Intended for
**Blenheim Estate Ltd**

Date
**March 2019**

Project Number
**1700003663**

# WINDRUSH INDUSTRIAL PARK, WITNEY, OXFORDSHIRE

# PHASE I ENVIRONMENTAL ASSESSMENT AND GROUNDWATER SAMPLING REPORT

RAMBOLL

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| Project No. | **1700003663** |
| Issue No. | **01** |
| Date | **11/03/2019** |
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| Approved by | **Matthew Pannett** |

Made by:

Checked/Approved by:
"[Insert scanned signature]"



**Version Control Log**

| Revision | Date | Made by | Checked by | Approved by | Description |
|---|---|---|---|---|---|
| 01 | 14/03.2019 | RH | MP | MP | First Issue to Client |

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# EXECUTIVE SUMMARY

Ramboll Environment & Health UK Limited (Ramboll) was commissioned by Blenheim Estate Limited (the "Client") to carry out a combined Phase I Environmental Assessment and groundwater monitoring report for Windrush Industrial Park, Windrush Park Road, Witney, Oxfordshire OX29 7DX. (the "Site"). The review is required in connection with the Client's proposed sale of the site. It is understood that the site will continue in its current use.

There are two aspects to this report. Firstly, to undertake a Phase I environmental assessment as would be expected for a property transaction that summarises the potential for contamination at the site. The second part of the report provides new, 2019, analytical data from groundwater monitoring wells installed in the past, and compares this to data from 2004 to 2006 & 2010. The monitoring wells were previously installed to assess the potential historic sources of contamination; some contamination has been encountered which is explained in this report along with management and remedial measures.

For the Phase I aspect of this report Ramboll undertook a site inspection in 2019. No significant potentially contaminative activities were identified as currently taking place on site or the recent past. Ramboll is unaware of any underground tanks in use and the majority of above ground tanks are bunded or located within buildings, with some limited evidence of spillages.

Potentially historic contaminative activities include: parts of the site (<10%) used for the maintenance and repair of aeroplanes in the 1930s and 1940s; manufacture of automotive components during the post-war period up until the mid-1980s; an area of the site (beneath Building 1X) marked on planning application maps from the 1960s as having been used for refuse disposal; above ground and underground tanks appear to have been present from at least the 1950s.

The site is located in a setting of moderate sensitivity with respect to groundwater resources. The site is underlain by a Secondary A aquifer (the Cornbrash) overlying a Principal aquifer (Jurassic Limestone). There are no licensed groundwater abstractions in close proximity to the site (the nearest is 990m away for spray irrigation). The site is also not in a groundwater source protection zone.

Given the distance of the nearest surface watercourse (a land drain 80m to the south, which flows into Colwell Brook), the site is considered to be located in a setting of moderate sensitivity with regard to surface water resources. The River Windrush is approximately 700m to the east. Groundwater flow is inferred from groundwater levels to be in a southerly direction.

Analysis of samples of groundwater has detected elevated concentrations of volatile organic compounds (VOCs), specifically chlorinated solvents including trichloroethene (TCE), dichloroethane (DCE) and vinyl chloride (VC)[1]. The VOCs appear to be localised to two areas of the site (around the series of boreholes BHH and BHC). This is consistent with past results. The concentration of VOCs have generally remained stable with some slight increases. Based on assessment of data from 2004 to 2006 and 2010 the VOCs seem to be in the same location and relatively stable. Evidence of natural attenuation is present with breakdown products of TCE being detected (DCE and VC). In addition, reducing conditions are indicated by parameters such as iron, manganese, sulphate and nitrate.

Free phase product (i.e. oil floating on groundwater) is present within borehole BHG in the north of the site. This too was found in the past, although the thickness of free phase product has increased. Total petroleum hydrocarbons (TPH) has also been detected at low levels in 2019 in some groundwater wells where it was not previously encountered. However, as with the VOCs, significant migration of hydrocarbons from the area of borehole BHG does not appear to have occurred over the last c.15 years. The free phase product has been described by the laboratory as likely to be hydraulic oil.

[1] Chlorinated solvents such as TCE are detected within the wider chemical analysis of volatile organic compounds.

No significantly elevated concentrations of methane or carbon dioxide were detected. This is consistent with past monitoring results, albeit gas venting in the western part of the site has been installed in an area where elevated levels of methane were previously detected. Monitoring positions were located close to historic records of refuse disposal and no elevated concentrations of methane were detected (or typical leachates in groundwater either).

Ramboll considers that both the VOCs and free phase product require remedial action to mitigate potential risks to the environment and site users. This is due to the elevated concentrations detected and the potential for the contaminants to continue to act as an on-going source of contamination (as a potential vapour issue and pollution of groundwater).

VOCs and free phase product are contaminants that are well known and routinely managed on many similar industrial and other sites across the UK. Remediation technologies have improved over the last few decades and it is envisaged that remediation could be achieved through standard industry techniques. The most efficient remediation methods are likely to be an in-situ technique for the VOCs and pumping of the free phase product from and excavation or series of boreholes. Detailed recommendations are presented at the end of this report.

In conclusion, Ramboll considers the main risk driver to be the potential for pollution of Controlled Waters and generation of vapours in the area around borehole BHH. There is considered to be a lower risk of site users being exposed to the soil and significant harm occurring due to the current commercial use of the site. Remedial action undertaken to reduce contaminant concentrations in groundwater would therefore address the main risk driver at the site. In summary, the contamination identified at the site is not abnormal and many brownfield sites with similar contaminants are routinely remediated. Following removal of the three identified sources of contamination Ramboll would likely consider this site to be a low to moderate risk.

Information from the local authority is currently awaited in terms of its view on the site and Part IIA of the Environmental Protection Act 1990.

# 1. INTRODUCTION

## 1.1 Background

Ramboll Environment & Health UK Limited (Ramboll) was commissioned by Blenheim Estate Ltd (the "Client") to carry out a combined Phase I Environmental Assessment and groundwater monitoring report of Windrush Industrial Park, Windrush Park Road, Witney, Oxfordshire OX29 7DX. (the "Site"). The review is required in connection with the Client's proposed sale of the site. It is understood that the site will continue in its current use.

## 1.2 Objectives

The objectives of the review were to assess the potential for soil or groundwater contamination, both at and in the vicinity of the site, and assess its significance in terms of risks to site occupants and potential liabilities to the site owner. For example, this includes the possibility of investigation and remedial actions being enforced by the Regulatory Authorities or other parties.

## 1.3 Scope

The scope of the review was as follows:

- a review of historical land uses and operations, at the site and on neighbouring land, to assess the potential for soil, groundwater and surface water contamination;
- a review of available geological, hydrogeological and hydrological data associated with the site;
- correspondence and/or discussions with the Regulatory Authorities;
- a site walkover; and
- gas and groundwater sampling from existing monitoring wells.

# 2. THE SITE

## 2.1 Introduction

The following information was derived from a site inspection undertaken by Robert Hodgson on 6th February 2019.

## 2.2 Site Location and Setting

The site is located approximately 2.5km west of the centre of Witney, Oxfordshire, at National Grid Reference 433290, 210370 (see Figure 1, Appendix 1). Land in the vicinity of the site slopes gently down-gradient to the south.

Surrounding land uses are detailed below, in Table 2.1.

**Table 2.1: Surrounding Land Uses**

| Direction | Description | Company Name | Distance |
|---|---|---|---|
| To the North | Public Highway (Burford Road) | N/A | Adjacent |
| | Petrol Filling Station | Texaco | Adjacent |
| | Industrial unit | Jason Hydraulics | Adjacent |
| | Undeveloped agricultural land | N/A | 20m |
| | Residential buildings | N/A | 80m |
| To the South | Industrial units | Glenmore Business Centre (including engineering works, printers, joiners and chemical distribution) | 20m |
| | Industrial unit | Abbott (pharmaceuticals/chemicals) | 40m |
| To the East | Sports ground | West Witney Sports Ground and pavilion | Adjacent |
| | Undeveloped agricultural land | N/A | Adjacent |
| | Residential properties | N/A | 400m |
| To the West | Vehicle Haulage Depot | N/A | Adjacent |
| | Industrial units | Numerous vehicle repair and servicing garages and engineering works | 20m |
| | Industrial units | Minster Industrial Park | 70m |

## 2.3 Site Description

### 2.3.1 Introduction

The site is irregular in shape and occupies an area of approximately 11.9 hectares (29.4 acres). The site layout is shown in Figure 2, Annex A.

The site is predominantly developed with industrial-type buildings occupying approximately 50% of the site area. Approximately 40% of the site is hard surfaced with asphalt or concrete in varying states of repair, with the remaining land comprising maintained ornamental soft landscaping and vegetated borders.

The site is accessed from three locations, on the northern boundary (main entrance), the western boundary (goods entrance) and the southern boundary (goods entrance).

The site has been in industrial use since the 1940s. Anecdotal information indicates that the site was originally used for the maintenance of military aeroplanes and was later used for the development, testing and production of automobile components. The site history is discussed in Section 3.

The site is currently divided into several buildings (see Figure 2), which are occupied by a number of separate companies. The current tenancy schedule is detailed in Table 2.2 below.

**Table 2.2: Tenancy Schedule**

| Building | Tenant | Nature of Activities | Time on Site | Other Information |
|---|---|---|---|---|
| 1 & 30 | Del Equipment (UK) Ltd. | Offices and manufacturing / warehouse for the manufacture of tail lifts, with Building 30 being an unused store. | *c.* 30 to 35 years | Formerly occupied by Chris Hayter Transport – food and domestic products distribution |
| 1X, 4X, 7 and PB4 | Smurfit Kappa UK Ltd. | Cardboard box manufacture | *c.* 28 years | Formerly Smiths |
| 2 and part of 3 | Vacant | Vacated by Ingram Micro (formerly known as DocData Fulfilment Ltd) in December 2018. Tenancy understood to end in April 2019. | | Formerly Sifan Systems Ltd. (manufacture of ventilation systems) |
| Unit 3A | Venture Entertainment Ltd. | Packing of media products (e.g. CDs, DVDs, Vinyl records). | *c.* 2 years | Formerly occupied by Clockwork Removals. |
| Unit 3B | Soame Interiors | Furniture and home goods store. | *c.* 4 years | Additional storage area and workshop. |
| Unit 3C | Universal Truck and Trailer Parts Ltd. | Retail of automotive parts and consumables; and re-coating brake shoes. | *c.* 6 years | |
| 4, 5 and Link 4/5 | Corndell Furniture Company Ltd. | Furniture manufacture | *c.* 28 years (Building 5) and *c.* 9 years (Building 4) | Formerly automotive manufacture. |
| 8 & 11c | Mediafleet Ltd. | Vehicle wrapping | c. 15-20 years | Formerly Witney Press (printers) and Tex (vehicle component manufacture and distribution). |
| 11a & 11b | UE Coffee Roasters | Coffee and tea processing and packaging; and Café. | *c.* 8 years | Formerly Smiths fire station and maintenance workshop; and Witney Press (printers). |

| Table 2.2: Tenancy Schedule | | | | |
|---|---|---|---|---|
| 12 | Witney Business and Innovation Centre | Serviced offices and meeting rooms. | Unknown | Formerly Lucas Automotive (until late 1990s) |
| 16 | Witney Commercials Ltd. | Vehicle repair garage. | *c.* 6 years | Formerly DRS Timber Products Ltd; and Chris Hayter Transport |
| Coseley Building | Meech; Oxford Products; DelEquipment | Warehousing / storage (not accessed by Ramboll) | Unknown | |
| College Building | Little Dots Daycare | Pre-school nursery (not accessed by Ramboll) | Unknown | Formerly Rentokil Initial Pest Control (since 1987); and City Link Property (Holding) Ltd. |
| Gatehouse | Body Evo | Women's fitness studios | Unknown | Formerly McLeans Coaches Ltd. |
| Vanbrugh Quarter | IndTech; Print Ready; Kombucha Kat; Micro Holdings | Workplace consumables; Printers; Health drink brewing; memorabilia distribution.<br>Furniture workshop; Deli storage. | up to *c.* 1 year | Formerly Buildings 26 and 27 |

In addition to the buildings on-site, the following goods yard / external yard areas and located on-site, as follows:

- the north-western corner of the site is used by Del Equipment Ltd. This is surfaced with concrete and asphalt in poor condition;
- the south-western corner is used by Smurfit Kappa. It is surfaced with concrete and asphalt in moderate condition, and has a petroleum interceptor. Construction is taking place in this area as the Smurfitt Kappa facility is being expanded;
- an area to the south of Buildings 4, 5 and Link Building 4/5 has been fenced-off and is in use as a contractors' compound. It is surfaced with concrete and asphalt in moderate to poor condition;
- an area to the north of Building 3 is used by DocData. It is surfaced with concrete and asphalt in moderate to good condition, and has a petroleum interceptor; and
- an area to the south-west of Building 8 is used by Media Fleet for van storage and is surfaced with concrete and asphalt in moderate condition.

## 2.4 Building Construction and Asbestos Containing Materials

A summary of the buildings on-site and a summary of their construction is presented in Appendix 2.

The majority of buildings are high-bay warehouses of steel and concrete frame construction with brick and breezeblock walls and concrete flooring. The majority of buildings have a part

pitched cement sheeting and part flat roof, with the exception of Buildings 3d, 4X and 16 and The Coseley Building, which have pitched profiled metal sheeting roofs and The College Building and the Gatehouse, which have pitched tiled roofs.

An asbestos survey in accordance with HSG264 (Asbestos - The Survey Guide, HSE 2012) has not been undertaken by Ramboll as it is outside the scope of this assessment. Given the age of some of the buildings, it is considered likely that asbestos containing materials (ACM) will be present within the building fabric of many of the buildings. Potential ACMs were observed in the form of corrugated cement roofing sheets in many of the buildings and additional structures, such as bike and motorcycle sheds. The paint store to the south of Building 5 is partially lined with potential ACM boarding in a poor condition; and ACM warning signs were noted throughout Building 1X.

Under the Control of Asbestos Regulations (2012), the "duty holder" for a building is required to assess where asbestos is or may be present and to develop and implement an ACM management plan, with review and updating as appropriate. The "duty holder" is the party who has, by virtue of contract or tenancy, an obligation for the repair and maintenance of the building.

## 2.5 Storage of Chemicals and Hazardous Substances

### 2.5.1 Underground Tanks

No underground storage tanks (USTs) were reported to be in use currently at the site, and the site contacts were unaware of any disused USTs. Ramboll did not observe evidence of any USTs on-site (e.g. no other manhole chambers of unknown purpose).

It should be noted that underground tanks are likely to have previously been located on-site, as detailed in the planning applications summarised in Section 3.3.1.

It is possible that a number of the Above-Ground Storage tanks (ASTs) (summarised below), utilise sections of underground pipework.

### 2.5.2 Above-Ground Storage

A summary of the ASTs on-site is presented in Table 2.3 below.

