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9 March 2015

Ref. FOI2015/02511

Dear

Thank you for your Email of 4 March 2015 requesting the following information:

"It is proposed to develop the attached site (Station Lane, Old Dalby, Leics) for housing and we have been given to understand that 20 year ago some intrusive investigation and desk studies have been carried out by the MOD and site was given a clean bill of health. The local LA planning department have requested a new site investigation be to be carried out and any information you may be able to provide us would be useful."

I am treating your correspondence as a request for information under the Freedom of Information Act 2000 (FOIA).

A search for the information has now been completed within the Ministry of Defence, and I can confirm that some information, in scope of your request is held.

The information you have requested can be found enclosed, but some of the information falls entirely within the scope of the absolute exemptions provided for at sections 40 (Personal Data) of the FOIA and has been redacted.

Section 40(2) has been applied to some of the information in order to protect personal information as governed by the Data Protection Act 1998. Section 40 is an absolute exemption and there is therefore no requirement to consider the public interest in making a decision to withhold the information.

Yours sincerely,

DIO Secretariat

If you are not satisfied with this response or you wish to complain about any aspect of the handling of your request, then you should contact DIO Secretariat in the first instance. If informal resolution is not possible and you are still dissatisfied then you may apply for an independent internal review by contacting the Information Rights Compliance team, 1st Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail CIO-FOI-IR@mod.uk). Please note that any request for an internal review must be made within 40 working days of the date on which the attempt to reach informal resolution has come to an end.

If you remain dissatisfied following an internal review, you may take your complaint to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not investigate your case until the MOD internal review process has been completed. Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website, <http://www.ico.org.uk>.

DEFENCE ESTATE ORGANISATION

OLD DALBY SUB-DEPOT (ABSDA)

**LAND QUALITY ASSESSMENT
PHASE ONE AND TWO:
DESK STUDY AND INTRUSIVE SURVEY
FACTUAL REPORT**

PROJECT NO: 07138 - FINAL REPORT

**Technical Report
February 1999
by
Aspinwall & Company Ltd**

Defence Estate Organisation
Blakemore Drive
Sutton Coldfield
West Midlands
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Prepared by Aspinwall & Company Limited
for the Defence Estate Organisation
under Commission WS13/1982/2

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REPORT RELEASE SHEET
DEFENCE ESTATE ORGANISATION

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LAND QUALITY ASSESSMENT
PHASE ONE AND TWO:
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Contents

Chapter	Page
1 Introduction	1
2 Phase I - Desk Study Assessment	3
3 Phase II - Intrusive Investigation	11
4 References	16

Illustrations

- Figure 1 : Site location plan
- Figure 2 : Site layout plan
- Figure 3 : Exploratory hole location
- Figure 4 : Borehole sampling location
- Figure 5 : Surface water sampling locations
- Plate 1 : Firing range
- Plate 2 : POL area

Appendix

- 1 Asbestos Materials Register
- 2 Trial Pit Logs
- 3 Analytical Results and Method - Geochem Group Ltd,
August 1998

Introduction

1

- 1.1 In September 1996 a Phase 1 Desk Study was undertaken at the Old Dalby Army Base Storage and Distribution Agency (ABSDA) Site by W.S. Atkins Midlands (WSAM) (Ref 1). This desk study concluded that, based on its historical use, the site had potential to be contaminated and recommended that an intrusive investigation be carried out in order to identify the nature, extent and likely significance of the contamination at the site. WSAM carried out a preliminary Phase I site investigation and concluded that a further and more detailed site investigation was needed in order to clarify the environmental risk associated with the site.
- 1.2 In May 1998 Aspinwall & Company (Aspinwall) was commissioned by the Defence Estate Organisation (DEO) to carry out a Phase I and II Desk Study and Intrusive Survey in connection with undertaking a Land Quality Assessment (LQA) at the site. The Phase I part of this LQA involved a desk-based review of existing information and environmental conditions at the site, as well as site reconnaissance. This resulted in the requirement for a Phase II (intrusive) investigation.

Objectives

- 1.3 The objectives of this Land Quality Assessment were to undertake a desk based review of existing and additional information, followed by an intrusive investigation, in order to determine the environmental quality of the land at the site and identify the potential for any associated health or environmental risks. The objectives of the Phase I part of this factual report can be summarised as follows:
- to establish the environmental setting of the site in relation to its geology, hydrogeology and hydrology;
 - to establish the sources of potential contamination at the site as a result of its current and previous use; and
 - to use this information to determine whether the proposed scope of the intrusive investigation was sufficient and to amend it as necessary.

Methodology - Desk Study

- 1.4 The assessment involved a review of the existing Phase I and II reports (Ref 1 and 2) completed by WS Atkins (Midlands) (WSAM) during 1996/97, which included background information about the site from both public and Ministry of Defence (MOD) sources together with results of intrusive investigations. Further information on site sensitivity was obtained from geological, hydrological and hydrogeological maps and memoirs, and information held by the Environment Agency. The site reconnaissance for the current LQA was carried out prior to the

Introduction *continued*

1

intrusive investigation. Details relating to the site's history were obtained from the Army Historical Branch, DERA Radiation Protection Service (DRPS) and conversations with site personnel to confirm and supplement data in the WSAM reports. The methodology for the Phase II work is detailed elsewhere in this report.

