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ROYAL BOROUGH OF KENSINGTON AND CHELSEA

CONDITION 27

(41)

DOCUMENT TYPE

DISCHARGE OF CONDITIONS

APPLICATIONS

LATE UPDATE

PP/02/01324

PP/02/01324

Lots Road Power Station And Chelsea Creek

Due to case file size the content has been broken down and scanned in sections as denoted.

Index of content of case files

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- 35 Condition 12 -Superseded Docs
- 36 Condition 12 -Superseded Docs
- 37 Condition 12 -Superseded Drawings
- 38 Condition 12 -Superseded Drawings
- 39 Condition 25
- 40 Condition 25 + 29
- 41 Condition 27

Our ref 123162-02/MDQ

Date 17 July 2007

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Fax +44 (0)20 7755 2765
Direct Tel +44 (0)20 7755 2451
michael.quint@arup.com

www.arup.com

Ms Rebecca Brown
Royal Borough of Kensington and Chelsea
Council Offices
37 Pembroke Road
London W8 6PW

Dear Rebecca

Lots Road Power Station
Contamination Issues

Further to our letter of 23 June 2007 and your agreement with its contents via a telephone conversation with my colleague James Assem, we have pushed ahead and undertaken a preliminary risk assessment for the above site (see enclosed). We have also identified certain data gaps that we propose to fill via the undertaking of limited site investigation activities, which are described therein.

The enclosed report provides a summary of the site-related information currently in existence, a description of the approved redevelopment proposals, a preliminary risk assessment (including a conceptual site model), a site investigation strategy and a preliminary remedial strategy. In this respect, we believe it provides RBKC with sufficient information to begin discharge of the relevant planning condition (RBKC Condition 27):

> *"Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination as has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or of a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval"*

Following completion of the additional site investigation work, we will provide a generic quantitative risk assessment, a detailed quantitative risk assessment (if necessary), a final remedial strategy and a verification scheme.

As described in our previous letter, we anticipate a timescale of approximately three months from now until we can submit our final conclusions regarding the site. The reason for this is that we need to organise, procure and carry out the ground investigation, prior to us performing the necessary risk-based interpretation of the results.

../2

Ove Arup & Partners Ltd
Registered in England Number 1312453
13 Fitzroy Street London W1T 4BQ

As described in the enclosed report, it is not anticipated that the final remedial strategy will change much from that described. In relation to the planned demolition, asbestos & plant removal phase of work we will not be disturbing the ground.

Thank you for your consideration of this matter. It would be greatly appreciated if you could confirm your general agreement with the contents of the report, the site investigation approach and timescale outlined in this letter, as soon as possible, so that we can proceed with the activities forthwith.

Should you have any questions or need any further information, please do not hesitate to contact James or myself, as above.

Yours sincerely

Michael Quint
Associate Director

Planning Consultants

dp9

100 Pall Mall
London SW1Y 5NQ

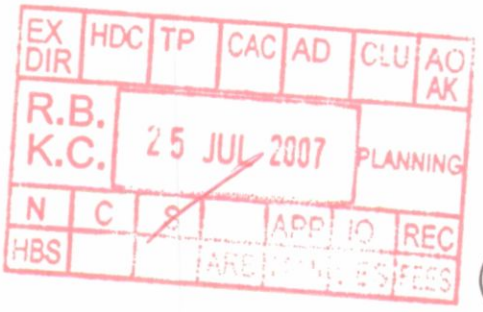
telephone 020 7004 1700
facsimile 020 7004 1790

www.dp9.co.uk

JRS/DP1025

24 July 2007

Royal Borough of Kensington & Chelsea
Planning and Conservation
The Town Hall
Hornton Street
LONDON
W8 7NX
For the attention of Bruce Coey



66

Dear Sirs

LOTS ROAD POWER STATION
Planning Permission Ref. PP/02/01324 – Submission of Details Pursuant to Condition 27

On behalf of our clients, Circadian Ltd, we hereby submit details pursuant to condition 27 of the above planning permission granted by the Secretary of State on 30 January 2006. We have previously discussed the submission of details pursuant to conditions with both Bruce Coey and Georgina Slader of your Council's Planning Department.

Condition 27 – Contamination

Condition 27 states that,

"Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination as has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or of a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval."

Accordingly, the submission of details comprises four copies of a report prepared by Arup entitled 'Preliminary Risk Assessment' and approval is therefore sought for the enclosed document to discharge the above condition.

Prior to the submission of the enclosed details, we have also undertaken discussions with Rebecca Brown of your Council's Environmental Health Department. For your information we enclose a copy of a letter dated 17th July 2007 from Arup to your Council's officer to agree the

scope of the submission of details. We have sent a copy of the enclosed report direct to Rebecca Brown.

We trust you will find the enclosed information to be acceptable and will be contacting you to discuss this in more detail in the future. In the meantime, if you have any queries, please contact Julian Shirley at the above address.

Yours faithfully

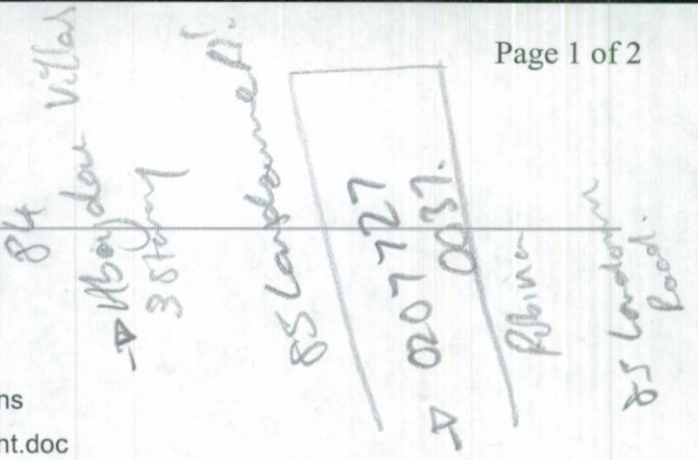
DP9

DP9

Encs.

CC: Rebecca Brown RB Kensington & Chelsea

Moss up Street
- 11th October



Slader, Georgina: PC-Plan

From: Brown, Rebecca: HHASC-EnvHlth
Sent: 10 October 2007 16:27
To: Slader, Georgina: PC-Plan
Subject: RE: Lots Road - Discharge of Conditions
Attachments: Lots Road Preliminary Risk Assessment.doc

Georgie,

Here are comments from Environmental Health on the 'Preliminary Risk Assessment' for Lots Road. Sorry it has taken so long. Will you forward it to the consultants? The person to contact is James Assem (James.Assem@arup.com) (Environmental Consultant from Arup).

On the sustainabililty issues which you called about yesterday, please forward it to us and we will get back to you as soon as we can.

If you get any queries relating to asbestos, Bruce Bradley in our Health and Safety Team is the man to contact.

If you have any questions, please get in touch.

Regards

Becky

From: Slader, Georgina: PC-Plan
Sent: 10 October 2007 14:20
To: Brown, Rebecca: HHASC-EnvHlth; O'Riley, Jennifer: TELS-WasteLeis; Morrison, Angus: PC-Plan
Subject: FW: Lots Road - Discharge of Conditions

Please attached a letter I have received from the Environment Agency regarding the information submitted to discharge the conditions.

Specifically it identifies matters in relation to the Creek, the Riverside Walk and Contamination.

Angus – please can you see her note re: condition 7. Do you wish to comment further re: your observations?

Kind regards
Georgie

Georgina Slader
Planning and Conservation
Telephone 020 7361 2664

From: Scott, Anna [mailto:anna.scott@environment-agency.gov.uk]
Sent: 10 October 2007 14:06
To: Slader, Georgina: PC-Plan
Cc: Jane Pitten
Subject: Lots Road - Discharge of Conditions

Hi Georgina

Please find attached our formal response for the discharge of conditions for Lots Road Power Station. A hard copy will follow in the post but is likely to be delayed as a result of the recent strike action.

Kind Regards

Anna Scott
Major Projects Officer
Planning Liaison - NE Thames

Direct Dial 01707 632323
Fax 01707 632515

Apollo Court
2 Bishops Square Business Park
St Albans Road West
Hatfield, Herts
AL10 9EX

Developers: www.environment-agency.gov.uk/developers

Please consider the environment and only print this email if needed.

Lots Road Preliminary Risk Assessment
Comments by Environmental Health

The planning condition
Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of the decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed with in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval.

Comments for Planners/Summary of information
The preliminary risk assessment is comprehensive and brings together previous site investigations undertaken on this site and briefly sets out what is proposed for the next site investigation.

So far 135 samples have been taken in areas outside the main building within the East Yard. These show metal and hydrocarbon contamination in the soil, perched water and groundwater.

Summary of sources of potential contamination identified as requiring further assessment:

Source	**Risk to (receptor)**	**Means (pathway)**
Perched water	Site workers and residents Groundwater in River Terrace Gravels and Thames/Chelsea Creek	Inhalation of vapours Migration of dissolved phase contamination
Ground gas	Site workers	Migration of gas into buildings
River Terrace Gravels	Thames and Chelsea Creek	Migration of dissolved phase contamination

Once the results of these investigations have been undertaken, a further risk assessment will be undertaken, prior to the remediation strategy being developed. I can confirm that I am satisfied with this approach, subject to agreement of my comments to the consultants below. However, the proposed site investigation locations are in areas which are

and have been historically inaccessible, such as within the power station main building and the former pump house. Removal of asbestos, equipment and some demolition is required to gain suitable access to conduct the site investigation. The planning condition above says that

'development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of the decontamination work has been submitted to and approved in writing by the local planning authority.'

However, it then goes on to say

'The approved works of decontamination and verification shall be carried out before development begins ***or in accordance with a programme first agreed*** *with in writing by the local planning authority.'*

So far, we do not have a report detailing all contamination found or proposals for its removal etc because further site investigation work has not been possible due to the presence of existing buildings. Does this mean that the wording of the condition will have to be changed before these investigations can take place, or can we overlook this if we agree a separate programme for remediation (bearing in mind we won't be able to do this until the site investigations have taken place) incorporating the proposed site investigations? Please can you advise the developer (and me) on the best way to proceed.

Request for additional information
The following comments need to be addressed by the consultants who submitted the report:

Results of previous site investigations
There is no description of the depths that the boreholes and trial pits were dug to (except in the LUL 1992 investigation for which there is no other information available). This also applies to ground gas monitoring. This is particularly important in areas where there will be no basement, or contamination resides at depths below basement level.

Section 6.2.1 comments on identified hotspots.
'Only one sample collected from the former dock…' Please state the number of samples taken in this area so we can understand how significant or otherwise that this is.

Potential pollution linkages
It is appreciated that some of the potential pollutant linkages will be broken due to the hard standing nature of part of the development, and others will require further investigation (to protect groundwater, for example). However, on page 4, it has been identified that vegetation is currently breaking through the tarmac, which shows that pathways that might normally be dismissed could in fact be significant in the future. This

should therefore be considered. Also, whilst there is a brief reference to building materials and services (P15) as being potential receptors, I could not see any assessment of potential risk. Photograph 6 shows water ingress within the deep trench containing pipework. Where do these pipes lead? Is this water likely to be contaminated, what is the condition of the pipework?

Proposed site investigation

I would like to request that an additional borehole is dug, and samples taken in the area that is to become a lawn, given its proximity to the coal pit and East yard.

Please explain why no sampling is proposed for:

- the West Yard, given the presence four light oil tanks and the 100 ton tank. It is appreciated that underground cables are present, but does this preclude any investigation?
- the north east corner of the turbine hall or
- the laboratory stores.

I do think these areas should be investigated further.

Please explain why only three boreholes in the east of the site will be used for groundwater and gas monitoring purposes. This should be investigated on a site wide basis to see what the current situation is.

General additions to document

Please could you:

- provide a map that shows that locations of pollutant hotspots identified;
- On P1 and P17 is says *'On completion of the site investigation a GQRA will be undertaken and the remedial strategy revised to incorporate the findings'* (or similar). Please add a GQRA *'and a DQRA (if required)'* will be undertaken and...
- P6 refers to two oil spillages that occurred during the decommissioning process. Are any further details available on how much oil was spilt and how the spillage was dealt with?
- P7 – What has happened to the remainder of the waste that was identified but not removed?
- On Figure 3 'Proposed development and land use' there is a thin strip of lime green adjacent to Chelsea Creek and the site boundary that I could not identify in the legend;
- On Figure 4 'Site investigation locations' please add to the legend defining which symbols relate to which investigation.
- On page 20 and in table 4, residual risks are defined as 'low, medium and high'. Please include a short narrative on what these terms actually mean.
- Figure 5 shows the potential sources of contamination, but I could not make out the railway sidings (which the text says to be at the west of

Chelsea Creek present in the 30s. Do these fall outside the site boundary as these are a potential source.

- All imported material must be tested and results forwarded to Environmental Health.
- Please ensure the Environment Agency approve the piling methodology proposed and see final copies of the site investigation, remediation strategy and validation report.
- Please ensure that the remediation strategy covers (among other things) spoil disposal.

END.

Further to our meeting with the Applicant and Consultants at ARUP on 7 September 2007, we advised that within the terracing some sections are sloped to allow for flatfish to access the terraces. We also advised that a 'V' shaped could be knocked into the weirs to allow for migration of fish.

Condition 27 (Site Investigation)

We cannot recommend discharge of this conditions until we have received and reviewed all the Site Investigation reports and together with the agreed validation reports.

Please contact me if you have any questions to the above.

Yours sincerely

Ms Anna Scott
Major Projects Officer
Planning Liaison

Direct dial 01707 632323
Direct fax 01707 632515
Direct e-mail anna.scott@environment-agency.gov.uk

End

creating a better place

Environment Agency

Georgina Slater
Royal Borough of Kensington and Cheslea
Planning and Conservation
The Town Hall
Hornton Street
LONDON
W8 7NX

Our ref: NE/2007/104036/01-L02
Your ref: PP/02/01324

Date: 10 October 2007

Dear Ms Slater

DETAILS PURSUANT TO CONDITIONS 7, 9, 12, AND 27 (KENSINGTON AND CHELSEA).
LOTS ROAD POWER STATION

We advise the following in relation to the discharge of Conditions 7, 12, and 27 of Planning Permission 2002/03132/FUL:

Condition 7 (Landscaping)

We are happy to recommend the discharge of this condition.

Condition 9 (Riverside Walk)

We cannot recommend the discharge of this condition as acceptable drawings with dimensions to scale have not been submitted to demonstrate that the distances set out in the condition have been achieved.

Condition 12 (Treatment of Chelsea Creek)

We cannot discharge the condition regarding the treatment of Chelsea Creek.

We do not think the terraces are designed to allow sufficient accretion of sediment which is necessary for the creation of a self-sustainable vegetated habitat. In addition, the terraces make extensive use of gabions and as such the end result is over-engineered and not a sufficient biodiversity enhancement to mitigation for the development.

We have reviewed the salinities for the creek and it is proposed to use freshwater plants in an area where it will be a third strength sea water at high tide (when the plants are inundated) so it is unlikely these plants will survive.

Lots Road Preliminary Risk Assessment
Comments by Environmental Health – 10th October 2007

Condition 27
Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of the decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed with in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval.

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The preliminary risk assessment is comprehensive and brings together previous site investigations undertaken on this site and briefly sets out what is proposed for the next site investigation.

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Summary of sources of potential contamination identified as requiring further assessment:

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Perched water	Site workers and residents	Inhalation of vapours
	Groundwater in River Terrace Gravels and Thames/Chelsea Creek	Migration of dissolved phase contamination
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River Terrace Gravels	Thames and Chelsea Creek	Migration of dissolved phase contamination

Once the results of these investigations have been undertaken, a further risk assessment will be undertaken, prior to the remediation strategy being developed. I can confirm that I am satisfied with this approach, subject to agreement of my comments to the consultants below. However, the proposed site investigation locations are in areas which are

and have been historically inaccessible, such as within the power station main building and the former pump house. Removal of asbestos, equipment and some demolition is required to gain suitable access to conduct the site investigation. The planning condition above says that

'development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of the decontamination work has been submitted to and approved in writing by the local planning authority.'

However, it then goes on to say

'The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed with in writing by the local planning authority.'

So far, we do not have a report detailing all contamination found or proposals for its removal etc because further site investigation work has not been possible due to the presence of the existing buildings. In order for this information to be produced the buildings would need to be removed which would result in the Developer making a start on site. This in turn would result in them being in breech of the planning condition. We need to discuss this matter with them in more detail.

Request for additional information
The following comments need to be addressed by the consultants who submitted the report:

Results of previous site investigations
There is no description of the depths that the boreholes and trial pits were dug to (except in the LUL 1992 investigation for which there is no other information available). This also applies to ground gas monitoring. This is particularly important in areas where there will be no basement, or contamination resides at depths below basement level.

Section 6.2.1 comments on identified hotspots.
'Only one sample collected from the former dock...' Please state the number of samples taken in this area so we can understand how significant or otherwise that this is.

Potential pollution linkages
It is appreciated that some of the potential pollutant linkages will be broken due to the hard standing nature of part of the development, and others will require further investigation (to protect groundwater, for example). However, on page 4, it has been identified that vegetation is currently breaking through the tarmac, which shows that pathways that might normally be dismissed could in fact be significant in the future. This should therefore be considered. Also, whilst there is a brief reference to

building materials and services (P15) as being potential receptors, I could not see any assessment of potential risk. Photograph 6 shows water ingress within the deep trench containing pipework. Where do these pipes lead? Is this water likely to be contaminated, what is the condition of the pipework?

Proposed site investigation

I would like to request that an additional borehole is dug, and samples taken in the area that is to become a lawn, given its proximity to the coal pit and East yard.

Please explain why no sampling is proposed for:

- the West Yard, given the presence four light oil tanks and the 100 ton tank. It is appreciated that underground cables are present, but does this preclude any investigation?
- the north east corner of the turbine hall or
- the laboratory stores.

I do think these areas should be investigated further.

Please explain why only three boreholes in the east of the site will be used for groundwater and gas monitoring purposes. This should be investigated on a site wide basis to see what the current situation is.

General additions to document

Please could you:

- provide a map that shows that locations of pollutant hotspots identified;
- On P1 and P17 is says *'On completion of the site investigation a GQRA will be undertaken and the remedial strategy revised to incorporate the findings'* (or similar). Please add a GQRA *'and a DQRA (if required)'* will be undertaken and...
- P6 refers to two oil spillages that occurred during the decommissioning process. Are any further details available on how much oil was spilt and how the spillage was dealt with?
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- On Figure 3 'Proposed development and land use' there is a thin strip of lime green adjacent to Chelsea Creek and the site boundary that I could not identify in the legend;
- On Figure 4 'Site investigation locations' please add to the legend defining which symbols relate to which investigation.
- On page 20 and in table 4, residual risks are defined as 'low, medium and high'. Please include a short narrative on what these terms actually mean.
- Figure 5 shows the potential sources of contamination, but I could not make out the railway sidings (which the text says to be at the west of

Chelsea Creek present in the 30s. Do these fall outside the site boundary as these are a potential source.

- All imported material must be tested and results forwarded to Environmental Health.
- Please ensure the Environment Agency approve the piling methodology proposed and see final copies of the site investigation, remediation strategy and validation report.
- Please ensure that the remediation strategy covers (among other things) spoil disposal.

Slader, Georgina: PC-Plan

From: Julian Shirley [julian.shirley@dp9.co.uk]
Sent: 15 November 2007 17:45
To: Slader, Georgina: PC-Plan
Subject: Lots Road - Condition 27 (Contamination)
Attachments: CL002_LotsRd_RBKCrev04.pdf

Georgina

For your information, please see attached a copy of an updated report and summary table prepared by ARUP responding to the comments raised by Rebecca Brown over contamination issues (Condition 27) for Lots Road.