**Table 2.3 Above Ground Storage Tanks**

| Tank | Size | Contents | Age/Condition | Containment | Surfacing surrounding tank | Observed staining |
|---|---|---|---|---|---|---|
| A | 72,000 litres | Heating Oil | c. 15 – 25 years | Adequately bunded. Fill point external to bund. | Vegetated | None |
| C | 5,000 litres | Ad blue | Relatively modern. | Double-skinned and situated in a brick bund. Fill point within bund. | Concrete in good condition, sloping towards drain. | None |
| D | 2,650 litres | Waste Oil | Unknown | Single-skinned and situated in a brick bund. Fill point within bund. | Concrete in good condition, sloping towards drain. | Minor |
| E | 4,000 litres | Caustic Soda (Sodium Hydroxide) | Moderate condition | Within building. Adequately bunded. Fill point outside bund on external wall. | Concrete in moderate condition. Drains and vegetation near. | Heavy white encrustations covering bund floor. |
| L | 1,250 litres | Waste oil | Moderate condition | Open-topped, dual skinned steel tank within bund. Tank is filled and emptied through the open top. | Concrete in good condition. | Slight staining consistent with the rest of the workshop. |
| M | 1,000 litres | Diesel | Good condition | Understood to be dual skinned of plastic construction, no external bund. The fill point is located beneath a cover. Capped dispensing tap is unbunded, at base of tank. | Small concrete plinth with unsurfaced ground surrounds. | Staining observed beneath dispensing tap (<0.5m$^2$). |
| N | 2x 15,000 litres | Empty (to be used for brewing health drink) | New unused condition | Unknown, suspected double skinned, unbunded. | Concrete in good condition. | None. |

Access was not gained to the sprinkler pumphouse used by Smurfit Kappa UK Ltd., south-west of Building 1X. The site contact reported that diesel is transferred from the 1,000 litre tank (Tank M) today-tanks associated with the operation of the site's sprinkler system.

There are 5 x Liquefied Petroleum Gas (LPG) tanks located on concrete hardstanding in the southern corner of the site associated with Smurfit Kappa UK Ltd.

Plinths and/or pipework associated with suspected former ASTs were observed within the first-floor boiler room of Building 12 (Witney Business and Innovation Centre); and adjacent south of the point where Buildings 2 and 3 joins.

Anecdotally, the following is also of note and no longer present:

- a disconnected fuel dispensing pump was located to the south of Building 5 connected to a former AST via an underground fuel line estimated to be c. 1–2m in length. A fuel dispensing pump was also present in the former McLeans service yard area in the east of the site; which was connected to a tank situated in the northern section of the McLeans yard.
- Tank B, a 36,000 litre self-bunded diesel tank located within a concrete bund. The fill point and dispensing pump were housed in a lockable metal cupboard external to bund, with drip tray.
- Tank F, a 1,000 litre bunded tank containing Nalco 72223 (water treatment), located in Building 1X. This is understood to have been replaced by the use of IBCs.
- Tank G, a 1,000 litre bunded tank containing Naleo Oxsc3 (water treatment), located in Building 1X. This is understood to have been replaced by the use of IBCs.
- Tank H, a 5,000 litre self-bunded diesel tank with a disconnected dispensing pump, located to the south of Building 5.
- Tank J, a 2,000 litre single-skinned, unbunded tank in poor condition. The contents were unknown.
- Tank K, a 20,000 litre bunded petrol tank with fill point located within bund; and dispenser located external to bund.

### 2.5.3 Other Chemical Storage

Other noteworthy chemical storage includes the following:

*Building 1:*

- two IBCs (Intermediate Bulk Containers of c. 1000 litres capacity) of hydraulic oil, both situated on drip trays in Building 1. At the time of inspection, one was noted to be empty and the second at approximately 70% of capacity. Internal concrete hardstanding was noted to be in good condition;
- four fork lift truck battery charging points. No staining was noted on surrounding concrete hardstanding;
- a number of empty and full gas propane canisters were noted in a locked compound in the eastern section of the DEL Equipment Ltd. yard.

*Building 3:*

- Numerous tins of paint and furniture oil / wax were observed in the shop and workshop of Unit 3B – all noted to be <2.5 litre containers;
- one 25 litre container of water-based paint was observed in the workshop of Unit 3C;
- Approximately fifty 25 litre containers of anti-freeze coolant, degreaser, brake and clutch cleaner, screen wash, and AdBlue were observed in the retail area of Unit 3C;

- Approximately forty 25 litre containers of engine oil were observed in the retail area of Unit 3C;
- Four 205 litre containers of AdBlue were observed in the retail area of Unit 3C;

*Building 1X:*

- two large starch hoppers and a mixing tank for the preparation of glue, situated on the mezzanine section in the north of the building;

  two metal IBC-type units containing Naleo 74833 (water treatment) situated on the mezzanine level;
- four 205 litre drums of Nopcomaster DF 124L situated on a wooden pallet on the mezzanine level in the manufacturing area. The majority of drums in this area were noted to be empty as this product is reportedly being replaced with Naleo 74833;
- a degreasing bath draining to a 205 litre drum situated in the engineering workshop. No secondary containment was observed.

*Building 4X:*

A number of barrels and containers are located in the south of Building 4X. At the time of the inspection, the following oils and chemicals were present:

- ten 205 litre drums of Q8 oil;
- two 205 litre drums of Castrol oil (one situated on a wooden pallet);
- one 205 litre drum of Texaco oil;
- Several 25 litres containers of various oils; and
- one IBC-type container of waste oil.

The oils were observed to be stored in marked bays along the western wall of the building, located on drip trays (or on a wooden pallet as mentioned above). The flooring in this area is concrete with no drains, and no visual evidence of significant spills or leaks was observed.

*Building 5:*

- Approximately ten 25 litre cans of stain and lacquer were observed situated in close proximity to the spray booths in Building 5. There are approximately 10 spray booths in total, of which two were inspected;
- a solvent reclaimer is located in the external yard area of Building 5 in the south-east of the site. A solvent odour was noted in this store;
- a paint store is located in the south-east of the site, containing approximately one hundered 25 litre containers of wood stain, lacquer and thinners. Minor patchy hydrocarbon staining was noted in this store;
- eight propane gas cylinders are located in the yard area of Building 5, five of which were empty. These cylinders are not stored in a lockable compound;

*Building 8:*

- a flammables store containing cans of spray paints, four 5 litre cans of silicone remover and screen wash;
- one 205 litre drum for waste ink, situated directly on concrete hardstanding;
- four propane gas canisters utilised for the heating of the building.

*Building 11c:*

- One 205 litre drum of isopropanol was observed on a wooden pallet in the southern section of Building 11. The surrounding concrete was noted to be in good condition.

*Building 16:*

- 205 litre drums of waste antifreeze, waste fuel, and waste oil filters were observed adjacent to the waste oil AST;
- 205 litre drums of clean engine oil and antifreeze were observed on containment pallets.
- Approximately fifty IBCs were observed in storage adjacent to the Coseley Building. These reportedly belong to Witney Commercials in Building 16; and are full of water used to test lorry trailers under load.

*Vanbrugh Quarter:*

- Approximately twelve IBCs were observed in Unit 6 (Kombucha Kat) that are used to transport their health drink product to be canned off-site.

It should be noted that access to all units was not gained and as such there is potential for further bulk / minor storage of fuels and chemicals at the site.

## 2.6 Drainage and Wastewater

It is understood that surface water and foul drains discharge to municipal sewers. No effluent treatment plant was observed on-site associated with any of the buildings. No site drainage plans were available at the time of the inspection.

During the site inspection, four fuel/oil interceptors were identified on-site, as detailed below. There may be others on-site, potentially within buildings not observed by Ramboll.

- a three-stage petroleum interceptor is located in the goods yard to the south of Building 4X;
- according to site personnel in Building 3, a petrol interceptor chamber is located adjacent to the west of Building 3. This appeared to be a single stage interceptor;
- a three-stage oil interceptor is located to the north of Building 2; and
- a suspected multi-stage interceptor is located off the south-eastern corner of Building 1.

The spray booths located in the south of Building 5, associated with the furniture manufacturing, are reportedly equipped with water-based filtration systems, which are drained on a quarterly basis by a waste contractor.

The operation of the drainage and obtaining consents would likely be the responsibility of the tenants. The drainage system including the interceptors is not considered to pose a significant risk of soil or groundwater contamination.

## 2.7 Waste Disposal

As part of the site walkover, Ramboll did not record individual waste streams generated from each building.

General observations from the site walkover indicated that the majority of tenants utilised skips situated on hardstanding for general office and food waste purposes. The storage of such waste at the site is not considered to pose a ground contamination risk to the site.

A full review of waste documentation was not included in the scope of the assessment. The following waste storage was of note:

*Building 1X/4X:*

- Tank D – waste oil tank of 2,650 litre capacity (refer to Table 2.3); and
- One IBC-type container of waste oil located on a drip tray on concrete hardstanding (refer to Section 2.3.3).

*Building 5:*

- Three 'chemsafes' used to contain waste lacquer from the spray booths, although were empty at the time of inspection. The units were located externally in the south-eastern section of the Corndell part of the site and situated directly on concrete hardstanding, observed to be in reasonable condition.

*Building 8:*

- One 205 litre drum for waste ink, situated internally directly on concrete hardstanding.

*Building 11c:*

- a 'waste acid store' inside the south of Building 11 (all chemicals had been removed). This is considered to be a waste store formerly utilised by the previous tenant, Tex (vehicle component manufacture).

*Building 16:*

- Tank L - a 1,250 litre waste oil tank (see Table 2.3) that is emptied as required by a licenced waste contactor.
- 205 litre drums of waste antifreeze, waste fuel, and waste oil filters, collected by a licenced waste contractor.

## 2.8 Polychlorinated Biphenyls (PCB)

Electrical substations and additional transformers were identified on-site, as follows:

- a new substation is located at the entrance to the Vanbrugh Quarter, which appears to have been constructed alongside the new units in 2017;
- a substation present to the north-west of Building 3. This appears contemporary with the adjacent buildings (c. 1950s). The surfacing in this area is concrete in fairly good condition with no nearby drains;
- a large substation arranged over two floors is located in Building 11, which houses two transformers and associated switchgear, which appears contemporary with the buildings (1940s/1950s). Service trenches were present in the concrete floor, with no nearby surface drains;
- a transformer is located to the east of Building 3;
- a transformer is located in the north of Building 4. Concrete in this area is in fairly good condition with no visual evidence of leaks or spills;
- a transformer is located in the north of Building 5 and was considered to pre-date the transformer in Building 4. The surrounding concrete hardstanding was noted to be in good condition, although visual evidence of oil staining in the vicinity of the transformer and on the unit was noted.

Given the age of some of these transformers, the possibility of PCB-containing oils having been utilised cannot be ruled out.

## 2.9 Ozone Depleting Substances

A survey of ODS was not undertaken. The responsibility for compliance with legislation regarding refrigerant gases would be expected to rest with the tenant. Refrigerant gases are not generally considered to pose a ground contamination risk.

## 2.10 Key Issues Identified from the Site Inspection

2.10.1 The Site

Bulk storage of diesel, oils and chemicals takes place at the site currently. Ramboll is unaware of underground tanks currently in use on-site and the majority of above ground tanks appear to have secondary containment. The following tanks were observed to be either unbunded or showed visual evidence of leakage/spillage:

- Tank E inside Building 1X, a bunded caustic soda tank surrounded by heavy white encrustations (within the bund), with an external fill point showing visual evidence of minor spills, on concrete slabs close to vegetated areas;
- Tank M located to the south-east of Building 1X, an unbunded diesel tank with slight staining observed beneath the dispensing point. The tank is situated upon a concrete pad with unsurfaced ground in the near vicinity.

A number of IBCs and 205 litre drums situated throughout the site were also observed with no secondary containment. Ideally, as a matter of good practice, these containers should have secondary containment.

2.10.2 The Surroundings

To the north and east the site is largely surrounded by undeveloped land (agricultural and sports grounds), which would not be expected to have a significant potential for contamination.

Land to the south and west and the wider surroundings are largely in light industrial use, including maintenance garages, haulage firms and a modern chemicals/pharmaceuticals works. Identified potentially contaminative uses in the immediate area comprise a petrol filling station and a hydraulics works immediately adjacent to the north.

# 3. SITE HISTORY

## 3.1 Introduction

A review of the previous land uses at the site was carried out by inspecting historical maps and through contact with the Local Planning Authority and Environmental Health Department of the Local Authority. This has enabled an assessment to be made of the potential for contamination associated with former activities, both on-site and in the surrounding areas.

## 3.2 Site History

A number of historical maps were examined as part of the environmental review. The historical development of the site and surrounding area is detailed in Table 3.1 below. Selected historical maps are presented in Appendix 3.

**Table 3.1 Site History**

| Date & Scale | On-Site Features | Off-Site Features |
|---|---|---|
| 1880 1:2,500 | The site was undeveloped greenfield land. | The site was bounded to the north by a road. The wider surroundings were undeveloped greenfield land. |
| 1884 1:10,560 | The site remained unchanged. | The surroundings were largely unchanged. A Blanket Mill was marked 850m north east. |
| 1899 1:2,500 | The site remained unchanged. | The surroundings were largely unchanged. |
| 1900 1:10,560 | The site remained unchanged. | The surroundings were largely unchanged. An Old Quarry was marked 550m east. |
| 1921 1:2,500 | The site remained unchanged. | The surroundings were largely unchanged. |
| 1922 1:10,560 | The site remained unchanged. | The surroundings were largely unchanged. |
| 1938 1:10,560 | The site had been partially developed with small industrial buildings located in the centre and northern edge of the site. | Industrial buildings had been developed adjacent to the site to the east. |
| 1947 1:10,560 (aerial photograph) | The site was occupied by agricultural land. | The industrial buildings adjacent to the east were no longer shown. |
| 1955 1:10,560 | The site was shown as undeveloped land (previously shown buildings may have been omitted from the map due to national security considerations). | The surroundings were largely unchanged. |
| 1975 1:2,500 | The site had been entirely developed with a number of industrial buildings, marked as an Automobile Accessory Works. Buildings occupied c. 55% of the site, with c. 30% being laid to hard standing and the remainder vegetated. Large tanks were present in the centre of the site, and smaller tanks in the east and south east, and | Immediately to the north of the site a garage (with the appearance of a filling station) was shown. Adjacent to the south east lay an electricity substation, and adjacent to the north west an engineering works (with a tank) was located. A small Motor Repair Works was marked 120m north west, and a Sewage Works lay 140m south west. |

**Table 3.1 Site History**

| | | |
|---|---|---|
| | a small pond was marked in the north. | |
| 1977<br>1:10,560 | The site remained unchanged. | The surroundings were largely unchanged. |
| 1987<br>1:2,500 | A building in the western corner of the site had been removed; and nearby storage tanks at the western site boundary were also no longer shown. A building in the centre-west of the site, located adjacent north-west of two circular storage tanks, had been removed. | Approximately ten light industrial units had been developed adjacent south-west of the site. |
| 1991-1994<br>1:2,500 | The southern corner of the site had been redeveloped to create a building extension and yard; a storage tank had been removed. | The surroundings were largely unchanged. |
| 1999<br>1:10,000<br>1999<br>1:2,500<br>(aerial photograph) | The site was marked as Windrush Industrial Park. A building in the north of the site had been partially removed. A building in the south of the site had been extended, and a feature with the appearance of a large sprinkler tank had been constructed in the west of the site. Two circular storage tanks in the centre of the site were no longer present. A warehouse-type building had been developed in the centre-east of the site. | The former engineering works adjacent to the west of the site was marked as a warehouse. Further industrial buildings had been developed adjacent to the east, and as part of the Minster Industrial Park, 100m north west. A depot was marked 120m west of the site, and evidence of embankments and a possible reservoir was shown in this area. |
| 2006<br>1:10,000 | The site appeared largely unchanged. | Further light industrial development had taken place in the immediate surroundings to the south-west and south-east of the site. Several unspecified warehouse and works-type buildings had been developed along the south-western boundary and from 50m south-east. |
| 2010<br>1:10,000 | The site remained unchanged. | Additional warehouse-type buildings had been developed from 200m south-east. The immediate surroundings remained unchanged. |
| 2019<br>1:10,000 | A portion of the site, adjacent to the northern boundary had been redeveloped with light industrial units (known as the Vanburgh Quarter). | Warehouse-type buildings had been developed from approximately 500m south-east and 500m south-west of the site. |

Ramboll is aware that the site was developed for industrial uses in the 1940s with anecdotal information that the site was originally used for the maintenance of military aeroplanes and subsequently used for the development, testing and production of automobile components after the Second World War.

