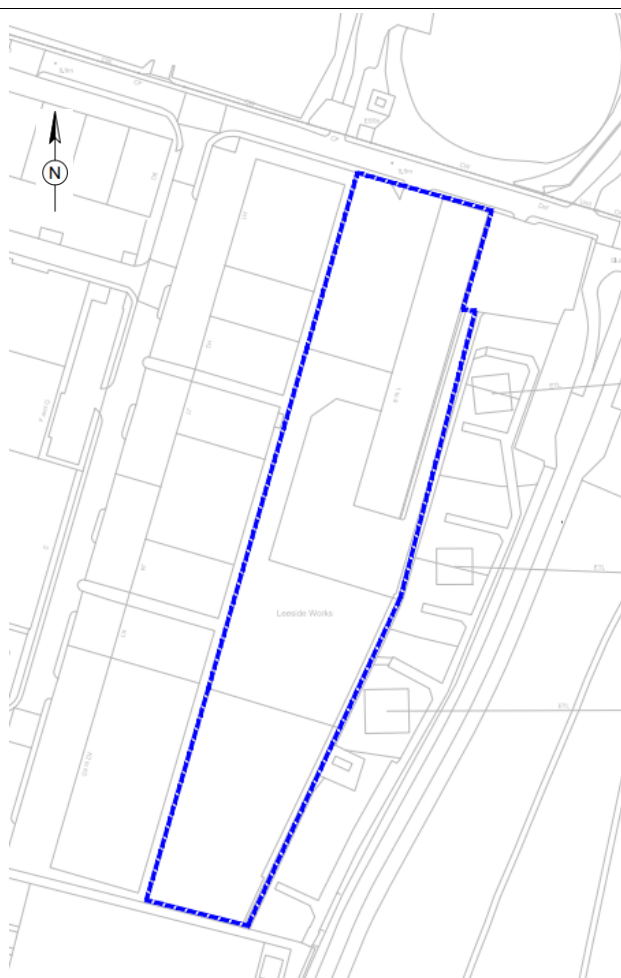


Appendix A. Remediation Options Appraisal





NGET ARRIVA BUS DEPOT, TOTTENHAM (8021)



— — — — —
NGET NON-
OPERATIONAL LAND

Site Address	Leaside Road, Tottenham, N17 0SG	NGP Document Tracking code	
Report Title	NGET Arriva Bus Depot, Tottenham (8021). Remediation Detailed Design		
Report Type	Contamination	Retention Period	Indefinitely
Site Code	8021	Author (Company)	AtkinsRéalis
Report Date	November 2025	Factual/Interpretative	Interpretative
Draft/Final	Final	H&S File?	No
Work Stage*	Remediation		
Brief description of contents	Remediation Options Appraisal for the former depot site located off Leaside Road, Tottenham (8021).		
Access Permitted	NGET Land Regeneration Team	NGET Contact	LRM: Gareth Taylor LRA: Matthew Lush



Notice

This document and its contents have been prepared and are intended solely as information for National Grid Electricity Transmission (NGET) and use in relation to Options Appraisal for the Phase 2 remediation at the NGET Former Depot, Tottenham.

AtkinsRéalis UK Limited (AtkinsRéalis) assumes no responsibility to any other party, other than those identified in the Term Deed of Appointment dated 2017, in connection with this document and/or its contents unless approved by the collateral warranty at the request of National Grid Property Holdings in accordance with AtkinsRéalis 2017-2026 Environmental Services Framework agreement. Copying of this report without the permission of National Grid Property Holdings and/or AtkinsRéalis is not permitted.

Document history

Document reference: 5225197

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft	LI	MT	DC	PH	October 2025
2.0	Final. Updated following Client comments	EC	LI	LI	DC	November 2025
3.0	Updated to include further client comments.	LI	-	-	PH	November 2025

Client signoff

Client	National Grid Electricity Transmission
Project	NGET ARRIVA BUS DEPOT, TOTTENHAM (8021)
Job number	5225197
Client signature/date	



Contents

1.	Introduction.....	1
1.1	General.....	1
1.2	Background	2
1.3	Objectives.....	2
1.4	Report Limitations	3
2.	Site Summary.....	4
2.1	Site Setting	4
2.2	Site History	6
2.3	Summary of Remediation Drivers	6
3.	Phase 2 Remedial Conceptual Site Model	9
3.1	Introduction.....	9
3.2	Potential Contaminant Linkages	9
3.3	Summary of Human Health PCLs	15
3.4	Summary of Controlled Waters PCLs	15
4.	Remediation Options Appraisal	19
4.1	Introduction.....	19
4.2	Remediation Objectives	19
4.3	Preliminary Qualitative Appraisal	19
4.4	Numerical / Detailed Appraisal of Remedial Options	32
4.6	Options Appraisal Conclusions	38
5.	Conclusions	40
5.1	Recommended Remediation Techniques	40
5.2	Next Steps.....	41
6.	References	42

Tables

Table 2-1	Site Information	4
Table 2-2	Summary of NAPL distribution and thickness.....	7
Table 3-1	Conceptual Site Model and Risk Assessment	10
Table 4-1	Preliminary Remediation Options Appraisal	21



Table 4-2	Numerical / Detailed Appraisal of Options	34
Table 5-1	Remediation Recommendations	40



1. Introduction

1.1 General

AtkinsRéalis UK Ltd (AtkinsRéalis) has been commissioned by National Grid Electricity Transmission (NGET) to undertake the design of the Phase 2 remediation for the Former Bus Depot, located off Leaside Road, Tottenham, N17 0SG (herein referred to as 'the site').

The site is proposed for redevelopment as part of the wider North London Reinforcement Project (NLRP), which will see the site redeveloped to facilitate an upgrade to the adjacent NGET owned substation to the east and south. Remediation of the site is required to enable the development works to continue, and to ensure that the site is suitable for use as an operational substation site.

A development led Phase 1 remediation commenced in January 2025 to excavate shallow Made Ground and superficial soils in the locations of the proposed cable corridors, and remove any non-aqueous phase liquids (NAPL), where encountered. The Phase 1 remediation was paused due to design challenges with the overall proposed cable development and other proposed development solutions are being developed by NGET, that include the possible construction of a pylon. In order to limit any programme delays to the construction phase, the Phase 2 remediation designs are being progressed. The Phase 1 remediation works are outside of the scope of this document and the Phase 1 documentation should be sought for information relating to those works.

The intention of this document is to provide an options appraisal for the Phase 2 remediation which is proposed for the site. This document provides the details to partially discharge Requirement 11 of the NLRP Development Consent Order (DCO) (2014 No. 1052), related to Phase 2, for Stage 3a of the development works. NGET propose to undertake the Phase 2 remediation to mitigate against unacceptable risks to controlled waters.

Stage 3a of the works constitutes the preparatory stages of work to clear the site and demolish the on-site structures, to enable Stages 3b and 4 to take place, which comprises the construction of the infrastructure to upgrade the adjacent substation. The NGET Tottenham Substation forms part of the NLRP to upgrade the 275kV overhead lines between Waltham Cross and Tottenham to a higher voltage (400kV). Demolition of the on-site buildings to concrete slab level was completed in August 2024.

The proposed upgrade works on site, and beneath Tottenham Marshes to the east, comprise the construction of underground cables and a cable sealing end compound in the north-east of the site.

This report builds on the documentation that was submitted for the Phase 1 remediation ([1], [2], [3], [4]) and an additional three documents that have been submitted to support the discharge of the Phase 2 sub-requirements of Requirement 11 of the DCO listed below:

- AtkinsRéalis, NGET Former Bus Depot, Tottenham (8021). Factual Site Investigation Report. 2025 [5];
- AtkinsRéalis, NGET Former Bus Depot, Tottenham (8021). Interpretative Site Investigation Report. 2025 [6]; and
- AtkinsRéalis, Former Bus Depot, Tottenham (8021). CW DQRA Update and NAPL Assessment. 2025 [7].

These documents should be consulted for full details on the site and any pertinent details are summarised in this report.

As it was necessary to demolish the on-site buildings to carry out further source characterisation and delineation work at the site, the remediation has been designed in phases. This phasing approach has allowed for refinement of the remediation design throughout the process. The phasing plan and chronological context is summarised as:

- Phase 0: Demolition of the former depot building. This was completed in August 2024;
- Phase 1: Shallow remediation to enable the development works associated with the underground cables, and removal of NAPL, where encountered. This began in January 2025, but was paused due to design challenges with the overall proposed cable development. Other proposed development solutions are being developed by NGET, that include the possible construction of a pylon; and,
- Phase 2: Remediation to mitigate risks to controlled waters across the wider site. The design of which is informed by targeted ground investigation and assessment carried out in 2024 and early 2025.

This report has been produced in line with guidance outlined in the Environment Agency's Land Contamination Risk Management [8], National Planning Policy Framework [9] and Planning Policy Guidance [10].

AtkinsRéalis have continuously engaged with the Environment Agency throughout the Phase 1 remediation design process, regarding the conclusions of the 2025 Controlled Waters Detailed Quantitative Risk Assessment (CW DQRA) [7] and to introduce the key drivers for the Phase 2 remediation. The Environment Agency has agreed with the conclusions drawn in the 2025 CW DQRA [7], a betterment approach to remediation at the site and the rationalisation of the source areas presented in this document.

1.2 Background

The site is located off Leaside Road, Tottenham, London and is situated in the north-east of the Mowlem Trading Estate, approximately 1.5 km to the east of Tottenham.

The recent site arrangement comprised a building and plumbing merchants, steel fabricators, and a storage and logistics yard before these were demolished in the summer of 2024. This demolition was carried out to clear the site for development works, associated with the NLRP.

