



Homes
England

Date: 1 December 2022

Our Ref: RFI4133

Tel: 0300 1234 500

Email: infogov@homesengland.gov.uk

Making homes happen

██████████
By Email Only

Information Governance Team
Homes England
Windsor House – 6th Floor
50 Victoria Street
London
SW1H 0TL

Dear ██████████

RE: Request for Information – RFI4133

Thank you for your request for information which was processed in accordance with the Environmental Information Regulations 2004 (EIR).

You requested the following information:

Homes England FOI ref: RFI2659

"2..... No radiation remediation was undertaken in these plots as it was not required as provided in the surveys. ..."

Dear FOI,

Further to my above FOI regarding Daedalus, Hampshire and Homes England's reply.

As a point of clarification of Homes England's reply, please supply the full details of the 'surveys' referred to in Homes England's FOI reply point 2. (as copied above).

Response

We can confirm that we do hold the requested information. Please find enclosed the following Annexes:

Annex A – HMS Daedalus Walkover Gamma Survey

Annex B – Radiation Walkover Survey Report

However, we rely on Regulation 13(1) of the EIR 2004 to withhold some of the information from disclosure.

Regulation 13 – Personal Data

We have redacted information on the grounds that it constitutes third party personal data and therefore engages Regulation 13 of the EIR.

To disclose personal data, such as names, contact details, addresses, email addresses and personal opinions could lead to the identification of third parties and would breach one or more of the data protection principles.

OFFICIAL



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Tel: 0300 1234 500

Email: infogov@homesengland.gov.uk

Regulation 13 is an absolute exception which means that we do not need to consider the public interest in disclosure. Once it is established that the information is personal data of a third party and release would breach one or more of the data protection principles, then the exception is engaged.

The full text in the legislation can be found on the following link;
<http://www.legislation.gov.uk/ukxi/2004/3391/regulation/13/made>

Right to Appeal

If you are not happy with the information that has been provided or the way in which your request has been handled, you may request an internal review. You can request an internal review by writing to Homes England via the details below, quoting the reference number at the top of this letter.

Email: infogov@homesengland.gov.uk

The Information Governance Team
Homes England – 6th Floor
Windsor House
50 Victoria Street
London
SW1H 0TL

Your request for review must be made in writing, explain why you wish to appeal, and be received within 40 working days of the date of this response. Failure to meet this criteria may lead to your request being refused.

Upon receipt, your request for review will be passed to an independent party not involved in your original request. We aim to issue a response within 20 working days.

You may also complain to the Information Commissioner's Office (ICO) however, the Information Commissioner does usually expect the internal review procedure to be exhausted in the first instance.

The Information Commissioner's details can be found via the following link:

<https://ico.org.uk/>

Please note that the contents of your request and this response are also subject to the Freedom of Information Act 2000. Homes England may be required to disclose your request and our response accordingly.

Yours sincerely,

The Information Governance Team
For Homes England



Wates Residential

HMS Daedalus

Walkover Gamma Survey

Project no. 810200

NOVEMBER 2018





RSK GENERAL NOTES

Project No.: 810200 (00)

Title: Gamma Walkover Survey: HMS Daedalus

Client: Wates Residential

Date: November 2018

Office: RSK, 172 Chester Road, Helsby, WA6 0AR

Status: Final

Author	<u>Reg 13(1)</u>	Technical reviewer	<u>Reg 13(1)</u>
	<u>Reg 13(1)</u>		<u>Reg 13(1)</u>
Signature		Signature	
Date:	<u>November 2018</u>	Date:	<u>November 2018</u>
Project manager	<u>Reg 13(1)</u>	Quality reviewer	<u>Reg 13(1)</u>
	<u>Reg 13(1)</u>		<u>Reg 13(1)</u>
Signature		Signature	
Date:	<u>November 2018</u>	Date:	<u>November 2018</u>

RSK Radiological Limited (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.



CONTENTS

1	INTRODUCTION	1
1.1	Commissioning	1
1.2	Objectives	1
1.3	Scope of works	1
1.4	Existing reports	2
1.5	Limitations.....	2
2	SITE DETAILS	3
2.1	Site location	3
2.2	Site description	3
2.3	Site history	3
3	METHODOLOGY	4
3.1	Survey equipment.....	4
3.2	Survey methodology	4
3.3	Radiological controls.....	4
4	RESULTS	6
4.1	Data analysis	6
4.1.1	05/11/2018 Gamma data analysis	6
4.1.2	06/11/2018 Gamma data analysis	6
4.2	Data review	6
5	CONCLUSIONS AND RECOMMENDATIONS.....	8
5.1	Conclusions	8
5.2	Recommendations.....	8

FIGURES

Figure 1	Site location plan
Figure 2	Site constraints plan
Figure 3	Eastern site survey area
Figure 4	Western site survey area
Figure 5	Eastern site gamma heat map
Figure 6	Western site gamma heat map

APPENDICES

Appendix A	Service constraints
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1 INTRODUCTION

1.1 Commissioning

RSK Radiological Ltd (RSK) was commissioned by Wates Residential to carry out a walkover gamma survey of their Eastern parcel of land at HMS Daedalus (Figure 1). No intrusive works were requested. The survey was also to include a subsection of the client's Western parcel of land that was not covered during a previous walkover exercise. The project was carried out to an agreed brief as set out in RSK's proposal (Ref. T810200_L01 (00), dated 26 October 2018).