- 1.5 This factual report, combining both Phases I and II of this LQA, is structured as follows. Chapter 2 presents the findings of the Desk Study (Phase I). Chapter 3 provides details of the intrusive investigation, a description of the works carried out, summary of ground conditions, details of sampling techniques, analytical procedures, and sample preservation and preparation methods, together with details of laboratory chemical analysis suites. Trial pit and window sample records and analytical test results are provided as appendices.

Phase I – Desk Study Assessment

2

- 2.1 This chapter is based on data contained within the WSAM reports (Ref 1 and 2) together with additional researched information obtained by Aspinwall and Company during this commission.

Site Location

- 2.2 The Old Dalby ABSDA site is situated approximately 1 Kilometre (km) to the east of Old Dalby, between Loughborough and Melton Mowbray, Leicestershire at Grid Reference 684 239 (Ref 3). The site is located in a rural area surrounded by open agricultural land. A site location plan is shown in Figure 1.

Site Description

- 2.3 The site covers an area of approximately 20 hectares and consists predominantly of large warehouses and areas of hardstanding, with some open ground and grassed areas. A Site Layout Plan is shown in Figure 2. The site slopes gently from north to south at a regular gradient, however the central Petrol, Oil and Lubricant (POL) area is slightly raised and levelled above surrounding topography. An abandoned rifle range in the south east corner of the site is an open area of overgrown ground and is raised to a level several metres above the remainder of the site.
- 2.4 The site is surrounded by a 2 Metre (m) high security fence and access is via the main security gatehouse. To the east, the site is bordered by a small industrial estate which previously formed the Army Base Repair Organisation (ABRO) section of the Sub-depot. Station Lane separates the site to the north from the open fields which otherwise surround it. A small group of terraced houses lies to the west of the site.
- 2.5 A large proportion of the area occupied by the site consists of brick-built warehouses surrounded by tarmac or concrete hardstanding, with some grass verges and several large emergency water supply tanks. Other areas, particularly in the north west and south west consist of concrete pads surrounded by rough overgrown ground, which are used as car parks. The POL area close to the centre of the site is a slightly raised area of tarmac and compacted roadstone on which is located the vehicle re-fuelling and lubrication point. This area also currently acts as a storage area for a number of disused vehicles and trailers.
- 2.6 In the extreme west of the site, two separately fenced compounds are sited. The radar test compound is the southern most and is made up of overgrown rough ground with areas of concrete hardstanding and small brick sheds, one having being used to store salt. Directly adjacent to this to the north is the MOWLEM compound which is largely concrete hardstanding with an office building and several small outbuildings. Scrap metal is currently stored here, and an above ground diesel tank (bunded and empty) is located in the south-east corner.

Phase I - Desk Study Assessment *continued* 2

- 2.7 In the south east corner of the site is an abandoned rifle range, which is currently heavily overgrown. This area has been built up above the adjacent hillside and is consequently several metres above the level of the rest of the site in this area.

Site History

- 2.8 Information in the site history is contained within an earlier Phase 1 study of the site (Ref 1) prepared by WSAM. Further details were also provided following consultation with the Army Historical Branch.
- 2.9 Map records from 1887 show the site as part of an extensive area of farmland, until development in the early 1940s by the MOD. Old Dalby Lodge was located at the current site of the MOWLEM compound, with a row of cottages and several small "pits" directly to the south. A major railway line ran approximately northwest to southeast to the southwest of the site, with a branch-line to the east, directly south of the site. A small reservoir was also noted to the east of the site. There is little change in the area shown on map records, up to and including the 1952 edition. Developments on the site itself are not shown.
- 2.10 The Ministry of Defence (MOD) site was initially constructed as a Vehicle Depot and opened in December 1940, but its role rapidly changed due to the demand for storage of technical equipment, and the site had become a large "Central Ordnance Depot" by the end of 1941. During the war, workshop machinery and trailers, machine tools and optical and electrical test equipment became the main types of equipment stored. A German prisoner of war camp was also sited at Old Dalby. The adjacent ABRO section of the sub-depot was primarily used for the maintenance and repair of military equipment and vehicles, while the ABSDA section was primarily used for storage, as well as housing a Royal Electrical and Mechanical Engineers (REME) vehicle workshop.
- 2.11 In 1956, the "Central Ordnance Depot" was redesignated as a "Technical Stores Depot" and held equipment such as machinery and spares, vehicle fitments, map reproduction and cinematographic equipment, optical and fire control stores, bakery equipment, boot and textile repair machinery, baling, laundry and bath equipment, industrial gas refrigeration and air conditioning equipment, and electrical test equipment. Radar equipment was also retained, predominantly between 1959 and 1968. It appears that railway sidings from the main rail line ran across the site to the boiler house and along the western side of the site and may have been used for the transfer of coal and goods.
- 2.12 Utilisation of the site for storage and equipment maintenance has continued since the 1960s, in addition to other now abandoned uses of the buildings, including an indoor rifle range and the moulding of fibreglass canoes. The ABRO section of the sub-depot has been sold and now comprises a small industrial estate. The usage of the ABSDA section of the site has essentially remained unchanged to date.

