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Middlewick Ranges, Colchester

Phase 1 Land Quality Assessment,

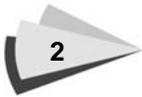
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Final



June 2018

Amec Foster Wheeler Environment
& Infrastructure UK Limited



Report for

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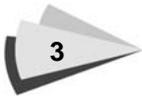
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Document revisions

No.	Details	Date
1	Draft	April 2018
2	Final	June 2018



Land Quality Statement

Introduction and Terms of Reference

The Ministry of Defence (MOD) require an assessment of the land quality at Middlewick Ranges near Colchester to support the disposal for commercial/industrial and/or residential potential future uses of the land. Amec Foster Wheeler Environment and Infrastructure UK Ltd. (Amec FW) was commissioned by the Defence Infrastructure Organisation (DIO) to undertake a Phase One Land Quality Assessment (LQA) of the site under commission number DIOCB3/230.

Site Description

The Middlewick Ranges site is in Blackheath approximately 1 mile south of Colchester city centre. There are currently three firing ranges at the site. This includes one 600m sixteen lane gallery range (Range D) and two 600m twelve lane electronic targeting ranges (ETR) (Ranges B and C). The range control building and workshop are present near the entrance in the north-west of the site. Stop butts are present at the end of the ranges. On the middle range (Range C), the top of the stop butt has been supplemented with sand bags to raise the level of the stop butt. The range area is fenced off from the surrounding land.

The land in the east outside the range area was formerly Range A but is now publically accessible land. The land outside of the ranges to the south lies within the danger area. The area to the south comprises open fields with public access restricted during firing. Site staff indicated that behind the stop butt of Range D, there are mounds which are believed to be from historic de-leading activities.

Environmental Setting

The site is of moderate sensitivity with respect to groundwater. It is underlain by a Secondary A Aquifer in the Kesgrave Catchment Subgroup which provides baseflow to rivers. The Thames Group Formation (formerly known as the London Clay) provides protection from the shallow aquifer to the underlying aquifers in the Lambeth Group and the Chalk.

The site is of high sensitivity with respected to surface water as Birch Brook, a tributary of the River Colne, flows from east to west through the centre of the site.

The ecological sensitivity of the site is moderate as a SSSI is present immediately beyond the south-eastern boundary of the site.

Site History

The site was acquired in 1874 and a firing range constructed in the northern half of the site. This range was re-orientated between 1898 and 1922. A range in the east of the site ceased use before 2005 and this area is not publically accessible land.

Ash from burnt animal carcasses from the 2001 foot and mouth outbreak was buried to the south of the stop butts in 2001. The groundwater discharge licence was transferred to MAFF and is understood to be managed by the Animal Health Veterinary Laboratories Agency. A review published by the Scientific Advisory Committee indicates that "The risk of the foot and mouth disease virus surviving from the date of the carcass burials in 2001 is negligible".

Further details are being sought from the Animal Health Veterinary Laboratories Agency as to status of the licence and the monitoring being carried out. The site is not shown as a current or historical landfill and there are no entries for the site under the current public registers for groundwater discharges.

A landfill is shown to be present on the eastern boundary of the site which operated from 1983 to 2010.

Potential Sources of Contamination

A number of potential contaminant sources have been identified at the site.

Potential Source Number	Potential Source	Associated Contaminants
S1	Firing ranges	Heavy metals and explosive residues
S2	Off-site landfill (to east)	Soil gas (methane and carbon dioxide)
S3	Foot and mouth disease animal burial site - ash from animal carcasses and silage and wheat	Polycyclic aromatic hydrocarbons (PAHs) from ash Methane and carbon dioxide from wheat and silage burial

Potential Risks Identified at the Site

Potential risks to sensitive receptors have been identified at the site and the table below summarise the risk assessment, which has been completed based on potential redevelopment for commercial/industrial or residential use.

Potential Source with associated contaminants	S1	S2	S3	
	Firing Range	Off-site landfill	Foot and Mouth Disease Animal Burial Site	
Receptors	Heavy metals and explosive residues	Methane and carbon dioxide	PAHs from combustion	Methane and carbon dioxide from wheat and silage
Residents under future use (R1)	Moderate		Moderate	
Commercial site users under future use (R2)	Moderate/low	Moderate	Moderate/low	Moderate
Future site Property and utilities (R3)				
Secondary A Aquifer (R4)	Moderate/low		Moderate/low	
Birch Brook (R5)	Moderate/low		Moderate/low	

Overall Land Quality

A number of potential current and historical sources of contamination have been identified at the site, namely: the firing ranges; a landfill located off-site by the eastern boundary; and burial pits for burnt remains of animal carcasses and specified ancillary waste associated with Foot and Mouth Disease outbreak in 2001.

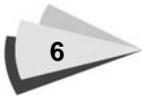
If the site is redeveloped for a residential end use, the potential risks from the firing ranges are assessed as moderate. These potential risks would be moderate/low if the site is redeveloped for commercial end use. The off-site landfill is considered to pose a moderate risk to future development if mitigation is not incorporated into the building design. The site use as a burial area for ash from animal carcasses together with wheat and silage poses a potential moderate risk to site users and buildings from soil gas, whilst the burial ash poses a potential moderate and moderate/low risk to people under residential and commercial use respectively.

Suitability for use

Overall, the site is considered to be suitable for commercial and residential end use, although any redevelopment of the site would require assessment of land quality and the associated potential risks to future site users and buildings. In particular, the soil quality in proposed garden areas and areas of soft landscaping and the need for gas protection (especially on the eastern boundary of the site and by the former animal carcasses burial) would require further assessment.

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1. Background

1.1 Terms of Reference

The Ministry of Defence (MOD) require an assessment of the land quality at Middlewick Ranges near Colchester to support the disposal for commercial/industrial and/or residential potential future uses of the land. Amec Foster Wheeler Environment and Infrastructure UK Ltd. (Amec FW) was commissioned by the Defence Infrastructure Organisation (DIO) to undertake a Phase One Land Quality Assessment (LQA) of the site under commission number DIOCB3/230.

1.2 Aims and Methodology

The aims of the Phase One LQA were to collate and review desk study information on the likely ground and contamination conditions at the site and provide a risk assessment for commercial/industrial and residential land use. The risk assessment has identified potential risks to human health and the environment posed by the site, which may affect their current and potential future use and subsequent valuation, and has described the scale of these risks and liabilities.

The scope of works for the Phase One LQA comprised:

- ▶ acquisition and interpretation of factual information from site, MOD and public domain sources;
- ▶ a site visit on 12th March 2018; and
- ▶ preparation of a report and technical note to present information gathered, interpret the implications for land quality and provide advice on further works if appropriate.

The findings of the study are based on the information made available to Amec FW by the MOD site personnel, together with information obtained from public domain sources.

1.3 Purpose of the report

The purpose of the report is to assess the land quality of the site for potential disposal or redevelopment. The report therefore considers future commercial and residential end use but does not include consideration of detailed designed of any future development. Amec FW has assumed that all information and/or documents provided by the client in connection with the preparation of this report are accurate, complete and not misleading.

1.4 Layout of the report

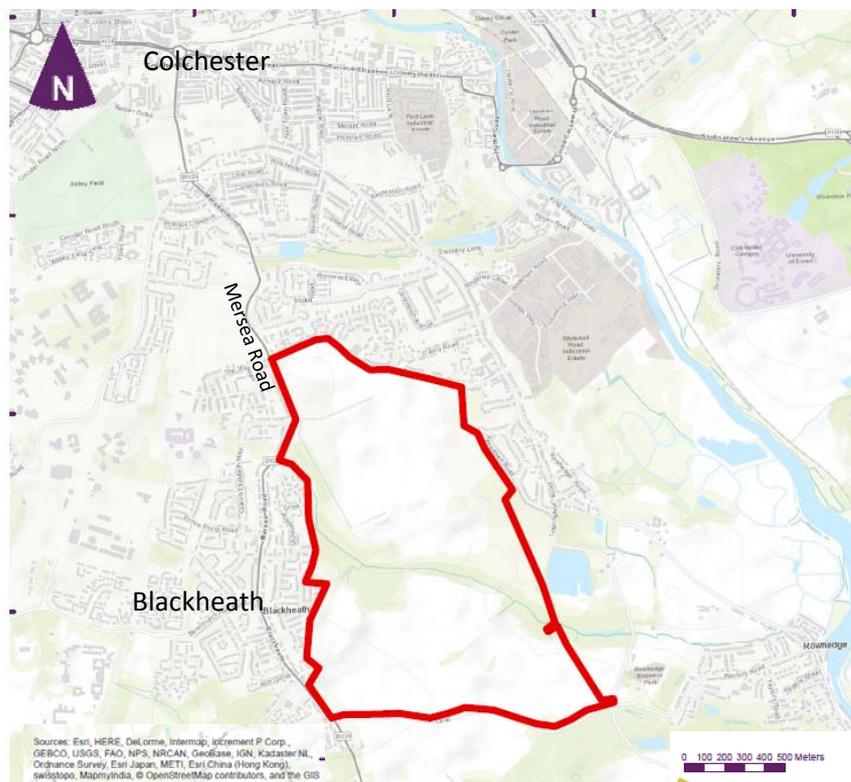
Chapter 2 provides a description of the site and results of the review of regulatory information. Chapter 3 discusses the site's history, Chapter 4 details the environmental setting of the site in relation to the geology, hydrogeology, hydrology and ecology. Chapter 5 provides a conceptual site model and qualitative risk assessment addressing the significance of any sources of potential contamination identified at the site. Chapter 6 provides a summary of overall land quality at the site. Supporting information is provided in Appendices.

2. Site Setting

2.1 Location and Access

The Middlewick Ranges site is centred on National Grid Reference (NGR) 601000, 222500 in Blackheath approximately 1 mile south of Colchester city centre. The location shown in Figure 1. The site occupies an area of 197 hectares and is accessed from Mersea Road via an entrance in the north–west. The site includes areas to the east and south which are accessible to the public via a series of footpaths.

Figure 2.1 Plan showing site location



2.2 Site Boundary

The land surrounding the site to the west, north and north-east is principally residential housing. To the south of the site, there is a field and to the south-east there is a pond and allotments. Chain link fencing is present on the western boundary and palisade fencing is present on the eastern boundary where the site backs on to housing. A road (Weir Lane), which is owned by the MOD and is closed during firing, forms the southern boundary. Hedges and post and wire fencing are present on the southern and eastern boundaries with gaps to allow the public to access this land.

2.3 Site Description

There are currently three firing ranges. This includes one 600m sixteen lane gallery range (Range D) and two 600m twelve lane electronic targeting ranges (ETR) (Ranges B and C). The range control building and workshop are present near the entrance in the north-west of the site. Stop butts are present at the end of the ranges. On the middle range (Range C) the top of the stop butt has been supplemented with sand bags to raise the level of the stop butt. The range area is fenced off from the surrounding land.

The land in the east outside the range area was formerly Range A but is now publically accessible land. Long raised mounds are present in this area which correspond to the former firing points in this area. The land outside of the ranges to the south lies within the danger area. The area to the south comprises open fields with public access restricted during firing. Site staff indicated that behind the stop butt of Range D, there are mounds which are believed to be from historic de-leading activities. Figure 2.2 below shows the site and key features.

Birch Brook is present flowing from east to west in a wooded strip of land though the centre of the site beyond the stop butts. In the east of this wooded area is a Redoubt. This is a post medieval fort built in 1648 during the siege of Colchester. This area was not accessed during the site visit as live firing was in progress. Inspection from the residential area indicated that a ditch was present around this area.

The site is generally flat with the range at a level of 29 m above ordnance datum (AOD). The ordnance survey maps indicate the brook in the centre of the site is about 10m lower than the remaining land and the land to the north and south slopes gently down to the river from the north and south.

Fly tipping of domestic waste was observed in part of the site.

Site photographs are included in Appendix A.

Figure 2.2 Plan showing site areas and feature



2.4 Services and utilities

2.4.1 Electricity pylons

Electricity pylons are present in the north-east of the site

2.4.2 Gas pipeline

A buried gas pipeline is reported to be present in the east of the site

2.4.3 Site Drainage

No information was available on current or previous drainage at the site

2.5 Other activities across the site

2.5.1 Burning Grounds and incinerators

There are no known current or historical burning grounds or incinerators on the site.