This report is subject to the RSK service constraints given in Appendix A and limitations that may be described through this document.

1.2 Objectives

The objective of the work is:

- to identify any potential radiological contamination that may be present at the surface or near-surface
- to provide assurance, which the client can communicate to the EHO that the site is absent of radiological risk or, if radiological contamination is present, that further investigation is warranted.

1.3 Scope of works

The scope of this assessment includes:

Pre-survey planning

- producing suitable monitoring protocols
- producing a robust methodology
- producing a site specific H&S plan and risk assessment.

Site survey

- completing a walkover survey of the whole Eastern parcel of land
- completing a walkover survey of a subsection of the Western parcel of land.

Interpretation and reporting

- site description including details of the surveyed areas
- site survey constraints
- statistical analysis of data to identify radiological areas of interest
- data review with conclusions to be communicated by the client to the EHO.



1.4 Existing reports

The following report detailing previous works at the site was made available for review:

- Aurora Health Physics Services Ltd, Radiation Walkover Survey At Daedalus, AHP/CMB/REP/17/01, 19 April 2017.

1.5 Limitations

In the Eastern site there are several points marked and photographed in Figure 2 that were not covered by the walkover, due to the ground being inaccessible or an object covering the surface.

The area that required surveying on the Western site did not have obvious indications of the boundary, consequently a larger area than required was surveyed to ensure all necessary ground was covered.

2 SITE DETAILS

2.1 Site location

Site location details are presented in in Table 1 and a location plan is displayed in Figure 1.

Table 1: Site location details

Site name	HMS Daedalus
Full site address and postcode	Daedalus Airfield, Lee-on-the-Solent, PO13 9YA
National Grid reference (centre of site)	Lat: 50.808771 Lon: -1.2023574

2.2 Site description

The survey was conducted on the Eastern parcel of land that is being developed by Wates Residential, with an area of approximately 2.61 ha (Figure 3). Additionally, a subsection of the Western parcel of land, which was not surveyed under previous contracts, was included in this survey exercise (Figure 4). Most of the Eastern parcel consisted of made ground typically containing soil mixed with variable sized fragments of brick, metal, glass, etc. Many areas featured a mixture of vegetation. Some survey areas consisted of concrete slabs, pathways and tarmac. Whilst existing buildings on site prevented survey work at those specific locations as they were not accessed, the survey did cover the immediate accessible area around the buildings.

The area surveyed from the Western parcel consisted of only made ground and did not contain the large pieces of brick, metal and glass found in the Eastern site.

2.3 Site history

Historically, this site operated as a Royal Navy Air Service base first being established in 1917 as a seaplane base during the First World War. In 1918 it became an RAF station, continuing its training purposes before being transferred to the Royal Navy in 1930s. Post Royal Navy use (1996 – 2014) several non-military organisations have made of the site.

Due to previous landfill practices at RAF bases during the ascribed time period, which included the burial of radium luminised articles, such as radium dials, there is a potential presence of Radium-226 (Ra-226) contamination in the local area.



3 METHODOLOGY

3.1 Survey equipment

The equipment selected for the survey was the handheld Georadis RT-30 SUPER IDENT monitor. The monitor uses a NaI detector providing the functions of radionuclide identification, gross gamma detection and dose rate. The data is constantly recorded and mapped as the surveyor traverses the site area using an external GPS datalogger connected to the monitor. Any areas of interest that indicate an elevated activity above the established background activity is highlighted and targeted measurements are taken in the field, to identify the specific radionuclide(s) present.

3.2 Survey methodology

The aim was for full coverage of the site by walkover gamma survey. This method will detect gamma emissions at or close to the ground surface at concentrations less than the current EPR 2016 (Amendment 2 of 2018) 1 Bq/g out of scope concentration for waste arising from remediation of historical Radium ground contamination. Contamination deeper below ground level will be detectable but only if concentrations are greater than this. The deeper in the ground that contamination occurs, the greater the activity concentration needs to be for some of the gamma emissions to reach the surface and be detected.