Phase I – Desk Study Assessment *continued* **2****Summary of Uses**

- 2.13 Different areas of the site have been used for a wide variety of activities relating to warehousing of military stores and equipment. Historical activities relevant to a LQA are as follows:

Building / Area	Past / present use	Chemicals potentially present
Building No.3	Chemical storage and usage / workshop / rifle range / acid neutralisation pit (adjacent)	Acids / lime / metals / sulphates
Building No.7	Fibreglass moulding	Fibreglass resins / solvents
Building No.20	Vehicle servicing and washing	Oil / solvents / detergents
Building No.24	Boiler House	Coal / oil / various chemicals
Building No.36	Oil / chemical storage	Oils / solvents
POL point	Fuel / oil storage, vehicle storage / refuelling	Fuels / oils
Area between Building Nos.4 and 8	Vehicle parking / storage	Oils / fuels
Area to south-west of Building No.5	Disposal of spent battery acid in brick pit	Acids / sulphate / metals
Areas to east and south of Building No.7	Disposal of paint / solvents	Solvents / metals
Area between Building Nos.7 and 27	Vehicle / equipment storage	Oils / metals / ash / various chemicals
Area to east of Building No.24	Equipment sorting / storage	Oils / metals / acids
Area to south of Building No.58	Chemical storage	Acids / ash / salt / solvents / degreasants / asbestos

Phase I – Desk Study Assessment *continued* 2

Fuel Storage

- 2.14 There were originally four underground fuel storage tanks sited beneath the refuelling point in the POL area. Two of these tanks previously contained petrol and have now been infilled. The remaining two contain DERV and agricultural (red) diesel fuels and are currently in use. The exact locations of the tanks are unknown to site staff and no plans were made available during the course of the site investigation.

Asbestos

- 2.15 The site has been occupied by warehouse buildings for over half a century some of which still have asbestos cement roofs, while others have been replaced. Asbestos was used as insulation material in a number of buildings. However, removal of the majority of this material has taken place. Full details of site asbestos is given on the Asbestos Materials Register in Appendix 1.

Site Services

- 2.16 Details of site services were obtained from a previous survey carried out on the site by WSAM (Ref 1).
- 2.17 There is a comprehensive system of electrical and telecom services. A mains overhead low and high voltage supply connects to a transformer to the north-east of the site in the former ABRO section and a 11/6.6 kiloVolt(kV) supply reaches the ABSDA site to the north of building No. 3. A network of high and low voltage electrical power supply and street lighting cables exists across the site. British Telecom cables across the site originate from a surface joint box to the north east of the former building No. 13 on the old ABRO section of the site.
- 2.18 A live 6" water main passes along the northern and beyond the eastern boundaries of the site. A medium pressure supply of gas runs parallel with the southern side of Station Road and a supply from this main to building No 39 appears to be the only connection on to the site.

Drainage

- 2.19 It appears that surface water draining on to the site from the south east passes around the eastern and western sides via culverts and then into a storm sewer running along Station Lane/Dalby Lane to the north of the site. This then discharges into the Dalby Brook to the north of the site. Foul effluent is discharged to a sewage treatment works to the north east of the site. There are currently three oil interceptors in use on the site, two of which discharge to foul

Phase I – Desk Study Assessment *continued* 2

sewer and the other to a storm sewer. In addition there are two interceptors situated to the east of building No 3 and to the south of building No 5; the nature of their connection into the site drainage system and their current state of repair is unknown.

Areas of Suspected Infill or Waste Disposal

- 2.20 The raised area of the abandoned rifle range in the south east of the site is understood to have been constructed from the tipping of excavated material obtained during the construction of the former building No 9.
- 2.21 The disposal of spent vehicle batteries and scrap materials took place on land to the west of Building Nos 7 and 27. Metal fragments mixed with ash are known to have been disposed of on the embankment of ground surrounding the areas now used for scrap metal storage (former coal stockpile to the east of the main Boiler House) (Ref 1) and may also have been deposited on paths or spread around other areas of the site. No other areas of suspected infill or dumping have been identified.

Radioactivity and Explosive Ordnance

- 2.22 There is no evidence that live munitions were ever stored at the depot, although small arms and armament stores are known to have been kept at the site during the Second World War. Records indicate that detection equipment, potentially including radioactive sources, has been stored at the depot. It appears unlikely that with strict storage and handling procedures in place, any radioactive material would have been discarded at any time or would have remained following the movement of the stores from the depot in 1968.
- 2.23 The DRPS undertook a radiological survey over a portion of the ABSDA site during a survey of the adjacent ABRO site in February and March 1996 (Ref 4). The following buildings and surrounding ground were surveyed:
- Building No.7;
 - Ground between Building Nos. 6 and 9;
 - Ground occupied by the former outdoor firing range located to the east of Building No.7.
- 2.24 No radiological contamination was detected within the site. Some slight radiological contamination in the form of ash and clinker was detected in an area to the east of the south-east corner of the site.

