Planning Delivery Sub-Zone. When all Remediation Works necessary for the protection of human health are completed within any particular Planning Delivery Zone, a consolidated Validation Report drawing together the Planning Delivery Sub-Zone validations shall be submitted to the Local Planning Authority. This shall include detailed topographic mapping of the as-built ground levels. Validation of the Remediation Works for the protection of controlled waters shall be undertaken on completion of the relevant Remediation Works relating to controlled waters and a Validation Report shall be submitted to the Local Planning Authority for the whole of each Planning Delivery Zone.</p> <p>Reason: To ensure that all Remediation is properly validated and recorded.</p>	

1.4 Outstanding Works

As part of the outstanding works in PDZ2 it is acknowledged that a further 12 month groundwater monitoring period will commence as soon as reasonably practicable post Games in order to establish long term trends in contaminant chemical concentrations. This monitoring will specifically target the presence of the main contaminants of concern in this area, which includes vinyl chloride, chlorinated ethanes, dissolved ethanes, methane, arsenic, and total organic content determinants such as sulphate, iron and chloride. In addition the presence or absence of non-aqueous phase liquids (NAPL) will also be recorded. On the basis of these monitoring works the need for any further remedial works in this area as required, by the Regulator/PDT will be undertaken to fully discharge Condition 35. As a result this 12 month monitoring and any further remedial works, if required, represent a residual remediation item and until its completion in accordance with the requirements of the Regulator/PDT then Condition 35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application⁽¹⁾ can only be partially discharged.

1.5 Limitations/Exclusions

This CVR is based on third party information made available to the ODA from the sources listed as key supporting data and references and the information is assumed to be accurate and complete.

This CVR does not present new information or re-evaluate any of the data previously assessed within the approved documents summarised herein.

This CVR should be read in light of the legislation, statutory requirements and/or industry good practice applicable at the time of the works being undertaken. Any subsequent changes in this legislation, guidance or design may necessitate the findings to be reassessed in the light of these circumstances.

2. Basis of Remedial Design

The Enabling Works Project primarily comprised site clearance, demolition, earthworks and remediation works to deliver a platform upon which the infrastructure and venues for the London 2012 Olympic Park could be constructed. These works were implemented by the Enabling Works Tier 1 Contractor (BAM Nuttall Limited (BNL)). The objective of the Enabling Works was also to ensure the site was remediated to a standard protective of both human health and controlled waters receptors as defined by the Olympic and Legacy Masterplans (see Section 2.2).

The Global Remediation Strategy (GRS) was prepared by Capita Symonds for the project as a high level roadmap that was further developed by the construction zone specific Site Specific Remediation Strategies (SSRS). In addition, the SSRS were informed by the investigation works completed in accordance with the Intrusive Investigation Method Statement (IIMS) that presents a framework and provides a generic specification for undertaking contamination intrusive investigations across the London 2012 Olympic Park. For the purposes of risk assessment and remediation, PDZ2 was divided into Construction Zone 2a (CZ2a) and Construction Zone 2b (CZ2b). The internal boundary that divided CZ2a and CZ2b was a notional boundary that was not physically present on-site. CZ2a and CZ2b were further sub-divided according to Legacy land use, remediation areas defined by the Designers and phasing of the works due to handover dates.

2.1 Site Location

PDZ2 comprises an approximately triangular parcel of land widening to the south, with City Mill River forming the western boundary, the River Lea adjacent to the northern boundary, the Waterworks River forming the eastern boundary and the southern part of the site being bounded by railway lines. The site is surrounded in all directions by the Olympic Park Development. The total area of the site is approximately 11.5 hectares and is presented in Figure 1.

2.2 Olympic and Legacy End Use

The Olympic and Legacy end use as defined by the Designers is:

Olympic Mode (Figure 2): The majority of CZ2a will encompass a Transport Area with soft and hard landscaping along the City Mill River and Waterworks River. In CZ2b the majority of the Site will be soft and hard landscaping with a spectator seating area to the south.

Legacy Mode (Figure 3): The majority of PDZ2 will comprise interspersed areas of soft landscaping and hard standing with an area to the south east being designated for mixed residential use.

There have been no significant land use changes within PDZ2, for example, venue movements or changes in topography. In the latter case, these topographical changes were reviewed and assessed (where appropriate) in SSRS and RMS addenda respectively. The Masterplan figures should be read in conjunction with Drawing SKE-ATK-XX-ZZZ-OLP-XXX-O-0003 (Sub Zone Remediation Areas (including areas anticipated as no remediation)).

2.3 Site History

The London 2012 Olympic Park has had an extensive industrial legacy of potentially contaminative land uses ranging from, but not limited to, petrol stations, glue factories, match works, uncontrolled landfills, garages and fish processing. A summary of the site history, reproduced from the SSRSs, is provided below in Table 2.1, noting the vast majority of the sites industrial development occurred up to 1970, with only minor changes occurring thereafter.

Table 2.1: Summary of PDZ2 Historical Land Uses

Timescale	Historical Land Use
1869 - 1896	The site largely comprises open fields. A railway line is situated adjacent to the southern boundary of CZ2a. The line was extended to include further tracks in 1896.
1916	Wolsey Match Works, a Fish Meal Factory and Virgemount Chemical Works are situated on the northern part of CZ2a. The remaining parts of the site still appear to be open fields.
1948-1951	Railway lines traverse CZ2b in a north - south direction crossing the south eastern boundary into CZ2a. An engine cleaning shed is located in the north of CZ2b. A tow path runs along the eastern boundary. An electric sub-station and tanks are noted adjacent to the Wolsey Match Works. Virgemount Chemical Works is no longer shown. The remaining site area is generally categorised as either rough grassland or heath cover with some tree cover.
1954, 1960, 1965-1968	An electricity pylon is located in the south east and north of CZ2b. Two more structures (most likely buildings) are located in the southern half of CZ2b.
1968	CZ2b is predominantly covered by a network of train lines. Wolsey Works remains situated in the northern part of the site. Very little open space remains.
1970	Additional buildings are located in the northern area of CZ2b and a tank is identified to be present in mid-way along the western site boundary.

2.4 Site Investigation

As part of the site investigation scoping exercise a review of the historical (and current) site usage via walkover surveys, review of trade directories, aerial photographs and pertinent environmental data sources was used to design a technically robust and pragmatic site investigation. This has resulted in several stages of site investigation and associated ground gas and groundwater monitoring/sampling being undertaken both prior to and as part of ODA redevelopment of the site. The exploratory holes carried out during the Site Investigation phase are presented on Figure 4 and summarised below in Table 2.2 (in terms of the stratum the exploratory hole was terminated), noting this excludes exploratory holes carried out during the remediation phase.

Table 2.2: Summary of exploratory holes in PDZ2 (during the Site Investigation Phase only)

Number & Stratum	Made Ground	Alluvium	River Terrace Deposits	Lambeth Group	Thanet Sands	Chalk
Exploratory Holes	90	3	41	20	13	4

2.5 Geology

In summary, the ground conditions encountered during site investigations carried out prior to and during the Enabling Works comprised Made Ground overlying Alluvium, which in turn overlay the River Terrace Deposits (RTD). The solid strata comprised the Lambeth Group overlying the Thanet Sand Formation, with the White Chalk present at depth. A more detailed description of each geological stratum is given in Table 2.3 below.

Table 2.3: Summary of PDZ2 Geology

Stratum	Generalised Description	Approximate Thickness Range (m)	Aquifer Classification
Made Ground	Dark brown silt, clay and sands with brick, concrete, clinker and flint gravels	2.0 to 9.0	Not Classified
Alluvium	Soft, mottled, slightly sandy gravelly clay with fragments of shell and fibrous organic material	0.3 to 4.0	Non-Productive
River Terrace Deposits	Medium dense very sandy gravel of flint and quartzite with occasional pockets of grey silty sand.	1.5 to 7.5	Secondary (Minor)
Lambeth Group	Various interbedded lithologies comprising stiff mottled sandy laminated clay, very dense silty sand, flint gravel, rare shell fragments, occasional pockets of silt and rare amorphous fibrous organic lenses.	11.0 to 15.5	Secondary (Minor)
Thanet Sand	Very dense speckled silty sand with occasional flint gravel.	11.5	Secondary (Minor)
Upper Chalk	Structureless white sandy silt with gravel of low density chalk and flint.	<i>(base not proven)</i>	Principal (Major)

2.6 Hydrogeology

The SSRS⁽³⁾ classifies the ground directly underlying the site (relating to the RTD) as a Secondary (Minor) Aquifer. The Thanet Sands are generally in continuity with the Chalk and are classed as a Secondary (Minor) aquifer, with the Upper Chalk classified as a Principal (Major) aquifer (see Table 2.3 above). Water encountered within the Made Ground is referred to as perched water (which was discontinuous), groundwater within the RTD is referred to as shallow groundwater and groundwater within the Thanet Sand and the Upper Chalk is referred to as deeper groundwater.

The Lambeth Group is generally considered to behave as an aquitard across the Olympic Park, limiting downward migration to the Thanet Sands and Upper Chalk, due to the presence of clays and silts of relatively low permeability interbedded with sand lenses of greater permeability.