2.5.2 Fuel storage

There is currently no fuel storage of any kind on any of the site.

2.5.3 Firing ranges

The site is used as an active small arms firing range. The majority of the munition used is 5.56mm and 7.62mm rounds. On Range C, 8.59mm rounds are also used. No 7.62mm tracer rounds are allowed on the range.

Information held on site indicates that the stop butts were last de-leaded on 21st August 2015.

The rounds fired since the last de-leading are indicated below

- ▶ B Range – 395,391 rounds
- ▶ C Range – 318,559 rounds
- ▶ D Range – 252,915 rounds

Discussion with site staff indicated that a range was historically present in the east of the site (Range A). This is no longer present. In addition the site staff have indicated that there are mounds present behind the stop butt for Range D, which are sand from the historical leading of stop butt D. Lead has also been uncovered by animal digging in the stop butt area between Range B and C.

The site staff also indicated a pistol range and possible grenade range may have been present on-site in the 1970s.

2.5.4 Fly-tipping

The boundaries of the site are publically accessible. Fly-tipping material is present at these boundaries, particularly where these bound residential areas.

2.5.5 Storage of Hazardous substances

There are no COSHH cupboards or hazardous chemical stores on site.

2.5.6 Radioactivity

A radiological records search has been carried out for the site by DSTL. This is included in Appendix B. The report concluded that Dstl are not aware of any radioactive contamination issues at Middlewick Ranges.

2.5.7 Chemical weapons

There are no records of chemical weapons having been stored on the site.

2.6 Regulatory information

A review of regulatory information has been undertaken from the Environment Agency websites "What's in your Backyard"¹ and the public registers².

The search revealed there is a landfill (Fingringhoe Road Landfill) located just beyond the south-east boundary. This accepted industrial, commercial and household waste and operated from 1983 to August 2010.

Three other landfills were identified within 1km of the site. The nearest was Place Farm, which is located approximately 300m from the site.

¹ http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

² <http://epr.environment-agency.gov.uk/ePRIInternet/>

Figure 2.3 Plan showing Landfills near the site



There is a waste transfer station located 300m from the south-eastern corner of the site. There are no other environmental permits for industrial installations or radioactive substances within 500m of the site.

The UK Radon Website³ indicates the site lies in a radon affected area of the United Kingdom that has 0% to 1% above the Action Level for homes.

2.6.1 Foot and Mouth Disease (FMD) Burial

The site was authorised under the 1998 groundwater regulations for burial of burnt remains of animal carcasses and specified ancillary waste in April 2001. The burial is reported to have included the burnt carcasses of 153 cattle, 469 pigs, 2230 sheep and two goats together with 370 tonnes of wheat and 100 bags of silage from confirmed foot and mouth outbreaks at nearby farms. The licence is attached in Appendix C. The authorisation appears to have been transferred to the Ministry of Agriculture, Fisheries and Food (MAFF) in May 2001. The authorisation was to cease 1st May 2005 and the Animal and Plant Health Agency (APHA) have indicated that they believe that the groundwater authorisations on this site have now expired. The site is not shown as a current or historical landfill and there are no entries for the site under the current public registers for groundwater discharges.

The burial area was beyond the stop butts as shown in Figure 2.4. This area was not accessible during the site visit.

³ <http://www.ukradon.org/information/ukmaps>

Figure 2.4 Plan showing Foot and Mouth Burial site



A review by Department of the Environment, Fisheries and Rural Affairs (DEFRA) on the 2001 outbreak⁴ concluded in 2017. This included assessment of sites with buried carcasses which as indicated in the freedom of information request from 2016 “categorically that this did not take place”⁵ and a further FOI⁶ indicates it was an ash burial site.

The following conclusion were noted in the review:

“1. The risk of the FMD virus surviving from the date of the carcass burials in 2001 is negligible. Animals that were known to be infected were not buried and the evidence is that the virus in any infected carcasses that were buried will not have persisted in the burial sites....

2. Based on the available evidence, the advice of the sub-group is that the overall risk of other notifiable diseases spreading from the sites is very low....

3. The risk to water quality risk can be derived from projections of the end-points for the leachate decay curves subject to the completion of a systematic review of the monitoring regimes at the burial sites described below....

4. Given the scale and unique status of the 2001 FMD outbreak burial sites, and the likely continued public interest in them, a systematic review of the monitoring regimes at all the burial sites should be undertaken. The purpose is to design a robust monitoring programme that provides scientific evidence on water quality risks that is sufficient to establish the remaining liability at the sites. The data emerging from the sites should be analysed regularly, with a view to ensuring the monitoring remains fit for purpose and cost effective. The two pieces of work recently commissioned by Defra, which are based on the advice of the sub-group, are the

⁴ Science Advisory Council (SAC) Report by SAC Sub-Group on 2001 Foot and Mouth Outbreak Carcass Burial 15 March 2017 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/642195/sac-fmd-carcass-burial-review.pdf

⁵ https://www.whatdotheyknow.com/request/377625/response/922303/attach/3/20170117%20F.pdf?cookie_passthrough=1

⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/591305/ATIC1024.pdf

start of this systematic review and should be used to inform the forward management of the FMD carcass burial sites managed by Defra...”

The Animal and Plant Health Agency (APHA) have been contacted. Their response can be found in Appendix D. They have indicated that:

- ▶ “As far as the risk of onward transmission of foot and mouth disease from the buried material, there is zero risk
- ▶ Of the approximately 153 cattle buried, 33 were born before 1996. In relation to the 33 animals born before 1996, there is a negligible risk of bovine spongiform encephalitis (BSE – “mad cow”) prions being present (this could be the case if not all material was properly incinerated at the time)”

In addition the APHA provided information on the latest monitoring carried out in December 2011 at the site. The main reason for the monitoring being undertaken at the site was to comply with Environment Agency ground water pollution legislation rather than for assessing animal disease risks. The data related to one borehole on the last monitoring report. The exact location of this boreholes has not been confirmed. The grid reference provided is 2.7km south of the current site boundary. Boreholes 1, 2 and 3 were referenced as being “obsolete” and APHA have no records if any of the boreholes have been capped.

The results of the monitoring provided are summarised below against environmental quality and water standards.

Table 2.1 Summary of monitoring at Borehole 4 in December 2011

Determinand	Units	Environmental Quality Standards - Freshwater	Drinking Water Standards	Concentration
Sulphate	mg/l	-	250 (0)	52
Chloride	mg/l	-	250 (0)	41
Phosphate	mg/l	-	-	<0.1
Ammoniacal Nitrogen as N	µg/l	600 (0)	390 (0)	20
Nitrate as N	mg/l	-	11 (0)	6
Nitrite as N	mg/l	-	0.15 (0)	0.02
Chemical Oxygen Demand (Total)	mg/l	-	-	18
Biochemical Oxygen Demand	mg/l	5 (0)	-	<2
TPH	mg/l	-	0.01 (0)	<0.01

Exceedances shown in brackets

3. Site history

3.1 Sources of information

An historical review of the development of the site and surrounding area has been undertaken based on the following sources:

- ▶ Historical Maps from 1874 to 1960s;
- ▶ Historic England archive aerial photographs;
- ▶ MoD sources;
- ▶ An archaeological report for the site and surrounding land prepared for Landmarc Support Services⁷ which is available on-line; and
- ▶ Anecdotal information from site walkover.

The information below describes the significant historical activities on the site. It should be noted that sites with a military or defence connection were often not included on OS maps during and between the World Wars and subsequent Cold War for reasons of national security.

3.2 Historical usage

The Government acquired Middlewick range in 1874⁸. The 1898 maps showed the ranges aligned from north-west to south-east rather than the current north-south alignment. The Redoubt was labelled as a gravel pit and a second gravel pit was present adjacent to Cabbage Hall Farm. (Pits are still present in these areas). The south-east of the site was a drill ground. Between 1898 and 1922, the range was realigned and extended to the northern boundary of the site to form a 1000 yard range and changes to the stop butts comprise movement from a series of individual mounds to a long barrier. Buildings were constructed in the location of the current site workshop and range control. The drill ground is now marked as being a manoeuvre ground.

⁷ Wessex Archaeology, March 2008, Fingringhoe And Middlewick Ranges And Friday Wood DTA Colchester Training Area, DTE East, Essex - Archaeological Desk-based Assessment and Monument Condition Survey

⁸ <http://www.british-history.ac.uk/vch/essex/vol9/pp251-255>

Figure 3.1 Map Extract from 1898

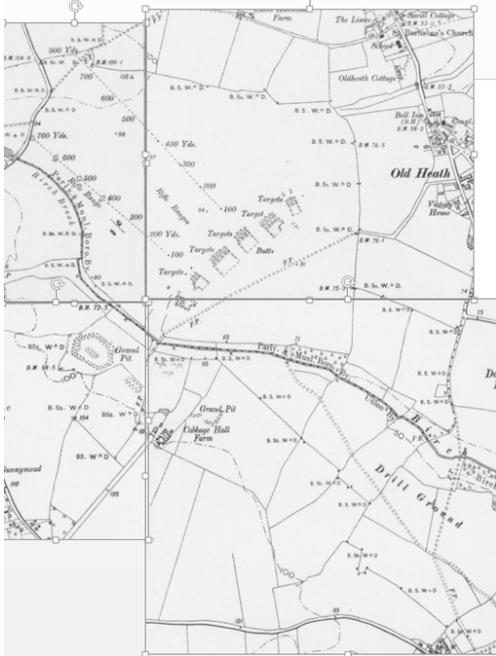


Figure 3.2 Map Extract from 1922



Little change occurred between 1922 and 1938 on-site. The land to the north was developed with allotments to the north and an ordnance depot constructed off-site to the north-east. As part of the Colchester Stop Line, pill boxes and spigot mortar emplacements were constructed near the site entrance and two pill boxes were constructed on the eastern and western boundary. An anti-tank ditch was also constructed east-west across the north of the site. This is still present adjacent to the access road along the north of the site.

The buildings near the vicinity of the site entrance included a building where the current range control building is currently located is labelled as Middlewick cottages in 1953. It is unclear when these cottages were converted to the current layout. The length of the ranges appeared to reduce between 1968 and 1975, with the area in the north beyond the 600 yard line no longer shown as a firing point. The range in the east (Range A) is understood to have ceased being used prior to 2005. An aerial photo shows the fence around the firing area was constructed in 2013.

3.3 Archaeological Issues/Listed Buildings

A search of the Historic England website⁹ indicates that there are no entries such as listed buildings or scheduled monuments on the site. Archaeological features listed by Wessex Archaeology include the pill boxes and spigot mortar emplacements, the anti-tank trench and the 17th century fort (the Redoubt).

⁹ <https://historicengland.org.uk/listing/the-list/map-search>

4. Environmental Setting

4.1 Sources of information

Information on the site environmental setting has been obtained from the following sources:

- ▶ British Geological Survey (BGS) Digital Geological map, 1:50,000 scale, Sheet 224 and 242 (Colchester and Brightlingsea. Bedrock and Superficial) and BGS Geology of Britain Viewer
- ▶ The Environment Agency Website – What's in your Backyard?
- ▶ The Environment Agency Catchment Data Explorer
- ▶ The MAGIC website which provides geographic information about the natural environment from across government.