Phase I – Desk Study Assessment *continued* 2

Previous Investigations

- 2.25 Four previous ground investigations are known to have been carried out on the site. The earliest of these was carried out by Soil Mechanics Limited and involved the installation of seven boreholes to a depth of 20m; the locations of these are unknown. This investigation identified clay of variable composition and groundwater strikes between 2 and 4m depth.
- 2.26 In April 1981, Geological Investigations Limited constructed six boreholes to a depth of 10m at unknown locations on the site. This survey encountered similar conditions to the previous site investigation with some gypsum crystals and ironstone nodules within the clay between 2m and 6m. Groundwater strikes were noted between 0.5 and 7.3m.
- 2.27 Geotechnics installed 3 boreholes to a depth of 10m and constructed six trial pits within the Old Dalby site in 1988. Descriptions of ground were similar to previous investigations, but more lamination of the clays were described and groundwater strikes identified between 4.1 and 6.3m. Made ground was encountered and was described as coal, ash, clinker, brick rubble and gravel to depths between 0.25 and 0.8m below ground level.
- 2.28 WS Atkins (Midlands) (WSAM) carried out a Phase 2 investigation (Ref 2) of the site in 1996, which was based upon the findings of an earlier Phase I Assessment, (Ref 1). This involved installing ten boreholes to a depth of 10m and nine window sample holes. These encountered the Lower Lias Clays generally, less than 0.4m of Made Ground consisting of ash, slag or brick rubble. A total of 58 soil samples were taken and tested for a suite of analyses including volatile organic compounds (VOCs) and petroleum hydrocarbons. In addition, gas and groundwater monitoring standpipes were installed in the ten boreholes and surface water samples were taken from three locations along the Dalby Brook, into which surface water from the site discharges.
- 2.29 The W S Atkins study concluded that limited soil and groundwater contamination was present at the site, and most soil contamination occurred as near surface metal contamination and associated with the disposal of various materials. Slightly elevated chromium contamination was noted in groundwater samples in addition to significant contamination by naphthalene in one borehole. Surface water quality was concluded to be satisfactory. This Phase II Report however lacked sufficient interpretation of data, discussion of methodology or conclusions and contained only broad recommendations for site remediation and risk control.

Phase I – Desk Study Assessment *continued* 2

Environmental Setting

Geology

- 2.30 The BGS 1:50,000 sheet 142 (Ref 5) shows the site to be underlain by Jurassic Lower Lias clays of up to 180m thickness, with sandy shales, limestones and ferruginous limestones at various depths. These strata are overlain by thin drift deposits in places. Immediately to the south of the site Middle Lias sandy clays are exposed, although these are largely overlain by glacial boulder clay in this area. There is no evidence of faulting within the strata on which the site is constructed, although there is some tensional faulting within these strata to the east.

Mining

- 2.31 There is no evidence of coal mining activity in the locality of the site, although it lies within an area for which a licence to extract coal has been granted. Ironstone workings are known to have existed at a location approximately 1.5 km to the south east of the site and a small clay pit was also situated approximately 300m to the south. There are no workings recorded within the area occupied by the site, although gypsum mines are sited approximately 2.5 km to the south east.

Hydrogeology

- 2.32 The area is classified on the National Rivers Authority (NRA) (now the Environment Agency (EA)) groundwater vulnerability map of England and Wales (Ref 6) as a non-aquifer in terms of sensitivity to surface contaminants, although the NRA regional Appendix, Severn Trent Region (Ref 7) indicates that the limestone bands within the Lias clay can yield significant quantities of water. Movement of groundwater may however take place via secondary permeability and fissures in limestone horizons. Earlier investigations have also indicated that discontinuous shallow perched horizons of groundwater exist within the upper weathered surface of the Lias Clay. Searches have not identified any licensed or unlicensed groundwater abstractions points in the vicinity of the site.

Hydrology

- 2.33 Water has been observed to emerge from the base of the embankment which forms the former rifle range and springs have issued from the ground at other locations on the site (Ref 1). These are likely to be associated with the geological boundary between the Lower Lias clays and the Middle Lias sandy clays. Drainage of surface water is in an approximately north to south direction, and it enters at

Phase I - Desk Study Assessment *continued* 2

least one dyke to the north which flows into Dalby Brook. This watercourse has a 1 in 5 year flood flow which is allegedly partially due to increased run-off from the sub-depot. Dalby Brook in turn flows into the River Smite which has a water quality classification of 1B or "Good" (Ref 8).

Phase II – Intrusive Investigation

3

Scope of Works

- 3.1 The intrusive investigation involved the excavation of 11 trial pits and the drilling of 21 window sample holes. The locations of these excavations were focused on areas of potential contamination from boiler house wastes, vehicle storage and refuelling and the disposal of waste materials such as spent batteries identified during the Phase I Desk Study. Figure 3 shows the sampling locations.