The closest drinking water abstraction is operated by Thames Water Utilities at the Old Ford Pumping Station approximately 0.6km west of the site.

2.7 Hydrology

The site is bounded on three sides by three surface watercourses: City Mill River flows southwards along the western boundary, the River Lea flows southwards along the northern boundary and the Waterworks River flows southwards along the eastern boundary.

2.7.1 Impoundment

The Impoundment Scheme is a British Waterways, London, led project involving the construction of additional locks to improve the navigation of the River Lea and its tributaries. The details and potential effects of the impoundment works on the River Lea, its tributaries and groundwater levels are reported in the Capita Symonds Groundwater Modelling Study and a Halcrow report on impoundment⁽⁴⁾. Principally, the study addressed two main areas:

- potential changes in contaminant migration pathways in the aquifers; and
- the increased risk of groundwater related flooding.

Given the impoundment scheme was completed in 2008, the Enabling Works in this zone was completed according to post-impoundment conditions. It was therefore required that further assessment of the interaction between the river and the shallow groundwater be undertaken to determine any changing conditions. This study concluded that there would be a theoretical 'change point' in surface water levels approximately 2.4km upstream of the Prescott Channel impoundment structure (adjacent to CZ5a and CZ6d, upstream to the north of PDZ2). Downstream (south) of this change point, surface water levels would be increased to above the previous mid-tide river levels, with an approximate 0.5m increase at the southern end of CZ1a to an average of 2.3m AOD. Therefore, as PDZ2 is approximately level with CZ1a, it is expected that this approximate 0.5m increase will also apply to surface water levels adjacent to PDZ2^(3b-3g).

When considering the potential impacts on contaminant migration, the study states that although the current tidal nature of the groundwater-surface water interaction is likely to dilute any contaminant concentrations within the groundwater, the impoundment scheme would increase the rate of flow and thus dilution of any groundwater contamination. The overall contaminant loading to the river is likely to remain the same post-impoundment^(4a). Therefore, based on the findings of the British Waterways report and subsequent measured groundwater elevation variation at the site, it was considered that the results of the SSRs were applicable for both the pre- and post- impoundment scenarios^(3b-3g).

3. Development of Remediation Design

In early 2007, a series of Site Specific Remediation Strategies (SSRSs) were issued for CZ2a and CZ2b⁽³⁾ with the Enabling Works project commencing shortly thereafter on site and completing in 2010. The aim of these documents was to design a remediation strategy that practicably minimised the risks to the identified human health and controlled waters receptors.

Given the risk assessment and remediation for PDZ2 was divided into CZ2a and CZ2b due to vacant possession and construction programme purposes, the Conceptual Site Model (CSM) (see Drawings ENW-ATK-2-SP1-DR-Y-3-H11-0022, ENW-ATK-2b-SP1-DR-Y-3-H11-0024 and 25) was derived based on these individual Construction Zones. The CSM outlined within the SSRSs presents the potential sources of contamination, sensitive human health and controlled waters receptors, and pathways representing pollutant linkages between the sources and receptors.

The SSRS documents used a two-tiered approach to risk assessment, incorporating Generic Quantitative Risk Assessment (GQRA) and Detailed Quantitative Risk Assessment (DQRA). GQRA was undertaken using screening values outlined in the Global Remediation Strategy (GRS), unless otherwise indicated. If ground conditions were found to exceed GQRA screening values, further assessment and DQRA was undertaken and Site Specific Assessment Criteria (SSAC) and Site Specific Remediation Targets (SSRTs) were derived. SSAC illustrate the individual contaminant concentrations protective of either controlled waters or human health, while SSRTs are the chemical criteria above which remedial corrective action is likely to be required. Representative concentrations for soil and groundwater data were derived through statistical analysis and where this representative concentration exceeds the respective SSAC remedial action or further delineation was required^(3b-3g).

The risk assessment process outlined in both the CZ2a and CZ2b SSRSs identified significant risks to both human health legacy and controlled waters receptors across PDZ2 that required excavation, treatment and/or further investigation/delineation^(3b-3g).

The remedial design was developed in tandem with remedial works in PDZ2 as more data from further site investigation became available. In accordance with good practice and to ensure a robust CSM was maintained the design documentation was further refined to ensure the remedial works were reflective of the encountered ground conditions. A summary of the three principal changes to the conceptual site model design are presented within Appendix B. These changes primarily related to the collection of additional data and changes in the EWFL, which necessitated a reassessment and refinement of the CSM, which in turn enabled the SSACs to be altered.

Following on from the design, the Enabling Works Tier 1 Contractor – BAM Nuttall issued a series of Remediation Method Statements (RMS)⁽⁵⁾ to the PDT for their approval. These RMSs detail how the design will be implemented with the intention of:

- supporting ground contamination management, including the basis upon which validation would be achieved;
- summarising additional ground investigation data completed after approval of the SSRS (and subsequent SSRS Addenda) and assessing whether the additional information supported the existing CSM;
- defining the extent of the remediation required by the current design;
- providing an outline of the remedial measures proposed;
- outlining the environmental monitoring procedures in place to protect against potential impacts from the works; and
- discharge of the relevant planning conditions relating to ground contamination.

For validation reporting purposes the project developed a structured receptor-based approach to demonstrate compliance with the SSRS via the Human Health, Unsaturated Zone and Groundwater Validation Reports. This is schematically presented as a flow chart in Table 1.1.

3.1 Human Health Design

The remediation design allows for placement of a Human Health Separation Layer (HHSL) or hardstanding in the proposed Olympic and Legacy end uses within PDZ2. These measures reduced the Human Health pathways such as dermal contact, ingestion and dust inhalation to acceptable levels^(3 & 5). The general remedial profile adopted across the Park is presented in Appendix A.

The placement of a minimum of 600mm HHSL (or less should hard standing be used) is designed to result in the underlying General Fill materials having to comply with less stringent remedial targets. The HHSL (the base of which is demarcated by a brightly coloured Marker Layer) and General Fill are required to be validated to demonstrate compliance with the Human Health and Controlled Waters Site Specific Assessment Criteria (SSACs).

The remedial strategy is based on a number of assumptions and/or limitations, which are further identified in Table 5.1, although the primary assumption is highlighted below:

- No private gardens or vegetable growing areas are proposed for Legacy end use thus reducing risks associated with the ingestion pathway.

Given the remedial works have been completed based on the information contained within the remedial design, should the assumptions set out in these documents change then a re-assessment may be considered necessary.

3.2 Controlled Waters Design

The three rivers surrounding PDZ2 were considered as the main controlled waters receptors. However, following further investigation and modelling it was identified that only the Waterworks River was likely to be impacted by contamination present within PDZ2^(3b-3g). Notwithstanding this, the relevant pollutant linkage for the identified receptors involved exposure to contamination within unsaturated soils via soil leaching and vertical migration, and lateral migration within the RTD^(3b-3g). The shallow aquifer was considered by the Environment Agency to represent a source and/or pathway for contaminants but not a receptor^(3b-3g).

Unsaturated zone soils in CZ2a and CZ2b were also identified to be impacted by varying levels of both inorganic and organic contaminants, which were considered to be the primary source of contamination^(3b-3g).

In addition, the CZ2a SSRS^(3b-d & g) also identified two areas of concern within the shallow RTD groundwater;

- Zone One in the north of CZ2a where general RTD groundwater quality was suspected to be impacted; and
- Zone Two in the west and south of CZ2a where potential Light Non-Aqueous Phase Liquid (LNAPL) was suspected.

Given the above findings specified in the SSRS⁽³⁾ and RMS⁽⁵⁾ the following remedial approaches were implemented across the site based upon development requirements in each area.

- excavation of unsaturated soils to deliver the earthworks and for remediation of the defined hotspot along with its replacement with chemically acceptable backfill materials (as defined by the Site Specific Assessment Criteria (SSAC)); and
- further investigation, monitoring, sampling and analysis as well as assessment of the two groundwater areas of concern (Zone 1 & 2).

3.2.1 Southern Plume

Upon completion of the majority of the SSRS programme in the south of the Olympic Park, it became apparent that an area of contaminated groundwater was present within the RTD across several southern PDZs, including the southern part of PDZ2. This affected area was subsequently referred to as the 'Southern Plume'. The former Banner Chemicals Area of CZ3a was identified as the primary source of a southward migrating diffuse plume consisting mainly of cis 1,2-dichloroethene, vinyl chloride, and arsenic^(3i & 5e).