Historically the site has been used as a bus depot which included associated infrastructure such as above and below ground oil tanks. Prior to this, the north of the site was occupied by an engineering works and an infilled pond is indicated to be present beneath the south of the site. A historical sludge pond is understood to have been located in the central extent of the site, in the footprint of a central infilled pond. The land off-site to the north of the site was used as a gasworks and other heavy industrial uses were present within the local area such as a chemical works.

Previous site investigations and assessments by other consultants have taken place at the site between 2013 and 2016 [11], [12], [13] and pertinent data has been incorporated into the 2025 assessments [5], [6], [7].

Widespread contamination in soils and groundwater has been identified across the site, including exceedances of risk-based criteria in the north and south of the site identified by the 2025 CW DQRA. Dense non-aqueous phase liquid (DNAPL) has been recorded at the base of the superficial deposits in the centre and south of the site.

1.3 Objectives

NGET is proposing to undertake voluntary remediation of identified potential contaminant linkages (PCLs) related to unacceptable risks at the former depot site in order to deem the site suitable for use as an operational substation.



The objective of this report is to set out the sources that are considered necessary to remediate and to establish the most sustainable and cost-effective approach to risk driven remediation at the site, cognisant of the wider area, constraining factors and neighbouring sensitive receptors.

The scope completed in order to achieve this objective is presented below:

- Brief summary of pertinent site information;
- Review of the key findings of AtkinsRéalis risk assessments and presentation of a conceptual site model (CSM);
- Appraisal and refinement of source areas across the site considering identified risks following generic assessment, DQRA and possible off-site risk drivers;
- Completion of a Remediation Options Appraisal to determine an appropriate approach to future remedial work in the context of the assessments completed, site specific constraints, and sustainable remediation principles; and
- Outline recommended next steps.

This report has been produced to align with Stage 2 of Land Contamination Risk Management (LCRM) guidance [8].

1.4 Report Limitations

This report has been produced subject to the following exclusions and limitations:

- This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or in part after its original submission.
- Data from previous reports undertaken by third parties have been incorporated into this report. This data has been assumed to be correct for the purposes of this assessment. AtkinsRéalis does not accept responsibility for inaccuracies in the data supplied by any other party.
- The accuracy of historical maps cannot be guaranteed, and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
- Any borehole data from British Geological Survey (BGS) sources are included on the basis that “The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation”.
- This report draws upon data from the intrusive ground investigation and monitoring of a relatively small proportion of the sub-surface site conditions. Therefore, this information is not necessarily exhaustive and further information relevant to the site may be available from other sources. Inferences drawn from these assessments are subject to the inherent limitations of any such study.
- Climate change impacts to the site have been considered in the interpretative reporting based on the UKCP18 projections, current at the time of writing. This report has been based on the conclusions. Any future changes to climate change projections which may significantly alter the relevant modelling parameters have not been accounted for.
- This report has been compiled on the basis of the current ground conditions and the current information provided on the development design. Changes to the ground conditions and development design could result in further assessments being required. NGET has provided information about the proposed end development that AtkinsRéalis has used in modelling future ground conditions. AtkinsRéalis does not take any responsibility for any inaccuracies in the information that NGET has provided. This report contains information related to the Phase 2 remediation only.



2. Site Summary

2.1 Site Setting

A summary of relevant background information is presented in Table 2-1 and full information is detailed in the AtkinsRéalis 2025 report [5].

Table 2-1 Site Information

Site Details	Site Address: NGET Arriva Bus Depot, Leaside Road, Tottenham N17 0SG Site access is from Leaside Road. Ordnance Survey (OS) Grid reference: 535413, 191516 A site location plan is provided in Figure 1.
Site Description	The site is approximately rectangular and covers an area of approximately 1.2 hectares (ha). The site is vacant and secured by BNP Paribas.
Site Ownership and boundaries	The site is owned by NGET and the former buildings have since been demolished. The site plan is provided as Figure 2. Palisade fencing bounds the site in all directions. The entrance gate to the site is present in the north.
Adjoining and nearby land uses, including sensitive and contaminative	North: Former gasworks, currently being constructed as residential blocks of apartments; East: NGET owned substation infrastructure and the Pymmes Brook surface water course 30 m to the east; South: NGET Tottenham Substation; and West: Mowlem Trading Estate (various commercial and industrial uses).
Site Topography	The site is largely flat, with localised depressions, and is located at approximately 10 m Above Ordnance Datum (AOD).
Ground cover and description	The site is largely covered by concrete and asphalt hardstanding. The approximate proportions of ground cover are 80% hardstanding and 20% covered by crushed concrete.
Services	A composite drawing that presents information from service providers that have assets on, or in the near vicinity of the site is included in the AtkinsRéalis 2023 Factual Site Investigation Report [5]. Following the demolition of the buildings, many of the services on site have been disconnected and those within the northern extent of the Phase 1 remediation footprint have been removed. The following services are located on-site: ▪ A surface drain entering from Leaside Road crossing the site in a north-east to south-west alignment before exiting the site at the eastern boundary. Although not shown on site, electricity infrastructure is present adjacent to the east of the site that includes pylons.
Proposed development	An upgrade of the substation to the east and south of the site, comprising underground cables and a cable sealing end compound to be constructed in the north-east of the site that forms the Phase 1 remediation area. Different design solution for the proposed development are currently being developed by NGET.



Geology	Made Ground was encountered to a maximum depth of 6.0 m below ground level (bgl), underlain by superficial deposits of Alluvium to a maximum depth of 5.85 m bgl and River Terrace Deposits (RTD), namely the Kempton Park Gravels (KPGR), to a maximum depth of 7.8 m bgl. Alluvium was not found to be present within the southern portion of the site, in the vicinity of the anticipated southern and central infilled ponds (noting the central pond was labelled as a 'sludge pit'). Cohesive soils are present in the southern infilled pond area. The bedrock geology comprises the London Clay Formation (LCF) proven off-site (approximately 40 m to the north east) to a depth of 19 m bgl [12]. This formation is in turn underlain by the Lambeth Group, Thanet Sand and White Chalk Group at depth. There is one Brit Pit reported within 250 m of site associated with the Tottenham Marshes sand and gravel commodity to the south.
Hydrogeology	Superficial: Alluvium – secondary undifferentiated aquifer Superficial: Kempton Park Gravel (KPGR) – secondary A aquifer Bedrock: London Clay Formation – unproductive strata Bedrock: Lambeth Group, Thanet Sand – secondary A aquifer AtkinsRéalis consider there to be a continuous groundwater body above the London Clay within the Made Ground and Kempton Park Gravels where the Alluvium is not present (the central and southern areas of site). During the 2024 groundwater monitoring [5], groundwater elevation within the Kempton Park Gravels ranged from 7.63 m to 7.77 m Above Ordnance Datum (AOD), in the north at BH24-02, and between 7.59 m to 7.63 m AOD at BH11, located within the centre of the site. Groundwater elevations within boreholes installed within the Kempton Park Gravels, coincident with the historical southern infilled pond, were noted to be higher than other locations with levels of between 8.88 m to 8.99 m AOD at BH24-12, . Further to the south of the infilled pond, groundwater elevation within the Kempton Park Gravels were between 7.83 m to 8.72 m AOD at BH12-02D. It is anticipated that the Made Ground and Kempton Park Gravels are typically separate groundwater bodies and the groundwater within the Made Ground is continuous, which is consistent with the findings of the 2023 groundwater monitoring and the 2024 CW DQRA [7]. Where the Alluvium is absent (in the south of the site), the two groundwater bodies are considered to be in hydraulic continuity. Groundwater levels indicate that groundwater within the Kempton Park Gravels has a southerly and easterly flow direction.
Hydrology	The closest surface water feature to the site is the Pymmes Brook located approximately 30 m to the east of the site parallel to the eastern site boundary. The Brook flows from the north-north-east to the south-west in direction. The River Lea Navigation Canal is located 230 m to the east of the site and the River Lea is located approximately 250 m to the east of the site. Other surface water features include the Banbury Reservoir located approximately 360 m to the east of the site and the Lockwood Reservoir located approximately 530 m to the south of the site. It is understood that the Lee River Reservoir Chain are primarily fed by surface waters, including the Pymmes Brook, River Lee Diversion and River Lee Flood Relief Channel. There are no reported licensed surface water abstractions within 1 km of the site.



2.2 Site History

A full review of historical maps for the site and the surrounding area provided in the Groundsure report has previously been undertaken and is included in the 2023 AtkinsRéalis Factual Site Investigation report [5].

In summary, the site remained largely undeveloped until 1955, between 1955 and 1956 a pond is shown to be present in the south of the site with buildings shown to be present from 1967 and the pond no longer shown and assumed to have been infilled. A second pond is shown in the centre of the site circa 1967 until 1981. The buildings on-site present from 1967 were demolished and redeveloped in 2001, with a tank shown to be present east of centre of the site on mapping dating from 2001. All on-site buildings were demolished by August 2024 and the site is currently vacant.

Off-site to the north, significant development has taken place including the presence of the Tottenham and Edmonton Gasworks and the Gothic Gasworks. Additionally off-site development includes the Leaside Depot and a chemical works, the NGET Tottenham Substation and industrial warehouses.

2.3 Summary of Remediation Drivers

2.3.1 Existing Reports

Information related to the previous site investigations is summarised in the AtkinsRéalis 2023 [1] and 2025 Factual Reports [5] and these should be consulted for full details. A combined exploratory ground investigation plan is provided as Figure 3.