## 3.3 Regulatory Authority Information

3.3.1 Local Authority Planning Department

has reviewed planning records available on the internet relating to the site and a summary of relevant applications has been added to Table 3.2.

**Table 3.2 Planning History**

| Application number | Description | Date approved |
|---|---|---|
| 66/50 | Swarf house (includes oil store and sump tank). Believed to be former Building 9 - *no longer present* | 1950 |
| 71/51 | Workshop extension – *location not known* | 1951 |
| 174/51 | Extension to swarf house, Building 9 – *no longer present* | 1951 |
| 172/52 | Extension to 2 existing boiler houses. Mapping showed pre-existing battery charging stations, effluent plant (west of site), transformers and 3 x 2,250 litre petrol tanks with pumps (centre of site) - *no longer present* | 1952 |
| 311/53 | Light engineering store (south of current Building 3) - *no longer present* | 1953 |
| 312/53 | Annex to metal finishing department in west of site (former Building A) - *no longer present* | 1953 |
| 349/53 | Extension to Building 1 | 1953 |
| 84/54 | Gatehouse, car park and bike racks – *present currently* | 1954 |
| 149/54 | Building with oil fuel tank (location not known) – *no longer present* | 1954 |
| 314/54 | Northlight building for motor production (E section of Building 1) – *present currently* | 1954 |
| 337/54 | Industrial storage building – *location not known* | 1954 |
| 24/55 | Warehouse building (former Building B) - *no longer present* | 1955 |
| 357/55 | Petrol pumps and UST north of Building 3. Mapping shows tank, pump and test houses – *no longer present* | 1955 |
| 389/55 | Electrical substation on site of Building 2 – *no longer present* | 1955 |
| 69/56 | Factory units (Building 5 & 4X) – *present currently* | 1956 |
| 202/56 | Conveyor bridge between Building 1 and warehouse to north (Coseley Building) – *no longer present* | 1956 |
| 320/57 | Extension to Building 5, including calorifier room – *no longer present* | 1957 |
| 356/57 | Combustion heater test house north of Building 3. Mapping shows ASTs – *believed no longer present* | 1957 |
| 370/57 | Extension to Building 20 (believed to be located on site of current Building 1X) – *no longer present* | 1957 |

**Table 3.2 Planning History**

| Application number | Description | Date approved |
|---|---|---|
| 372/57 | Transmission test lab to north of Building 3. Mapping shows petrol and paraffin tanks north east of Building 3, and underground fuel ducting (9 inches by 9 inches). Inspection pits, tank house and boilers – *believed no longer present* | 1957 |
| 417/58 | Canteen extension (Building 26) – *present currently* | 1958 |
| 423/58 | Compressor house (Former Building 14) – *present currently* | 1958 |
| 515/58 | Generator house (Former Building 14) – *present currently* | 1958 |
| 540/58 | Substation (Former Building 14) – *present currently* | 1958 |
| 249/59 | Paint stores and stoving enamels (Building 30) - *present currently* | 1959 |
| 435/59 | Extension to existing Coseley building – *present currently* | 1959 |
| 116/60 | Addition of office block (Building 1) – *present currently* | 1960 |
| 398/60 | Link Building 4/5 – *present currently* | 1960 |
| 327/63 | Demolition of compressor house and annex – *location not known* | 1963 |
| 683/63 | Compressor house (location not known) – *believed no longer present* | 1963 |
| 168/64 | Tanks, pump and test house (location not known) – *believed no longer present* | 1964 |
| 198/64 | Northlight extension (Building 4X) – *present currently*. Area previously used for refuse disposal | 1964 |
| 207/64 | Storage building – *location not known* | 1964 |
| 211/64 | Demolition of existing small buildings and erection of new northlight building to the north of Building 3 – *present currently* | 1964 |
| 412/64 | Personnel block (adjacent to Gatehouse) – *present currently* | 1964 |
| 435/64 | Extension to boiler house and Building 11 – *present currently* | 1964 |
| 300/65 | Tank farm comprising reinforced concrete foundations and tank supports partly roofed to provide bulk storage for solutions associated with metal finishing south of Building 4 – *no longer present* | 1965 |

**Table 3.2 Planning History**

| Application number | Description | Date approved |
|---|---|---|
| 451/65 | Water pressure boosting plant (north of Building 3) – *present currently* | 1965 |
| 310/66 | Maintenance workshop. Mapping shows fire station in Building 11, and battery room in centre of Building 11 – *these buildings are present currently* | 1966 |
| 563/66 | Flat roof northlight (Building 1X) – *present currently* | 1966 |
| 470/67 | Water cooling and storage tank west of Building 1X – *no longer present* | 1967 |
| 89/69 | Trade effluent treatment building south of Building 3. Mapping shows Fuel tank south west of Building 22 (location not known) with two effluent treatment tanks – *no longer present* | 1969 |
| The planning office was unable to provide information spanning the period 1969-1986 within reporting timescales, in 2010 | | |
| 86/0101 | Change of use from engineering to warehousing (Building 1) – *present currently* | 1986 |
| 88/0782 | Alterations to existing access (northern site entrance). | 1988 |
| 89/0985 | Change of use from General Industrial to Storage and Distribution (Building not known) | 1989 |
| 89/1947 | Extension to Building 1X/4X and new road – *present currently* | 1989 |
| 89/2138 | Sprinkler tank and pump house (*Tanks O-Q*), starch silo and fuel oil storage tank (*Tank A*) (Building 1X/4X) – *present currently* | 1990 |
| 90/0133 | Construction of chimney stack (Building 1X/4X) - *present currently* | 1990 |
| 92/0161 | Extension to loading canopy and extension to yard (Building 1X/4X) - *present currently* | 1992 |
| 92/1021 | Extension to existing canopy, side extension and extension to existing hard standing and new road - *present currently* | 1992 |
| 93/0636 | Alteration to elevation to create vehicle entrance to testing laboratory for automotive components (building not known) | 1993 |
| 95/1549 | Improvement of car parking facilities and enhancement of landscaping (whole site) | 1995 |
| 96/0158 | Re-cladding of roofs, walls and insertion of roller shutter doors (Building 16 and Coseley Building) - *present currently* | 1996 |
| 96/0312 | Demolition of Building 9 and erection of loading bay extension - *present currently* | 1996 |
| 96/0572 | Formation of new car park & vehicle turning area (Rear of Building 11) – *present currently* | 1996 |

**Table 3.2 Planning History**

| Application number | Description | Date approved |
|---|---|---|
| 96/1729 | Formation of new parking area 9Building 5) | 1996 |
| 2000/0760 | Erection of free-standing canopy for loading bays (Building 1) – *present currently* | 2000 |
| 2000/1207 | Construction of loading canopy and extension of hard standing for goods vehicles (Building 4) – *present currently* | 2000 |
| 2001/0704 | Erection of drum store building (Building 3). *This has not been unidentified on site, and may not have been constructed.* | 2001 |
| 2001/1799 | Change of use from Business to Retail Ancillary (Building 12) – *present currently* | 2001 |
| 2002/0710 | Relocation of car park & re-designation of existing car park to trailer park (Rear of Units A & B) | 2002 |
| 2003/728 | Construction of two single storey industrial units with two storey office accommodation (Storage or Distribution) | 2003 |
| 05/0616 | Subdivision of existing vacant warehouse into five self contained units with new bay doors to match existing, part demolition of existing unit to create new yard area (Building 3). | 2005 |
| 12/0142 | Change of use from office to children's nursery, alterations to include replacement windows, canopy over play area and alterations to access road (College Building). | 2014 |
| 13/0815 | Erection of spray booth / oven (Building 16). *This has not been unidentified on site, and may not have been constructed.* | 2013 |
| 14/0746 | Part change of use from office/storage to private gym for a temporary period of up to five years (Building 12). | 2014 |
| 15/02568 | Erection of terrace of industrial units with associated parking (Gateway House). *This is understood to be in early stages of construction.* | 2015 |
| 15/02645 | Temporary change of use of existing small office building to a private gym (Gateway House). *Present currently* | 2015 |
| 15/04444 | Construction of a new single storey, timber clad pitched roof building adjacent to the existing nursery and backing onto the existing play area for pre-school children (Adjacent to College Building). | 2015 |
| 15/04452 | Demolition of existing end-of-life industrial units and construction of fourteen individual "starter" industrial & storage units (Vanburgh Quarter). | 2016 |
| 16/02499 | Erection of additional unit to approved application 15/04452/FUL (Vanburgh Quarter). | 2016 |
| 18/02376 | Erection of extension and canopy (Building 1X/4X) | 2018 |

Historical mapping in the planning department records (application no. 198/64) identified part of the site in the west (<5% of the site area) as having been used for refuse disposal in the early 1960s.

3.3.2 Local Authority Environmental Health Department

An enquiry has been made to the Environmental Health Department at West Oxfordshire District Council in an attempt to identify if the Council has any specific information about the site, particularly with reference to its status under Part 2A of the Environmental Protection Act 1990. In addition, information on private water abstractions has been requested. *This information is awaited.*

A Part B environmental permit under the Pollution Prevention and Control Regulations 2000 had been issued to Corndell Furniture (on-site in Building 5) for wood coating activities. This was previously referred to as a Local Authority Air Pollution Control authorisation and has been held by Corndell Furniture since 1993.

3.3.3 Petroleum Licensing Authority

An enquiry has been submitted to the Petroleum Enforcement Officer at Oxfordshire County Council / Oxfordshire Fire and Rescue Service in order to establish if the site is currently or has previously been licensed for the bulk storage of petroleum products. *This information is awaited.*

### 3.4 Environmental Database

The following information has been obtained from a review of a proprietary environmental database procured by Ramboll relating to the site and surrounding land:

- there are no records of landfill sites (former or current) within 1km radius of the site;
- there are two records of a licensed waste management facility located within 1km of the site. Licensed to Fraser Evans & Sons at The Tyre Yard, Downs Road, located adjacent west of the site, registered as a waste transfer site for tyre disposal; and Ubico Ltd at Supergas Industrial Estate, located approximately 130m west of the site, registered as a materials recycling facility;
- there are no Environmental Permits to operate a Part A(1) or A(2) installation under the Environmental Permitting Regulations (formerly referred to as IPPC and LA-IPPC Authorisations) located on-site. There is one located within a 1km radius. This is licensed to Bevan Recycling (UK) ltd., approximately 55m west for carbonisation and associated processes within the fuel and power industry;
- there is one Environmental Permit to operate a Part B installation under the PPC Regulations (formerly referred to as LAPPC Permits) registered to the site. This is held by Corndell Furniture (situated in the south-west of the site) for wood coating processes. There are a further five Part B permits within 500m of the site. The closest of these is licensed to Park View Filling Station, 10m north for petrol filling station operations;
- there is no Radioactive Consent registered within 250m of the site;
- there are no records of pollution incidents attributable to the site. The only pollution incident to controlled waters recorded within 1km of the site occurred on Downs Road, approximately 60m west of the site in November 1993. The pollutant was not recorded. This was classified by the Environment Agency (EA) as a minor incident;
- no prosecutions or enforcement actions have been taken against the site or premises within 250m for contamination incidents;

- one statutory designated sensitive ecological site is recorded within 1km of the site. This is referred to as the Upper Thames Tributaries, approximately 430m north, recorded as an Environmentally Sensitive Area (ESA); and
- there is one fuel site located within 250m of the subject site. This is registered as Park View Filling Station, situated 10m north and is currently operational.

The site lies in a "radon Affected Area" as defined by Public Health England (i.e. an area where between 1% and 3% of residential properties are projected to contain radon above the residential action threshold). Under Health and Safety legislation, employers have a duty to manage workplace risks including the potential for radon exposure. Health and Safety Executive guidance recommends radon monitoring for workplaces located in radon Affected Areas. If the workplace radon threshold is exceeded, the Ionising Radiations Regulations 1999 require employers to take action to reduce risks.

According to the Building Research Establishment, radon protection measures are not required for new buildings at this location.

The LinesearchbeforeUdig database lists pipelines distributing crude oil and refined hydrocarbon products owned and/or operated by a number of UK pipeline operators, including BPA, BP, ConocoPhillips, Esso, Government Pipelines and Storage System, Sabic, Shell and Total. According to the database, there are no records of underground oil or refined hydrocarbon products pipelines on the site or within 250m.

## 3.5 Potential for Historical Contamination

3.5.1 The Site

The following historic potentially contaminative activities have been identified as having taken place on-site. Evidence from historical maps and the planning records indicates that these activities are likely to have been restricted to the site itself and did not occur outside the site boundary:

- anecdotal information indicates that parts of the site (potentially no more than 10% of the site in the north-east) were used for the maintenance and repair of aeroplanes possibly from as early as the 1930s. The historical maps do not show development on the site dating from this period (possibly due to national security restrictions), however, from the site inspection, some of the buildings on-site appear to date from this time;
- the majority of the on-site buildings were used for the manufacture of automotive components during the post-war period up until the 1980s. This is understood to have included the testing of vehicle heaters (dates not known); and
- from the mid-1980s onward, the site has been divided into a number of industrial units and operated as an industrial park (as discussed in Section 2 above).

Specific potentially contaminative activities that have been identified as having taken place on-site historically are as follows (see Figure 2 for approximate locations):

- an area of the site (<5% of the site area) was marked on planning application maps from the 1960s as having been used for refuse disposal (at a time when the site was in use for automotive component manufacture);
- from planning and petroleum licensing records, a number of oil/petroleum tanks have been identified on site. At least three former underground storage tanks were present on-site from the 1950s onwards (no longer in use), one of which incorporated underground fuel lines. A number of above ground fuel storage tanks have also been present on site from the 1950s onwards;
- a 1950 planning application details a swarf house with sump tank on site (former Building 9);

- planning records indicate that metal finishing took place on site, and a tank farm containing metal finishing chemicals was located on-site from the 1960s until the 1980s. Paint stores and stoving enamels were also stored on site;
- information from the planning records indicates that electrical substations and transformers have been present on site since the 1950s;
- planning maps show battery charging areas dating from the early 1950s (location unknown and no longer present on site); and located in the centre of Building 11 in the 1960s (no longer present on site); and
- planning department maps indicate an effluent treatment plant located in the west of the site from the early 1950s (no longer present). A trade effluent treatment building was located south of Building 3 from 1969 (no longer present). Two further effluent treatment tanks (no longer present) were also located on-site (location unknown) in 1969.

