

London 2012 Olympic Park

Follow-on Project (Stage 2) Consolidated Validation Report – Planning Delivery Zone 3

January 2013

Notice

This document and its contents have been prepared and are intended solely for the Olympic Delivery Authority (ODA's) information and use in relation to summarising the ODA Follow-on Project remediation and validation works within Planning Delivery Zone 3 on the Olympic Park site.

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Document History

JOB NUMBER: 5094113			DOCUMENT REF: REP-ATK-PM-03Z-ZZZ-ZZZ-Z-0001			
3	Final following PPDT comments 10/12/2012	████	████████	████	████	January 2013
2	Final following PPDT comments	████████	████████	████	████	November 2012
1	Final	████████	████████	████ ████	████	August 2012
0	Draft for comment	████████	██████	████ ████	████	March 2012
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

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PART III

1. Introduction

1.1 Scope

The aim of this Stage 2 Consolidated Validation Report (CVR) is to provide a high level summary of the approved Follow-on Project earthworks remediation related documentation pertaining to Planning Delivery Zone 3 (PDZ3) of the London 2012 Olympic Park, Stratford, London. These remediation earthworks were completed as part of the Olympic Delivery Authority (ODA) redevelopment of the Olympic Park. This Follow-on Project (FoP) Stage 2 CVR provides information with regards to the ODA FoP earthworks, which have been completed following on from creation of the Enabling Works platform. The Enabling Works validation scope has been reported separately within the Enabling Works (Stage 1) CVR (Ref. 1). The Enabling Works (Stage 1) and FoP (Stage 2) CVRs form the complete consolidated validation report for ODA works within each PDZ.

This FoP (Stage 2) CVR is produced on the basis that the individual FoP remediation and validation reports have previously been approved by the Local Planning Authority (now the London Legacy Development Corporation Planning Policy and Decisions Team (PPDT) formerly the ODA PDT). Therefore, this report does not reproduce or re-evaluate any of the detailed testing, results, or assessments that have been previously reported, which are referred to herein. This document provides a summary of existing FoP validation information and no new information is presented.

This document has been prepared to discharge the ODA's obligation under Condition OD.0.36 ('Protection and Validation of Remediation') of the 2007 Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Their Legacy Transformation Planning Application (Ref. 2) as well as a number of related Slot-In validation Planning Conditions, as outlined in Section 1.3 below.

1.2 Report Objectives

As the focus of the CVR reports is to discharge the relevant Planning Conditions associated with validation reporting on the Olympic Park, the CVRs are to be issued in stages to provide clarity and ensure progressive regulatory approval is achieved. The staged process is set out below and shall discharge the prevailing planning obligations as follows:

- **Stage 1** – *submitted separately via the Enabling Works CVR* - comprises Part I (Background) and Part II (Implementation of Design – Site Preparation (Enabling Works)). Part I sets out the completed remediation works within the context of the preceding remedial design. Part II discusses the implementation and validation works completed by the Enabling Works Team. The objective of this CVR (Stage 1) is to discharge fully the ODA's obligations under Condition SP.0.35 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Site Preparation Planning Application (Ref. 3).
- **Stage 2** – *this document* - comprises Part III (Implementation of Design – Olympic Development (Follow-on Projects)). Part III presents the completed construction and remediation works as

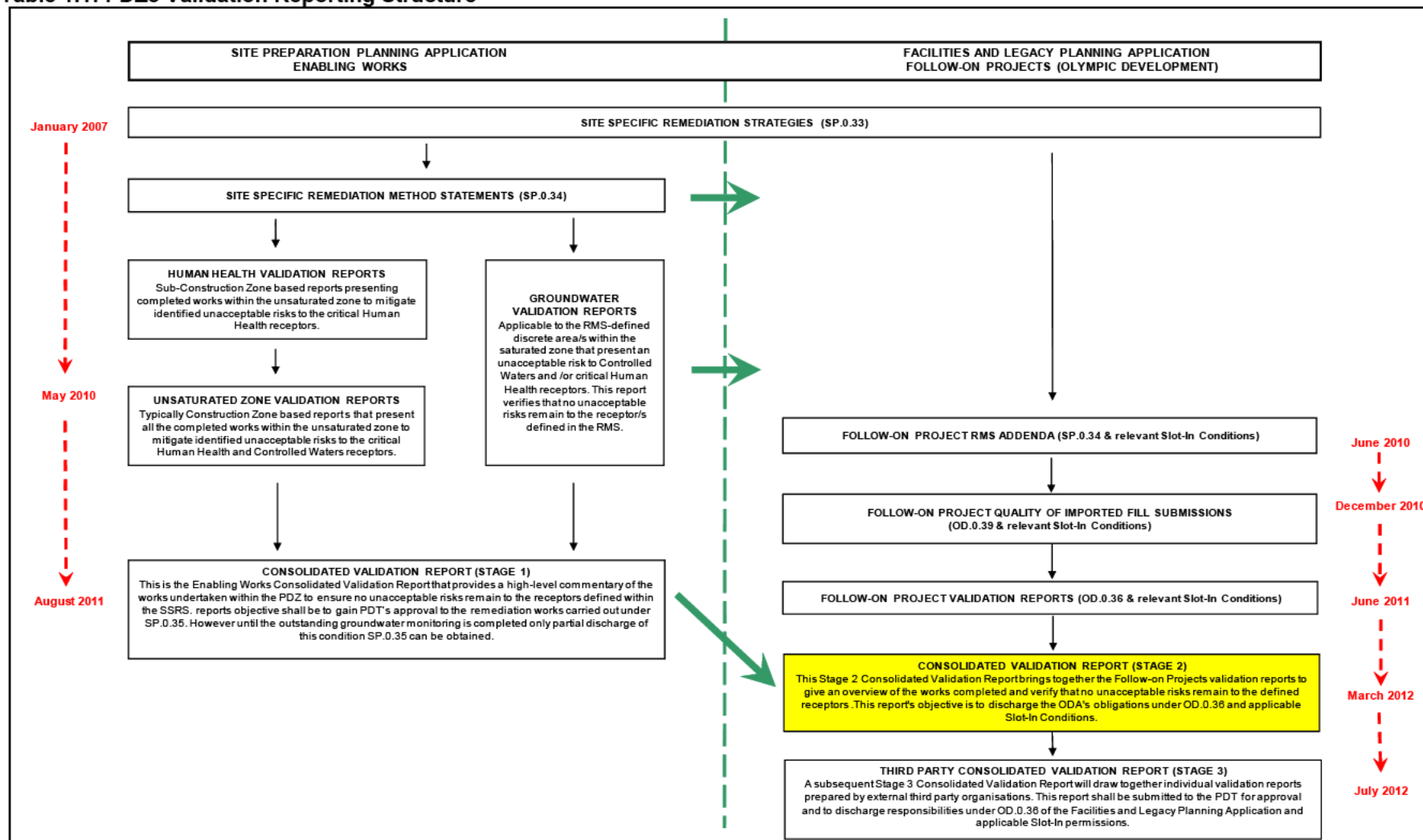
required to facilitate the development aspects of the works i.e. infrastructure, venues and landscaping. This CVR is submitted to discharge the ODA's obligation under Condition OD.0.36 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Their Legacy Transformation Planning Application (Ref. 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 (HHSL) 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 PPDT approval of their works by way of separate validation reports. As a consequence of these separate validation reports, a further CVR (Stage 3) will be required to be submitted under Condition OD.0.36 of the Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Legacy Transformation Planning Application (Ref. 2). This Stage 3 CVR has been prepared and submitted independently, by LOCOG, and includes the sponsor showcase and Games time overlay works.

This Stage 2 CVR also provides a summary of the Enabling Works residual actions which have been closed out by the FoPs, and those which remain to be addressed. Together with the Enabling Works (Stage 1) CVR and, the Stage 3 CVR, this report is intended to inform future developers/owners/operators at the site, including the London Legacy Development Corporation (LLDC) of the remediation and validation works completed. In addition, these reports will look to highlight any residual actions / issues which need to be considered as part of future development.

Future stages of CVR production will likely be required to capture post-Games Transformation and Legacy re-development works. The PDZ3 validation reporting sequence presenting the three stages of the Consolidated Validation Reporting process is presented in Table 1.1 below.

Table 1.1: PDZ3 Validation Reporting Structure



* Please refer to Appendix B for a summary of each report and the development of the remedial design, implementation and validation

1.3 Relevant Planning Conditions

The reporting boundary for this PDZ3 FoP (Stage 2) CVR is presented on the attached Figure 1.

This document is submitted to PPDT for discharge of the Planning Condition OD.0.36 of the 2007 Park-wide Olympic, Paralympic and Legacy Transformation Planning Applications: Facilities and Their Legacy Transformation Planning Application (Decision Notice Ref. 11/90313/VARODA) (Ref. 2), which states:

'Validation of the Remediation Works for the purposes of human health protection must be provided within two months of completion of the Final Build Layer within any Construction Zone. When all works for the protection of human health are completed within each Planning Delivery Zone, a consolidated validation report, drawing together the Construction Zone validations, shall be submitted to the Local Planning Authority. This shall include topographic mapping of the final finished ground levels'.

In addition, this document seeks to discharge the equivalent Planning Condition from a number of subsequent Slot-In Planning Applications relating to specific variations in the construction of certain infrastructure, buildings and landscaping from those set out in the original 2007 Application. These Conditions have similar wording to OD.0.36 above and are written so as to dovetail with this Condition. These Slot-In Conditions are listed below and further detail regarding their status is provided in Table 2.3:

- Infrastructure (Outer Perimeter Security Fence (OPF)) - 08/90151/FULODA (Condition 26)
- Infrastructure (Loop Road) - 08/90194/FULODA (LOD.22)
- Infrastructure (Underpass U02) - 08/90353/FULODA (UOD.27)
- Infrastructure (Temporary ramp to Bridge H17) - 09/90247/FULODA (Condition 23)
- Infrastructure (Underpass U06) - 09/90022/FULODA (UOD.28)
- Infrastructure (Secondary Access Roads) - 09/90298/FUMODA (Condition 22)
- Infrastructure (OPF River Sections) - 10/90298/FULODA (Condition 21)
- Infrastructure (Emergency Services Staging Area 3f) – 11/90753/FULODA (Conditions 26 & 27)
- Utilities (Terminal Pumping Station) - 08/90059/OUTODA (Condition 25)
- Utilities (Multi-zonal below ground Utilities) - 12/90021/FULODA (Condition 12)
- Utilities (Deep Foul Sewer) - 08/90060/FULODA (Condition 21)
- Utilities (Utilities Corridor) - 08/90377/FULODA (Condition 16)
- Utilities (Electrical Transformers) - 09/90211/FULODA (Condition 19)
- Utilities (Old Ford Water Recycling Plant) - 10/90060/FULODA (WOD.34)

- Utilities (Transformer EN318) – 10/90585/FULODA (Condition14)
- Venues (Warm-Up track) - 10/90331/OUTODA (Condition 32)

1.4 Site Location

PDZ 3 is located approximately 1.1 km west of Stratford, London and comprises primarily the Main Olympic Stadium, within Construction Zone (CZ) 3a, and the Pumping Station, which along with the Athletics Warm-Up track (WUT) are located in CZ3b. CZ3a is a triangular parcel of land covering approximately 20ha that is bounded by surface watercourses (City Mill River to the east and the River Lea Navigation to the west and northwest) and the Greenway to the south. CZ3b is a rough triangular parcel of land and is bounded by the River Lea Navigation to the west, the railway line to the south and east and the Greenway to the north.

The site layout and location are presented on Figure 1.

For a summary of the wider site context/background of PDZ3, including the history, geology, hydrogeology, hydrology and site investigations completed refer to the Enabling Works (Stage 1) CVR (Ref.1).

1.5 Olympic and Legacy End Use

The Olympic and Legacy end uses for PDZ3, as defined by the Designers, are as follows:

Olympic Mode (see Figure 2): The Olympic Stadium forms approximately 50% of the total site area for CZ3a. The remainder of the site is covered with hard landscaping with a relatively small proportion of soft landscaping bordering the surface watercourses. The pumping station, deep sewer shaft and the WUT occupy CZ3b.

Legacy Mode (see Figure 3): The Main Olympic Stadium will remain in use as a legacy facility. The surrounding areas will be used for a combination of: residential; educational use; a permanent road; deep foul sewer; soft river bank; and soft landscaping. The Pumping Station part of CZ3b is designated as residential use.

Upon completion of the Olympic and Paralympic Games the WUT will be removed and the site will be returned to its original land owner, and therefore no legacy land use has been proposed in this area.

Changes to the design that have impacted the remediation aspects of the project were detailed and subsequently agreed with PPDT in Remediation Method Statements (RMSs), Site Specific Remediation Strategies (SSRSs) and their addenda/corrigenda (refer to Section 2.2).

1.6 Outstanding / Excluded Works

All preceding relevant Remediation Validation reports for PDZ3 had been approved by PPDT (refer to the report References and summary information in Appendix B).

Certain third party works, outside the ODA scope, have been completed in PDZ3 for which limited information is available for inclusion herein. This includes the construction of the Old

Ford water recycling plant and LOCOG Common Domain overlay works. As discussed in Section 1.2 above it will be the responsibility of the third parties to prepare, submit and obtain PPDT approval of their works by way of separate validation reports, which, for the LOCOG element, will be summarised within a separate Stage 3 CVR.

1.7 Report Limitations

This CVR is based on third party information made available to the ODA from the sources listed as key supporting data and references and this 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. Neither does this document present information from third parties working within the Planning Boundary, but whose works are outside of ODA's control or scope. Where appropriate, these works will be detailed within separate validation reports and summarised within a Stage 3 CVR.

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 and FoP Amendments

2.1 Background

The FoP works comprised construction of the principal infrastructure including: services/utilities; roads; bridges; and support structures; the key permanent and temporary venues; and the hard and soft landscaping for the London 2012 Games. Most of these structures were built on the earthworks platform constructed by the Enabling Works project whose remit comprised site clearance, demolition, earthworks and remediation works. The objective of the earthworks and remediation is to ensure the site has been remediated to a standard protective of both human health and controlled waters receptors as defined by the Olympic and Legacy Masterplans.

The remedial strategy for the Park was set out in a series of increasingly focussed documents which commenced with a Global Remediation Strategy (GRS) (Ref. 4). The GRS was further developed by the CZ SSRSs (Ref. 5), which were informed by site investigation works completed in accordance with the Intrusive Investigation Method Statement (IIMS) (Ref. 5). The design documentation was further refined in a series of SSRS Addenda, to ensure the remedial works were reflective of the encountered ground conditions. These documents are all discussed in further detail within the Enabling Works (Stage 1) CVR (Ref.1).