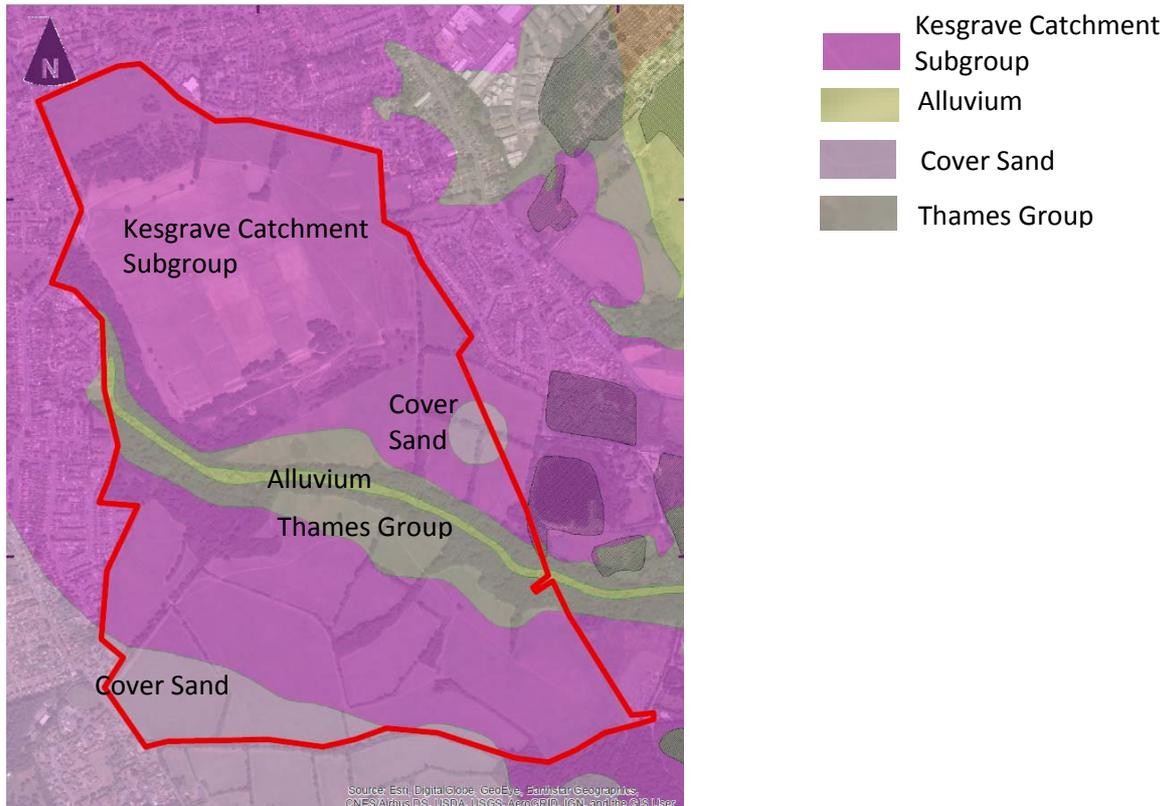
4.2 Geology

The BGS 1:50,000 scale Sheet 224 and 242 (Colchester and Brightlingsea) shows the majority of the site to be underlain by sand and gravel of the Kesgrave Catchment Subgroup. This is absent in the vicinity of Birch Brook and thin line of alluvium is present under the brook. Cover sand is present overlying the Kesgrave formation on the southern boundary and in an area in the east of the site. A 2016 report by CSGS¹⁰ for an adjacent site to the north indicated that the soil of Kesgrave Catchment subgroup has a neutral to slightly alkaline pH.

The Kesgrave Catchment Subgroup is underlain by the Thames Group (formerly known as London Clay). BGS boreholes logs from two locations described the Thames Group as a brown or blue clay. The clay was shown to be about 27-30m thick. Below this the Thames Group becomes more sandy and can be difficult to distinguish from the underlying the Lambeth formation which is in turn underlain by Chalk.

¹⁰ CSGS 2016 Report On An Intrusive Investigation For A Proposed Replacement Lidl Supermarket, At Abbot's Road, Colchester <http://www.planning.colchester.gov.uk/WAM/doc/Application%20Form-2436838.pdf?extension=.pdf&id=2436838&appid=1001&location=VOLUME1&contentType=application/pdf&pageCount=1>

Figure 4.1 Summary of geology



4.3 Groundwater

The Environment Agency classifies the Kesgrave Catchment Subgroup as a Secondary Aquifer. Boreholes near the site show the groundwater is a depth of 4 to 7mbgl. The groundwater flow in the Kesgrave sand and gravel has not been confirmed but is likely to be towards Birch Brook which cuts through the centre of the site.

There are no licensed abstractions within 1km of the site shown on the Environment Agency website and the site does not lie within a source protection zone.

Colchester Borough Council was also contacted for information on any private water supplies within 2km of the site. The Council have been contacted about private water abstractions and the only private water supply recorded was a private well, single dwelling, located at 601567 223874 over 750m north-east of the site boundary.

4.3.1 Groundwater Sensitivity: Moderate

The site is underlain by a Secondary A Aquifer which provides baseflow to the on-site brook. The Thames Group Formation provides protection from the shallow aquifer to the underlying aquifers in the Lambeth Group and the Chalk.

4.4 Surface Water

Birch Brook flows from east to west across the site. This is a tributary of the River Colne which is a river of moderate ecological and good chemical quality.

Figure 4.2 Summary of Hydrology



The Upper Colne Marshes are Sites of Special Scientific interest (SSSI) near the confluence with Birch Brook. Approximately 1km south of the site is the Roman River.

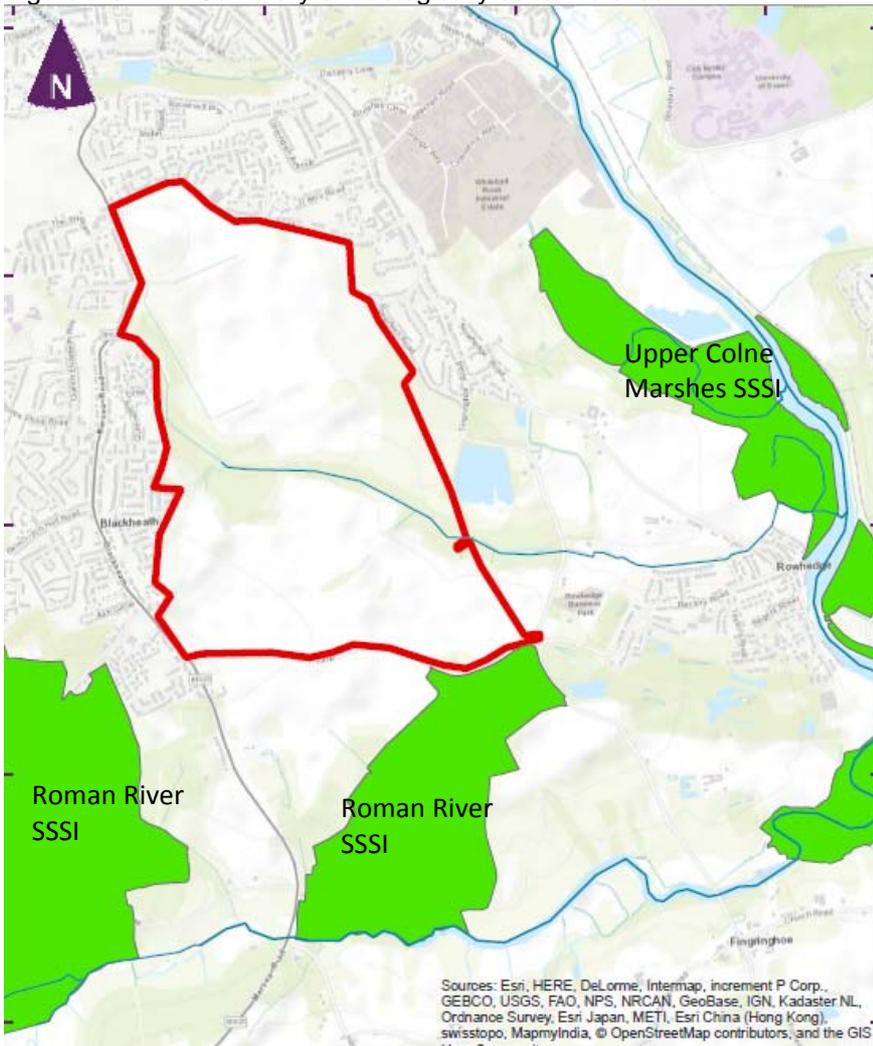
4.4.1 Surface Water Sensitivity: High

Birch Brook is a tributary of the River Colne and passes from east to west through the centre of the site.

4.5 Ecology

Immediately beyond the southern boundary of the site is a SSSI.

Figure 4.3 Summary of Ecologically sensitive sites



Upper Colne Marshes SSSI

4.5.1 Ecological Sensitivity: Moderate

The ecological sensitivity of the site is moderate as a SSSI is present immediately beyond the south-eastern boundary of the site.

5. Conceptual Model and Environmental Risk Assessments

This chapter presents the initial conceptual site model (CSM) developed for the site and identifies the presence of any potentially unacceptable risks. The conceptual model is a representation of the relationship between contaminant sources, pathways and receptors developed on the basis of hazard identification. Unique identification numbers or letters are allocated to each source, pathway and receptor; these are then carried forward to the risk assessment. The CSM provides a graphical representation summarising the key features of the sites, along with the plausible pathways and any sources (as detailed in full in Chapters 2 to 4) of relevance to the risk assessment. This conceptual model is shown schematically in Figure 3 along with the contaminant sources detailed below. The land uses for which the assessment has been undertaken are commercial/industrial and residential.

5.1 Potential Contaminant Sources

A number of potential sources of contamination have been identified at the site.

Table 5.1 On-Site Sources of Contamination

Potential Source Number	Potential Source	Associated Contaminants	Comment
S1	Firing Ranges	Heavy metals and explosive residues	Present since 1870s
S2	Off-site landfill	Soil Gas	Off-site landfill closed in 2010
S3	Foot and Mouth Disease Carcass Ash Burial	Soil gas, Polycyclic aromatic hydrocarbons (PAHs)	A review by the Science Advisory Council (SAC) indicates that pathogens are unlikely to persist at the site. Information has been obtained from the Animal and Plant Health Agency on the status of the licence and the monitoring at the site. They indicate there is negligible risk from BSE and none from foot and mouth and the groundwater authorisations have expired. Thus these are not considered further.

5.2 Unexploded ordnance (UXO)

No specific UXO risk assessment has been carried out for the site. The site has been used as a small arms range.

5.3 Identified Receptors

The proposed end use of the site has not been confirmed and could extend to both residential and commercial end uses. Potential receptors specific to the site are (note: only the receptors considered to be at risk from a source have been included in Table 5.1):

Table 5.2 Summary of Receptors

Receptor Type	Descriptions
Human health	Residents under future use (R1)

Receptor Type	Descriptions
Human health	Commercial site under future use (R2)
Property	Future site buildings and services (R3)
Groundwater	Secondary A Aquifer (R4)
Surface Water	Birch Brook (R5)

5.4 Risks to construction workers

The risk assessment does not consider risks to current and future construction/site maintenance workers on the basis that risks to workers will be dealt with under the Health and Safety at Work Act (1974) and regulations made under the Act. Given the nature of the site, risks to below ground/maintenance workers should be managed by undertaking a bespoke risk assessment that is appropriate to the type of work and potential contamination at a location. Where practicable the risks should be designed out and any residual risks are managed by control measures including PPE. Use of a generic risk assessment approach where neither the scope of work, nor area of investigation, have been defined can lead to an inappropriate risk classification and should relate to the specific activity proposed.

Site-specific contamination data obtained from all site investigations should be included in the pre-construction information for any below ground works, to enable any contractors to address as necessary in their risk assessments and method statements.

5.5 Identified Pathways

Potential environmental fate and exposure pathways specific to the site are:

- ▶ direct contact, ingestion or inhalation of contaminated soils and soil dust (pathway P1);
- ▶ lateral and vertical migration of gases into buildings and inhalation of gases or contaminant vapours (pathway P2);
- ▶ vegetable uptake and subsequent ingestion in garden areas (pathway P3);
- ▶ leaching of contamination from soils via rainwater infiltration (pathway P4); and
- ▶ vertical and lateral migration in groundwater (pathway P5).

5.6 Preliminary Risk Assessments

A preliminary risk assessment has been undertaken for these potential source-pathway-receptor linkages to identify potentially unacceptable risks on a qualitative basis. This approach is based on Department for the Environment Food and Rural Affairs (DEFRA) Statutory Guidance on Contaminated Land¹¹ and the DEFRA/ Environment Agency (EA) Model Procedures (CLR11)¹² and Construction Industry Research and Information Association (CIRIA) guidance on risk assessment¹³, whilst reference has also been given to the DIO LQA Management Guide Risk¹⁴. The risk is therefore based on a consideration of both:

¹¹ Department for Environment, Food and Rural Affairs, Circular 01/2012, Contaminated Land. April 2012

¹² DEFRA/ Environment Agency, Model Procedures for the Management of Land Contamination, CLR11, September 2004.

