

## Radlett Strategic Rail Freight Interchange

### Area 2

Remediation Options Appraisal

August 2018

## Quality Management

<b>Job No</b>	CS-070751		
<b>Project</b>	Radlett SRFI – Area 2		
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<b>Title</b>	Remediation Options Appraisal		
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<b>Prepared by</b>	PWE	Signature (for file)	
<b>Authorised by</b>	NRB	Signature (for file)	

## Revision Status / History

<b>Rev</b>	<b>Date</b>	<b>Issue / Purpose/ Comment</b>	<b>Prepared</b>	<b>Authorised</b>
-	2/8/18		PWE	NRB

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## Contents

1. Introduction	1
1.1 Preamble	1
1.2 Development Proposals	1
1.3 Previous Relevant Reports	1
1.4 Planning Context and Report Purpose	1
2. Environmental Setting	3
2.1 Location	3
2.2 Description	3
2.3 Surrounding Land Use	3
2.4 Previous Development History	3
2.5 Mapped Geology	3
2.6 Hydrogeology	4
2.7 Hydrology	4
3. 2016 Ground Investigations	5
3.1 Scope	5
3.2 Conditions Encountered	5
3.3 Summary Ammonia Impacts	5
4. Remediation Options	7
4.1 Introduction	7
4.2 Permeable Reactive Barrier	7
4.3 In Situ Bioremediation	7
4.4 Groundwater Pump and Treat	8
4.5 Soil Excavation	8
5. Discussion and Conclusion	10

## Appendices

Appendix A – Architect’s Proposed Development Layout
Appendix B – Site Location Plans
Appendix C – Monitoring Well Location Plan

# 1. Introduction

## 1.1 Preamble

1.1.1 This document has been produced by Capita Property and Infrastructure Limited for Helioslough Limited (the Client) to describe options for environmental remediation at Area 2 of the Radlett SRFI development.

## 1.2 Development Proposals

1.2.1 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 nearby Midland Mainline. The new rail line will pass through Area 2 – the subject of this report – before entering Area 1 at approximately the mid-point of its eastern boundary.

1.2.2 A visual / acoustic mound is proposed to be constructed to the east of the new rail link, along most of the eastern side of Area 2. Bunds are also proposed to be constructed at Area 1 on that plot's northern, western and southern boundaries.

1.2.3 An architect's drawing illustrating the proposed development layout at Areas 1 and 2 is provided in Appendix A.

## 1.3 Previous Relevant Reports

1.3.1 This document follows and is informed by three preceding geo-environmental assessments undertaken by Capita:

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

## 1.4 Planning Context and Report Purpose

1.4.1 Outline planning consent for the scheme was granted by the Secretary of State for Communities and Local Government in July 2014 (ref. APP/B1930/A/09/2109433). Condition 24 of that consent relates to the investigation and assessment of ground contamination.

1.4.2 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) in its role as a statutory planning consultee, with particular reference to evaluation of risks to controlled waters.

- 1.4.3 In its response of 17 May 2018 the EA requested that a remediation options appraisal (ROA) be undertaken in respect action that might be taken in respect of concentrations of ammoniacal nitrogen detected in groundwater below Area 2. This document therefore intends to satisfy the EA request.

## 2. Environmental Setting

### 2.1 Location

- 2.1.1 The proposed 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.
- 2.1.2 Area 1 is approximately centred on Ordnance Survey National Grid Reference (NGR) 515690, 203720 and can be located at postcode AL2 2ET. Area 2 is approximately centred on NGR 516123, 203253. Location plans are provided in Appendix B.

### 2.2 Description

- 2.2.1 Detailed site descriptions are provided in the previous Capita reports. In summary Area 2 covers an area of about 26 hectares and comprises disused land with sporadic, locally dense vegetation. A number of small ditches bisect this 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.
- 2.2.2 The Midland Mainline railway forms a north-south oriented boundary between Areas 1 and 2. The railway is on an embankment which is typically about 2 to 3m above current Area 2 ground levels.

### 2.3 Surrounding Land Use

- 2.3.1 Area 2 is bordered to the south by the M25 motorway and to the west by the Midland Mainline railway. Land use to the immediate north and east is agricultural, with a residential development known as Napsbury Park situated about 0.5 km to the north-east.

### 2.4 Previous Development History

- 2.4.1 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.
- 2.4.2 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.

### 2.5 Mapped Geology

- 2.5.1 Geological map extracts from the British Geological Survey Digital Geological Map of Great Britain at 1:50,000 scale indicates the site to be underlain by superficial deposits of the Kesgrave Catchment Subgroup. This lithology is described as 'sand and gravel'.
- 2.5.2 The underlying solid geology comprises the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated).