### 3.5.2 Surrounding Area

The following potentially contaminative activities have been identified as having taken place in the surrounding area:

- a petrol filling station has been located immediately adjacent to the north of the site from the 1960s/1970s to the present day. In general terms, petrol filling stations are considered significant potentially contaminative activities;
- A hydraulic engineers is located adjacent to the north east of the site;
- a tyre disposal waste transfer site has been located immediately adjacent to the west of the site since at least the 1990s; and
- vehicle servicing operations and engineering works have been present within 100m of the site from the 1970s onwards.

The above activities represent potential off-site sources of contamination that could potentially migrate beneath the site. The potential for contamination (if present) to migrate beneath the site from off-site sources or away from the site onto third party land would be dependent on the underlying geological conditions, which are discussed in Section 4.

# 4. ENVIRONMENTAL SETTING

Desk-based research of the local geology, hydrogeology and hydrology was carried out in order to establish the potential for migration of contamination onto or away from the site, and to assess the sensitivity and vulnerability of the site's setting with respect to surface water, groundwater and ecological resources.

- Information was obtained from a number of sources, including:
- examination of published geological maps produced by the British Geological Survey (BGS) and associated sheet memoirs (where available);
- a proprietary environmental database procured by Ramboll; and
- Regulatory Authority websites including the Environment Agency (EA).

## 4.1 Geology and Hydrogeology

According to the BGS map (Sheet 236, Witney, 1:50,000 scale), the site is directly underlain by solid geology of Cornbrash Formation (fine-grained limestone with marl and mudstone horizons, at thicknesses of up to 5m), which is subsequently underlain by Forest Marble Formation (clays with limestone between 5m and 15m thick). The Forest Marble may outcrop directly beneath the site in the south-west.

The whole site is further underlain by the following solid geology:

- Middle Jurassic Limestones with Marl and Mudstone horizons (50-75m in thickness); underlain by
- Lias (Mudstones with Limestone beds) at thicknesses of 100m to 120m; underlain by
- Upper Coal Measures at depth.

The underlying Cornbrash Formation are permeable and water-bearing. Shallow groundwater is present beneath the site as discussed further in Section 5. The underlying solid geology (Middle Jurassic Limestone) is also likely to be water-bearing and permeable, primarily through fissure flow. The Lias at depth is of low permeability and can support small abstractions.

The EA classifies the Cornbrash Formation as a Secondary A Aquifer (formerly classified as a minor aquifer), which has the potential to support small-scale, local abstractions. The deeper underlying Middle Jurassic Limestone is classified as a Principal Aquifer (formerly referred to a major aquifer, with highly permeable strata, able to support regionally important abstractions).

The EA groundwater vulnerability map (Sheet 38; Upper Thames and Berkshire Downs) confirms that the site overlies a formerly classified minor aquifer.

According to a publicly available third-party environmental database, there is one licensed groundwater abstraction within 2km of the site. This is located approximately 990m south-west of the site and is licensed to Witney Golf Club Ltd. for spray irrigation.

According to an EA data source, the site is not located within a currently designated groundwater Source Protection Zone (SPZ).

## 4.2 Hydrology

The nearest identified surface watercourse to the site is a drain running from 80m south-west and joining the Colwell Brook. This is not classified under the EA General Quality Assessment Scheme. The closest watercourse classified by the EA is the River Windrush (700m north), which is currently classified by the EA as being of 'moderate' ecological quality and 'good' chemical quality under the Water Framework Directive classification scheme.

According to the EA, the site is located in Flood Zone 1 (Low Probability). This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1% in any year). The closest area of land recorded as having an elevated risk of flooding is located approximately 550m north of the site.

According to a publicly available third-party environmental database, there are five licensed surface water abstractions within a 2km radius of the site. These are detailed in Table 4.1 below.

**Table 4.1 Licensed Surface Water Abstractions within 2km**

| License Holder | Distance from Site | Abstraction Source | Purpose |
|---|---|---|---|
| TSS (UK) Ltd. | 850m NE | River Windrush | Hydraulic testing |
| Mr I Solkin | 1.62km NW | River Windrush | Hydroelectric power generation |
| Bryant Homes West Midlands Ltd. | 1.76km E | River Windrush | Wetland support – Transfer between sources |
| Mr I Solkin | 1.85km NW | River Windrush | Transfer between sources |
| Early's of Witney Plc | 1.97km E | River Windrush | General use; general cooling; and process water |

## 4.3 Significance of Geology, Hydrogeology and Hydrology

The site is considered to be situated in an area of moderate sensitivity with respect to groundwater resources, due to the underlying minor aquifer (Cornbrash), overlying a major aquifer (Jurassic Limestone). However, no groundwater abstractions for public potable supply are located within 2km of the site. Moreover, the site is not located within an EA designated groundwater Source Protection Zone.

The site is considered to be located in an area of low to moderate sensitivity with respect to surface water resources, due to the distance of the nearest surface water course (a land drain 80m south). There are no surface water abstractions in close proximity to the site.

# 5. ENVIRONMENTAL MONITORING

## 5.1 Introduction

Site investigation work has previously been undertaken by ENVIRON (which has subsequently become Ramboll) in 2004 to 2006 & 2010. At the time this was to support the sale and purchase of the site. Pertinent factual data and information from these investigations has been included in this report.

In summary, past work has found chlorinated solvents in groundwater in two areas of the site, and free phase product in a third area. Elevated concentrations of land gas were also found in a localised area and a venting trench installed. Full suites of chemical analyses were undertaken in 2004 to 2006 & 2010 (including metals, PAHs etc). Only those contaminants of concern were analysed on 2019 (i.e. TPH and VOCs).

## 5.2 Conceptual Site Model

As discussed in earlier sections of this report, there are potential sources of contamination at the site and contamination has been detected in groundwater in the past.

The most plausible potential contaminant migration pathways are considered to be:

- Migration of contaminants to and within groundwater; and
- Vapour risks to site users.

Risks to site users via direct contact pathways are lower due to the commercial use of the site and typical exposure patterns to the soil. In this respect risks are common with most industrial and brownfield land.

Consequently, site investigations have concentrated on gas and groundwater sampling.

## 5.3 Environmental Monitoring Scope of Work

The scope of the monitoring was as follows:

- one round of gas monitoring of accessible boreholes;
- one round of groundwater sampling of accessible boreholes; and
- chemical analysis of 15 groundwater samples for a range of contaminants, and analysis of free phase product.

## 5.4 Gas Monitoring

Land gas monitoring of all accessible monitoring wells was undertaken by Ramboll on 13th February 2019. The wells were monitored for methane, carbon dioxide, oxygen, hydrogen sulphide, flow rate and atmospheric pressure using a portable infra-red gas analyser (GFM430).

## 5.5 Groundwater

Groundwater levels in all accessible monitoring wells were measured on 13th February 2019, and sampled on 14th and 15th February 2019. A total of sixteen groundwater wells were monitored and samples obtained for detailed analysis (including a sample of free product from borehole BHG). A summary of the field observations during groundwater monitoring are presented in Section 6.6.

Prior to groundwater sampling, the monitoring wells were developed to remove standing water thus ensuring that a representative groundwater sample was obtained. A groundwater sample was then obtained from each well following groundwater recharge using a peristaltic pump and dedicated disposable sampling tubing, to minimise loss of volatile contaminants (if present).

Fifteen groundwater samples, and one sample of free product, were placed promptly into sealed containers appropriate to the type of analysis being undertaken and labelled with site-specific sample identification information. All groundwater samples were subsequently scheduled for chemical analysis. Samples were submitted to an accredited independent laboratory for analysis and stored in cool boxes maintained at a low temperature, to avoid the loss of hydrocarbon and volatile compounds (if present).

## 5.6 Topographic Survey

A topographic survey was undertaken at the site for ENVIRON on 16th November 2010, which surveyed the exploratory locations as x, y and z co-ordinates. The survey also allowed the relative resting groundwater levels within the boreholes to be calculated in order to determine flow direction of the groundwater body or bodies beneath the site.

## 5.7 Groundwater Monitoring Survey

Groundwater was encountered at shallow depths in the majority of boreholes in what is considered to represent the Cornbrash deposits (Secondary A Aquifer). Groundwater was encountered between depths of 1.26m bgl (BHJ) and 2.59m bgl (BHH), excluding the boreholes BHC and BHD, which are installed to a greater depth. Groundwater was encountered at lower depths in BHC and BHD, at depths of 5.56m bgl and 4.22m bgl, respectively.

The boreholes were levelled in relation to a site datum and the resting groundwater levels were calculated in order to allow groundwater flow direction to be inferred. Resting groundwater depths are presented in Table 6.1 below.

**Table 6.1 Groundwater Monitoring Results**

| Borehole | Borehole Elevation (m AOD) | Depth to Water (m bgl) | Relative Groundwater Elevation (m AOD) |
|---|---|---|---|
| BHB | Not available | 1.62 | Not available |
| BHC3 | 105.58 | 5.56 | 100.022 |
| BHD | 106.90 | 4.22 | 102.68 |
| BHE | 107.38 | 1.72 | 105.66 |
| BHF | 107.86 | 1.41 | 106.45 |
| BHG | 108.02 | 1.49* | 106.53 |
| BHH | 107.69 | 2.59 | 105.10 |
| BHH1 | 107.55 | 1.96 | 105.59 |
| BHH2 | 108.34 | 1.77 | 106.57 |
| BHJ | 104.24 | 1.26 | 102.98 |
| BHK | 104.54 | 1.49 | 103.05 |
| BHL | 107.40 | 1.71 | 105.69 |
| BHM | 106.76 | 1.60 | 105.16 |
| BHN | 107.24 | 1.99 | 105.25 |
| BHP | 107.51 | 1.66 | 105.85 |
| BHQ | 107.84 | 1.35 | 106.49 |

N.B. Ordnance datum reference based on topographical survey undertaken by ENVIRON on 16th November 2010

* Free phase product identified at a thickness of 0.65m (between 0.84m and 1.49m bgl) on 13th February 2019.

The topographic survey shows the site slopes gently downwards towards the south eastern section of the site, with BHJ located at the lowest relative elevation. Groundwater in boreholes BHC and BHD appear to be c. 3-5m lower than the boreholes in the north and western sections of the site.

From the groundwater level data, there appears to be more than one groundwater body at the site. The majority of boreholes appear to be in an upper perched groundwater body within the Cornbrash and Forest Marble deposits. The groundwater within this water body is relatively shallow, at a depth of approximately 1m to 3m below ground level (c. 103m to 106m AOD). This groundwater body appears to broadly follow the topography at the site, flowing in an overall south-easterly direction towards Colwell Brook.

The site is unusual in terms of groundwater given the different water levels. The drop in relative groundwater elevation does not appear to mimic topography to the same extent. It is possible that there may be an unidentified geological structure in the eastern section of the site, which may be influencing the groundwater. Furthermore, the Cornbrash and Forest Marble deposits, which contain mudstone bands and foundation structures in nearby buildings, also have the potential to influence the groundwater at the site. There is not enough data from the lower water table to accurately determine groundwater flow in this water body.

The direction of groundwater flow in the upper perched groundwater body is presented in Figure 4 (Appendix 1).

### 5.8 Field Evidence of Potential Contamination

Field evidence of potential contamination during the recent groundwater monitoring round (14th and 15th February 2019) was limited to the identification of free phase product in one location (BHG) at a thickness of 0.65m; and a slight hydrocarbon odour in groundwater sampled from borehole BHB.

In 2010, the thickness of free phase product at this location was recorded as 0.12m (16th November 2010); and 0.2m (25th November 2010). Additionally, in 2010, a hydrocarbon sheen was noted in BHC1 and BHP during sampling; and a hydrocarbon odour was noted in BHE, BHG, BHH and BHP. These were not observed in 2019.

# 6. GAS MONITORING

## 6.1 Introduction

Land gas monitoring was undertaken on one occasion by Ramboll from sixteen existing boreholes across the site. The wells were monitored for methane, carbon dioxide, oxygen, hydrogen sulphide, flow rate and atmospheric pressure using a portable infra-red gas analyser (GFM430).

The ground gas assessment included in this report is provided for indicative purposes only and is not intended for use as a detailed ground gas risk assessment. This section provides only the results of one round of monitoring, incidental to groundwater monitoring.

Ramboll has applied a semi-quantitative method in line with current good practice guidance on risk assessment to assess ground gas risks. Full details of Ramboll's assessment methodology are presented in Appendix 4.

## 6.2 Summary of Monitoring Results

The ground gas monitoring results are presented in full in Appendix 6 and are summarised below.

### 6.2.1 Methane

Methane was not detected above the instrument detection limit of the gas analyser (<0.1%) in any of the sixteen monitoring wells during the gas monitoring round.

### 6.2.2 Carbon Dioxide

Carbon dioxide was detected in thirteen of the sixteen monitoring wells at concentrations ranging between 0.4 % v/v measured in BHN and 4.0% v/v in BHG. The elevated concentrations of carbon dioxide in BHG coincided with the presence of free-phase product (oil) on the water within this borehole.

Concentrations of carbon dioxide were not detected above the instrument detection limit of the gas analyser (<0.1%) in boreholes BHC3, BHH, and BHL.

### 6.2.3 Oxygen

In general oxygen concentrations ranged between 10.5% v/v in BHD and 21.0% v/v in BHC3, with lower concentrations coinciding with slightly elevated concentrations of carbon dioxide. However, in BHG depleted oxygen levels were recorded (3.1% v/v). This coincided with elevated concentrations of carbon dioxide, which is likely to be associated with the presence of free-phase product within the borehole.

### 6.2.4 Flow Rates

Positive flow rates detected above the detection limit of the instrument were detected in two of the sixteen boreholes. A flow rate of 2.6 litres per hour was recorded in BHP; and 3.2 litres per hour was recorded in BHE. In each case flow rate returned to 0.0 litre per hour during monitoring, over an approximately one-minute time period.

### 6.2.5 Atmospheric Pressure

Atmospheric pressure was identified from publicly available records for the 48-hour period prior to the monitoring round[2] and was recorded at each monitoring location during the monitoring

[2] http://wow.metoffice.gov.uk/ accessed on 19/02/2019

round with the portable gas analyser. The monitoring was conducted during a period of relatively high, stable atmospheric pressure; recorded at 1015mb throughout the monitoring round.

### 6.2.6 Significance of Land Gas Monitoring

Ramboll has used the Modified Wilson and Card method to identify a preliminary characteristic situation for the Site, by calculating a preliminary site Gas Screening Value (SGSV). The SGSV is calculated using a worst-case scenario (i.e. the maximum gas concentration and flow rates detected) across the entire site during the monitoring period.

The 'Characteristic Situation' can then be derived by comparison with the relevant tables within the CIRIA C665 document. It is important to note that SGSVs are not absolute thresholds but guideline values.