¹³ Construction Industry Research and Information Association (CIRIA), Contaminated Land Risk Assessment. A Guide to Good Practice. CIRIA C552, 2001

¹⁴ Ministry of Defence, Land Contamination Management – Land Quality Assessment (LQA), Practitioner Guide, 02017/01, June 2017

- ▶ the likelihood of an event (probability – takes into account both the presence of the hazard and receptor and the integrity of the pathway); and
- ▶ the severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

Further information on the risk assessment methodology used is given in Appendix E. The method of dealing with identified risks and the level of significance of those risks will be a function of site use. Potentially unacceptable risks identified for future use are considered in Table 5.3.

Table 5.3 Potential environmental risks for future use

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard [severity]	Likelihood of Occurrence	Risk
S1 Firing Range	Heavy metals (lead, antimony, copper, nickel, zinc, arsenic, tin) and explosive residues	Firing range used since 1870s. Anecdotal evidence of stop butt sand and lead bullets from historic de-leading present in parts of the site. De-leading itself does not remove fine lead particles but is principally aimed at removing large lumps of lead that present a ricochet hazard on the range. Evidence from investigation on other ranges indicates that explosive residues do not tend to persist. The neutral to alkaline pH of the sand and gravel may limit the mobility of lead in the soil and reduce the corrosion rate				
		Residents under future use (R1)	P1. Direct contact, ingestion, inhalation P2. Inhalation of vapours P3. Vegetable uptake and subsequent ingestion in garden areas	Health Hazard [Medium]	Likely Potential for heavy metals to be present in garden areas	Moderate
		Commercial site users under future use (R2)	P1. Direct contact, ingestion, inhalation P2. Inhalation of vapours	Health Hazard [Medium]	Low Likelihood Potential for heavy metals to be present in soft landscaping areas	Moderate/Low
		Secondary A Aquifer (R4)	P5. Vertical and lateral migration in groundwater	Pollution of Controlled waters [Medium]	Low Likelihood The neutral to alkaline pH of the sand and gravel may limit the mobility of lead in the soil and reduce the corrosion rate	Moderate to low
		Birch Brook (R5)	P5. Vertical and lateral migration in groundwater	Pollution of Controlled waters [Medium]	Low Likelihood The neutral to alkaline pH of the sand and gravel may limit the mobility of lead in the soil and reduce the corrosion rate. Dilution in river likely	Moderate to low
S2 Off-site landfill	Methane and carbon dioxide	Off-site landfill adjacent to the east of the site from 1983 to 2010				
		Residents under future use (R1)	Lateral and vertical migration of gases into buildings and inhalation of gases or contaminant vapours (pathway P2)	Explosion, asphyxiation [Severe]	Low likelihood Potential for ventilation between site and buildings. Regulation of recently close landfill likely.	Moderate
		Commercial site users under future use (R2)				
Property including service pipes (R3)						

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard [severity]	Likelihood of Occurrence	Risk	
S3 Foot and Mouth Ash Burial	PAHs from combustion	Burned carcasses, silage and wheat buried on site in 2001. Risks from pathogen have not been included on the basis on the report by SAC.					
		Residents under future use (R1)	P1. Direct contact, ingestion, inhalation P3 Vegetable uptake and subsequent ingestion in garden areas	Health Hazard [Medium]	Likely Potential for heavy metals to be present in garden areas.	Moderate	
		Commercial site users under future use (R2)	P1. Direct contact, ingestion, inhalation	Health Hazard [Medium]	Low Likelihood Potential for heavy metals to be present in garden areas	Moderate/Low	
		Secondary A Aquifer (R4)	P5. Vertical and lateral migration in groundwater	Pollution of Controlled waters [Medium]	Low Likelihood PAHs likely to have low mobility. Activity is monitored under a licence.	Moderate to low	
		Birch Brook (R5)	P5. Vertical and lateral migration in groundwater	Pollution of Controlled waters [Medium]	Low Likelihood PAHs likely to have low mobility. Activity is monitored under a licence.	Moderate to low	
	Soil gas from degradation of wheat and silage	Residents under future use (R1)	Lateral and vertical migration of gases into buildings and inhalation of gases or contaminant vapours (pathway P2)	Explosion [Severe]	Low likelihood Potential for ventilation between site and buildings.	Moderate	
		Commercial site users under future use (R2)					
		Property including service pipes (R3)					

The risks from the identified potential sources are summarised below:

Table 5.4 Summary of environmental risks from potential sources

Potential Source with associated contaminants	S1	S2	S3	
	Firing Range	Off-site landfill	Foot and Mouth Disease Burial Site	
Receptors	Heavy metals and explosive residues	Methane and carbon dioxide	PAHs from combustion	Methane and carbon dioxide from wheat and silage
Residents under future use (R1)	Moderate		Moderate	
Commercial site users under future use (R2)	Moderate/low	Moderate	Moderate/low	Moderate
Future site Property and utilities (R3)				
Secondary A Aquifer (R4)	Moderate/low		Moderate/low	
Birch Brook (R5)	Moderate/low		Moderate/low	

6. Overall Land Quality and Suitability for Use

A number of potential current and historical sources of contamination have been identified at the site, namely: the firing ranges; a landfill located off-site by the eastern boundary; and burial pits for burnt remains of animal carcasses and specified ancillary waste associated with Foot and Mouth Disease outbreak in 2001.

If the site is redeveloped for a residential end use, the potential risks from the firing ranges are assessed as moderate. These potential risks would be moderate/low if the site is redeveloped for commercial end use.

The off-site landfill is considered to pose a moderate risk to future development if mitigation is not incorporated into the building design.

The site use as a burial area for ash from animal carcasses together with wheat and silage poses a potential moderate risk to site users and buildings from soil gas, whilst the burial ash poses a potential moderate and moderate/low risk to people under residential and commercial use respectively.

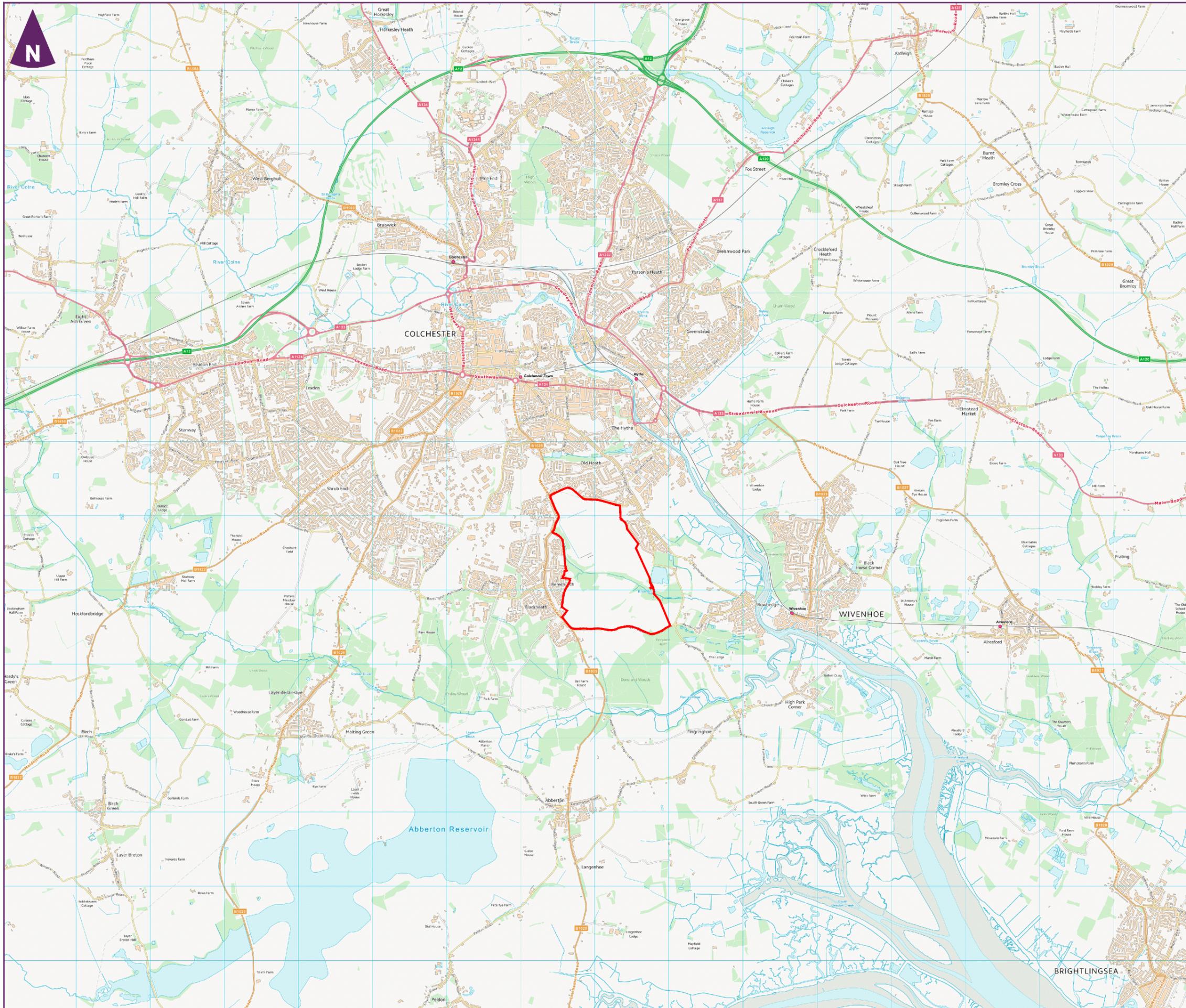
Overall, the site is considered to be suitable for commercial and residential end use, although any redevelopment of the site would require assessment of land quality and the associated potential risks to future site users and buildings. In particular, the soil quality in proposed garden areas and areas of soft landscaping and the need for gas protection (especially on the eastern boundary of the site and by the former animal carcasses burial) would require further assessment.

Figures

Figure 1 – Site Location Plan

Figure 2 – Site Layout Plan

Figure 3 – Site Conceptual model



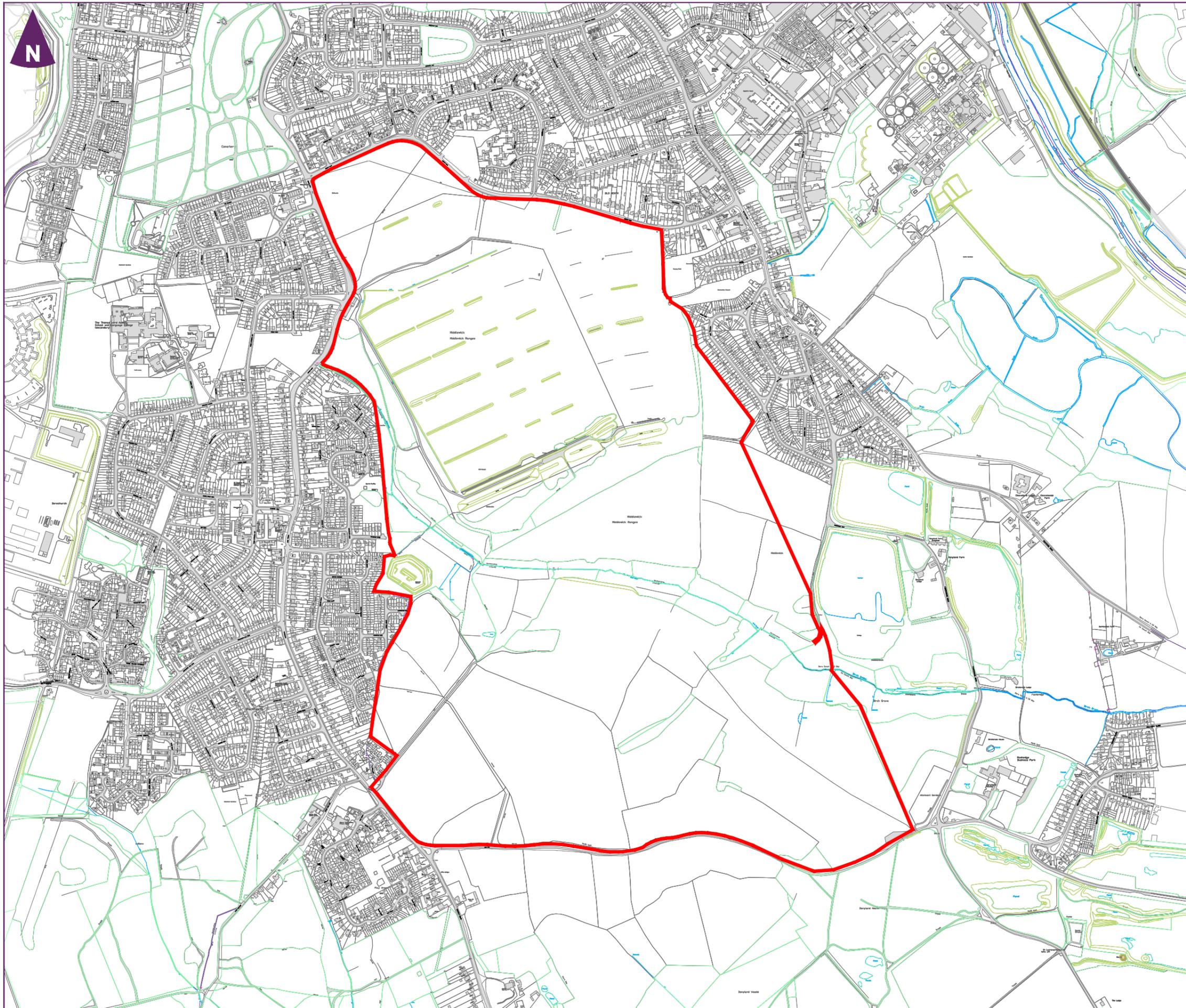
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 Site boundary

