



Remediation Contingency Plan

Radlett Strategic Rail Freight Interchange Area 2

Date: April 2019

Issue: 02

Reference: 18-175

Status: D

Prepared by: PWE

Date: 18/04/2019

Authorised by: NRB

Date: 18/04/2019

Issuing office: WT

DOCUMENT CONTROL

Issue	Date	Status	BC Author (Date/Initials)	BC Approval (Date/Initials)	Notes
1	11/03/2019	D	11/03/2019_PWE	11/03/2019_NRB	
2	18/04/2019	D	18/04/2019_PWE	18/04/2019_PWE	

REPORT CONDITIONS

This document has been prepared by Bradbrook Consulting Limited ("Bradbrook Consulting") for the titled project (or named part thereof) and should not be relied upon or used for any other project without prior written authorization being obtained from Bradbrook Consulting. Bradbrook Consulting accepts no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned. Any persons so using or relying upon this document for such other purpose do so at their own risk.

This report was prepared for the sole use of the named Client and shall not be relied upon or transferred to any other party without the express written authorisation of Bradbrook Consulting. It may contain material subject to copyright or obtained subject to license; unauthorised copying of this report will be in breach of copyright/license.

The findings and opinions provided in this document are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described in this report. Factual information, including, where stated, a visual inspection of the site, has been obtained from a variety of sources. Bradbrook Consulting assumes the third party data to be reliable, but has not independently confirmed this; therefore, Bradbrook Consulting cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The findings and opinions presented in this report are relevant to the dates when the assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of the report. Where such information might impact upon stated opinions, Bradbrook Consulting reserves the right to modify the opinions expressed in this report. Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by Bradbrook Consulting for the effects of any future changes to such guidelines and legislation.

The limitations of liability of Bradbrook Consulting for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

CONTENTS

	Page No.
1. INTRODUCTION	1
2. PLANNING CONTEXT AND REPORT PURPOSE	1
3. SITE SETTING AND PROPOSED DEVELOPMENT	1
4. PREVIOUS DEVELOPMENT HISTORY	2
5. GROUND CONDITIONS	2
6. HYDROGEOLOGY AND HYDROLOGY	2
7. GROUNDWATER ASSESSMENT	3
8. GROUNDWATER MONITORING	3
9. REMEDIATION PROPOSALS	4
10. CONCLUSIONS	5

1. Introduction

1.1 This document sets out a proposed contingency and action plan in relation to remediation of Area 2 of the Radlett Strategic Rail Freight Interchange (SRFI). It has been produced by Bradbrook Consulting for Helioslough Limited and should be read in conjunction with the following previous reports by Capita Property and Infrastructure Ltd:

- Remediation Options Appraisal for Area 2, ref CS-070751-PE-18-075-R dated July 2018
- Geo-environmental Monitoring Proposals for Areas 1 and 2 ref CS-070751-PE-17-050-R v2 dated January 2018.
- Addendum to Controlled Waters Detailed Quantitative Risk Assessment for Area 2, ref. CS070751-CAP-00-XX-RP-Y-CWDQRA rev 2.0 dated January 2017.
- Controlled Waters Detailed Quantitative Risk Assessment for Area 2, ref. CS070751-CAP-00-XX-RP-Y-CWDQRA rev 2.0 dated January 2017.
- Ground Contamination Assessment and Remediation Strategy for Area 2, ref CS-070751-PE-16-143-R rev C dated October 2016.
- Ground Contamination Assessment and Remediation Strategy for Area 1, ref CS-070751-PE-16-134-R rev B dated October 2016.

2. Planning Context and Report Purpose

- 2.1 The proposed development benefits from outline planning consent granted by the Secretary of State for Communities and Local Government in July 2014 (ref. APP/B1930/A/09/2109433). Condition 24 of the consent relates to the investigation and assessment of ground contamination.
- 2.2 The above-listed Capita reports have been submitted to the local planning authority, St Albans District Council (SADC), in relation to particular parts of Condition 24. The reports have also been reviewed by the Environment Agency (EA) who has provided comments regarding potential pollution risks to controlled waters.
- 2.3 The EA has provided specific comments in relation to the Remediation Options Appraisal in a letter to SADC dated 16 January 2019. This Bradbrook Consulting report aims to address the points raised in that letter, in particular regarding a contingency plan in the event that long-term monitoring of groundwater were to indicate that contaminants of concern were migrating to potentially cause pollution.

3. Site Setting and Proposed Development

- 3.1 The overall proposed SRFI development site comprises land in and around the former Radlett Aerodrome to the south of North Orbital Road (the A414) and to the north of the M25 motorway in the Upper Colne Valley, Hertfordshire.