Based on the limited results from this investigation, a preliminary worst case SGSV for the site has been calculated as 0.128l/hr by multiplying the maximum detected carbon dioxide concentration (4.0% in BHG) by the highest recorded flow rate (3.2l/h in BHE). This preliminary maximum SGSV corresponds to CIRIA C665 Characteristic Situation 1 (CS1, Very Low Risk), where gas protection measures are not required in buildings.

This gas risk assessment is only based on one round of monitoring. In the context of the proposed continued use of the site as an industrial park, gas protection measures are unlikely to be required.

During the Phase I site walkover, Ramboll observed a gravel-surfaced trench in the south-west of the site, with an adjacent vent pipe with cowl, which in combination appears to be a gas trench venting system. This feature was noted by ENVIRON to be present in 2010, with methane monitoring points noted along the fence line. These monitoring points were not observed in 2019; and the gravel trench appeared to be fairly overgrown with low vegetation.

# 7. GROUNDWATER MONITORING

## 7.1 Analytical Strategy

The analytical strategy focused on potential contaminants of concern based on previous groundwater analysis undertaken at the site. These comprised chlorinated solvents and total petroleum hydrocarbons.

The analytical rationale is presented in Table 8.1.

**Table 8.1 Summary of Analytical Testing**

| Analytical Suite | Rationale | No of groundwater samples submitted |
|---|---|---|
| Total Petroleum Hydrocarbons (TPH) *via* Criteria Working Group (CWG) Methodology | Target analysis for fuels | 15 |
| Volatile Organic Compounds (VOCs) | Target analysis for fuels and solvents | |
| Monitored Natural Attenuation Suite | To assess the level of natural attenuation occurring at the site | |
| Whole oil trace | To identify and characterise free phase product | 1 |

## 7.2 Assessment of Risk

A Generic Quantitative Risk Assessment (GQRA) of the groundwater analytical results (in terms of risk to human health and controlled waters) has been undertaken. The results of this exercise are summarised below; a summary table and laboratory certificates of analysis are provided in Appendix 5. For the purposes of this report, it is assumed the site will remain in its current use, in a commercial context.

## 7.3 Risks to Human Health

The groundwater analytical results obtained during this investigation have been screened against the Ramboll volatilisation GAC for a commercial end use.

The VOC vinyl chloride, was recorded at a concentration of 1,989.3µg/l in monitoring well BHH, which exceeds the GAC of 63µg/l. BHH is located adjacent to the western site boundary, within the service yard of Building 1. BHH is also located within an area of the site that has a ground gas venting system in place, comprising a gravel filled trench and an off-set vent pipe.

No other contaminants recorded concentrations exceeding the respective Ramboll Generic Assessment Criteria (GAC) guideline values.

Free phase product was recorded at borehole BHG during the 2019 monitoring visits (which is consistent with the 2010 monitoring). The thickness of free product was recorded as 0.65m (i.e. present between 0.84m and 1.49m bgl); this has increased since the monitoring rounds undertaken in 2010 (0.12m and 0.2m thickness). Borehole BHG is located adjacent to the northern site boundary in close proximity to an off-site manufacturer of hydraulic cylinders and a petrol filling station (both located off-site).

Borehole BHG is also in close proximity to the former UST located north of Building 3 identified in the 2010 Phase I ESA. The presence of free phase product has the potential to act as a theoretical risk to human health. However, given that the majority of hydrocarbon fractions were identified in the aliphatic hydrocarbon range C16 – C35 comprising less volatile, heavier end

hydrocarbon fractions indicative of hydraulic oils and/or lubricating oils, this is unlikely to act as a significant risk to human health.

## 7.4 Risks to Controlled Waters

### 7.4.1 Introduction

The key controlled waters receptors located on and in the vicinity of the site are:

- groundwater within the underlying Secondary A aquifer (Cornbrash) and Principal aquifer (Jurassic Limestone);
- off-site surface watercourses, namely a drain running from 80m south-west, which joins the Colwell Brook approximately 300m south of the site. The River Windrush is located 700m north.

The Ramboll GAC for controlled waters in this scenario are derived from the Environmental Quality Standards (EQS) values since groundwater in the vicinity of the site is not abstracted for drinking water purposes. Where EQS values are not available, the UK Drinking Water Standards (UK DWS) and World Health Organization (WHO) criteria have been used as alternative guidelines, although notably conservative for the site setting.

Full details of Ramboll's assessment methodology are presented in Appendix 4.

### 7.4.2 Secondary Aquifers

Groundwater analytical results identified the following elevated concentrations of contaminants, in relation to the Ramboll GAC for controlled waters:

- The following VOCs were identified at concentrations in excess of the Ramboll GAC for controlled waters.
  - Vinyl Chloride was detected in eight of the fifteen samples analysed. Seven of which were recorded at concentrations exceeding the GAC of 0.375µg/l; and ranged between 0.5µg/l (BHQ) and 1,989.3µg/l (BHH). The majority of detections were recorded in the west of the site; However, vinyl chloride was also detected in BHC3 located in the south-east of the site, where the depth to groundwater is greater.
  - 1,1-Dichloroethene (1,1 DCE) was only detected in one sampling location in the west of the site (BHH) at a concentration of 14µg/l, which exceeds the GAC of 7µg/l.
  - cis-1-2-Dichloroethene was detected in nine of the fifteen samples analysed. Three of which were recorded at concentrations exceeding the GAC of 50µg/l. A maximum concentration of 6,777µg/l was recorded in BHH in the west of the site, with a concentration of 434µg/l in nearby BHH1, and a concentration of 167µg/l in BHC3 in the south-east of the site.
  - Trichloroethene (TCE) was detected in four sampling locations, all of which were at concentrations exceeding the GAC of 7.5µg/l. Concentrations in the west of the site ranged between 9µg/l (BHH1) and 70µg/l (BHL); and a concentration of 44µg/l was recorded at BHC3 in the south-east of the site.
  - Naphthalene was detected in one location, which marginally exceeded the GAC of 2µg/l with a recorded concentration of 3µg/l in BHL.
  - Isopropylbenzene and propylbenzene were detected at low concentrations (14µg/l and 24µg/l respectively) in sampling point BHB in the north-east of the site, adjacent to the off-site petrol filling station. There is no available GAC for these VOCs.
- The BTEX compounds and MTBE were each detected in at least one sampling location. Benzene was recorded at concentrations exceeding the GAC of 1µg/l in two locations. A concentration of 160.9µg/l was recorded in BHB in the north of the site; and a concentration

of 16.2µg/l was recorded in BHH in the west of the site. MTBE was recorded at a concentration of 0.1µg/l in BHL; and 7.6µg/l in BHB. However, there is no available GAC for MTBE.

- Detectable concentrations of total petroleum hydrocarbons (TPH) were recorded in eight sampling locations; therefore, exceeding the GAC of 10µ/l. The most significantly elevated concentrations were recorded in BHH (2,389µg/l) and BHB (1,126µg/l).
  - Free phase product was identified in BHG at a thickness of 0.65m. The hydrocarbon fractions (C16-C35) suggest the presence of a heavy oil, interpreted by the laboratory as possible hydraulic oil. This has the potential to act as a risk to controlled waters.
  - Lighter fractions of hydrocarbons detected are likely to be reflective of the VOCs and BTEX compounds detected in these locations.
- The following determinands were analysed as part of a suite of tests for assessing monitored natural attenuation. The following determinands are a measure of groundwater quality; those that were recorded in excess of the GAC are reported as follows.
  - Nitrite was detected in one sample only, at a concentration of 0.594mg/l in BHJ. This marginally exceeds the GAC of 0.5mg/l.
  - Ammonium was detected in seven of the fifteen analysed samples. Three of which were recorded at concentrations in excess of the GAC of 0.5mg/l. A maximum concentration of 1.59mg/l was recorded in BHK.
  - Manganese was detected in ten of the fifteen sampling locations. Six of which were recorded at concentrations in excess of the GAC of 123µg/l. Excedances were spread across the site and sampling locations with a maximum recorded concentration of 271µg/l in BHP, located in the west of the site.
  - An elevated concentration of iron (III) was recorded in BHB in the north of the site as a concentration of 15.11mg/l, which exceeded the GAC of 1mg/l. All other detections were below the GAC.

The MNA parameters show reductive conditions are present in places at the site which confirms the correct conditions are present for natural attenuation to occur (as also indicated by the breakdown products of TCE).

Detected contaminant concentrations exceeding the controlled waters GAC are presented in Figure 5, Appendix 1.

### 7.5 Comparison with Previous Monitoring Data

Concentrations of key contaminants for all available groundwater monitoring rounds have been compiled in Table 8.2 below.

Sampling locations BHH and BHH1 have historically recorded VOCs (vinyl chloride, cis-1,2-dichloroethene, and trichloroethene) at concentrations exceeding the relevant GAC, which has continued to be the case up to and including the latest round of monitoring.

Sampling location BHC3, in the south-east of the site, recorded elevated concentrations of VOCs (vinyl chloride, cis-1,2-dichloroethene, and trichloroethene) in February 2019. Dichloroethene and trichloroethene have historically been identified at elevated concentrations since monitoring began in 2004.

It was not possible to sample from BHC, BHC1, or BHC2 in February 2019 as the monitoring wells could not be located, and are assumed to have been destroyed. In the past these boreholes have contained elevated concentrations of chlorinated solvents.

Increases in TPH in 2019 were observed in BHB and BHH. BHB is located across groundwater gradient from BHG, where free phase product has been identified; and adjacent to the off-site

petrol filling station. Either of these factors could be considered a possible cause for the increase in TPH concentration observed in BHB. The concentration in BHH is potentially affected by the presence of VOCs also identified in the sample (including benzene and MTBE which are characteristic of petrol).

**Table 8.2 Summary of Groundwater Analysis Between 2004 and 2019**

| Test | | Vinyl Chloride | 1,1-Dichloroethene | 1,1-Dichloroethane | cis-1,2-Dichloroethene | Trichloroethene | Tetrachloroethene | Total TPH (C5-35) |
|---|---|---|---|---|---|---|---|---|
| **Units** | | **µg/l** | **µg/l** | **µg/l** | **µg/l** | **µg/l** | **µg/l** | **µg/l** |
| **Human Health GAC** | | **63** | **16000** | **260000** | **13000** | **530** | **4600** | **NC** |
| **Controlled Waters GAC** | | **0.375** | **7** | **10** | **50** | **7.5** | **1** | **10** |
| **BHB** | Nov-04 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Feb-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Jun-05 | <10 | <1 | <1 | <1 | <2 | <1 | 120 |
| | Oct-05 | <10 | <1 | <1 | <1 | <1 | <1 | 90 |
| | Oct-06 | <10 | <1 | <1 | 14 | <1 | <1 | 20 |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | <0.1 | <3 | <3 | <3 | <3 | <3 | 1126 |
| **BHC** | Nov-04 | **73** | 6 | 30 | 1500 | 270 | <1 | <10 |
| | Feb-05 | **110** | 11 | 73 | 1700 | 230 | <1 | 110 |
| | Jun-05 | 38 | 7 | 52 | 1100 | 160 | <1 | 160 |
| | Oct-05 | **86** | 14 | 93 | 1800 | 190 | <1 | 1200 |
| | Oct-06 | 53 | 9 | 43 | 1300 | 120 | <1 | 140 |
| | Nov-10 | < 1.0 | 5.7 | 21 | 440 | 110 | < 1.0 | <10 |
| | Feb-19 | NF | NF | NF | NF | NF | NF | NF |
| **BHC1** | Nov-04 | 18 | 13 | 170 | 1000 | 98 | <1 | <10 |
| | Feb-05 | **120** | 48 | 630 | 2700 | 340 | <1 | <10 |
| | Jun-05 | 30 | 44 | 380 | 2300 | 420 | <1 | 100 |
| | Oct-05 | 54 | 61 | 380 | 2200 | 330 | <1 | 70 |
| | Oct-06 | **69** | 430 | 390 | 3100 | **640** | <1 | 40 |
| | Nov-10 | 7.6 | 48 | 140 | 1100 | 510 | < 1.0 | 716 |
| | Feb-19 | NF | NF | NF | NF | NF | NF | NF |
| **BHC2** | Nov-04 | **170** | 8 | 5 | 2700 | **640** | <1 | <10 |
| | Feb-05 | **190** | 7 | 4 | 2000 | 350 | <1 | <10 |
| | Jun-05 | **63** | 5 | 2 | 1500 | 220 | <1 | 110 |
| | Oct-05 | **160** | 9 | 4 | 2100 | 260 | <1 | 40 |
| | Oct-06 | **100** | 6 | 2 | 1700 | 150 | <1 | 30 |
| | Nov-10 | - | - | - | - | - | - | - |

**Table 8.2 Summary of Groundwater Analysis Between 2004 and 2019**

| Test | | Vinyl Chloride | 1,1-Dichloroethene | 1,1-Dichloroethane | cis-1,2-Dichloroethene | Trichloroethene | Tetrachloroethene | Total TPH (C5-35) |
|---|---|---|---|---|---|---|---|---|
| | Feb-19 | NF | NF | NF | NF | NF | NF | NF |
| **BHC3** | Nov-04 | <10 | <1 | <1 | 180 | 27 | <1 | <10 |
| | Feb-05 | <10 | <1 | 1 | 160 | 20 | <1 | <10 |
| | Jun-05 | <10 | <1 | <1 | 180 | 23 | <1 | 80 |
| | Oct-05 | <10 | <1 | 2 | 160 | 18 | <1 | 50 |
| | Oct-06 | <10 | <1 | - | 120 | 11 | <1 | 30 |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | 99 | 30 | < 1.0 | <10 |
| | Feb-19 | 16.7 | <3 | <3 | 167 | 44 | <3 | 78 |
| **BHD** | Nov-04 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Feb-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Jun-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Oct-05 | <10 | <1 | <1 | 2 | <1 | <1 | 40 |
| | Oct-06 | <10 | <1 | <1 | <1 | <1 | <1 | 40 |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | <0.1 | <3 | <3 | <3 | <3 | <3 | <10 |
| **BHE** | Nov-04 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Feb-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Jun-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Oct-05 | <10 | <1 | <1 | <1 | <1 | <1 | 80 |
| | Oct-06 | <10 | <1 | <1 | <1 | <1 | <1 | 60 |
| | Nov-10 | < 1.0 | < 1.0 | 7.4 | < 1.0 | < 1.0 | < 1.0 | 1389 |
| | Feb-19 | <0.1 | <3 | <3 | <3 | <3 | <3 | <10 |
| **BHF** | Nov-04 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Feb-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Jun-05 | <10 | <1 | <1 | <1 | <1 | <1 | <10 |
| | Oct-05 | <10 | <1 | <1 | <1 | <1 | <1 | 10 |
| | Oct-06 | <10 | <1 | <1 | <1 | <1 | <1 | 40 |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | <0.1 | <3 | <3 | <3 | <3 | <3 | <10 |
| **BHG** | Nov-04 | <10 | <1 | 2 | 16 | 5 | <1 | <10 |
| | Feb-05 | **140** | <1 | 18 | 220 | 1 | <1 | 400 |
| | Jun-05 | 39 | 3 | 47 | 140 | 1 | <1 | 1800 |
| | Oct-05 | - | - | - | - | - | - | <10 |