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 Scale 1:50,000 @ A3

Client


Phase 1 LQA
 Middlewick Ranges


Figure 1
 Site location plan



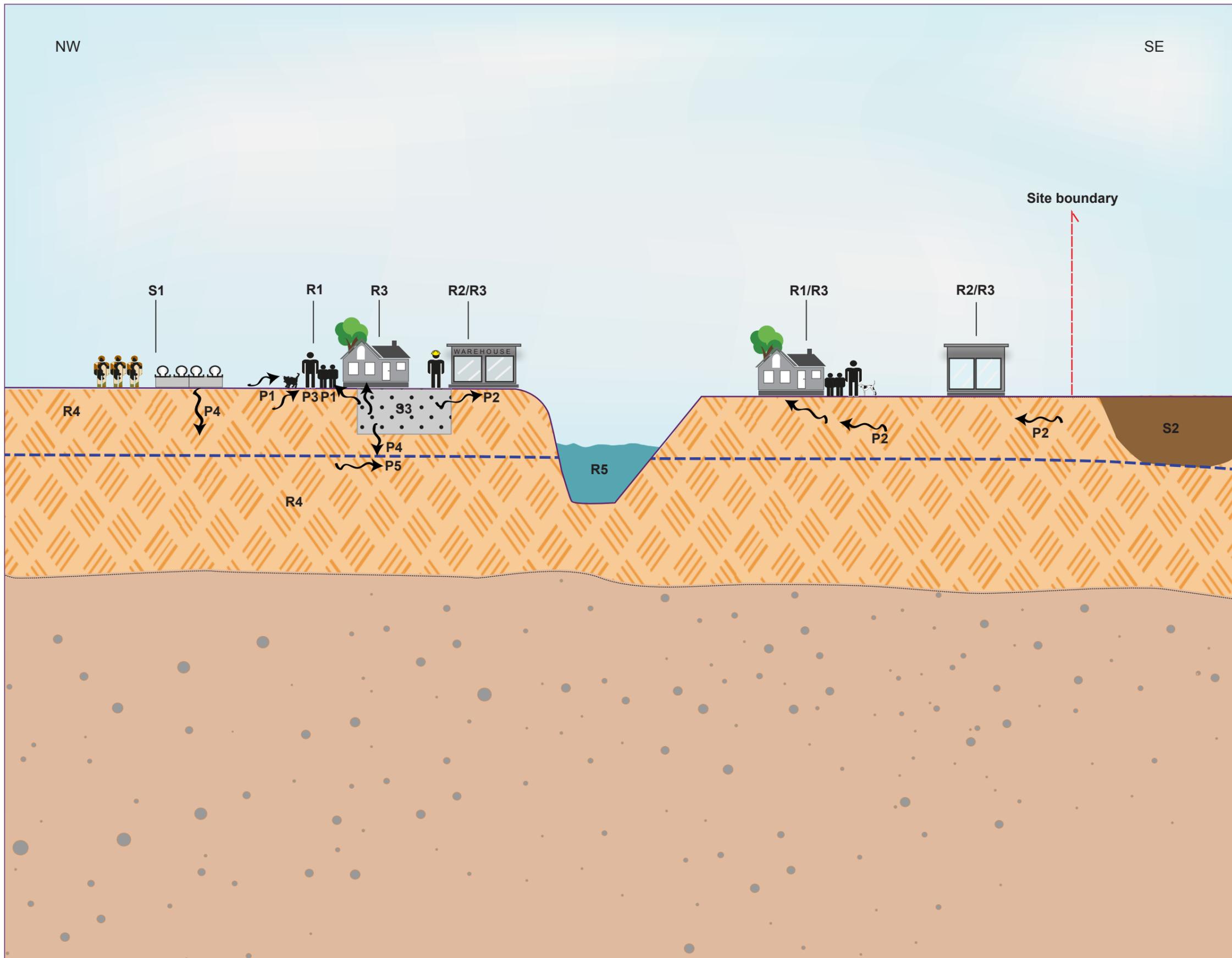
Key
Site boundary

0 m 500 m
Scale 1:10,000 @ A3

Client
Defence Infrastructure Organisation

Phase 1 LQA
Middlewick Ranges
amec foster wheeler

Figure 2
Site layout plan



- Key**
- Thames group formation
 - Kesgrave sub-group formation
- Sources:**
- S1 Firing ranges
 - S2 Off-site landfill
 - S3 Ash burial from Foot and Mouth disease carcass
- Pathways:**
- P1 Direct contact ingestion or inhalation of contaminated soils and soil dust
 - P2 Lateral and vertical migration of gases or contaminant vapours
 - P3 Vegetable uptake and subsequent ingestion in garden areas
 - P4 Leaching of contamination from soils via rainwater
 - P5 Infiltration vertical and lateral migration in groundwater
- Receptors:**
- R1 Residents under future use
 - R2 Commercial site under future use
 - R3 Future site buildings and services
 - R4 Secondary A Aquifer
 - R5 Birch Brook

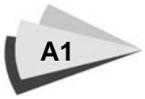
Client



Phase 1 LQA
Middlewick Ranges



Figure 3
Site conceptual model



Appendix A Site Photographs

**Middlewick Ranges, Colchester,
Site Walkover Photographic Record**

Plate 1 – View across the firing ranges from north-west



Plate 2 – View south to target on mantle at Range B with stop butt behind



**Middlewick Ranges, Colchester,
Site Walkover Photographic Record**



Plate 3 – Range control building



Plate 4 – Open area in east looking north –east showing former firing point mounds



Plate 5 – Danger area south of stop butts from east fop site looking south-west

**Middlewick Ranges, Colchester,
Site Walkover Photographic Record**



Plate 6 – Pill box on eastern boundary





Appendix B DTSL Radiological Records Search

AMEC Foster Wheeler
Environment & Infrastructure UK Limited
Principal Consultant
Floor 12
25 Canada Square
Canary Wharf
London
E14 5LB



(For attention of Barry Mitcheson)

Our Ref: CBRD/DE/490158/708883 AMEC 2
Your Ref: 20180306 Wood-AMECFW RRCS search

Date: 21st March 2018

RADIOLOGICAL RECORDS SEARCH – Middlewick Ranges, Colchester Training Area

1. In response to your request, Dstl have conducted a search of records relating to any radiological contamination issues at Middlewick Ranges, Colchester Training Area. This records search will provide an input into the Phase One Land Quality Assessment of the site.

Desk Study Methodology

2. Dstl have searched a number of information sources including the MOD radioactive holdings database, archive records and published information. In addition, information was sought from members of the Dstl Radiation Protection Advisory Body and site personnel with respect to any known radiological issues.

Results of Records Search

3. Findings of this desk study are summarised in Table 1 (Annex A), which includes full references for any information identified. It should be noted that Table 1 also indicates where a source of information was interrogated, but where no information was available.

Summary

4. In conclusion, Dstl are not aware of any radioactive contamination issues at Middlewick Ranges.

5. Under direction from DIO, the findings of this records search are purely factual and Dstl have not included any interpretation of the information relating to potential radioactive contamination.

6. Should you obtain additional information that you would like Dstl to comment upon, please do not hesitate to contact the undersigned.

DEE EMERSON
Senior Health Physicist
Dstl RPA Body

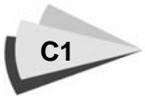
Report Prepared by:

Richard Aylward-Wilson
Survey & Sensing Team

Table 1 Information Sources for Radiological Records Search of Middlewick Ranges

INFORMATION SOURCE	COMMENTS	REFERENCE
MOD Radioactive Holdings Database	No Records held for Middlewick Ranges, Colchester Training Area	Dstl internal records [date of search: 21/03/2018]
Environmental Regulator Notifications/Approvals	Dstl has no records that the site ever required a notification or approval from the environmental regulator for the keeping of radioactive substances or the accumulation or disposal of radioactive waste (Environmental Permitting Regulations 2016) at Middlewick Ranges, Colchester Training Area	Dstl internal records [date of search: 21/03/2018]
Dstl Records	A search of Dstl internal records did not identify any radiological contamination issues at Middlewick Ranges, Colchester Training Area	Dstl internal records [date of search: 21/03/2018]
Site Monitoring Details	There are no records of radiological contamination surveys or radon monitoring taking place on the site Middlewick Ranges is not located in a Radon affected area of the United Kingdom.	Dstl internal records [date of search: 21/03/2018] http://www.ukradon.org/information/ukmaps
INFORMATION SOURCE	COMMENTS	REFERENCE
Published Information (including any information from the internet/intranet)	Internet & Published information : WWII Pillbox and Spigot Mortar Emplacements identified in a Historic Environment Desk-Based Assessment. A search of the MOD intranet did not return any relevant information regarding the site.	https://www.wessexarch.co.uk/sites/default/files/field_file/68560_Colchester%20Ranges_for%20web_0.pdf MOD Intranet search [date of search: 21/03/2018]
Site Contacts (e.g. Radiation Safety Officer)	Telecom : SSGT Stapleton (Ops Room EOD Colchester)	[date of telephone call: 21/03/2018] No information as to the use/loss of radioactive material on the ranges.

	Radiation Safety Officer HQ Colchester Garrison	No response – unanswered calls
Information from Radiation Protection Advice and previous advisory visit reports	No information on any contamination recorded. The advisory visit reports only reflect the radiation protection arrangements for standard use military equipment containing radioactivity (e.g. sights, compasses, defile markers) held by units on the main Colchester Garrison and not on the range area.	[date of search: 21/03/2018]



Appendix C Authorisation for tipping of ash from animal carcasses



ENVIRONMENT
AGENCY

AUTHORISATION NO.	GWELF/50686
SCHEDULE NO.	GWELF/50686 01

GROUNDWATER REGULATIONS 1998

REGULATION 18(3)(a)

AUTHORISATION OF DISPOSAL OR TIPPING FOR THE PURPOSE OF DISPOSAL

TO: Major H.G. Waller
Ministry of Defence
H.Q EATA
Gryphon House
Goojerat Barracks
Colchester
Essex CO2 7NZ

The ENVIRONMENT AGENCY ("The Agency") in pursuance of its powers under the Groundwater Regulations 1998 and in accordance with Regulation 18(3)(a) of those Regulations, hereby **AUTHORISES** the disposal of **burnt remains of animal carcasses and specified ancillary waste by burial.**

AT: Middlewick Ranges, East Donyland, Colchester, Essex

TO : land at TM 0120 2240, as shown on the attached plan GWELF/50686 01

SUBJECT TO: the conditions set out in the following Schedule :

GROUNDWATER AUTHORISATION schedule ref. no GWELF/50686 01

The Agency will review this Authorisation at least every 4 years and may vary or revoke the Authorisation in writing at any time.

This Authorisation is issued on the 30th day of April 2001 and takes effect from 8th April 2001

Signed.....*Simon Wood*.....