- 2.5.3 As noted above, some of the site is known to have been historically quarried for sand and gravel and the resultant voids used for landfilling. Whilst the presence of landfill / artificial ground is not reflected in the mapped geology, extensive landfill waste has been detected below parts of the site.

## 2.6 Hydrogeology

- 2.6.1 The sedimentary bedrock (i.e. Chalk of the Lewes Nodular Chalk Formation and Seaford Chalk Formation) is as a Principal Aquifer. The superficial Kesgrave deposits are a “Secondary A” aquifer
- 2.6.2 The site is situated within groundwater source protection zone 2 (Outer zone), related to 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.
- 2.6.3 Details of nearby groundwater abstractions are listed in the 2016 geo-environmental reports.

## 2.7 Hydrology

- 2.7.1 The nearest significant surface watercourse is the River Colne which is situated about 500 m east of the site and flows in a southerly direction. .
- 2.7.2 The River Ver is located about 1 km west of the site at its nearest point.
- 2.7.3 There are no known surface water abstractions in the site vicinity.



## 3. 2016 Ground Investigations

### 3.1 Scope

3.1.1 Intrusive ground investigation works were undertaken by Capita in 2016 across Areas 1 and 2. These comprised construction of boreholes with monitoring wells and extensive trial pitting to both areas. Soil, soil leachate and groundwater samples were laboratory tested for a range of potential chemical contaminants and a programme of water level and ground gas monitoring was undertaken.

3.1.2 A drawing illustrating the exploratory hole locations in Area 2 is provided in Appendix C.

### 3.2 Conditions Encountered

3.2.1 The whole of Area 2 was found 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).

3.2.2 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).

3.2.3 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. This generally coincided with the deeper sand and gravel of the Kesgrave and the top of the underlying Chalk.

3.2.4 Localised pockets of perched groundwater were occasionally detected within the landfill deposits, at between about 3 and 5mbgl.

### 3.3 Summary Ammonia Impacts

3.3.1 32 soil, 5 soil leachate and 10 groundwater samples were analysed from Area 2 in August 2016. This was followed by analysis of six additional groundwater samples in October 2016.

3.3.2 Laboratory analysis of the soil samples did not detect significant concentrations of chemical contaminants and risks to human health were for the most part concluded to be low.

3.3.3 However moderate exceedances of several determinands were reported within groundwater, with the following concentrations of ammoniacal nitrogen recorded:

Location	Lithology	Measured Concentration of Ammoniacal Nitrogen ( $\mu\text{g/l}$ )	
		August 2016	October 2016
BH51	Kesgrave and Chalk	38	120
BH52 (shallow)	Landfill	49	-
BH52 (deep)	Chalk	67000	76000
BH53	Kesgrave and Chalk	23	<15
BH54 (shallow)	Landfill	24000	-
BH54 (deep)	Chalk	42000	37000
BH55	Kesgrave and Chalk	< 15	57
BH56	Chalk	200	-
BH57	Kesgrave and Chalk	300	1000
BH58	Chalk	120000	-

- 3.3.4 On the basis of these results, and notwithstanding the beneficial effect of placing enhanced capping over this part of the development site (as demonstrated in the 2016 groundwater DQRA), the EA has requested a remediation options appraisal. This will sit alongside the long term groundwater monitoring proposals described in the January 2018 Capita report.

## 4. Remediation Options

### 4.1 Introduction

4.1.1 In the event that long term groundwater monitoring detects increases in concentrations of ammoniac nitrogen following implementation of the development proposals, there are a number of remediation options that might be considered. These are outlined below, along with their potential advantages and disadvantages.

### 4.2 Permeable Reactive Barrier

4.2.1 EA publication titled 'Guidance on the use of permeable reactive barriers for remediating contaminated groundwater' (2002) provides the following definition:

A Permeable Reactive Barrier (PRB) is an engineered treatment zone of reactive material(s) that is placed in the subsurface in order to remediate contaminated fluids as they flow through it. A PRB has a negligible overall effect on bulk fluid flow rates in the subsurface strata, which is typically achieved by construction of a permeable reactive zone, or by construction of a permeable reactive 'cell' bounded by low permeability barriers that direct the contaminant towards the zone of reactive media.

4.2.2 It is considered hypothetically possible that a PRB could be constructed on the southern (i.e. downstream) site boundary to 'intercept' groundwater upstream of the inner source protection zone and groundwater abstraction wells

#### Advantages

- Following initial expenditure to construct the PRB, operation and maintenance costs are relatively low.
- The system could be installed without significant disruption to the long term operation of the site.