**Table 8.2 Summary of Groundwater Analysis Between 2004 and 2019**

| Test | | Vinyl Chloride | 1,1-Dichloroethene | 1,1-Dichloroethane | cis-1,2-Dichloroethene | Trichloroethene | Tetrachloroethene | Total TPH (C5-35) |
|---|---|---|---|---|---|---|---|---|
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | - | - | - | - | - | - | - |
| **BHH** | Nov-04 | **660** | 3 | <1 | 2200 | 58 | <1 | <10 |
| | Feb-05 | **820** | 3 | <1 | 2200 | 10 | <1 | 80 |
| | Jun-05 | **610** | 2 | <1 | 1300 | 2 | <1 | 100 |
| | Oct-05 | **740** | 2 | 1 | 1600 | 5 | <1 | 150 |
| | Oct-06 | <10 | <1 | <1 | 1100 | <1 | <1 | 240 |
| | Nov-10 | **450** | < 1.0 | < 1.0 | 670 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | **1989.3** | 14 | <3 | 6777 | 13 | <3 | 2389 |
| **BHH1** | Nov-04 | 41 | <1 | <1 | 6000 | **770** | 16 | <10 |
| | Feb-05 | <10 | 3 | <1 | 3900 | 160 | 7 | 100 |
| | Jun-05 | **170** | 3 | <1 | 2600 | 170 | 6 | 190 |
| | Oct-05 | 57 | 4 | <1 | 8200 | 140 | 5 | 360 |
| | Oct-06 | 50 | 2 | <1 | 3900 | 30 | <1 | 280 |
| | Nov-10 | **250** | 8.7 | < 1.0 | 4300 | 47 | < 1.0 | <10 |
| | Feb-19 | 25.4 | <3 | <3 | 434 | 9 | <3 | 318 |
| **BHH2** | Nov-04 | <10 | <1 | <1 | 240 | 7 | 3 | <10 |
| | Feb-05 | 13 | <1 | <1 | 87 | 7 | 10 | 210 |
| | Jun-05 | <10 | <1 | <1 | 50 | 4 | 24 | 130 |
| | Oct-05 | <10 | <1 | <1 | 79 | 5 | 17 | 150 |
| | Oct-06 | <10 | <1 | <1 | 20 | 4 | 17 | 200 |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | 1.7 | <3 | <3 | 10 | <3 | <3 | 91 |
| **BHH3** | Nov-04 | **1600** | 22 | <1 | **41000** | **2000** | <1 | <10 |
| | Feb-05 | **4100** | 50 | - | **30400** | 37 | <1 | 450 |
| | Jun-05 | **1600** | 12 | - | **17000** | 4 | <1 | 580 |
| | Oct-05 | **3800** | 6 | <1 | 9400 | 4 | <1 | 540 |
| | Oct-06 | <10 | <1 | <1 | 8900 | 8 | <1 | 240 |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | NF | NF | NF | NF | NF | NF | NF |
| **BHI** | Nov-04 | <10 | <1 | 2 | 470 | 6 | <1 | <10 |
| | Feb-05 | 19 | 1 | 3 | 890 | 11 | <1 | <10 |

**Table 8.2 Summary of Groundwater Analysis Between 2004 and 2019**

| Test | | Vinyl Chloride | 1,1-Dichloroethene | 1,1-Dichloroethane | cis-1,2-Dichloroethene | Trichloroethene | Tetrachloroethene | Total TPH (C5-35) |
|---|---|---|---|---|---|---|---|---|
| | Jun-05 | 49 | 2 | 5 | 1700 | 15 | <1 | <10 |
| | Oct-05 | <10 | <1 | 1 | 350 | 2 | <1 | 90 |
| | Oct-06 | 58 | 2 | 6 | 1600 | 5 | <1 | 70 |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | NF | NF | NF | NF | NF | NF | NF |
| **BHJ** | Nov-04 | <10 | <1 | <1 | 62 | 3 | <1 | <10 |
| | Feb-05 | <10 | <1 | 4 | 63 | 6 | <1 | 1800 |
| | Jun-05 | <10 | <1 | 4 | 41 | 4 | <1 | 920 |
| | Oct-05 | <10 | <1 | <1 | 26 | 3 | <1 | 230 |
| | Oct-06 | <10 | <1 | <1 | 10 | <1 | <1 | 190 |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | 2.6 | < 1.0 | < 1.0 | 431 |
| | Feb-19 | 0.9 | <3 | <3 | 10 | <3 | <3 | 101 |
| **BHK** | Nov-04 | <10 | <1 | 1 | 10 | 3 | <1 | <10 |
| | Feb-05 | <10 | 1 | 4 | 4 | 3 | <1 | 110 |
| | Jun-05 | <10 | <1 | <1 | <1 | <1 | <1 | 310 |
| | Oct-05 | <10 | 5 | 4 | 5 | 4 | <1 | 100 |
| | Oct-06 | <10 | 3 | 7 | 3 | 2 | <1 | 90 |
| | Nov-10 | < 1.0 | < 1.0 | 1.9 | < 1.0 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | 0.2 | <3 | <3 | <3 | <3 | <3 | 654 |
| **BHL** | Nov-04 | - | - | - | - | - | - | - |
| | Feb-05 | - | - | - | - | - | - | - |
| | Jun-05 | - | - | - | - | - | - | - |
| | Oct-05 | - | - | - | - | - | - | - |
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | < 1.0 | 1.5 | 6.5 | 39 | 65 | < 1.0 | <10 |
| | Feb-19 | 1 | <3 | <3 | 31 | 70 | <3 | 51 |
| **BHM** | Nov-04 | - | - | - | - | - | - | - |
| | Feb-05 | - | - | - | - | - | - | - |
| | Jun-05 | - | - | - | - | - | - | - |
| | Oct-05 | - | - | - | - | - | - | - |
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | 8.8 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | <0.1 | <3 | <3 | 5 | <3 | <3 | <10 |

**Table 8.2 Summary of Groundwater Analysis Between 2004 and 2019**

| Test | | Vinyl Chloride | 1,1-Dichloroethene | 1,1-Dichloroethane | cis-1,2-Dichloroethene | Trichloroethene | Tetrachloroethene | Total TPH (C5-35) |
|---|---|---|---|---|---|---|---|---|
| **BHN** | Nov-04 | - | - | - | - | - | - | - |
| | Feb-05 | - | - | - | - | - | - | - |
| | Jun-05 | - | - | - | - | - | - | - |
| | Oct-05 | - | - | - | - | - | - | - |
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | - | - | - | - | - | - | - |
| | Feb-19 | <0.1 | <0.5 | <0.8 | <0.9 | <0.18 | <0.26 | <0.85 |
| **BHP** | Nov-04 | - | - | - | - | - | - | - |
| | Feb-05 | - | - | - | - | - | - | - |
| | Jun-05 | - | - | - | - | - | - | - |
| | Oct-05 | - | - | - | - | - | - | - |
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | 2.9 | < 1.0 | 2.7 | 7 | < 1.0 | < 1.0 | <10 |
| | Feb-19 | 4 | <3 | <3 | 7 | <3 | <3 | <10 |
| **BHQ** | Nov-04 | - | - | - | - | - | - | - |
| | Feb-05 | - | - | - | - | - | - | - |
| | Jun-05 | - | - | - | - | - | - | - |
| | Oct-05 | - | - | - | - | - | - | - |
| | Oct-06 | - | - | - | - | - | - | - |
| | Nov-10 | < 1.0 | < 1.0 | < 1.0 | 26 | 6.8 | < 1.0 | <10 |
| | Feb-19 | 0.5 | <3 | <3 | 27 | <3 | <3 | <10 |

Notes:
NC = No criteria available
NF = Not found
- = Not tested / no result available
Grey highlight indicates exceedance of Controlled Waters GAC
**Bold text** indicates exceedance of Human Health GAC

# 8. CONCLUSIONS

This report provides an assessment of ground contamination at the site and a strategy for mitigating the identified risks. Potential sources of contamination are mainly associated with the site's long historical manufacturing uses and contaminants have been detected in groundwater. The contaminants are consistent with past industries and not uncommonly found on many brownfield and industrial sites.

The most plausible risks associated with the identified contamination are considered to be the potential for pollution of controlled waters and risks to human health volatile compounds in groundwater. Remediation, as explained in the next section, would therefore need to focus on breaking these potential pollutant linkages.

Contamination has been identified in three separate areas of the site: two hotpots of chlorinated solvents and a third area comprising free phase product. Monitoring over the last approximately 15 years has shown that the contamination has remained relatively stable in terms of location and concentration (albeit some rises have been detected).

Potential off-site sources of contamination may be responsible for the free phase product and this would need to be investigated further. As the free phase product is a relatively 'heavy' hydrocarbon it is unlikely to migrate significant distances or be particularly soluble in groundwater. Therefore, remediation would only need to concentrate on source removal.

The hotspots of chlorinated solvents are on the boundaries of the site and third-party land would also need to be considered in terms of remediation, along with controlled waters. There is evidence that the chlorinated solvents are breaking down naturally (i.e. evidence of breakdown or daughter compounds in groundwater) and this can be accelerated through a number of remediation techniques as explained in the next section.

In summary, the contamination identified at the site is not abnormal and many brownfield sites with similar contaminants are routinely remediated. Following removal of the three identified sources of contamination Ramboll would likely consider this site to be a low to moderate risk.

# 9. RECOMMENDATIONS

## 9.1 Strategy

Remediation should be sustainable and protective of the environment. Ramboll's proposed approach would be to remediate the identified sources of contamination in order to break the pollutant source, pathway and receptor connections. This would most likely be based on contaminant mass removal with remedial targets confirmed by quantitative risk assessment and sustainability analysis.

For the free phase product the remediation is likely to required removal of the main mass of free product (following identification and delineation of its source). Dissolved phase TPH remediation is not likely to be required due to the relatively low levels detected.

Chlorinated solvent remediation would likely comprise an insitu technique (both cost effective and practical), followed by monitored natural attenuation.

Further, more specific details are provided in the next two sections.

## 9.2 Free Phase Product

The following is our proposed strategy to mitigate risks associated with the free phase product:

- Develop remedial targets based on removal of recoverable free phase product and confirm source removal only is a viable approach.
- Qualitatively rule out the need for dissolved phase hydrocarbon remediation due to the free phase product being relatively insoluble, low volatility and 'heavy' less mobile hydrocarbon fractions.
- Delineation of the free phase product prior to remediation being undertaken. This will allow appropriate remediation schemes to be designed. Delineation could include in-situ techniques, boreholes or trial pits.
- Undertaken further work to determine the likely source of the free phase product (on-site or off-site).
- The most cost-effective remediation technique is likely to be abstraction of free phase product from excavations. This is because there is available space in the area of impact, it is a rapid and cost-effective technique and can be validated reasonably quickly.
- If an off-site source is responsible, installation of cut off walls or a similar barrier in the ground may be needed if the source cannot be 'turned-off'.
- Other remedial techniques are available such as enhanced vacuum extraction from wells. However, such techniques are not likely to be cost effective or have certainty of time for completion.
- A validation report should be prepared following the remediation. This should include all details of the remediation work, plans, photos, free phase product recovery, and post remediation groundwater monitoring (either from sumps or boreholes in the area of impact).

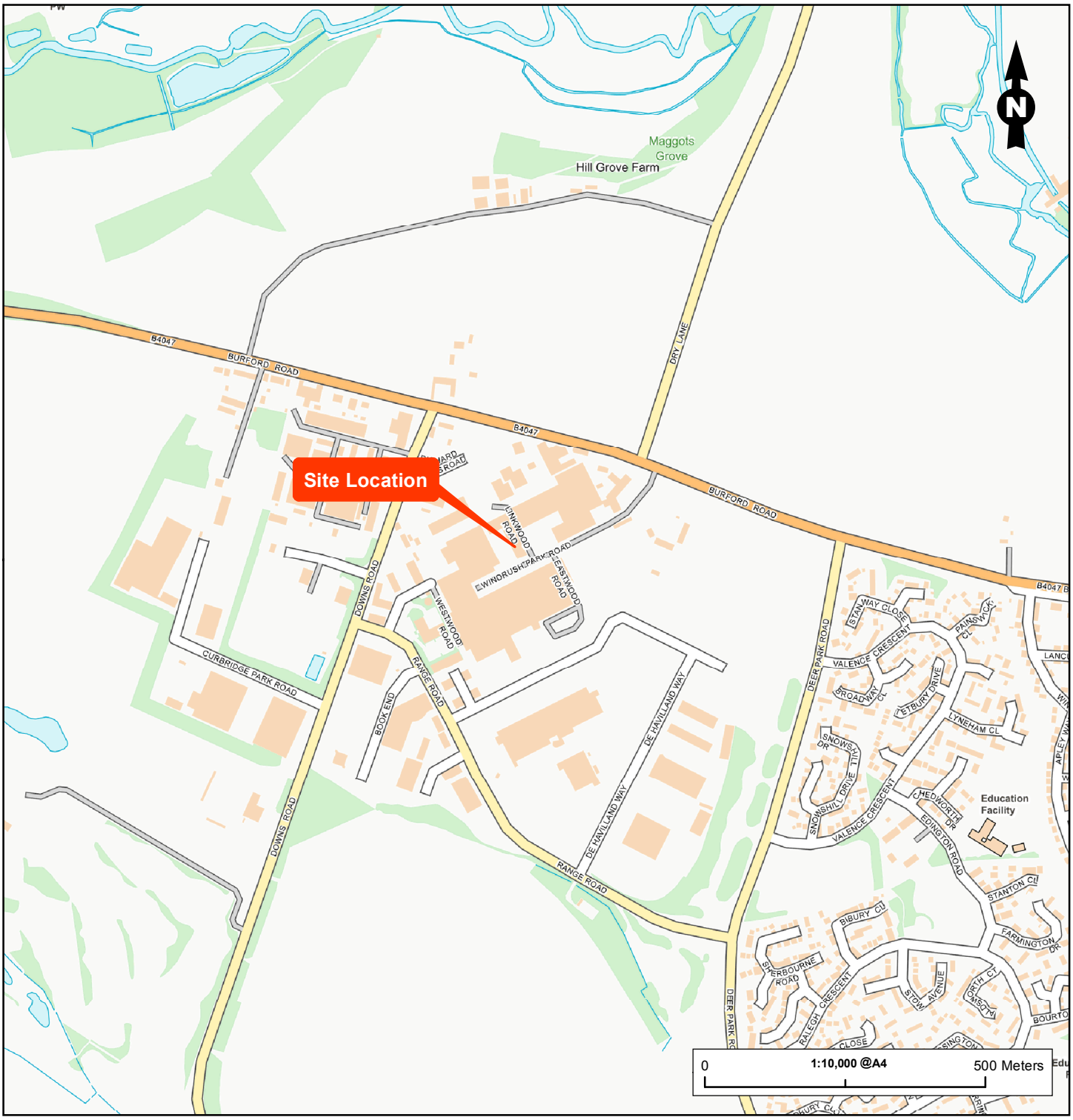
## 9.3 Volatile Organic Compounds

Proposed remediation measures for the two areas of volatile organic compounds include:

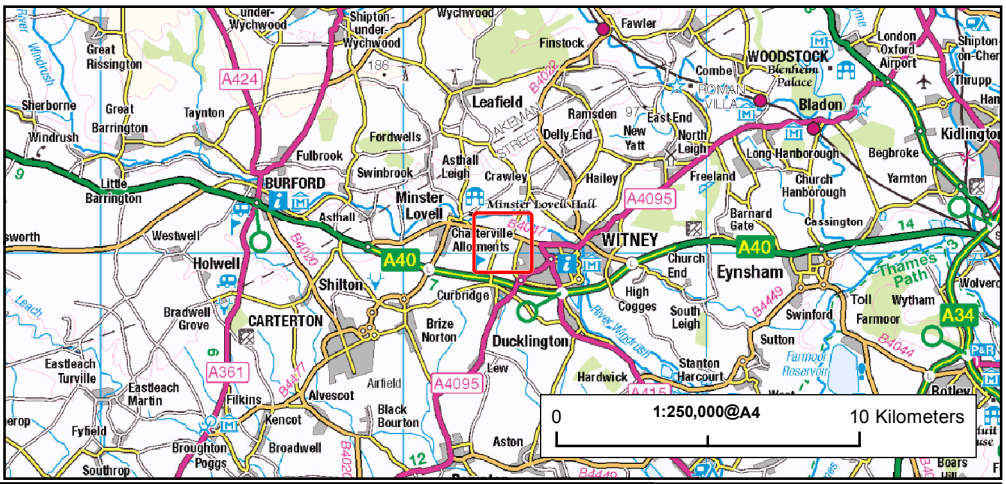
- Evidence of advanced natural attenuation including biodegradation is present (i.e. significant concentrations of trichloroethene daughter products, vinyl chloride and dichloroethane, have been detected).
- This suggests that the right conditions are present for enhanced biodegradation of the chlorinated solvents in groundwater.