Trial Pit/ Window sample	Purpose
TP1, TP2, TP3, TP4	To identify the nature of material in the area of the firing range, and the presence and nature of any contamination pertaining to potential fill material.
TP5 - TP8, TP11, WS1 - WS4, WS16 - WS 21	To identify the presence and nature of any contamination arising from the disposal or storage of boiler ash and other miscellaneous materials.
TP9, TP10, WS5 - WS15	To identify the presence and nature of any contamination arising from leakage or spillage of vehicle lubrication oils and fuels.

- 3.2 A flame ionisation detector (FID) survey was carried out on the excavated material and around the location of the excavations to identify the presence of any flammable gases within the soil. A radiation survey was also carried out around the excavations using a 44B probe and mini-monitor. Further details on the scope of works undertaken are provided below.

Quality Control

- 3.3 Soil samples were collected from excavated material or from shallow depths in the trial pits. Samples were taken where contaminated material was identified visually or where there was considered to be potential for contamination. This generally consisted of at least one sample of near-surface material (usually fill material) with a second sample from underlying natural ground (clays). Further samples were taken where there was a variation in fill material or contamination was identified visually. The approximate depth from which samples were collected is shown in the trial pit logs in Appendix 2. Samples were taken to provide representative vertical and lateral coverage as well as from material where visual or olfactory evidence of contamination was encountered.
- 3.4 For soil samples, approximately 0.5 to 1 Kilogram (kg) of soil was placed in sealed polythene bags. Soil samples were collected using a stainless steel trowel; the

Phase II – Intrusive Investigation *continued* 3

trowel was rinsed with water to ensure removal of any residual material and dried between each sampling occasion. Where clay samples were collected, any parts of the sample which may have been in contact with the JCB bucket were removed to prevent cross-contamination.

- 3.5 Groundwater samples were collected using dedicated water tubing fitted with foot valves. Boreholes were purged for 10 minutes prior to sampling to remove approximately three times the volume of standing water in the borehole. Wellhead measurements were taken of pH and electrical conductivity during purging, and continued until measurements had stabilised. Surface water samples were taken using a glass bailer, which was rinsed through with de-ionised water between each sample being taken.
- 3.6 One litre clear glass containers were used for the majority of contaminants; plastic containers with sulphuric acid preservative were used for ammoniacal nitrogen and phenols. One duplicate sample was taken (sample labelled BH5 is a duplicate of the sample from borehole 12) to ensure consistency in analytical methods.
- 3.7 All samples were transferred immediately to appropriate storage containers kept in cool boxes packed with frozen freezer packs, and consequently kept cool before being sent to the laboratory at the end of the site investigation.
- 3.8 The samples were sent to the Geochem Group Limited Laboratories in Chester who are UKAS (UK Accreditation Service) accredited for the majority of the methods of analysis employed. They are audited regularly by Aspinwall and have shown acceptable results in inter-laboratory schemes such as CONTEST. Samples were tracked using Aspinwall and Geochem Chain of Custody forms.

Trial Pit Excavation and Window Sampling

- 3.9 The excavation of trial pits was undertaken on 6 and 10 July 1998. Trial pits provide the opportunity for close examination of sub-surface strata and the collection of samples and expose more ground to visual examination than auger holes or boreholes.
- 3.10 Trial pits were excavated with the aid of a JCB excavator to depths of approximately 3 metres below ground level (mbgl). The exposed ground strata were carefully examined and recorded by an experienced environmental scientist from Aspinwall in accordance with BS 5930. The trial pit logs are provided in Appendix 2 with selected photographs. On completion, all trial pits were immediately backfilled with arisings and compacted. The locations of all trial pits are shown in Figure 3.
- 3.11 Trial pit excavation involves considerable time and disruption and window sampling was also carried out in order to present a more general indication of the nature of the ground, and allow soil samples to be obtained. Window samples

Phase II – Intrusive Investigation *continued* 3

were obtained using a percussive hammer together with window sampling equipment which penetrated the ground to a depth of approximately 3m. Window sampling equipment was decontaminated between holes by the removal of all visible dirt, and water rinse where necessary. The resulting cores were examined and recorded by an experienced environmental scientist from Aspinwall in accordance with BS 5930. The window sample logs are provided in Appendix 2 with selected photographs. On completion, all boreholes were immediately backfilled with arisings and the surface covering restored. The locations of window samples are shown in Figure 3.