Assessment of data collected from the Southern Plume considered that natural attenuation is occurring and is likely to continue to occur. Removal and treatment of unsaturated soils in several locations in the southern Olympic Park has resulted in the removal of the majority of the identified sources and therefore it is anticipated that the residual groundwater contamination will decline over time. Following completion of a twelve month period of groundwater monitoring^(3i, 5e & 6e) it was acknowledged that a further period of groundwater monitoring will be required to confirm that both the natural degradation and subsequent reduction in contaminant trends are continuing. As a result a further 12 month period of groundwater monitoring will commence as soon as practicable after Games. The results of this monitoring and any associated remedial action will be confirmed with the Regulator/PDT, but until these works are completed to the satisfaction of the PDT/regulator they will remain as a residual remediation items

PART II

4. Implementation of Design – Site Preparation (Enabling Works)

4.1 Summary of Works Undertaken

Remediation works within PDZ2 began in 2007 on the basis of the SSRSs with the remedial design developing as the remediation works progressed (as discussed above). The majority of the physical earthworks Enabling Works scope was completed in 2010, with the first period of the Southern Plume groundwater monitoring programme ceasing in late 2011. A detailed summary of all changes to the remedial design is available within the approved PDZ2 RMS and Validation Reports, which are summarised in Appendix B.

4.1.1 Significant Land Use Changes

There have been no significant land use changes within PDZ2, for example, venue movements or changes in topography. In the latter case, these topographical changes were reviewed and assessed (where appropriate) in SSRS and RMS addenda respectively.

4.1.2 Hotspots

The PDZ2 SSRSs and RMSs identified six contamination hotspot locations requiring remediation to be protective of Human Health and Controlled Waters.

Table 4.1: Number of Unsaturated Zone Defined Hotspots (presented in the SSRS & RMS) in PDZ2

Document	No. of hotspots	Comments
Site Specific Remediation Strategies (including subsequent addenda)	CZ2a: 5	4 hotspots represent a risk to Human Health and 1 hotspot represents a risk to Controlled Waters
	CZ2b: 1	1 hotspot represents a risk to Human Health
Remediation Method Statement (including subsequent addenda)	CZ2a: 5	4 hotspots represent a risk to Human Health and 1 hotspot represents a risk to Controlled Waters
	CZ2b: 1	1 hotspot represents a risk to Human Health
Validation Reports (including subsequent addenda)	CZ2a: 5	4 hotspots relate to Human Health and 1 hotspot relates to Controlled Waters.
	CZ2b: 1	1 hotspot represents a risk to Human Health

NB: Hotspot numbers are not cumulative

All unsaturated zone hotspots identified to represent a risk to human health and controlled waters were excavated, validated and replaced with fill materials compliant with the prevailing SSACs.

4.2 Unsaturated Zone (Combined Human Health and Controlled Waters)

There were a total of six RMS defined remediation zones that required excavation and validation within the unsaturated zone of PDZ2. Whilst it was originally considered that perched water treatment will be considered necessary by the SSRS Designers, following the collection of additional data and further assessments, it was concluded that no specific treatment would be considered necessary.

In certain circumstances a number of outliers were recorded as part of the chemical validation testing of backfill materials to demonstrate compliance. These outliers were then subsequently delineated, removed, validated and backfilled with compliant materials. In the limited number of cases where this was not the case, due to agreements with the Follow On Projects, these are recorded in Table 5.1 and Figure 10.

As a part of the earthworks and remediation design there was a requirement for a minimum of 600mm separation layer (human health protective material) to be placed unless specifically agreed with PDT that an alternative such as hard standing could be utilised. In certain instances the FoPs were better placed to either install the Human Health Separation Layer or undertake general remediation works in which case this requirement will have been passed to the FoP to complete.

In total, approximately 119,000m³ of unsaturated soil were removed during Enabling Works activities in PDZ2 and replaced with approximately 62,500m³ of chemically acceptable general fill was placed beneath the Marker Layer as backfill to hotspots, additional remedial excavations and to raise levels to sub-formation^(6b&d). The Enabling Works sub grade and subformation drawings are presented on Figure 5 and 6 respectively. Further details of the general fill material, volumes, sampling frequency and chemical testing are provided in Table 4.2.

A total of 15,600m³ HHSL was placed up to a thickness of 300mm over a brightly coloured Marker Layer comprising orange Terram geotextile^(6b&d). The Marker Layer serves as a visual indication of the boundary between underlying general fill and / or in situ soils and relatively 'cleaner' overlying HHSL. The Enabling Works Formation Level is illustrated on Figure 7 and the extent of Marker Layer and thickness of HHSL is illustrated on Figure 8.

It was agreed in certain circumstances that the thickness of/or presence of the HHSL/marker layer can be varied to suit the incoming Follow-on Projects scope of works. These agreements were made to facilitate earlier workings and for the benefit of the Programme. Such circumstances were discussed and formally agreed with the incoming Project Team, which are detailed in the specified Validation Reports and presented in Figure 8. Further details of separation layer materials both from on-site and off-site sources, along with their sampling frequencies and any corrective actions are detailed in Table 4.2 below.

In addition, elevated concentrations of the volatile organic compounds were identified at the base of the Made Ground in the southern section of the PDZ2 coincident with Zone 2 saturated zone areas of concern. To further understand the potential risk to human health in the currently defined Legacy end use setting, vapour wells were installed, monitored, sampled and assessed (based on outdoor air). The recorded VOCs were identified to be below the derived vapour specific SSAC^(6d).

Table 4.2: PDZ 2 Unsaturated Zone Fill Volumes, Sampling Frequency and Corrective Actions

Material Type	Material Description	Origin	Volume (m ³)	Number of Samples	Sampling Frequency	Exceedances
General Fill	Processed Made Ground	Olympic Park	62,500	189 soil samples	1 sample per 330 m ³	<p>Nine statistical outliers were noted but given their isolated nature there were not considered to represent an unacceptable risk to either human health or controlled waters.</p> <p>In addition three exceedances of trichloroethene were noted. Revised modeling was undertaken utilising the Waterworks Rivers as the compliance, which showed these exceedances did not pose a risk to either human health or controlled waters</p>
	Lime stabilised F1 blend: 33% Thanet Sand; 45% Washed Gravel; and 22% Washed Sand					
	Lime stabilised Thanet Sand					
	Crushed concrete and concrete from the crusher side belt					
	Crushed limestone	Imported from Torr Quarry in Somerset				
Separation Layer	Lime stabilised Thanet Sand	Olympic Park	15,600	98 soil samples	1 sample per 159 m ³	<p>Three boron exceedances were present, but there were not statistical outliers and the overall population mean passed. So these samples were deemed acceptable</p>
	Silty Sand subsoil material	Imported from Bournewood Quarry in Kent		92 leachate samples	1 sample per 169 m ³	

4.3 Saturated Zone

4.3.1 CZ2a RTD Groundwater

Intrusive investigations and further monitoring was undertaken within CZ2a to confirm the groundwater quality in Zone One and the LNAPL area of Zone Two as well as to verify the assumptions made at the initial remedial design stage. Following the installation of additional boreholes, two further rounds of groundwater level monitoring and quality sampling was completed in both zones. This was followed by weekly LNAPL measurements in Zone Two. This monitoring programme was conducted over a period of three months, which identified no exceedances of the SSAC in Zone One and the absence of LNAPL within Zone Two. It was on the basis of these additional works that it was concluded that groundwater remediation works were not considered necessary within CZ2a^(6c).

4.3.2 Southern Plume

The Southern Plume Position Paper⁽³ⁱ⁾ and RMS^(5e) specified an ongoing groundwater monitoring strategy across the southern part of the site. The aim of this monitoring network is to determine whether degradation of the chlorinated ethenes and arsenic occurs over time given the extensive remedial works undertaken in both the unsaturated zone across the South Park and discrete in-situ groundwater remediation in the source area within the former Banner Chemicals Area in PDZ3.

Following completion of the groundwater monitoring, the validation report^(6e) concluded that complete dechlorination was occurring. The evidence for this was through decreasing concentrations of tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE) and vinyl chloride which were less than the SSAC. The recorded arsenic concentrations were compliant with the wider plume objectives, which is primarily as a result of source removal. In summary, this report confirms via monitoring, the Southern Plume COCs do not represent an unacceptable to risk to Human Health and/or Controlled Waters. However, following review of this report, the PDT has requested that monitoring be extended both in its geographical extent (as monitoring wells in CZ3a Banner are now included) and duration (monitoring to be undertaken for a further 12 months based on monthly monitoring for the first quarter and then quarterly thereafter), although the overall number of monitoring wells has significantly reduced.

In addition to the discrete fluctuation of cDCE and Vinyl Chloride in NBHCZ3a-1043 and NBHCZ3a-889 in the final two rounds of the initial groundwater monitoring regime, during further discussions with the PDT it was agreed that groundwater monitoring would continue to understand further the ongoing stability of the residual plume, following completion of the in-situ remedial works in the former Banner Chemicals area. It is considered that this additional monitoring will enable the longer term assessment of contaminant trends particularly as the aquifer returns to a state of equilibrium and hence a further 12 month period of groundwater monitoring will be undertaken which will commence as soon as reasonably practicable post Games in order to establish the long term trends in

contaminant concentrations. This monitoring will specifically target the presence of the main contaminants of concern in this area, which includes vinyl chloride, chlorinated ethanes, dissolved ethanes, methane, arsenic, and total organic content determinants such as sulphate, iron and chloride. In addition the presence or absence of non-aqueous phase liquids (NAPL) will also be recorded. On the basis of these monitoring works the need for any further remedial works as required by the Regulator/PDT to fully discharge Condition 35 will be defined.