Within the SSRS and SSRS Addenda, a Conceptual Site Model (CSM) was developed for CZ3a, which presented potential sources, pathways and receptors. Individual contaminant concentrations protective of either controlled waters or human health, termed Site Specific Assessment Criteria (SSAC), were derived through the SSRS risk assessment process.

The CZ3a CSM identified several human health critical receptors associated with the Olympic Park and Legacy end uses. It is on this basis that the CZ3a CSM was split into two Human Health zones based on the end use of the site: Zone I to the north which predominantly represented the Main Stadium and the surrounding landscape areas, while Zone II to the south covered the residential and education end uses. The critical receptors in Zone I were determined to be both a child and female adult; the child receptor is considered for the outdoor air pathway (in a residential scenario representative of soft landscaping) and the female commercial receptor for indoor air which represents Stadium occupancy. For Zone II a child receptor is considered the appropriate receptor. The key sources and pathways to these receptors include dermal contact/ingestion/inhalation of placed soils, especially within soft landscape areas and communal residential landscape space.

The critical controlled waters receptors were considered to be the City Mill River (to the east of the site), the River Lea (flows to the west) and the Waterworks River (located 200 m from the eastern boundary of CZ3a). In addition discontinuous perched water, a potential contamination source, was identified within the lower portion of the Made Ground above the Alluvium, with groundwater present within the River Terrace Deposits

(RTD) Minor Aquifer. Deeper groundwater was present in the Lambeth Group, the Thanet Sands Formation and the Upper Chalk. In the context of the site, the groundwater within the RTD and Lambeth Group are not considered to be sensitive receptors on the basis that they have little resource potential and rather constitute potential pathways for contamination migration. The Thanet Sand Minor Aquifer is in continuity with the Chalk Major Aquifer which is considered to be a sensitive receptor. The Chalk is provided protection by a substantial thickness of low permeability soil in the upper overlying Lambeth Group, which acts as an aquitard to downward contaminant migration. On this basis there is not considered to be a direct pathway between the overlying RTD aquifer and the deeper Chalk aquifer and hence a pollutant linkage is not formed. However, in discrete areas within the south east of PDZ3 it is considered likely that the Lambeth Group has been compromised to allow the downward migration of contaminants.

The risk assessment process identified significant risks to both human health legacy and controlled waters receptors that required action in form of excavation, treatment and / or further investigation / delineation. As a result of this remediation work limited residual actions were transferred to the FoPs and these are outlined further in Table 3.1. All Enabling Works validation reports are summarised within the Enabling Works (Stage 1) CVR (Ref.1) and the process is presented graphically within the flow chart in Table 1.1.

For the CZ3b section of PDZ3 a pumping station SSRS (Ref. 6) and a Contamination Assessment Position Paper (Ref. 7) were issued for the areas within CZ3b. This document was designed to provide an indication of the soil and groundwater quality in terms of risks to human health during the Olympic phase only. The site will return to its original owner upon completion of its usage during the Olympics phase.

2.2 FoP Design

Guidance to assist the FoPs with their remedial works and production of planning related documents was produced by PDT (Ref. 8). This document provided a framework for the FoPs to follow when considering their remedial requirements, set out the anticipated contents of remedial planning submissions and included templates/tools to support the completion of these documents.

At the completion of the Enabling Works phase of the programme all identified remedial hotspots within PDZ3 had been addressed through appropriate removal or risk assessment such that the FoPs were not required to complete hotspot remediation. A number of residual remedial issues were identified by Enabling Works, which required consideration/action by the FoPs and/or future parties working on the site, as detailed in the Enabling Works (Stage 1) CVR (Ref. 1) and further reviewed in Section 3.2.

In broad terms the FoP remedial design comprised the completion of the remedial cover system, placement of compliant fill materials and validation of localised excavations to facilitate construction e.g. service corridors and foundation excavations. The remedial cover system comprised HHSL and Marker Layer, demarcating the better quality soil of the HHSL (see Section 3.3 and 3.4) from the underlying general fill and / or *in-situ* soils. Further, where projects encountered *in-situ* soils there was a requirement for the FoPs to assess further what remediation and validation would be required to ensure areas were suitable for Legacy use.

A summary of the design for the FoP works, comprising infrastructure, utilities and venues is provided within Table 2.1.

Table 2.1 – Summary of FoP Construction Design within PDZ3

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Team Stadium)	Bridge F07	Connecting northern section of the Main Stadium with east of PDZ4	Southern section	Northern section	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)
Infrastructure (Balfour Beatty, Structures, Bridges & Highways (SBH))	Bridge F08	Connecting eastern side of PDZ3 (Main Stadium) with north of PDZ2	Not applicable (N/A)	All areas	<ul style="list-style-type: none"> Continuous flight auger (CFA) piling Placement of reinforced earthworks, load transfer platform and general fill 	<ul style="list-style-type: none"> Final elevation 11 to 5.2 m above ordnance datum (AOD) approximately Surrounding area: 450 mm below final finish level (FFL). Marker Layer and HHSL installed. Bridge deck: FFL with no Marker Layer
Infrastructure (Team Stadium)	Bridge F11	Connecting PDZ3 to PDZ2	Northern section	Southern section	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Team Stadium)	Bridge F17	Connecting the north of PDZ3 and the east of PDZ4	Southern section	Northern section	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)
Infrastructure (Team Stadium)	Bridge H04	Connecting east of PDZ3 to west of PDZ2	Southern section	Northern section	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)	Details contained in the Main Stadium validation report (MS-BH-3AX-MU-DN-SZ-2-0116)
Infrastructure (Nuttall SBH)	Bridge H06	Spans over the City Mill River connecting the south eastern section of PDZ 3 with south of PDZ2	Entire structure	N/A	<ul style="list-style-type: none"> CFA piling VCCs installation Construction of retaining walls and placement of general fill Construction of gabion baskets containing crushed concrete 	<ul style="list-style-type: none"> Final elevation of bridge abutment: approximately 9.7 to 6.4 m AOD No Marker Layer and HHSL installed as part of the bridge abutment construction or approach ramp
Infrastructure (Nuttall SBH)	Bridge H17	Spans over the River Lea connecting eastern side of PDZ3 with south of PDZ4	Entire structure	N/A	<ul style="list-style-type: none"> CFA piling VCC installation Construction of abutment retaining wall and gabion baskets 	<ul style="list-style-type: none"> FFL completed during construction of South Loop road (completed by Nuttall SBH)

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Nuttall SBH)	Temporary footbridge F14 (works did not require validation and reporting)	Spans over the Greenway providing temporary Games time access for athletes between the Warm up Track (CZ3b) and the Main Stadium (CZ3a)	N/A	Entire structure	<p>Established with PDT that validation of this structure was not required as earthworks limited to sacrificial piles and minor ground re-profiling.</p> <ul style="list-style-type: none"> Sacrificial auger piles Minor surface re-profiling and making good 	<ul style="list-style-type: none"> FFL completed by LPR South during verge / White Space works Above ground structure to be wholly removed post Games
Infrastructure (Nuttall SBH)	South Loop road	Road connecting Bridges H06 and H17 including Main Stadium drop-off	All areas	N/A	<ul style="list-style-type: none"> Installation of surface water drainage Construction of road surface 	<ul style="list-style-type: none"> Final elevation approximately 6.0 to 3.0 m AOD Loop road: FFL with Marker Layer and HHSL (Marker Layer omitted in some sections south of Main Stadium) Road verges: below FFL (completed at a later date by Nuttall SBH)
Infrastructure (Nuttall SBH)	Western Entrance Road	The Western Entrance carriageway runs along the southern extent of CZ3b. The WUT carriageway is located around the southern and western perimeter of the Athletes WUT	N/A	All areas	<ul style="list-style-type: none"> Removal of existing carriageway Placement of sub-base and asphalt Installation of surface water drainage 	<ul style="list-style-type: none"> The FFL for the roads ranged between 4.5 – 7.6 m AOD, whilst the verges ranged between 5.0 – 7.8 m AOD

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Nuttall SBH)	Outer Perimeter Security Fence (and addendum)	Fence line around the perimeter of the Olympic Park	N/A	All areas	<ul style="list-style-type: none"> Localised augering, backfilling with concrete and installation of fence posts Placement of 300 mm layer of gravel between and around the fence posts 	<ul style="list-style-type: none"> To be completed by others: Placement of Marker Layer and HHSL (to be completed during Legacy Transformation) excluding two areas in CZ3b
Infrastructure (Nuttall SBH)	Surface Water Drainage Outfall S03-04	Outfall draining into the City Mills River in the south of PDZ3	All areas	N/A	<ul style="list-style-type: none"> Installation of sheet-piles for cofferdam construction Excavation of soils within cofferdam and backfill Placement of precast outfall chamber and spillway Installation of manhole above chamber 	<ul style="list-style-type: none"> Marker Layer installed around the outfall chamber but no HHSL placed completed by (Landscape & Public Realm (LPR) South).
Infrastructure (Nuttall SBH)	Surface Water Drainage Outfall S03-01	Outfall draining into the River Lea and lies adjacent to Bridge H17	All areas	N/A	<ul style="list-style-type: none"> Placement of graded granite stone to create a natural stone dam Installation of sheet piles for cofferdam construction Placement of mass concrete within the cofferdam Excavation of surface water drainage trench 	<ul style="list-style-type: none"> The site was re-profiled to achieve a site level of 600 mm below FFL FFL completed by LPR South

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Nuttall SBH)	Underpass U02	Construction of a new carriageway/underpass beneath the Greenway and Northern Outfall sewer	All areas	N/A	<ul style="list-style-type: none"> Construction of a U-trough concrete structure Surface water installation beneath and adjacent to new carriageway 	<ul style="list-style-type: none"> Marker Layer installed at the base of the U-trough excavation, eastern road verge and underpass approach road. FFL of new Marshgate Lane between approximately 4.50 m AOD and - 0.023 m AOD.
Infrastructure (Nuttall SBH)	Underpass U06	Construction of a new carriageway connection PDZ3 and PDZ8	All areas	N/A	<ul style="list-style-type: none"> Construction of a U-trough concrete structure comprising reinforced concrete slab and retaining walls Placement of asphalt road surfacing Installation of surface water drainage 	<ul style="list-style-type: none"> Carriageway was at FFL between 3.38 – 2.43 m AOD Road verges / pedestrian footpath not at FFL (completed at a later date by Nuttall SBH)

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Infrastructure (Nuttall SBH)	Additional earthworks within PDZ3	Earthworks in several White Areas, verges of the Loop Road and sections of new Pudding Mill Lane to bring to final finished level.	All areas	N/A	<ul style="list-style-type: none"> Placement of limestone gravel and concrete to bring to FFL Construction of the approach ramp verges Removal of former carriageways 	<ul style="list-style-type: none"> White Areas was at FFL of between 3.3 – 6.0 m AOD The FFL in the Loop road verges was between 5.1 – 5.6 m AOD The new carriageway was constructed to FFL of between 1.5 – 3.7 m AOD
Infrastructure (Nuttall SBH)	Operational Area 3F	Construction of Emergency Vehicle Parking Area	N/A	All areas	<ul style="list-style-type: none"> Excavation for street lighting ducts Installation of utilities Construction of temporary development platform Installation of street lighting columns and security fence 	<ul style="list-style-type: none"> All areas to FFL
LPR South (Skanska)	Soft Landscaping and footpath areas	Construction works for soft landscape areas white space areas (WSA) and verges along the South Loop Road	All areas	N/A	<ul style="list-style-type: none"> Soft landscape area construction comprised placement of topsoil and gabion stones 	<ul style="list-style-type: none"> The applicable areas were constructed to FFL ranging between 2.2 – 9 m AOD
Logistics (Volker)	Temporary Utilities	Installation of temporary ducting for temporary power and water feeds in CZ3b	Ducting	N/A	<ul style="list-style-type: none"> Excavation of shallow trenches for duct run Installation of utility and ducts with surrounding bedding sand 	<ul style="list-style-type: none"> Marker Layer completed by Jackson during construction of WUT

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Utilities (Barhale)	Pumping Station	Pumping Station and raising main part of the Primary Foul Drainage system.	All areas	N/A	<ul style="list-style-type: none"> Installation of two boreholes Construction using pre-manufactured concrete shaft segments for inner and outer walls 	<ul style="list-style-type: none"> HHSL placed varied from 500 to 600 mm
Utilities (Barhale)	Deep foul sewer	Primary Foul Drainage Shaft P9, 10, 11 & 12 and Secondary Foul Drainage Shaft S9, 10, 11 & 12 in south and south west of PDZ3	All areas	N/A	<ul style="list-style-type: none"> Installation of two boreholes Sinking of shafts via caisson method Excavation of tunnel linking shafts Placement of fill material around shafts 	<ul style="list-style-type: none"> Ground surrounding shafts: 600 mm below FFL. No Marker Layer placed (completed by Nuttall SBH)
Utilities (Cofely)	District Heating and Cooling Network	Pipe work located along the south west of the Main Stadium leading into PDZ4 through H17	All areas	N/A	<ul style="list-style-type: none"> Trench excavation Installation of heating and cooling pipes Trench backfill 	<p>To be completed by others:</p> <ul style="list-style-type: none"> Placement of Marker Layer and HHSL to FFL (completed by LPR South and Nuttall SBH)
Utilities (Volker)	LOCOG Connectables	Excavation and installation of temporary utilities within sections in PDZ3	N/A	All areas	<ul style="list-style-type: none"> Excavation of battered trench Installation of potable and foul water connections Reinstatement of surface 	<ul style="list-style-type: none"> Works were carried out in areas where FFL had been attained. Marker Layer was breached and reinstated