#### Disadvantages

- Significant upfront expenditure.
- Landfill exists within the site up to its southern boundary with the M25. Landfill also exists below land to the south of the M25. It is not known whether landfill was excavated and removed to facilitate construction of the M25 itself, or is present below the motorway. Therefore, groundwater exiting a PRB on the southern site boundary would be entering landfilled ground, likely to be on similar composition, either immediately or shortly thereafter. The installation of a PRB in these circumstances offers little obvious benefit to local and regional groundwater quality.

### 4.3 In Situ Bioremediation

4.3.1 Bioremediation involves enhancement of natural processes to degrade hazardous chemicals and generally requires a mechanism for stimulating and maintaining the activity of suitable micro-organisms in the soil.

#### Advantages

- Requires no power supply.
- No waste products are generated.
- Low operation and maintenance costs

#### Disadvantages

- Difficult to implement given landfill extends beyond southern site boundary
- Any injection wells may become plugged by microbial growth
- Lower certainty of outcome and potentially significantly longer timescales.

## 4.4 Groundwater Pump and Treat

4.4.1 This approach involves extraction of groundwater via a network of abstraction wells, followed by treatment at the surface and disposal of the treated water. This disposal can be to foul sewer, to a surface water course, or to the ground, all under the necessary environmental permits and licencing arrangements.

#### Advantages

- Off-site receptors are protected through hydraulic containment of dissolved phase contaminants.
- Can provide a robust solution if sufficient abstraction points are installed and hydrogeological conditions are favourable.

#### Disadvantages

- Significant complexities to securing the necessary permits for groundwater disposal. There are no nearby foul sewer connections.
- The presence of landfill to the south may result in drawing in unknown contaminants from beyond site boundaries.
- Potentially very costly to install and operate.

## 4.5 Soil Excavation

4.5.1 Excavation of the landfill materials and removal from site to a modern engineered facility is in principal possible.

#### Advantages

- Removes the contaminant source.
- Provides the most rigorous solution to mitigating future geo-environmental risks.

#### Disadvantages

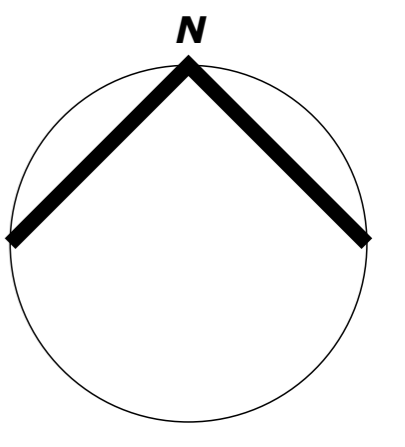
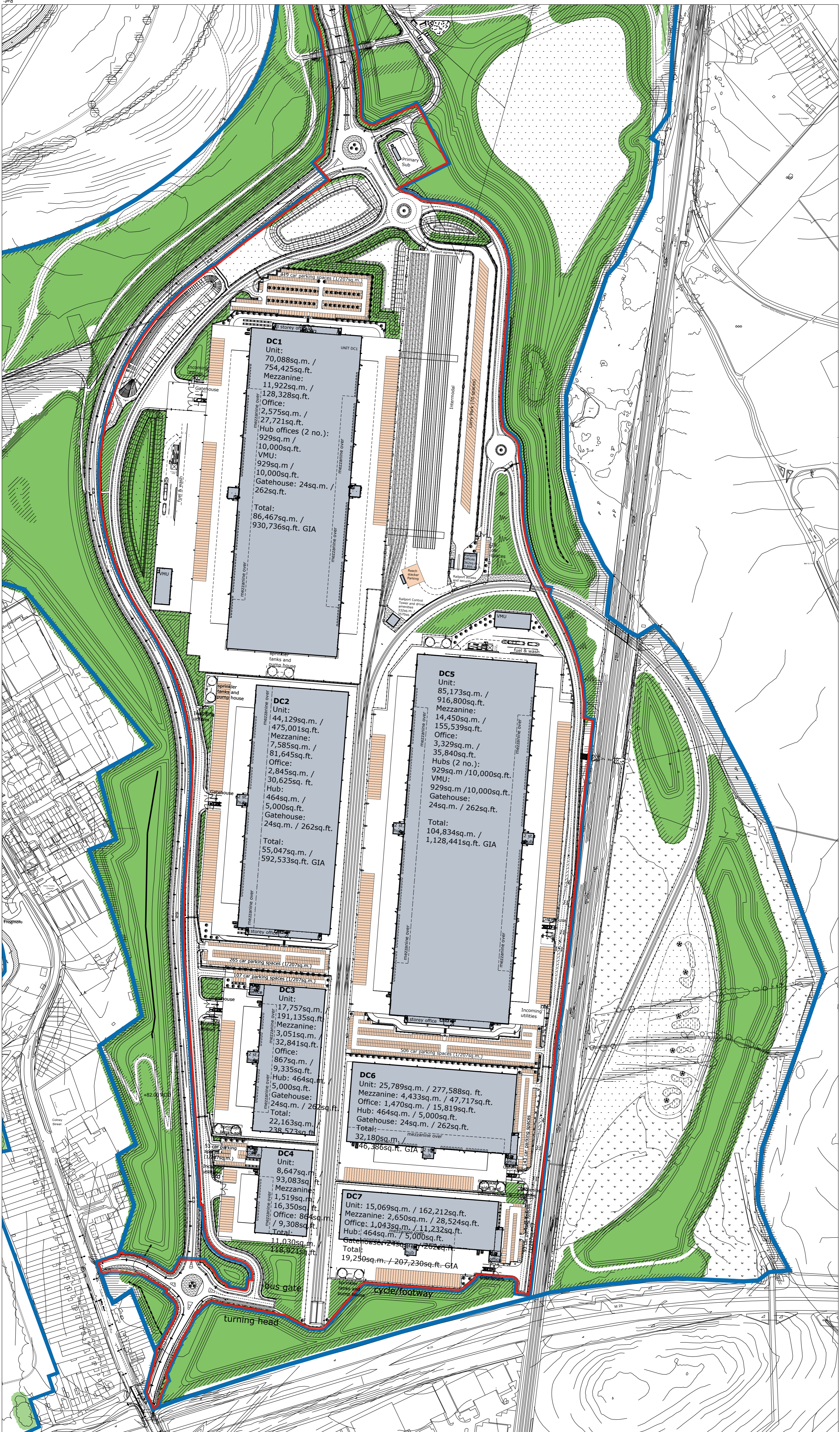
- Very substantial costs.
- Very substantial environmental externalities including vehicle movements, noise, dust.