Summary of Ground Conditions

- 3.12 Made ground was encountered across the site at depths ranging between 0 and 0.9m and up to depths of approximately 3m at the former rifle range. Interfaces with natural strata below varies from sharp to a gradual transition where the fill material consists of clay. The made ground on the site is directly underlain by the Lower Lias Clay which is heavily weathered to a maximum depth of approximately 2.4m and hence is visible as two fairly distinct layers in places. The less weathered Lias Clay was encountered to the base of all excavations carried out during this investigation.
- 3.13 The fill material consisted of black/brown/grey/red ash and gravel fill with sand, clay, clinker, cobbles, humic material and wood, metal, bricks, glass and roots and organic matter in places. Small quantities of broken asbestos roofing sheet were identified at depths up to 0.7m in the radar test compound and a layer of degraded car batteries was found in the eastern section of this area at approximately 0.5m below ground level.
- 3.14 The Lower Lias Clay directly underlying the made ground was variable in colour, from brown to various shades of grey and exhibited characteristics of heavy weathering including extensive orange and light grey mottling. This upper material was often soft, damp and redeposited in some areas of the site. The generally less weathered clay beneath was predominantly dark grey to brown in colour with a more consistent shaley texture, some sandy patches, less evidence of oxidation and occasional ironstone nodules.
- 3.15 Perched groundwater was encountered only within the made ground in the northern part of the former rifle range, and ingress into the excavated pits was significant. Hydrocarbon odours were noted at various locations around the site and elevated FID readings were also detected, predominantly in the POL area where light to heavy diesel/mineral oil was observed within the made ground at shallow depths.
- 3.16 The radiation survey carried out as a precautionary measure to ensure there was no risk to the health and safety of personnel involved in this intrusive investigation detected levels of radiation greater than twice the background level.

Phase II – Intrusive Investigation *continued* 3

These were all situated in the vicinity of the POL area and were considered to be attributable to naturally occurring radiation in the roadstone used to surface this part of the site.

Chemical Analysis

- 3.17 The complete results of chemical analysis of soil, groundwater and surface water samples are presented in Appendix 3.

Soils

- 3.18 A total of 55 samples (of 79 retrieved) were tested for a standard analytical suite as follows:
- pH;
 - total sulphate;
 - total metals (arsenic, cadmium, chromium, mercury, lead, selenium, nickel, zinc, copper);
 - solvent (toluene) extractable matter (SEM).
- 3.19 In addition to the basic suite above, 30 samples were selected for analysis for total polynuclear aromatic hydrocarbons (PAHs) (by Gas Chromatography-Mass Spectrometry (GC-MS), asbestos, mineral oil, nitrogen, sulphur and oxygen - containing resins (NSO), and total cyanide. Twelve samples were tested for total petroleum hydrocarbons (diesel range organics (DRO) and gasoline range organics (GRO)). Eight samples were tested for volatile organic compounds (VOCs).
- 3.20 Samples selected for analysis for PAHs and asbestos were done so on the basis of achieving an even spread of results across the site, but also where either hydrocarbon contamination appeared to be present or where fill material was identified. In these cases, some samples of the natural material encountered at sampling locations were also tested.
- 3.21 Analysis for total petroleum hydrocarbons (DRO and GRO) was undertaken specifically where visual or olfactory evidence of fuel contamination was identified. Analysis of samples for volatile organic compounds (VOCs) was carried out on samples taken from locations where elevated concentrations of flammable gases were detected by FID survey.

Phase II – Intrusive Investigation *continued*

3

Waters

3.22 Eight groundwater samples were taken from the existing boreholes on the site including one duplicate (Figure 4). The remaining three boreholes which were constructed as part of the WSAM (1996) site investigation (BH11, BH13 and BH16) appear to have been destroyed and could not be located. In addition three surface water samples were obtained from locations along the Dalby Brook to the north of the site (Figure 5). Two of these (SW2 and SW3) were taken at points where water appears to be discharging from the site, although flow from these inlets was extremely slow. A third sample (SW1) was taken from a point upstream of these discharge points. Water samples were analysed for an initial suite as follows:

- pH;
- biological oxygen demand (BOD);
- chemical oxygen demand (COD);
- total organic carbon (TOC);
- ammoniacal nitrogen;
- electrical conductivity (EC);
- chloride(Cl);
- phenols;
- PAH; and
- total metals (arsenic, cadmium, chromium, mercury, lead, selenium, nickel, zinc, copper).

References

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1. WS Atkins (Midlands) A Phase 1 Land Quality Assessment of the ABSDA Site at Old Dalby Leicestershire. September 1996.
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Figure 1 : Site location plan

Figures

DEFENCE ESTATE ORGANISATION

OLD DALBY SUB-DEPOT (ABSDA)

**LAND QUALITY ASSESSMENT
PHASE ONE AND TWO:
DESK STUDY AND INTRUSIVE REPORT
LAND QUALITY STATEMENT**

PROJECT NO: 07138 - FINAL REPORT

**Technical Report
February 1999
by
Aspinwall & Company Ltd**

Defence Estate Organisation
Blakemore Drive
Sutton Coldfield
West Midlands
B75 7RL

Prepared by Aspinwall & Company Limited
for the Defence Estate Organisation
under Commission WS13/1982/2

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DEFENCE ESTATE ORGANISATION

OLD DALBY SUB-DEPOT (ABSDA)
LAND QUALITY ASSESSMENT
PHASE ONE AND TWO:
DESK STUDY AND INTRUSIVE SURVEY
LAND QUALITY STATEMENT

Task Officer
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RESTRICTED COMMERCIAL

Contents

Chapter	Page
1 Land Quality Statement	1

Illustrations

- Figure 1 : Site location plan**
- Figure 2 : Site layout plan**
- Figure 3 : Sources of contamination**

Land Quality Statement

1

Introduction

- 1.1 In May 1998 Aspinwall & Company was commissioned by the Defence Estate Organisation (DEO) to carry out a Phase I and II Desk Study and Intrusive Survey for the provision of a Land Quality Statement on the ABSDA Site at Old Dalby. Previously work had been carried out by WS Atkins under separate commission and this work was used to assist in targeting the Aspinwall & Company Investigation.
- 1.2 The Phase I part of this LQA involved a desk-based review of existing information and environmental conditions at the site, as well as a site reconnaissance. The desk study concluded that the site had been used in connection with potentially contaminating activities and the extent of contamination needed to be defined. The investigation work included the excavation of trial pits and the drilling of shallow "window sample" boreholes to obtain samples of the ground materials for analysis.
- 1.3 This Land Quality Statement provides a non-technical summary of the overall environmental condition of the site and its suitability for redevelopment.