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Utilities (UKPN / Murphys)	Electrical installations	Installation of cables in pre-installed ducts. The works were carried out as part of the LVU (Lea Valley Utilities) Concession works. LVU is the trading name of UK Power Networks Independent Network Operator (IDNO) on the Olympic Park	All areas	N/A	<ul style="list-style-type: none"> Installation of voltage networks within installed ducting system Excavation for joint, substation and link box locations 	Complete: <ul style="list-style-type: none"> Reinstatement to within 150 mm of the FFL
Utilities (McNicholas)	Multi Utilities	Utilities located along the loop road verge areas in PDZ3. The network also included branches into Bridges H06, H17 & F07 (utilities installed included potable water, non-potable water, electrical & telecommunications networks and associated utility infrastructure)	All areas	N/A	<ul style="list-style-type: none"> Trench excavation Installation of utilities Trench backfill 	To be completed by others: <ul style="list-style-type: none"> Placement of Marker Layer and HHSL to FFL (completed by LPR South and Nuttall SBH). Placement of a Root - X geotextile barrier for mitigation of Japanese knotweed
Venues (Team McAlpine)	Main Stadium	Construction of Stadium infrastructure and associated facilities	All areas	N/A	<ul style="list-style-type: none"> Erection of stadium structure and field of play Installation of a range of services including electrical, surface water drainage, water supply and foul water drainage 	<ul style="list-style-type: none"> Areas to FFL Installation of Marker Layer and HHSL. However omitted in mainly areas of hard standing.
Venues (Jacksons)	Warm up track	Construction of WUT in CZ3b for temporary usage during the Olympics & Paralympics Games	N/A	All areas	<ul style="list-style-type: none"> Raising ground levels Installation of drainage 	<ul style="list-style-type: none"> Area to FFL (for Games time only) Installation of Marker Layer

Project	Task	Description	Permanent	Temporary	Scope of Works (requiring Validation Reporting)	Final Surface / Works to be completed
Venues (Team McAlpine)	LOCOG compound	Construction of LOCOG compound for usage during the Olympics & Paralympics Games	N/A	All areas	<ul style="list-style-type: none"> Re-profiling to reduce gradient of the site Installing gabion walls to create terraced platforms 	<ul style="list-style-type: none"> Installation of 490 mm above Marker Layer capping material FFL installed by LOCOG prior to the Olympic Games
Venues (Team McAlpine)	Outside Broadcast (OB) compound	Construction of the Stadium OB compound for use during the Olympics and Paralympics Games	N/A	All areas	<ul style="list-style-type: none"> Excavation above and below Marker Layer Raising ground levels using imported material Reinstatement of Marker Layer 	<ul style="list-style-type: none"> Installation of 490 mm above Marker Layer capping material FFL installed by LOCOG prior to the Olympic Games in main OB compound
Venues (Team McAlpine)	Stadium Island	Summary of radiological related works undertaken within the Stadium Island area	N/A	N/A	<ul style="list-style-type: none"> Radiological survey during enabling and construction works 	NA

2.2.1 Addenda to the Enabling Works Remediation Method Statements

A number of addenda to the established Enabling Works South Park RMSs were completed and approved for works undertaken by the FoPs in PDZ3 (Refs. 9, 10, 11, 12 & 13). These RMS addenda established the FoPs methodologies to undertake their earthworks so as to complete the remedial strategy across the site, whilst protecting/maintaining the existing Enabling Works remediation and detailing validation of their works. These documents were submitted to PDT to discharge the Park-wide Planning Condition covering provision of RMS (SP.0.34) in addition to seeking discharge of related Slot-In Planning Conditions. The relevant FoP RMS addenda and Applications for PDZ3 are summarised in Table 2.2 below.

Table 2.2 – RMS Addenda relevant to PDZ3

Project / Contractor	Document Title and Reference	Planning Application and Status	Rationale
CLM Logistics & Security (CLM L&S)	Remediation Method Statement Addendum. CLM Logistics & Security Work Packages (0009-TPI-EWK-CM-PRO-0001)	09/90294/FULODA (Condition LOD.22): Approved (10/90492/AODODA)	This document presents the changes to the remedial approach from those detailed in the approved Enabling Works RMS for the PDZ and CZ where CLM L&S undertake earthworks within the Olympic Park. This includes both temporary and permanent major transport routes together with common space areas, where no major venue/structure is to be constructed.
SBH Lot 2 (BAM Nuttall)	Olympic Park Lot 2 (PDZ1, PDZ2, PDZ3, PDZ4, PDZ8) and Lot 5 (PDZ5 & PDZ6) Remediation Method Statement Addendum – Structures, Bridges and Highways (7040-SBH-SPK-W-REP-0027 & 7080-SBH-NPK-W-REP-0017)	08/90151/FULODA (Condition 25): Approved 08/90194/FULODA (LOD.21): Approved (10/90579/AODODA) 10/90298/FULODA (Condition 20): Approved (10/90343/AODODA) 08/90353/FULODA (Condition UOD.25) 09/90022/FULODA (Condition UOD.26) 11/90032/AODODA Approved	SBH Lot 2 works covered temporary and permanent bridges, the loop road and security fence. In their RMS a variations was proposed to reduce the thickness of the HHSL / shallow placement of Marker Layer under the permanent loop road.

Project / Contractor	Document Title and Reference	Planning Application and Status	Rationale
Utilities (McNicholas)	Design Note for McNicholas Works in the Olympic Park, Planning Delivery Zones 1, 2, 3, 4, 5, 6, 7 and 8 (8526-UNN-ECW-U-MST-0070, 8514-UNN-UCW-U-MST-0001)	08/90377/FULODA (Condition 15): Approved (10/90523/AODODA)	To address the multi-utilities scope of works. Variations included placement of Marker Layer and reduced HHSL by subsequent FoPs overlying the utilities works where permanent hard standing was to be installed. No sub-grade validation testing for the utility linear corridors was proposed.
Team Stadium (McAlpine)	Design note. Team Stadium site Verification Criteria. MS-BH-3AX-MU-RP-CG-2-0003	09/90247/FULODA (Condition 22) Approved 10/90595/AODODA	This note was produced to document changes to the remedial approach over those detailed in the CZ3a RMS
Warm Up Track (Jacksons)	Technical Note: Planning Application for WUT – Remediation Requirements (Issue 2)	10/90331/OUTODA (Condition 46) Approved 11/90126/AODODA	This paper was produced to state the compliance of the WUT development with previous remediation assumptions

Note: Refer to Appendix B for a summary of the key elements of the various RMS addenda applicable to PDZ3.

2.2.2 Hard standing as a Substitute to the Separation Layer

Under a site wide RMS addendum completed by the Enabling Works remediation designers a framework was established for reducing the thickness of the HHSL under suitably robust hard standing (Ref. 14). The basic premise behind this design change was that hard standing would act as a suitable barrier to certain pollution pathways (namely ingestion and dermal contact) and reduce the requirement for a full-thickness separation layer.

The framework document required individual projects to provide information of where this approach was being adopted and provide details with regards to the extent of the area and transition from reduced thickness to full-thickness.

For PDZ3 an RMS addendum to reduce thickness of the HHSL beneath the permanent PDZ3 Loop road and Underpass U02 and U06 carriageway was approved by the PDT (refer to the Nuttall SBH RMSs within Table 2.2 above ref. 7040-SBH-SPK-W-REP-0027 & 7080-SBH-NPK-W-REP-0017).

2.2.3 Quality of Imported Fill Submissions

Under the Park wide 2007 Planning Permissions (OD.0.39 and SP.0.37) and a number of the subsequent Slot-In Permissions, a requirement existed for projects, which intended to import unbound fill materials from off-Park to confirm suitability of the material for use on the project in advance of importation. This was to ensure that the material did not constitute a waste. A framework document, setting out the information required to satisfy the discharge of these 'Quality of Imported Fill' Planning Conditions was established by the Enabling Works remedial designers and subsequently adopted by the FoPs (Ref. 15). Planning applications, in accordance with the framework, were submitted by a number of the FoPs and those applications submitted in relation to Slot-In conditions are summarised in Table 2.3, below.

A large proportion of the materials imported were supplied through the ODA's aggregate supplies concessionaire, Aggregate Industries, who worked alongside CLM Logistics to develop a further framework to encourage use of Waste Recycled Action Programme (WRAP) compliant recycled aggregates (Refs. 16 & 17).

2.2.4 Gabion Material

A site wide framework (Ref. 18) was approved by the PDT (Decision Notice: 10/90330/AODODA), which addressed the use of site derived gabion material in the FFL and established that no chemical testing of the material for human health or controlled waters verification purposes was required to be undertaken. This framework was based on the principle that the nature and placement of gabion material mitigates the dermal contact, inhalation and ingestion pathways to human health receptors. Regarding potential risks to controlled waters receptors, the Environment Agency agreed that visual inspection of the material during hand placement was sufficient to ensure no fines or visual signs of contamination or deleterious material was present.

2.2.5 SSAC Amendments

Following derivation of the original SSAC for HHSL and general backfill materials for the individual zones / sub-zones across the Park, as provided in the remedial designer's SSRS documents, a number of amendments were subsequently discussed and agreed in consultation with PDT. These Olympic Park wide SSAC amendments included the following key documents:

- Site Wide RMS Addendum (Asbestos in the Sub-grade & General Fill), ref. MST-ENL-CE-ZZZ-OLP-SP1-E-0159 Rev 05 (Decision Notice Ref 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). This document details the sampling strategy to be utilised when an asbestos value of >0.1% w/w is encountered within the HHSL or General Fill.
- Site Wide SSRS Addendum (Justification of deviation from the GRS in the derivation of SSAC), ref. MEM-ATK-CM-ZZZ-OLP-ZZZ-0004 Rev 2 – This memorandum documents the changes Atkins applied in the derivation of SSAC from the methodology or data sources presented in the GRS along with justification for the changes.
- Proposed changes to the Human Health SSAC values for Lead, General Metals, and PAHs in the Separation Layer, and to the SSAC values for General Fill, ref. REP-ATK-CM-ZZZ-OLP-ZZZ-E-0004 – 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 Polycyclic Aromatic Hydrocarbons (PAHs) assessing the potential contribution from each of the vapour inhalation pathways based on the Henry's Law Constant.

- Errata to Document entitled 'Proposed changes to the Human Health SSAC values for Lead, General Metals, and PAHs in the Separation Layer, and to the SSAC values for General Fill' ref. REP-ATK-CM-ZZZ-OLP-ZZZ-E-0004 – Atkins recalculated the inhalation Tolerable Daily Intake for lead; but the inhalation pathway was still not considered to be significant. The dermal pathway for lead was also calculated, resulting in a new SSAC for areas of soft landscaping not associated with commercial buildings. In addition, Atkins further justified the use of a fraction of organic carbon (FOC) of 0.01.

2.2.6 Pre-validation Remediation Slot-In Conditions

A number of the FoP works were subject to Slot-In Planning Permissions, which generally related to structural design changes rather than changes to remediation, and retained the key remediation Conditions from the 2007 Permissions as follows:

- Landscape and Planting Details (OD.0.28) – FoPs required to submit details of the means by which installed remediation measures would be safeguarded during landscaping works.
- Foundation Details (OD.0.26) – FoPs required to demonstrate the means by which existing remediation measures would be safeguarded during foundation construction works, along with any measures to prevent ingress of gaseous contaminants into that building or the contamination of controlled waters.
- IIMS, SSRS, RMS (SP.0.32, SP.0.33 and SP.0.34) – FoPs required to consider the suitability of the prevailing IIMS, SSRSs and RMSs for the area of their works and to provide details of any changes to these strategies or demonstrate how these strategies still applied.
- Quality of Imported Fill (OD.0.39) – FoPs were required to confirm suitability of imported material for use on the project (see Section 2.2.3 above).

Table 2.2 above provides details of the RMS Slot-In Conditions discharged by the FoPs in PDZ3. A summary of the discharge of the remaining remediation Slot-In Conditions is provided in Table 2.3 below.

Table 2.3 – ODA Remediation Slot-In Conditions relevant to PDZ3

Slot-In Application	Planning Conditions							Validation
	Landscape Details	Foundation Details	IIMS	SSRS	RMS	Grouped IIMS, SSRS, RMS	Quality of Imported Fill	
08/90059/OUTODA 11/90314/VARODA Terminal Pumping Station Utilities: Barhale	N/A	Condition 48 Approved: 09/90045/REMODA	Condition 21 (discharged under Condition 24)	Condition 22 (discharged under Condition 24)	Condition 23 (discharged under Condition 24)	Condition 24 Approved: 10/90136/AODODA	Condition 28 Approved: 10/90136/AODODA	Condition 25 Approved: 10/90136/AODODA
08/90060/FULODA Deep Foul Sewer Utilities: Barhale	N/A	N/A	Condition 17 (discharged under Condition 20)	Condition 18 (discharged under Condition 20)	Condition 19 (discharged under Condition 20)	Condition 20 Approved: 10/90137/AODODA	Condition 23 Approved: 10/90137/AODODA	Condition 21 Approved: 10/90137/AODODA
08/90151/FULODA Outer Perimeter Security Fence Infrastructure: Nuttall SBH	N/A	N/A	Condition 23 Approved: 10/90514/AODODA	Condition 24 Approved: 10/90514/AODODA	Condition 25 Approved: 10/90343/AODODA & 10/90514/AODODA	N/A	Condition 28 Approved: 10/90343/AODODA	Condition 26 Approved: 10/90514/AODODA 12/90215/AODODA
08/90194/FULODA Loop Road Infrastructure: Nuttall SBH	N/A	LOD.39 N/A	LOD.18 (discharged under LOD.21)	LOD.19 (discharged under LOD.21)	LOD.20 (discharged under LOD.21)	LOD.21 Approved: 10/90579/AODODA	LOD.24 Approved: 10/90579/AODODA	LOD.22 Approved: 10/90579/AODODA
08/90353/FULODA Underpass U02 Infrastructure: Nuttall SBH	N/A	N/A	UOD.23 Approved: 11/90810/AODODA	UOD.24 Approved: 11/90810/AODODA	UOD.25 Approved: 11/90810/AODODA	N/A	UOD.30 Approved: 11/90810/AODODA	UOD.26 & UOD.27 Approved: 11/90810/AODODA
09/90022/FULODA Underpass U06 Infrastructure: Nuttall SBH	N/A	N/A	UOD.24 Approved: 11/90032/AODODA	UOD.25 Approved: 11/90032/AODODA	UOD.26 Approved: 11/90032/AODODA	N/A	UOD.31 Approved via: 10/90343/AODODA	UOD.28 Approved: 11/90032/AODODA
08/90377/FULODA Utilities Corridor Utilities: McNicholas	N/A	Condition 19 N/A	Condition 12 (discharged under Condition 15)	Condition 13 (discharged under Condition 15)	Condition 14 (discharged under Condition 15)	Condition 15 Approved: 10/90523/AODODA	Condition 18 Approved: 11/90004/AODODA & 11/90015/AODODA	Condition 16 Approved: 11/90229/AODODA
09/90211/FULODA Electrical Transformers Utilities: Morrison	N/A	N/A	Condition 15 (discharged under Condition 18)	Condition 16 (discharged under Condition 18)	Condition 17 (discharged under Condition 18)	Condition 18 Approved: 11/90331/AODODA	None	Condition 19 Approved: 11/90331/AODODA