The walkover survey uses the following methodology:

1. walk multiple linear transects across the survey area at approximately 1m/s with the instrument at a pre-determined optimum height above the ground. The spacing of the transects was maintained at no greater than 1m, and high visibility waypoints were used to maintain this spacing.
2. the detector automatically records the required radiological data at 1 second intervals (i.e. dose rate and gross gamma count rate), and the GPS position at 30 second intervals.

The survey conducted across the site is intended to confirm the presence and extent of any potential radiological contamination detectable at ground level. The method detects the level of gamma radiation present (i.e. the gross gamma measurements) and defines where the spatial bounds of any contamination is, and the magnitude of each identified area.

3.3 Radiological controls

This work was performed in accordance with project specific Radiological Monitoring Protocol, 810200 – Daedalus, Lee-on-the-Solent Walkover Survey Radiological Monitoring Protocol. Table 1 displays the hold points used during the survey, in case radiological contamination was detected. The survey approach for personal radiological safety was one of a reassurance exercise, and hold points were set accordingly.



Table 2 – Radiological hold points

Hold Point - lower	Hold Point - upper
> 0.3 $\mu\text{Sv/h}$ (γ) contact dose rate (i.e. contact with the ground or with an artefact)	> 0.3 $\mu\text{Sv/h}$ (γ) ambient dose rate (i.e. at waist height); or > 0.5 $\mu\text{Sv/h}$ (γ) contact dose rate
Action	Action
<ul style="list-style-type: none"> Continue work but avoid prolonged contact with the item or area Report to the RPA at earliest convenience during the shift 	<ul style="list-style-type: none"> Record the levels and extent of area affected Suspend work and notify the RPA immediately RPA to provide advice on course of action and review of risk assessment

4 RESULTS

4.1 Data analysis

During the survey no positive responses were identified that were directly attributable to the ground. Some positive responses were detected but were linked to building materials. To confirm there were no other areas which may be of interest requiring more detailed survey work, statistical analysis of the recorded data was performed. This exercise would identify very slight positive responses which may not be readily noticeable during the field work. In this context, slight positive responses would be those considered to be outside of the normal probability distribution of the data, and could be indicative of contamination deeper in the ground.

4.1.1 05/11/2018 Gamma data analysis

The 95% confidence level has been determined based on the expected standard deviation and the observed standard deviation for the data. There are a number of results outside the 95% confidence level, but no more than would be expected. These data points have been inspected by desktop exercise and the following conclusions drawn:

- there were approximately 20 data points in the upper 5%
- there is no pattern to the upper 5 percentile data points occurring
- each individual data point in the upper 5 percentile is commensurate with credible background levels.

4.1.2 06/11/2018 Gamma data analysis

There are a number of results outside the 95% confidence level, more than would be expected. The threshold cps value to be considered a positive response (outlined in the radiological protocol document) was 100 above background. The background recorded for the Eastern site ranged 88 – 142 cps, so a conservative threshold value of 188 was drawn. These data points have been inspected by desktop exercise and the following conclusions drawn:

- there are approximately 100 data points in the upper 5%
- these occur in areas of the Eastern site where existing buildings are present
- the upper 5% results up to the maximum observed of 208 cps are typical of certain types of brickwork commonly encountered on sites. All Targeted Gamma Measurements confirmed the presence of natural Thorium and Potassium-40, both of which are expected natural inclusions in building materials.

4.2 Data review

The gross gamma results suggest that there is some structure on the ground, due to being more variable than would be expected if all survey areas were soil/earth. This fits with the site description in subsection 2.2. The ambient background radiation levels across the both sites were found to be typical of the UK and did not indicate any elevated readings



due to enhanced naturally occurring radioactive inclusions in the ground. Gamma spectrometry was undertaken in the field with the hand-held device. The only identified radionuclides were Potassium-40 (K-40) and Thorium-232 (Th-232), which were found in the ground and building materials. Elevated levels of these radionuclides were also present within the bricks of existing buildings on the Eastern site. All the positive responses identified during the survey are attributed to the enhanced natural radionuclide inclusions within the brickwork of the above ground building structures.

The variability in the gross gamma data show that the results are commensurate with that expected from construction materials and earth. Furthermore, there is no evidence that the identified radionuclides are anything other than natural and are within levels which would expect to be encountered as natural background radiation. No Ra-226 or any other artificial gamma-emitting radionuclides were detected throughout the survey.

The results of the walkover survey can be seen in Figures 5 and 6 for the Eastern site and the Western site respectively.



5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

There was no Ra-226 or any other artificial gamma-emitting radionuclide detected in the surveyed area. The only identified radionuclides were naturally occurring K-40 and Th-232, found in earth and building materials. Numerous positive responses were detected, but these were found to originate from naturally occurring inclusions in the building materials, particularly brickwork, which are not subject to radioactive substances regulation and do not pose a radiological hazard.