4.4 SSRS Groundwater Monitoring

Groundwater monitoring has been undertaken for a number of purposes with different monitoring and sampling requirements. One of these groundwater monitoring strands ('Validation') aims to validate the remediation works by monitoring/sampling the underlying aquifers within this PDZ before, during and after the bulk remediation works. This requirement originated from the SSRS, where the Designers required the groundwater data gathered as part of the Enabling Works to be assessed to determine the presence or absence of any adverse effects. As such, this data has been utilised as a line of evidence to demonstrate the aquifers conditions within the PDZ has not significantly deteriorated from the conditions at pre-commencement (of earthworks) phase.

Exploratory locations were installed as monitoring wells into the underlying geology, with specific reference to the RTD and Chalk, to record the hydrogeological conditions. The hydrogeochemical data collected prior to, during and following completion of the remedial works has shown there to be no consistent upward trend. It is on this basis that these monitoring wells were appropriately decommissioned in line with Project Documentation⁽⁹⁾ (which is based on the applicable Environment Agency guidance) prevailing at the time as reported in the applicable unsaturated zone validation reports^(6b & d). However, as noted in Section 4.3.2 above, groundwater monitoring for a further 12 month period will be undertaken to confirm that the groundwater results are not showing an upward trend, but if required further remedial works shall be undertaken.

4.5 Other Matters

4.5.1 Non Remediated Areas

A number of discrete areas within PDZ2 have been retained across the Olympic Park in accordance with approved Site Planning Application conditions and/or due to operational constraints. Within these areas full site investigation coverage has not been possible due to the presence of a particular features that must be retained. Typical retained features include retained buildings and services, third party boundaries, retained roads and other areas of hardstanding, batter exclusion zones and areas of retained vegetation (either confirmed or aspirational). These discrete areas in PDZ2 are discussed further in the Validation Reports^(6b&d) and are presented on Figure 9

To further support these non-remediated areas, the Designers have submitted a site wide retained areas risk assessment report⁽⁷⁾ to the PDT for the approval. This report qualitatively assesses potential risks to human health and controlled waters arising from potentially contaminated land beneath those areas. The assessment considers the nature of the retained features, contamination presence identified in the nearby area, and the final land use and receptors. Relevant extracts from the latest Retained Areas Risk Assessment Report are presented in Appendix D.

4.5.2 Unexploded Ordnance

An Olympic Park wide risk assessment for German air-dropped unexploded ordnance (UXO) was conducted by BAE Systems in advance of the project⁽⁸⁾. The objective of this document was to assess the potential to encounter UXO during the project, to evaluate implications of such an occurrence and to determine whether risk mitigation measures would be necessary. The assessment considered there to be a moderate (for open land) and a high (for all surface watercourses) probability of German air-dropped UXO being encountered in PDZ2. Given this, ordnance experts were present on site during these earthworks to identify any suspected objects. In addition, all site staff were briefed in the types of ordnance that may be encountered and the procedures when suspected objects were encountered. However, no suspected UXO were identified during the works within PDZ2^(6b&d).

4.5.3 Pathogens

During the works a small number of bones and shell fish were identified at the sub-grade. Given this, additional sub-grade samples were collected in these locations and analysed for a pathogen suite comprising anthrax (*Bacillus anthracis*), *E.coli*, Enterobacteriaceae, faecal streptococci, listeria, salmonellae and total coliforms. A review of the results concluded there was no unacceptable risk to human health via the direct contact / ingestion pathways due to the presence of the overlying General Fill and/or HHSL intercepting the pathway^(6b&d).

4.5.4 Radiological Material

The Tier 1 Enabling Works Contractor considered it prudent to undertake a radiological survey of the sub-grade using a specialist sub-contractor^(5a,5b&5d) in light of the identification of radiological materials in adjacent PDZ's. During the radiological survey, a localised area of slightly elevated readings was encountered (see Drawing 2DD-ENL-CK-02Z-OLP-SP1-E-0514). Approximately 5m³ of Made Ground (a sandy gravel) was removed for assay to determine the most appropriate disposal approach. The sub-grade was then resurveyed to confirm readings were not above background concentrations.

In addition to the above, a temporary holding facility was constructed in May/June 2009 consisting of two individual cells (please see Drawing 2DD-ENL-CK-02Z-OLP-SP1-E-0579). These cells were constructed to receive radioactive materials 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*) of materials encountered in PDZ2 and elsewhere on the Olympic Park. These temporary cells held a total volume of 193m³ of 'exempt' materials and were removed from site in August 2009 to an appropriately licensed off-site facility. Following off-site disposal a clearance survey of the temporary holding area was conducted by the specialist sub-contractor. All survey results were comparable with background levels and no further action was considered necessary^(6b&d).

4.5.5 Unexpected Contamination

No unexpected contamination was identified within PDZ2, unless otherwise stated in Section 4.5.4.

4.5.6 Methodology for Assessing Asbestos

The assessment for asbestos and criterion in the HHSL and the below marker layer materials was further developed as the works progressed. This development gave rise to a Site Wide SSRS that revised the SSACs and its assessment methodology^(3h).

4.6 Sampling and Analytical Testing

TES Bretby, or ESGL as they are currently known, was selected to undertake the chemical analysis of the soils and groundwaters at their off-site laboratory. Bretby's Method Detection Levels were generally able to detect the determinands listed in the SSRS and are suitably accredited through MCerts and UKAS (where appropriate). Further details pertaining to the sampling strategy and frequency are presented in the respective Unsaturated Zone Validation Reports^(6b&d).

The Planning Application required all validation samples to be collected in-situ. However, in order to reduce the potential for placing non-compliant soils (general fill and separation layer) whilst maintaining the programme, Enabling Works commissioned an on-site chemical laboratory and used field analytics to aid real-time decision making on soil reuse through further characterisation. The on-site chemical laboratory was UKAS accredited (where appropriate) for the main chemical tests on soils. However, these results were not typically utilised in the validation reporting, although they were occasionally used as a secondary lines of evidence.

The frequency of sampling and testing for hotspots, subgrade and backfill materials (general fill and separation layer quality materials) were undertaken to acceptable standards in accordance with the Site Preparation Planning Application.

4.7 Waste Management

The Enabling Works in PDZ2 was completed under Olympic Development Authority [ODA] Environmental Permit (issued as a Waste Management Licence) for the south Olympic Park [Reference: EAWML80790 and subsequent Notice of Variation, Modification Number: M0597]. This Environmental Permit enables the ODA to use site-won materials, suitable for use after treatment, but classified as either hazardous or non-hazardous waste, to be used as fill to create the landform required for the redevelopment. This Environmental Permit enables the placed materials to be "recovered", and as such they cease to be a waste, which minimises disposal to landfill and serves a useful purpose in replacing materials that would otherwise have had to be imported to construct the scheme.

The permit also covers the import and use of waste materials from an alternative source whose works are directly associated with the potential Olympic Park redevelopment. These fill materials can be utilised where they are deemed suitable for use and a need for these materials has been demonstrated. 'Suitable for use' will be proved in accordance with the Memorandum of Understanding (MoU) which is an agreement between the ODA and the Environment Agency covering Waste Licensing Issues. The ODA will seek to discharge this upon approval of the Stage 2 CVR.

4.8 Health, Safety and Environment

Remediation works were completed in accordance with Construction (Design and Management) (CDM) Regulations. As CDM Co-ordinator, Arup were responsible for producing the Health and Safety file for PDZ2, in conjunction with the Contractor, Project Manager and Client. A Permit to Work system was in operation for the duration of remediation works. Staff wore suitable Personal Protective Equipment (PPE), with gloves, helmets, boots, eye protection and hi-vis clothing required at all times as a minimum. Environmental monitoring comprising fugitive emissions, air quality, noise, dust (including PM10), nitrogen dioxide and odours was carried out at the site throughout the works, which were progressively presented on a monthly basis in the Tier 1 Environmental Monitoring Monthly Reports^(6b&d).

5. Conclusions

The PDZ2 Validation Reports⁽⁶⁾ conclude that neither the soils nor groundwater in PDZ2 currently pose an unacceptable risk to the SSRS defined critical controlled waters and human health receptors. However, further monitoring is required to assess whether and to what extent contaminants from an up-gradient source have migrated into PDZ2. This assessment will look to determine whether these contaminants have had a detrimental impact upon the conditions beneath PDZ2, such that an unacceptable risk is posed to the critical human health and controlled water receptors. It is on this basis that this PDZ2 Consolidated Validation Report seeks to gain partial discharge from PDT for the ODA works undertaken in accordance with Condition 35 of the Site Preparation Planning Application.

However, it is noted that the separation layer has not been completed at the time of producing this report and it remains the responsibility of the Follow On Project that, as a minimum, they complete the separation layer to a thickness of no less than 600mm, unless otherwise agreed with the PDT. It is only upon the appropriate completion and validation of the Separation Layer that the remediation works will be considered to be complete. The incoming Project Teams shall be cognisant of the SSRS underlying assumptions of the SSRS and the items noted in Section 5.1 and Table 5.1 below.