A hard of the report has been sent to Rebecca. If you have any queries, please do not hesitate to contact me.

Regards

Julian Shirley
Associate

direct: 020 7004 1716
mobile: 07795 397616
e-mail: julian.shirley@dp9.co.uk

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100 Pall Mall
London
SW1Y 5NQ

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Our ref 123162-02/AJA

Date 15 November 2007

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james.assem@arup.com

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Ms Rebecca Brown
Royal Borough of Kensington and Chelsea
Council Offices
37 Pembroke Road
London W8 6PW

ARUP

Dear Rebecca

Lots Road Power Station
Contamination Issues

Thank you for comments, received on the 31st October 2007, to our Preliminary Risk Assessment Report.

The enclosed report has been up-dated to incorporate response to your queries and the attached table provides a summary of the responses to each of your points raised. With the addressing of your comments, we believe it provides RBKC with sufficient information to begin discharge of the relevant planning condition (RBKC Condition 27):

> *"Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination as has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or of a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval"*

Following completion of the additional site investigation work, we will provide a generic quantitative risk assessment, a detailed quantitative risk assessment (if necessary), a final remedial strategy and a verification scheme. It is anticipate that the ground investigation works will commence in January 2008, which will be followed by the risk-based interpretation of the results.

As described in the enclosed report, it is not anticipated that the final remedial strategy will change much from that described. In relation to the planned demolition, asbestos & plant removal phase of work we will not be disturbing the ground.

Thank you for your consideration of this matter. It would be greatly appreciated if you could confirm your agreement with our response to your comments.

../2

Ove Arup & Partners Ltd
Registered in England Number 1312453
13 Fitzroy Street London W1T 4BQ

Should you have any questions or need any further information, please do not hesitate to contact Mike Quint or myself, as above.

Yours sincerely

James Assem
Hydrogeologist

Enc Tabulated response to queries
PRA Issue 2

QUERY No.	CONDITION	QUERY	RESPONSE	RELATED DRAWING
Contam	27	There is no description of the depths that the boreholes and trial pits were dug to (except in the LUL 1992 investigation for which there is no other information available). This also applies to ground gas monitoring. This is particularly important in areas where there will be no basement, or contamination resides at depths below basement level.	Depths have been included within Chapter 5 of the PRA report.	
Contam	27	Section 6.2.1 comments on identified hotspots. 'Only one sample collected from the former dock…' Please state the number of samples taken in this area so we can understand how significant or otherwise that this is.	Amended in report to include numbers. Phenol 33 samples, PCBs 14 samples and VOCs 15 sampled	
Contam	27	However, on page 4, it has been identified that vegetation is currently breaking through the tarmac, which shows that pathways that might normally be dismissed could in fact be significant in the future. This should therefore be considered.	During Construction, appropriate PPE and best practice procedures shall be followed, mitigating the risks. This is not considered a significant pathway post-development.	
Contam	27	Also, whilst there is a brief reference to building materials and	Appropriate class of concrete will be required based on the chemical data and the suitability of piping for potentially aggressive ground should be made.	

		services (P15) as being potential receptors, I could not see any assessment of potential risk. Photograph 6 shows water ingress within the deep trench containing pipework. Where do these pipes lead? Is this water likely to be contaminated, what is the condition of the pipework?	The deep trench contains the water inlet pipes which draw water from the River Thames and traverse the site extending to the Pump House, before looping round to discharge back to the river. The water ingress shown in to the trench, based on the depth, is likely to be from groundwater within the River Terrace Gravels and could potentially contain contaminants. The condition of the pipe work is unknown, but it is known that it was sealed and vented as part of the decommissioning works	
Contam	27	I would like to request that an additional borehole is dug, and samples taken in the area that is to become a lawn, given its proximity to the coal pit and East yard.	Maritime / geotechnical trial pit and borehole TPN402A and BHN311 can provide this information.	Figure 8.1 of PRA
Contam	27	Please explain why no sampling is proposed for: - the West Yard, given the presence four light oil tanks and the 100 ton tank. It is appreciated that underground cables are present, but does this preclude any investigation? - the north east corner of the turbine hall or - the laboratory stores.	The west Yard is outside the development proposal area. In addition, the former tank locations are now a bulk supply point. The services include mains sewer, pipe work associated with the power station and a significant number of high voltage cables supplying London Underground. This leaves little room for investigation locations with a safe working distance from the cables Phase 3 investigation includes foundation assessment trial pits in the northeast corner of the site (i.e. TPN806), environmental samples shall be collected from this area to provide this information. Geotechnical holes BHN301 and BHN302 are located adjacent to and down gradient of the stores and should	Figure 8.2 of PRA Figure 8.1 of PRA

			provide adequate information.	
Contam	27	Please explain why only three boreholes in the east of the site will be used for groundwater and gas monitoring purposes. This should be investigated on a site wide basis to see what the current situation is.	Additional locations are included within the power station and former pump house	Figure 8.2 of PRA
Contam	27	provide a map that shows that locations of pollutant hotspots identified;	Noted	Figure 6 of PRA
Contam	27	On P1 and P17 is says *'On completion of the site investigation a GQRA will be undertaken and the remedial strategy revised to incorporate the findings'* (or similar). Please add a GQRA *'and a DQRA (if required)'* will be undertaken and...	Noted	
Contam	27	P6 refers to two oil spillages that occurred during the decommissioning process. Are any further details available on how much oil was spilt and how the spillage was dealt with?	A handover document included as part of the EIS includes only a summary of the decommissioning works and report. Detailed information is not available	
Contam	27	P7 – What has happened to the remainder of the waste that was identified but not removed?	Instrumentation containing mercury remains on site which is yet to be fully decommissioned. Exact quantities within the equipment are unknown, but assumed to be the differential (60kg).	

Contam	27	On Figure 3 'Proposed development and land use' there is a thin strip of lime green adjacent to Chelsea Creek and the site boundary that I could not identify in the legend;	This relates to the Reed Bed Terrace, although colouring of the key does not quite match	
Contam	27	On Figure 4 'Site investigation locations' please add to the legend defining which symbols relate to which investigation.	Noted	Figure 4 - PRA
Contam		On page 20 and in table 4, residual risks are defined as 'low, medium and high'. Please include a short narrative on what these terms actually mean.	Noted – reference is to CIRIA	
Contam		Figure 5 shows the potential sources of contamination, but I could not make out the railway sidings (which the text says to be at the west of Chelsea Creek present in the 30s. Do these fall outside the site boundary as these are a potential source.	Noted – to be included	Figure 5 - PRA
Contam		All imported material must be tested and results forwarded to Environmental Health.	Noted	
Contam		Please ensure the Environment Agency approve the piling methodology proposed and see	Noted	

		final copies of the site investigation, remediation strategy and validation report.		
Contam		Please ensure that the remediation strategy covers (among other things) spoil disposal.	Noted – waste classification samples to be collected from stockpiled material this is to be incorporated in to Remediation Strategy	

Circadian Limited

Lots Road Power Station - RBKC Site

Preliminary Risk Assessment

November 2007

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ARUP

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Executive Summary

Circadian Ltd. proposes to redevelop the site of the Lots Road Power Station, Chelsea, London. The intent of the development is to redevelop a now inactive industrial site into a mixed use residential development. The site straddles the boundary between the Royal Borough of Kensington and Chelsea (RBKC) and the London Borough of Hammersmith and Fulham. This report covers the Royal Borough of Kensington and Chelsea part of the site and is referred to in this report as the RBKC site.

Condition 27 of Planning Permission Ref. PP/02/01324 covering the RBKC Site refers to the processes and information requirements of a ground contamination investigation, assessment and remediation before any part of the development commences. This document is submitted pursuant to the discharge of this condition.

The RBKC site contains the main power station building along with ancillary buildings including the former pump house, a workshop, chemical stores and offices. In addition, at the eastern end of the site is the trash screening area for the surface water abstraction point.

The proposed redevelopment involves retention of the power station building. Therefore, soft stripping of the interior of the existing building is to take place to allow for the construction of a basement, retail units and apartments from the first floor upwards within the existing building shell. A basement is to extend across the East Yard and power station.

Historical information indicates that prior to the development of the power station the majority of the site supported greenfield land until docks and wharfs were constructed (c.1896). The power station was built by 1905 and was originally coal burning. This later became heavy oil burning in the 1960s and then gas fed with 'almost' diesel grade oil back-up in the 1970s and remained as such until its closure in 2002.

Five separate site investigations have been conducted on the site, dating from 1992. However, these have generally been limited to areas outside the main building within the East Yard. A total of 135 soil samples have been submitted for chemical analysis and identified metal and hydrocarbon contamination in the soil, perched water and groundwater.

The conceptual site model identifies several pollutant linkages that require further assessment. This identifies risks from ground gases and vapours and dissolved phase contaminants. However, due to the nature of the redevelopment, being predominantly hard-standing, some of the plausible pollutant linkages will be broken. Those plausible pollutant linkages that remain require further site investigation to quantify them.

The proposed environmental site investigation includes 7 boreholes in currently inaccessible areas of the power station and former pump house. A further 3 boreholes are proposed across the east of the site for groundwater and ground gas monitoring purposes. Samples will also be collected for environmental testing from some of the geotechnical and maritime investigation locations.

Removal of asbestos and plant work with limited demolition (to floor slab) is necessary to achieve the investigation goals as the uninvestigated areas are in currently restricted access locations.

On completion of the site investigation a Generic Quantitative Risk Assessment and Detailed Quantitative Risk Assessment, if required, and revised Remedial Strategy will be completed.

1 General

Circadian Ltd. proposes to redevelop the site of the Lots Road Power Station, located at Lots Road, Chelsea, London. The site straddles the boundary between the Royal Borough of Kensington and Chelsea (RBKC) and the London Borough of Hammersmith and Fulham (LBHF).

The Architect for the project is Terry Farrell and Partners. The developer has commissioned Ove Arup and Partners Ltd (Arup) to provide consultancy services including geo-environmental.

1.1 Background

Lots Road Power Station served as a supply of electricity for the London Underground and Tube network continuously for 97 years and was, at the time of initial commissioning rated as the largest power station in the world.

An Environmental Statement (ES) was submitted with the planning application for the redevelopment of the entire site in 2002. A Secretary of State decision in 2006 granted planning permission for the redevelopment of the site.

The proposed redevelopment of the entire site involves:

- partial demolition of the interior of the existing power station building, and the construction of apartments within the existing building shell. Due to the historical significance of the building, the original steel frame is to be preserved in places. Most changes to the structure will involve the removal of plant and equipment from the interior, with the exterior being preserved to retain its architectural features;
- construction of 7 low rise residential buildings;
- construction of 2 high rise residential apartment buildings. These towers are to be sited close to the river wall, either side of Chelsea Creek. The proposed northern tower is 25 storeys high and the proposed southern tower is 37 storeys high; and
- landscaping of the area to create an open park space for residents.

The intent of the development is to redevelop a now inactive industrial site into a mixed use residential development.

As part of the Planning Permission (Ref. PP/02/01324), Condition 20 (LBHF) and 27 (RBKC) refer to the processes and information requirements of ground contamination investigation, assessment and remediation before any part of the development commences. The condition relating to both boroughs states that,

> *"Development shall not begin until a scheme for the investigation and recording of contamination on the site has been agreed with the local planning authority and a report detailing such contamination as has been found, proposals for its removal, containment or otherwise being rendered harmless and measures to verify the adequacy of decontamination work has been submitted to and approved in writing by the local planning authority. The approved works of decontamination and verification shall be carried out before development begins or in accordance with a programme first agreed in writing by the local planning authority. If any contamination not previously identified is encountered during development, whether from a different source or of a different type to that addressed in the approved details or in an area expected to have been uncontaminated, then a revised scheme to deal with that contamination, including a programme of work, shall be submitted to and approved in writing by the local planning authority and carried out in accordance with that approval "*

This document is submitted pursuant to the discharge of Condition 27 attached to the planning permission for the RBKC site.

1.2 Site Location

The site straddles the boundary between the Royal Borough of Kensington and Chelsea (RBKC) and the London Borough of Hammersmith and Fulham (LBHF), with the boundary being delineated by Chelsea Creek. The RBKC area is on the north side of the creek, with the LBHF area to the south.

The RBKC site is dominated by the power station structure and ancillary buildings. The LBHF site is mainly wasteland with the exception of a large oil store and pressure reducing station (PRS). As a result of the site make-up the development history for each area has been different. To aid in understanding of the site it is considered to consist of two parts, the LBHF site and the RBKC site. This report covers the RBKC site.

Figure 1 shows the site location, with the red outline indicating the general site boundaries of the project. These boundaries indicate the area of development, not the proposed building locations. This outline template has been superimposed over all site maps and figures throughout this report.

1.3 Scope and Objectives

The original assessment work was completed in 2002, subsequent to this a change in government guidance occurred, as described in CLR11 (Environment Agency 2004). Therefore, an appraisal of all existing information in line with the methodology outlined in CLR11, including the development of a conceptual site model (CSM) completion of a preliminary risk assessment (PRA) has been undertaken and is presented within this report for the RBKC site.

1.4 Information Resources

This section details the information used to complete the environmental desk study.

1.4.1 Site History

Historical maps and aerial photographs have been reviewed in order to ascertain the development of the site and changes in site usage. The following types of maps have been reviewed as part of this desk study

(i) Non-Ordnance Survey Maps pre-dating 1878, back to 1664.

(ii) Ordnance Survey (OS) maps dating from 1878 onwards.

(iii) Aerial Photographs from the National Monuments Record.

Non-Ordnance and early Ordnance Survey maps are semi-pictorial in nature and do not adhere to current day surveying standards. They are useful for determining early land use and for identifying major features that may have been subsequently constructed over, removed or redirected, such as creeks, rivers and railway lines.

OS maps are issued at two different ranges of scale: 1:1250 and 1:2500 scale maps show significant detail. The larger scale 1:10,560 and 1:10,000 scale maps are of a lower resolution and many features shown on smaller scale maps are not shown. The smaller scale range maps have been reviewed for this report.

The aerial photographs were sourced from the National Monument Record Office.

It is important to note that OS maps are often composites of information collated over a range of years, and there may be a further delay in the actual publication of the map itself. Therefore, some care should be applied when using maps to date development.

A selection of the maps and aerial photographs used in this assessment is provided in Appendix A.

1.4.2 Previous Reports

An ES was submitted with supporting Appendices for the Planning Application. The relevant parts of this ES were reviewed by Arup and are listed below:

- Waterman Group (Watermans), November 2004. Lots Road Power Station and Land at Thames Avenue, Regulation 19 Environmental Statement (Chapters 6 and 15 and Appendix G) for Circadian Ltd.
- Waterman Group (Watermans), November 2004. Lots Road Power Station and Land at Thames Avenue, Regulation 19 Environmental Statement: Non-Technical Summary for Circadian Ltd.
- STATS Geotechnical, 1995. Environmental and Related Studies at Lots Road Generating Station, Chelsea, London SW10. Vols. 2 to 5 for London Transport Property.

1.4.3 Site Walkover

A site visit was conducted on 2nd May 2007 by an Arup Employee. This was done to inspect the current status of the site, the environmental setting and surrounding land uses. A record of the site visit is included in Appendix B.

1.5 Report Structure

This report presents the findings of a preliminary environmental desk study for the RBKC site undertaken by Arup. The report is preliminary based on information collated and presented within the Environmental Impact Assessment and has the following structure:

- Section 1 introduces the site and its proposed use;
- Section 2 details the sites history;
- Section 3 outlines the geology, hydrogeology and hydrology of the site;
- Section 4 details previous site investigations conducted on the site;
- Section 5 provides a preliminary conceptual site model;
- Section 6 gives an outline remedial strategy; and
- Section 6 provides conclusions and recommendations for the site.

This report has been produced for the use of Circadian Ltd. in connection with the proposed redevelopment of the Lots Road site. It is not intended for, and should not be used by any third party.

2 Introduction

2.1 Site Description

The RBKC site is located at National Grid Reference 526400 176940 and the site boundaries are as follows:

- Lots Road to the northwest;
- Chelsea Harbour Drive to the southwest;
- Chelsea Creek to the southeast; and
- A short boundary by the Sortex waste transfer facility on the northeast side.

The southern wall of the power station lies along the northern wall of Chelsea Creek (Photograph 1).

The current status of the site was assessed during the site visit on 2nd May 2007. Photographic representation is provided in Appendix B.

The RBKC site contains the main Power Station building along with ancillary buildings including the former pump house, a workshop, chemical stores and offices. In addition, at the eastern end of the site is the trash screening area for the surface water abstraction point. Between the trash screen and Power Station/stores buildings is the East Yard a concreted/tarmac area for parking. Areas of this tarmac are in poor condition with vegetation breaking the ground surface. This is illustrated in Photographs 2 & 3.

Between the former pump house and Power Station is the West Yard, a tarmac area providing access to the Bulk Supply Point. The tarmac in this area is generally in good condition with the exception of areas adjacent to the buildings (Photograph 4).

Figure 2 displays the buildings currently present on the site.

The present layout within the Power Station building is multiple levels, as indicated in Photograph 5, including a deep service trench at approximately 9m below road level, which runs east to west containing pipework. The main pipes are water inlet pipes which draw water from the River Thames and traverse the site extending to the Pump House, before looping round to discharge back to the river. Water ingress was noted in to this area during the site walkover, with evidence of staining on the wall and noise of trickles of water (Photograph 6).

2.2 Topography

The topography of the RBKC site is generally flat, with an elevation of between approximately +4 and +5mOD.

2.3 Proposed Land Use

The proposed development involves retention of the Power Station building. Therefore, soft stripping of the interior of the existing building is to take place to allow for the construction of a basement, retail units and apartments from the first floor upwards within the existing building shell (KC3). A basement is to extend across the East Yard and power station. The remaining development of the site includes:

- removal of ancillary buildings;
- construction of 2 low rise residential buildings, with non-residential use on the ground floor, in the East Yard (KC2A and B);
- construction of 1 low rise residential buildings, with a basement, in the location of the former pump house (KC4);

- construction of 1 high rise residential apartment building consisting of 25 storeys (KC1). This tower is to be sited close to the river wall in the East Yard; and
- hard landscaping of the area with granite block paving, planting and a small lawn above terracing of the creek.

Figure 3 shows the proposed development and land uses.

3 Site History

Selected historical maps are presented in Appendix A and discussed within this chapter.

3.1 Pre-Power Station Development

Prior to the development of the power station the majority of the site was Greenfield until circa. 1896, when to the north of Chelsea Creek (at the western end of the site) a dock and wharf for the loading of Timber was constructed (Swan Wharf) and a colour works and Chelsea Vestry Wharf. Two docks were excavated into the RBKC site, one on the Thames itself (Vestry Wharf) and one within Chelsea Creek, in the timber wharf. Lots Road is shown, with a bridge over Chelsea Creek at the Lots Road corner.

In 1905 the dock was infilled and wharfs and colour works removed to make way for the Lots Road Power Station, which was built to supply energy for London Underground. This construction required the backfilling of the Western dock in Chelsea Creek, and the enlarging of the dock on the Thames, in order to accommodate the barges that delivered coal to the power station. The southern wall of the power station lies along the northern wall of Chelsea Creek.