Team Leader – Scientific Support



SCHEDULE OF CONDITIONS



**ENVIRONMENT
AGENCY**

Burial of Pyre Ash and ancillary farm waste

GENERAL

1. The disposal shall consist only of burnt remains of animal carcasses and specified ancillary farm waste.
2. The disposal shall be undertaken at the location specified in condition 3 below so that:
 - (a) There shall be no direct discharge of List 1 substances (set out in Annex 1 to this Authorisation) to groundwater or surface waters;
 - (b) Groundwater (as defined by the Groundwater Regulations 1998) is not polluted;
 - (c) The disposal shall not cause any adverse effects on sources of water for potable supply;
 - (d) Disposal of List 1 and List 2 substances (set out in Annex 1 to this Authorisation) shall only be made in accordance with the following conditions of this Authorisation.
 - (e) Provided that the disposal hereby authorised is made in accordance with all of the conditions of this Authorisation, the disposal shall not be taken to be in breach of conditions (a), (b) or (c) above because it contains substances or has properties identified in and controlled by conditions (a), (b) or (c).
 - (f) The Authorisation holder shall take all practicable measures to minimise adverse environmental impact of the disposal.
3. The disposal shall be made by burial on an area of land centered at:
 - (a) National Grid Reference TM 0120 2240
 - (b) As shown marked on the attached Plan GWELF/50686 01
4. No part of the disposal area shall lie within:
 - (a) 10 metres of the nearest watercourse (which includes ditches and open land drains which may run dry for part of the year);
 - (b) 50 metres of any well, spring or borehole, irrespective of its current use;
 - (c) 500 metres of any well, spring or borehole used for potable water supply
 - (d) 25 metres of an identified swallow hole.

RECORD OF DISPOSAL

5. A record of the disposal is appended to this Authorisation.



MONITORING AND REPORTING SYSTEMS

6. Engineered groundwater monitoring systems shall be provided to enable monitoring of the groundwater outside the disposal pit, in accordance with British Standards 5930 Code of Practice for Site Investigations.
7. A record of the groundwater monitoring and sampling results shall be made and submitted to the Agency at 6 monthly intervals for 4 years or until the Agency specifies otherwise

EXPIRY DATE

8. The Authorisation shall cease to have effect on 01/05/2005.



ANNEX 1.

Summary listing of the substances to be controlled under the Groundwater Regulations 1998.

List One. "List One" substances are the most toxic and must be prevented from entering groundwater. They include pesticides, sheep dip and solvents.

- Organohalogen compounds and substances which may form such compounds in the aquatic environment
- Organophosphorus (OP) compounds
- Organotin compounds
- Substances which possess carcinogenic, mutagenic, or teratogenic properties in or via the aquatic environment (including substances which may have those properties which would otherwise be in list two)
- Mercury and its compounds
- Cadmium and its compounds
- Mineral oils and hydrocarbons
- Cyanides

List Two "List Two" substances are less dangerous but, if disposed of in large amounts, could be harmful to groundwater. Entry of these substances into groundwater must be restricted.

- The following metals and metalloids and their compounds

Zinc	Antimony	Uranium
Copper	Molybdenum	Vanadium
Nickel	Titanium	Cobalt
Chromium	Tin	Thallium
Lead	Barium	Tellurium
Selenium	Beryllium	Silver
Arsenic	Boron	

- Biocides (including pesticides) and their derivatives not appearing in list one
- Substances which have a deleterious effect on the taste or odour of groundwater, and compounds liable to cause the formation of such substances in such water and to render it unfit for human consumption.
- Toxic or persistent organic compounds of silicon, and substances which may cause the formation of such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances.
- Inorganic compounds of phosphorus and elemental phosphorus
- Fluorides
- Ammonia and nitrites



ENVIRONMENT
AGENCY

AUTHORISATION NO.	GWELF/50686
SCHEDULE NO.	GWELF/50686 01

RECORD OF DISPOSAL

Date of burial	8 th April 2001
Location <i>NGR</i>	TM 0120 2240
Area & depth of burial	2700m ³ (90m x 10m x 3m)
Nature of carcasses <i>Animal type & whether incinerated</i>	Pyre Ash: Cattle, pigs, sheep, goats
Approx. number of carcasses	153 cattle (33 pre-1996) 469 pigs 2230 sheep 2 goats
Reason for burial <i>Disease type</i>	Confirmed foot & mouth: Greenacres Farm 7 th March 2001 Old England's Farm 7 th March 2001 Marsh Farm 8 th March 2001 Wick Farm 9 th March 2001 Rye Farm 14 th March 2001
Materials added <i>e.g accelerants</i>	370 tonnes of wheat 100 bags of silage





GROUNDWATER REGULATIONS 1998
AUTHORISATION TO DISCHARGE IN/ON TO LAND
CERTIFICATE OF HOLDER

Part A

To: The Ministry of Defence

The Environment Agency hereby confirms that the above named is the registered holder of the Authorisation

Nature of Discharge/Disposal: Pyre Ash and Ancillary Waste from Foot and Mouth infected Farms into land

At: Middlewick Range, Colchester Essex

Note: This certificate should be kept with the Authorisation document for future reference. If you transfer responsibility for the discharge to someone else you must pass the Authorisation to them and tell the Agency within 21 days. Responsibility for the Authorisation cannot be disclaimed by the holder but the registration of the holder may be transferred to a successor. To do this please complete the form below, then tear it off and return it to the address shown. If you fail to transfer the Authorisation, even though you are no longer on the site, you may still be liable for prosecution for pollution. If you transfer the Authorisation but do not tell us, you will be committing an offence. In case of any queries please contact your local Environment Agency.

Part B Please complete in block capitals or type.

To: The Ministry of Defence

Groundwater Regulations 1998: Notice of Transfer of Authorisation to Discharge to land

Authorisation: GWELF/50686 **Name: Ministry of Defence**
Address: H.Q EATA
Gryphon House
Goojerat Barracks
Colchester
Essex CO2 7NZ

We hereby serve notice on the Agency that We are no longer the Holder of the above Authorisation which was transferred to:

Name of new holder: The Ministry of Agriculture Fisheries and Food

Address: Government Buildings
Beeches Road
Chelmsford
Essex
Post Code: CM1 2RU

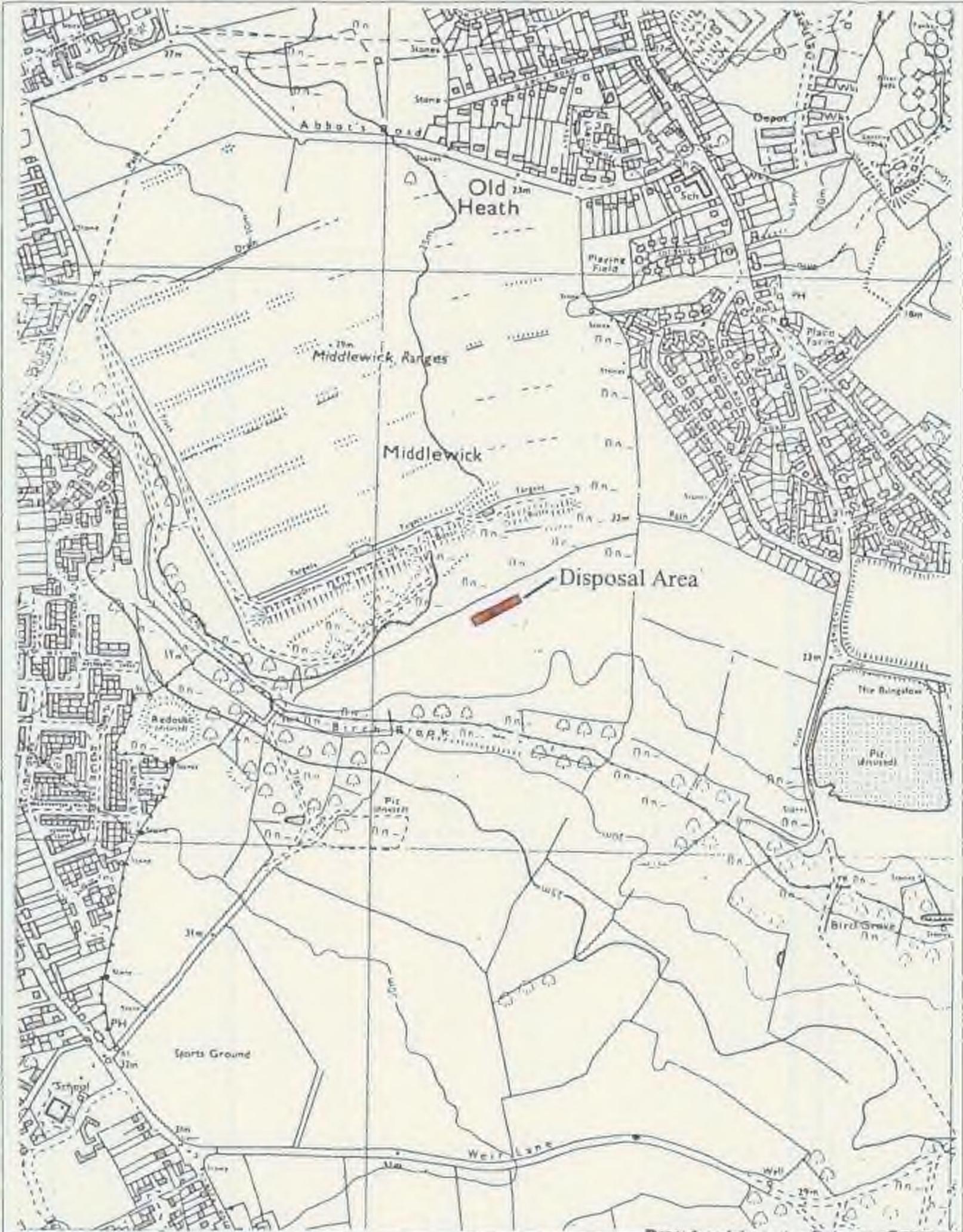
Date of Transfer to new Holder: 25th May 2001

Signed:

Name: (block capitals): D.R.C. BOWDON

Dated: 20 June 2001
Position: Agent.
(to be signed when signing on behalf of corporate bodies)





LOCATION PLAN
SCALE 1 : 10,000

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CONTAMINATED AREA MIDDLEWICK RANGE COLCHESTER

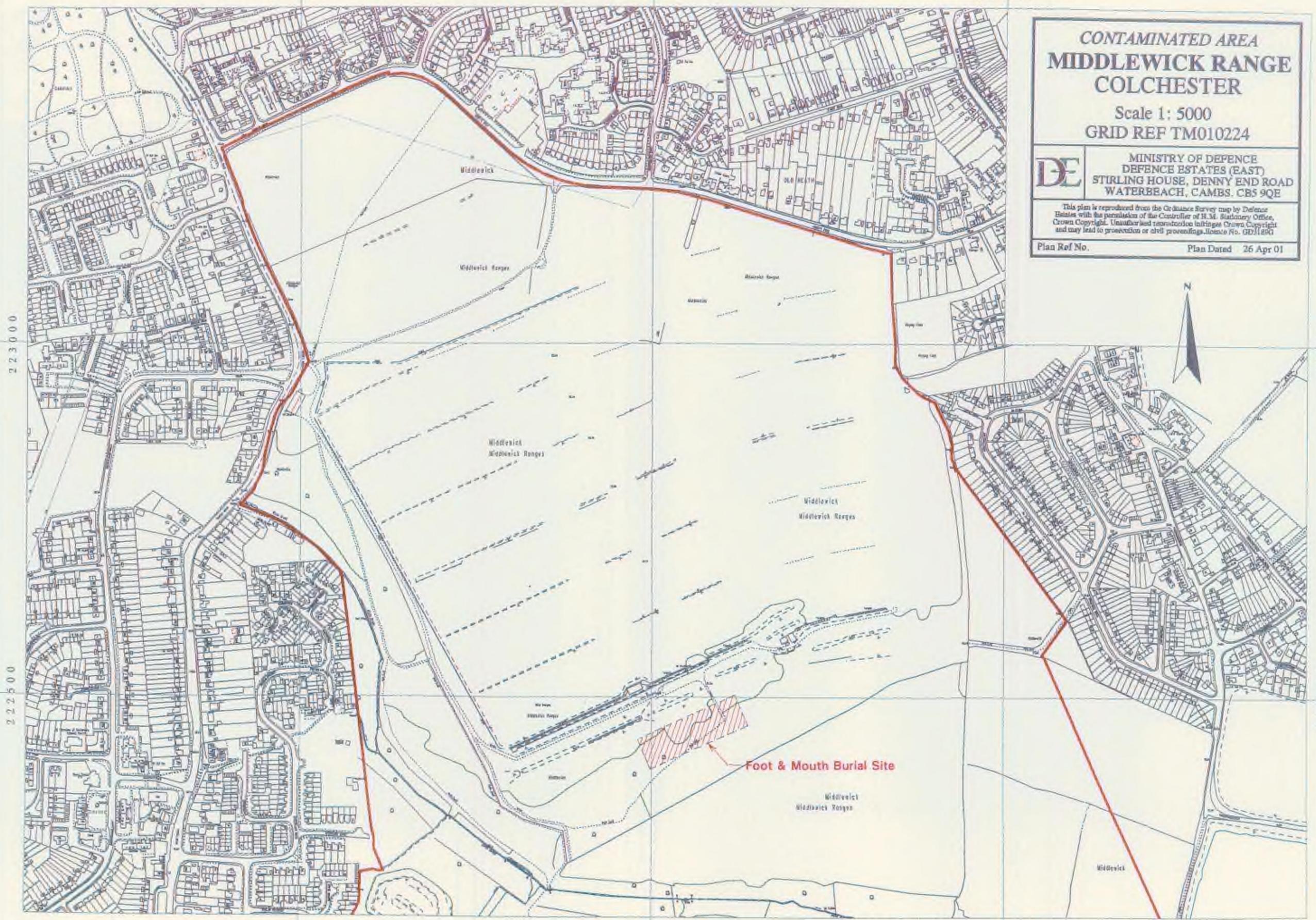
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MINISTRY OF DEFENCE
DEFENCE ESTATES (EAST)
STIRLING HOUSE, DENNY END ROAD
WATERBEACH, CAMBS. CB5 9QE