Slot-In Application	Planning Conditions							Validation
	Landscape Details	Foundation Details	IIMS	SSRS	RMS	Grouped IIMS, SSRS, RMS	Quality of Imported Fill	
09/90247/FULODA Temporary ramp to Bridge H17 Infrastructure: Team Stadium	N/A	N/A	None	None	None	Condition 22 Approved: 10/90595/AODODA	Condition 26 Approved: 10/90595/AODODA	Condition 23 Approved: 10/90595/AODODA
09/90298/FUMODA Secondary Access Roads Infrastructure: Nuttall SBH	N/A	Condition 37 N/A	Condition 17 <i>Letter to PPDT prepared to discharge condition</i>	Condition 18 <i>Letter to PPDT prepared to discharge condition</i>	Condition 19 <i>Letter to PPDT prepared to discharge condition</i>	Condition 20 <i>Letter to PPDT prepared to discharge condition</i>	Condition 25 <i>Letter to PPDT prepared to discharge condition</i>	Condition 22 <i>Letter to PPDT prepared to discharge condition</i>
10/90060/FULODA Old Ford water recycling plant Utilities	N/A	N/A	N/A	N/A	WOD.32 <i>Thames Water scope</i>	None	WOD.37 <i>Thames Water scope</i>	WOD.34 <i>Thames Water scope</i>
10/90298/FULODA Outer Perimeter Security Fence River Sections Infrastructure: Nuttall SBH	N/A	N/A	Condition 17 (discharged under Condition 20)	Condition 18 (discharged under Condition 20)	Condition 19 Approved: 10/90343/AODODA	Condition 20 Approved: 10/90514/AODODA	Condition 23 Approved: 10/90343/AODODA	Condition 21 Approved: 10/90514/AODODA
10/90331/OUTODA Warm Up Track Venue: Jacksons	N/A	Condition 18 Approved: 11/90493/AODODA 11/90126/AODODA	N/A	N/A	N/A	Condition 46 Approved: 11/90126/AODODA	Condition 35 Approved: 11/90141/AODODA 11/90466/AODODA 12/90102/AODODA	Conditions 31 & 32 Approved: 11/90466/AODODA 12/90102/AODODA
10/90585/FULODA Transformer EN318 Utilities	N/A	N/A	None	None	None	None	Condition 16 Closed via email from PDT 29/03/2012	Condition 14 Closed via email from PDT 29/03/2012
11/90746/FULODA Project Betty (gas supply installation to the Stadium) Utilities: Fulcrum	N/A	N/A	None	None	None	None	Condition 21 Approved: 12/90340/AODODA	None
11/90753/FULODA Emergency Services Staging Area 3f Infrastructure: Nuttall SBH	N/A	N/A	None	None	None	Condition 25 Approved: 12/90235/AODODA	Condition 23 Approved: 12/90235/AODODA	Conditions 26 & 27 Approved: 12/90235/AODODA

Slot-In Application	Planning Conditions							Validation
	Landscape Details	Foundation Details	IIMS	SSRS	RMS	Grouped IIMS, SSRS, RMS	Quality of Imported Fill	
12/90021/FULODA Multi-zonal below ground Utilities Utilities: Park Ops / Logistics	N/A	N/A	None	None	None	None	Condition 14 Approved: 12/90243/AODODA	Condition 12 Approved: 12/90243/AODODA

3. Implementation of Design – Follow-on Projects

3.1 Summary of Works Completed

PDZ3 is the portion of the site where the Main Stadium is located. In addition to this, the pumping station and WUT are also located in PDZ3 south of the Main Stadium (refer to Figure 2). The Main Stadium and the pumping station will remain in use in Legacy, while the WUT is a temporary facility and will be removed.

The following key construction earthworks were completed by the ODA FoPs within PDZ3 and further details from each FoP validation report are provided within Appendix B, including where Enabling Works residual actions were addressed (see also Section 3.2 below).

3.1.1 Infrastructure

3.1.1.1 Loop Road

The southern Loop Road was constructed by BAM Nuttall along the southern edge of CZ3a (Refs. 10 & 19). The road passes through PDZ3 along the southern section of the Main Stadium from Bridge H17 to Bridge H06 and also includes the Stadium drop-off (south-west of the Main Stadium). From Bridge H17 it extends into PDZ4, while from Bridge H06 it continues into PDZ2. Bridge H06 is located at the eastern extent of the road, linking PDZ3 to PDZ2 and Bridge H17 is located at the western extent of the road, linking PDZ3 to PDZ4. Surface water drainage was installed beneath the road and the Marker Layer was installed beneath the sub-base, with the tarmac hard cover providing an effective substitute for HHSL. However Marker Layer was omitted in some sections of the Loop Road (see Section 3.4 and Figure 6). The Loop Road was completed to FFL but the road verges were terminated below FFL, with completion of such carried out by Nuttall SBH at a later date (see Section 3.38 and Figures 6 and 7).

3.1.1.2 Western Entrance and Warm-Up Track Carriageways

The Western Entrance and WUT carriageways were constructed by BAM Nuttall within CZ3b (Ref. 20). In addition to the carriageways, the works also included the construction of accompanying road verges and drainage installation. The Western Entrance runs along the southern extent of CZ3b whilst the WUT carriageway runs around the southern and western perimeter of the athletes' warm-up track, at which point it joins with the Western Entrance carriageway. To enable the construction of the new carriageway the existing section of the carriageway was removed and rebuilt with placement of Type 1 limestone gravel and asphalt. Surface water drainage (including manholes and a pumping station) was installed as part of the carriageway construction. Marker Layer was installed as part of the works and placed beneath the sub-base (Type 1 limestone gravel) within the carriageways and beneath 150 mm thick topsoil within the carriageway verges (see Section 3.4 and Figure 6). The carriageways and related verges were completed to FFL (see Sections 3.3 and 3.4, and Figures 6 and 7).

3.1.1.3 Bridges – F07, F08, F11, F14, F17, H04, H06 and H17

A total of eight new bridge structures were constructed within PDZ3 to provide the connections required during Games Phase and Legacy. BAM Nuttall constructed bridges H06, H17 and F14 (Ref. 21 & 22). The PDZ3 branch of bridges F07, F11, F17 and H04 were constructed by Team Stadium (Ref. 23), while Balfour Beatty, under the SBH Lot 4 contract, constructed bridge F08 (Ref. 24). Four of the bridges (F07, F11, F17 and H04) include a temporary element, which will be used during Games mode and then removed during the Legacy transformation, leaving a smaller permanent structure. However, Bridges F08 and F14 are entirely temporary structures and will be completely removed post Games (see Table 2.1 above). The only fully permanent bridge structures within PDZ3 are Bridges H06 and H17. Construction of the bridge abutments comprised: excavation to create piling / crane platforms, installation of continuous flight auger (CFA) piles, installation of vibro concrete columns (VCCs), construction of retaining walls (clad with gabion baskets in some instances) and reinforced earthworks, ground re-profiling, and backfilling. Marker Layer and HSSL were incorporated into some bridge abutments; however in certain areas these features were omitted (see Sections 3.3 and 3.4, and Figures 6 and 7), with installation completed by subsequent FoPs (during construction of the South Loop Road – Nuttall SBH or verge / White Space Areas – LPR South) or by future FoPs during Legacy transformation following removal of the temporary bridge structure (LLDC).

3.1.1.4 Drainage and outfalls (Outfalls S03-01 and S03-04)

As part of the SBH Lot 2 contract, BAM Nuttall constructed a network of surface water drainage. Drainage was installed beneath the Southern Loop Road in PDZ3, which connects to Outfall S03-04 (Ref. 25) and Outfall S03-01 (Ref. 26). Outfall S03-04 drains, via a reed bed, into City Mill River which is located south east of the Main Stadium and to the north of Bridge H06 (west). Outfall S03-01 drains into the River Lea Navigation in the western boundary of CZ3a and lies adjacent to Bridge H17.

Outfall S03-04 was constructed within a sheet-piled cofferdam which ties into the existing river wall. The soils within the cofferdam were excavated to the top of the RTD which required the complete removal of the Alluvium. The excavation was backfilled with virgin material, mass concrete and blinding sand. The presence of the outfall and the mass concrete placed within the structure provides an impermeable replacement to the excavated Alluvium. Marker Layer was installed around the outfall chamber but was not placed beneath it, however construction of the site to FFL was not carried out as part of this work package (see Sections 3.3 and 3.4, and Figures 6 and 7).

Construction of Outfall S03-01 required the placement of a natural stone dam (which was removed following completion of the works). Following re-profiling and placement of material, a cofferdam and the outer outfall chamber was constructed by installation of sheet piles along the line of the River Lea. Within the outer chamber, material was excavated to depth thereby removing the underlying alluvium and exposing the RTD. Following this bulk removal of material, a 500 mm plug of mass concrete was placed at the base of the cofferdam prior to the installation of the precast, 23 tonne, outfall chamber. The outfall structure is not considered to represent a new contamination pathway to deep aquifers. The works were completed to FFL and Marker Layer by LPR South (see Section 3.3 and Figures 6 and 7).

3.1.1.5 Olympic Park Perimeter Fence Line

BAM Nuttall constructed a fence around the perimeter of the Olympic Park as part of the SBH Lot 2 contract (Refs. 27 & 28). The OPF comprises a “358 mesh” system manufactured by Zaun Ltd to meet Olympic specification and extends approximately 4.8 m above ground level, with fence posts installed at 25.7 m intervals. Localised augering was required and the fence posts were secured with concrete. Placement of fill material was limited to a 300 mm thick layer of imported granite gravel between and around the fence posts. Marker Layer and HHSL were not placed along the OPF due to the limited extent of excavations and the established easements and boundary agreements. The OPF will be removed during Legacy transformation, and any necessary remediation (including placement of Marker Layer and HHSL) and validation will be completed at this point by subsequent Transformation Contractors (refer to Table 4.1).

In CZ3b, prior to the installation of the fence posts, the average ground level was raised using general fill. Marker Layer was then placed over the fill material followed by imported granite gravel.

3.1.1.6 Underpass U02

The U02 underpass runs through Marshgate Lane beneath the Greenway and Northern Outfall Sewer connecting CZ3b with CZ3a (Ref. 29). The works involved the construction of a U-trough concrete structure, a new Marshgate Lane carriageway and approach plus the installation of surface water drainage system. The excavations undertaken for the construction of the new Marshgate Lane carriageway extended below the Enabling Works placed Marker Layer. Marker Layer and HHSL was installed following construction of the underpass. However, in the carriageway areas, HHSL was not placed as the hard standing acts as an adequate substitute in accordance with the BAM Nuttall RMS addendum and Sitewide RMS addendum (Ref. 10 & 14).

3.1.1.7 Underpass U06

Underpass U06 spans between CZ3b and CZ8b and consists largely of a U-trough concrete structure comprising a reinforced concrete slab and retaining walls (Ref. 30). No ground investigation or remediation works were undertaken by Enabling Works within the area of the underpass, therefore Marker Layer and HHSL were absent prior to commencement of works. Eight sub-grade validation samples were collected and assessed against the respective SSACs with no exceedances identified. (Locations where the FoP have excavated beyond the Enabling Works sub-grade levels are shown on Figure 5.)

Marker Layer was placed at the base of the excavation for the installation of drainage and construction of the U-trough structure and HHSL placed above this. However, HHSL was not placed within the carriageway as the hardstanding will act as a substitute as defined in the Site Wide RMS Addendum (Ref. 14). Material placed above the Marker Layer included imported Type 1 material (virgin crushed limestone) and Class 6N. FFL for the road verges, with landscaping carried out by LPR South.

3.1.1.8 Infrastructure Addendum

The works related to this report were undertaken by BAM Nuttall (Ref. 31) and includes the following:

- Earthworks in White Areas 42, 50 and 51 (areas of soft and hard landscaping between Marshgate Lane and Pudding Mill Lane).
- Earthworks in sections of the verges of the Loop Road.
- Construction of small sections of new Pudding Mill Lane and Western Entrance carriageways.
- Earthworks in an area to be landscaped located to the west of Pudding Mill Lane and north of Western Entrance carriageway.

White Areas 42, 50 and 51

These areas are located between Marshgate Lane and Pudding Mill Lane, where they are raised above these carriageways.

White Area 42 – The existing stone pavement located within the area was removed and replaced with a 450 mm thick concrete slab. A Marker Layer was installed beneath the concrete slab. Imported Type 1 limestone gravel was placed over the concrete slab followed by 240 mm layer of asphalt to bring it to FFL of 4.5 m AOD. In the small northern area, topsoil was placed over the Type 1 limestone gravel bringing the area to a FFL of approximately 3.3 m AOD.

White Area 50 – This area was handed over at formation level with Marker Layer present. Type 1 limestone gravel (approximately 900 mm thick) was placed over the existing surface to FFL ranged between 5.0 m AOD and 6.0 m AOD.

White Area 51 – A pedestrian footpath was constructed around the pumping station whilst the eastern section was landscaped. In order to construct the pedestrian footpath the existing surface level was lowered by up to 300 mm and filled with Type 1 crushed limestone as sub-base, followed by asphalt. A Marker Layer was installed beneath the Type 1 sub-base in the southern section where it has been omitted by Enabling Works. The landscape area was constructed by placement of Type 1 followed by topsoil over the existing ground. The FFL level with White Area 51 ranged between 4.2 m AOD and 4.6 m AOD.

Loop Road Verges

Works were carried out within the Loop Road northern (adjacent the Main Stadium Drop-Off) and southern verges (Bridge H17 and H06 approach ramps). The bridge abutment and approach ramp construction involved the placement of Type 1 limestone gravel and Class 6P2 and 6l materials placed in the areas. A Marker Layer was installed following the material placement. For the verge associated with the Main Stadium Drop-Off, 400 mm of Type 1 limestone gravel was placed followed by concrete, 30 mm sand/cement mortar. The FFL of the verge areas ranged between 5.1 m AOD and 5.6 m AOD.

Construction of sections of Pudding Mill Lane and Western Entrance carriageways

The construction of the new carriageways required removal of the existing carriageways and placement of a layer of Type 1 limestone gravel as sub-base followed by asphalt. The FFL of the carriageway ranged between 1.5 m AOD and 3.7 m AOD.