Site Location

- 1.4 The Old Dalby ABSDA (Army Base Storage and Distribution Agency) site is situated approximately 1 Kilometre (km) to the east of Old Dalby, between Loughborough and Melton Mowbray, Leicestershire at Grid Reference 684 239. The site is located in a rural area surrounded by open agricultural land. A site location plan is shown in Figure 1.

Site Description

- 1.5 The site covers an area of approximately 20 hectares and consists predominantly of large warehouses and areas of hardstanding, with some open ground and grassed areas. A Site Layout Plan is shown in Figure 2. The site slopes gently from north to south at a regular gradient, however the central Petrol, Oil and Lubricant (POL) area is slightly raised and levelled above surrounding topography. An abandoned rifle range in the south east corner of the site is an open area of overgrown ground and is raised to a level several metres above the remainder of the site.
- 1.6 The site is surrounded by a 2 metre (m) high security fence and access is via the main security gatehouse. To the east, the site is bordered by a small industrial estate which previously formed the Army Base Repair Organisation (ABRO) section of the Sub-depot. Station Lane separates the site to the north from the

Land Quality Statement *continued*

1

open fields which otherwise surround it. A small group of terraced houses lies to the west of the site.

- 1.7 A large proportion of the area occupied by the site consists of brick-built warehouses surrounded by tarmac or concrete hardstanding, with some grass verges and several large emergency water supply tanks. Other areas, particularly in the north west and south west consist of concrete pads surrounded by rough overgrown ground, which are used as car parks. The POL area close to the centre of the site is a slightly raised area of tarmac and compacted roadstone on which is located the vehicle re-fuelling and lubrication point. This area also currently acts as a storage area for a number of disused vehicles and trailers.
- 1.8 In the extreme west of the site, two separately fenced compounds are sited. The radar test compound is the southern most and is made up of overgrown rough ground with areas of concrete hardstanding and small brick sheds, one having being used to store salt. Directly adjacent to this to the north is the MOWLEM compound which is largely concrete hardstanding with an office building and several small outbuildings. Scrap metal is currently stored here, and an above ground diesel tank (bunded and empty) is located in the south-east corner.
- 1.9 In the south east corner of the site is an abandoned rifle range, which is currently heavily overgrown. This area has been built up above the adjacent hillside and is consequently several metres above the level of the rest of the site in this area.

Site History

- 1.10 Map records from 1887 show the site as part of an extensive area of farmland, until development in the early 1940s by the MOD. A major railway line ran approximately northwest to southeast to the southwest of the site, with a branch-line to the east, directly south of the site. A small reservoir was also noted to the east of the site. There is little change in the area shown on map records, up to and including the 1952 edition. Developments on the site itself are not shown.
- 1.11 The Ministry of Defence (MOD) site was initially constructed as a Vehicle Depot and opened in December 1940, but its role rapidly changed due to the demand for storage of technical equipment, and the site had become a large "Central Ordnance Depot" by the end of 1941. It is understood that during the war, workshop machinery and trailers, machine tools and optical and electrical test equipment became the main types of equipment stored. A German prisoner of war camp was also sited at Old Dalby. The adjacent ABRO section of the sub-depot was primarily used for the maintenance and repair of military equipment and vehicles, while the ABSDA section was primarily used for storage, as well as housing a Royal Electrical and Mechanical Engineers (REME) vehicle workshop.
- 1.12 In 1956, the "Central Ordnance Depot" was redesignated as a "Technical Stores Depot" and held equipment such as machinery and spares, vehicle fitments, map

Land Quality Statement *continued*

1

reproduction and cinematographic equipment, optical and fire control stores, bakery equipment, boot and textile repair machinery, baling, laundry and bath equipment, industrial gas refrigeration and air conditioning equipment, and electrical test equipment. Radar equipment was also retained, predominantly between 1959 and 1968. It appears that railway sidings from the main rail line ran across the site to the boiler house and along the western side of the site and may have been used for the transfer of coal and goods.

- 1.13 Utilisation of the site for storage and equipment maintenance has continued since the 1960s, in addition to other now abandoned uses of the buildings, including an indoor rifle range and the moulding of fibreglass canoes. The ABRO section of the sub-depot has been sold and now comprises a small industrial estate. The usage of the ABSDA section of the site has essentially remained unchanged to date.