3.2 Post Power Station Construction

The power station was originally constructed on a series of concrete plinths extending across the main building. The following describes the history of the power station:

- Originally, Lots Road Power Station was coal fed, with docks and a coal pit at the western end of the site by the mouth of Chelsea Creek. A Ash Pit was present in the northwest corner.
- In the 1930's development of the western side of Chelsea Creek commenced with further coal stores supplied by train. Associated railway sidings covered most of the site west of Chelsea Creek at this time.
- By 1951 a series of modernisation works at the power station had taken place including a construction of a tank next to the east dock and rail lines at the west end of the power station, which were used to remove ash taken from the boilers, have been removed and replaced with a water sluicing system and gantry crane.
- In the 1960's the power station was converted to using heavy fuel oil and the construction of the west pump house and control room. The pump house was built to draw cooling water at an increased rate from the Thames, in line with the increased requirements of the new boilers and turbines that were installed. The pumps in this building are set at a depth of approximately 50 feet (15m) below ground level, within a bored pile retaining wall. This depth ensured that the pumps are below the low water mark at all times. By 1968 the docks and coal pit had been in filled, with the dock sealed by a mass concrete structure. Four small tanks at the west end of the power station were also constructed. The building on the northeast boundary, adjacent to the water screen structure is indicated as a rubber works. Next to this building is a structure with two semi-circular ramps. This is later referred to as the Cremorne Wharf Refuse Tip, which in the present day is the Sortex waste transfer station.
- In the 1970's the power station was converted to utilise gas, with a back up of light fuel oil by one 100 ton tank at the west end of the main power station.
- By 1987 the 4 small oil tanks at the western end of the main power station building were removed and a Bulk Supply Point for EDF constructed.
- In 2002 the power station was decommissioned. Decommissioning included sealing and filling of voids; draining of systems (oil spillages are noted to have occurred, but

locations and quantities are not provided); cutting of gas and electricity supplies; and removal of wastes from the site such as, oil from sumps and mercury (135kg identified, 75kg documented as being removed. Some instruments remain, which contain mercury that could not be removed due to loose asbestos). In addition, several type 2 and 3 asbestos surveys were conducted. Asbestos fibres were noted to be ubiquitous throughout the main station building.

Presently the site is occupied and at the western end of the main building (excluded from the development area) the EDF energy bulk electricity supply station is present.

The Envirocheck Report details several pollution incidents to controlled waters within the vicinity of the site. Those of note include:

- Two Category 3 Minor Incidents involving the release of oil in to Chelsea Creek (1994 and 1995) within 200m of the site; and
- Category 3 Minor Incident involving the release of sewage within 200m of the site.

However, none of these pollution incidents appear to be directly attributable to Lots Road Power Station.

4 Geology, Hydrogeology and Hydrology

4.1 Geology

Due to the presence and operational activity of the power station, intrusive works have been constrained to the car park at the eastern end of the building, where the former docks and coal pit were located.

To date, seven separate investigations have been conducted at the site, resulting in excavation of 57 locations on the RBKC Site.

The ground model established from the investigation details is summarised in Table 1.

Table 1 Ground Conditions – RBKC Site

Stratum	Approximate Thickness (m)	Brief Description
Made Ground	3 to 5 (>7m in the dock/coal pit)	Mixed ash and brick deposits with clinker
Alluvium	1.0 to 4.2	Silty sandy clay with bead bands
River Terrace Deposits	1.6 to 4.0	Sand and gravel
London Clay	39[1]	Blue grey clay
Lambeth Group	18[1]	Mottled clay with sandy layers
Thanet Sand	10[1]	Fine green grey sand
Chalk	Not proven	White chalk with flints

Notes:

[1] Taken from one borehole, drilled in 1930s

4.2 Hydrogeology

Based on the available information the groundwater conditions at the Lots Road site are:

- Perched water within the Made Ground;
- The River Terrace Gravels Minor Aquifer; and
- The Chalk (including Basal Sands) Major Aquifer.

4.2.1 Perched water within the Made Ground

Monitoring installations across the site have identified perched water within the Made Ground, which is present as a result of the low permeability Alluvial Clay. This perched water within the Made Ground is likely to be variable across the site, and relatively immobile.

4.2.2 River Terrace Gravels Aquifer

The River Terrace Gravels are relatively thin beneath the site and are likely to be tidally influenced by the River Thames. During drilling carried out for the ES some tidal monitoring was conducted and a range for the water level was given as between -1.2mOD and 1.4m OD.

4.2.3 Chalk Aquifer

The Chalk Aquifer of the London Basin is a Major Aquifer used for potable supply. Available groundwater is mainly present within the Chalk and Thanet Sand Formation, but the lower beds of the Lambeth Group, which directly overlie the Thanet Sands, can also be productive.

The Chalk Aquifer has been used from the early 18th century as a source of industrial water. A bore has been constructed on site in the NW corner to extract water for use in the power station. This water was boiled to generate steam for the turbines.

Given that the power station was extracting water from the Chalk Aquifer, it would be expected that the level of the aquifer was artificially depressed within the vicinity of Lots Road. During the decommissioning of the power station 4 years ago the well was capped, it is likely that some recovery of the water level will have occurred.

4.3 Hydrology

Chelsea Creek forms the southeast boundary to the site and has served as an outfall for cooling water during the power station's operation. This usage served to keep the channel free from silt deposits. However, since the decommissioning of the power station in 2002, this channel has progressively silted up.

The River Thames forms the east-southeast boundary to the site and is tidal along this reach. Flood defences, in the form of a River Wall, separate the site from the River Thames and Chelsea Creek.

5 Historic Site Investigations

Several site investigations have been conducted on the RBKC site, dating from 1992. However, these have generally been limited to outside of the main building within the East Yard. The investigations conducted to date are:

- London Underground Limited (LUL) 1992;
- STATS Geotechnical (STATS) 1995;
- Mouchel Consulting (Mouchel) 1999; and
- Waterman Group 2000 and 2003.

A brief outline of the work undertaken during each investigation is described in this section.

5.1 LUL 1992 Investigation

LUL drilled two boreholes in the West Yard of the site which terminated in the London Clay at 30m below ground level (bgl). No information is available on whether samples were collected and submitted for chemical testing.

5.2 STATS 1995 Investigation

The investigation conducted by STATS included five trial pits (to a maximum of 3.3m bgl), three probeholes (to maximum of 3m bgl) and six boreholes(one to 25m bgl, one to 13.4m bgl, and the remainder between 6m and 7m bgl). These were all within the East Yard area of the site and concentrated mainly on the former coal pit and dock, with one location near the offices.

Soil and water samples were collected as part of the investigation. Chemical testing of samples included analysis for:

- Heavy metals;
- Other inorganics, including sulphide and cyanide;
- Organics, including Polycyclic Aromatic Hydrocarbons (PAHs), with selected samples speciated and selected analysis for Poly-chlorinated Bi-Phenyls (PCBs) and Total Petroleum Hydrocarbons (TPH); and
- Asbestos screening.

5.3 Mouchel 1999 Investigation

The 1999 investigation conducted by Mouchel included drilling of 11 boreholes on the site. One borehole was drilled to a depth of 10m, five boreholes were drilled to a depth of between 5m and 7m and five boreholes were terminated at <4m bgl. Again the locations were all within the East Yard of the site.

Soil and water samples were collected and analysed for the following determinands:

- Heavy metals; and
- Organics, including PAHs, PCBs, TPH and Chlorinated Volatile Organic Compounds.

5.4 Waterman 2000 and 2003 Investigations

Two intrusive investigations were commissioned by Waterman. The first in 2000 involved the drilling of 16 boreholes (six to <1.5m bgl, seven to between 2.5m and 5m bgl and three to between 8m and 9.5m bgl) and excavation of three trial pits (all <1m bgl). These were mainly confined to the East Yard, with the exception of three locations at the western end of

the power station and two in the East bunker house. In general, these locations did not extend to any depth (<1.5m bgl) due to services and multiple concrete layers.

Soil and water samples were collected and analysed for the following determinands:

- Heavy metals;
- Other inorganics, including sulphide and cyanide;
- Organics, including PAHs, PCBs and TPH; and
- Asbestos screening.

The second investigation in 2003 only included four window sample holes to 3m depth, which were all located around the ancillary buildings at the east end of the power station.

Soil samples were collected and analysed for the following determinands:

- Heavy metals; and
- TPH.

In addition to the above, surface samples of deposits within the power station were also collected and analysed.

Figure 4 displays all the investigation locations completed on the site to date, as identified above.

6 Conceptual Site Model

6.1 Introduction

In accordance with the current UK (and European) approach to contaminated land assessment, the potential environmental risks have been considered in the context of a conceptual source-pathway-receptor (SPR) model of the site. Potential SPRs are described below, based on the proposed site end-use. Figure 3 displays the proposed development for the site.

To assess the potential contaminative processes on the site and types of contaminants that may be present, the following information was used in addition to the 2004 ES:

- the Department of Environment (DoE) Industry Profile for Power stations (excluding nuclear power stations).

6.2 Potential Contamination Sources

Lots Road Power Station had feed stock entering at the western end and water intake in the eastern end. Tanks for water treatment, drainage collection and storage prior to discharge are present throughout the southern half of the main power station building. At the western end of the main building (excluded from the development area) an EDF energy bulk electricity supply point is present.

Figure 5 displays potential sources of contamination on the site and these are summarised in Table 2.

Table 2 Potentially Contaminative Historic RBKC Site Uses

Land Use	Potential Contaminants	Comments	Previously Investigated?
Coal Pit	PAHs, Heavy metals and sulphur	Later became an Ash Pit filled in 1968 possibly with soil arisings from the Pump House construction and demolition rubble	3 locations within the Coal Pit footprint
Dock (East Yard)	PAHs, metals	Filled in during 1968 and sealed from the River Thames by a mass concrete structure. Fill material possible demolition rubble	10 locations within the Dock footprint
Ash Pit	PAHs, Heavy metals and sulphur	Deep excavation (circa 15m) for the Pump House in this area likely to removed majority of impacted ground	No – presence of pump house precludes investigation
4 tanks	Light Oil	Light oil storage tanks located at western end of the power station	No – replaced by Bulk Supply Point which is still operational
Oil Tank	Light Oil	100 ton Light Oil tank at west end of the Power Station	No – significant underground services present in the West Yard
Boiler House	Heavy / Light Oil	Heavy oils were stored in the former coal store (Oil Storage Facility) on the west bank of Chelsea Creek and transferred by over ground pipework to the western end of the power station. Spillages/ leakage from loading gantries, pipework or tanks could have led to contamination by heavy oils, although this is solid at ambient air	1 location, but refused on concrete hardcore

Cleaning and Water Purification Tanks	Ammonium, hydrazine, hydrochloric acid, ammonium biflouride and sodium bromide	Located in the eastern end of the main power station on the boiler side and in East Yard	3 locations in East Yard, 3 locations in the east boiler house (minimal depth due to concrete).
Turbine Hall	Asbestos and oils	Asbestos fibres were noted to be ubiquitous throughout the main station building	No – presence of machinery precludes investigation
General Waste	PAHs, heavy metals	clinker and PFA produced by burning process	Surface deposit samples collected
Waste water Tanks	Oils, PAHs	Located in the boiler house of the main station and extended from the central area to the western end. Collected water from Sumps to remove water ingress from deep channels running through the turbine hall	No – access restraints prevent drilling
Transformers	Oils, PCBs and Phthalates	present at the western end of the site, currently within the former pump house, previous locations include current position of the Bulk Supply Point	No – significant underground services present in the West Yard
Site Instruments	Mercury	Mercury was used in instrumentation and was stored on site. 135kg was identified, 60kg documented as being removed during decommissioning, although instrumentation remains on site	7 locations around former stores

6.2.1 Soil Conditions

A total of 43 locations have been investigated across the RBKC site, corresponding to approximately 35m spacing. The assessment detailed in the EIS identified the following Contaminants of Concern (COCs):

- elevated concentrations of metals (arsenic, boron, copper, nickel, selenium and zinc);
- inorganics (asbestos, total sulphate); and
- organics (phenols, PCBs, VOCs and TPH).

The ashy Made Ground stratum was identified as a source of contamination, with hot spots of elevated metals identified within the former dock and coal pit.

Only one sample out of 15 analysed, collected from the former dock, contained elevated VOC concentrations. Only one sample, collected between the former dock and coal pit, contained elevated phenol (out of 33 analysed) and PCBs (out of 14 analysed), implying a localised impact.

The investigations conducted to date focused mainly on the East Yard area due to the presence of the power station and onsite structures limiting access elsewhere. This was recognised within the EIA and further provision for investigation was made. Gaps in the data set that would require filling exist in the following areas:

- Power Station, particularly the western end where the feed stock entered; and
- former Pump House and transformer area.

Asbestos is present throughout the remaining structures on the site. In general, asbestos is in a cement bound form, however, it was noted during the Site Walkover that loose asbestos fibres were present on the ground within buildings and open areas where cladding had been

degraded by birds. Removal of the asbestos by a suitably licensed contractor is required prior to any works.

6.2.2 Groundwater and Perched Water Conditions

Perched water within the Made Ground was found on the site, ranging between 1 and 3.4 mAOD. Groundwater is present within the River Terrace Gravels and is tidally influenced with a range of over 1m.

Groundwater and perched water samples were compared against UK Drinking Water Standards and Dutch Intervention Values.

Perched Water

Sampling from monitoring installations across the site has identified contamination within the perched water by both inorganics (mainly metals) and organics. A total of 15 samples were collected from the perched water and the contaminant assessment within the ES identified the following COCs:

- elevated concentrations of metals (arsenic, boron, iron);
- inorganics (sulphate); and
- organics (phenols, TPH, PAHs, phthalates).

Low concentrations of TPH were recorded across the East Yard, with no discernible hotspots evident. The most recent sampling (2003) did not record elevated TPH or phthalates. No free-product has been identified at any time.

Elevated metal concentrations were limited and mainly present in and around the former coal pit and dock (Figure 6).

Groundwater (River Terrace Gravels)

The contamination assessment within the ES notes 14 groundwater samples were analysed, with the following COCs identified:

- elevated concentrations of metals (lead, iron, selenium, nickel);
- inorganics (sulphate, thiocyanate, ammonium); and
- organics (phenols, TPH, PAHs, phthalates).

However, the majority of locations presented as containing maximum concentrations are not installed within the River Terrace Gravels, but within the Made Ground. Therefore, these are likely to be more representative of perched water.

Analysing only results from installations within the River Terrace Gravels identifies the following COCs:

- elevated concentrations of metals (lead, iron, selenium, nickel);
- inorganics (sulphate, thiocyanate, ammonium); and
- organics (phenols, TPH).

The metal concentrations are marginally elevated above the water quality standards. TPH concentrations were seen to reduce to below detection limit on a second round of sampling in 2000.

6.2.3 Ground Gas

Gas monitoring was undertaken on the site in 1995 and 1999, but did not include flow rates. Elevated methane concentrations were noted at three locations, although only one consistently. The presence of ground gases are expected due to the presence of organic layers (Peat) and substantial Made Ground.

Monitoring west of Chelsea Creek was conducted and flow rates recorded were very low, typically of natural sources.

Gas sampling was also conducted in 1995 and 1999. The 1995 gas analysis revealed the presence of some volatile organic compounds (VOCs). The 1999 gas analysis did not identify any VOCs.

Due to the nature of the development, further gas monitoring is required to establish appropriate mitigation measures.

6.3 Pathways

Lateral Migration of Dissolved Phase Contamination: Perched water and groundwater containing dissolved phase contamination may move off-site to underlying strata and controlled waters within the River Terrace Gravels aquifer, River Thames or Chelsea Creek.

Ingestion of Soils or Dust: During ground intrusive works, site workers engaged with excavation and excavated material may come into contact with impacted material through ingestion of soils or dust. Site visitors and neighbours may be impacted by ingestion of dust. These pathways may be removed by implementing appropriate dust suppression working measures and using correct personal protective equipment (PPE).

Inhalation of Vapour or Dust: Volatilisation of hydrocarbon product and soil gases including carbon dioxide and methane may occur in the subsurface and accumulate in overlying confined spaces. Generation of dust through excavation, and stockpiling of excavated material, may impact site workers and neighbours. This can be suppressed by appropriate working methods including keeping stockpiles and potentially dusty areas damp. Services may also act as migration pathways for any ground gases present. Venting of service ducts may be required.

Dermal Contact with Soils or Dust: During ground intrusive works, site workers who are dealing closely with excavation and excavated material may come into contact with impacted material through dermal contact. This pathway may be removed by implementing appropriate working measures and using correct PPE.

6.4 Receptors

Site and Maintenance Workers: Construction personnel for the new development, visitors to the construction site and future maintenance workers.

Future Site Users: Future site users are workers, residents and visitors.

Groundwater: The site is underlain by the River Terrace Gravels which is classified as controlled waters.

Ecosystem: There are no ecological receptors on-site. However, ecological survey work has been undertaken west of Chelsea Creek on the LBHF site. Chelsea Creek and the River Thames also support ecosystems. The specific risks to ecology are not covered within this report.

Building Materials and Services: Building materials that are potentially at risk from contaminated soils are concrete, plastic and metals. Appropriate class of concrete will be required based on the chemical data and the suitable material for service pipe work for potentially aggressive ground should be made.

Site Neighbours: During redevelopment, disturbance of the subsurface may generate dust and mobilise contamination off-site if not carefully controlled.

Surface Water: The River Thames and Chelsea Creek border the site.

6.5 Plausible Pollutant Linkages

A summary of the plausible pollutant linkages based on the SPRs outlined above is provided in Table 3.

Table 3 Plausible Pollutant Linkages – RBKC Site

Sources	→	Pathways	→	Receptors	
HUMAN HEALTH					
Construction Phase					
Made Ground soils impacted by former land-uses.	→	Ingestion of soils or dust disturbed during redevelopment works.	→	***Onsite***	Site and maintenance workers.
				Offsite	Neighbouring residents / site workers.
	→	Dermal contact with soils or dust during redevelopment works.	→	***Onsite***	Construction workers.
				Offsite	Neighbouring residents / site workers.
	→	Inhalation of vapour or dust generated during redevelopment works.	→	***Onsite***	Site and maintenance workers.
				Offsite	Neighbouring residents / site workers.
Perched water	→	Inhalation of vapours	→	***Onsite***	Construction workers.
Perched water	→	Ingestion of water	→	***Onsite***	Construction workers.
Future Site Users					
Made Ground soils impacted by former land-uses.	→	Ingestion of soils or dust disturbed by future users.	→	***Onsite***	Maintenance workers. Future residents / visitors
				Offsite	Neighbouring residents / site workers.
	→	Dermal contact with soils or dust by future users.	→	***Onsite***	Maintenance workers. Future residents / visitors
				Offsite	Neighbouring residents / site workers.
	→	Inhalation of vapour or dust generated by future users.	→	***Onsite***	Future site workers and residents.
				Offsite	Neighbouring residents / site workers.
Perched water	→	Inhalation of vapours	→	***Onsite***	Future site workers and residents.
Ground gas	→	Migration of gas in to buildings	→	***Onsite***	Future site workers.
CONTROLLED WATERS					
Leachable sources of contamination present in Made Ground that have been impacted by their former use.	→	Vertical migration of dissolved phase contaminants.	→	***Onsite***	Groundwater in the River Terrace Gravels aquifer.
				Offsite	The River Thames and Chelsea Creek.
Sources of contamination present in the River Terrace Gravels	→	Lateral migration of dissolved phase contaminants.	→	The River Thames and Chelsea Creek.	

Sources	→	Pathways	→	Receptors
Sources of contamination present in perched water	→	Vertical or lateral migration of dissolved phase contaminants.	→	Groundwater in the River Terrace Gravels and River Thames/ Chelsea Creek.

7 Preliminary Remediation Strategy

The redevelopment of the site is for mixed residential use, with retail at ground level and includes an extensive basement across the majority of the site, as shown in Figure 7. The site is to be hard landscaped (Figure 3) with some terracing and lawn to the Creek.