5.2 Recommendations

No area of the site is considered to warrant further radiological investigation.



FIGURES



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Client	WATES RESIDENTIAL
Project Title	DAEDALUS GAMMA SURVEY
Drawing Title	SITE LOCATION PLAN

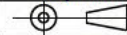
Drawn AP	Date 12.11.18	Checked LC	Date 12.11.18	Approved LC	Date 12.11.18	Project No. 810200	Drawing File 810200-L01(00)D001A
Scale 1:50000	Orig Size A4	Dimensions —	Drawing No. FIGURE 1			Rev. A	



LEGEND:

 Site survey boundary



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	14.11.18	FIRST ISSUE	HD	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	



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CLIENT
WATES RESIDENTIAL

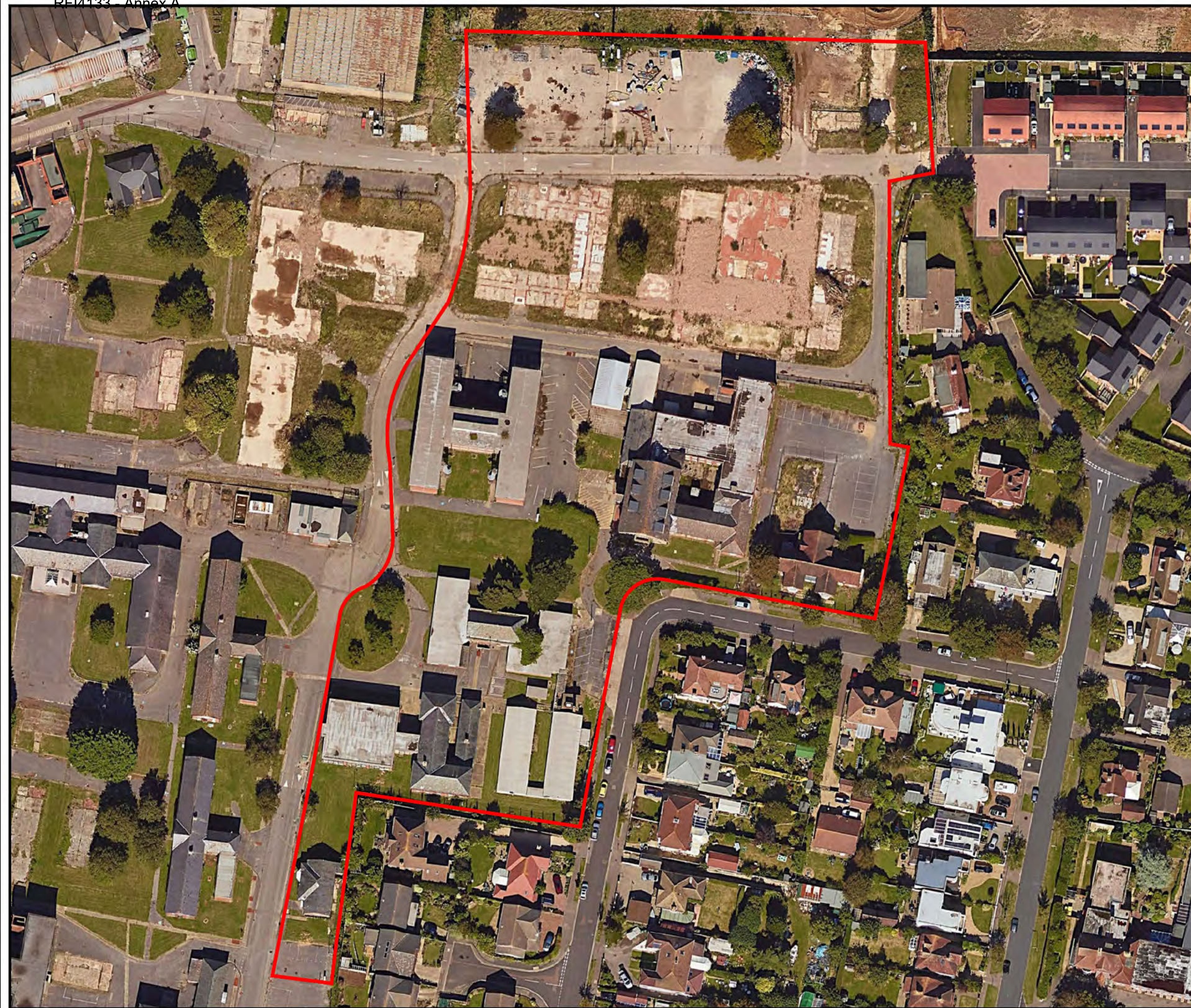
PROJECT
DAEDALUS GAMMA SURVEY

TITLE
SITE CONSTRAINTS PLAN


JOB No.: 810200 DRAWING FILE: 810200-L01(00)D002A

BY:	DATE:	CONTRACT NO.	REV:
HD	14.11.18		A

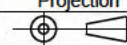
FIGURE 2



LEGEND:

 Site survey boundary



REV.	A	12.11.18	FIRST ISSUE	AP	LC	LC
			DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection		Scale		Orig Size
m				NTS		A3



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CLIENT	WATES RESIDENTIAL				
PROJECT	DAEDALUS GAMMA SURVEY				
TITLE	EASTERN SITE SURVEY AREA				
JOB No.:	810200		DRAWING FILE:	810200-L01(00)D003A	
BY:	DATE:	CONTRACT NO.	FIGURE 3	REV:	A
AP	12.11.18				



LEGEND:

— Site survey boundary



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	12.11.18	FIRST ISSUE	AP	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	

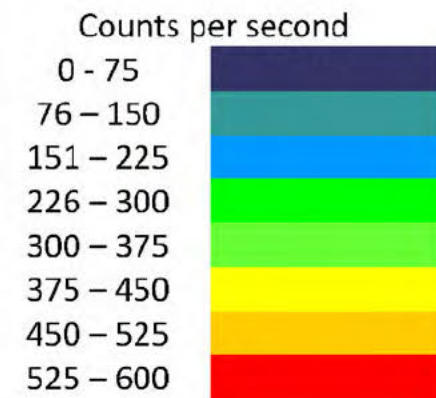


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CLIENT	WATES RESIDENTIAL				
PROJECT	DAEDALUS GAMMA SURVEY				
TITLE	WESTERN SITE SURVEY AREA				
JOB No.:	810200		DRAWING FILE:	810200-L01(00)D004A	
BY:	DATE:	CONTRACT NO.:	FIGURE 4	REV:	A
AP	12.11.18				



LEGEND:



REV.	DATE	DESCRIPTION	BY	CHKD.	APR.
A	14.11.18	FIRST ISSUE	HD	LC	LC
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	



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CLIENT
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PROJECT
DAEDALUS GAMMA SURVEY

TITLE
EASTERN SITE GAMMA HEAT MAP

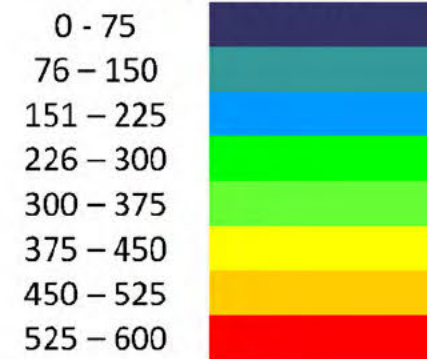
JOB No.:	DRAWING FILE:
810200	810200-L01(00)D005A

BY:	DATE:	CONTRACT NO.:	FIGURE 5	REV:
HD	14.11.18			A



LEGEND:

Counts per second



REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	14.11.18	FIRST ISSUE	HD	LC	LC

Dimensions	Projection	Scale	Orig Size
m		NTS	A3



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CLIENT
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PROJECT
DAEDALUS GAMMA SURVEY

TITLE
WESTERN SITE GAMMA HEAT MAP

JOB No.: 810200
DRAWING FILE: 810200-L01(00)D006A

BY:	DATE:	CONTRACT NO.	FIGURE 6	REV:
HD	14.11.18		FIGURE 6	A



APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Wates Residential (the "client") in accordance with the terms of a contract [RSK Group Standard Terms and Conditions] between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. the Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely
 - b. the Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection
 - c. the Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.



8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on-site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on-site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

RADIATION WALKOVER SURVEY AT DAEDALUS

19 APRIL 2017

COMMERCIAL IN CONFIDENCE



Aurora Health Physics Services Ltd, 3 The Terrace,
Library Avenue, Harwell Oxford, Oxfordshire OX11 0SG.

Report Title:	Radiation walkover survey at Daedalus
Customer Contact:	Reg 13(1) Campbell Reith
Customer Address:	Raven House, 29 Linkfield Lane, Redhill, Surrey RH1 1SS
Telephone:	01737 784 500
Date:	09/05/17
Reference:	AHP/CMB/REP/17/01
Please Contact:	Reg 13(1)
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Issue	Date	Comments
Issue 01	09/05/17	

	Name	Position	Date	Signature
Author:	Reg	RPA	09/05/17	Reg 13(1)
Reviewer:	Reg	RPA	10/05/2017	Reg 13(1)

Contents

1	Introduction.....	4
2	Health, Safety & Security.....	4
3	Radiological Survey.....	4
3.1	Ground Survey.....	5
3.1.1	RadSurvey Detector and Ratemeter.....	5
3.1.2	RadSurvey Methodology.....	6
3.1.3	Background Readings.....	6
3.1.4	RadSurvey Results.....	6
4	Conclusions & Recommendations.....	10
5	References.....	10

1 Introduction

Aurora Health Physics Services Limited (Aurora) was commissioned by Campbell Reith to carry out a gamma radiation walkover survey of an area of land on the site of the former MoD establishment HMS Daedalus, Lee on Solent Hampshire. The survey was carried out on the 19th and 20th April 2017.