Site Sensitivity

- 1.14 The site lies in a location of low sensitivity with respect to both groundwater and medium sensitivity with respect to surface water.
- 1.15 The 1:50,000 British Geological Survey (BGS) map indicates that the site is underlain by Lower Lias Clays, overlain by thin Drift deposits. The Lower Lias Clays up to 180m thick comprising predominantly clays with interbedded limestone, ferruginous limestones and shales at various depths. The results of previous ground investigations proved firm to stiff, yellow brown becoming blue grey clay to depths of up to 10m.
- 1.16 The Lias Clay is a relatively low permeability strata. Groundwater has been proved by previous investigations at depths of 15.25m with perched groundwater at shallower depth. Perched water horizons could be present within the upper weathered surface of the Lias Clay. The Lower Lias Clay is classified as a non-aquifer in terms at sensitivity to surface contaminants, although the limestone bands can yield significant quantities of water. There are no known licensed groundwater abstraction points in the vicinity of the site.
- 1.17 There are no known watercourses on site, however there are a number of non-permanent springs within the site. There is a ditch/dyke to the north of the site which flows into the Dalby Brook, north of the site. The Dalby Brook in turn flows, into the River Smite which is classified as a 1B or 'good' quality watercourse by the Environment.

Sources of Relevant Information

- 1.18 The information used in this assessment of land quality includes:

Land Quality Statement *continued*

1

- Phase 1 Desk Study Report and preliminary Phase 2 Site Investigation prepared by WS Atkins Consultants (September 1996 and February 1997 respectively).
- Further information obtained by Aspinwall during the compilation of the Phase I Desk Study including information from statutory consultees such as the Environment Agency, and the Environmental Health Departments of local authorities.
- An intrusive investigation undertaken as part of this study which involved the excavation of 11 trial pits and 21 window sample holes.
- Chemical analysis of soil and water samples collected during the investigation.

Ground Conditions

- 1.19 Eleven trial pits were excavated and 21 window sample holes were constructed across the site, as shown in Figure 2. The trial pits and window samples exposed near surface materials and confirmed made ground overlying drift deposits of clay in all areas of the site. The depth of made ground varied from 0 - 0.9 metres over most of the site and > 3.1 metres in the area occupied by the former rifle range.
- 1.20 The fill generally comprised a black/brown ash and gravel with sand, clay, clinker, cobbles, organic material and occasional wood, metal, brick and glass.
- 1.21 The natural ground comprised a firm to stiff, brown and grey (weathered to orange, brown and grey) clay with occasional sandy patches. Perched ground-water was noted within the made grounds in the northern area of the former rifle range only.

Sources of Identified Contamination

- 1.22 Analysis of soil and groundwater samples has shown that the majority of the site to be uncontaminated. Contamination identified at the site by this investigation is limited to:
- limited occurrences of low levels of toxic metals (lead, arsenic, mercury and cadmium) in soils associated with areas of fill material.
 - limited occurrences of potentially phytotoxic metals in soils, associated with areas of fill material, although the mean pH of soils at the site is slightly alkaline, and therefore phytotoxic effects are unlikely to be exhibited.
 - A number of occurrences of elevated sulphate in soils and groundwater.

Land Quality Statement *continued*

1

- The presence of organic materials, predominantly due to petroleum hydrocarbons.
- No asbestos fibres were detected in those soil samples that were chosen for analysis.

1.23 Figure 3 illustrates the distribution of the identified sources of contamination.

Risks Identified at the Site

- 1.24 A risk assessment of the hazards which have been identified at the site has been undertaken in order to estimate the potential risks to sensitive receptors. The receptor may be human health, a water resource, a sensitive local ecosystem or even future construction materials. Receptors can be connected with the hazard via one or several exposure pathways. Without the three essential components of a 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.
- 1.25 Over the majority of the site hazards were identified in localised or isolated areas. The risks were found to be negligible or low under present site conditions, low or moderate to low during redevelopment where potential contamination in the soil is disturbed as a result of excavation works and again negligible upon redevelopment after minor remediation works have been undertaken.

Overall Land Quality

- 1.26 On the basis of the intrusive work undertaken and the enquiries and information researched for Phase I as part of this Land Quality Assessment, it is considered that many areas of the site are free from significant contamination. Slight contamination by toxic (predominantly in the fill material) and organics (both fill and groundwater) exists in localised areas of the site as illustrated in Figure 3a and 3b. Phytotoxic metals (predominantly in the fill material) are noted to be more widespread across the site, but in view of the neutral to alkaline conditions, this is likely to limit the phytotoxicity at the site. There remains a low risk that other localised areas of contamination may exist in areas not directly covered by this investigation. The toxic and phytotoxic metals are predominantly confined to fill materials at the site. In the area of the POL (petrol, oil and lubricant) point there are marginally elevated levels of hydrocarbons present within the Made Ground.

Land Quality Statement *continued*

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Redevelopment

- 1.27 Based on the findings of the investigations carried out, no conditions have been encountered on the site which present a significant threat to the redevelopment of the site for either a residential or industrial end-use. The levels of contaminants at the site are not considered to present any constraints to redevelopment providing limited precautionary measures are adopted.

Figures

Figure 1 : Site location plan