In addition it is acknowledged that a further 12 month groundwater monitoring period is required to be undertaken as soon as reasonably practicable post Games. This monitoring will specifically target the presence of the main contaminants of concern in this area in order to define the long term trends in contaminant concentrations. On the basis of these monitoring works the need for any further remedial works as required, by the Regulator/PDT to fully discharge Condition 35 will be defined. As a result this 12 month monitoring represents a residual remediation item and until its completion in accordance with the requirements of the Regulator/PDT then Condition 35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application⁽¹⁾ can only be partially discharged

5.1 Further Work

Table 5.1 records the outstanding works that were within Enabling Works scope that has been transferred to the Follow On Projects to complete and validate (see Figure 10) and restrictions on future works. This table seeks to update similar tables presented in the individual Validation Reports referenced herein⁽⁶⁾.

In addition, Table 5.1 records some key aspects for the Follow On Projects to consider as part of their works. This table does not in any way alleviate the incumbent Project Teams from complying with the full requirements of the remediation documentation, their legal, regulatory and contractual obligations.

Table 5.1: Outstanding Works transferred to the Follow On Project, Restrictions on Future Works and some key aspects for the Follow On Projects to consider as part of their works

No.	Title	Description	Action By
1	Potential removal of sub-grade with asbestos concentrations >0.1 w/w (wet-weight)	Asbestos concentrations in the sub-grade have been identified at >0.1% w/w. Confirmation has now been received from the OPLC that no further works are required in this respect as the pathway to human health has been intercepted by the overlying general fill and/or separation layer.	- (this action has now been closed)
2	Completion of shallow groundwater monitoring and assessment works associated with the Southern Plume.	The Enabling Works Team is responsible for implementing and reporting upon the groundwater monitoring strategy associated with the 'Southern Plume'. This monitoring is scheduled for initial review towards the end of 2011. These results will be reported separately for approval by the PDT.	- (these works have been completed)
3	Completion of groundwater monitoring for the Southern Plume	Southern Plume' groundwater monitoring across the southern part of the Olympic Park shall continue for a period of approximately 12 months as soon as reasonably practicable post Games. The groundwater monitoring results and any associated additional remedial actions required by the Regulator/PDT approval to fully discharge condition 35 will be defined.	Enabling Works (novated to the Olympic Park Legacy Company (OPLC))
4	Decommission groundwater monitoring boreholes.	Decommission all boreholes at the site, with the exception of those identified for further monitoring associated with Item 2) above and those requiring monitoring by others [currently WSP Environmental under the direction of CLM] associated with the Global Groundwater Monitoring Strategy [GGMS]. The GGMS boreholes to be retained are shown on drawing 2DD-ENL-CE-02a-OLP-SP1-E-0074 and 2DD-ENL-CE-02b-OLP-SP1-E-0075. Those responsible for those boreholes shall ensure appropriately decommissioning only after works are completed to the satisfaction of the Regulator/PDT. The replacement of any borehole lost during future construction phases shall located as near as practically possible to its original location.	Follow on Project
5	Placement of Marker Layer and HHSL	Follow On Projects are required to provide survey plans within two months of completion of the entire (minimum 600mm thickness) separation layer to demonstrate to the PDT an acceptable thickness of separation layer. These survey plans should also identify any areas where the marker layer is not laid. Reference should be to Figure 6, 7, 8 & 9 for the survey of the separation layer, the EWFL the extent of marker layer placed during Enabling Works and the non-remediated area drawing.	Follow on Project

No.	Title	Description	Action By
6	Suitable infrastructure design	Structures should be designed recognising the chemical and other characteristics of the stratum in which they are founded. Sections in contact with potentially contaminated materials may need to be resistant to chemical attack, particularly by sulphates.	Follow on Project
7	Suitable methods to protect pathways	Consideration of design and construction methods (for example, choice of suitable pile design and construction methods) to avoid creation of pathways to lower aquifers.	Follow on Project
8	Ground gas / vapour assessment	Assessment of soil gas and soil vapour hazard and appropriate design and construction.	Follow on Project
9	Protection of monitoring installations and facilities	Undertake any required measures to protect monitoring and groundwater remediation installations and facilities. Any damage to such installations or facilities is to be reported to the Permit to Proceed team (see Appendix D) as soon as practicable so that remedial works / decommissioning (as appropriate) can be undertaken.	Follow on Project
10	Completion of unremediated areas	Should the areas retained be subject to alteration, then the Follow On Project shall complete the necessary remediation works.	Follow on Project
11	Final validation report	The Follow On Project shall produce and gain approval of final validation report on completion of construction to complete above monitoring and remediation requirements, primarily the provision of the full HHSL.	Follow on Project
12	Excavation of soils at the Site	<p>The Permit To Proceed Protocol (Appendix E) must be implemented for all below ground works. A review of available data relating to the condition of the soils at the Site should be undertaken prior to any excavation and appropriate precautions must be undertaken.</p> <p>The Validation Reports prepared by Enabling Works are based on long-term risks to the end-user assuming the Legacy end use stated in the SSRS and does not consider risks to construction or maintenance workers when validating the site. Any risks to construction workers can safely mitigated through PPE and suitable engineering precautions. Reference should also be made to the Health & Safety File.</p>	Follow on Project(s) / Future land owners
13	Restrictions to remediation	<p>Restrictions to remediation exist in defined areas of PDZ2 as shown on Figure 9.</p> <p>If these areas are developed in the future, an assessment will be required to determine if remediation is required. In the meantime, any construction adjacent to the areas should consider available evidence from samples taken at the limits of the remediation works.</p>	Follow on Project(s) / Future land owners

No.	Title	Description	Action By
14	Risk assessments	In addition to risk assessments outlined above regarding excavation of soils at the Site, appropriate risk assessments would need to be undertaken with respect to UXO, pathogens, asbestos, radiation and ground gas/vapours when undertaking excavations and / or construction activities at the Site.	Follow on Project(s) / Future land owners
15	Soil vapour	The future land owner should be cognisant of the below ground concentrations particularly with respect to vapours in the vicinity of borehole NBHCZ2a-810 [e.g. creation of a migration pathway from piling]. As outlined further in item 15 below, should development be proposed over this area then a reassessment of the risks may be required.	Future land owners
16	Future land use	<p>The areas designated for different land uses shall not be amended without reassessment of the soil conditions. In particular if the Legacy redevelopment plan is amended such that the locations associated with NBHCZ2a-810 are situated beneath buildings, rather than on the concourse, further monitoring and assessment would be necessary to evaluate the potential risks from the vapour inhalation pathways and to define any required mitigation measures for the development.</p> <p>The Site shall not be used for growing edible crops or for private gardens.</p>	Future land owners
17	Changes in final level	Changes reducing final levels at all will need a reassessment of the underlying soil and potentially additional investigation or remediation. The design levels used for the Enabling Works remediation assume that a minimum 600mm thickness HSSL will be provided.	Follow on Project(s) / Future land owners

6. References

1. Planning Application Approval (Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application, Application No – 07/90011/FUMODA, Date of Application - 7th February 2007): Condition 35
2. Planning Application Approval (Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and their Legacy Conditions Planning Application, Application No – 07/90010/OUMODA, Date of Application - 7th February 2007): Condition 36
3. PDZ2 Site Specific Remediation Strategies (SSRS):
 - a) Capita Symonds. REP-CSP-VZ-02b-OLP-XXX-E-0170. Preliminary SSRS PDZ2 (CZ2b). January 2007. (ODA Ref.: 07/90011/AODODA)
 - b) Atkins. REP-ATK-CM-02a-OLP-XXX-E-0002. SSRS for CZ2a. April 2008. (ODA Ref: 08/90130/AODODA)
 - c) Atkins. REP-ATK-CM-02a-OLP-XXX-E-0003. SSRS for CZ2a - Addendum to Final Report. May 2008. (ODA Ref.: 08/90130/AODODA)
 - d) Atkins. REP-ATK-CM-02a-OLP-XXX-E-0004. Corrigendum to the SSRS for CZ2a. July 2008. (ODA Ref.: 08/90288/AODODA)
 - e) Atkins. REP-ATK-CM-02b-XXX-XXX-E-0002. CZ2b Office Building Position Paper. August 2008 (*this Position Paper was not formally submitted to PDT, but is referred to within the 2b SSRS (ODA Ref: 08/90318/AODODA)*).
 - f) Atkins. REP-ATK-CM-02b-OLP-XXX-E-0002. SSRS for CZ2b. October 2008. (ODA Ref: 08/90318/AODODA)
 - g) Atkins. REP-ATK-CM-02a-OLP-XXX-E-0007. SSRS for CZ2a, Addendum 2. December 2008. (ODA Ref: 09/90014/AODODA)
 - h) 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)
 - i) Atkins. 0241-ENW-ENW-CM-REP-0007. Southern Plume Position Paper: SSRS Addendum for CZ2a, CZ2b, CZ3a (Banner Chemicals), CZ3b (Pumping Station), CZ8a, CZ8b, CZ8c North and CZ8c South. April 2011. (ODA Ref: 10/90567/AODODA)
4. Groundwater Reports
 - a) Capita Symonds. REP-CSP-VZ-ZZZ-OLP-XXX-E-0866. Lower Lea Valley Groundwater Model. July 2008. (*this document is referenced within ODA Ref: ODA Ref: 08/90318/AODODA*)
 - b) Halcrow Group Limited. REP-ENL-CM-ZZZ-OLP-SP1-E-0012. British Waterways. Lower Lea Impoundments: Assessment of the Effects on Groundwater in the Terrace Gravels. January 2007. (*this document is referenced within ODA Ref.: 09/90031/AODODA*)
5. PDZ2 Remediation Method Statements (RMS):
 - a) Nuttall. MST-ENL-CE-02A-OLP-SP1-E-0055. CZ2a Ground Contamination RMS. December 2008. (ODA Ref.: 08/90288/AODODA)