Radioactive contamination has previously been identified on the site (ref. 1) from the use of radium luminised materials and these may still be present.

2 Health, Safety & Security

Copies of the following Aurora documents were submitted to Campbell Reith prior to commencing work:

- Aurora Survey Risk Assessment & Method Statement – AHP/RPA/RAMS/CMB/17/01

3 Radiological Survey

All instruments used during the work are listed in Table 1 below.

Table 1. Instruments Used for Survey.

Instrument	Used for monitoring	Aurora Asset Number	Calibration Date	Background reading on site
RadSurvey 3" NaI GPS system	Ground gamma contamination	AHP0203/204	8 th Feb 2017	150 – 250 counts per second (cps)
Exploranium GR135 NaI probe	Ground gamma contamination	AHP0052	7 th Feb 2017	80 – 100 cps
Mini 1000	Gamma dose rate	AHP0191	2 nd Aug 2016	0.1 µSv/hr
Electra ratemeter BP19 probe	Surface beta contamination	AHP0224	27 ^h Mar 2017	20 cps
Electra ratemeter DP6 probe	Surface alpha and beta contamination	AHP0273	24 ^h Mar 2017	alpha 0.5 cps beta 12 cps

3.1 Ground Survey

The survey was undertaken using Aurora's 'RadSurvey' System (RadSurvey), as shown in Figure 1 below. The RadSurvey instrument consists of a sensitive gamma radiation detection system linked to a Global Positioning System (GPS) enabling accurate gamma radiation contour mapping of the site. The data collected during the survey is used to accurately demonstrate and validate the radiological status of the identified areas.

The survey system is configured using real time differentially corrected GPS to provide continual spatial reference information allowing the survey unit to be operated at sub-metre accuracy. Radiation and positional information is displayed and collected autonomously in the data logger.



Figure 1. Aurora's RadSurvey system in use.

3.1.1 RadSurvey Detector and Ratemeter

The survey unit is configured with a 75 mm by 75 mm high-sensitivity sodium iodide detector mounted in a protective case carried at a height of approximately 0.2 m above ground level.

The detector is connected to a multi-channel analyser (MCA) which is configured to provide gross gamma counts per second, every second, to the data logger. The RadSurvey system is capable of detecting material of regulatory interest to a depth of approximately 0.3 m in soil. Therefore, at soil

depths significantly greater than 0.3 m, or where the surface covering is not soil, i.e. concrete or tarmac, it is possible that radioactive contamination may not be identified.

3.1.2 RadSurvey Methodology

The survey methodology involved traversing the site in nominal 1 m wide lanes using the survey equipment. Data was accumulated at the rate of one reading per second and recorded in the data logger, resulting in one radiation reading per 1 m² of the accessible areas of the site. Global Positioning System (GPS) information is automatically linked to the radiological data for ease of interpretation.

In areas of the site where the ground is populated with trees or shrubs, GPS coverage is not always 100 percent and gaps in the displayed data are possible. Where this occurs, detector data is still collected and reviewed to check if any high-count rates are observed in any areas that aren't covered by the GPS.

3.1.3 Background Readings

Typical background readings for the RadSurvey detector varied from 100 counts per second (cps) to 300 cps. All organic materials contain some level of radioactivity. Naturally occurring radionuclides include the uranium (²³⁸U and ²³⁵U) and thorium (²³²Th) decay chains commonly found in soils and rock and radioactive potassium (⁴⁰K) commonly found in wood, clay and brick. These background levels vary between different materials (e.g. rock and soil) and in different areas of the UK. Background readings were taken for each instrument during equipment set up and function testing.

3.1.4 RadSurvey Results

Using a Geographical Information System (GIS) the gathered data is displayed in map form. Interpolation was carried out on the data to provide a display of the radiation contours of the site as a surface picture. The area of the survey was confirmed with Campbell Reith at the site to ensure that the survey area was consistent with the intended development. This area is bounded approximately by the red line shown in Figure 2 below.



Figure 2. Plan view of the area surveyed within red line boundary.

The survey collected 34,586 data points ranging between 92 and 434 counts per second (cps). The average reading on the site was 241 cps with a standard deviation of 50 cps. There were no areas of the site with statistically significant elevated count rates. The results of the RadSurvey can be seen as a surface picture in Figure 3.