Landscaped areas located to the west of Pudding Mill Lane and north of Western Entrance carriageway

A concrete slab was present across the majority of the southern section of the site and the northern section comprised a relatively flat plateau with existing un-remediated soils at the surface. Type 1 limestone gravel was placed over the existing soils in the northern area and above the existing gravel concrete slab in the southern area. A Marker Layer was installed in the northern area but not in the south as the existing concrete slab was considered to provide a suitable visual barrier to assist with the removal of materials post Olympic Games (other contractors, Jacksons, placed a Marker Layer in the areas where the concrete slab was absent). The FFL ranged between 4.5 m AOD and 5.8 m AOD.

3.1.1.9 Operational Area 3f: Emergency Vehicle Parking Area

The works associated with this area was carried out by BAM Nuttall (Ref. 32). The works to prepare the site included the installation of a security fence and street lighting (with shallow utility ducting) and the construction of the final finish (block brick and tarmac) pavement for Olympic development. Existing levels were re-profiled prior to the construction of the temporary development platform. The temporary development platform consists of the placement of imported Type 3 sub-base beneath brick block pavement areas and imported Type 1 sub-base. Completion of surfacing works to FFL consists of either block brick paving with bedding sand (0.13 m thick) or tarmac (either 0.115 m or 0.14 m thick). This hardcover is considered to form the separation layer for the purposes of the development.

3.1.2 Landscape and Public Realm

3.1.2.1 Soft landscaping

The Skanska White Space Area Validation Report (Ref. 33) covered completion of works within PDZ3 for areas WSA 34 and 35 (including Western Access).

WSA 34 is located in the south eastern part of CZ3a. Construction of soft landscape in the area comprised placement of limestone gabion stone and/or topsoil (in tree planting areas) of varying thickness (150 – 250mm). This area has been constructed to FFL ranging between 2.2 – 9 m AOD with no Marker Layer placed.

WSA 35 is located in the south western part of CZ3a and includes an access road connecting the South Loop Road to the Thames Water operations in Old Ford reserve, also known as the Western Access. Works within this area comprised placement of 150 mm topsoil and 150 to 450 mm subsoil, underlain by Marker Layer (orange geogrid). A footpath was constructed along the western boundary of WSA 35 to provide access to the Greenway. This was carried out by placement of tarmac and Type 1, underlain by Marker Layer. The construction of filter and carrier drainage has also been undertaken. WSA 35 was constructed to FFL ranging between 4.24 – 9.4 m AOD.

3.1.3 Logistics

3.1.3.1 Temporary Utilities

The validation report covers the installation of ducting and utilities for temporary power and water feeds during construction works (Ref. 34). The majority of the ducting will be left in place to allow for potential use for any future permanent utilities. Marker Layer was absent in some sections handed over to CLM Logistics for the installation of the ducting. In these areas it was not installed following the works, but was replaced where

encountered. As-dug materials were used as backfill and bedding sand was placed as part of the utility surround. CLM L&S have not placed any areas of permanent hard cover as part of the works and therefore the works formation level does not represent the FFL. Placement of Marker Layer and completion of works to FFL were carried out by LPR South and Nuttall SBH at a later date.

3.1.4 Utilities

3.1.4.1 Pumping Station and Deep foul sewer

Barhale undertook the construction of a new Pumping Station in CZ3b which forms a key part of the Primary Foul Drainage system on the Olympic Park (Ref. 35). This system also incorporated installation of a new gravity Primary Drainage Sewer made up of primary and secondary shafts. The system has been designed to cope with construction, Games and Legacy flows. Marker Layer and HHSL underlain by general fill were installed within the footprint of the Pumping Station (see Sections 3.3 and 3.4, and Figures 6 and 7). The gravity driven deep foul sewer was constructed throughout the Olympic Park, gravitating towards the newly constructed Pumping Station in CZ3b, which discharges into the Thames Water Northern Outfall Sewer. The system has been designed to operate in a variety of conditions including dry weather with limited flow.

Primary Foul Drainage Shafts P9 to P12 and Secondary Foul Drainage Shafts S8 to S10 were constructed within PDZ3 (Ref. 30). The works included construction of a tunnel linking the shafts and drilling of two boreholes in order to gather groundwater elevation and geotechnical data to assist construction. No Marker Layer and HHSL were placed around the shafts. Completion to FFL was carried out by the subsequent FoPs..

3.1.4.2 Multi-utilities

The following utilities were installed by McNicholas within PDZ3: Potable Water; Non-Potable Water; duct crossing; electricity; electrical junction boxes; communication boxes; telecommunications networks; and transformers (Ref. 12 & 36). The utilities were installed along the Loop Road, proposed verge areas of PDZ3 and within sleeves through Bridges F07, H06 and H17. The works comprised trench excavation, utility installation and backfill. McNicholas replaced Enabling Works Marker Layer where encountered or placed new Marker Layer where none had been previously placed (except within the verge of the loop road where Marker Layer and HHSL were omitted), with none of the site being completed to FFL (see Sections 3.3 and 3.4, and Figures 6 and 7). The works included variations to the McNicholas RMS: use of *ex-situ* data to validate Soil Hospital material, and use of pre-existing Enabling Works validation data and site investigation data to validate as dug materials from 'unremediated areas'. In the latter instance this issue was recorded as a residual action requiring consideration by future land owners and developers when undertaking maintenance of the utilities corridor in PDZ3 (for further details refer to Table 4.1 below). In areas where McNicholas encountered Japanese Knotweed, the excavation was lined and capped using a Root-X barrier membrane to mitigate against Japanese Knotweed migration (see Section 3.12). Works associated with Japanese Knotweed mitigation was carried out in accordance with the Invasive Species Protocol (Ref. 30).

3.1.4.3 District Heating and Cooling Network

Within PDZ3 the District Heating and Cooling (DHC) networks runs from east to west of the Main Stadium. Along this route it branches into various locations including Bridge H06 and H17, CZ3b and the Main Stadium (Ref. 37). The Principal Contractor for this project was Cofely and in March 2010 McNicholas was instructed to commence some limited civil earthworks components relating to installation of the DHC network. These works were limited to two locations on the PDZ3 DHC network where the earthworks element (excavation and backfill) were carried out by McNicholas (Ref. 38). The earthworks associated with the DHC were completed below FFL for completion by SBH Lot 2.

3.1.4.4 LOCOG Connectables

Works undertaken by Volker to install the underground utilities associated within PDZ3 were reported in the Site Wide Validation Report for the LOCOG Readily Connectables and LV Blakey Panels (Ref. 39). Excavations to allow the installation of potable water pipes were carried out at various locations Park-wide. The excavations comprised a standard stepped trench battered down to a typical depth of 1.2 m bgl. In instances where Marker Layer was breached, this was reinstated to a typical overlapping detail at all locations. Works were not completed to FFL by Volker but were subsequently completed by either LPR or the LOCOG Common Domain contractor.

3.1.4.5 Lea Valley Utilities (LVU) works

J Murphy and Sons Ltd (Murphys) on behalf of Lea Valley Utilities (LVU) completed the electrical network, which included site-wide excavations at joint, substation & link boxes to install cabling. These excavations were limited in extent and depth to approximately 1.5 m to facilitate installation through existing validated materials. No LVU excavations extended beneath the Enabling sub-grade. In locations where the Marker Layer was penetrated both the excavated material above and below the Marker Layer was removed from site and disposed to a suitably licensed landfill. Marker Layer was replaced at the level it was encountered and tied into the existing Marker Layer.

The LVU works consisted of installation of the 11,000v High Voltage network and a 415v Low Voltage (LV) network throughout the Olympic Park (Ref. 40). This was installed in a duct system provided by others. The High Voltage network was also constructed within purpose made Salmore pits, again constructed by others, at any location where cables left the main "spine" or where joints were located. This was different to the LV network, where joints and routes away from the spine were directly buried before re-entering the duct system.

3.1.5 Venues

3.1.5.1 Main Stadium

The Main Stadium occupies the north / central part of CZ3a (Ref. 23). The site was handed over to Team Stadium at formation level by the Enabling Works team. On handover, HHSL soils were not placed on the inner and outer batter slopes of the Stadium bowl as this would form the podium batter, which would be beneath the stadium structure. In addition to the construction of the Main Stadium, other works were also carried out including installation of a range of services including drainage, electrical

and water supply. With the exception of Bridge F08 (covered by Balfour Beatty) all other stadium bridge abutments are covered in the Main Stadium validation report. Due to the complex nature of the stadium construction the strategy for installation of HHSL and Marker Layer was changed. These changes have been highlighted in the Team Stadium Validation Criteria note (Ref. 11).

During construction some potential areas of local contamination were encountered, which were excavated and removed. In general, following the removal of the potentially contaminated material the sub grade of the excavation was validated by collection of a series of samples from the base and sides of the excavation and sent for chemical testing. Asbestos was also detected during the construction works, but the risk to future site users was deemed low as the necessary criteria was met. In addition, none of the affected areas remained exposed as there was either hard standing or soft landscaping present. The Main Stadium report presented the validation information to confirm these issues were addressed.

Radiological material was identified during the Enabling Works phase and although it was removed Team Stadium took the precaution of appointing a radiological consultant (Nuvia) to support them during their works. The findings of Team Stadium's radiological assessment works were presented and approved through an Addendum to the Main Stadium validation report. This report is summarised below in Section 3.1.5.5.

3.1.5.2 Warm Up Track

The construction of the WUT generally involved the raising of the ground levels in CZ3b for temporary usage during the Olympic and Paralympic Games (Ref. 41). Post-games the site will be restored to its original level and previous use before being returned to the existing landowner. The WUT was outside the Enabling Works scope, therefore ground investigation and remediation works were not carried out. Approximately 40,000 m³ of fill material was used to raise ground levels and this was placed above either a geotextile Marker Layer or existing concrete hard standing both of which act as both a separator and visual demarcation between the placed material and original ground. The temporary surface water drainage network was designed to be installed within the imported placed material although some excavation below the existing site surface was necessary for connection to the existing drainage network. Testing of the placed imported fill recorded one exceedance of the SSAC for benzo(a)pyrene which was demonstrated as not representing a risk during the short-term Games time use of the site. Subsequent transformation phase works will remove this material and re-assess suitability for re-use. The site was finished to formation level with Nuttall SBH completing the peripheral areas to FFL and LOCOG's sub-contractors completing the track surface and surrounding soft landscaping.

3.1.5.3 LOCOG Compound

The site was developed as a back of house area to be used as a staging section for the opening and closing ceremonies during the Olympic Games (Ref. 39). It will consist of a 3-storey marquee, workshops, parking, a large welfare block and a storage site. On handover, to reduce the gradient of the site, re-profiling works was carried out to bring the site to a revised earthwork level. This comprised minor cut and fill operations and in some sections of the site, included works below the Marker Layer and installation of a series of gabion walls to create terraced platforms. Marker Layer was placed in all areas where revised sub-formation levels were below the original sub-formation and a 490 mm HHSL was installed over the entirety of the site area. The remaining 110 mm to achieve the mandatory 600 mm HHSL was placed by LOCOG's sub-contractors.

3.1.5.4 Outside Broadcast (OB) Compound

The OB compound is subdivided into two areas; the main OB compound and the south west OB compound area (Ref. 42). The main OB compound will accommodate outside broadcast vehicles during the Olympics and Paralympics games whilst the latter will be occupied by backup generators and back of house storage. The build up of the main OB compound is a 300 mm base layer of site derived 6F2 overlain by 190 mm of imported Type 1 giving a combined thickness of 490 mm (see Sections 3.3 and 3.4, and Figures 6 and 7).

The additional 110 mm of blacktop to make up the 600 mm capping thickness was provided by others (LOCOG) prior to the Olympic Games. The south west OB compound has a similar build up but fill has been placed to maximum 600 mm thickness. Marker Layer removed during any excavations was reinstated prior to backfilling above Marker Layer level.

3.1.5.5 Stadium Island Validation Report Addendum

The purpose of this addendum report (Ref. 43) was to provide a summary of all radiological related works that have taken place on the Stadium Island area since July 2007. It summarises the radiological works undertaken by the Enabling Works project during the site preparation of the Stadium Island prior to handover to Team Stadium. It also highlights radiological works undertaken by Team Stadium and reported by Nuvia Ltd., their specialist sub-contractor, during the construction phases of the Stadium Island, following the handover. Further information is provided in Section 3.14 below.

3.2 Residual Actions from Enabling Works

Table 3.1 below presents the residual actions identified at the end of the Enabling Works stage of the project, as summarised within the Enabling Works (Stage 1) CVR for PDZ3 (Ref. 1) and summarises the works undertaken by the FoPs to address these actions, where relevant.