- b) Nuttall. MST-ENL-CK-02b-OLP-SP1-E-0079. Ground Contamination RMS for CZ2b (Planning Delivery Zone 2). April 2009. (ODA Ref.: 09/90031/AODODA)
 - c) WSP. MST-ENL-CE-02a-OLP-SP1-E-0116. Olympic Park CZ2A River Terrace Deposits Groundwater (Zone One and LNAPL) RMS. June 2009. (ODA Ref.: 09/90164/AODODA)
 - d) Nuttall. MST-ENL-CK-02a-OLP-SP1-E-0121. Addendum to the Ground Contamination RMS for CZ2a (Delivery Zone 2). July 2009. (ODA Ref.: 09/90226/AODODA)
 - e) Nuttall. MST-ENL-CE-ZZZ-OLP-SP1-E-0270. Southern Plume RMS. April 2011. (ODA Ref.: 10/90606/AODODA)
6. PDZ2 Validation Reports:
- a) Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0090. CZ2a and 2b. Human Health Validation Report (Excluding Late Access Areas). October 2009. (ODA Ref.: 09/90334/AODODA)
 - b) Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0091. CZ2a and 2b Unsaturated Zone Validation Report. November 2009. (ODA Ref.: 09/90399/AODODA)
 - c) WSP. REP-ENL-CE-02a-OLP-SP1-E-0222. Olympic Park CZ2a RTD Groundwater (Zone One and Zone Two LNAPL) Verification Report. May 2010. (ODA Ref.: 09/90369/AODODA)
 - d) Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0320. CZ2a and 2b Unsaturated Zone Validation Report Addendum. May 2010 (ODA Ref.: 10/90586/AODODA)
 - e) Nuttall. REP-ENL-CE-ZZZ-OLP-SP1-E-0458. CZ2a, CZ2b, CZ3a, Cz3b (Pumping Station), CZ8a, CZ8b and CZ8c Southern Groundwater Plume Validation Report. October 2011. (ODA Ref.: 11/90733/AODODA)
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9. Nuttall. MST-ENL-CE-ZZZ-OLP-SP1-E-0006. Decommissioning and Protection of Retained Boreholes and Window Sample Installations and Removal of Concrete Rings, April 2008 (*this document is referenced within* ODA Ref.: 10/90586/AODODA)

FIGURES

- Figure 1: Location of Planning Delivery Zone 2
- Figure 2: Olympic End Use for Planning Delivery Zone 2
- Figure 3: Legacy End Use Planning for Delivery Zone 2
- Figure 4: Site Investigation Locations for Planning Delivery Zone 2 (A0)
- Figure 5: Sub Grade Level for Planning Delivery Zone 2 (A0)
- Figure 6: Sub Formation Level for Planning Delivery Zone 2 (A0)
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- Figure 8: Extent of Marker Layer and Human Health Separation Layer for Planning Delivery Zone 2
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- Figure 10: Summary of Exceedances requiring Action by Follow On Projects
- Figure 11a: Spatial Coverage of Enabling Works Validation Reporting Areas for Planning Delivery Zone 2 [Health Health]
- Figure 11b: Spatial Coverage of Enabling Works Validation Reporting Areas for Planning Delivery Zone 2 [Groundwater]

DRAWINGS

- ENW-ATK-2-SP1-DR-Y-3-H11-0022 – CZ2a Conceptual Site Model (reproduced from the SSRS)
- ENW-ATK-2b-SP1-DR-Y-3-H11-0024 - CZ2b Human Health Conceptual Site Model (reproduced from the SSRS)
- ENW-ATK-2b-SP1-DR-Y-3-H11-0025 - CZ2b Controlled Waters Conceptual Site Model (reproduced from the SSRS)
- ENW-ATK-2-SP1-DR-Y-3-H11-0016: (CZ2a) Human Health Zoning (reproduced from the SSRS)
- SKE-ATK-XX-ZZZ-OLP-XXX-O-0003: Sub Zone Remediation Areas (including areas anticipated as no remediation)
- ENW-ATK-2-SP1-DR-Y-3-H11-0056: Site Plan Showing Controlled Water Zones (reproduced from the SSRS)
- 2DD-ENL-CK-02Z-OLP-SP1-E-0514: CZ2 – Extent of Radioactivity Surveys
- 2DD-ENL-CK-02Z-OLP-SP1-E-0579: CZ2 – Location of Temporary Exempt Radioactive Waste Deposition (which has since been removed)

APPENDICES

Appendix A: Glossary of Terms and Definitions

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Appendix C: Key Parties

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APPENDIX A:

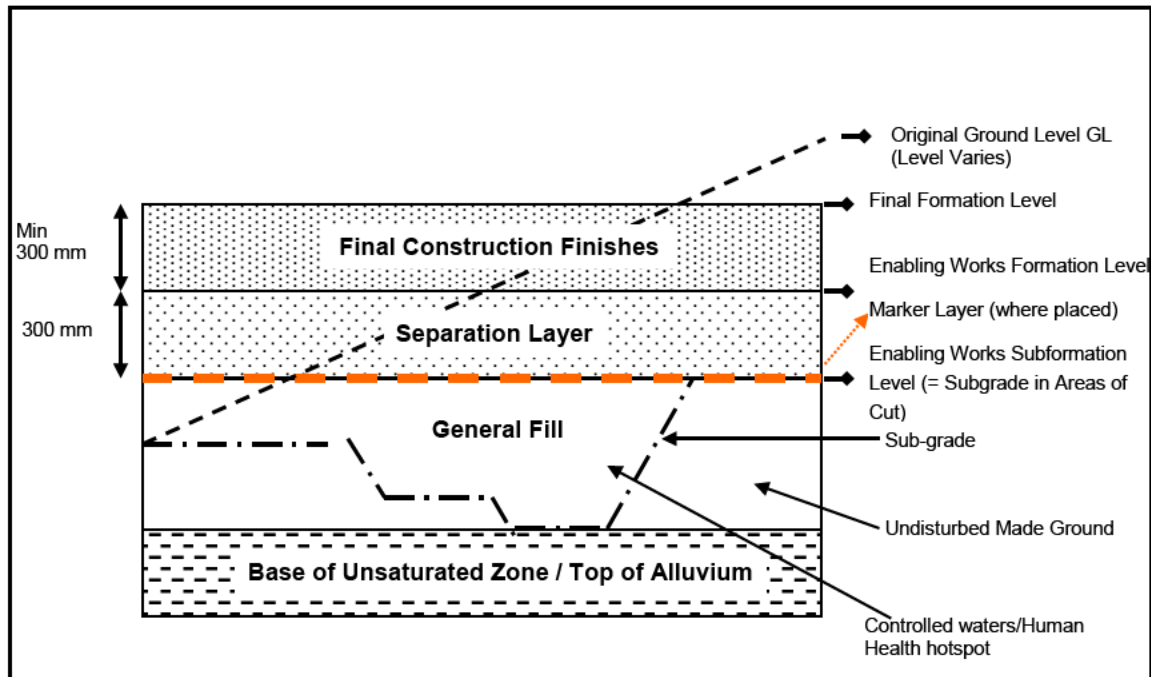
Glossary of Terms and Definitions

Glossary of Terms and Definitions

Term	Meaning / Definition
BNL	BAM Nuttall Limited (Enabling Works)
CoC	Contaminant(s) of Concern
CSM	Conceptuel Site Model
CVR	Consolidated Validation Report
CZ	Construction Zone
DPVE	Dual Phase Vapour Extraction
DQRA	Detailed Quantitative Risk Assessment
EA	Environment Agency
EQS	Environmental Quality Standard
ESGL	Environmental Scientifics Group Limited
EWFL	Enabling Works Formation Level
FFL	Final Finished Level
GRS	Global Remediation Strategy
GQRA	Generic Quantitative Risk Assessment
GWAC	groundwater assessment criteria
HHSL	Human Health Separation Layer
LDA	London Development Agency (see OPLC)
LNAPL	light non-aqueous phase liquid
ODA	Olympic Delivery Authority
ORC	Oxygen Release Compound
PAH	Polycyclic Aromatic Hydrocarbons
ODA PDT	Olympic Delivery Authority Planning Decisions Team
OPLC	Olympic Park Legacy Company (formerly known as LDA)
PDZ	Planning Delivery Zone
RMS	Remediation Method Statement
RTD	River Terrace Deposits
SSAC	Site Specific Assessment Criteria

SSRS	Site Specific Remediation Strategy
SSRSpec	Site Specific Remediation Specification
SSRT	Site Specific Remediation Target
UXO	Unexploded Ordnance
WSP	WSP Group Plc
WYGE	White Young Green Environmental

Generalised Earthworks Summary and Terminology



APPENDIX B:
Schedule of Key Documentation
(including summary of contents)

SUMMARY OF CONTENTS

This section provides a summary of the development of remedial design, implementation and validation relevant to this Planning Delivery Zone. In addition, we have summarised two site wide documents that form the basis for design and five that have resulted in changes to the SSACs for clarity. In the case of the latter five documents, whilst these are referred to the applicable Validation Reports, and in some cases the RMS's, it is felt that given the impact these reports have had, that these should be specifically discussed in this section. This section should be read in conjunction with the text of this CVR and the reference list presented in Section 6.