Based on the proposed redevelopment and the Plausible Pollutant Linkages identified in the conceptual site model, the residual risks remaining have been assessed and are summarised in Table 4. The risk classification of Very Low, Low, Medium and High risks has been based on the CIRIA guidance C552. A brief description of each is provided below:

- High Risk - There is a high probability that severe harm could arise or is occurring to a designated receptor from an identified hazard. Urgent investigation (if not undertaken already) is required and remedial works may be necessary;
- Moderate Risk - It is possible that harm could arise to a designated receptor from an identified hazard. However, if is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk. Some remedial works may be required in the longer term;
- Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
- Very Low Risk - There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

This identifies risks from ground gases and vapours and dissolved phase contaminants as the main risk. To quantify the risks posed by these PPLs additional investigation is recommend. This should include:

- Up to 2 boreholes in and around the former pump house, where access allows, drilled to the London Clay (one to be retained for development monitoring). These locations are to assess ground gas and impacts from the transformers and former uses as an ash pit as no data currently exists in this area;
- Up to 5 boreholes within the former power station, access permitting, particularly to characterise ground conditions at the western end where fuel oils entered and for gas monitoring. Limited data currently exists in this area and further is required to fully characterise the conditions;
- 1 borehole near the former water treatment plant to be retained for development monitoring;
- 2 boreholes in the East Yard and Trash Screen area for development monitoring; and
- Environmental testing for TPH, PAHs and metals (ubiquitously), selected samples for PCBs and VOCs. These analytes are recommended based on the known processes to have been conducted at the site.

A proposed site investigation plan is included in Figures 8.1 to 8.3. These site investigation plans also incorporate locations required for maritime and geo-technical investigative purposes. It is proposed to also collect samples for contamination testing from the majority of these, in addition to those outlined above.

The environmental site investigation locations are in areas which are and have been historically inaccessible, such as within the power station main building and the former pump house. Removal of asbestos, equipment and some demolition is required to gain suitable access to conduct the site investigation.

No investigation locations are proposed for the West Yard area. The west Yard is outside the development proposal and operated by EDF Energy. The main sources identified in this area are former oil tank locations. These now form the bulk supply point. In addition, numerous services, including mains sewer, pipe work associated with the power station and a significant number of high voltage cables supplying London Underground are present in the West Yard. This leaves little room for investigation locations with a safe working distance.

On completion of the site investigation a GQRA will be undertaken and Detailed Quantitative Risk Assessment, if required, and the Remedial Strategy revised to incorporate the findings.

Table 4 Preliminary Remediation Strategy

Sources	→	Pathways	→	Receptors		Redevelopment	Residual Risk
HUMAN HEALTH							
Made Ground soils impacted by former land-uses.	→	Ingestion of soils or dust disturbed by future users.	→	***Onsite***	Maintenance workers. Future residents / visitors	The site will be hard-standing with the exception of terracing for the Creek and a small lawn area. In addition a basement will extend over the majority of the site restricting the potential for dust generation. The small landscaped area will have a clean 1m layer imported. The imported material would be tested and comply with standards identified in the Remediation Strategy.	LOW
				Offsite	Neighbouring residents / site workers.		
	→	Dermal contact with soils or dust by future users.	→	***Onsite***	Maintenance workers. Future residents / visitors	The site will be hard-standing with the exception of terracing for the Creek and a small lawn area. In addition a basement will extend over the majority of the site restricting the potential for dust generation. The small landscaped area will have a clean 1m layer imported. The imported material would be tested and comply with standards identified in the Remediation Strategy.	LOW
				Offsite	Neighbouring residents / site workers.		
	→	Inhalation of vapour or dust generated by future users.	→	***Onsite***	Future site workers and residents.	The site will be hard-standing reducing the potential for dust generation. The majority of the buildings have basements and will have minimal risk from vapours due to venting.	LOW
				Offsite	Neighbouring residents / site workers.		
Perched water	→	Inhalation of vapours	→	***Onsite***	Future site workers and residents.	The site will be hard-standing reducing the potential for dust generation. The majority of the buildings have basements and will have minimal risk from vapours due to active venting.	LOW TO MEDIUM
Ground gas	→	Migration of gas in to buildings	→	***Onsite***	Future site workers and buildings.	There is limited existing ground gas information. There is potential for ground gases and further gas monitoring is required with GQRA and remedial measures to be confirmed.	MEDIUM
CONTROLLED WATERS							
Leachable sources of contamination present in	→	Vertical migration of dissolved phase	→	***Onsite***	Groundwater in the River Terrace Gravels aquifer.	Following redevelopment the majority of site will be hard-standing reducing the infiltration and	LOW

Sources	→	Pathways	→	Receptors		Redevelopment	Residual Risk
Made Ground that have been impacted by their former use.		contaminants.		*Offsite*	The River Thames and Chelsea Creek.	leachability. Made Ground (and any identified sources of potential contamination) would be removed by basement excavations. No soakaways will be used on site.	
Sources of contamination present in the River Terrace Gravels	→	Lateral migration of dissolved phase contaminants.	→	The River Thames and Chelsea Creek.		Decommissioning of the power station over 5 years ago has removed the main sources of contamination. Hard standing and removal of soil hotspots will further mitigate risks.	LOW TO MEDIUM
Sources of contamination present in perched water	→	Vertical or lateral migration of dissolved phase contaminants.	→	Groundwater in the River Terrace Gravels and River Thames/ Chelsea Creek.		Decommissioning of the power station has removed the main sources of contamination. Hard standing and removal of soil hotspots will further mitigate risks. Basement excavations may require dewatering, which will require disposal either off-site or via interceptor to sewer. Perched groundwater within the former East Dock is expected to be contained and isolated. A piling risk assessment to mitigate the potential for contamination in the underlying aquifer should be completed.	LOW TO MEDIUM

8 Conclusions and Recommendations

The site is part of a former power station complex and was the location of the main turbine hall, boiler house and associated fuel and electrical infrastructure. The site has planning permission for redevelopment for high density residential and retail purposes.

Several potential contamination sources have been identified at the site and these have, on the whole, undergone intrusive investigation as part of previous site characterisation studies and for the purposes of the environmental impact assessment that was undertaken in support of the planning application. Key findings of these studies are as follows:

- Soils within the RBKC site have elevated concentrations of metals (arsenic, boron, copper, nickel, selenium and zinc), other inorganics (asbestos, total sulphate) and certain organics (phenols, PCBs and TPH).
- Perched water within the RBKC site has elevated concentrations of metals (arsenic, boron, iron), other inorganics (sulphate) and certain organics (phenols, TPH, PAHs, phthalates).
- Deeper groundwater within the RBKC site has slightly elevated concentrations of metals (lead, iron, selenium, nickel), other inorganics (sulphate, thiocyanate, ammonium) and certain organics (phenols, TPH, PAHs, phthalates).

Given the nature of the contamination detected, the previously collected data is judged to be still valid for site assessment purposes.

A conceptual site model has been outlined which identifies several plausible pollutant linkages. These linkages have been assessed in terms of the new development and a preliminary remedial strategy. Subsequently the following linkages have been identified as requiring further assessment.

Sources	Pathways	Receptors		Redevelopment	Residual Risk
Perched water	Inhalation of vapours	***Onsite***	Future site workers and residents.	The site will be hard-standing reducing the potential for dust generation. The majority of the buildings have basements and will have minimal risk from vapours due to active venting.	LOW TO MEDIUM
Ground gas	Migration of gas in to buildings	***Onsite***	Future site workers.	There is limited existing ground gas information. There is potential for ground gases and further gas monitoring is required with GQRA and remedial measures to be confirmed	MEDIUM
Sources of contamination present in the River Terrace Gravels	Lateral migration of dissolved phase contaminants.	The River Thames and Chelsea Creek.		Decommissioning of the power station over 5 years ago has removed the main sources of contamination. Hard standing and removal of soil hotspots will further mitigate risks.	LOW TO MEDIUM
Sources of contamination present in perched water	Vertical or lateral migration of dissolved phase contaminants.	Groundwater in the River Terrace Gravels and River Thames/ Chelsea Creek.		Decommissioning of the power station has removed the main sources of contamination. Hard standing and removal of soil hotspots will further mitigate risks. Basement excavations may require dewatering, which will require disposal either off-site or via interceptor to sewer. Perched groundwater within the former East Dock is expected to be contained and isolated. A piling risk assessment to mitigate the potential for contamination in the underlying aquifer should be completed.	LOW TO MEDIUM

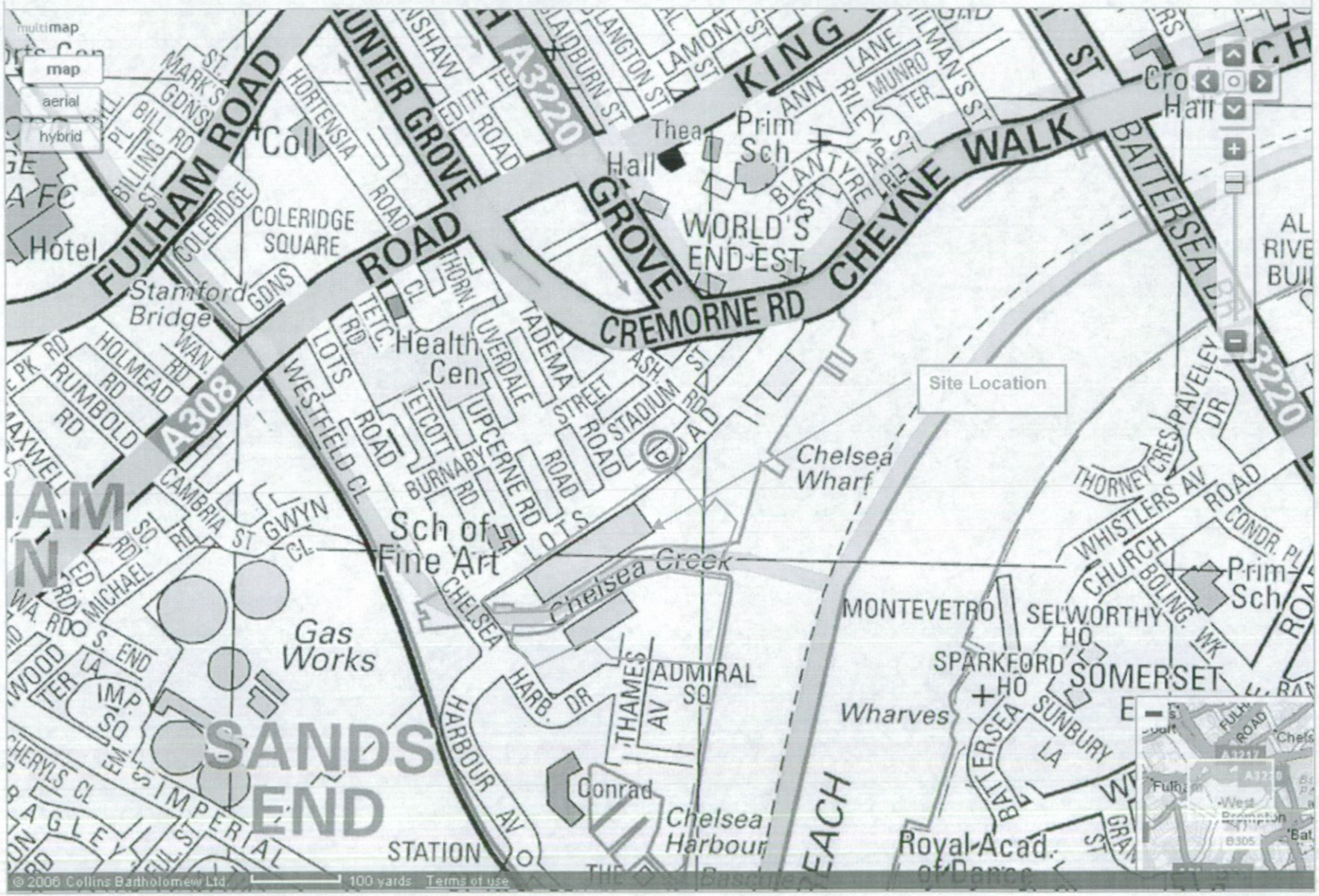
These PPLs will need to be assessed under the proposed development scheme via a generic quantitative risk assessment (GQRA) and possibly a detailed quantitative risk assessment (DQRA) prior to a remediation strategy being developed.

Prior to the GQRA, additional intrusive investigation of the site is necessary to augment the existing data set.

The site investigation would include drilling of seven boreholes in the former pump house and power station building footprints and three boreholes across the east of the site for monitoring.

On completion of the GQRA, a DQRA may be required, following which a Remediation Strategy and Verification Design can be completed. These will all need to be tied into the development proposals for the site.

FIGURES



LOTS ROAD
SITE LOCATION

123162-02

FIGURE 1

Legend

SITE BOUNDARY

Notes:

ARUP
13 FITZROY STREET
LONDON W1T 4BQ
TEL: +44 (0)20 7636 1531

Client

CIRCADIAN LTD

Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

LAYOUT PLAN

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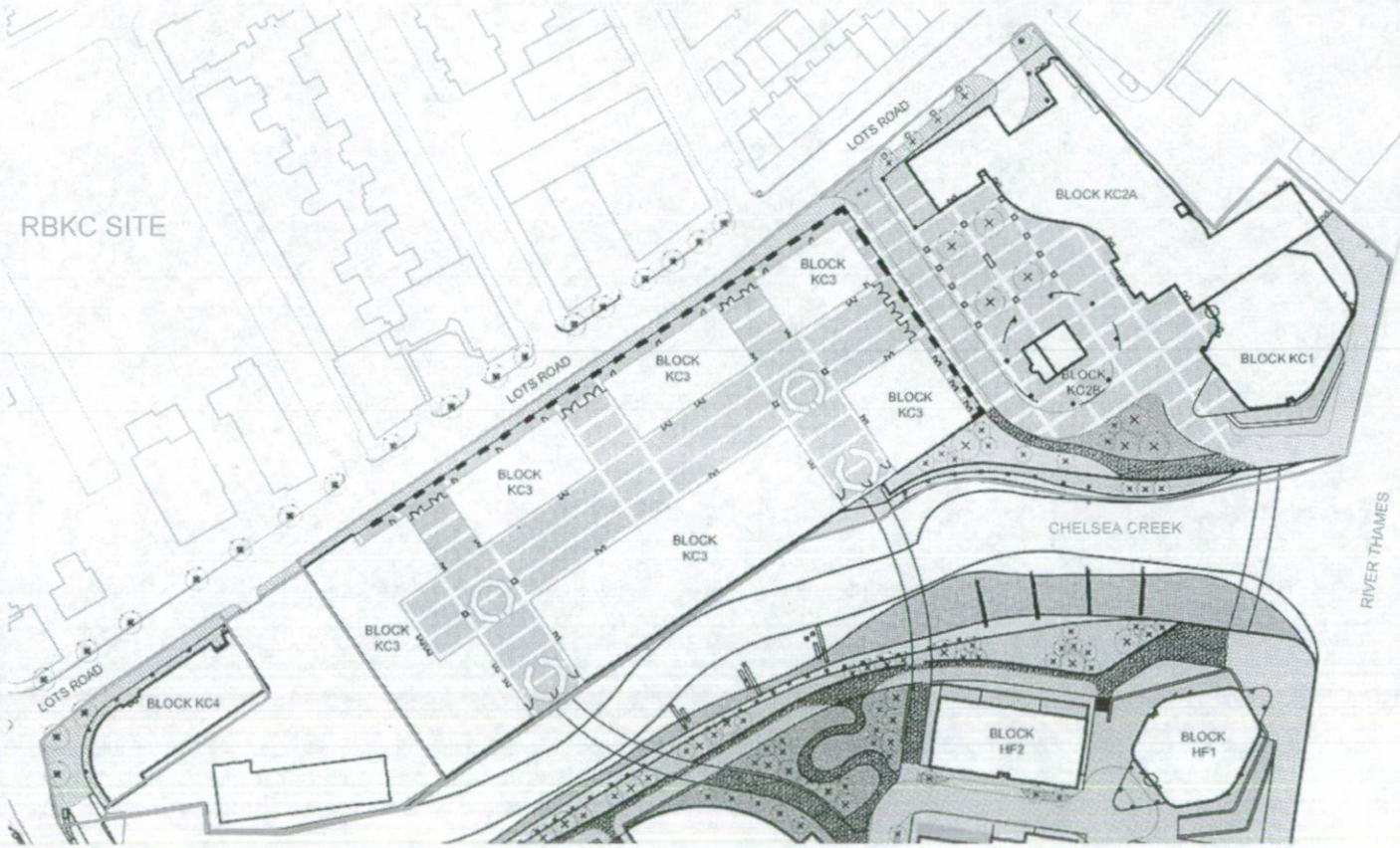
FIGURE **2**



Legend

Notes: Plan as of 02/07/2007

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13 FITZROY STREET
LONDON W1T 4BQ
TEL: +44 (0)20 7636 1531

Client

CIRCADIAN LTD

Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

PROPOSED DEVELOPMENT AND LAND USE

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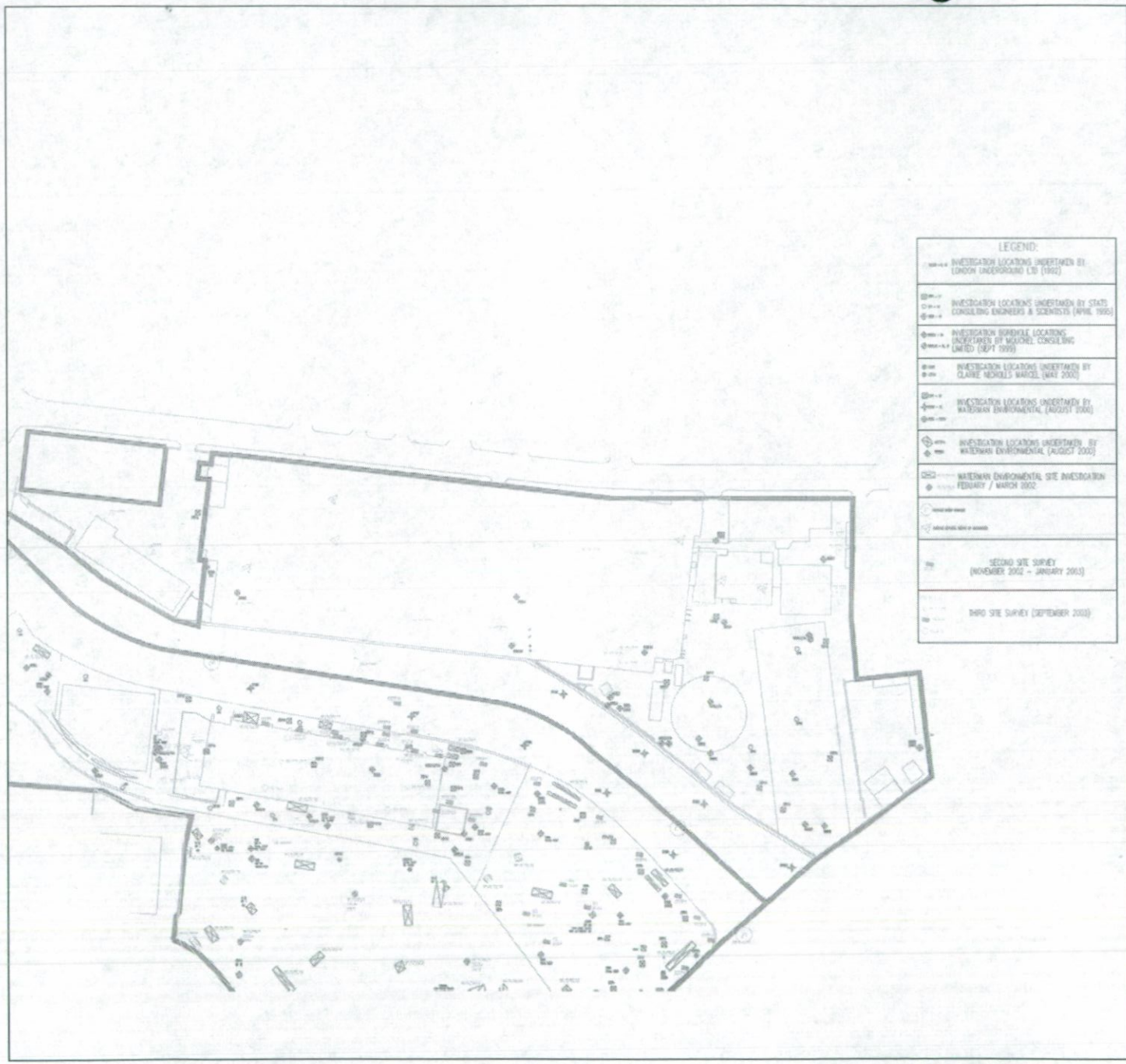
FIGURE 3