- 3.2 Area 2 is approximately centred on NGR 516123, 203253 and covers an area of about 26 hectares, comprising disused land with sporadic, locally dense vegetation. A number of small ditches bisect the area centrally from west to east, and a north-south ditch is also present on the western boundary and along most of the eastern boundary. The Midland Mainline railway forms its western boundary, with Area 1 of the development beyond. The railway is on an embankment which is typically about 2 to 3m above current site levels.
- 3.3 Area 1 of the development is proposed to comprise an intermodal freight terminal and rail and road served distribution units. A new rail line is proposed to service the development via a link from the Midland Mainline. The new rail line will pass through Area 2 before entering Area 1 at approximately the mid-point of its eastern boundary.

4. Previous Development History

- 4.1 Area 2 was in agricultural use until the 1960s. Quarrying of parts of the site for sand and gravel took place in the 1960s and '70s and the resultant voids were used for landfilling of household and commercial wastes in the 1970s and '80s.
- 4.2 It was a condition of the landfill licence that a cover layer of clay reject material not less than 30cm thick be placed over the uppermost waste layer. The clay layer should be covered by not less than 60cm overburden or subsoil.

5. Ground Conditions

- 5.1 Ground investigations undertaken by Capita 2016 identified Area 2 to be surfaced with a layer of topsoil between about 0.1 and 0.5m thick. In areas of historic landfilling this was generally underlain by:
- 1 to 2m gravelly clay (landfill capping);
 - 4 to 6m landfill consisting of a mix of domestic refuse and commercial and construction type wastes;
 - 1 to 2m thick clayey / gravelly base layer of re-worked soil (possibly a landfill lining or unworked natural deposits).
- 5.2 The underlying natural soils, which were detected at much shallower depths outside landfilled areas, comprised the Kesgrave Catchment Subgroup - interbedded gravelly clay and clayey sand layers over sand and gravel - over Chalk. The top of the Chalk was reached at between about 9 and 14mbgl (59.3 and 62.7mAOD).

6. Hydrogeology and Hydrology

- 6.1 Groundwater below Area 2 was between about 64mAOD (about 9m below ground level) at the northern end falling to about 60.5mAOD (circa 14m below ground level) in the south-east corner. Flow is therefore directed towards the south/south-east at a

approximate gradient of 1 in 230. The water table generally coincided with the deeper sand and gravel of the Kesgrave and the top of the underlying Chalk.

- 6.2 Localised pockets of perched groundwater were also occasionally detected within the landfill deposits, at between about 3 and 5mbgl.
- 6.3 The Chalk is as a Principal Aquifer and the superficial Kesgrave deposits are a Secondary A aquifer. The site lies within groundwater source protection zone 2 (Outer zone) which is associated with an abstraction >1km to the south / south-west. The Inner part of this SPZ extends almost to the site's south-western corner but does not reach the site boundary.
- 6.4 The nearest significant surface watercourse is the River Colne which is situated about 400 m south and east of the site, flowing in a generally southerly direction. The River Ver is located about 1 km west of the site at its nearest point.
- 6.5 There are no known surface water abstractions in the site vicinity.

7. Groundwater Assessment

- 7.1 Groundwater quality was investigated in detail as part of the 2016 investigations, and risks to potential receptors were assessed using the Consim model during the 2017 DQRA. The identified contaminants of potential concern included PAH compounds; metals; and ammoniacal nitrogen. The DQRA considered risks from the landfill in its current condition and considered a 'squeezed' model to simulate the effects of placement of earth bunds on top of the landfilled ground (to create proposed landscaping bunds). A third model simulated the effects of reduced surface water infiltration following placement of a new capping layer and engineered land drainage.
- 7.2 The DQRA demonstrated that reducing infiltration over landfilled areas in Area 2 will provide a beneficial reduction in concentrations of all the key contaminants modelled. It was concluded that implementation of the SRFI development provides an opportunity to improve groundwater quality in the Chalk aquifer.
- 7.3 It was however recognised that concentrations of ammoniacal nitrogen, whilst modelled to be reduced, may still exceed drinking water standards.

8. Groundwater Monitoring

- 8.1 A comprehensive programme of groundwater monitoring has been proposed in order to provide groundwater quality data for an extended period prior to, during and for one year following construction of the rail line at Area 2. Details are set out in the Capita January 2018 Geo-environmental Monitoring Proposals report.
- 8.2 In its letter of 16 January 2019, the Environment Agency has expressed that this form of Monitored Natural Attenuation typically requires a minimum of two years of time-series monitoring data. This is to ensure meaningful and statistically valid data trends.
- 8.3 The following amended monitoring programme is therefore proposed:

Location	Analysis Suite	Monitoring Frequency
BH52	<ul style="list-style-type: none"> TPH-CWG 	<ul style="list-style-type: none"> 1-month intervals for 6 months prior to commencement of Area 2 development works, to establish baseline conditions. 1-month intervals during bund construction 1-month intervals for the first 6 months following bund completion At 9, 12, 18 and 24 months post bund construction. The programme may be extended as required to provide meaningful and statistically valid trends.
BH53	<ul style="list-style-type: none"> BTEX 	
BH54	<ul style="list-style-type: none"> Speciated PAH (US EPA 16) 	
BH55	<ul style="list-style-type: none"> VOC 	
BH56	<ul style="list-style-type: none"> Ammoniacal nitrogen an N 	
BH57	<ul style="list-style-type: none"> Nitrate as N 	
BH58	<ul style="list-style-type: none"> Metal/metalloids: As, Bo, Cd, CA, Cr (VI), Cu, Pb, Mg, Hg, K, Se, Na, Zn) 	

9. Remediation Proposals

- 9.1 As noted above, it is recognised that the Environment Agency requires the development of a remediation contingency and action plan. Such a plan would be implemented should the monitoring data indicate contaminants are migrating and causing pollution to a sensitive Controlled Water receptor.
- 9.2 The previous investigation data and modelling indicates ammoniacal nitrogen to be the principal contaminant of concern with the potential to present a plausible risk in the context of the 'capped' landfill model.
- 9.3 Groundwater flow below the site has been demonstrated to be directed towards the south, and the nearest sensitive receptors, as defined in the DQRA, comprise:
- The River Colne, located about 380 m down-gradient of the southern boundary.
 - The down-gradient groundwater abstraction point, 1 km to the south-west.
 - A theoretical compliance point 50 m south of the site (as recommended in EA groundwater protection guidance).
- 9.4 It is proposed that the following measures would be implemented to prevent migration of site-derived pollutants towards these receptors:
- Construction of a series of groundwater abstraction wells along the southern boundary, with response zones sealed within the permeable Chalk some 12 m to 20 m below the surface.

- These wells are to be designed to act as a down-gradient barrier, to intercept groundwater flow and prevent migration beyond the site's southern boundary.
- Groundwater would be abstracted and pumped to an above-ground 'wastewater lagoon' located in the south-western sector of the site, outside the historically landfilled areas.
- Abstracted groundwater is to be treated by mechanical aeration to reduce the ammonia concentration. In order to achieve this the lagoon environment is to be controlled to ensure high levels of dissolved oxygen are maintained.
- The lagoon is to be dosed as necessary to maintain a suitable pH (typically between 7.5 and 8), and the water adequately mixed to reduce stratification of differing ammonia concentrations.
- Treated groundwater will overflow from the aeration lagoon into an infiltration basin positioned away from areas of historical landfilling. This basin will allow infiltration of uncontaminated water into the unsaturated Kesgrave Gravel lithology.
- The following sequence is therefore proposed:




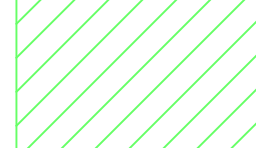


- Enclosed drawing 18-175D/700 illustrates likely abstraction well locations and the position of a treatment lagoon and infiltration basin. The drawing also indicates the locations of existing wells to be used for the long-term water quality monitoring.
- It is recognised that any dewatering/abstraction and subsequent discharge to ground activities will likely require Environmental Permits under the Environmental Permitting (England and Wales) Regulations 2010, from the Environment Agency. These would need to be in place prior to commencement of construction.

10. Conclusions

- 10.1 This report summarises the site's geo-environmental status and the proposals for long-term monitoring of groundwater quality. It describes a remediation contingency plan to address potential ongoing elevated concentrations of ammonia in groundwater, based on the outputs generated by previous detailed risk assessment. The treatment consisting of groundwater abstraction, aeration and re-circulation via infiltration basin. In this way a robust mechanism will be in place to ensure that any plume, if present, is stable or shrinking, and that attenuation is occurring over a sustained period without unacceptable risk to downstream receptors.



Legend

- BH XX
-  Groundwater monitoring wells.
-  Approx. extent of Landfill Sites.
-  Groundwater flow direction.
-  Groundwater abstraction well.

Infiltration basin for discharge of treated groundwater.

Lagoon for groundwater treatment by mechanical aeration.

Groundwater abstraction wells. Final spacing to be confirmed following pump testing.

Rev	Tech	Date	Description
Watford Office 1st Floor, The Junction Station Road Watford Hertfordshire, WD17 1ET United Kingdom			
T: +44 (0)20 8339 9006 E: info@bradbrookconsulting.com W: www.bradbrookconsulting.com			Bradbrook Consulting <small>London • Kingston • Watford • Warrington • Dubai</small>
Client HELIOSLOUGH LTD			
Project Title RADLETT SRFI			
Drawing Title GROUNDWATER REMEDIATION CONTINGENCY PLAN			
Purpose of Issue <input type="radio"/> Information <input type="radio"/> Preliminary <input type="radio"/> Approval <input type="radio"/> Tender <input type="radio"/> Construction <input type="radio"/> Record Copy <input type="radio"/>			
First Issue Date	Drawn By	Scale	Checked
Apr 2019	NDH	1:2000 @ A1	PWE
Drawing Number 18-175D / 700			Rev. P1