- Considered to have poor sustainability credentials – essentially moves the contaminants to a different location.

## 5. Discussion and Conclusion

- 5.1 In considering the available remediation options it is apparent that no particular technique offers a clearly favourable approach - there are significant drawbacks to all of the available options.
- 5.2 It remains Capita's view that long term groundwater monitoring alongside the proposals to substantially reduce rainwater infiltration by installing new engineered land drainage provides the most beneficial and proportionate way forwards.
- 5.3 In the event that a deterioration in groundwater quality is consistently demonstrated and attributable to the proposed development, the options described in this report can be re-considered in consultation with the applicable regulators.
- 5.4 Proposals are already in hand to ensure timely sharing of monitoring information with the Environment Agency and the local planning authority. A final close-out / verification report is also to be submitted for approval.
- 5.5 In this way there is considered to be a robust mechanism in place to ensure groundwater is not detrimentally impacted. Furthermore, in combination with the preceding Capita reports, sufficient information is considered to have been provided to allow planning condition 24.1 to be discharged. The remaining elements of the condition are to be addressed in due course subject to any previously undiscovered contamination and/or the findings of the long-term monitoring programme.

# Appendix A – Architect’s Proposed Development Layout



**KEY:**  
— DEVELOPMENT SITE APPLICATION BOUNDARY  
— ASSOCIATED INFRASTRUCTURE AND COUNTRY PARK AREAS

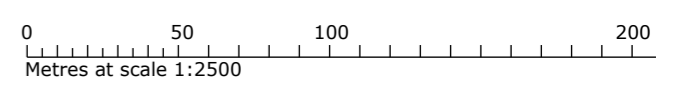
**AREAS SCHEDULE**  
 Logistics Park Buildings (excluding Railport):  
 330,971sq.m. / 3,562,820sq.ft. GIA

Ancillary Railport buildings:  
 694sq.m. / 7,465sq. ft. GIA

**TOTAL:**  
 331,665sq.m. / 3,570,285sq.ft. GIA

**PARKING**  
 1602 car parking spaces total (1/207sq.m.) (including railport)

617 trailer spaces total (1/538sq.m.) (including railport)