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SITE BOUNDARY

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LONDON W1T 4BQ
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Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

SITE INVESTIGATION LOCATIONS

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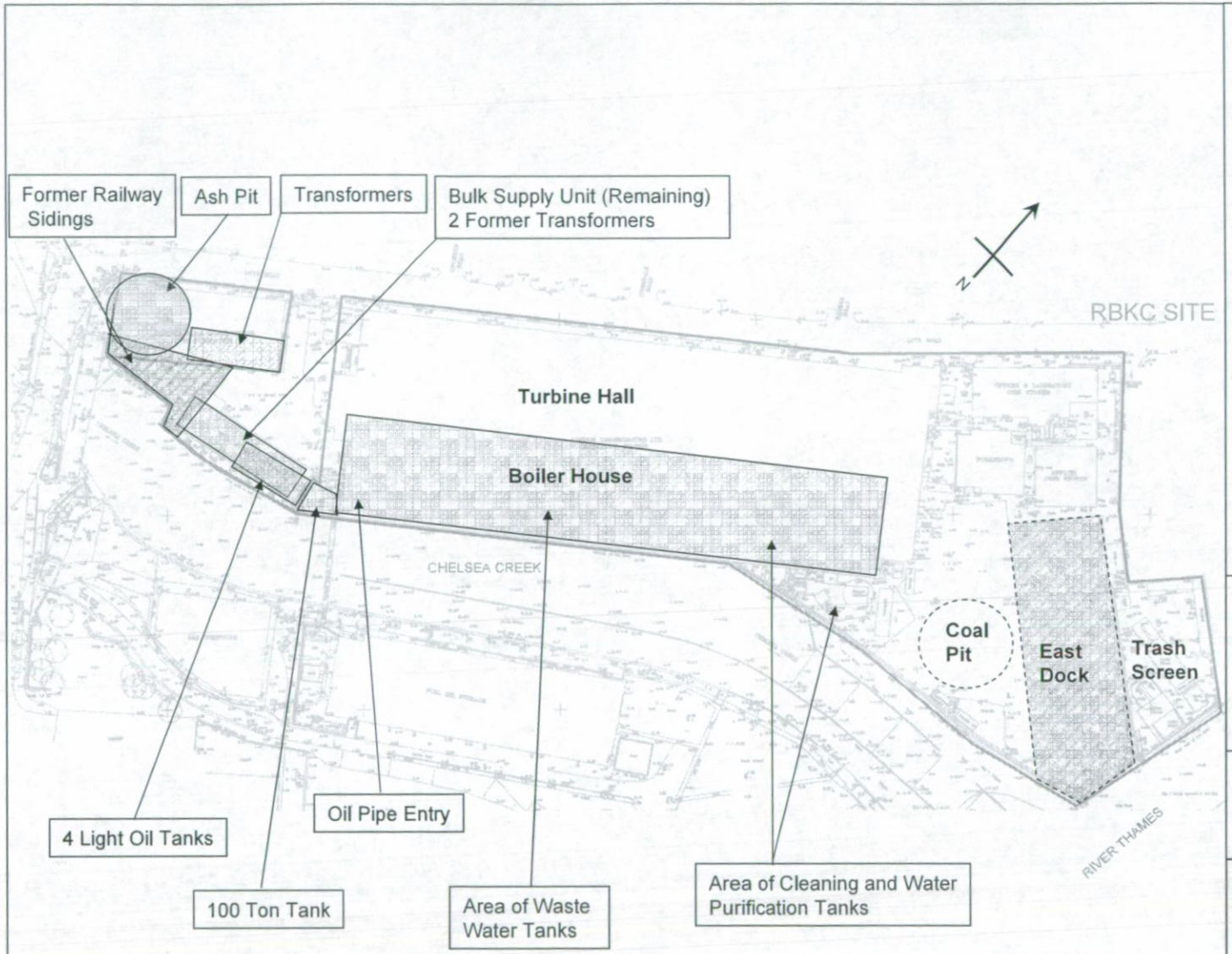
FIGURE **4**



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SITE BOUNDARY

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TEL: +44 (0)20 7636 1531

Client

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Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

POTENTIAL SOURCES OF CONTAMINATION

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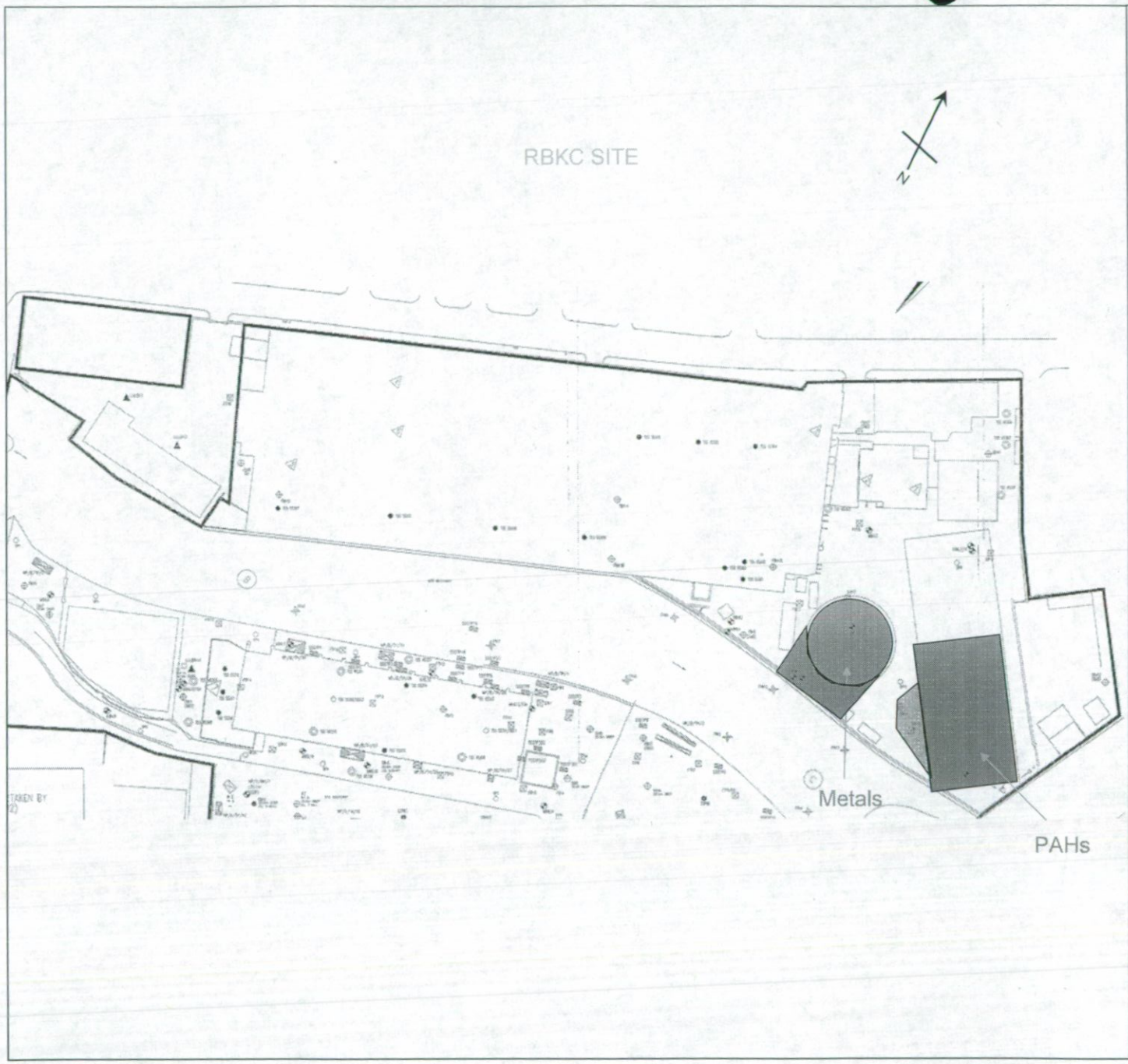
FIGURE **5**



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Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

AREAS OF ELEVATED SOIL CONCENTRATIONS

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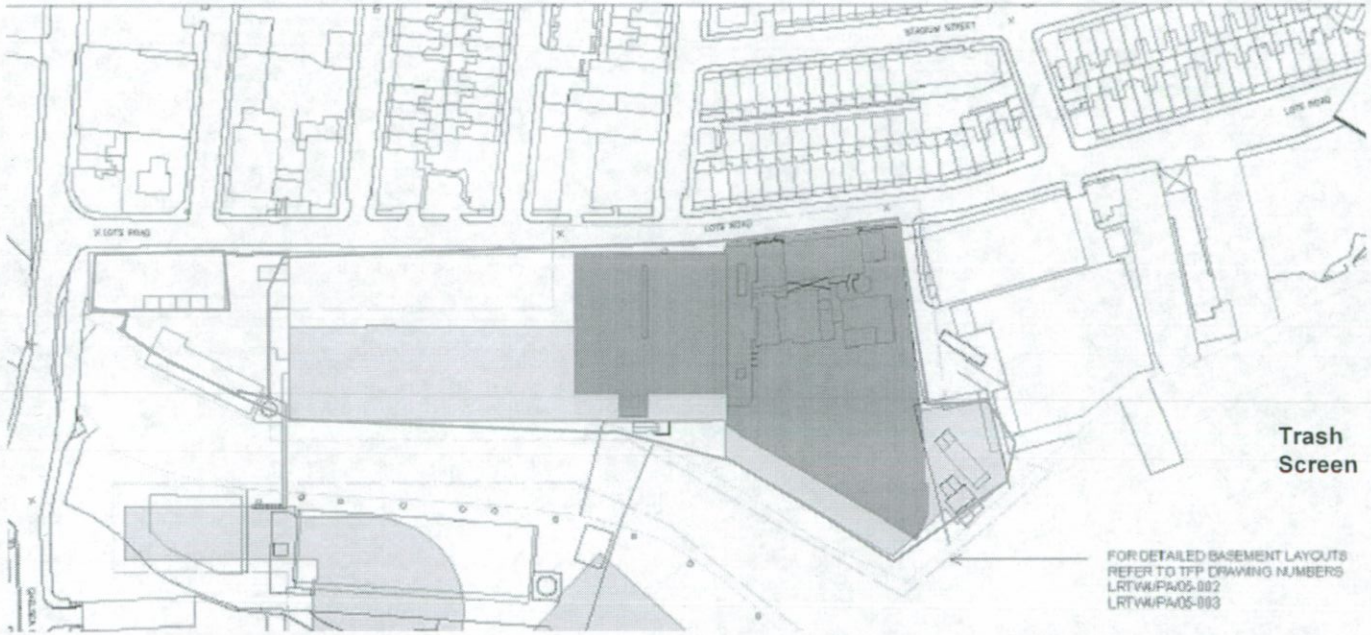
FIGURE 6

RBKC SITE



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LONDON W1T 4BQ
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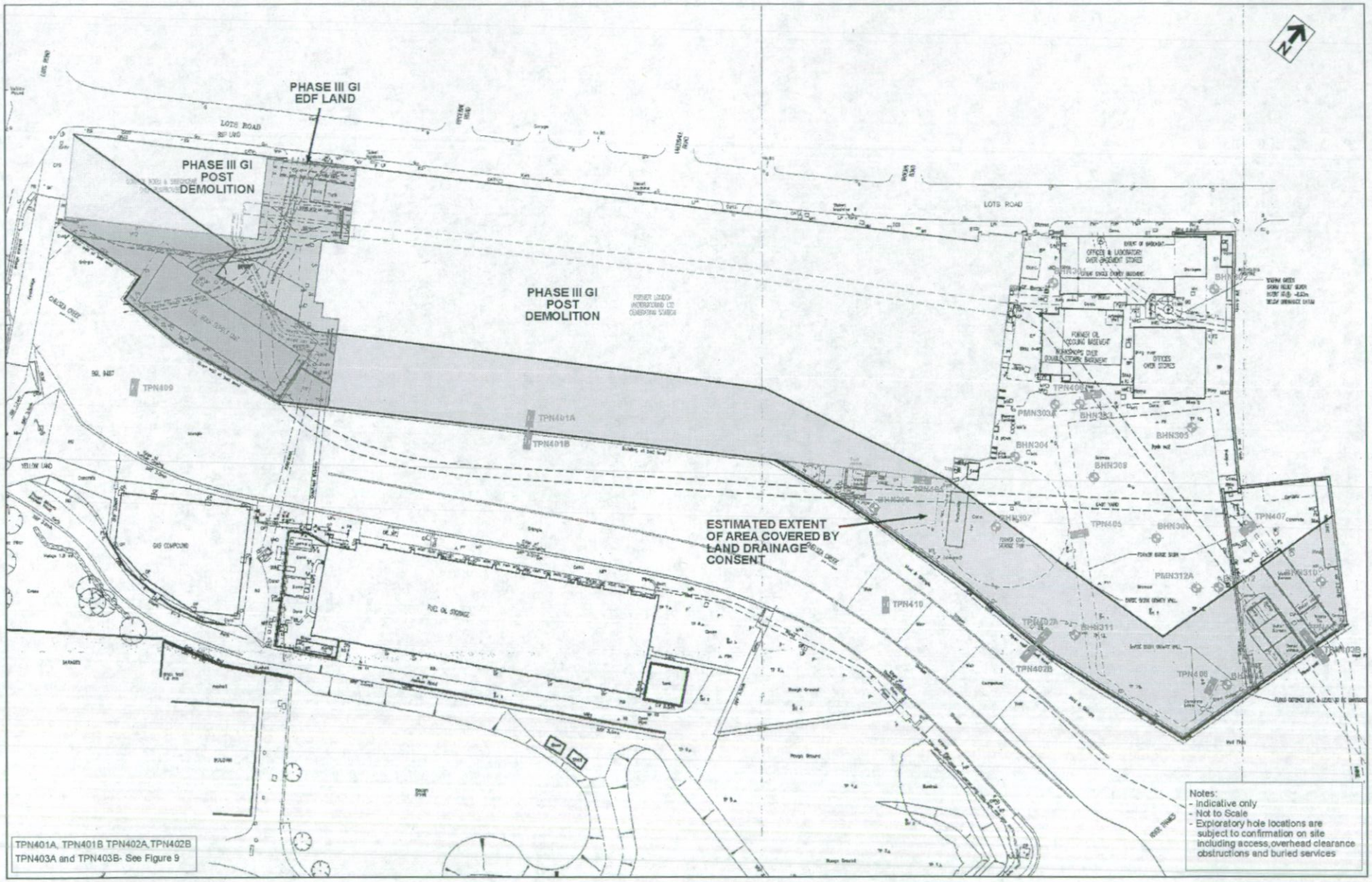
Title

ROYAL BOROUGH OF KENSINGTON AND CHELSEA SITE:

BASEMENT LAYOUT

Ref: J:\123162\4\05\CL\CL001_Fig2&5.ppt

FIGURE **7**

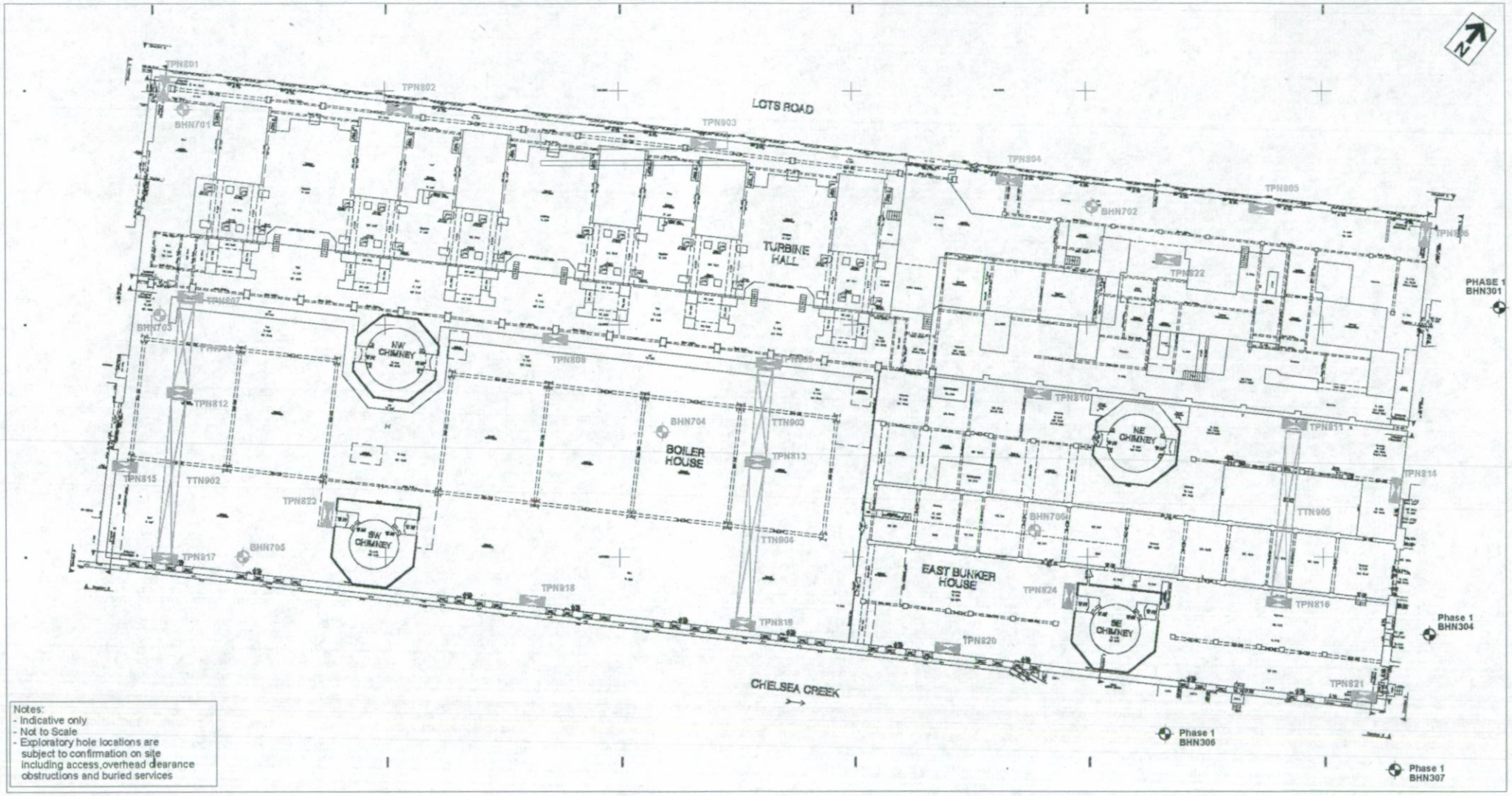


LOTS ROAD - PHASE 1

RBKC - INDICATIVE EXPLORATORY HOLES

123162

FIGURE 8.1

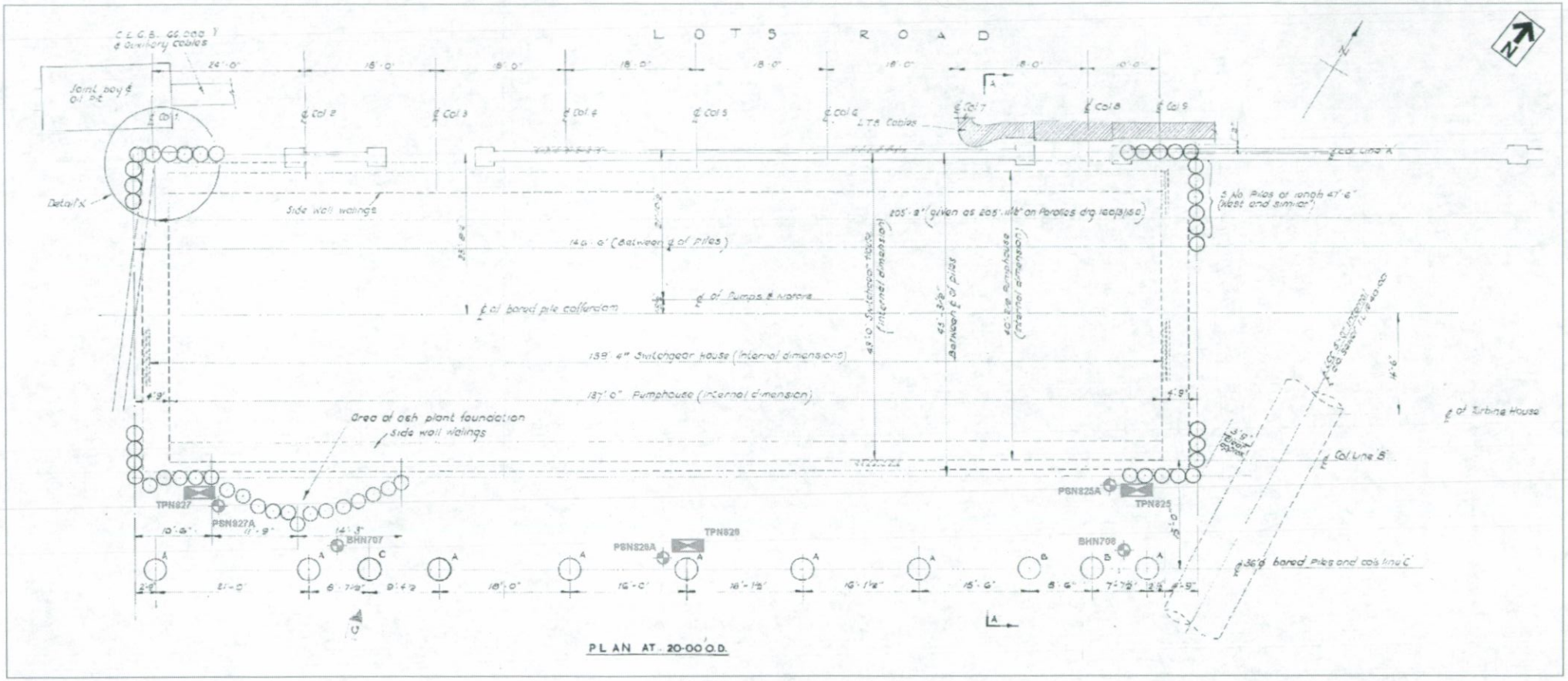


LOTS ROAD - PHASE 3

RBKC - POWER STATION INDICATIVE EXPLORATORY HOLES

123162

FIGURE 8.2



Notes:
- Indicative only
- Not to Scale
- Exploratory hole locations are subject to confirmation on site including access, overhead clearance obstructions and buried services

LOTS ROAD - PHASE 3

RBKC - PUMP HOUSE INDICATIVE EXPLORATORY HOLES

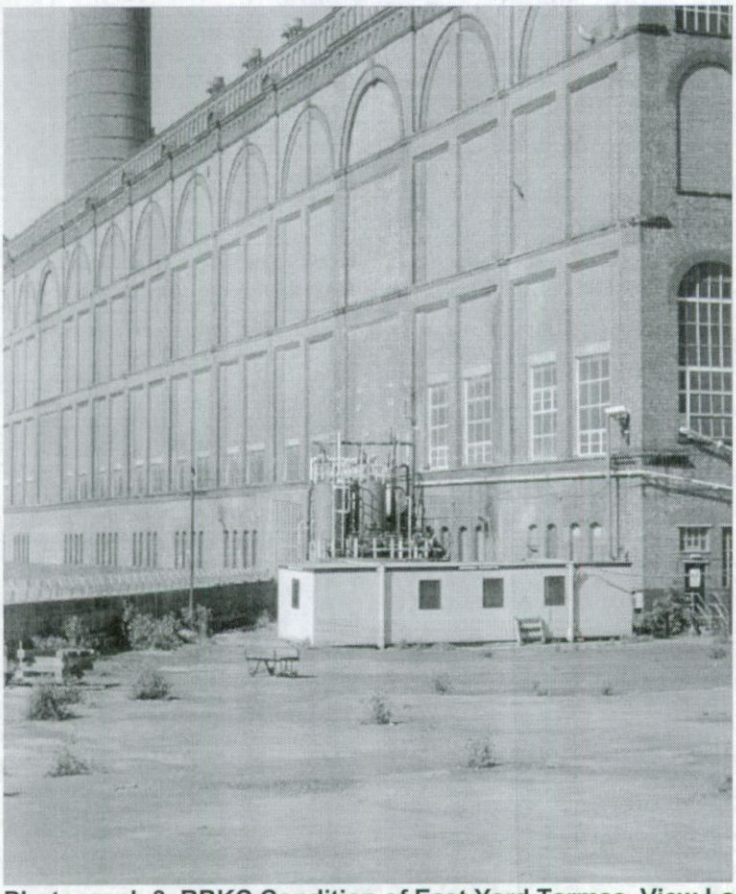
123162

FIGURE 8.3

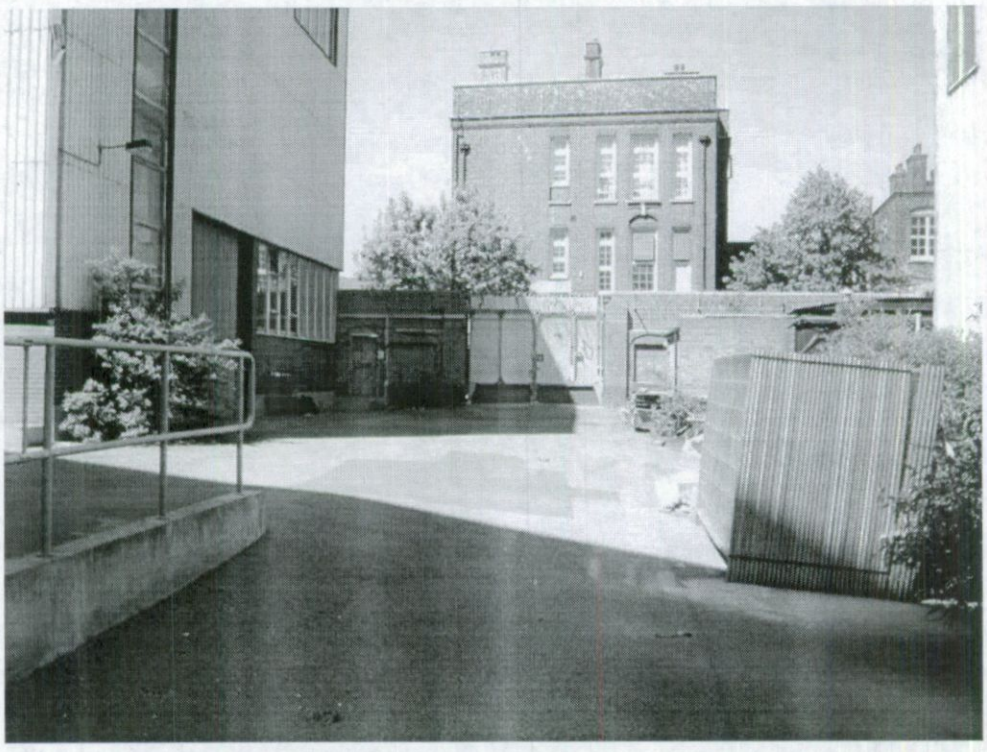
PHOTOGRAPHS

Photograph 1 RBKC Power Station Southern Boundary

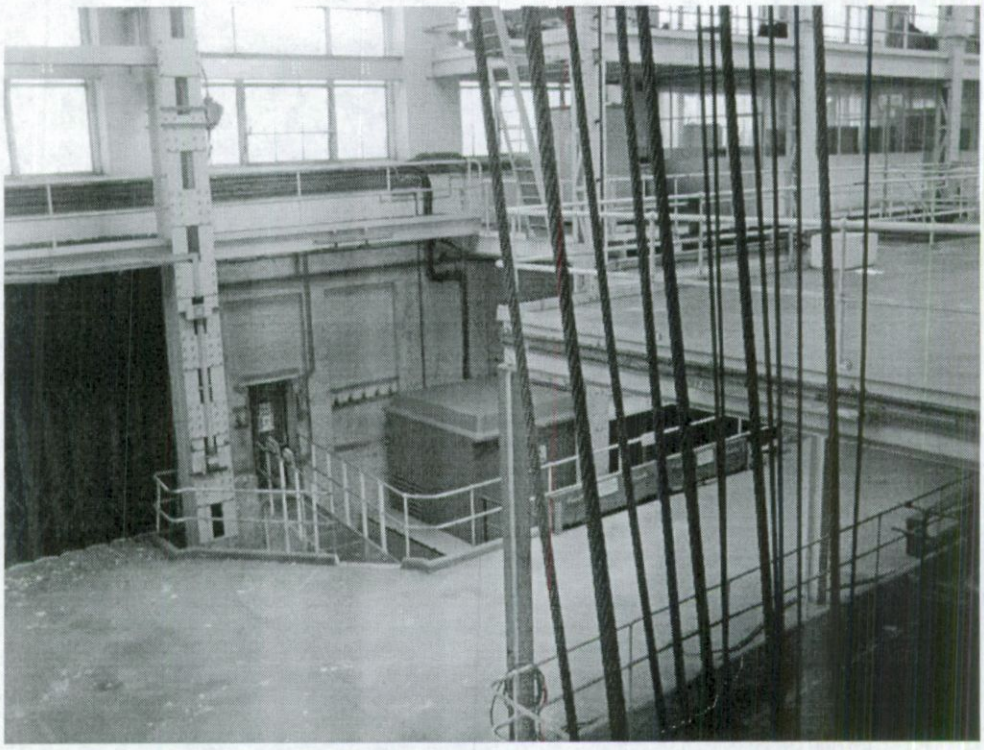
Photograph 2 RBKC Condition of East Yard Tarmac, View Looking Southeast



Photograph 3 RBKC Condition of East Yard Tarmac, View Looking West



Photograph 4 RBKC Condition of West Yard Tarmac



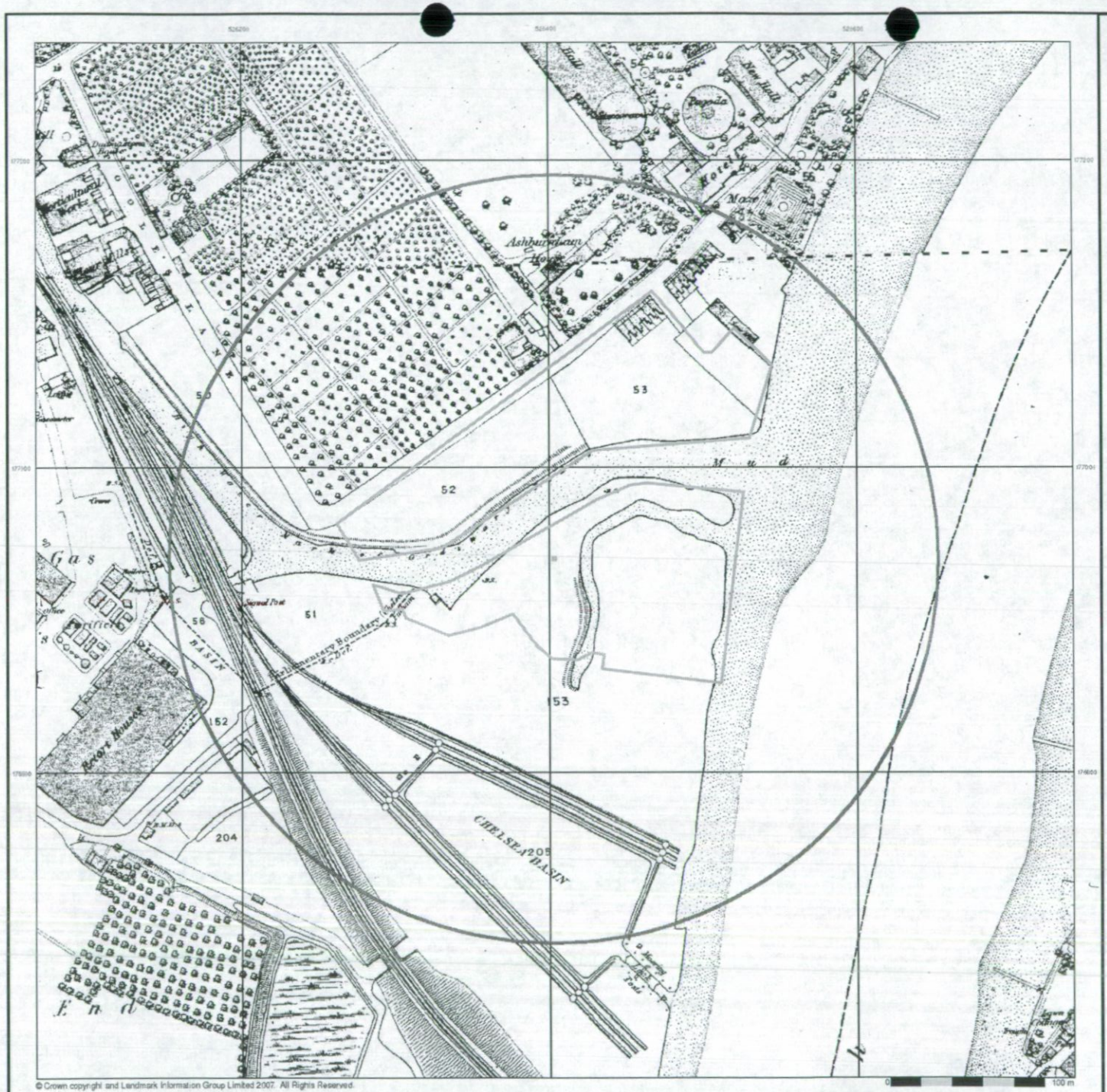
Photograph 5 RBKC Power Station Internal Layout

Photograph 6 RBKC Water Ingress within the Deep Trench of the Turbine Hall

Appendix A

Selected Historical Maps and Aerial Photographs

A1 Selected Historical Maps and Aerial Photographs



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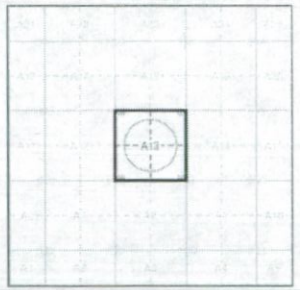
Published 1869 - 1874

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

Historical Map - Segment A13



Order Details

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Customer Ref:	75744-41
National Grid Reference:	526400, 176940
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	250

Site Details

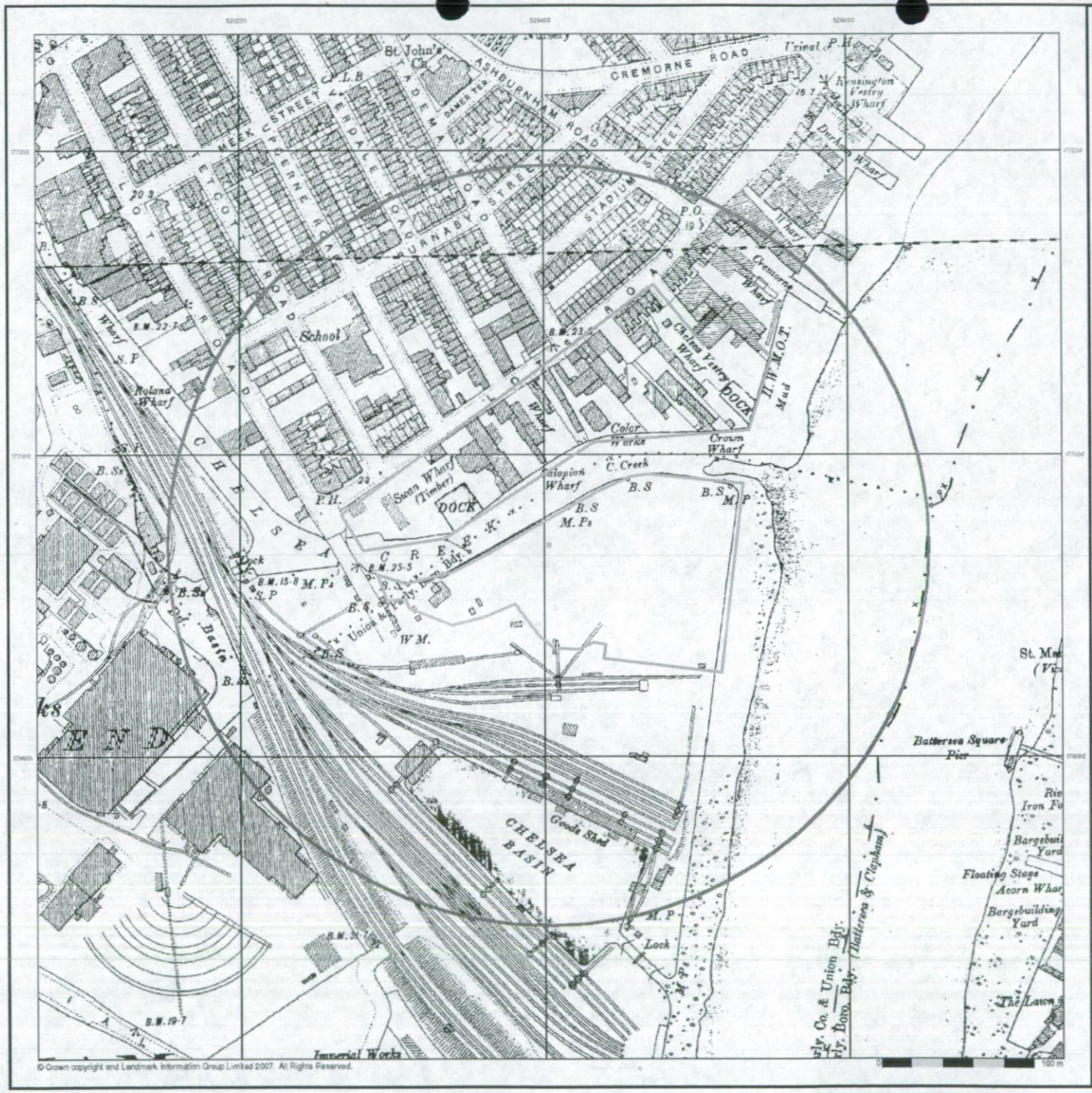
Site at 526400, 177000

LOTS ROAD
OS MAP 1869 – 1874

LANDMARK

123162-02

A Landmark Infor



Envirocheck®
A Landmark service

London

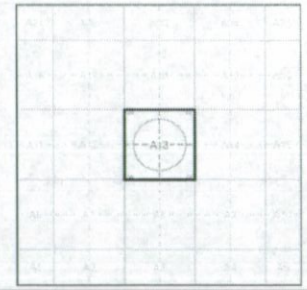
Published 1896

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

Historical Map - Segment A13



Order Details

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Customer Ref:	75744-41
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Search Buffer (m):	250