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 has been 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 Site Specific Remediation Strategies (SSRS) to support planning application requirements and detailed design.

In particular the intrusive investigation works provided sufficient information to:

- (i) assess the nature, extent and source of soil and groundwater contamination;
- (ii) assess the soil gas generation potential;
- (iii) prepare site conceptual model;
- (iv) undertake generic and detailed quantitative risk assessment; and
- (v) 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 Olympics, the GRS has been 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 (QRA) has been undertaken to derive generic screening values for areas potentially requiring remediation.

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

Atkins. REP-ATK-CM-ZZZ-OLP-ZZZ-E-0004. Proposed changes to the Human Health SSAC values for Lead, General Metals, and PAHs in the Separation Layer and General Fill. August 2008. (ODA Ref.: 08/90265/AODODA)

Revised SSAC were calculated for lead using the Provisional Tolerable Weekly Intake method for the Soft Landscaping Legacy end use, for general metals using a single Soil Ingestion Rate, and for PAHs assessing the potential contribution from each of the vapour inhalation pathways based on the Henry's Law Constant.

Atkins. REP-ATK-CM-ZZZ-OLP-ZZZ-E-0004 Errata to Document entitled 'Proposed changes to the Human Health SSAC values for Lead, General Metals, and PAHs in the Separation Layer and General Fill'. September 2008. (ODA Ref.: 08/90265/AODODA)

This report recalculated the lead SSAC using the inhalation Tolerable Daily Intake and the dermal pathway. This resulted in a new SSAC for areas of soft landscaping not associated with commercial buildings.

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 SSRS 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 memorandum 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.

Site-Specific Documents

Capita Symonds. REP-CSP-VZ-02b-OLP-XXX-E-0170. Preliminary SSRS PDZ2 (CZ2b). January 2007 (ODA Ref.: 07/90011/AODODA)

This report presents the preliminary design for CZ2b outlining the site history, environmental setting, CSM, preliminary risk assessment and remedial design. The preliminary remedial design outlines the potential requirement for the selective removal of contamination hotspots and the placement of chemically and geotechnically compliant materials to the EWFL. However, given the report was based on an insufficient spatial coverage of CZ2b the SSRS concluded further investigation is required to adequately characterise the ground and contamination conditions and for these findings to be included in a Full SSRS.

Atkins. REP-ATK-CM-02a-OLP-XXX-E-0002. SSRS for CZ2a. April 2008 (ODA Ref: 08/90130/AODODA)

The report outlines the CSM, preliminary risk assessment and specifies the remedial strategy. The remedial strategy includes derivation of SSACs, remediation and the installation of a chemically and geotechnically compliant materials to the EWFL. The Designers identified seven discrete outliers requiring remedial action in the unsaturated soils and site wide exceedances from ammoniacal nitrogen and four PAHs to address risks to controlled waters receptors. The controlled waters DQRA also identified two perched water sources requiring remedial action and specified treatment of the underlying RTD. The Designers also identified the presence of free phase in discrete areas within the perched water, RTD and Lambeth Group that require removal. No risks to Human Health were identified.

Atkins. REP-ATK-CM-02a-OLP-XXX-E-0003. SSRS for CZ2a - Addendum to Final Report. May 2008 (ODA Ref.: 08/90130/AODODA)

This addendum has been prepared to incorporate recommendations made in the main SSRS in order to reduce the conservatism of the controlled water risk assessment approach. These changes comprise: revised zoning across the site; introducing a pathway length by acknowledging that across the southern section of the site the source is not adjacent to the receptor as groundwater in River Terrace Deposits flows from west to east (towards Waterworks River). In addition, site specific Kd values using soil and leachate concentrations for PAHs was developed. These changes directly impacted upon the remedial strategy by way of this reassessment which resulted in no unsaturated zone hotspots requiring removal; perched water treatment is no longer considered necessary; but treatment of the underlying RTD is required at 13 locations.

Atkins. REP-ATK-CM-02a-OLP-XXX-E-0004. Corrigendum to the SSRS for CZ2a. July 2008 (ODA Ref.: 08/90288/AODODA)

This report presents updated SSACs that supersede those presented in Appendix J of the CZ2a SSRS Addendum.

Atkins. REP-ATK-CM-02b-XXX-XXX-E-0002. CZ2b Office Building Position Paper. August 2008 (*this Position Paper was not formally submitted to PDT, but is referred to within the 2b SSRS (ODA Ref: 08/90318/AODODA)*).

A Position Paper for the CZ2b temporary offices was necessary due to the acceleration of the construction programme. Given the limited data, the Position Paper relies on the CSM developed in the initial CZ2a SSRS, by utilising CZ2a Zone 1 controlled waters SSACs alongside the appropriate GAC for the human health assessment. This Position Paper is based on installation of a marker layer and HHSL (or a hardstanding) and the removal of identified hotspots in unsaturated soils. This report concluded that potential exposures to human health are not expected to exceed the derived, conservative GAC relevant to the Office Building and that no remediation will be required for the protection of the Waterworks River. The findings of this report were superseded by the subsequent CZ2b SSRS (see below).

Atkins. REP-ATK-CM-02b-OLP-XXX-E-0002. SSRS for CZ2b. October 2008 (ODA Ref: 08/90318/AODODA)

The report outlines the CSM, preliminary risk assessment and specifies the remedial strategy. The remedial strategy includes derivation of SSACs and remediation and the installation of a chemically and geotechnically compliant materials to the EWFL. The Designers identified one unsaturated zone hotspot requiring treatment to be protective of Human Health, one perched water hotspot requiring treatment to be protective of Human Health and treatment of the RTDs for both inorganic and organic contaminants.

Nuttall. MST-ENL-CE-02A-OLP-SP1-E-0055. CZ2a RMS. December 2008 (ODA Ref.: 08/90288/AODODA)

This report is based on the SSRS Addendum (May 2008) and Corrigendum (July 2008) respectively and specifies the implementation of the remedial design. In addition to the placement of geotechnically and chemically compliant backfill, there is also a requirement for the treatment of the RTDs. There are no unsaturated zone hotspots or perched water requiring treatment.

Atkins. REP-ATK-CM-02a-OLP-XXX-E-0007. CZ2a Addendum 2 SSRS. December 2008 (ODA Ref: 09/90014/AODODA)

This report updates the original SSRS and initial addendum (which considered controlled waters risk assessment alterations only) incorporating the most recent EWFL (Scenario 10) and additional site investigation and monitoring data collected subsequent to the previous SSRS and the associated addendum and corrigendum. This addendum includes risk assessment, updated SSACs and provides a revised remedial strategy. This assessment has resulted in the identification of four discrete areas in the unsaturated zone representing a risk to Human Health from VC and TPH and one discrete location representing a risk to controlled waters from Boron as well as treatment of the RTD.

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 600mm 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.

Nuttall. MST-ENL-CK-02b-OLP-SP1-E-0079. Ground Contamination RMS for CZ2b (Planning Delivery Zone 2). April 2009 (ODA Ref.: 09/90031/AODODA)

This report is based on the main SSRS (October 2008) and specifies the implementation of the remedial design. In addition to the placement of geotechnically and chemically compliant backfill, it also specifies the removal of the single unsaturated zone hotspot representing a risk to Human Health and confirms that no treatment of perched water is required following a BNL reassessment. It also confirms that additional monitoring of the underlying RTD will be undertaken prior to any treatment.

WSP. MST-ENL-CE-02a-OLP-SP1-E-0116. Olympic Park CZ2A River Terrace Deposits Groundwater (Zone One and LNAPL) RMS. June 2009 (ODA Ref.: 09/90164/AODODA)

This report provides the outline and detailed site works and infrastructure installations required to undertake RTD groundwater monitoring and potential remediation to achieve the following objectives: achievement of RTD Groundwater SSACs within CZ2a Treatment Zone One; and verification of LNAPL in Treatment Zone Two, to less than 5mm during monitored static recovery in the well or agreement from the Environmental Regulator. In addition, the dissolved phase contamination in Treatment Zone Two will be addressed as part of the wider Southern Plume investigation. Prior to detailed design, further investigation (set out in this report) is specified to identify and delineate the extent of dissolved phase contamination in Zone One and LNAPL in Zone Two.