Table 3.1 – Residual Remedial Actions from Enabling Works for PDZ3

No	Title	Description	Responsibility	Action completed by FOP
1	Completion of groundwater monitoring for the Southern Plume	<p>'Southern Plume' groundwater monitoring across the southern part of the Olympic Park shall continue for a further period of 12 months , although this will be subject to groundwater monitoring results and any associated remedial actions required by the PPDT / Regulator . The proposed LLDC 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 the area, which includes vinyl chloride, chlorinated ethenes, dissolved ethanes, methane, arsenic, and total organic content determinants such as iron and chloride for the River Terrace Deposits. This monitoring will be undertaken in eleven boreholes (as defined in Drawing 2DD-ENL-CK-03a-OLP-SP1-E-0382), which has been previously agreed with the PPDT / Regulator. These monitoring locations will be sampled on a monthly basis for six months and then following a review of the data and further discussion with the regulator / PPDT the monitoring may reduce to a quarterly frequency for the final six months.</p>	<p>Enabling Works (novated to LLDC for completion in the Transformation Phase)</p>	<p>N/A</p>

No	Title	Description	Responsibility	Action completed by FOP
2	Completion of groundwater monitoring for the Thanet Sands	<p>Post-remediation groundwater validation monitoring will continue in the Thanet sands and Chalk in the Banner Area of PDZ3 for a further twelve month period, which will commence as soon as reasonably practicable post Games . . . Monitoring, sampling and testing will be undertaken across boreholes (six Thanet Sand and four Chalk boreholes – see drawing 2DD-ENL-CK-03a-OLP-SP1-E-0831) as previously agreed with the PPDT / regulator. The groundwater monitoring will be undertaken on a monthly basis for six months and then following a review of the data and further discussion with the regulator / PPDT the monitoring may reduce to quarterly for the final six months. <i>In-situ</i> monitoring in the form of water level, electrical conductivity, temperature, pH, dissolved oxygen, oxidation reduction potential. Chemical testing for arsenic (total and dissolved), ammoniacal nitrogen, polycyclic aromatic hydrocarbons, volatile organic carbons, total organic carbon, dissolved methane and ethene. In all cases the presence or absence of non-aqueous phase liquids (NAPL) will also be recorded.</p>	<p>Enabling Works (novated to LLDC for completion in the Transformation Phase)</p>	<p>N/A</p>

No	Title	Description	Responsibility	Action completed by FOP
3	Placement of vapour barriers to buildings in accordance with the SSRS.	Assessment of soil gas and soil vapour hazard and appropriate design and construction. Gas and vapour protection measures may be needed in the construction of any inhabited or enclosed spaces. The CZ3b SSRS recommended that a gas and vapour protection membrane is to be installed in the foundation of the 3b Pumping Station building, in order to provide protection against potential VOC vapours (e.g. chlorinated hydrocarbons) from perched water, groundwater and deeper soils. It is also stated that the necessity for this should be confirmed by a soil vapour survey. The LLDC (or Olympic Park Legacy Company as it was known at the time) confirmed in internal project correspondence on 28 th June 2010 that vapour barriers will be installed into future development in the CZ3a Banner area. On this basis reference should be made to Drawing 2DD-ENL-CK-ZZZ-OLP-SP1-E-0419 entitled Olympic Park South Areas that require Vapour Mitigation Measures or Further Vapour Assessment, which illustrates the locations across the South Park that will potentially require further vapour assessment. Depending upon the results of this assessment then further vapour mitigation measures may be required.	FoP and LLDC in the Transformation and Legacy phases.	A ground gas assessment was produced by Team Stadium due to the potential migration pathway to indoor air. Gas measures were installed during the construction of the Main Stadium No other structures requiring a soil gas / vapour assessment has been constructed by the FoPs in PDZ3.
4	Placement of vapour barriers to buildings in CZ3a Banner	The LLDC has confirmed their agreement to the incorporation of appropriate vapour mitigation measures beneath all future (Legacy) structures constructed within the former Banner Area.	LLDC	N/A
5	Radiation	Radiological screening is required when excavating beneath the marker layer [below the Enabling Works sub-grade level] or into the batter to the raised podium, towards the northern end of CZ3a. Areas where radiological surveys have been undertaken and associated radiological finds are illustrated in Drawing 2DD-ENL-CK-03a-OLP-SP1-E-0555: CZ3A Extent of Radioactivity Surveys (Two sheets)	FoP	Addendum Report (Ref. 43) covers radiological survey in vicinity of Main Stadium, OB compound and LOCOG compound.

No	Title	Description	Responsibility	Action completed by FOP
6	Works in CZ3b outside the area covered by the CZ3b Pumping Station	Works proposed by the Position Paper are limited to the placement of a minimum 600 mm thick HHSL and dealing with the protection of indoor airspace against gas and vapour ingress. Liaison with the PPDT will be required to ensure that the appropriate validation documents are submitted and planning approval is obtained.	Following On Project (Warm Up Track Team)	Validation report (Ref. 38) for WUT track covers some areas outside the CZ3b Pumping Station.
7	Placement of additional separation layer over remainder of site, and marker layer/separation layer where previously omitted	<p>The extent of the marker layer placed during the Enabling Works is shown on drawings Figures 8, 9 and 10. In these areas, the Follow-on Project must place an additional minimum of 300 mm HHSL.</p> <p>Where omitted by Enabling Works, the follow-on contractor is responsible for the placement of the marker layer and full [minimum 600 mm thickness] HHSL.</p> <p>Where the required additional separation layer outlined above cannot be placed, reassessment must be undertaken to demonstrate that a suitable barrier to protect human health exists [e.g. hardstanding] and Regulatory approval must be sought and achieved.</p>	FoP	Details of the extent of Marker Layer, HHSL and FFL are given in Table 2.1, Sections 3.1 & 3.3 Appendix B and Figure 6, 7 and 8, herein.
8	Provision of survey plans of final separation layer	<p>Provide survey plans within one month of completion of the entire (minimum 600 mm thickness) separation layer to demonstrate to the planning authority an acceptable thickness of separation layer. These survey plans should also identify any areas where the marker layer is not laid.</p> <p>Where Enabling Works have placed separation layer, the FoP must place an additional minimum of 300 mm HHSL, except within the LOCOG area, where a minimum of 110 mm additional thickness is required due to the 490 mm thick separation layer placed by Enabling Works in that area.</p>	FoP	Details of the extent of Marker Layer, HHSL and FFL are given in Table 2.1, Sections 3.1 & 3.3 Appendix B and Figure 6, 7 and 8, herein.

No	Title	Description	Responsibility	Action completed by FOP
9	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.	FoP	FoP structures have been designed to take account unknown ground conditions on the Olympic Park. This includes infrastructure (utilities and drainage, bridges, loop road and hard landscaping).
10	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.	FoP	<p>As detailed within Section 3.9 below, environmental risk assessments were produced by all FoPs carrying out piling works.</p> <p>Section 3.9 also describes measures taken to ensure pathways were not created where FoP works involved penetration and/or removal of the Alluvium.</p> <p>For assessment of risks associated with penetration and / or removal of the Alluvium within PDZ3 please refer to the Atkins Alluvium Technical Note (Ref. 44).</p>

No	Title	Description	Responsibility	Action completed by FOP
11	Protection of monitoring and groundwater remediation installations and facilities	<p>Undertake any required measures to protect monitoring and groundwater remediation installations and facilities across the PDZ3 Site. Any damage to such installations or facilities is to be reported to the PTP team (or equivalent) as soon as practicable so that remedial works / decommissioning (as appropriate) can be undertaken.</p> <p>Although groundwater treatment plants for the CZ3a hydraulic capture system, CZ3a Banner RTD injection and CZ3a Banner Thanet Sand NAPL removal / EVO delivery have been decommissioned, the underground pipe work and selected wells remain in the event that these systems require reactivation in the future. As such, this pipe work must be protected until such time as they are confirmed by the Client as no longer required. Should pipe work be damaged then the RemTech (or equivalent) should be notified. Reference should be made to Drawing 2DD-ENML-CE-03a-OLP-SP1-E-0811 entitled CZ3a LOCOG – Remaining Groundwater Infrastructure.</p>	FoP	FoPs followed these guidelines during their works and ensured that access to monitoring locations and facilities was maintained. Further information, is provided in Appendix B.
12	Verification of breaches of marker layer	<p>Where the follow-on contractor works involve excavation below the marker layer, backfill will need to be verified against SSAC; marker layer re-instatement must be verified. Any damage to such installations or facilities shall be reported to the client delegated team (PtP team or equivalent) as soon as practicable so that remedial works / decommissioning (as appropriate) can be undertaken</p>	FoP	All FoP works below and above the Marker Layer are covered in their respective validation reports which is summarised within this report (in Section 3 and Appendix B)

No	Title	Description	Responsibility	Action completed by FOP
13	Final validation report	Produce and gain approval of final validation report on completion of overall construction or of construction required to complete above remediation requirements, primarily the provision of the full HHSL. In addition, post Games validation reporting will also have to report on the results of the proposed groundwater monitoring in the River Terrace Deposit, Thanet Sand and Chalk aquifer. In addition the report will also detail any additional remediation works that are required to be undertaken following review of the groundwater monitoring results.	FoP	All FoP validation reports for PDZ3 approved by the PPDT to date are summarised within this report (in Section 3 and Appendix B)
14	Excavation of soils at the Site	<p>The PtP Protocol must be implemented when excavating at the site. Arisings from excavations shall be treated as contaminated unless proven otherwise.</p> <p>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 human health assessment presented in this report was 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. It is considered that following an appropriate risk assessment, any risks to construction workers may be safely mitigated through PPE and suitable engineering precautions.</p>	FoP	<p>FoP compliance with the PtP Protocol is detailed within Section 3.6 herein and within the individual validation reports summarised in Appendix B.</p> <p>As detailed within Section 3.17, FoP works incorporated appropriate health and safety measures for workers involved in excavation of soils.</p>

No	Title	Description	Responsibility	Action completed by FOP
15	Restrictions to remediation	<p>Restrictions to remediation exist in defined areas of PDZ3 as shown on Figure 9. These restrictions include:</p> <ul style="list-style-type: none"> Greenway and retained vegetation area between CZ3a and CZ3b. Ecological area in the southwest of CZ3a. Offset from railway line in southeast of CZ3a and in CZ3b. Offset from River Lea to maintain towpath. Parts of Pudding Mill Lane and Marshgate Lane. <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> <p>An assessment of the retained areas was undertaken in the Retained Areas Risk Assessment Report (RARAR) (Ref. 45).</p>	FoP	Details contained within Section 3.10 and the RARAR (Ref. 45)
16	Risk assessments	<p>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, radiation, asbestos and ground gas/vapours when undertaking excavations at the Site.</p>	FoP	<p>Sections 3.13, 3.14 & 3.17 describe the risk assessments undertaken by FoPs in relation to excavation of soils</p> <p>As regards ground gas assessment please refer to Item above</p>
17	Future land use	<p>Any future uses of the Site must comply with the SSRS definition and therefore must not include private gardens. The areas designated for different land uses shall not be amended without reassessment of the soil conditions. The Site shall not be used for growing edible crops. All future buildings must have appropriate vapour mitigation/membrane measures as agreed by LLDC.</p>	FoP / Future Land Owners	N/A

No	Title	Description	Responsibility	Action completed by FOP
18	Changes in final level	Changes to final levels reducing them at all will need a reassessment of the underlying soil and potentially additional investigation or remediation.	FoPs	Instances where FoPs have used permanent hard standing as a substitute to the HHSL are detailed within Section 2.2.2 Further details
19	Investigation of the western portion of the CZ3b site	The main portion of the CZ3b site, which lies to the west of the Pudding Mill Lane, was neither investigated nor remediated by either the London Development Agency or the ODA as neither organisation owned the land. Therefore following the removal of the Warm-Up track and hand back of the site, the existing land owner should give consideration to the investigation of the site; in order to confirm if the soil and groundwater beneath the original ground level represents and unacceptable risk to the health of future site operatives or the surrounding controlled waters (in the form of the nearby rivers or the underlying aquifers).	CZ3b Land Owner.	N/A

Note: Where residual actions require further consideration and / or need to be addressed as part of the next stages of the project (including Transformation / Legacy works) these have been taken forward and included in Table 4.1.

3.3 Human Health Separation Layer

The HHSL forms the upper section of the cover system across the Olympic Park and is of such a chemical quality that it is deemed to present no unacceptable risk to human health or controlled waters based on the known Legacy use and SSRS assumptions. The default thickness of the HHSL is 600 mm though this varies in accordance with the ground build up and agreed variations (see Sections 2.2.1 and 2.2.2 above).

The thickness of HHSL placed by the ODA Enabling and FoP contractors within PDZ3 varies between 150 mm to a maximum of 1,200 mm, in the Warm up Track area in CZ3b.

Areas of soft landscaping within PDZ3 where the thickness of HHSL is less than the default thickness (600 mm) comprise:

- White Space Area 34 – parts of WSA34, in the south eastern section of CZ3a, have a minimum HHSL thickness of 150 mm, ranging to 250 mm. This comprises topsoil and/or limestone gravel placed on top of existing ground. Part of this area of the site forms the batter to the adjacent railway with the remainder adjacent to the loop road (Ref. 33).
- White Space Area 35 - a section of soft landscaping in WSA35, adjacent to the Western Access to the Old Ford reserve in the south western section of CZ3a, was completed with 150 mm topsoil and between 150 and 450 mm subsoil underlain by Marker Layer (Ref. 33).
- Western Entrance and road verges, CZ3b – sections of the Western Entrance and Warm up Track road verges in CZ3b were completed with 150mm topsoil overlying Marker Layer and existing ground (Ref. 20).

Areas where hard standing was used in place of the full thickness HHSL included part of the Main Stadium, the loop road, and wider permanent pathways, where, in accordance with approved RMS addenda the permanent hard standing (including roads) acts as a substitute to the HHSL.

Figures 6 and 7 show the location of Marker Layer and location and thickness of separation layer placed by the FoPs, while Figure 7 also shows the locations within PDZ3 where hardstanding has been used as a substitute to HHSL. Figure 9 shows the 'retained' or unremediated areas within PDZ3 and those subject to FoP works.

A total of approximately 120,800 m³ imported HHSL material has been placed as part of the FoP works in PDZ3. The principal material types imported from off-Park comprised sub-and topsoil placed within the soft landscape areas, road verges, White Space Areas etc, virgin Type 1 / 2, Class 6A, 6C, 6N and 6I material used for road construction and as engineered fill for structures, virgin and recycled gravels and sands for pipe bedding / utility surrounds and engineered light-weight fill again for structures. Re-used, site derived materials principally comprised fill from the Westfield development and the Power Line

Underground (PLUG) works across the site, which was used as sub-base beneath hard standing and as sub-soil.

The placed HHSL in PDZ3 has been validated *in-situ* by the FoPs on a testing frequency of at least one sample per 200 m³ of placed material or an agreed variation to this frequency. The main agreed variation to this approach was for testing of the Soil Hospital supplied HHSL material placed by the WUT project. This material was subject to *ex situ* testing by the Soil Hospital, prior to importation to CZ3b and then subsequently tested *in situ*, as per the PDT agreed methodology, on a frequency of one sample per 1,000m³ for soil analysis and one sample per 5,000m³ for leachates.

One human health exceedance for benzo(a)pyrene was identified within the HHSL placed in the WUT area. The exceedance was found to be acceptable to remain in place for Games time, based on the short duration of use of the site and resulting short term exposure. This material will, however, need to be removed as part of the WUT Legacy Transformation works or assessed further in terms of the Legacy use of the site. If the material is to be reused elsewhere on the Park during Transformation it should be assessed to determine its suitability. This is included in the residual action list outlined in Table 4.1 and the location of the exceedance shown on Figure 10.

3.4 Marker Layer

The Marker Layer, a brightly coloured (orange) terram or netlon geogrid forms an integral part of the Park's cover system and provides a visual demarcation between the HHSL (see Section 3.3) and underlying general fill or existing ground. For planning and remediation design purposes, no special health and safety precautionary measures or controls are required for those undertaking works within material above the Marker Layer. Material below the Marker Layer should be considered potentially contaminated and requires further health and safety consideration.