- Notes:**
- Revision:**
- T NJ 08/12/2017**  
Updated with revised landscape masterplan for Areas 1 and 2.
  - S NJ 08/11/2017**  
Updated with revised landscape masterplan and updated Highway information.
  - R NJ 22/06/2017**  
Updated with revised landscape masterplan, rail underpass and estate road lighting.
  - Q NJ 16/06/2017**  
Updated with revised bypass alignment, bypass lighting, landscape masterplan. Services/utilities added in model.
  - P NJ 25/03/2017**  
Updated with revised bypass alignment, bypass lighting, landscape masterplan, internal estate roads and minor kerb line alterations to plot layouts.
  - N NJ 22/03/2017**  
Updated with revised landscape layout, bypass alignment, external lighting and rail mounted crane arrangement.
  - M NJ 14/03/2017**  
Updated with revised landscape layout, bypass alignment and estate road access to DC3. Reachstacker parking and fuel bowser added to Intermodal. Incoming utilities, bypass lighting and on-plot lighting added.
  - L NJ 27/10/2016**  
Colour fill added to Primary sub-station.
  - K NJ 28/09/2016**  
Graphical amendments to Development Site application boundary.
  - J NJ 26/09/2016**  
Graphical amendments to Development Site application boundary.
  - H NJ 15/09/2016**  
Graphical amendments to rail sidings.
  - G NJ 07/09/2016**  
Proposed landscape amended. General draughting updates.
  - F NJ 20/08/2016**  
Amendments to Intermodal area, car parking and blue boundary line. General updates to all disciplines.
  - E NJ 11/08/2016**  
Red line boundary amended in accordance with CGMS email 8.8.16.
  - D NJ 10/08/2016**  
Soakaways, landscape and by-pass layouts updated. Red line boundary amended in accordance with CGMS email 8.8.16.
  - C NJ 02/08/2016**  
Estate road updated with Capita layout rec'd 01.08.16. Intermodal layout updated accordingly.
  - B NJ 29/07/2016**  
Proposed contours, soakaways, DC1 car park, proposed landscape updated.
  - A NJ 26/07/2016**  
Internal estate roads, vegetation and ponds updated.



Architects | Masterplanners  
**STEPHEN GEORGE & PARTNERS LLP**  
 170 London Road  
 Leicester LE2 1ND  
 t: 0116 247 0557 f: 0116 254 1095  
 www.stephengeorge.co.uk

**Radlett Strategic Railfreight Interchange Masterplan**

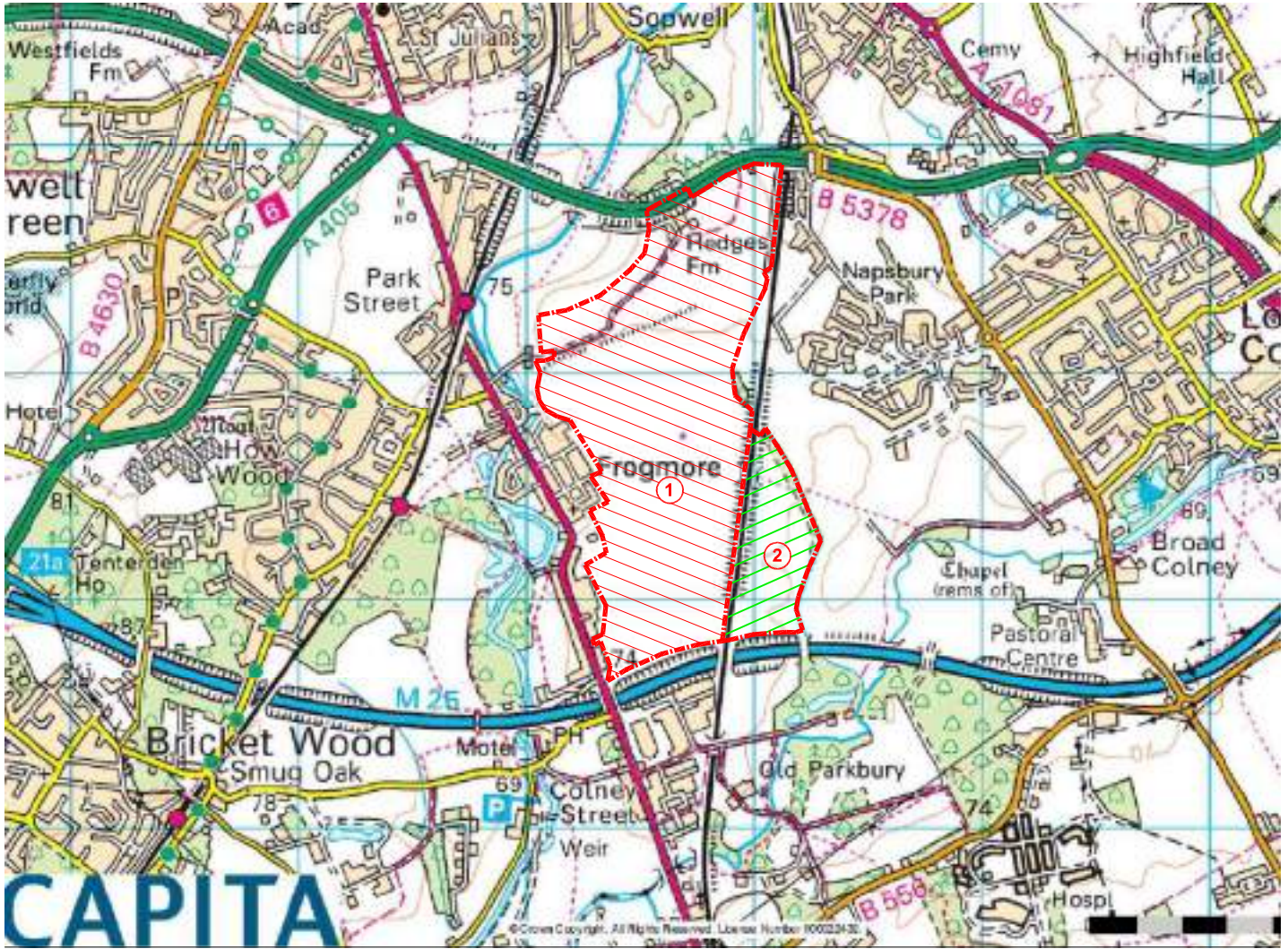
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Team:	NJ
Date:	24/07/2016
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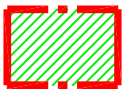
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## Appendix B – Site Location Plans