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Plan Ref No. _____ Plan Dated 26 Apr 01



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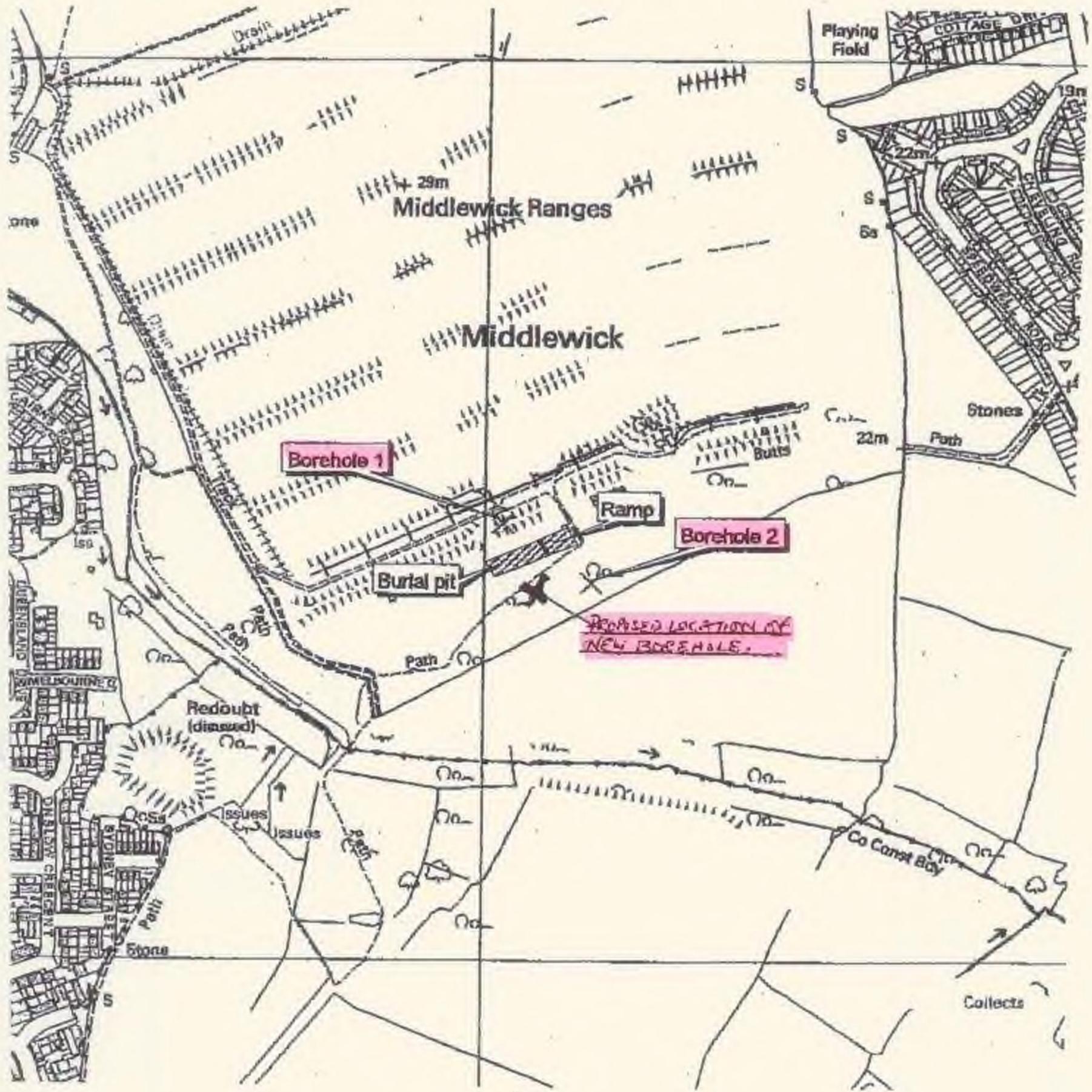
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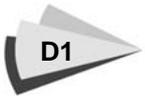
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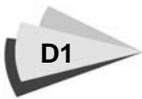
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Middlewick Ranges Foot & Mouth Disposal Site





Appendix D Response from APHA



From: OUTBREAK NDCC FIELD OPERATIONS [mailto:OUTBREAKNDCCFIELDOPERATIONS@apha.gsi.gov.uk]
Sent: 25 May 2018 11:02
To: [REDACTED]
Cc: [REDACTED]
Subject: [REDACTED] FW: Official - Action - Middlewick Ranges Colchester LQA phase 1(Foot and Mouth Burial Site for Assessment)

Good Morning Barry

Once again, please accept our apologies for the delay in acquiring this information!

As explained, our team inherited this “legacy” work – and since 2001, “corporate knowledge holders” have moved on from the department and computer systems have changed which has made it difficult to identify information.

We’ve reviewed our records and can confirm

- APHA have records that there was ash buried on this site that originated from animals culled during the 2001 foot and mouth disease outbreak
- Of the approximately 153 cattle buried, 33 were born before 1996
- As far as the risk of onward transmission of foot and mouth disease from the buried material, there is zero risk
- In relation to the 33 animals born before 1996, there is a negligible risk of bovine spongiform encephalitis (BSE – “mad cow”) prions being present (this could be the case if not all material was properly incinerated at the time)
- The main reason for sampling being undertaken at the site was to comply with Environment Agency ground water pollution legislation rather than for assessing animal disease risks
- We believe that the ground water authorisations on this site have now expired
- We’ve found evidence that the last sampling undertaken at the site was done in December 2011, with a report being produced in May 2012. A copy of the report is attached (we had to redact personal information, but you should have what you need here)
- The monitoring was carried out by ESG – now (<https://www.socotec.co.uk/>) on behalf of Moucel and it appears that at one point, there were 4 bore holes being monitored
- We only have reference to one bore hole on the last monitoring report – the grid reference for this is TM0220218800
- Bore holes 1-3 are referenced as being “obsolete”. We have no records if any of the bore holes have been capped – this could be an issue that needs to be looked at if the site is being on-sold

Please let me know if there is any further information you need in relation this site.

Regards

Matt

Matthew Price

Head of National Operational Capability and Field Response Team

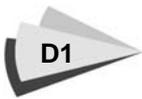
Contingency Planning

Animal and Plant Health Agency (APHA)

Telephone: 0208 026 3676 | Email: [REDACTED]

Website: www.gov.uk/apha | Twitter: [@APHAgovuk](https://twitter.com/APHAgovuk) | Facebook: [aphagov](https://www.facebook.com/aphagov)

Address: Area 5C Nobel House, 17 Smith Square, London, SW1P 3JR



From: Customer Advice
Sent: 20 March 2018 12:22
To: CSC TB DWO (APHA) <CSCCTB-DWO@apha.gsi.gov.uk>
Subject: Official - Action - Middlewick Ranges Colchester LQA phase 1(Foot and Mouth Burial Site for Assessment)

We are carrying out work on behalf of the MOD on the Middlewick Ranges. The site contacts have provided information on the presence of burial of ash from the carcasses of animals from the 2001 foot and mouth outbreak, together with wheat and silage. We understand that the licence for disposal is currently managed by the Animal & Plant Health Agency who have taken over from the Animal Health Veterinary Laboratories Agency

To support future management of the site, could you provide information on

1. Any monitoring carried out at the site (including any information on the boreholes shown to be present on the site including logs and soil and groundwater samples including the monitoring required as part of the licence)
2. Information on the status of the authorisation (e.g. Was it replaced following expiry on 01/05/2005 and any agreement with the Environment Agency on returning the licence after 2005).
3. Any restrictions which remain on activities in the area and information on any risks that need to be managed in relation to this disposal.

Regards
Barry

Barry Mitcheson CChem, SiLC, ASOBRA (Human Health and Vapour), RSOBRA (Gas and Groundwater)
Principal Consultant
Floor 12, 25 Canada Square, Canary Wharf, London E14 5LQ, United Kingdom

www.woodplc.com

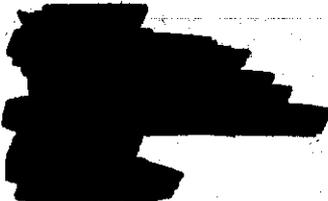
Animal and Plant Health Agency (APHA). This email and any attachments are intended for the named recipient only. If you have received it in error you have no authority to use, disclose, store or copy any of its contents and you should destroy it and inform the sender. Although this email and associated attachments will have been checked for viruses whilst within APHA systems, we cannot accept responsibility once it has left our systems. Communications on APHA computer systems may be monitored and/or recorded to secure the effective operation of the system and for lawful purposes.

TEST REPORT

WATER SAMPLE ANALYSIS



Report No. EXR/128705 (Ver. 1)



Site: Middlewick Range

The 1 sample described in this report were registered for analysis by ESG on 05-Dec-2011. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 16-Dec-2011

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited. Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

- Table 1 Main Analysis Results (Pages 2 to 3)
- GC-FID Chromatograms (Page 4)
- Analytical and Deviating Sample Overview (Page 5)
- Table of Method Descriptions (Page 6)
- Table of Report Notes (Page 7)

On behalf of
ESG:



Operations Manager

Date of Issue: 16-Dec-2011

Tests marked ^W have been subcontracted to another laboratory.

ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

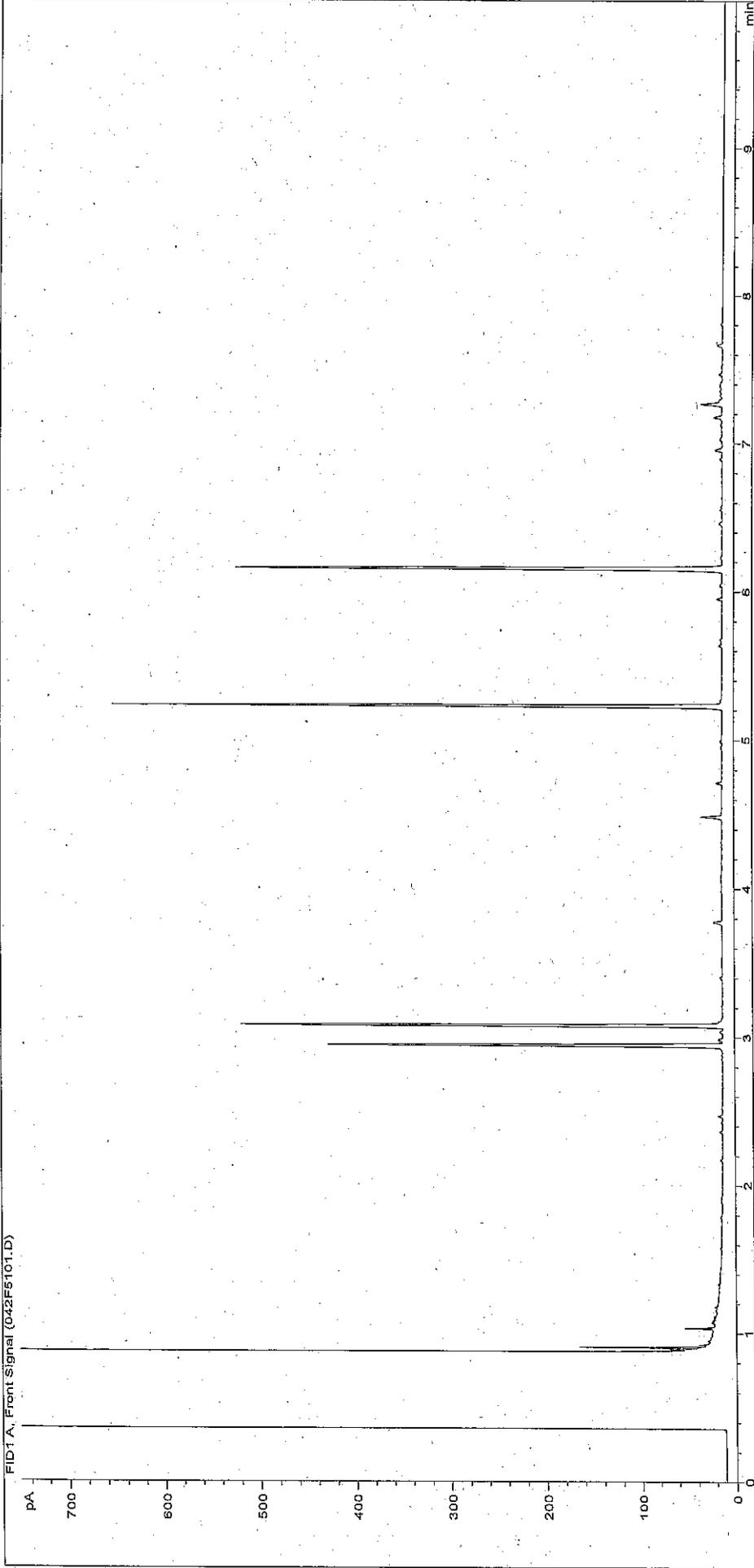
Units :	mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
	Method Codes :	WSLM12	WSLM17	KONENS	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPWATVAR	KONENS	KONENS	WLSLM11	WLSLM13	TPHFID	ICPWATVAR						
Method Reporting Limits :	2	2	1	3	1	1	1	1	1	0.01	0.01	5	0.1	0.01	0.01	0.1	0.1	0.1	0.1	0.1	0.1	0.1
UKAS Accredited :	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
LAB ID Number EX/	1153315																					
Client Sample Description	EID0004																					
Sample Date	01-Dec-11																					
Total Alkalinity as CaCO3 w	48																					
Total Acidity as CaCO3 w	Nil																					
Chloride as Cl w	41																					
Total Sulphur as SO4 (Total) a	52																					
Calcium as Ca (Total) a	34																					
Magnesium as Mg (Total) a	7																					
Sodium as Na (Total) a	18																					
Potassium as K (Total) a	3																					
PAH GC-MS (16) o	Req																					
Ammoniacal Nitrogen as N	0.02																					
Nitrite as N	0.02																					
Nitrate as N	6.0																					
Chemical Oxygen Demand (Settled)	18																					
Total Organic Carbon w	4.9																					
TPH GC	<0.01																					
Phosphorus as P (Total) a	<0.1																					

Water Sample Analysis		Date Printed	16-Dec-2011
		Report Number	EXR/128705
		Table Number	1

Client Name Contact			Middlewick Range

Units : mg/l Method Codes : WSLM20 Method Reporting Limits : 2 UKAS Accredited : No	Biochemical Oxygen Demand w	<2.0	Water Sample Analysis
LAB ID Number EX/	1153315	EID0004	Date Printed Report Number Table Number
Sample Date	01-Dec-11	[REDACTED]	16-Dec-2011 EXR/128705 1
Client Sample Description	[REDACTED]	[REDACTED]	Middlewick Range
Client Name Contact	[REDACTED]	[REDACTED]	[REDACTED]

Petroleum Hydrocarbons (C8 to C40) by GC/FID



Sample ID: EX1153315
Multiplier: 0.005
Dilution: 1
Acquisition Method: TPH_RUNF.M
Acquisition Date/Time: 15-Dec-11, 23:55:10
Datafile: D:\TES\DATA\Y2011\121511TPH_GC16\121511 2011-12-15 08-44-34\042F5101.D

Job Number: W12_8705
Client: [REDACTED] Middlewick Range
Site: Middlewick Range
Client Sample Ref: EID0004

Where individual results are flagged see report notes for status.

Customer ██████████
Site Middlewick Range
Report No W128705

Consignment No W31486
 Date Logged 05-Dec-2011

Report Due 28-Dec-2011

ID Number	Description	MethodID	Sampled
EX/1153315	Accredited to ISO17025		01/12/11
	EID0004		
		CUSTSERV	Report B
		ICP/AT/VA	Total Sulphur as SO4 (Tot) VAR
			Calcium as Ca (Total) VAR
			Magnesium as Mg (Total) VAR
			Sodium as Na (Total) VAR
			Potassium as K (Total) VAR
			Phosphorus as P (Total) VAR
		KONENS	Chloride as Cl (Kone)
			Ammoniacal Nitrogen (Kone)
			Nitrite as N (Kone)
			Nitrate as N (Kone calc)
		PAHMSW	PAH GC-MS (16)
		TPHFID	TPH GC
		WSLM11	Chemical Oxygen Demand (Settled)
		WSLM12	Total Alkalinity as CaCO3
		WSLM13	Total Organic Carbon
		WSLM17	Total Acidity as CaCO3
		WSLM20	Biochemical Oxygen Demand

Note: For analysis where the Report Due date is greater than 7 days (PAH, Pesticides, PCB, Phenols, Herbicides) or 2 days (BOD) after the sampling date, although we will do our utmost to prioritise your samples, they may become deviant whilst being processed in the Laboratory.

In this instance, please contact the Laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
^	Analysis Subcontracted

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	PAHMSW	As Received	Determination of PolyAromatic Hydrocarbons in water by pentane extraction GCMS quantitation
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM11	As Received	Acid Dichromate oxidation of the sample followed by colorimetric analysis.
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM13	As Received	Instrumental analysis using acid/persulphate digestion and dispersive IR detection.
Water	WSLM17	As Received	Titration with Sodium Hydroxide to required pH
Water	WSLM20	As Received	Determination of Biological Oxygen Demand using 5 day incubation and dissolved oxygen probe

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on an air dried basis
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm³@ 15°C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile

CR Denotes Crocidolite

AM Denotes Amosite

NAIS No Asbestos Identified in Sample

Symbol Reference

[^] Sub-contracted analysis. Note: The accreditation status is that assigned by the subcontract laboratory.

^{\$\$} Unable to analyse due to the nature of the sample

[¶] Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

[¥] Results for guidance only due to possible interference

[&] Blank corrected result

^{I.S} Insufficient sample to complete requested analysis

^{I.S(g)} Insufficient sample to re-analyse, results for guidance only

^{Intf} Unable to analyse due to interferences

^{N.D} Not determined

^{N.Det} Not detected

^{Req} Analysis requested, see attached sheets for results

^P Raised detection limit due to nature of the sample

* All accreditation has been removed by the laboratory for this result

[‡] MCERTS accreditation has been removed for this result

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

END OF REPORT

Where individual results are flagged see report notes for status.



Appendix E Risk assessment Approach

Preliminary Risk Assessment Methodology

Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risks to receptors. The receptor may be human health, a controlled water, a sensitive local ecosystem or even future construction materials. Receptors can be linked with the hazard under consideration via one or several exposure pathways (e.g. the pathway of direct contact). Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway and receptor, there can be no risk. Thus, the mere presence of a hazard at a site does not mean that there will necessarily be attendant risks. The following risk assessment thus focuses on those parts of the site where hazards or potential hazards have been identified and is not general to the whole site.

Hazards

Potential sources of contamination are identified for the site, based on a review of the current and previous site uses. Not only the nature but also the likely extent of any contamination is considered, e.g. whether such contamination is likely to be localised or widespread.

Receptors

The varying effects of a hazard on individual receptors depends largely on the sensitivity of the target. Receptors include any people, animal or plant population, or natural or economic resources within the range of the source which are connected to the source by the transport pathway. Receptors can, in addition, extend to remediation processes and future construction materials that may be adversely affected by on-site contamination. In general, however, receptors can be divided into a number of groups depending on the final use of the site.

Pathways

The mere presence of contamination does not infer a risk. The exposure pathway determines the dose delivered to the receptor and the effective dose determines the extent of the adverse effect on the receptor. The pathway which transports the contaminants to the receptor or target generally involves conveyance via soil, water or air.

Exposure Assessment

By considering the source, pathway and receptor, an assessment is made for each contaminant on a receptor by receptor basis with reference to the significance and degree of the risk. In assessing this information, a measure is made of whether the source contamination can reach a receptor, determining whether it is of a major or minor significance. The exposure risks are assessed against the present site conditions.

A preliminary risk assessment has been undertaken for these potential source-pathway-receptor linkages to identify potentially unacceptable risks on a qualitative basis. This approach is based on DEFRA and CIRIA guidance on risk assessment and Model Procedures. Risk is based on a consideration of both:

The likelihood of an event (probability); [takes into account both the presence of the hazard and receptor and the integrity of the pathway].

The severity of the potential consequence [takes into account both the potential severity of the hazard and the sensitivity of the receptor].

The definitions of the classification of consequence and likelihood are given below

Likelihood of Contaminant Linkage

High likelihood	An event is very likely to occur in the short term, and is almost inevitable over the long term OR there is evidence at the receptor of harm or pollution.
Likely	It is probable than an event will occur. It is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	Circumstances are possible under which an event could occur. It is by no means certain that even over a longer period such an event would take place, and less likely in the short term.
Unlikely	It is improbable that an event would occur even in the very long term.

Potential Consequence of Contaminant Linkage

Severe	Acute risks to human health. Short-term risk of pollution of sensitive water resource (e.g. major spillage into controlled waters). Impact on controlled waters e.g. large scale pollution or very high levels of contamination. Catastrophic damage to buildings or property (e.g. explosion causing building collapse). Ecological system effects – irreversible adverse changes to a protected location. Immediate risks.
Medium	Chronic risks to human health. Pollution of sensitive water resources (e.g. leaching of contaminants into controlled waters). Ecological system effects – substantial adverse changes to a protected location. Significant damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage).
Mild	Non-permanent health effects to human health. Pollution of non-sensitive water resources (e.g. pollution of non-classified groundwater). Damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage). Substantial damage to non-sensitive environments (unprotected ecosystems e.g. crops).
Minor/ Negligible	Non-permanent health effects to human health (easily prevented by appropriate use of PPE). Minor pollution to non-sensitive water resources. Minor damage to non-sensitive environments (unprotected ecosystems e.g. crops). Easily repairable effects of damage to buildings, structures, services or the environment (e.g. discoloration of concrete, loss of plants in a landscaping scheme).

In order to then determine the risk to the identified receptor, both the likelihood and severity of the potential hazard is input into a risk assessment matrix as follows:

Potential Significance of Contaminant Linkage Matrix

Matrix		Likelihood			
		High Likelihood	Likely	Low Likelihood	Unlikely
Potential consequence	Severe	Very High	High	Moderate	Moderate/Low
	Medium	High	Moderate	Moderate/Low	Low
	Mild	Moderate	Moderate/Low	Low	Negligible
	Minor / Negligible	Moderate/Low	Low	Negligible	Negligible



The overall definition of risk is given below

Potential Significance

Very High Risk	Severe harm to a receptor may already be occurring OR a high likelihood that severe harm will arise to a receptor, unless immediate remedial works/mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions/mitigation measures are undertaken. Remedial works may be required in the short term, but likely to be required over the long term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be medium. Some remedial works may be required in the long term.
Low Risk	Possible that harm could arise to a receptor. Such harm would at worst normally be mild.
Negligible	Low likelihood that harm could arise to a receptor. Such harm unlikely to be any worse than mild.