The default position across the Olympic Park is that the Marker Layer is located a minimum 600 mm below the FFL. Beneath the hard landscaping the Marker Layer has been installed at 600 mm below FFL though with certain agreed exceptions/variations. The extent of the Marker Layer across the Zone is shown on Figure 6.

Variations in the placement of the Marker Layer have been agreed for a number of projects within PDZ3, as follows:

- Nuttall SBH areas – Marker Layer was omitted in some sections of the CZ3a South Loop road following completion of construction works. This was retrospectively approved by the PDT via the Nuttall SBH RMS (refer to Table 2.2 above) and Loop Road validation report (Ref. 19) based on the fact that the road is permanent in Legacy.
- Multi-utilities corridor – some sections of the utility corridor works have omitted Marker Layer or placed the marker layer at a deeper depth (i.e. underneath installed utilities) different from the default 600 mm below FFL. This has been

agreed with the PDT within the validation report for utility works in PDZ3 (Ref. 38).

- Main Stadium – in areas of hard standing the hard standing itself acts as a separation layer and the base of the hard standing acts as a Marker Layer i.e. when the hard standing is penetrated clearly a different material type has been encountered. Therefore no Marker Layer has been installed beneath hard standing. This was agreed with PDT via the Main Stadium RMS / Design Note (refer to Table 2.2 above) and confirmed in the Main Stadium validation report (Ref. 23).
- WSA – Marker Layer was not placed in WSA 34 located in the south eastern section of CZ3a. This was approved by the PDT via the applicable validation report (Ref. 33).
- Warm up Track – Marker Layer was only placed in areas of existing soft standing in the area of the WUT, with existing hard standing (concrete) acting as a marker of the boundary between existing ground and material placed by the project. The WUT placed fill is due to be removed as part of Transformation works and the site returned to its previous land owner (Ref. 41).

The above variations have been approved by PDT through either an RMS addendum or validation submission. Refer to Appendix B and Table 2.1 above for further details of these agreed variations and see Figure 6 for the extent of Marker Layer placement.

3.5 General Fill

General backfill was placed beneath the HHSL and Marker Layer during FoP deeper excavations in PDZ3 (where applicable) including as part of construction of pumping station, drainage installation, foundation works for bridge abutments and structures and to raise site elevation levels.

A total of approximately 48,800 m³ of general fill was placed during FoP works with approximately 41,400 m³ derived from within the Park. Imported general fill principally comprised recycled (Waste Recycling Action Programme, WRAP compliant) demolition rubble, rail ballast and glass and recycled sand for pipe bedding / utility surrounds. Chemical testing of the placed below marker layer fill was generally undertaken on a frequency of one sample per 1,000 m³. In some circumstances agreed in retrospect, however, *in-situ* testing of Soil Hospital supplied general fill was not undertaken and works were validated through assessment of stockpile test data provided by Soil Hospital. Within PDZ3, this approach was adopted by the multi-utilities contractor McNicholas and in certain instances by Team Stadium, where Soil Hospital data, based on an *ex situ* sampling frequency of 1 per 500 m³, was utilised to demonstrate compliance. Assessment of these data has established that the FoP placed general fill material does not represent an unacceptable risk to the identified SSRS receptors.

In addition, McNicholas re-used a small volume of as-dug, existing, unremediated ground excavated from beneath the sub-grade and did not undertake validation of the replaced material. For PDZ3 a total estimated volume of 156 m³ of as-dug material was re-used

within the multi-utilities excavations. Where this approach was adopted the projects sought retrospective PDT approval via presentation of either pre-construction site investigation data or adjacent Enabling sub-grade data to demonstrate compliance. See residual item 2.14 in Table 4.1 for details of actions / mitigation required for future maintenance workers in relation to the McNicholas multi-utilities corridors in PDZ3.

3.6 Safeguarding Remediation

On completion of the Enabling Works remediation, processes were put in place by CLM and Atkins to ensure the protection of the integrity of these works. The processes were collectively known as the PtP system.

This system ensured the protection of remediation works and the maintenance of environmental protection measures during FoP excavation works. The PtP system was implemented across the Olympic Park and was fully adhered to by FoPs throughout the duration of the works. The procedure is described in full in the PtP protocol (Appendix D).

Prior to the commencement of any ground excavation works, all the information required by the PtP team was provided on an ATK-084 'Protection of Remediation Works' *pro forma* completed by the FoPs of any remedial aspects they should be aware of during their works. On completion of the ground excavation works FoPs provided as-built details to the PtP team to demonstrate adequate protection of existing remediation works. This process was supported by monthly PtP audits of the projects by the PtP team, which monitored materials management and protection of remediation works. Any non-compliances identified were informed to the CLM project management team and steps put in place to address the issues.

'Slot-In' Conditions relating to the safeguarding of remediation during foundation works are detailed within Table 2.3.

3.7 Soil Hospital Process

As part of the Olympic Park development, a facility known as the Soil Hospital was established and made available for use throughout the project. The procedure is detailed within the Soil Hospital protocol (Ref. 46). The Soil Hospital was introduced with a view to maximising the re-use of site derived earthworks materials within the Park, in accordance with the ethos of the Construction Code of Practice (Ref. 47). Soil Hospital provided a hub for processing/handling materials generated by ground works within the Park (both Enabling Works and FoPs) and included treatment facilities and related testing of produced materials to maximise re-use across the project.

Prior to any material movements to or from the Soil Hospital, all the information required by Soil Hospital was provided on an ATK-088 'Request from Follow-on Contractor' *pro forma* completed by the FoPs and submitted to the Soil Hospital team. The Soil Hospital maintained stockpiles of a range of recycled earthworks materials and collected chemical and geotechnical test data on these materials which was supplied to the FoPs for them to confirm acceptability based on the proposed area of placement. When FoPs needed to dispose of material, the Soil Hospital team provided a response detailing the arrangements for disposal of the material within the Park or agreement that the material could be disposed of off-site (landfill).

3.8 Gas / Vapour Protection Measures

Gas and vapour protection measures are driven by the design of certain structures / venues across the Olympic Park in the context of the known and established gas regime. The identified structure in PDZ3 which required a ground gas/vapour assessment was the Main Stadium.

Following previous ground gas risk assessments presented in the SSRS and additional assessment carried out by Buro Happold (Ref. 48) it was concluded that incorporation of soil gas protection measures for the Main Stadium was necessary to deliver a safe development. The following details were considered for the installation of soil gas protection measures within the Stadium structure:

- Prevent the migration of hazardous concentrations of ground gases into enclosed areas of the Stadium.
- Ensure the dilution and dispersion of these hazardous gases beneath the Stadium footprint.
- Allow safe passive venting of these gases to atmosphere.
- Prevent the migration of these gases via preferential pathways (such as service runs, drainage etc) to sensitive unprotected structures.

Full details of the protection measures design are provided in 'Soil Gas Protection Measures Design Details' (Ref. 49).

These gas protection measures were delivered by Team Stadium and validated and reported within the Main Stadium validation report (Ref. 23).

3.9 Mitigation Measures for Contamination Migration

Residual Action 10 in Table 3.1 states that FoPs must adopt suitable design and construction methods to avoid creation of contamination pathways to lower aquifers.

Environmental risk assessments were produced by all FoPs carrying out piling works and subsequently approved by the regulators (the Environment Agency). These risk assessments are listed in Table 3.2 below.

Table 3.2 – FoP Piling Environmental Risk Assessments

Task	Document References
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Bridge F07	7050-SBH-F07-C-REP-0029 (08/90332/REMODA)
Bridge F08	7050-SBH-F08-C-REP-0028-P01 (08/90332/REMODA)
Bridge F11	7050-SBH-F11-C-REP-0011 (08/90332/REMODA)
Bridge F14	7040-SBH-F14-W-NTS-0001-P04 (11/90493/AODODA)
Bridge F17	7050-SBH-F17-C-REP-0030 (08/90332/REMODA)
Bridge H04	7050-SBH-H04-C-REP-0014-P01 (08/90332/REMODA)
Bridge H06	REP-OAP-CG-ZZZ-HBR-H06-X-0006 (09/90072/REMODA)
Bridge H17	REP-OAP-CG-ZZZ-HBR-H17-X-0002 (09/90072/REMODA)
Main Stadium	MS-BH-3AX-NA-SP-CG-2-0203 (08/90337/AODODA)

In addition, one of the key SSRS assumptions for PDZ3 was that the cohesive Alluvium underlying the Made Ground across the site provides a barrier to the migration of overlying contamination to the RTD aquifer. Where works compromised or breached the Alluvium the remedial strategy called for consideration of replacement of cohesive fill or suitable substitute to the Alluvium, for example, an impermeable membrane. However, within the Banner site, the Alluvium was removed but this is covered in a revision to the SSRS (Refs. 1 & 5).

Construction of surface water drainage outfalls S03-04 and S03-01 (Refs. 26 & 27) involved removal of Alluvium. At the request of the PDT a site wide assessment of penetrations of the Alluvium has been produced by the remedial Design Team (Ref. 44) which considers the risks to the underlying RTD. This document forms a separate submission to this CVR. It concludes that, the Alluvium was fully penetrated in one area associated with the McNicholas multi-utilities (Ref. 38). However, the McNicholas utility trench where Alluvium was removed is located directly south of the Banner Chemicals area beneath the permanent Loop Road where drainage is managed. In addition, the penetration is in an area where ground / perched water is captured by the U02 cofferdam and subsequently pumped to foul sewer thus preventing migration to receptors. Based on these aspects the report concludes that penetration of Alluvium in this area is not considered to present a significant risk to controlled water receptors..

Where relevant, information has been submitted to the PPDT and the Environment Agency with regards to safeguarding remediation and minimising potential contamination pathways in the context of the applicable foundation design condition(s). In certain circumstances no such details are required to be submitted because, either the foundations are such that there is considered to be no unacceptable risk in terms of safeguarding remediation / creating potential contaminant pathways or no specific foundations have been proposed / constructed.

3.10 Non Remediated Areas

Works by FoPs within areas defined as 'unremediated' i.e. those not subject to remediation during the Enabling Works phase of the project within PDZ3, were limited to certain boundary areas of the Zone (retained areas) and instances of excavation beneath Enabling

Works sub-grade (*in-situ soils*). These works were undertaken by Skanska LPR (Ref. 33), Nuttall SBH (Refs. 29 and 31), utilities (Ref. 38) and Team Stadium (Ref. 23) projects and have been reported separately. Refer to Figure 9 for the location of these areas.

A separate, addendum RARAR (Ref. 50) has been produced to capture the works completed by the FoPs in these unremediated areas, forming an addendum to the existing RARAR (Ref. 45). Where works in these areas have a potential to impact future works these are recorded in Table 4.1.

3.11 Sampling and Analytical Testing

In-situ sampling and validation chemical testing, undertaken by the FoPs, was in accordance with recognised UK industry guidance and Park-wide protocols. Analysis of samples was undertaken by UKAS accredited laboratories and soils were analysed using MCERTS accredited methods.

Test suites were designated by the individual FoPs to capture the relevant compounds listed within the zonal SSAC for HHSL and general backfill, as outlined within the SSRS for PDZ3.

3.12 Invasive Species

Invasive species treatment during the FoP works in PDZ3 has focussed on control/eradication of Japanese Knotweed identified in the south west and south east of the site. The works were undertaken during utilities installation in these locations by McNicholas. Following removal of the contaminated materials the trenches were lined and capped with a Root-X root geotextile barrier to retard any migration of Japanese Knotweed along the utilities installation. Further details can be found in the McNicholas validation report (Ref. 38). Works associated with Japanese Knotweed mitigation was carried out in accordance with the Invasive Species Protocol (Ref. 51). The excavated knotweed material was exported off site using the appropriate Park protocols. The BAM Nuttall LPR project has undertaken ongoing treatment of invasive species, especially along the river banks and these works will likely need to be continued in the future. Reference should be made to residual action 2.21 in Table 4.1 below, the Park Wide Invasive Species Treatment Report (Ref. 52) and Appendix E.

3.13 Unexploded Ordnance

A Park wide risk assessment of German air-dropped UXO was conducted by BAE Systems in advance of the project (Ref. 53). 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 reported that there was a high likelihood of German air-dropped UXO existing within PDZ3.

No UXO were recorded during the Enabling Works phase of the project. Based on this and the limited extent of the FoP works undertaken beneath the Enabling Works sub-grade, the risk associated with the FoPs encountering UXO was deemed to be low. No UXO was encountered during the FoP works in the Zone.

3.14 Radiological Material/Unexpected Contamination

A Remediation Change Note Report (Ref. 54) presents a summary of unexpected contamination identified in Construction Zone 3a in the form of very low level and some low level radioactive waste. Following on from this, a radiological report (Ref. 43) provides a summary of all radiological related works that took place on the Stadium Island during the Enabling Works and construction phases has been completed. Following removal of radiological material during the Enabling Works phase, Team Stadium appointed a radiological consultant (Nuvia Ltd) to support them during the construction of the Main Stadium and associated areas. During both the pre construction Enabling Works and the construction of the Stadium Island site which followed, the type and nature of radiological contaminated materials encountered has been consistent. With the exception of one smoke alarm containing a small sealed radioactive source (which is exempt from radioactive waste regulation) no artefacts such as luminous dials were found at the Stadium Island site during either stage of the works. With the exception of the materials left *in-situ* and at depth all near surface soils above the threshold count rate were excavated and removed from the Stadium Island and taken to the Soil Hospital.

Following completion of the Main Stadium building and infrastructure the measurable radiological concentrations at the site surface were within the bounds of variability of the Olympic Park background concentrations. This conclusion, however, is based on its current use as the 2012 Olympics Main Stadium. Any future variations to this use (especially involving excavation below the Marker Layer) would require a re-assessment of the risks from radiological contamination, as a precaution.

It is further noted that where as-dug materials were re-used as general fill within PDZ3 or general fill was re-used from another zone with a known previous radiological land use, that these materials have been placed beneath a full thickness Human Health Separation Layer or hard standing substitute. The full thickness (minimum 600 mm) of HHSL or hard standing substitute has been shown to provide an effective barrier to underlying materials thus breaking potential pathways to future human health receptors. Within PDZ3 the only areas identified as not having full thickness HHSL or an agreed hard standing substitute are WSA35 in the south eastern section of CZ3a and certain sections of the WUT area in CZ3b. WSA35 has been subject to placement of between 300 and 600 mm of imported, virgin HHSL. The WUT area was temporarily raised with between 300 and 1,000 mm thickness of compliant material imported through the Soil Hospital to facilitate Games time use. Future access and use of these areas will need to be considered in terms of potential pathways to underlying existing / unremediated ground and, as such, are identified within item 2.10 of Table 4.1 below.