Boundary Line of Areas 1



Boundary Line of Areas 2

Drawing status

**FOR INFORMATION**

Client



Project

**RADLETT SRFI  
HERTORDSHIRE**

Drawing

**SITE LOCATION PLAN  
AREAS 1 & 2**

Scale @ A4

NTS

Drawn

AR

Checked

PE

Project No.

**SS/018844**

Date

July, 2016

Office

**WATFORD**

Drawing Identifier

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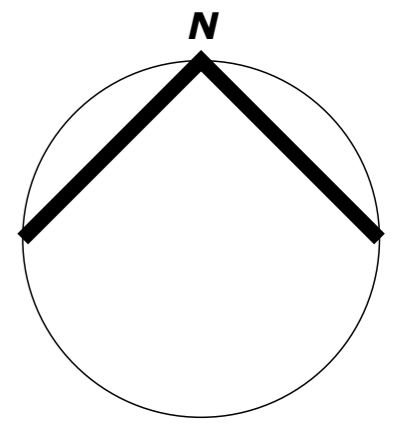
**London**  
Tele No: (+44) 0 20 7870 9300

**Watford**  
Tele No: (+44) 0 1923 817537

**Manchester**  
Tele No: (+44) 0 161 486 1521

**Bristol**  
Tele No: (+44) 0 1275 840831

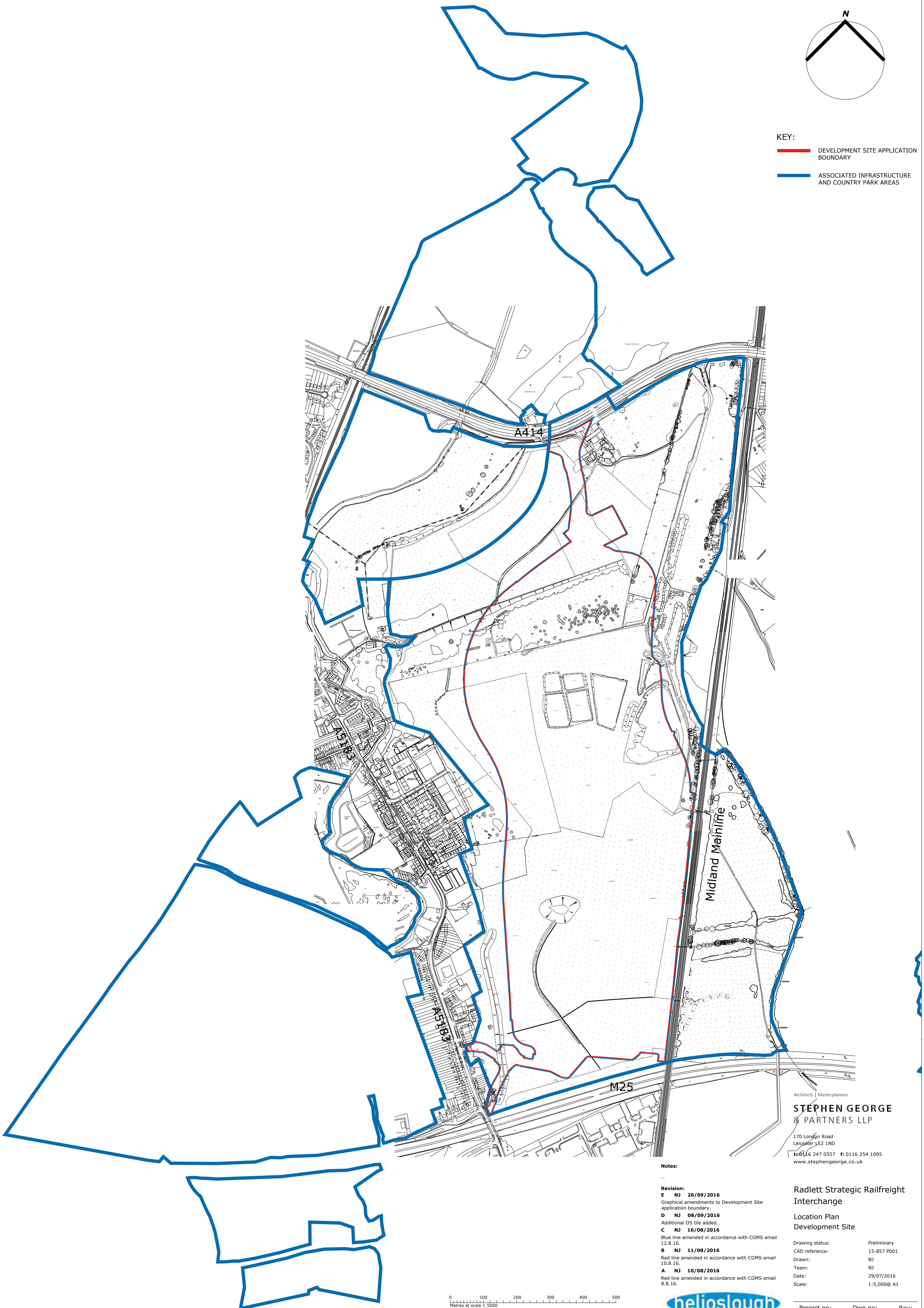
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**KEY:**

— DEVELOPMENT SITE APPLICATION BOUNDARY

— ASSOCIATED INFRASTRUCTURE AND COUNTRY PARK AREAS



Architects | Masterplanners  
**STEPHEN GEORGE & PARTNERS LLP**  
 170 Longon Road  
 Leicestershire LE2 1ND  
 t: 0116 247 0557 f: 0116 254 1095  
 www.stephengeorge.co.uk

**Notes:**

**Revision:**  
**E NJ 26/09/2016**  
 Graphical amendments to Development Site application boundary.  
**D NJ 08/09/2016**  
 Additional OS tile added.  
**C NJ 16/08/2016**  
 Blue line amended in accordance with CGMS email 12.8.16.  
**B NJ 11/08/2016**  
 Red line amended in accordance with CGMS email 10.8.16.  
**A NJ 10/08/2016**  
 Red line amended in accordance with CGMS email 8.8.16.