AtkinsRéalis has completed generic quantitative risk assessment and DQRA in 2023 [2], 2024 [3] and 2025 [6] [7]. The findings of these reports form the basis of the Phase 2 remediation design and these reports should be sought for full details. The principal drivers for remediation are provided herein and comprise gross contamination indicators and risk based exceedances.

2.3.2 Observations of NAPL

NAPL was detected at variable thicknesses during the groundwater monitoring between 2013 and 2024 in 13 locations as summarised in Table 2-2. It should be noted that due to degraded and emulsified nature of the NAPL recorded during the groundwater monitoring, measurable thicknesses of phase-separated NAPL was not always possible to be recorded using an interface probe.

The distribution of NAPL identified during groundwater monitoring between 2013 and 2024 is presented on Figure 4. The distribution of NAPL and in particular DNAPL is located centrally and in the south of the site, which is coincident with the historically infilled ponds.

A total of six product samples were obtained for whole oil analysis from five exploratory holes (BH12-01, BH12-03, BH11, BH24-10 and BH24-13). The sample results recorded the product as 'coal tar' in BH12-01 (2013 and 2023), BH12-03 (2013) and BH11 (2023 and 2024) and the recorded densities range between 1.0395 kg/m³ and 1.0754 kg/m³, which is consistent with the range for coal tar as presented in the Environment Agency DNAPL handbook [14]. No determination possible (NDP) was presented for product samples where the sample was listed as 'unsuitable for this test' at BH24-10 and BH24-13. Moreover, NDP was also presented for viscosity across all product samples as the product was found to be "too thin to register a result".



Table 2-2 Summary of NAPL distribution and thickness

Borehole	No. of monitoring rounds	No. of NAPL detections	NAPL thickness (m)	NAPL thickness adjusted with sump in London Clay Formation (m)*	Period
BH11*	8	5	0.40 to 1.74 DNAPL	0.30 to 1.64 DNAPL	May 2013 to October 2024
BH12-01*	9	6	0.10 to 1.00 DNAPL	<0.01 to 0.90 DNAPL	February 2013 to October 2024
BH12-02D*	9	3	0.05 to 0.30 DNAPL	<0.01 DNAPL	June 2023 to October 2024
BH12-03	3	3	n/a – presence indicated but no thickness recorded	n/a	February to March 2013
BH23-03	6	4	n/a – NAPL evidence on monitoring equipment but no measurable thickness recorded	n/a	May 2023 to October 2024
BH24-09	3	3	0.42 to 0.67 DNAPL	n/a	September to October 2024
BH24-10	3	3	0.15 to 0.40 DNAPL	n/a	September to October 2024
BH24-12*	3	2	0.08 DNAPL	<0.01 DNAPL	September to October 2024
BH24-13*	3	3	<0.01 LNAPL 0.22 to 0.83 DNAPL	<0.01 LNAPL <0.01 to 0.33 DNAPL	September to October 2024
BH24-14	3	2	0.22 to 1.00 DNAPL	n/a	September to October 2024
WS12-01	9	5	0.05 DNAPL	n/a	March 2013 to October 2024
WS12-02	9	5	0.01 to 0.15 DNAPL	n/a	May 2023 to October 2024
WS12-06	9	1	0.30 possible DNAPL	n/a	September 2024

*The response zone at BH11, BH12-01 and BH12-03 (0.10 m), BH12-02D and BH24-12 (0.30 m) and BH24-13 (0.50 m) extends into the impermeable London Clay Formation. This may act as a sump where DNAPL could pool to a greater thickness. Therefore, the thicknesses recorded at these locations as been adjusted in a separate column where encountered.

At locations BH12-01, BH12-02D, BH12-12 and BH12-13 "<0.01 m" indicates that a measurable thickness of DNAPL was not encountered on every monitoring visits.



2.3.3 Soil, Leachate and Groundwater Exceedances of risk based criteria

Screening of site specific assessment criteria (SSACs) with Level 4 dilution derived by CW DQRAs ([3], [7]) at the site against available site data indicated that exceedances were identified for organic contaminants such as benzene, PAHs (such as naphthalene, anthracene and fluoranthene) and 1, 2 dichloroethane.

When comparing the aromatic TPH >EC5-EC7 concentration against the benzene SSAC with Level 4 dilution for soils, there are five exceedances out of a total of 48 soil samples across three locations (BH24-03, BH24-08 and BH24-12).

When comparing the benzene concentrations in soil leachate, five out of a total of 17 samples exceeded the soil leachate SSAC with Level 4 dilution (17.1 mg/l) where the maximum recorded concentration of >10 mg/l was reported by the laboratory. For aromatic TPH >EC5-EC7 concentrations, no exceedances were identified in all 17 soil leachate samples analysed when compared with the benzene soil leachate SSAC with Level 4 dilution. Out of a total of 77 groundwater samples obtained between 2023 and 2024 across the site, 31 exceedances of the benzene groundwater SSAC with Level 4 dilution was identified (40% of groundwater samples obtained between 2023 and 2024). These locations are presented on Figure 4.

Overall, a lower number of exceedances of the SSAC with Level 4 dilution were noted for PAHs in soil, soil leachate and groundwater and were often seen at the same locations where benzene exceeds the SSAC with Level 4 dilution. The locations of PAHs exceedances were generally located centrally at BH24-07, BH24-08 and BH24-09 and in the south of the site such as BH12-01, BH24-12, BH24-13 and WS12-01.

Similarly, a lower number of exceedances of the SSAC with Level 4 dilution was noted for 1,2 dichloroethane in groundwater and these were located centrally (BH24-09, BH24-10 and BH24-11) and in the south of the site (BH12-01, BH24-12 and BH24-13). An additional 1,2 dichloroethane exceedance was also noted in the northern area of site at BH24-03.



3. Phase 2 Remedial Conceptual Site Model

3.1 Introduction

Land contamination is evaluated through the identification and assessment of Potential Contaminant Linkages (PCL) denoting where plausible source-pathway-receptor relationships have been identified and a potential risk to the receptor is present.

The approach adopted involves the development of a Conceptual Site Model (CSM) to describe sources of contamination, potential migration/exposure pathways and potential receptors that may exist at the site, and subsequently identified PCLs.

The PCLs that are relevant to the Phase 2 remediation zone have been summarised within this section in accordance with guidance provided in LCRM [8].

This options appraisal considers the future end use of the site as an operational substation comprising a cable sealing end compound to be constructed in the north-east of the site. This 'open storage' end use is consistent with a commercial end use. The cable sealing end compound will be unoccupied without any operational buildings across the site.

As part of the proposal, the ground surface across the site is expected to comprise predominantly hardstanding, crushed concrete or imported aggregate, with no or limited areas of soft landscaping. Therefore it is assumed that infiltration following development will be limited. A scenario where the slab has been removed and replaced with backfilled aggregate was also included in the DQRA [3] to model a more conservative, worst-case condition. The above ground concrete slab was broken out to match the existing ground level in the footprint of the former building and was only removed below ground in the Phase 1 remediation area to facilitate the establishment of a clean corridor for subsequent cable routes.

Construction phase risks such as risks to construction workers and risks associated with any future construction piling requirements into the Kempton Park Gravels aquifer are not covered in this CSM and are outside of the scope of this report.

3.2 Potential Contaminant Linkages

Following the earlier phases of investigation [1] [2] [3], targeted investigation across the site in 2024 [5], GQRA [6] and DQRA [7], a CSM has been developed. A summary of the CSM and remaining PCLs relevant to the site to be addressed by this options appraisal are summarised within Table 3-1. PCLs have been classified in accordance with CIRIA 552 guidance [15] and the risk rating provided is in absence of any mitigation.



Table 3-1 Conceptual Site Model and Risk Assessment

Source and Area/Structure	Critical Receptors and Scenarios	Pathway	Potential Consequence of Complete Contaminant Linkage	Likelihood of Complete Contaminant Linkage	Risk Rating
Source 1 – Hydrocarbon impacted Made Ground across the site.	Secondary A aquifer (Kempton Park Gravels) Secondary undifferentiated aquifer (Alluvium)	Leaching/dissolution from contaminated soil/NAPL	Medium	Low likelihood	Moderate / Low
		Leaching/dissolution from contaminated soil/NAPL followed by migration in groundwater	Medium	Low likelihood	Moderate / Low
	Surface water (Pymmes Brook)	Migration via surface water/drainage	Medium	Low likelihood	Moderate / Low
		NAPL migration and discharge to surface water	Medium	Low likelihood	Moderate / Low
Source 2 – Potential asbestos within Made Ground associated with the historical demolition and re-development of the site, and possible disposal on site. ACM encountered in BH24-06 and BH24-07.	On-site workers	Dust/fibre inhalation	Severe	Very unlikely	Low
	Off-site workers	Inhalation/direct contact with dusts that have blown off-site	Severe	Very unlikely	Low



Source and Area/Structure	Critical Receptors and Scenarios	Pathway	Potential Consequence of Complete Contaminant Linkage	Likelihood of Complete Contaminant Linkage	Risk Rating
Source 3 – Made Ground associated with southern and central infilled ponds (formerly recorded as a sludge pit).	Off-site workers	Inhalation of ground gases / ground vapours from contaminated soils	Severe	Unlikely	Moderate/Low
	Secondary A aquifer (Kempton Park Gravels)	Leaching/dissolution from contaminated soil/NAPL	Medium	Likely	Moderate
	Secondary undifferentiated aquifer (Alluvium)				
	Surface water (Pymmes Brook)	Leaching/dissolution from contaminated soil/NAPL followed by migration in groundwater	Medium	Likely	Moderate
		Migration via surface water/drainage	Medium	Likely	Moderate
		NAPL migration and discharge to surface water	Medium	Likely	Moderate
		Soil erosion/surface flooding resulting in discharge of contaminants to surface water	Medium	Likely	Moderate
Source 6 – Contaminated groundwater perched in the Made Ground and in the Kempton Park Gravels;	Secondary A aquifer (Kempton Park Gravels)	Migration to aquifer	Medium	Likely	Moderate
	Secondary undifferentiated aquifer (Alluvium)				
		Migration in groundwater	Medium	Likely	Moderate