- It is likely that the most appropriate remediation technique would be a combined approach of chemical reduction and microbial degradation.
- In-situ products could include an iron and substrate mixture to promote chemical and microbial degradation, or an oxidant to mobilise contamination followed by a reducing agent such as a hydrogen release compound. The former is likely to be most effective and provide quicker results.
- A network of wells would be required to inject the in-situ products into the ground in each area of the site. Such a network could also be used for delineation of the chlorinated solvents.
- Within six months there should be sufficient data to show that the remediation is progressing as planned but the remediation would not be fully complete. This, however, is often appropriate evidence to confirm the success of a remediation project.
- The remediation approach would be based on 'mass removal' of contaminants and traditional risk assessment.

# APPENDIX 1
# FIGURES



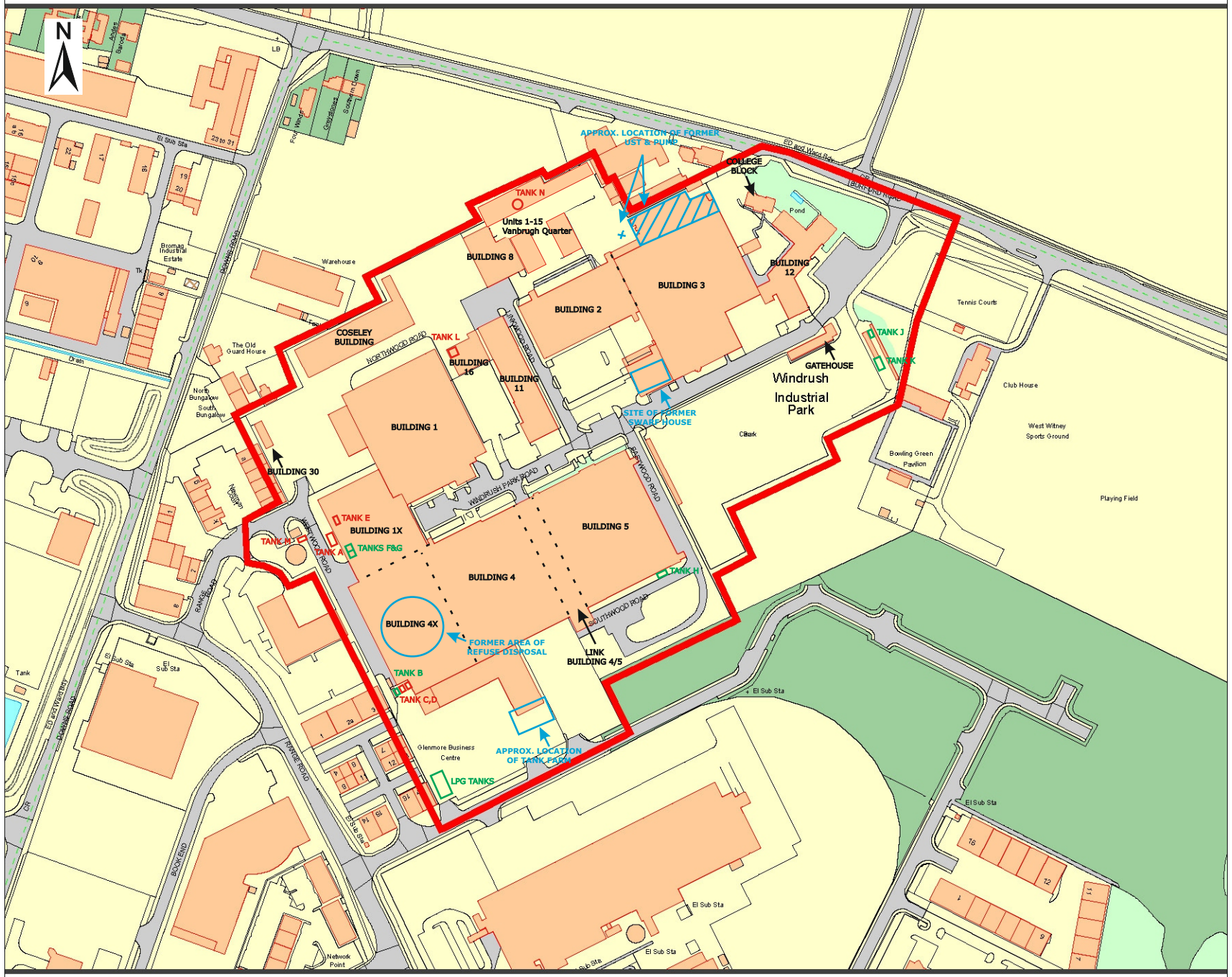





| | | | |
|---|---|---|---|
| Figure Title: Figure 1: Site Location | Project Name: Windrush Industrial Park, Witney, Oxfordshire | Date: March 2019 | RAMBOLL |
| | | Scale: As shown | |
| Project Number: 1700003663 | Client: Blenheim Estate Ltd | Issue: 1 | Prepared By: RH |



Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.




Legend

**Site Boundary**

**Red Annotations - Storage identified in 2019**

**Green Annotations - Storage identified in 2010**

**Blue Annotations - Info from Planning**

| | |
|---|---|
| Title | **Figure 2: Site Layout Plan** |
| Site | **Windrush Industrial Estate, Witney, Oxfordshire** |

| | |
|---|---|
| Client | **Blenheim Estate Ltd** |
| Project No. | **1700003663** |
| Issue | **1** |
| Date | **March 2019** |
| Drawn by | **DM/SC/RH** |

Scale **Not to scale**

RAMBOLL


Legend

- Site Boundary
- 2019 Sampling Locations
- 2010 Sampling Locations that are no longer available

| | |
|---|---|
| Title | **Figure 3: Sampling Location Plan** |
| Site | **Windrush Industrial Estate, Witney, Oxfordshire** |

| | |
|---|---|
| Client | **Blenheim Estate Ltd** |
| Project No. | **1700003663** |
| Issue | **1** |
| Date | **March 2019** |
| Drawn by | **DM/RH** |

Scale **Not to scale**

RAMBOLL


Legend

- Site Boundary
- 2019 Sampling Locations
- 2010 Sampling Locations that are no longer available
- Groundwater Level in Shallow Aquifer

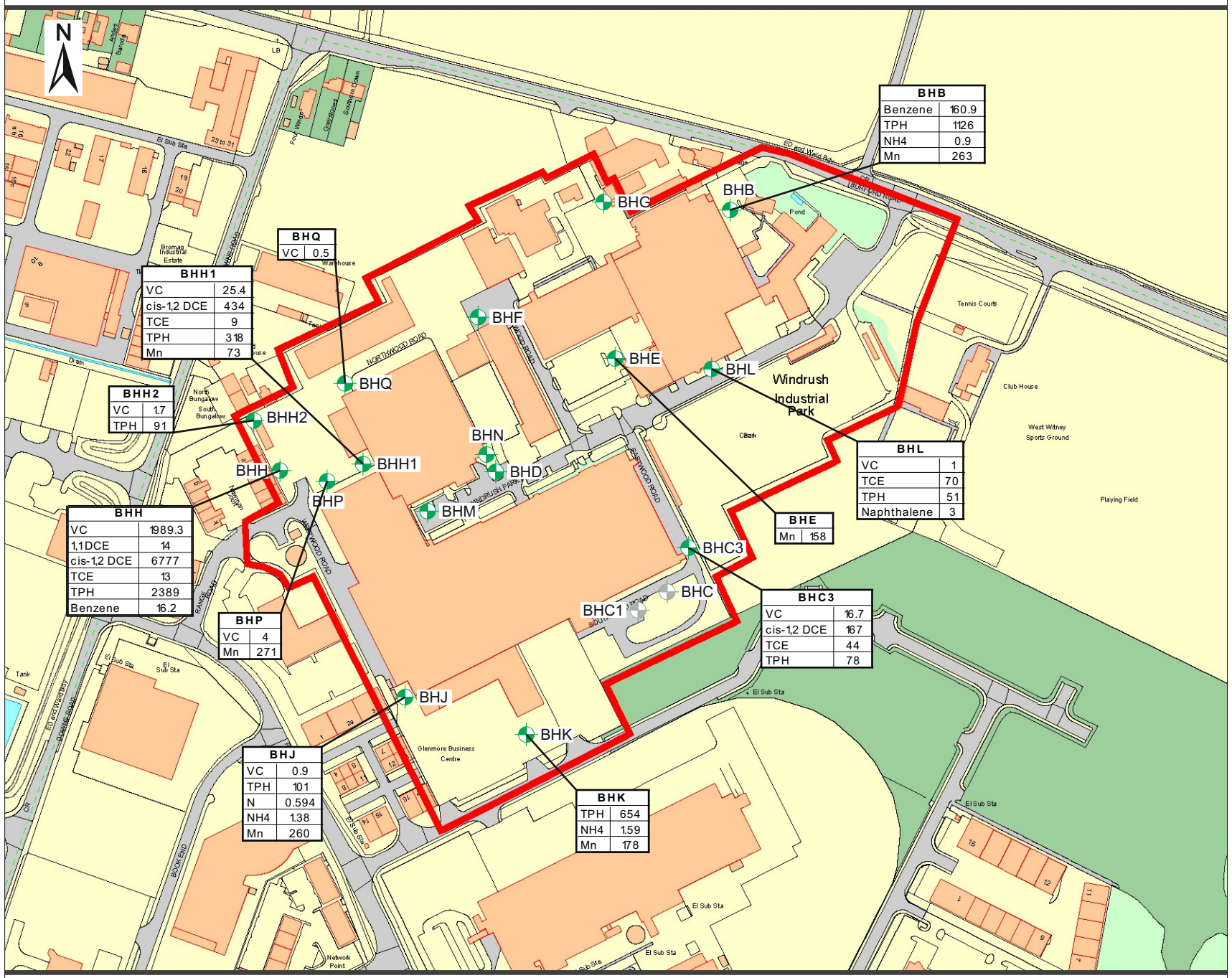
**Note: Groundwater levels based on 2019 data from BHE, BHF, BHG, BHH, BHH1, BHJ, BHK, BHL, BHM, BHN, BHP**

| | |
|---|---|
| Title | **Figure 4: Groundwater Level Plot** |
| Site | **Windrush Industrial Estate, Witney, Oxfordshire** |

| | |
|---|---|
| Client | **Blenheim Estate Ltd** |
| Project No. | **1700003663** |
| Issue | **1** |
| Date | **March 2019** |
| Drawn by | **DM/RH** |

Scale **Not to scale**

RAMBOLL




Legend

- Site Boundary
- 2019 Sampling Locations
- 2010 Sampling Locations that are no longer available

Notes
VC: Vinyl Chloride
1,1 DCE: 1,1-Dichloroethene
cis-1,2 DCE: cis-1-2-Dichloroethene
TCE: Trichloroethene
TPH: Total Petroleum Hydrocarbons C5-C35
N: Nitrite
NH4: Ammoniacal Nitrogen

Concentrations in µg/l; except
N, NH4, Fe 3+, which are in mg/l

| | |
|---|---|
| Title | **Figure 5: GAC Exceedances** |
| Site | **Windrush Industrial Estate, Witney, Oxfordshire** |

| | |
|---|---|
| Client | **Blenheim Estate Ltd** |
| Project No. | **1700003663** |
| Issue | **1** |
| Date | **March 2019** |
| Drawn by | **DM/RH** |