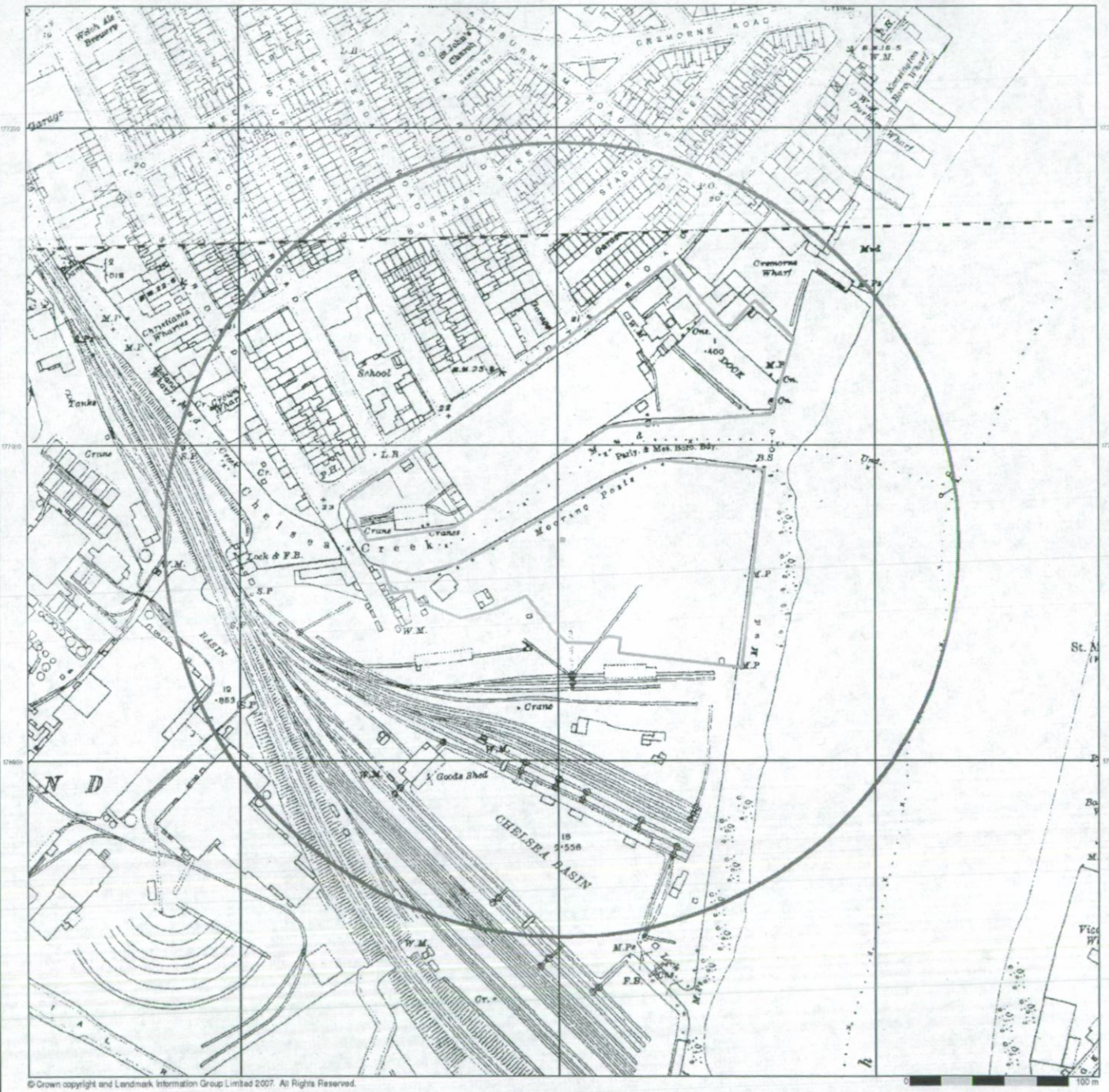
Site Details

Site at 526400, 176940

LOTS ROAD
OS MAP 1896

LAN 123162-02

A Landmark Inf



Envirocheck®
A Landmark service

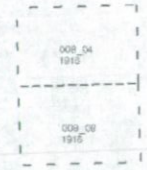
London

Published 1916

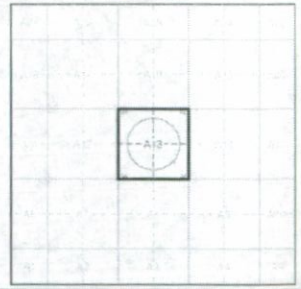
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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Customer Ref:	75744-41
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Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	250

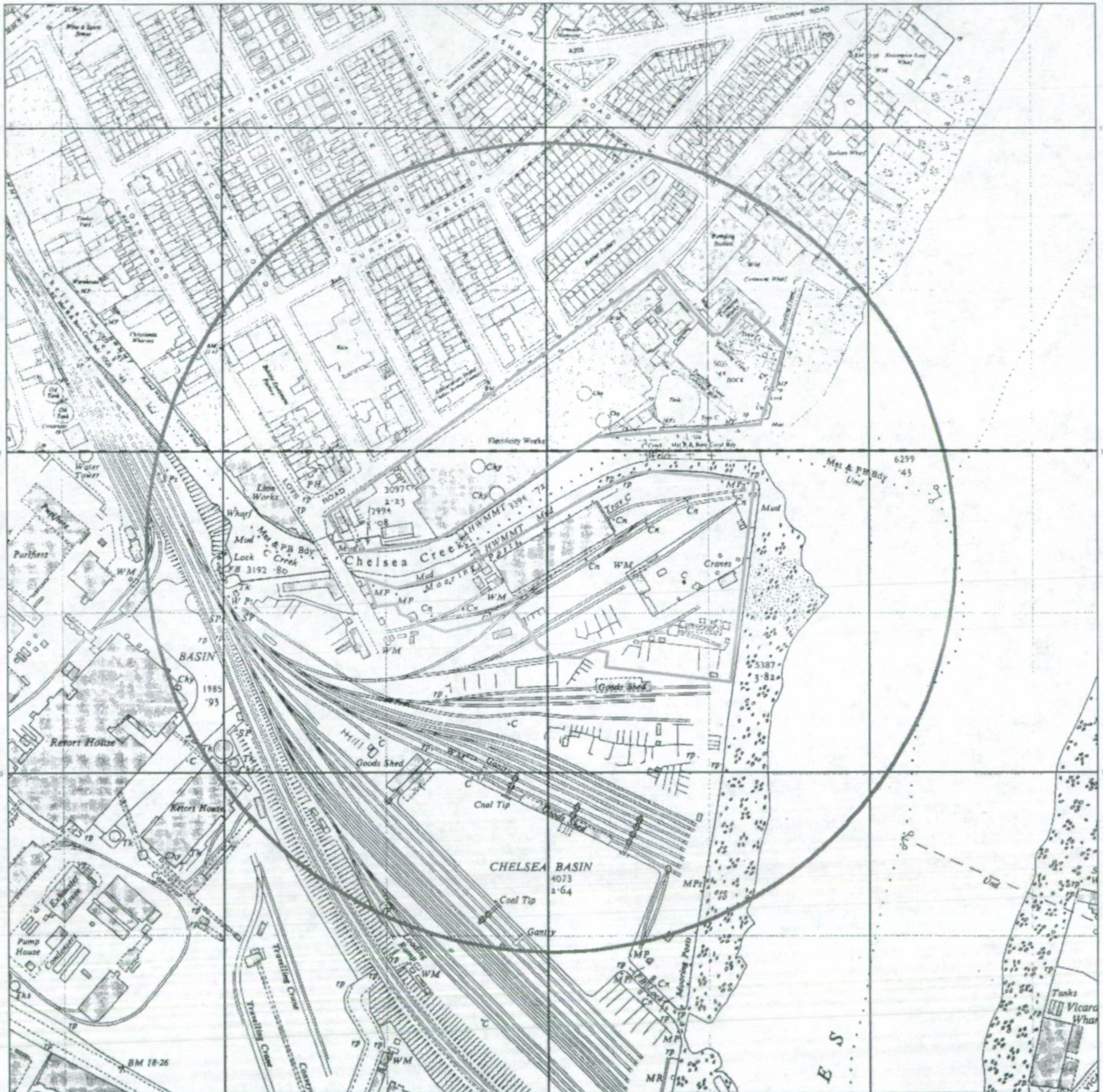
Site Details

Site at 526400, 177000

LOTS ROAD
OS MAP 1916

LA 123162-02

A Landmark



Envirocheck®

A Landmark service

Ordnance Survey Plan

Published 1951

Source map scale - 1:2,500

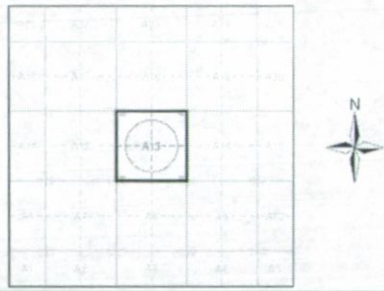
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TQ2677
1951

TQ2676
1951

Historical Map - Segment A13



Order Details

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Customer Ref:	75744-41
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Search Buffer (m):	250

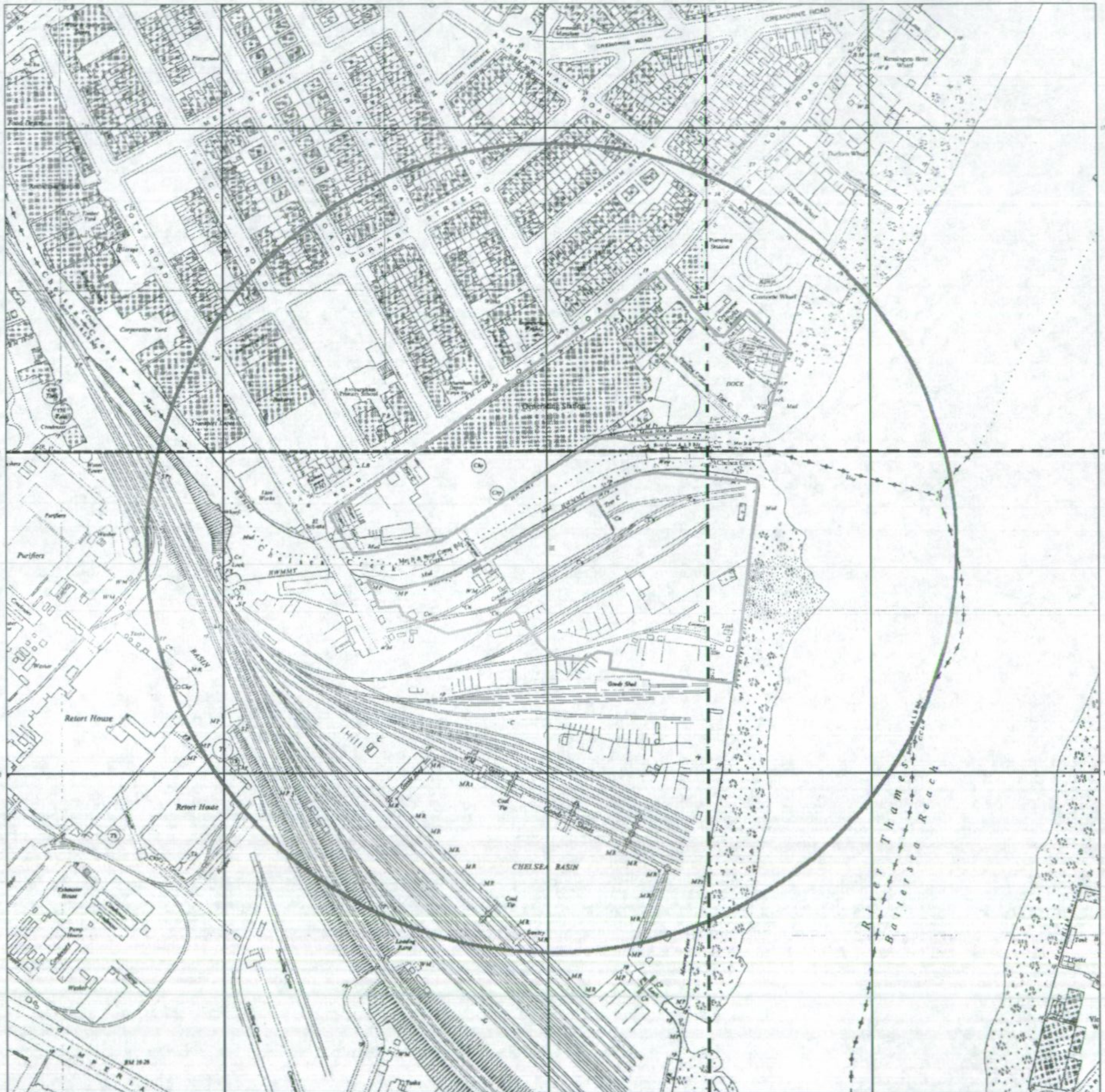
Site Details

Site at 526400, 177000

LOTS ROAD
OS MAP 1951

LA 123162-02

A Landmark



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A Landmark service

Ordnance Survey Plan

Published 1952 - 1968

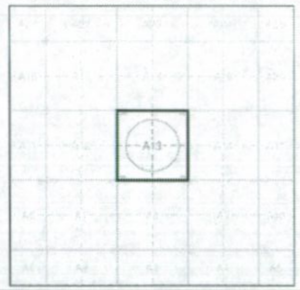
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TQ2577SW 1968	TQ2677SE 1958
TQ2676NW 1952	TQ2676NE 1957

Historical Map - Segment A13



Order Details

Order Number: 21435816_1_1
Customer Ref: 75744-41
National Grid Reference: 526400, 176940
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 250

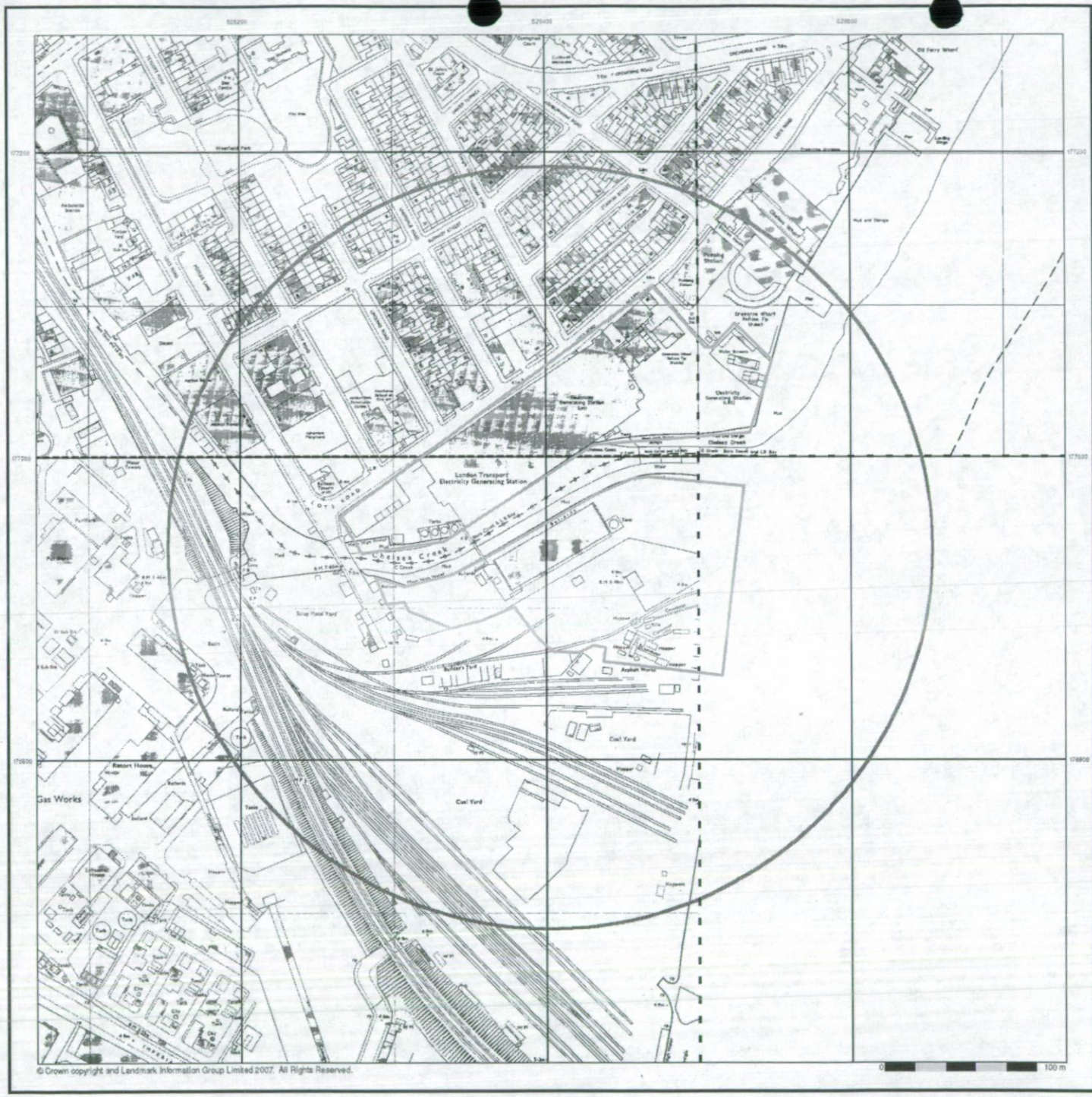
Site Details

Site at 526400, 177000

LOTS ROAD
OS MAP 1952 - 1968

123162-02

A Landma



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A Landmark service

Ordnance Survey Plan

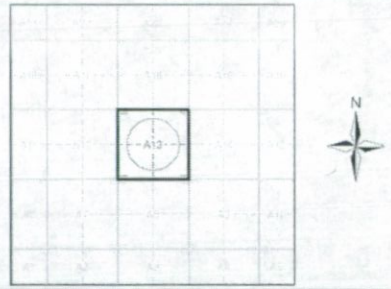
Published 1971 - 1990

Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

Historical Map - Segment A13



Order Details

Order Number:	21435816_1_1
Customer Ref:	75744-41
National Grid Reference:	526400, 176940
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	250

Site Details

Site at 526400, 177000

LOTS ROAD
OS MAP 1971 - 1990

LAND **123162-02**

A Landmark Inform

Envirocheck®
A Landmark service

Large-Scale National Grid Data

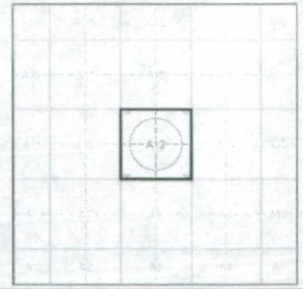
Published 1991

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

Historical Map - Segment A13



Order Details

Order Number:	21435816_1_1
Customer Ref:	75744-41
National Grid Reference:	526400, 176940
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	250