Source and Area/Structure	Critical Receptors and Scenarios	Pathway	Potential Consequence of Complete Contaminant Linkage	Likelihood of Complete Contaminant Linkage	Risk Rating
	Surface water (Pymmes Brook)	Migration via surface water drainage	Medium	Likely	Moderate
	Off-site workers	Inhalation of ground gases / ground vapours from contaminated soils	Severe	Unlikely	Moderate/Low
Source 7a – LNAPL in the Made Ground, Alluvium and Kempton Park Gravels within the southern and central infilled pond areas.	Off-site workers	Inhalation of ground vapours from contaminated soils	Severe	Unlikely	Moderate/Low
	Secondary A aquifer (Kempton Park Gravels)	Leaching/dissolution from contaminated soil/NAPL	Medium	Unlikely	Low
	Secondary undifferentiated aquifer (Alluvium)	Migration to aquifer	Medium	Unlikely	Low
	Surface Water (Pymmes Brook)	Leaching/dissolution from contaminated soil/NAPL followed by migration in groundwater	Medium	Unlikely	Low
		Migration via surface water drainage	Medium	Unlikely	Low
		NAPL migration and discharge to surface water	Medium	Unlikely	Low
Source 7b – DNAPL in the Made Ground, Alluvium and Kempton Park Gravels within the southern and central	Off-site workers	Inhalation of ground vapours from contaminated soils	Severe	Unlikely	Moderate/Low
	Secondary A aquifer (Kempton Park Gravels)	Leaching/dissolution from contaminated soil/NAPL	Medium	Likely	Moderate



Source and Area/Structure	Critical Receptors and Scenarios	Pathway	Potential Consequence of Complete Contaminant Linkage	Likelihood of Complete Contaminant Linkage	Risk Rating
infilled pond areas. The DNAPL has been identified as coal tar.	Secondary undifferentiated aquifer (Alluvium)	Migration to aquifer	Medium	Likely	Moderate
	Surface water (Pymmes Brook)	Leaching/dissolution from contaminated soil/NAPL followed by migration in groundwater	Medium	Likely	Moderate
		Migration via surface water drainage	Medium	Likely	Moderate
		NAPL migration and discharge to surface water	Medium	Likely	Moderate
Source 8 – Organic contamination in the Made Ground and Alluvium in the north of the site.	Off-site workers	Inhalation of ground vapours from contaminated soils	Severe	Unlikely	Moderate/Low
	Secondary A aquifer (Kempton Park Gravels)	Leaching/dissolution from contaminated soil/NAPL	Medium	Likely	Moderate
	Secondary undifferentiated aquifer (Alluvium)				
	Surface water (Pymmes Brook)	Leaching/dissolution from contaminated soil/NAPL followed by migration in groundwater	Medium	Likely	Moderate
		Migration via surface water/drainage	Medium	Likely	Moderate
		NAPL migration and discharge to surface water	Medium	Likely	Moderate



Source and Area/Structure	Critical Receptors and Scenarios	Pathway	Potential Consequence of Complete Contaminant Linkage	Likelihood of Complete Contaminant Linkage	Risk Rating
		Soil erosion/surface flooding resulting in discharge of contaminants to surface water	Medium	Likely	Moderate



3.3 Summary of Human Health PCLs

Table 3-1 shows that the PCLs are related to the potential vapour risk to off-site workers associated with the presence of gross contaminated soils, impacted groundwater, LNAPL and DNAPL, classified as a moderate/low risk.

A vapour specific ground investigation was undertaken by Advisian in 2016 [11] that installed sub slab monitoring wells beneath the former building (now demolished). The concentrations detected were utilised to derive indoor air concentrations using the Johnson and Ettinger model for volatile organic compounds (which included benzene), and none of these compounds were found to exceed generic assessment criteria for air quality. In addition, borehole monitoring data available on the London Borough of Haringey Planning Portal, which was obtained as part of the redevelopment of the Mowlem Industrial Estate to the west, did not identify hazardous soil vapour concentrations from exploratory hole locations approximately 80 m west of the site boundary. Ground gas and vapour mitigation measures were understood not to have been installed as part of the development in 2018. The construction of the adjacent buildings as warehouses with roller shutters, that are often opened during working hours, will act to limit the potential for vapour accumulation within internal rooms.

Considering the above and as the Phase 2 remediation is likely to comprise remediation of DNAPL across the site and gross contamination risk drivers to controlled waters, this mitigation will also mitigate the source of the potential off-site vapour risk PCLs to the west of the site (Sources 3 and 8). Unsaturated zone contamination mitigation may be targeted in the north and south of the site and further assessment may be recommended.

A low risk to on-site and off-site works from asbestos has been identified. Whilst asbestos is known to be present in the Made Ground beneath the site, the current and proposed hardstanding / crushed concrete surface coverage of the site limits the potential for human health exposure. An exposed area of soil approximately 1 m wide is present adjacent to the eastern palisade fencing; however, as future workers/visitors of the substation will traverse the site via pedestrian walkways, there is not considered to be a pathway from asbestos or contamination in soils to future site end users. No specific remediation for asbestos is recommended but it should be presumed to be present in shallow soils and the infilled pond areas. This report does not consider risks during construction, where it is expected that appointed Contractors will manage H&S risks through appropriate workplace controls and risk assessment.

The risk assessment and conceptual site model may require a review should there be any modifications to the proposed development and inclusion of any areas of soft landscaping or soft ground.

3.4 Summary of Controlled Waters PCLs

As detailed in Table 3-1, risks to controlled waters across the site are considered to be moderate. An objective of the 2024 investigation was to delineate areas that may present potentially unacceptable risks to controlled waters receptors across the site. These areas were defined as part of the AtkinsRéalis reporting [6] [7] and can be broadly termed: the northern area, the central infilled pond and the southern infilled pond. These are further discussed herein.

The CW DQRA [7] identified exceedances of Level 4 SSAC across the site for soil, soil leachate and groundwater. Remediation at the site will therefore be defined by these exceedances and the presence of NAPL.



3.4.1 Northern Area

Exploratory hole locations that are collectively included within the northern area of site are BH12-05, BH12-06, BH24-01, BH24-02, BH24-03, BH24-04, WS12-07 and WS12-08 as shown on Figure 3. This corresponds with Sources 1, 6 and 8 in Table 3-1.

LNAPL or DNAPL was not encountered in this area following intrusive investigation carried out in 2013, 2023 or 2024. It is noted that all boreholes completed in 2024 were drilled to the base of the Kempton Park Gravels and therefore screened the full thickness of the superficial aquifer. Groundwater samples obtained between 2023 and 2024 exceeded the SSAC with Level 4 dilution in the north east of the site in BH24-03 in the Kempton Park Gravels (benzene and 1,2-dichloroethane) and within the Made Ground within WS12-07 (benzene) in the north west.

Soil samples obtained from BH24-03 also contained organic contaminant exceedances of the soils SSAC with level 4 dilution for aromatic total petroleum hydrocarbons (TPH) >C5-C7, ethylbenzene, anthracene and fluoranthene at 1.5 m bgl, and for aromatic TPH >C5-C7 at 3.4 m bgl. As shown on the borehole logs included in Appendix A and Photo-Ionisation Detector (PID) profiles in Appendix B, nominal PID readings were recorded in the Made Ground until a reading of 3233 parts per million (ppm) at 1.5 m bgl, followed by readings that exceeded the maximum limit of the equipment of 15,000 ppm within the Made Ground to the top of the Alluvium at 3.5 m bgl. Volatile organic compounds (VOCs) were found to reduce gradually through the Alluvium from 2,432 ppm at 4 m bgl to 243.7 ppm at 5.5 m bgl, and further reduced in the Kempton Park Gravels. The Made Ground also had a strong hydrocarbon odour and was stained throughout. The Made Ground is considered likely to be one of the contributory sources of organic contamination in the groundwater in the area, in the north east of the site. It is noted that this contamination is not found at the same magnitude in the deeper Alluvium and Kempton Park Gravels.

As shown on Figure 4, BH24-03 is approximately 5 m to the north of the Phase 1 remediation footprint. In this area, the excavation initially extended to a depth of 1.7 m bgl; but was over-excavated to a cohesive layer at approximately 2 m bgl due to the presence of black stained soils. Even though a large volume of unsaturated zone soils grossly impacted with organic contamination in this area have already been excavated in the vicinity of BH24-03 (Source 8), it would be prudent to carry out further unsaturated zone remediation considering the exceedances of risk based criteria in BH24-03.

In the north west of the site, the maximum benzene concentration in groundwater of 140 mg/l was identified in WS12-07 that exceeds the Level 4 SSAC. Within the Made Ground at this location, from 0.22 m to 2.10 m, the soil is described as having a 'strong, sickly sweet odour' and PID readings of 15,000 ppm are recorded (assumed to represent the maximum equipment limit although no comment is provided on the historical borehole log) at these depths. Soil samples from WS12-07 were obtained in 2013 and the installation response zone crosses the Made Ground and Alluvium, with the water sample likely being collected from perched water in the Made Ground rather than the water table. As a result, BH24-02 was excavated immediately adjacent to WS12-07 as part of the 2024 investigation. PID readings exceeded the equipment limit of 5,000 ppm throughout the full depth of the Alluvium from 1 m to 4 m bgl. This indicates a more shallow source of VOCs as the PID readings declined from 4.5 m bgl to base. Concentrations of aromatic TPH >C5-C7 (indicator of benzene) in soils at 1 m and 3.5 m bgl did not, however, exceed the calculated level 4 soils SSAC, and there were no exceedances for other compounds.