Nuttall. MST-ENL-CK-02a-OLP-SP1-E-0121. Addendum to the Ground Contamination RMS for CZ2a (Delivery Zone 2). July 2009 (ODA Ref.: 09/90226/AODODA)

This report is based on the SSRS Addendum No.2 (December 2008) and specifies the implementation of the remedial design. In addition to the placement of geotechnically and chemically compliant backfill, BNL also specify the removal of 5 unsaturated zone hotspots (four for Human Health and one for Controlled Waters) noting the boron exceedance was withdrawn following discussions with the Environment Agency and BNL identifying another hotspot representing a risk to Human Health from TPH at NBHCZ2a-141. This RMS sets out the monitoring protocol to further assess the potential for groundwater treatment in the RTD. This will be further discussed in a groundwater specific RMS.

Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0090. CZ2a and 2b. Human Health Validation Report (Excluding Late Access Areas). October 2009 (ODA Ref.: 09/90334/AODODA)

This report validates the remedial works in the majority of PDZ2 comprising delivery of the EWFL, remediation of two of the six hotspots (the remaining four locations were outside of the reporting area) via excavation, validation and backfilling with geotechnically and chemically compliant fill. In addition, a temporary holding area was constructed to receive Exempt radioactive materials [classified Exempt in accordance with the *Radioactive Substances (Phosphatic Substances, Rare Earths etc) Exemption Order 1962* made pursuant to the *Radioactive Substances Act 1993*]. A total volume of 193m³ was temporarily deposited in two cells located adjacent to other another within CZ2 prior to off-site disposal to an appropriately licensed facility. A clearance survey of the temporary holding area found all the survey results were comparable with background levels and therefore no further action is required.

Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0091. CZ2a and 2b Unsaturated Zone Validation Report. November 2009 (ODA Ref.: 09/90399/AODODA)

This report validates the remedial works in PDZ2 comprising delivery of the EWFL, removal of the remaining identified hotspots totalling five Human Health and one controlled waters hotspots. In addition, BNL also removed two hotspots that were subsequently withdrawn by the Designers [this is excluded from Table 4.1 of the main report]. These hotspots were removed, validated and backfilled with geotechnically and chemically compliant fill.

WSP. REP-ENL-CE-02a-OLP-SP1-E-0222. Olympic Park CZ2a RTD Groundwater (Zone One and Zone Two LNAPL) Verification Report. May 2010 (ODA Ref.: 09/90369/AODODA)

Following further investigations, monitoring, sampling and analysis in CZ2a Zone One, with the exception of ammoniacal nitrogen, no exceedances of the SSAC have been recorded. It was therefore agreed, in line with the RMS, that no treatment works were considered necessary. It was also agreed with the Environmental Regulators that no treatment of ammoniacal nitrogen was necessary as these concentrations were comparable to those encountered in up groundwater gradient samples.

No evidence of LNAPL or sheen has been identified in CZ2a Zone Two during the three months of weekly monitoring. Furthermore, laboratory analysis of dissolved phase groundwater concentrations did not identify any significant hydrocarbon concentrations across CZ2a Zone Two. It is on this basis that no active remedial works are required at the site.

Elevated concentrations of dissolved phase contaminants including vinyl chloride previously identified in the RTD groundwater in CZ2a Zone Two will be addressed as part of the Southern Plume investigation and assessment.

Nuttall. REP-ENL-CK-02Z-OLP-SP1-E-0320. CZ2a and 2b Unsaturated Zone Validation Report Addendum. May 2010 (ODA Ref.: 10/90586/AODODA)

This report validates the additional works completed since submission of the main validation report. In summary, one outstanding action was identified in the main unsaturated zone report associated with further assessment of borehole NBHCZ2a-810 due to elevated levels of TPH, VOC and PAH encountered at the base of the Made Ground during installation of the borehole. Further assessment was undertaken using vapour monitoring which concluded that there was no unacceptable risk to human health. Additional groundwater monitoring concluded that there was no unacceptable risk to controlled waters.

SOUTHERN PLUME

Atkins. 0241-ENW-ENW-CM-REP-0007. Southern Plume Position Paper: SSRS Addendum for CZ2a, CZ2b, CZ3a (Banner Chemicals), CZ3b (Pumping Station), CZ8a, CZ8b, CZ8c North and CZ8c South. April 2011. (ODA Ref: 10/90567/AODODA)

This report presents a detailed technical review of the distribution of contaminants in River Terrace Deposits groundwater in the area referred to as the Southern Plume (CZ2a, CZ2b, CZ3a, CZ3b, CZ8a, CZ8b and CZ8c). The following contaminants of concern (COC) are considered relevant to the Southern Plume - tetrachloroethene (PCE); trichloroethene (TCE); cis-1,2-dichloroethene (cDCE); vinyl chloride (VC); and arsenic. This report also sets out the requirements for remediation and monitoring of the COC concentrations (as appropriate) in the Southern Plume and as such, constitutes an SSRS addendum for the construction zones listed above. Quarterly monitoring for chlorinated ethenes, ethene and arsenic will be carried out and the monitoring results will be evaluated to demonstrate the validation criteria is being met. These assessments will be presented at meetings with the Regulators. In addition, quarterly monitoring reports will be produced and submitted to the PDT as informatives prior to the final validation report. If the validation requirements are met and subject to approval by the PDT, monitoring will cease after a period of one year.

Nuttall. MST-ENL-CE-ZZZ-OLP-SP1-E-0270. Southern Plume RMS. April 2011. (ODA Ref.: 10/90606/AODODA)

This reports outlines how the remediation and monitoring strategy defined in the SSRS addendum will be implemented and sets out the validation objectives and the proposed content of the validation report.

Nuttall. REP-ENL-CE-ZZZ-OLP-SP1-E-0458. CZ2a, CZ2b, CZ3a, Cz3b (Pumping Station), CZ8a, CZ8b and CZ8c Southern Groundwater Plume Validation Report. October 2011 (ODA Ref.: 11/90733/AODODA)

This report assesses and provides a commentary upon the contaminant data collected from the specified monitoring network. This report concludes that complete dechlorination is occurring resulting in concentrations of PCE, TCE, cDCE and VC being less than the SSAC and recorded arsenic concentrations being compliant with the wider plume objectives primarily as a result of source removal. In summary, this report confirms via monitoring, that the Southern Plume COCs do not represent an unacceptable to risk to Human Health and Controlled Waters. Following review of this report, the PDT has requested that monitoring be extended both in its geographical extent (as monitoring wells in CZ3a Banner are now included) and duration (monitoring to be undertaken for a further 12 months based on monthly monitoring for the first quarter and then quarterly thereafter), although the overall number of monitoring wells has significantly reduced.

In addition to the discrete fluctuation of cDCE and Vinyl Chloride in NBHCZ3a-1043 and NBHCZ3a-889 in the final two rounds of the initial groundwater monitoring regime, during further discussions with the PDT it was agreed that groundwater monitoring would continue to understand further the ongoing stability of the residual plume, following completion of the in-situ remedial works in the former Banner Chemicals area. It is considered that this additional monitoring will enable the longer term assessment of these contaminant trends particularly as the aquifer returns to a state of equilibrium and hence a further 12 month period of groundwater monitoring will be undertaken which will commence as soon as reasonably practicable post Games in order to establish the long term trends in contaminant concentrations. This monitoring

will specifically target the presence of the main contaminants of concern in this area, which includes vinyl chloride, chlorinated ethanes, dissolved ethanes, methane, arsenic, and total organic content determinants such as sulphate, iron and chloride. In addition the presence or absence of non-aqueous phase liquids (NAPL) will also be recorded. On the basis of these monitoring works the need for any further remedial works as required by the Regulator/PDT to fully discharge Condition 35 will be defined.

APPENDIX C:

Key Parties

Key Parties for PDZ2

Responsibility	Organisation
Client:	Olympic Delivery Authority (ODA)
Land owner:	Olympic Park Legacy Company (OPLC) (this was transferred from London Development Agency)
Local Planning Authority:	ODA Planning Decisions Team - PDT
Key Stakeholders:	British Waterways Environment Agency London Borough of Newham
Client's Project Manager:	Atkins
Designer:	Atkins
CDM Coordinator:	Arup
Enabling Works Tier 1 Contractor:	BAM Nuttall Limited (Nuttall)
Enabling Works Tier 1 Contractor Technical Adviser – Remediation:	Halcrow
Main soil treatment contractors (Tier 2 Contractor):	DEME Environmental Contractors (DEC)
Groundwater Monitoring – Enabling Works:	BAM Nuttall Ltd.
Groundwater Monitoring – Post Enabling Works:	WSP Environmental
Chemical Testing Laboratory:	TES Bretby (ESGL)
Geotechnical Testing Laboratory:	Environmental Services Group Limited (ESGL)
Groundwater remediation in CZ2a (Tier 2 Contractor)	Erith/WSP Remediation
UXO Study:	BAE Systems
Radiological Specialists:	NUVIA (formerly known as NUKEM)

APPENDIX D:

Assessment of Retained Areas in PDZ2

APPENDIX E:
Permit to Proceed Protocol (CD only)