**Radlett Strategic Railfreight Interchange**  
**Location Plan**  
**Development Site**

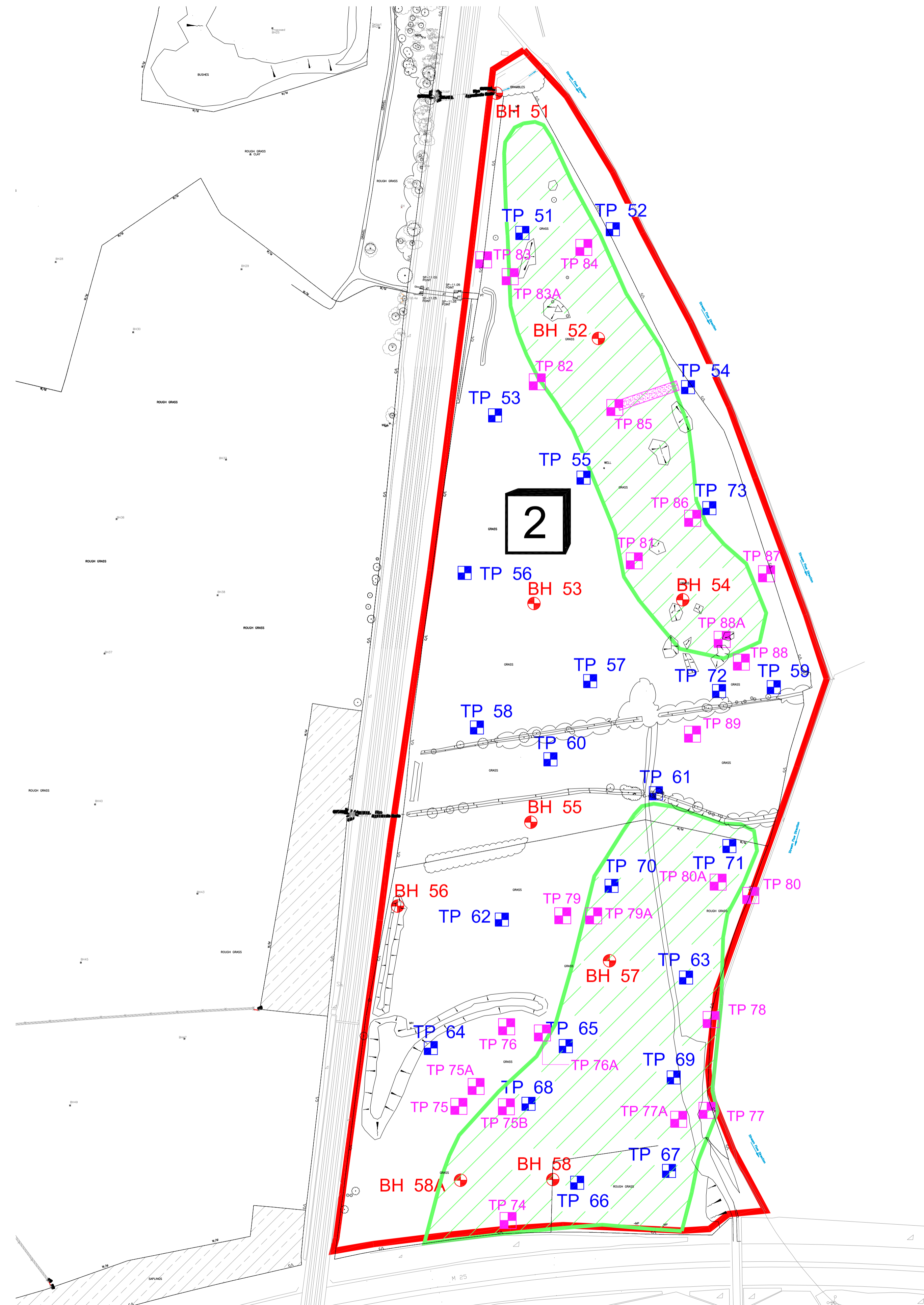
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 Team: NJ  
 Date: 29/07/2016  
 Scale: 1:5,000@ A1





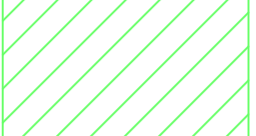

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## Appendix C – Monitoring Well Location Plan

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**Legend**

-  TP XX  
Trial pits July 2016  
(No's. 51-73)
-  BH XX  
Boreholes July 2016
-    
Approx. extent  
of Landfill Sites
-  TP XX  
Trial Pits October 2016  
(No's> 73-89)

**WORK IN PROGRESS**  
For information Only

P02	16.11.16	AR	TP (74-89) LOCATIONS REVISED	GA
P01	12.11.16	AR	TP LOCATIONS REVISED	GA

Rev	Date	By	Description	Rev' check

Drawing status  
**PRELIMINARY**



Project  
**RADLETT SRFI  
HERTFORDSHIRE**

Drawing  
**EXPLORATORY HOLE  
LOCATION PLAN - AREA 2  
TRIAL PITS  
(ON TOPO PLAN)**

Scale @ A1	Drawn	Checked
1:2000	NDH	NRB

Project No.	Date	Office
SS/018844	June 2016	WATFORD

Drawing Identifier	BS1192:2007 / Avanti Compliant
project	origin zone level file type role number revision
018844	-CA- 0 - GF - DR - S - 516 - P02

**CAPITA**  
 Property and infrastructure  
 Consulting Civil, Structural and Geo-environmental Engineers

<b>London</b> Tel: No: (+44) 0 20 7870 9300	<b>Watford</b> Tel: No: (+44) 0 1923 817537
<b>Manchester</b> Tel: No: (+44) 0 161 486 1521	<b>Bristol</b> Tel: No: (+44) 0 1275 840831

Capita Property and Infrastructure Ltd  
 Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2018542

**Capita Property and Infrastructure Limited**

Oak House  
Reeds Crescent  
Watford  
Hertfordshire  
WD24 4QP

Tel +44 (0)1923 817537