Although representative risk based criteria are not considered to have been exceeded in the north west of the site, it would be prudent to extend the unsaturated zone remediation recommended in the vicinity of BH24-03 to capture the WS12-07 and BH24-02 locations. This area is shown on Figure 5. This will also mitigate against the source of potential off-site vapour risks to the commercial receptors to the west.

Considering the above, remediation of the PCLs associated with organic contamination in the Made Ground (Source 8) is recommended at this stage.



3.4.2 Central and Southern Infilled Ponds (Southern Area)

Exploratory hole locations that are included within the central infilled pond are BH12, BH12-03, BH24-08, BH24-09, BH24-10, BH24-11, WS12-03 and WS12-04, as presented on Figure 3. Exploratory hole locations that are included within the southern infilled pond are BH12-01, BH12-02D, BH24-12, BH24-13, WS12-01 and WS12-02. These areas are collectively termed the Southern Area. This corresponds with Sources 1, 3, 6, 7a and 7b in Table 3-1.

DNAPL has been encountered which exceeded the DNAPL pool height in BH11, BH24-09, BH24-10, BH24-14 and BH24-15 and is considered to be possibly mobile, based on industry accepted guidance for a Kempton Park Gravels host matrix. Exceptions may be BH24-10 and BH24-14 which are present in topographic low surfaces of the London Clay which may limit the potential for lateral mobility. DNAPL was also encountered in BH12-03 and WS12-06 but did not exceed the critical pool height.

Groundwater samples obtained between 2023 and 2024 within the Kempton Park Gravels exceeded the SSAC with Level 4 dilution within the central infilled pond at BH24-08 (benzene), BH24-09 (benzene, 1,2-dichloroethane, fluoranthene and anthracene) and BH24-11 (benzene and 1,2-dichloroethane). Whilst DNAPL was not encountered at BH24-11, it is proximal and potentially down hydraulic gradient of BH24-08 and BH24-09 and therefore considered to be within the DNAPL source zone.

Groundwater samples also exceeded the SSAC with Level 4 dilution at BH23-04 (benzene) within the Made Ground and BH12-04 (benzene), and BH24-07 (benzene) within the Kempton Park Gravels. Evidence of NAPL was observed on monitoring equipment at proximal BH23-03, but no measurable thickness was recorded. This NAPL within the Made Ground in BH23-03 is likely acting as the source of benzene in proximity to BH23-04 and has been addressed by the part-completed Phase 1 remediation. BH12 and BH24-07 are considered to be down hydraulic gradient of areas with identified DNAPL within the Kempton Park Gravels and this is considered to be the source that should be remediated.

In the southern infilled pond area, DNAPL has been encountered within all exploratory hole locations largely at the base of the Kempton Park Gravels but only exceeded the DNAPL pool height in BH12-01. Groundwater samples obtained between 2023 and 2024 were noted to exceed the SSAC with Level 4 dilution in the same locations where DNAPL was encountered. A delineation exercise indicated DNAPL was present across the southern site area and it is therefore considered possible that it may also be found beyond the site boundaries to the east and south.

The DNAPL has been identified by laboratory testing as degraded coal tar and was visually found to be emulsified in nature across the site during the monitoring and draw-down works. The calculated NAPL transmissivity rates ranged between 0.205 m²/day at BH24-13 and 0.088 m²/day at BH24-10, indicating a poor recoverability potential. Together with the qualitative assessment of the thick DNAPL (provided in the CW DQRA report [7]), the recovery rate of the DNAPL on site is considered to be low.

Despite the low recoverability, remediation of the DNAPL encountered is recommended and is likely to be based on objectives of partial mass removal of the NAPL considering sustainability, cost and effectiveness, rather than restoration of the source zone. Such methods would reduce the overall contaminant load in the aquifer and sources of dissolved phase organic contamination across the site. Unsaturated zone remediation is recommended that also mitigates against human health risks to off-site receptors. Due to the likely presence of DNAPL beyond the site boundaries, it is unlikely that complete DNAPL removal will be achieved at the site. A pragmatic approach to the remediation that defines when sufficient DNAPL has been removed from the site should be considered.



Considering the above, remediation related to PCLs associated with Sources 3, 6 and 7b is recommended. This targeted area is shown on Figure 5. The 'LNAPL' occurrences identified in the Southern Area (Source 7a) may represent remnant source DNAPL. As significant measurable thicknesses were not observed during the ground investigations or subsequent monitoring, this 'LNAPL' is not the focus of remediation but will be indirectly mitigated as a result of any proposed works.



4. Remediation Options Appraisal

4.1 Introduction

This section provides an appraisal of remediation technologies that are considered most likely to represent technically and commercially feasible options for the works in the context of the site and has been undertaken in general accordance with the Environment Agency LCRM [8].

This appraisal has been undertaken based on the future use of the site as operational NGET infrastructure. The options appraisal does not consider the PCLs that were addressed by the Phase 1 remediation and these are outside of the scope of this report.

A major driver for the Phase 2 remediation is the construction phase of the substation upgrade, where the site will be inaccessible for the duration of the works. A construction phase programme has not been finalised but it has been assumed that works will commence in the second half of 2026 for the purpose of this document.

4.2 Remediation Objectives

The primary technical objectives for both the Phase 1 and Phase 2 remediation are detailed in the AtkinsRéalis Remediation Strategy [16]. The objectives specific to Phase 2 are as follows:

- to address PCLs identified in Section 3, as far as is reasonably practicable, and to render the site suitable for use as an operational substation. This comprises addressing unacceptable risks present in unsaturated soils in the north east and precautionary risks in the north west of the site;
- to undertake betterment of the site to address unacceptable risks to controlled waters and remove gross contamination, that will include the recovery of DNAPL in the central and southern infilled pond areas, as far as is reasonable and practicable, taking into account the likelihood that DNAPL may also be present beyond the site boundaries;
- to implement a sustainable remediation scheme, involving the aspiration to reduce waste, limit impact on the local community in terms of nuisance, and embody health and safety, as far as is reasonably practicable in the context of proposed development to render the site suitable for use as an operational substation;
- remediation detailed design should be agreed and implemented within the agreed programme so that it does not delay the construction phase of the proposed substation upgrade scheme (this will be submitted to London Borough of Haringey to partially discharge sub-requirements of the DCO application); and
- to regularly engage with the Environment Agency.

4.3 Preliminary Qualitative Appraisal

A preliminary qualitative appraisal of potentially viable remediation technologies along with justification as to why some of the remediation technologies are not considered to be appropriate for the works is presented in Table 4-1 for the northern and southern areas separately. These indicative remediation areas are shown on Figure 5.

The remedial options available to achieve the objectives above were considered through AtkinsRéalis' knowledge and understanding of the site, best practice techniques and guidance available ([17], [18]), stakeholder views, timescales, and wider site-specific factors, such as the site setting. During the evaluation of the remediation



options, consideration of the waste hierarchy and Sustainable Remediation Forum (SuRF) Guidance was undertaken to evaluate the potential sustainability of the remediation scope.

There are a number of approaches that could be used:

- Engineering solutions: such as excavation and off-site disposal, or cover systems; and
- Process-based solutions: typically involving physical, biological, chemical, and thermal processes.

It is possible that a combination of technologies will be required to achieve the remediation objectives.

An assessment of the feasibility of each remediation option has been determined as per the below with the summary provided in Table 4-1.



Table 4-1 Preliminary Remediation Options Appraisal

Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
Source removal: Excavation of unsaturated contaminated material and off-site disposal to landfill or soil treatment centre (STC).	Contaminated media are excavated, transported to, and disposed of at a suitably licenced landfill facility or STC. Most soil types and contaminants can be dealt with in this manner. Reduced levels are reinstated using material which is suitable for use (both chemically and physically).	- Removes source of contamination; - can address a wide range of contaminants, including those which may not be economically viable to remediate by other methods; - it is expected that material would predominantly be disposed of at a soil treatment centre rather than landfill; - it is rapid to deploy and remediation timescales are fast in comparison to other techniques; - remediation technology is commonly undertaken and has proven to be effective in such situations;	- Only suitable for shallow material present above water table; - Material may not be accepted at landfill/treatment centre; - less sustainable option as soils need to be transported off-site, although potential soil treatment centres are located within a reasonable distance; - relatively large number of traffic movements required via Leaside Road that is also used by other neighbouring commercial users; - likely requirement for import of material, after site-won aggregate is used; - stockpiles of contaminated soils stored on site have the potential to cause odour	<u>Northern Area:</u> Excavated soils from the Phase 1 remediation were not accepted at soil treatment centres due to the degree of black staining and hydrocarbon odours present in soils for disposal. These soils were sent to landfill that increased costs and reduced overall sustainability efforts. It is anticipated that unsaturated soils in the vicinity of BH24-03 will have a similar composition.	4	Not considered suitable due to potential odour release risk during excavation that was a significant problem during the Phase 1 remediation. In addition, this approach is not considered sustainable and is not taken forward.
				<u>Southern Area:</u> - DNAPL present at the site is considered to have migrated from 'source zone' soils and is present in the saturated zone at the base of the Kempton Park Gravels / infilled ground in the pond areas; - excavation of unsaturated zone soils would be costly considering the Phase 1 experience; and - due to the depth of DNAPL encountered at the base of the	5	

Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
		sufficient space on site for storage of stockpiles of material.	- accumulation and nuisance to off-site commercial site users; - potential for odours and dust to be generated during excavation.	Kempton Park Gravels / infilled ground in the pond areas, excavation is not considered to be feasible or sustainable.		
Ex-situ soil washing (on-site)	Ex-situ soil washing is a technology whereby excavated material is passed through a soil washing plant, not only washing contaminants from the soil, but also aerating it, which can aid the breakdown of organic contaminants.	- can address a wide range of contaminants; and - limited off-site disposal required reducing local traffic movements; - soil washing plant requires a large operational area that is available on-site.	- can lead to odour release; - asbestos is also present in the Made Ground soils across the site and the operational risk from fines would need to be assessed separately.	<u>Northern Area:</u> - high potential for odour release likely to cause nuisance to commercial residents to the north and west of the site; and - the volume of unsaturated soils for disposal in the northern area is unlikely to offset the costs of the mobilisation a soil washing plant. <u>Southern Area:</u> - high potential for odour release cause nuisance to commercial users to the west of the site; - other remedial methods are likely to be more effective at targeting the unsaturated zone contamination in the south of the site; - DNAPL present at the site is considered to have migrated	4	Not considered to be suitable across the site due to odour release and asbestos content.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
				from the 'source zone' soils and is present in the saturated zone at the base of the Kempton Park Gravels / infilled ground in the pond areas; and the volume of excavated soil required to reach the DNAPL at depth would render this option too costly.		
<i>In-situ</i> stabilisation/ solidification (on-site)	Stabilisation / solidification (S/S) alters the chemical and/or physical state of the ground <i>in situ</i> . Stabilisation involves the addition of chemicals to the soils and free product to produce more chemically stable compounds with reduced contaminant mobilisation potential. Solidification involves adding	- successful in treating low mobility DNAPL such as coal tar and unsaturated zone organic contamination; and - sufficient space on site for equipment required.	- the presence of cohesive soils within the infilled pond areas are likely to limit the mixing potential of the reagents added; - high costs compared to other remedial techniques. Pilot and laboratory trials will also be required that will increase costs; and - high carbon usage if cement is used.	<u>Northern Area:</u> - this technique has been successful in treating unsaturated soils similar to those present in the north of the site; - the presence of heterogenous Made Ground with possible obstructions may limit the success of this technique; - pilot trials are likely to deem suitability that will increase the costs; and - a fairly small area for treatment. <u>Southern Area:</u> - the unsaturated zone soils are not considered to be the source as the DNAPL has migrated into	3 4	Potentially suitable for the remediation and taken forward for assessment for the Northern Area. Not considered to be suitable for



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
	reagents to the soil to reduce its permeability, fluidity and friability and prevent access by mobilising agents such as water. Can be injected into the unsaturated zone or can be incorporated into earthworks.			the saturated zone. Other techniques are likely to be more suitable at mitigating against the remaining unacceptable risks in the unsaturated zone; unlikely to be suitable in the saturated zone where the DNAPL is found.		the Southern Area.
Thermal desorption (steam)	Thermal desorption is an application of heat to volatilise and mobilise contaminants in unsaturated soils and groundwater.	- can address a wide range of contaminants; and - must be combined with other remedial techniques. Typically deployed with soil vapour extraction but could be combined with a pumping / extraction technique for the DNAPL that will operate more effectively with increased mobility of the product.	- A relatively expensive remediation technology and this increases due to the requirement to be paired with another remedial option; - would require pilot trials to be carried out to determine effectiveness; - can increase the movement of contaminants in the aquifer and towards surface water receptors. Will require specific agreement with the Environment Agency;	<u>Northern Area:</u> - may be suitable for unsaturated zone but the presence of cohesive alluvial soils in places may limit recoverability; - An increased injection array may be required increasing costs. <u>Southern Area:</u> - Suitable for unsaturated zone sources; - considering the proximity of the site to the Pymmes Brook, this method is unlikely to be acceptable due to the	3 4	Potentially suitable for the remediation of the unsaturated zone only and taken forward for assessment for both areas.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
			- heterogenous soils (Made Ground) have a lower contaminant recovery efficiency; - likely to require hydraulic containment when used sub water table. - cohesive soils may require longer treatment times, increasing costs.	mobilisation of dissolved phase contaminants in the short term		
Bioventing	Air is injected into unsaturated zone soils to enhance the natural biodegradation process. By providing oxygen to existing soil microorganisms, bioventing stimulates their activity, accelerating the breakdown of contaminants.	- can be applied <i>in situ</i> to unsaturated zone soils; - effective at treating organic contamination in soils; - a sustainable and cost-effective option; - can be combined with other remedial techniques.	- the effectiveness is reduced in cohesive soils; - long length of remediation process. - Ineffective at treating NAPL in shorter timescales.	<u>Northern Area:</u> - the presence of cohesive Alluvium may hinder success. In the vicinity of BH24-02, the alluvial soils are noted as being clayey sand; - length of remediation may not align to site objectives; <u>Southern Area:</u> - the presence of cohesive soils within the infilled pond areas may limit the mixing potential of the reagents added; - will only mitigate unsaturated zone contamination and will therefore not recover DNAPL.	3	Potentially suitable for the remediation of the unsaturated zone only and taken forward for assessment for both areas.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
Chemical oxidation by injection	Oxidants can be injected upstream of the source zones and oxidation increases the rate of NAPL / organic contamination dissolution.	- effective in achieving partial mass removal in granular aquifers; and - can be combined with other remedial techniques.	- can increase dissolved phase concentrations in the aquifer in the short to medium term. Would require agreement with the Environment Agency; - relatively ineffective for NAPL impacts; - would require pilot trials to be carried out to determine effectiveness.	<u>Northern Area:</u> - injected oxidants do not spread and react effectively in the unsaturated zone; - can be combined with other techniques in the unsaturated zone to be effective but this is likely to increase costs compared with other remedial options. <u>Southern Area:</u> - not considered to be suitable for unsaturated soils; - can be deployed as a multi-level system, possibly treating unsaturated NAPL and saturated zone organic contamination; - injection into the saturated zone would also require hydraulic containment that would increase costs; - other techniques are considered to be more appropriate;	3	Not considered to be technically viable for the northern area. The need to incorporate hydraulic containment in the south of the site will increase costs and it is therefore not taken forward for assessment.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
Soil vapour extraction (SVE) only	A vacuum is applied through boreholes to induce a flow of air through the unsaturated zone. This extracted air removes volatile and semi-volatile contaminants from the soil.	- effective at removing a wide range of contaminants; - cost effective; - a method for achieving betterment at the site; - multi-depth screening zones can optimise coverage across the remediation areas; - can be combined with other remedial techniques.	- Targets the unsaturated zone only when deployed without other techniques; - will not mitigate coal tar; - cohesive soils may limit the success of the technique and cause longer remediation times; - varying timeframes for completion.	<u>Northern Area:</u> - the presence of Alluvium may hinder success. In the vicinity of BH24-02, the alluvial soils are noted as being clayey sand; however, the overlying Made Ground can be treated by this technique. <u>Southern Area:</u> - the presence of cohesive soils within the infilled pond areas may limit extraction; - can be deployed as a multi-level system to treat organic contamination at various depths in the southern area; - not suitable for the saturated zone DNAPL.	3	Potentially suitable for unsaturated zone remediation only and taken forward for assessment for both areas.
Engineered physical barrier (e.g piling, injection grouting)	Physical containment of the source zones, to break lateral migration of NAPL and organic contamination encountered in soils.	- low operational and maintenance costs; - prevents the migration of off-site contamination onto site; - can be combined with other remedial techniques.	high construction costs due to depth and spatial extent of DNAPL contamination in the south of the site. Increased costs due to need to excavate and dispose of contaminated	<u>Site wide:</u> - High costs considering widespread nature of contamination across the site; - Unlikely to effectively meet remediation objectives	5	Not considered to be suitable due high costs and limits to effectiveness.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
			soils to install physical barrier; and ▪ Potential for leakage of perched water and groundwater if poorly installed. ▪ Potential interference with groundwater flow pathways which could result in spread of contamination.			
Permeable Reactive Barrier (PRB)	Groundwater flows naturally through the permeable barrier, within which degradation processes occur, preventing downstream migration of contaminants.	▪ passive technique, with relatively low associated operational costs; and ▪ can effectively be used with other remedial techniques.	▪ High cost for installation; ▪ long term maintenance of the PRB is recommended; ▪ unsuitable for treatment/removal of NAPL source.	<u>Site wide:</u> ▪ long term maintenance unlikely to be favourable to NGET; and ▪ Does not recover DNAPL from the saturated zone that is a principal remediation objective.	5	Not considered to be suitable and does not meet the technical objectives of the remediation.
Pump and Treat	Acts to pump groundwater from beneath the site to the surface, where it can be treated and reinjected back into the aquifer or	▪ effective recovery of DNAPL and wide range of dissolved contaminants;	▪ long treatment time which is unlikely to align with the construction time; ▪ additional techniques can improve effectiveness but also	<u>Northern Area:</u> ▪ source of contamination is considered to be the overlying unsaturated zone and betterment methods are	4	Not considered suitable considering technical objectives in the Northern area.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
	discharged elsewhere.	- can treat contamination at depth; and - proven technique in the remediation sector.	- raises the cost for remediation; - residual contamination may be present; - poor quality aquifer in the wider area and this technique may cause off-site contamination to migrate and leach onto site; and - off-site discharge can be expensive.	recommended, rather than any groundwater treatment. <u>Southern Area:</u> - odours associated with the DNAPL are likely; - may generate a high volume of contaminated water that would require treatment and discharge / disposal; - a system that pumps the DNAPL from the saturated zone could be effective but may require the addition of other techniques to boost recovery, such as surfactants; and - unlikely to treat overlying unsaturated organic contamination.	4	Potentially suitable for the remediation and taken forward for assessment.
DNAPL extraction (fabric extraction)	An oleophilic / hydrophobic fabric intercepts the oil-water interphase and adsorbs the DNAPL product. The adsorbed product is desorbed	- does not extract groundwater so smaller volumes require disposal as a result of the works; - sustainable and cost effective solution	- varying period for treatment; - emulsified and degraded nature of the DNAPL present may hinder performance; - may draw in DNAPL from off-site causing	<u>Northern Area:</u> free product has not been encountered in the northern area. <u>Southern Area:</u>	2	Not suitable for the northern area.



Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
	at ground level and collected in a tank for disposal.	- compared with other remedial techniques; - low odour generation potential; and - this solution could be operational during the construction phase due to small footprint.	- uncertainty over the defined end point of the remediation; and - cannot be used in conjunction with surfactants and reagents.	effective for DNAPL recovery but unlikely to be suitable for the unsaturated zone hydrocarbon impact.		Potentially suitable for the remediation and taken forward for assessment for the Southern Area.
Enhanced DNAPL recovery by surfactants	Surfactants or solvents can be used to increase the mobility or solubility of the contaminants.	- can increase the movement of NAPL towards recovery wells; - can be used in conjunction with other remedial options; and - is fairly rapid to deploy and remediation timescales are fast in comparison to other techniques.	- can increase the movement of contaminants in the aquifer and towards surface water receptors. Will require specific agreement with the Environment Agency; - the presence of cohesive soils within the infilled pond areas may limit the mixing potential of the surfactants added.; - will require hydraulic containment to prevent migration of the surfactants. This will increase costs.	<u>Northern Area:</u> - free product has not been encountered in the northern area; - not suitable for unsaturated zone soils in this area. <u>Southern Area:</u> - effective for DNAPL recovery but unlikely to be suitable for the unsaturated zone hydrocarbon impact; - the presence of cohesive soils within the infilled pond areas may limit the mixing potential of the reagents added;	2	Potentially suitable for the remediation and taken forward for assessment for the Southern Area.

Remediation Option	Summary of Remediation Technology	Remediation Option Advantages	Remediation Option Disadvantages	Site Specific Area Appraisal	Cost Rating (1 to 5)*	Suitability
				hydraulic containment techniques also likely to be required.		
Monitored Natural Attenuation (MNA)	Monitoring of natural attenuation processes in the aquifer to indicate site specific remediation objectives are met. Typically comprises of a long-term groundwater monitoring campaign where natural attenuation parameters are tested and assessed over time.	- a cost-effective solution in the shorter term and sustainable option relative to other remediation technologies; - can be used in conjunction with other remedial options and is a useful line of evidence to prove betterment at the site; and - can be continued around construction phase activities.	- due to the proximity of the DNAPL present in the south of the site, it may be difficult to position a down hydraulic gradient borehole on site; - long monitoring period required to evidence results. Long-term monitoring and assessment increases costs; and - monitors dissolved phase contaminants and parameters only and does not target DNAPL.	<u>Site wide:</u> - the long monitoring period required to evidence results is unlikely to deem this method suitable for this site considering the construction programme; - conditions in the aquifer are likely to suggest degradation but concentrations are unlikely to reach acceptable levels without mitigation.	2	Not considered to be suitable due to the remediation objectives to remove DNAPL at the site and mitigate unacceptable risk to controlled waters. Timescales for an MNA approach also unlikely to be acceptable.

*Cost Rating: 1 – Low and 5 – High



4.4 Numerical / Detailed Appraisal of Remedial Options

Based on the preliminary qualitative appraisal in Table 4-1, the following remediation technology options have been taken forward for further evaluation for the Phase 2 remediation.

Northern Area – unsaturated zone only:

- In situ stabilisation / solidification (on-site);
- Bioventing;
- Thermal desorption; and
- Soil vapour extraction.

Southern Area – unsaturated zone:

- In situ stabilisation / solidification (on-site);
- Bioventing;
- Thermal desorption;
- Soil vapour extraction;

Southern Area – saturated zone:

- Hydraulic containment / pump and treat;
- DNAPL extraction, specifically fabric extraction; and
- Enhanced DNAPL recovery by the addition of surfactants.

The applicability of each potential remediation technology option has been appraised numerically against a series of predetermined criteria as listed below. This detailed appraisal has been undertaken in accordance with the Environment Agency LCRM guidance [8]:

- effectiveness;
- stakeholder views;
- operational requirements;
- commercial availability;
- track record;
- permissions;
- health and safety;
- environmental impact;
- long-term obligations;
- durability;
- cost; and
- sustainability.



A weighting factor has been applied to some of the assessment criteria and scores from each criterion have been added together to give a total score for each potential remediation technology option. The numerical / detailed options appraisal is included in Table 4-2. The table assumes that each remedial technique is being completed separately whereas a blend of some of the remediation approaches may be the preferred approach.

The weighting factor for environmental impact takes into account both the carbon footprint, transport, the local environmental impact and the environmental impact within a wider site setting.



Table 4-2 Numerical / Detailed Appraisal of Options

Remediation Options	Effectiveness	Stakeholder/ Views	Operational Requirements	Commercial Availability	Track Record	Permissions	Health and Safety Performance	Environmental Impact	Long Term Obligations	Durability	Cost	Sustainability	Total Score	Comment
Maximum Score	20	10	5	5	5	5	5	10	5	5	20	5	100	-
Northern Area – unsaturated zone only														
In situ stabilisation / solidification (on-site)	18	8	5	5	5	5	5	8	5	5	14	3	86	Effective technique with a strong track record. A moderate energy intensive approach compared with other methods.
Bioventing	12	9	5	5	4	4	5	10	5	3	18	5	85	Effective technique but the timescales required are not feasible within the development programme.
Thermal desorption	17	8	5	5	4	4	5	8	5	5	15	4	85	This technique cannot be utilised alone and would require a method such as soil vapour extraction to complete the remediation. This increases costs and sustainability score.



Remediation Options	Effectiveness	Stakeholder/ Views	Operational Requirements	Commercial Availability	Track Record	Permissions	Health and Safety Performance	Environmental Impact	Long Term Obligations	Durability	Cost	Sustainability	Total Score	Comment
Soil vapour extraction	16	9	4	5	5	4	5	9	5	4	16	5	87	There is a potential for contaminant rebound and therefore residual risk.
Southern Area – unsaturated zone														
In situ stabilisation / solidification (on-site)	18	8	5	5	5	5	5	8	5	5	14	3	86	Effective technique with a strong track record. A moderate energy intensive approach compared with other methods.
Bioventing	12	9	5	5	4	4	5	10	5	3	18	5	85	Effective technique but the timescales required are not feasible within the development programme.
Thermal desorption	17	8	5	5	4	4	5	8	5	5	15	4	85	This technique cannot be utilised alone and would require a method such as soil vapour extraction to complete the remediation. This increases costs and sustainability score.



Remediation Options	Effectiveness	Stakeholder/ Views	Operational Requirements	Commercial Availability	Track Record	Permissions	Health and Safety Performance	Environmental Impact	Long Term Obligations	Durability	Cost	Sustainability	Total Score	Comment
Soil vapour extraction	16	9	4	5	5	4	5	9	5	4	16	5	87	There is a potential for contaminant rebound and therefore residual risk.
Southern Area – saturated zone														
Pump and treat	17	8	3	5	4	3	5	8	5	5	10	2	75	Energy intensive and removal of high volumes of groundwater from the aquifer (likely contaminated) require disposal, reducing the sustainability score. Successful on contaminated sites in the UK.
DNAPL extraction, specifically fabric extraction	16	9	5	3	5	5	5	10	5	5	18	5	91	Low cost and energy usage. This technique is known to be successful at recovering DNAPL from similar sites in the UK, including the Meridian Water site to the north. There are possibly a low number of units in circulation in the UK.



Remediation Options	Effectiveness	Stakeholder/ Views	Operational Requirements	Commercial Availability	Track Record	Permissions	Health and Safety Performance	Environmental Impact	Long Term Obligations	Durability	Cost	Sustainability	Total Score	Comment
Enhanced DNAPL recovery by the addition of surfactants.	18	5	2	5	5	2	3	5	3	5	8	2	63	Would need to be deployed with hydraulic containment, increasing costs.



4.6 Options Appraisal Conclusions

The results of the numerical / detailed options appraisal have identified preferred viable solutions for the contamination found to be present across the site. These are discussed separately for the northern and southern areas.

Experience from the Phase 1 remediation has been built into the options appraisal. As a result, remedial techniques involving the excavation of soils have been discounted for the northern and southern areas. The principal sources in the south of the site are considered to be the infilled ponds. The financial costs and negative sustainable impacts associated with excavating the infilled material are considered to outweigh the environmental benefits. Consequently, *in situ* techniques are deemed to be more appropriate for achieving the remediation objectives.

During the remediation of previous industrial sites and gasworks, vapours, odours and dusts have been generated. Subsequent migration of vapours, odours and dusts have become a local nuisance to neighbours and local residents. The site is located within an urban area with commercial properties surrounding the site to the north and west. During the Phase 1 remediation, odours were reported to cause nuisance to commercial site users of the industrial estate to the west and the club to the northeast.

It is therefore a priority that during the remediation works the environmental impact and nuisance to the local surrounding environment are minimised. It is considered that remediation technologies such as excavation, ex-situ stabilisation and ex-situ bioremediation would require soil stockpiles on-site for a longer time and during the treatment / mixing process dusts, vapours and odours would be generated which could potentially migrate off-site, especially in hot or windy weather. *In situ* remedial techniques are considered to be the preferred options in order to minimise the nuisance impact of dusts, vapours and odours.