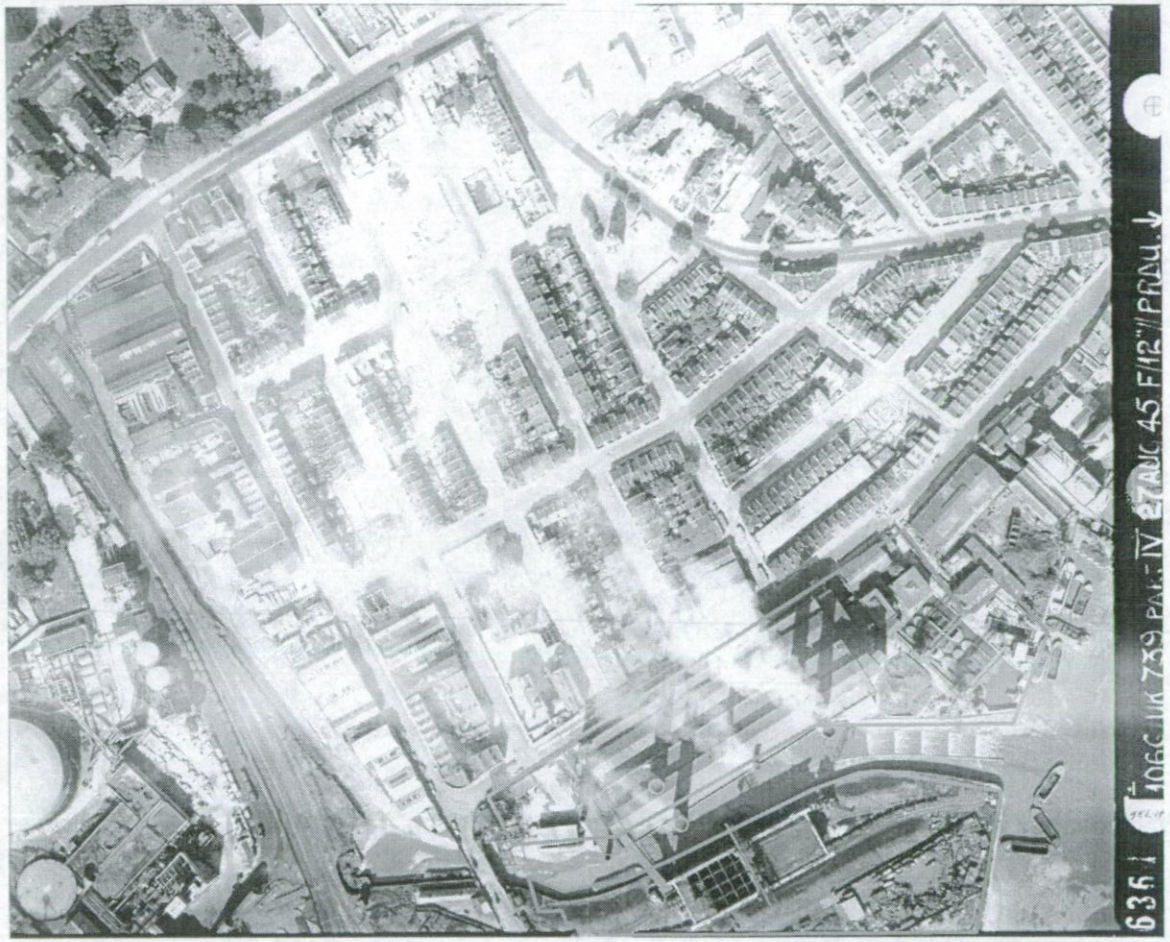
Site Details

Site at 526400, 177000

LOTS ROAD
LARGE SCALE NGD 1991

LA123162-02

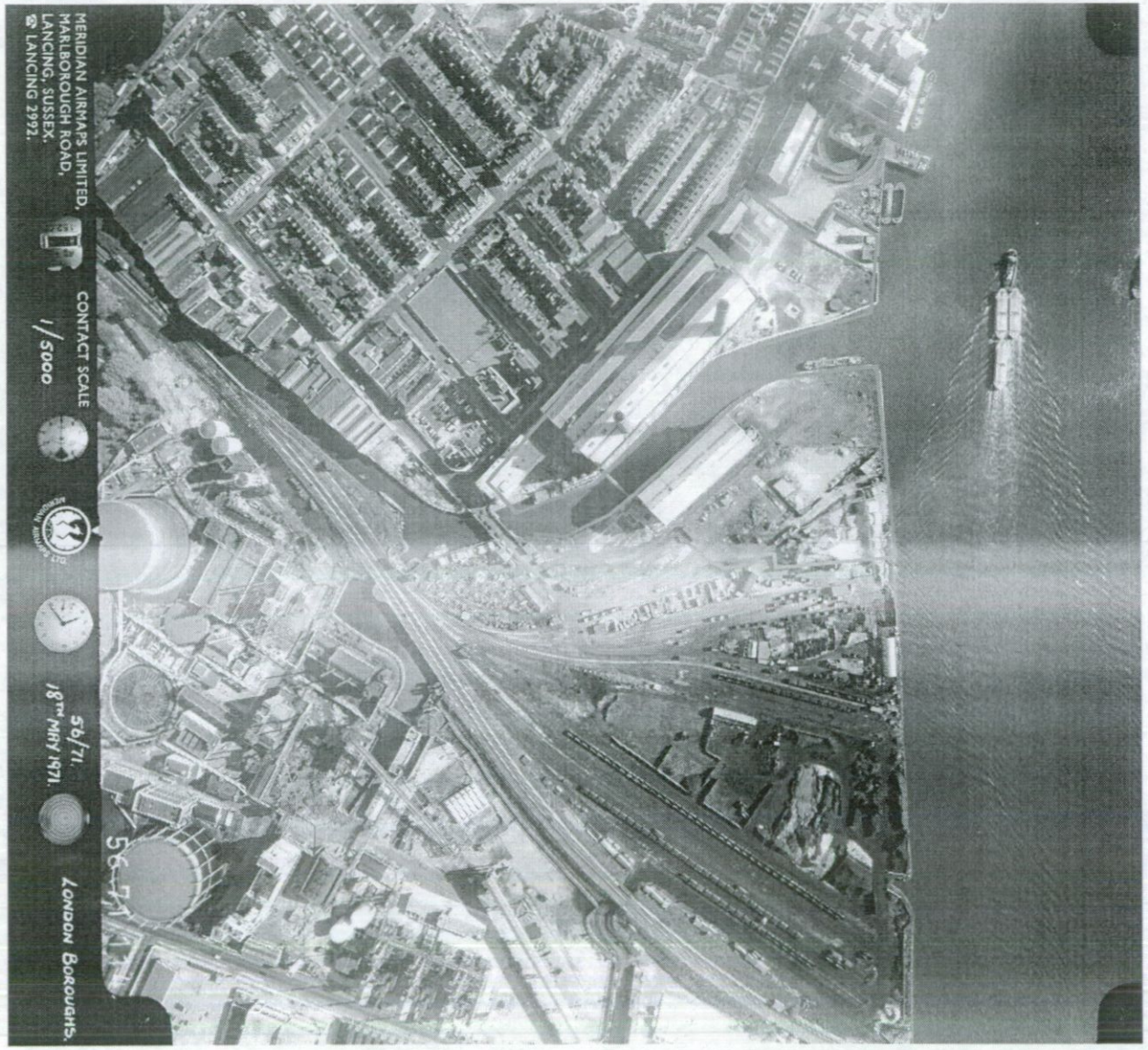
A Landmark



N

Sortie: RAF/106G/UK/739
Frame: 6364
Scale: 1:2500

LOTS ROAD
AERIAL PHOTO
27 AUG 1945



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Sortie: MAL/71056
Frame: 114
Scale: 1:5000

LOTS ROAD
AERIAL PHOTO
18th MAY 1971

Appendix B

Site Walkover

B1 Site Walkover

PROJECT: Lots Road	**PROJECT No**: 75744-41	
Auditor Name: James Assem	Date: 2nd May 2007	
Time on site: 8:50	Time off site: 13:45	Weather Conditions: Dry and sunny
Site Owner: Circadian Ltd.	Building Name or Ref: Lots Road Power Station	
Previous Owner: LUL	Contact Name:	
Site Tenant(s): Planned Maintenance Engineering Ltd (PME)	Contact Name: Mark Vigors (PME)	
Property Address:	Lots Road Power Station, Lots Road. Fulham London	
Access to Site:	Via intercom to reception/security.	
Current Site Use (description of operations):	Site is split into two, separated by Chelsea Creek, which also forms the boundary between LPA (Hammersmith and Fulham (LBHF) and Kensington and Chelsea (RBKC)) on the RBKC site is the decommissioned power station, occupied by security. At the western end is a bulk electricity station still used by EDF Energy and the former pump house. The LBHF site contains the oil storage facility, PRS (20%) and wasteland (80%).	
(Evidence of) Previous Use:	Buildings, boilers, turbines, etc. still present.	
Adjacent Site Uses and Description of Boundaries:	South of the site is the River Thames. To the west is the Chelsea Harbour development. On the eastern boundary is a waste transfer station North boundary is formed by Lots Road, with residential and School of Fine Art on the other side.	
Topography (slopes, vegetation, local subsidence):	RBKC site is all hardstanding and contains deep basements for pipework in the power station. LBHF site slopes down to the creek wall and PRS from Chelsea Harbour Drive. It is heavily vegetated around the oil storage facility and PRS and across the wasteland, although patches of less vegetation are present and coincide with the presence of builders waste. The ramp to the car park slopes down and has vegetated banks around it, fill material?	
Nearby Water Courses (including evidence of flooding):	Chelsea Creek runs through the site and is silting up with the weir submerged. Channel walls can be made out a low tide. The River Thames is present along the south boundary	
Description of Building: (including details of exterior condition, number of floors, heating and air conditioning systems):	Power station – steel frame with brick surround and concrete floors. Up to four levels, many split. Oil storage facility – corrugated iron roof and upper floor, with brick and concrete structure. Three storeys.	

PROJECT: Lots Road	**PROJECT No**: 75744-41
Auditor Name: James Assem	Date: 2nd May 2007
Services (buried cables, overhead cables and drainage, surface and foul):	Buried mains water, water inlet pipes and HV cables at western end servicing the Bulk Electricity Supply.
Description of Site Processes (including raw materials uses, wastes generated, storage areas etc):	Originally a coal-fired power station, converted to heavy fuel oil and then gas with light fuel oil back up. Storage of chemicals for water treatment and oils Wastes include ash from burning
Description of Waste Management Programme:	
ASTs (type, age, capacity, containment, alarm systems, leak testing results):	LBHF site - large AST adjacent to the oil store (south side) which is bunded (probably not 110%) but valves are un-bunded. RBKC site – between creek and power station at the east are four tanks (two upright gas?) and two horizontal). Within the power station are tanks for water treatment (hydrazine) tanks for sump water? Clean drain tanks (3) and cooling water tanks. Upright tank at the west end of the power station.
USTs (type, age, capacity, containment, alarm systems, leak testing results):	
PCBs (transformers):	The former pump house contains four transformers
Asbestos Materials (eg corrugated asbestos cement board roofing sheets etc):	Ubiquitous across the site as cladding (cement bound) – has been identified and marked. Is becoming fibrous in the oil storage facility.
Pesticides/Herbicides:	Empty biocide 5L drums in the car park
Air Pollution Control:	
Noise, Odours, Dust, Electromagnetic Radiation Sources:	Significant dust within the former boiler side of the power station and around the chimneys and within the lower levels. EM from the Bulk Electricity Supply
Visual Indications/Signs of Contamination:	LBHF site - the sump at the west end of the oil Storage facility has a sheen on it. Some bare vegetation patches are present.
POTENTIAL ISSUES:	The sump by the Oil Storage Facility Oil storage depot pipework still contains faint hydrocarbon odour Fill material used around car park Transformers

PROJECT: Lots Road	**PROJECT No**: 75744-41
Auditor Name: James Assem	Date: 2nd May 2007
Photographs:	IMG_0951.JPG – looking down in to sub-basement of power station at the pipework 952 – marked asbestos cladding 953 to 955 – pipework and sub-road level floors 957, 958 – transformers in the former pump house 959 – view looking west from the car park at power station 960, 971, 979 – ASTs between power station and creek 961, 962 - surface water abstraction screening point at east end of site 963, 967, 968 - AST by oil storage facility 964, 965 - sump at west end of oil storage facility 972, 973 – stressed vegetation patches 974 - looking east at car park 975 – Chelsea Creek view northwest 976 – Chelsea Creek view south 977, 980 – River Thames / Chelsea Creek confluence 978 – RBKC site looking southeast across car park 990, 991, 1004, 1003 – view looking west in the turbine hall 992, 994 – view of deep basement at the east end of the turbine hall with water ingress 995, 998 – water purification tanks 999 – cooling water tanks 1000 – clean water tank 1001 – oil remaining in pipework at the west end of the power station 1002 – AST at west end of the power station

INTEROFFICE MEMORANDUM

TO: GEORGINA SLADER

FROM: REBECCA BROWN

SUBJECT: LOTS ROAD – LAND CONTAMINATION

DATE: 15/02/2008

I have received further information from the consultants Arup following my comments in October and am satisfied with the responses received.

Once the site investigation work has been completed, Arup will provide us with the following documents:

- Generic quantitative risk assessment
- Detailed quantitative risk assessment
- A final remediation strategy and a
- Validation report.

As highlighted in my memo to you in October, please can you confirm that you are willing for the site investigation to proceed, as I believe that it will require some demolition work to occur?

Would you like me to email the consultants directly, or will you contact them?

Silver, Debrah: PC-Plan

From: Smith, Ashley: HHASC-EnvHlth
Sent: 22 June 2009 12:56
To: Silver, Debrah: PC-Plan
Subject: Lots Road Power Station
Attachments: Site Investigation comments_Jun09.doc

Hi Debrah,

I received a site report for the first phase of the ground investigation at the Lots Road Power Station development. I have attached my comments for your info. I will also send a letter detailing my comments, directly back to the consultants.

Many thanks

Kind regards

Ashley
Ashley Smith

Assistant Pollution Officer
Environmental Quality and Public Health
Royal Borough of Kensington and Chelsea
37 Pembroke Road
London
W8 6PW

Tel: 020 7341 5271
Fax: 020 7341 5645

Housing Health and Adult Social Care
Pembroke Road Council Offices, 37 Pembroke Road, Kensington, LONDON, W8 6PW

Executive Director - Housing, Health and Adult Care Services
Ms Jean Daintith

Director of Environmental Health
Mr Paul Morse MSc MCIEH

THE ROYAL BOROUGH OF
KENSINGTON
AND CHELSEA

Housing Health and Adult Social Care - Environmental Health Internal Memorandum

To:	Debrah Silver	**Room No:**	Planning South
From:	Ashley Smith	**Room No:**	
Direct Line:	020 7341 5271	**Fax:**	020 7341 5645
Email:	ashley.smith@rbkc.gov.uk		
Date:	22nd June 2009	**Ref:**	
Subject:	Lots Road Power Station – Phase 1 Investigation		

The following document has been submitted pursuant to Condition 27 for the above development site:

'Generic Quantitative Risk Assessment', Ove Arup and Partners Ltd, 13 October 2008, CL006_LR_v01.

We have the following comments:

Extent of the Investigation
The risk assessment includes site investigation results from previous ground investigations from 1995-2004 as well as the investigation undertaken between April and July 2008. We are satisfied with the extent of the 2008 investigation, covering mainly the east yard and foreshore areas of Chelsea Creek. The next phases of the site investigation will investigate the ground conditions within the power station building and the smaller yard to the west. As the risk assessment combines all previous investigations the results come from a fairly dense spread of exploratory locations which will enable informed decisions to be made about any remediation.

Results
The report divided the site up into three areas: the commercial zone, the landscape zone and the foreshore zone. All three zones had contamination mainly within the made ground. Asbestos was identified in all three zones at varying depths. The landscape zone in particular contained high concentrations of Arsenic and these were concluded to be associated with the ash pit. The results showed elevated levels of hydrocarbons in the foreshore zone which corresponded with the observations of black staining and hydrocarbon odours within the made ground and alluvium.

The results from the groundwater testing showed that both the perched water and river terrace deposits were contaminated with metals, ammoniacal nitrogen and hydrocarbons. The 2008 testing suggested that the river terrace deposits had recovered since the closure

of the power station and showed no elevated levels of contaminants. Leachate analysis showed exceedences of the screening values mainly in the ash pit and in-filled dock area. Gas monitoring did not measure any elevated levels of ground gas. When considering all the gas monitoring undertaken the report states that a very low hazard potential is assigned to the site.

Risk assessment

The risk assessment considered the construction and operational phase of the development and looked at the pollutant linkages within each zone. The sampling results were compared against CLEA guidelines and other appropriate guidelines where these were not available. All the pollution linkages were identified for the construction phase and appropriate mitigation proposed. With regards to the asbestos identified on site, specialist contractors are due to be employed to excavate these areas.

Commercial zone - We are satisfied that most of the contamination within the commercial zone will be removed as part of the basement excavation and that the risk from perched water vapours will be very low after the development is completed.

Landscape zone - The pollutant linkage within the landscape zone between the contamination in the made ground and the future users of the site will have to be mitigated. The current suggested mitigation for this is to excavate the landscaped area and install 1m of clean material to break any pathway. Full justification of this remediation proposal should be included within the remediation strategy. The presence of hydrocarbons, the location and mobility of the water table and any undulation of the surface within the landscaped area should be taken into account when choosing the appropriate cover system.

Controlled waters - We agree that the pollutant linkage between the contamination in the foreshore sediments and Chelsea Creek and the River Thames needs to be investigated further. We would be grateful if the timescales for the next 2 phases of the investigation could be clarified to us.

Leachate – We are satisfied that the pollutant linkage between the leachable contamination in the made ground and the gravels and Chelsea Creek will be broken by the excavation of the ash pit and basement and therefore the removal of the source. We are happy that the installation of hardstanding over most of the site will inhibit leachate generation.

Chimney Material - With regards to the re-use of the chimney material as a piling mat, we will require further information as to the location where this is likely to be used and also the results of leachate testing on this material. High levels of various contaminants were identified within the chimney material and therefore it is important that the level of leachable contamination is identified prior to its use on site.

Groundwater Quality - We are pleased to see that the water quality within the gravels will be monitored throughout the development. These results should be provided to us throughout the development and any deterioration that occurs should be investigated.

Perched groundwater - The report states that not all the perched water will be removed as part of the basement excavation, particularly the perched water within the made ground in the in-filled dock area. The remediation strategy should detail the piling and foundation design that will mitigate against the potential pathway to the river terrace deposits and the chalk aquifer. This should include the depth and location of the piles and the secant piled wall, please note that the preferred method for piling within contaminated ground is the continuous flight auger (CFA) method.

River terrace deposits – The report states that the quality of the river terrace deposits will be monitored during and post development. The remediation strategy should take into account the potential action required should the levels of ammoniacal nitrogen not be reduced after the development is complete.

Ground gas – We are pleased to see that further ground gas monitoring will be undertaken as part of Phase 2 and 3. Please can it be confirmed if further monitoring will be undertaken from boreholes BHN309 and BHN306B as well as different locations on the west of the site. The remediation strategy must include further details about the basement design and how it will mitigate against ground gas ingress.

Waste classification
The report confirmed that some material (mainly from the ash pit, foreshore sediments, landscaped area and in-filled dock) will need to be disposed of at a hazardous waste landfill site due the presence of asbestos. We are satisfied with the proposal to segregate waste on site in order to reduce the quantity of hazardous waste. Copies of a selection of the waste consignment notes and WAC results should be submitted as part of the validation report to prove that the waste was disposed of appropriately.

Conclusions and recommendations
The report concluded that the risks posed after the completion of the development provided that the proposed remedial measures are implemented, will be low-very low. We are satisfied with the measures proposed in the outline remediation strategy and are pleased to see that a watching brief will be maintained throughout the development process.

The report states that any unexpected tanks found during excavation will be fully decommissioned by a specialist contractor. We would like to be informed at the time, if a tank is excavated, however full details of any tank decommissioning can be submitted as part of the validation report.

Validation report
We are satisfied with proposed contents list for the validation report outlined in Section 9.11.

Further Information and meetings
It would be useful to have progress meetings to discuss the findings of the investigation phases and to enable us to keep track of the development. We would like further information on Phases 2 and 3, in particular the timescales and further details as to what they will include.

If you wish to discuss my comments in more detail please contact me on the details above.