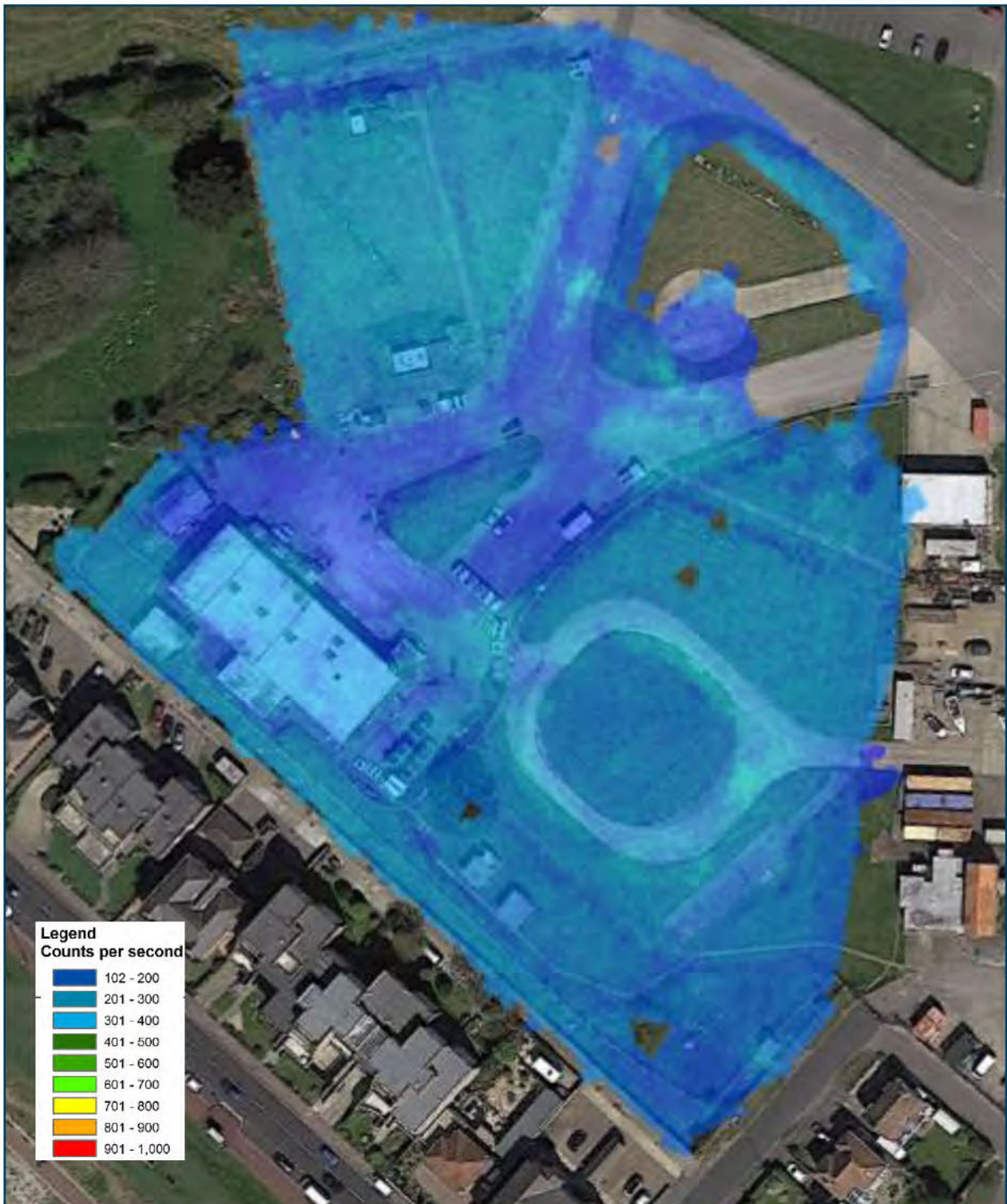


Figure 3. RadSurvey results showing levels in counts per second.

The site generally showed readings commensurate with those expected from natural background, taking into account variations due to different surface materials.

There are several areas in Figure 3 that are missing GPS data points (marked with no colouring). These are locations where either tree cover or site works prevented acquisition of a GPS signal or where a surface structure prevented access for monitoring. Where tree coverage prevents a GPS

signal being recorded the data is reviewed by the operator to confirm that no elevated reading are present in the data. The areas of missed coverage can be seen in Figure 4 below.

In addition, there was a section to the West side of the site that was composed of 'made ground' with up to approximately 50 cm additional depth of material (see Figure 4). Therefore, the surface measurements in this area are not representative of the material that is below the original ground.