4.6.1 Northern Area – unsaturated zone only

The numerical and detailed options appraisal has identified the preferred solution of soil vapour extraction as the most viable option for the northern area, particularly given the prevalence of benzene contamination. This technique would reduce concentrations of volatile compounds in the unsaturated zone, without the release of odours, mitigating the potential off-site vapour risk to the adjacent commercial users to the west. The presence of cohesive Alluvial soils in places may hinder the applicability of the method and it is therefore recommended that a betterment approach is agreed with the Environment Agency. This method can be combined with thermal desorption to increase efficacy at the site, pending liaison with remediation contractors.

Bioventing also scored highly in the options appraisal for unsaturated zone remediation; however, whilst this solution is cost effective, sustainable and less intensive than other options, the timescales for completion would render this solution impractical for the site. It is anticipated that the Phase 2 remediation will be completed prior to construction and therefore a shorter remediation programme is likely to be favourable for the client.

In situ stabilisation is also considered to be an effective method for the unsaturated zone remediation and has been effective on similar sites. The targeted remediation area comprises heterogeneous Made Ground, with concrete obstructions and bricks present and this limits the uniform distribution of the reagent required to stabilise the soils. This coupled with the presence of shallow perched water within the Made Ground may constrain this option.

4.6.2 Southern Area

As detailed for the northern area, soil vapour extraction is considered to be the preferred solution for unsaturated zone remediation across the site. This system can be deployed at targeted locations easily, across the southern



area, providing overall betterment and limiting the potential for off-site vapour risks to the commercial site users to the south west. The accessible volatile organic compounds will be removed, leaving heavier end compounds in situ and these are not risk drivers at the site.

The preferred method for treatment of the DNAPL at the base of the Kempton Park Gravels is considered to be DNAPL extraction, specifically the use of the fabric extraction technique. Following ground investigation and DNAPL drawdown tests across the south of the site, the degraded and emulsified nature of the DNAPL is considered to have a low recoverability potential. Pump and treat systems aiming to recover DNAPL of this nature also extract a high volume of contaminated water, that is energy intensive to treat and costly to dispose of. The addition of surfactants can aid any pump and treat system but would likely require the installation of a hydraulic containment system. On this basis, a pump and treat solution is not considered to be suitable for the remediation and the addition of surfactants (and a hydraulic containment system) would increase the cost of this solution compared with other techniques.

It is anticipated that DNAPL may extend beyond the site boundaries and therefore, a pump and treat system may also draw in contaminated water and NAPL from off-site. The fabric extraction technique does not draw water into the system, can be switched on and off instantaneously and provides real time measurements of the volume of DNAPL recovered. This is considered to manage this constraint at the site. Pilot trials are recommended to determine the applicability of this technique.

As discussed, due to the possible presence of DNAPL beyond the site boundary, the end-point of the remediation should be achievable and practicable considering the remediation objective of site betterment. Complete remediation of the DNAPL beneath the south of the site is unlikely to be achieved and as such, evidence of asymptotic recovery to demonstrate recovery as far as reasonably practicable will be set as an endpoint for the remedial process.

Prior consultation between AtkinsRéalis and the Environment Agency confirmed that the preferred technique of DNAPL extraction by fabric extraction is an acceptable approach.

4.6.3 Site-wide considerations

The environmental and sustainable impacts of the remediation works within the local site setting and within a wider context are key considerations. The preferred options presented are carried out *in-situ* on-site, limiting traffic movements around the site and reducing the carbon footprint of the works when compared with excavation and disposal of contaminated soils.

The timescales for construction are a key driver for the Phase 2 remediation. Although the development proposals are still being finalised and no construction programme has been provided, best efforts should be made to deliver a Phase 2 remediation prior to the construction phase so the works do not hinder the wider NLRP scheme. As such, remedial techniques that are highly effective in a short time period are likely to be favourable to the client.



5. Conclusions

5.1 Recommended Remediation Techniques

The results of the optional appraisal have concluded that a combination of techniques will provide the most appropriate remedial solution to achieve the remediation objectives. Based on these objectives, details of the selected techniques are provided in Table 5-1. A full conceptual site model will be provided in the Remediation Detailed Design, prepared under a separate cover.

The options provided are preliminary and may be refined following liaison with a specialist remediation contractor.

Table 5-1 Remediation Recommendations

Source	Location	Proposed remedial technique	Rationale
Sources 1 and 3 - Made Ground associated with southern and central infilled ponds (formerly recorded as a sludge pit).	Southern Area	Soil Vapour Extraction, possibly combined with thermal desorption. To be confirmed following liaison with a specialist remediation contractor.	Targeted unsaturated zone remediation where risk-based criteria has been found to exceed in soils. This approach will also mitigate potential off-site vapour risks to commercial users to the west.
Source 6 – Dissolved phase impact in groundwater perched in the Made Ground and in the Kempton Park Gravels.	Site-wide	No specific groundwater remediation is proposed.	The remediation objectives are to perform site betterment and mitigate unacceptable risks to groundwater. Whilst no targeted groundwater remediation techniques are proposed, the remediation works will improve the overall groundwater quality at the site and across the wider area. This approach has been agreed in principle with the Environment Agency.
Source 7b – DNAPL in the Made Ground, Alluvium and Kempton Park Gravels within the southern and central infilled pond areas. The DNAPL has been identified as coal tar.	Southern Area	DNAPL recovery by extraction, specifically the fabric extraction technique.	DNAPL recovery in the saturated zone, at the base of the Kempton Park Gravels is recommended. The targeted areas will be selected based on DNAPL pool height exceedances, low points at the top of the London Clay and site information obtained from the ground investigations completed at the site to date. Evidence of asymptotic recovery to demonstrate recovery as far as reasonably practicable will be set as an endpoint for the remedial process Pilot trials will likely be recommended.



Source	Location	Proposed remedial technique	Rationale
Sources 1 and 8 – Organic contamination in the Made Ground and Alluvium in the north of the site.	Northern Area	Soil Vapour Extraction, possibly combined with thermal desorption. To be confirmed following liaison with a specialist remediation contractor.	Unsaturated zone remediation is recommended where risk-based criteria is exceeded in groundwater. An indicative remediation area is provided that also includes a precautionary extension that will also mitigate potential off-site vapour risks to commercial users to the west.

The options appraisal and remediation recommendations have been based on available data. If further data is collected or unexpected contamination is encountered, revisions and updates to the options appraisal may be required. It should be noted there are limitations and uncertainties associated with the data as outlined in Section 1.4; however, the site has been subject to several phases of comprehensive site investigation (and Phase 1 remediation) and there are not considered to be significant data gaps.

5.2 Next Steps

Following completion of this options appraisal, the following next steps are recommended for the Phase 2 remediation:

- Liaison with competent Remediation Contractors who have experience with the recommended techniques and similar site geology;
- Completion of a Remediation Detailed Design to conclude the remediation design and specification;
- Carry out a human health DQRA for vapours to validate the assumptions made across the site by a previous consultant;
- Continued engagement with the Environment Agency and submission of the remediation design documentation to the London Borough of Haringey as part of the DCO submission for the site; and
- Completion of pilot trials to determine the effectiveness of the recommended remedial techniques.



6. References

- [1] Atkins, “NGET Arriva Bus Depot, Tottenham. Factual Site Investigation Report.,” 2023a.
- [2] Atkins, “NGET Arriva Bus Depot, Tottenham (8021). Interpretative Site Investigation Report.,” 2023b.
- [3] Atkins, “NGET Arriva Bus Depot. Controlled Waters Detailed Quantitative Risk Assessment Report,” 2024.
- [4] Atkins, “NGET Former Bus Depot, Tottenham (8021). Outline Remediation Strategy.,” 2024.
- [5] AtkinsRéalisis, “NGET Former Bus Depot, Tottenham (8021). Factual Site Investigation Report.,” 2025.
- [6] AtkinsRéalisis, “NGET Arriva Bus Depot, Tottenham (8021). Interpretative Site Investigation Report.,” 2025.
- [7] AtkinsRéalisis, “NGET Former Bus Depot, Tottenham (8021). CW DQRA Update and NAPL Assessment,” 2025.
- [8] Environment Agency, “Land Contamination Risk Management (LCRM),” 2020.
- [9] Department for Levelling Up, Housing and Communities, National Planning Policy Framework, UK Government, 2021.
- [10] Department for Levelling Up, Housing and Communities, Land Affected by Contamination, UK Government, 2019.
- [11] Advisian, “Indoor Air Quality Assessment Letter Report, Tottenham Arriva Bus Depot Ref 51576-03,” 2016.
- [12] Worley Parsons, “Geotechnical and Environmental Assessment Site Investigation Factual Report. Proposed Cable Route, Tottenham.,” 2013c.
- [13] Worley Parsons, “Environmental Assessment, Factual Site Investigation Report, Arriva Bus Depot, Tottenham,” 2013a.
- [14] Environment Agency, “An illustrated handbook of DNAPL transport and fate in the subsurface,” 2003.
- [15] CIRIA, C552: Contaminated Land Risk Assessment: A Guide to Good Practice. CIRIA., 2001.
- [16] Atkins, “NGET Former Bus Depot, Tottenham (8021). Outline Remediation Strategy.,” 2024.
- [17] Environment Agency, “An illustrated handbook of DNAPL transport and fate in the subsurface,” 2003.
- [18] CL:AIRE, “Guidance on the Assessment and Monitoring of Natural Attenuation of Contaminants in Groundwater,” 2024.



FIGURES