3.15 Materials Management and the Waste Recovery Licence

Temporary stockpiling of materials was managed by all FoPs in accordance with the established Park-wide guidance and included segregation of different types of material and, where required, sheeting and appropriate bunding of potentially contaminated material

to reduce rainwater infiltration/run-off and the release of odours/dust. Stockpiles were located to be clear of waterways and public places where practical and were constructed so as to shed water.

On-site material tracking has been undertaken by the FoPs across the project. All loads or groups of loads were subject to a ticketing process with a record of the source and destination of the load, its description, the time, date and vehicle identifier and signatures for representatives controlling the loading and unloading. The tickets were collated to provide daily and weekly summaries of materials moved. The information was then entered onto the Park wide Smartwaste/M³n system to allow material movements and re-use to be reconciled.

A Waste Recovery Licence (Environmental Permit) held by the ODA for its scope of works, has been managed by the CLM Waste Recovery Manager and sets out requirements with regards to managing the recovery of materials from within the Park and limits importation of waste materials. Any variations to the original consent have been discussed and subsequently agreed with the Environment Agency. No breaches of the Waste Recovery Permit have been recorded for the FoP works in PDZ3. The Environmental Permit was subsequently surrendered, in agreement with the Environment Agency, in Autumn 2012 following completion of the ODA's obligations.

3.16 Health, Safety and Environment

FoP works were completed in accordance with Construction (Design and Management) (CDM) Regulations. As CDM Co-ordinator, Arup were responsible for collating the Health and Safety file for PDZ3. Permit to work and permit to dig systems were in operation for the duration of FoP works. Staff wore suitable PPE, with gloves, helmets, boots, eye protection and hi-visibility clothing as a minimum at all times. All details regarding Health and Safety, environmental controls and monitoring are provided within the various FoP construction risk assessments and method statements.

Baseline environmental monitoring across the Olympic Park was initially undertaken and reported by Enabling Works. This moved across to Logistics in 2009. General environmental control measures that were in place during FoP works included the following, in accordance with the requirements of the ODA / CLM Code of Construction Practice (Ref. 47):

- wheel washes at site entrances/exits;
- wetting of roadways to prevent dust generation;
- sheeting of loads;
- use of hard surfaces for heavily-used haul roads;
- control of vehicle speeds on site;
- readily available spill kits to deal promptly with any spillages;
- monitoring to confirm the status of protected and invasive species; and
- tool box talks to brief workers on potential environmental issues.

3.17 Legacy Transformation Works

A number of structures and venues completed for the Olympic mode within PDZ3 will be subject to works in transformation to facilitate the Legacy development. Final details of these works are not currently known; however, it is known that certain bridge structures will be subject to decommissioning and removal of sections of deck and related abutments to reduce capacity for Legacy. The bridges within PDZ3 which will be subject to these transformation works include F07, F11, F17 and H04. In addition, Bridges F08 and F14 are wholly temporary structures and will be removed in their entirety during transformation works. Following completion of the Olympic use, the area developed for the WUT and Bridge F14 will be returned to its original use and owners and the OPF will also be removed.

It is noted that residual remedial works/protection of existing remediation, will be a requirement of transformation for these structures and venues in addition to the wider transformation works (refer to Table 4.1 below).

4. Conclusions

The PDZ3 FoP Validation Reports conclude that the placed and validated soils do not pose an unacceptable risk to the SSRS defined critical controlled waters and human health receptors. On this basis this PDZ3 CVR seeks to discharge the ODA's obligations under Condition OD.0.36 of the Facilities and Their Legacy Transformation Planning Application and the 'Slot-in' Validation Planning Conditions referenced in Section 1.3. Aside from the residual actions identified in Table 4.1 below, ODA has completed the vast majority of the SSRS remedial scope within PDZ3. However, confirmation is required from LOCOG, via their Stage 3 CVR, of completion of the final surfacing within the OB and LOCOG Compounds, to the south of Stadium, to demonstrate the design has been fully implemented in these areas. The final pre-Games site conditions are also subject to LOCOG works and details of these can be found in the LOCOG Stage 3 CVR.

Residual remedial actions for completion during future Transformation / Legacy works and/or restrictions to future development within PDZ3 are summarised in Table 4.1 below. The incoming Project Teams should be cognisant of these residual actions together with the underlying assumptions of the SSRS design.

4.1 Further Works - Residual List and Issues Affecting Future Development

Table 4.1 below records the outstanding works that have been transferred from the ODA Enabling Works and Follow-on Projects to LOCOG, the LLDC Transformation team and future developers / owners. This table collates the residual items identified in the preceding individual FoP reports and those passed on from the Enabling Works team (refer to the report summaries in Appendix B). The WUT is the only area of PDZ3 being handed back to its original landowners, as per residual item 2.6, Table 4.1.

In addition, Table 4.1 records some key aspects for future developers to consider as part of their works. It is further noted that 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.

4.2 Stage 3 Consolidated Validation Reporting

This report summarises the FoP validation works completed by the ODA to create the venues and infrastructure suitable for staging the London 2012 Olympic and Paralympic Games. It is recognised that other, non-ODA, parties have earthworks on the site which follow-on from these ODA completed works, most notably those completed by LOCOG. These works are not summarised herein and have instead been included in a third stage of the CVR programme.

In the context of the works in PDZ3, known third party works, which are not summarised herein, include the LOCOG overlay construction, including the Common Domain areas and completion of the final surfacing to the south of Stadium. Removal of the temporary LOCOG infrastructure, the 'bump-out' phase of the project, may also need to be captured through validation reporting and this will be established with the appropriate parties.

Further works, as a result of post-Games transformation will need to be captured under separate documentation and submitted against the relevant Legacy Transformation Development Planning Conditions (refer to items 2.4 and 2.5 in Table 4.1).

Table 4.1: Outstanding Works transferred to the Future Developers / Land Owners and Restrictions on Future Works in PDZ3

No.	Title	Site Specific Actions Required	Action By
2.1	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 (current scheduled end date December 2013), although this will be subject to groundwater monitoring results and PPDT approval. The proposed (LLDC) groundwater monitoring period will commence as soon as reasonably practicable post Games. Any variation in the scope or details of this monitoring would need to be agreed with the EA and PPDT before implementation.	Future land owners and developers / LLDC
2.2	Completion of groundwater monitoring for the Thanet Sands	Post-remediation groundwater validation monitoring will continue in the Thanet sands and Chalk in the Banner Area of PDZ3 for a further twelve month period, which will commence as soon as practically possible after the Olympic Games. Any variation in the scope or details of this monitoring would need to be agreed with the EA and PPDT before implementation.	Future land owners and developers / LLDC
2.3	Placement of vapour barriers to buildings in CZ3a Banner	The LLDC has confirmed their agreement to the incorporation of appropriate vapour mitigation measures beneath all future (Legacy) structures constructed within the former Banner Area. On this basis reference should be made to the PDZ3 Stage 1 CVR (REP-ATK-PM-ZZZ-ZZZ-ZZZ-E-0194) where information relating to the locations across the South Park that will potentially require further vapour assessment is contained. Depending upon the results of this assessment then further vapour mitigation measures may be required. If required these would need to be appropriately implemented and validated.	Future land owners and developers / LLDC
2.4	Removal of Temporary Structures / Areas	Removal of the WUT, LOCOG compound and OB compound and subsequent placement and/or replacement of Marker Layer and full HHSL to FFL (where applicable). The location of the temporary structures is shown in Figure 4.	Future land owners and developers / LLDC

No.	Title	Site Specific Actions Required	Action By
2.5	Removal of Temporary Bridges	Removal of temporary Bridges F07, F17, H04 (northern section) and F08, F11 and F14 (southern section) together with subsequent placement of Marker Layer and full HHSL to FFL. The location of the temporary structures is shown in Figure 4.	LLDC
2.6	Investigation of the western portion of the CZ3b site	Following the removal of the WUT and hand back of the site, the existing land owner should give consideration to the investigation of the site; in order to confirm if the soil and groundwater beneath the original ground level represents an unacceptable risk to the health of future site operatives or the surrounding controlled waters (in the form of the nearby rivers or the underlying aquifers). If remedial works are proposed then consideration will also need to be given to validating the works. The location of the WUT is shown in Figure 4.	CZ3b land owners
2.7	FoP SSAC exceedances removal	There was an exceedance of Benzo(a)pyrene identified within imported fill used on WUT. It was deemed suitable for inclusion in the works for Games use but further assessment / consideration will be required if the material is to be re-used during Legacy Transformation works. Additional information is contained in Figure 10 and within Appendix E.	Future land owners and developers / LLDC
2.8	Radiation	Any changes to the design of the Stadium Island in Legacy (particularly any excavation below the Marker Layer) will need to re-assess the risks from radiological contamination, as a precautionary measure. Refer to the Stadium Island Validation Addendum report for further information on this issue (Ref. 43).	Future land owners and developers / LLDC
No.	Title	General Actions Required	Action By
2.9	Placement of vapour barriers to buildings in accordance with the SSRS	Assessment of soil and gas vapour hazard and appropriate design and construction. If soil gas / vapour mitigation measures are required these would need to be appropriately implemented and validated. See also item 2.3 above.	Future land owners and developers / LLDC
2.10	Placement of Marker Layer and HHSL	FoPs were required to provide survey plans within two months of completion of the entire HHSL to demonstrate to the PPDT an acceptable thickness of HHSL (minimum 600 mm thickness). These survey plans also identified any areas where the Marker Layer was not laid. Reference should be made to Figures 6 & 7 within the PDZ3 Stage 2 CVR for the survey of extent of Marker Layer and HHSL placed or replaced during the works and non-remediated area drawing.	Future land owners and developers / LLDC

No.	Title	General Actions Required	Action By
2.11	Suitable infrastructure design	<p>Future land owners and developers need to consider ground conditions when designing infrastructure.</p> <p>Infrastructure installed beneath the Marker Layer should assume ground conditions are impacted by chemical contamination and appropriate mitigation measures should be taken (e.g. use of barrier pipes for potable water, sulphate resistant concrete etc).</p>	Future land owners and developers / LLDC
2.12	Suitable methods to protect contamination pathways	<p>In agreement with PPDT the remedial designers have completed a Park-wide assessment of risks to controlled waters from removal of Alluvium (0241-OPS-SPK-C-REP-0003).</p> <p>Future land owners and developers need to consider protection of contamination pathways as part of their earthworks design.</p>	Future land owners and developers / LLDC
2.13	Protection of monitoring and groundwater remediation installations and facilities	<p>Undertaking measures required to protect monitoring and groundwater remediation installations and facilities. Any damage to such installations or facilities is to be reported to the appropriate permitting parties as soon as practicable so that remedial works/decommissioning (as appropriate) can be undertaken.</p>	Future land owners and developers / LLDC
2.14	Excavation of soils at the Site	<p>Future land owners and developers shall take appropriate health and safety measures to protect workers involved in excavation of soils. It is likely that a permitting system similar to PTP shall be implemented within the Olympic Park in post-Games mode.</p> <p>Future land owners/developers should be cognisant of utilities works below Enabling works sub grade completed by McNicholas Utilities. In certain areas the project re-used non validated materials around their utilities. As such below Marker Layer soils around utilities should be treated as potentially contaminated / harmful to health. This is highlighted in the applicable Asset Holders health and safety file. Health and safety risks to future workers assessing these utilities should be assessed in advance of undertaking works. In addition future developers should also be aware of the Root-X membrane installed to retard the spread of Japanese Knotweed within utility works in some parts of PDZ3.</p>	Future land owners and developers / LLDC
2.15	Completion of unremediated areas & Restrictions to remediation	<p>An addendum (Ref. 50) to the RARAR has been produced by the remedial designers for details of areas not remediated as part of the ODA works. Contractors shall also be cognisant of the Residual Actions detailed in the RARA Addendum report (0241-ENW-PWD-CM-REP-0001) and in particular when working in the proximity of the features referenced in this report.'</p> <p>Future developers also need to consider what additional information is required in these areas. This includes the ODA 'White Space Areas' where the full remedial scope has not been implemented.</p>	Future land owners and developers / LLDC

No.	Title	General Actions Required	Action By
2.16	Risk assessments	Future land owners and developers shall undertake appropriate risk assessments with respect to UXO, pathogens, asbestos. Radiation and ground gas / vapours when undertaking excavations and/or construction activities during Legacy phase.	Future land owners and developers / LLDC
2.17	Future land use	Future land owners and developers shall ensure that areas designated for different land uses are not amended without reassessment of the soil conditions and that the Site is not used for growing edible crops or for private gardens. This includes the ODA 'White Space Areas' where the full remedial scope has not been implemented.	Future land owners and developers / LLDC
2.18	Changes in final levels	Any works by future land owners and developers involving a reduction of FFL will require a reassessment of the underlying soil and potentially additional investigation or remediation. The design levels used for the ODA remediation assume that a minimum 600 mm thickness HHSL will be provided.	Future land owners and developers / LLDC
2.19	OPF Removal	An easement associated with the OPF has meant that remediation and placement of Marker Layer and full HHSL has not been completed by ODA. The area of the OPF shall be assessed and corrective actions undertaken to complete the remedial design as part of the Legacy / Transformation phase. The location of the OPF is shown in Figure 4.	Future land owners and developers / LLDC
2.20	Piling Risk Assessments	Piling risk assessments are required for any future structures constructed across the site.	Future land owners and developers / LLDC
2.21	Invasive Species Monitoring	Ongoing monitoring of invasive species adjacent to river bank, as discussed in Section 3.12. The location of invasive species requiring ongoing monitoring is shown in Appendix E.	Future land owners and developers / LLDC
2.22	Validation reporting	Future works will need to be captured and recorded through the established validation process including further stages of Consolidated Validation Report production on a zonal basis. This includes the already established LOCOG Stage 3 CVRs, infrastructure 'bump-out', where necessary and subsequent Transformation and Legacy stages of the project.	LOCOG, LLDC and future land owners and developers

Note: This table incorporates residual actions following completion of the ODA Enabling and Follow-on Project works and represents the status at the end of the Stage 2 consolidated reporting (hence the Residual Action Nos. 2.1 etc). For the status of these residual actions following the LOCOG works please refer to the applicable Stage 3 CVR.

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