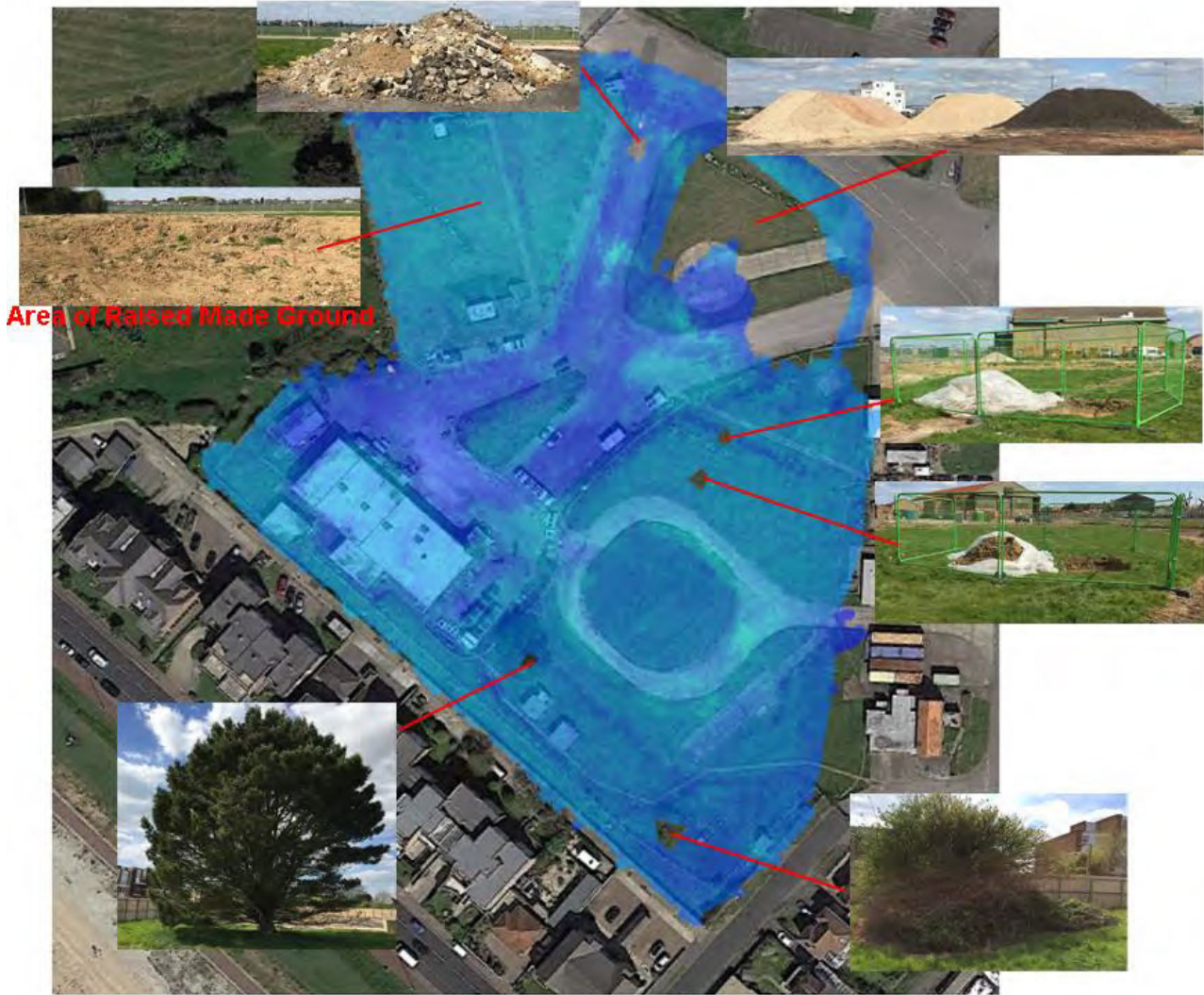


Figure 4. RadSurvey map showing locations that could not be surveyed

4 Risk assessment for future use

No evidence of contamination was found during the external ground survey. There is therefore no radiation exposure pathway for future occupants of the surveyed areas of the site. Not all areas could be accessed.

5 Conclusions & Recommendations

A gamma radiation walkover survey has been conducted of an area of ground formerly occupied by the Ministry of Defence within the confines of HMS Daedalus.

The survey indicates that most of the site had measurements commensurate with natural background and no areas with significant elevated radiation readings were identified during the survey.

Whilst the majority of the site area was subject to a RadSurvey, some areas could not be surveyed due to the presence of piles of excavated material as indicated in Figure 4. If these areas are cleared, then these locations could be surveyed to provide comprehensive coverage and information on their radiological status.

6 References

- 1 Entec HMS Daedalus Land Quality Assessment Radiological survey Report Project 05002
31 May 2007