Scale **Not to scale**

RAMBOLL

# APPENDIX 2
# BUILDINGS ON SITE

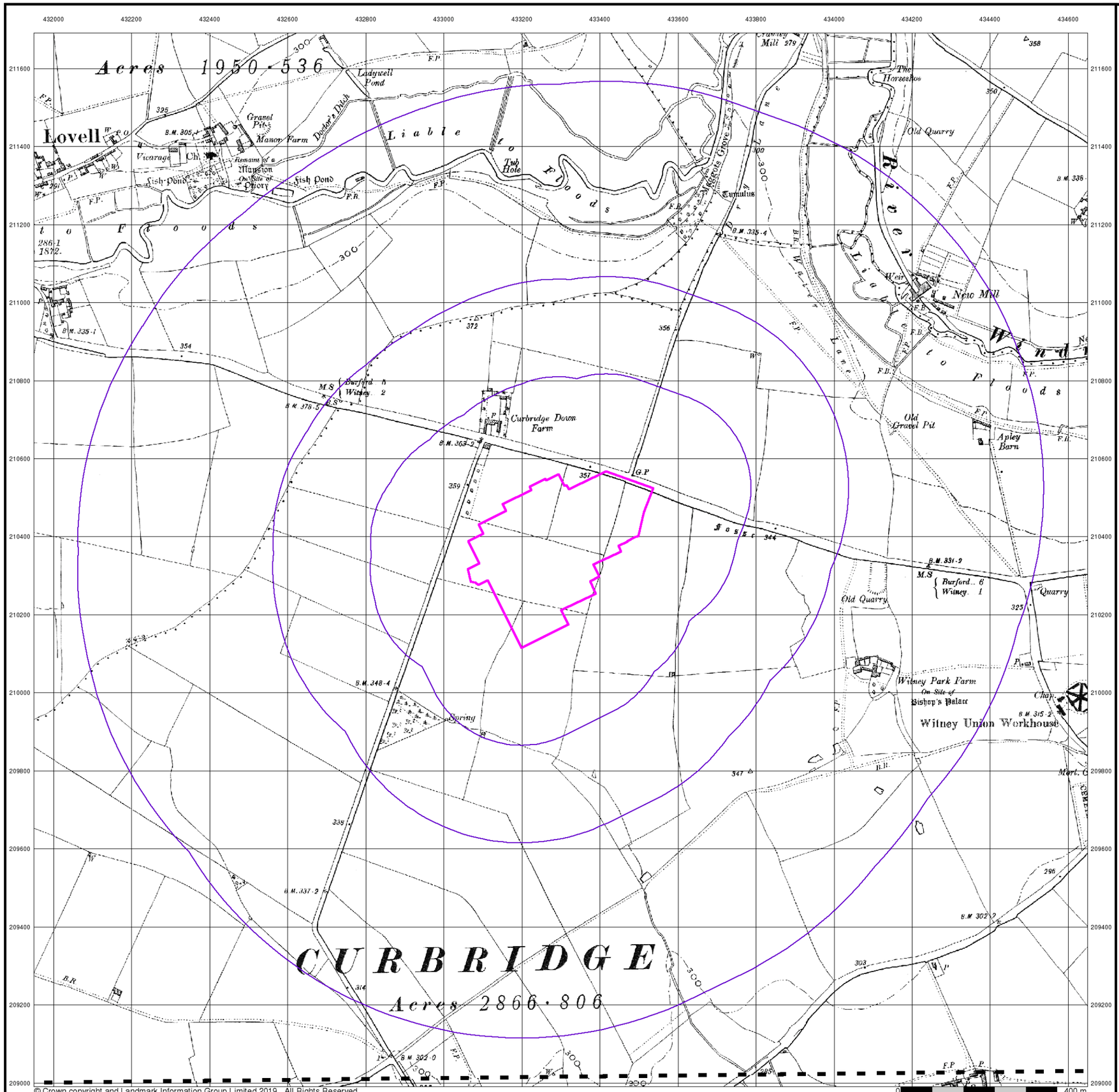
**Table B1: Buildings on Site**

| Building | Type | Size | Date |
|---|---|---|---|
| Building 1 | high bay northlight building with offices | 5300m$^2$ | 1940s-1960s |
| Building 1X | high bay northlight building with offices | 3000m$^2$ | 1950s-1960s |
| Building 2 | high bay northlight building with offices | 2100m$^2$ | 1950s-1960s |
| Building 3 | combination of four buildings | 8000m$^2$ | 1940s-1990s |
| Building 4 | high bay northlight building with offices | 6000m$^2$ | 1940s-1960s |
| Building 4X | high bay northlight building | 4200m$^2$ | 1960s |
| Link Building 4/5 | lower-rise northlight building | 1400m$^2$ | 1960s |
| Building 5 | high bay northlight building with offices | 6000m$^2$ | 1950s |
| Building 8 | high bay warehouse building | 700m$^2$ | 1950s-1960s |
| Building 11 | low-rise industrial units | 1,500m$^2$ | 1960s |
| Building 12 | office building | 1,400m$^2$ | 1950s |
| Building 16 | vehicle maintenance building | 350m$^2$ | 1940s-1960s |
| Building 30 | single storey | <100m$^2$ | 1950s |
| College Building | former residential building | 140m$^2$ | early-mid 20$^{th}$ C. |
| Coseley Building | high bay warehouse building | 1400m$^2$ | 1940s-1950s |
| Gatehouse | single storey | <50m$^2$ | 1950s/1960s |
| Water pumping station | single-storey | <100m$^2$ | 1960s |
| Sprinkler pump house | single-storey | <100m$^2$ | 1970s/1980s |
| Units 1 – 15 Vanbrugh Quarter | high bay warehouse / workshop units | 48 to 97m$^2$ | 2010s |

**Table B2: Building Construction**

| Building | Frame | Roof/ceiling | Flooring | Walls |
|---|---|---|---|---|
| Building 1 | Steel/ concrete | Part pitched cement sheeting and glazing, part flat (not accessible). Ceilings possibly ACM-lined | Concrete/tiled (possibly ACM) wood and carpet. | Brick/breezeblock |
| Building 1X | Steel/ concrete | Part pitched cement sheeting and glazing, part flat (not accessible). Ceilings possibly ACM-lined | Concrete/tiled (possibly ACM) and carpet. | Brick/breezeblock |
| Building 2 | Steel/ concrete | Part pitched cement sheeting and glazing, part flat (not accessible). Ceilings possibly ACM-lined | Concrete/tiled (possibly ACM) and carpet. | Brick/breezeblock |
| Building 3 | | | | |
| hangar buildings | Steel | Pitched, not visible | Concrete | Brick. Suspected asbestos identified by site contractors in partition walls. |
| Northlight building | Steel | Pitched cement sheeting and glazing | Concrete | Brick and breezeblock with brick and glazing to south. |
| one-storey extension | N/A | Not known | Not known | Brick |
| modern extension | Not known | Pitched, profiled metal sheeting and glazing | Concrete | Brick |
| Building 4 | Steel | Pitched cement sheeting and glazing, partially flat roofed (not accessible) | Concrete | Brick/breezeblock |
| Building 4X | Steel | Part pitched cement sheeting and glazing, part flat profiled metal sheeting | Concrete | Part brick/ breezeblock, part profiled metal sheeting |
| Link Building 4/5 | Steel | Pitched cement sheeting and glazing | Concrete | Brick/breezeblock |
| Units 1 – 15 Vanbrugh Quarter | Steel | Pitched profiled sheet metal | Concrete | Brick/breezeblock and profiled sheet metal cladding |

# APPENDIX 3
# HISTORICAL MAPS




RAMBOLL

## Oxfordshire

## Published 1900

## Source map scale - 1:10,560

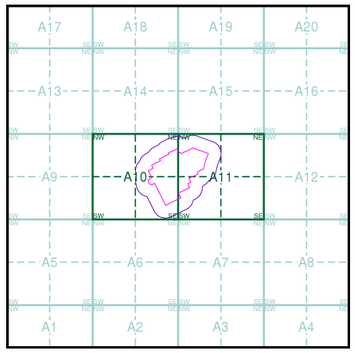
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

## Map Name(s) and Date(s)

031NE
1900
1:10,560

031SE
1900
1:10,560

## Historical Map - Slice A




## Order Details

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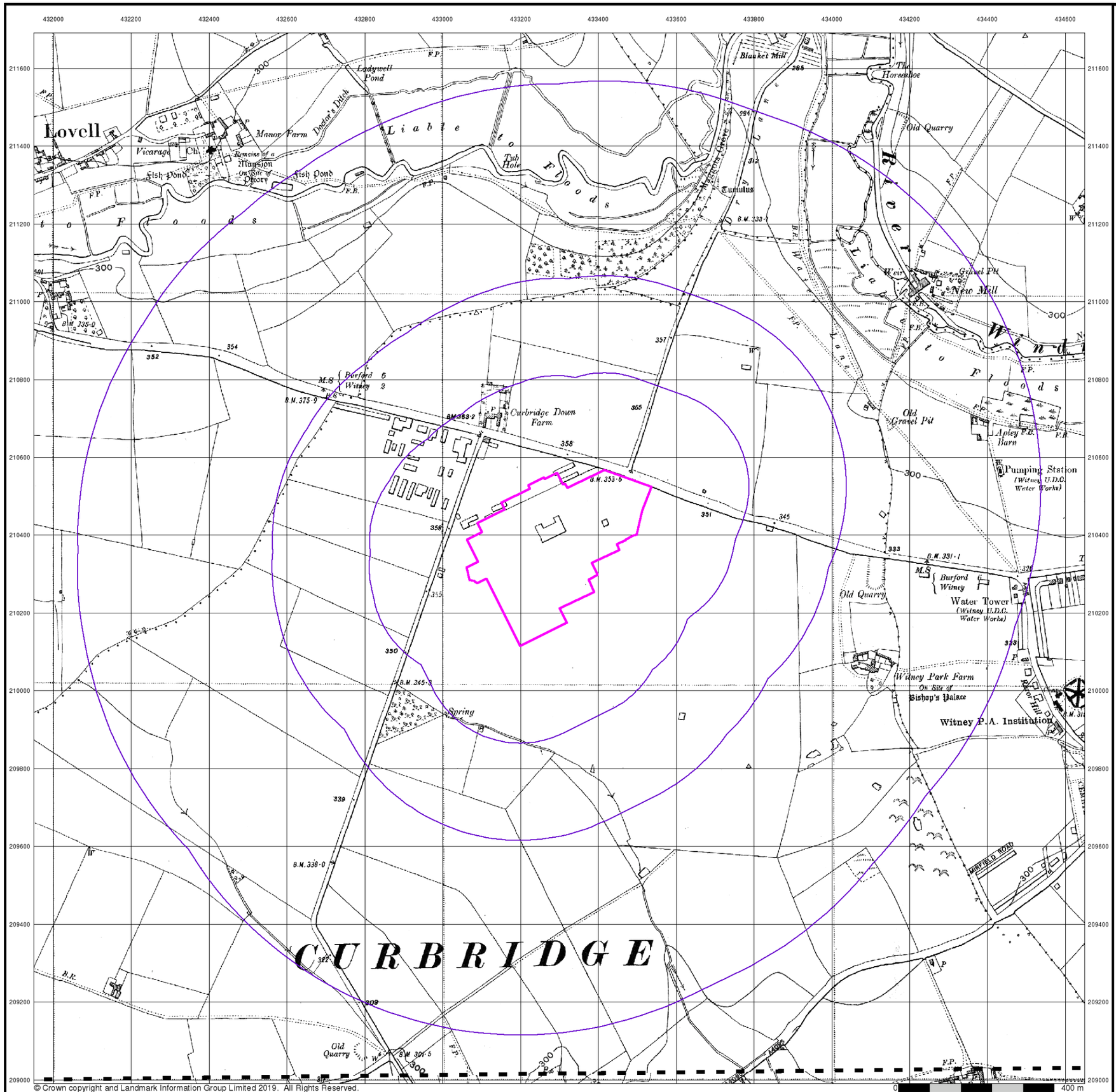
|---|---|
| Order Number: | 194077968_1_1 |
| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
| Search Buffer (m): | 1000 |

## Site Details

Windrush Industrial Park, Witney, OX29 7DX

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk




RAMBOLL

## Oxfordshire

## Published 1938

## Source map scale - 1:10,560

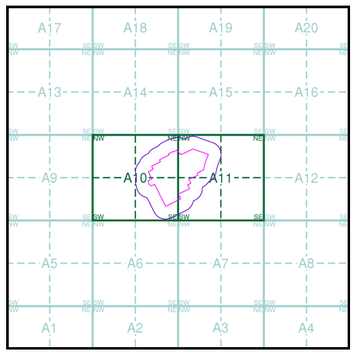
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

## Map Name(s) and Date(s)

031NE
1938
1:10,560

031SE
1938
1:10,560

## Historical Map - Slice A

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| Order Number: | 194077968_1_1 |
| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
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| Site Area (Ha): | 11.94 |
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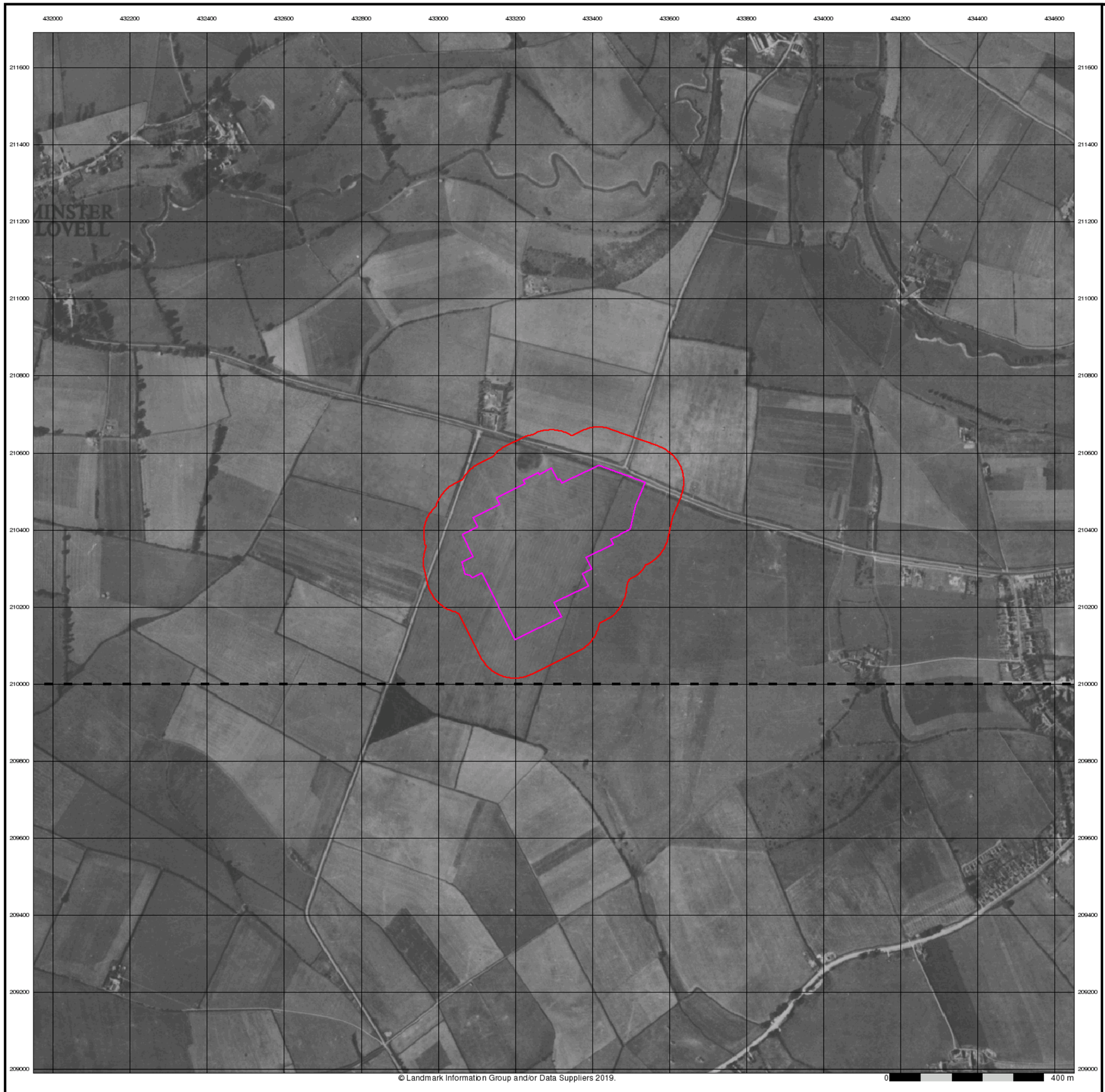



RAMBOLL

# Historical Aerial Photography

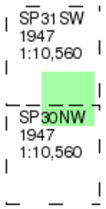
## Published 1947

## Source map scale - 1:10,560

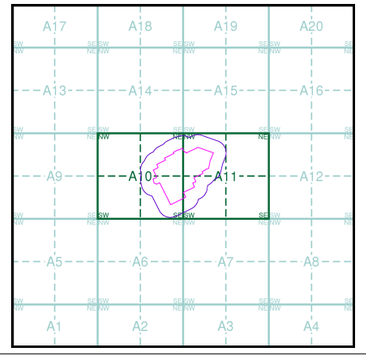
The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.



## Map Name(s) and Date(s)




## Historical Aerial Photography - Slice A




BRITISH LIBRARY

## Order Details

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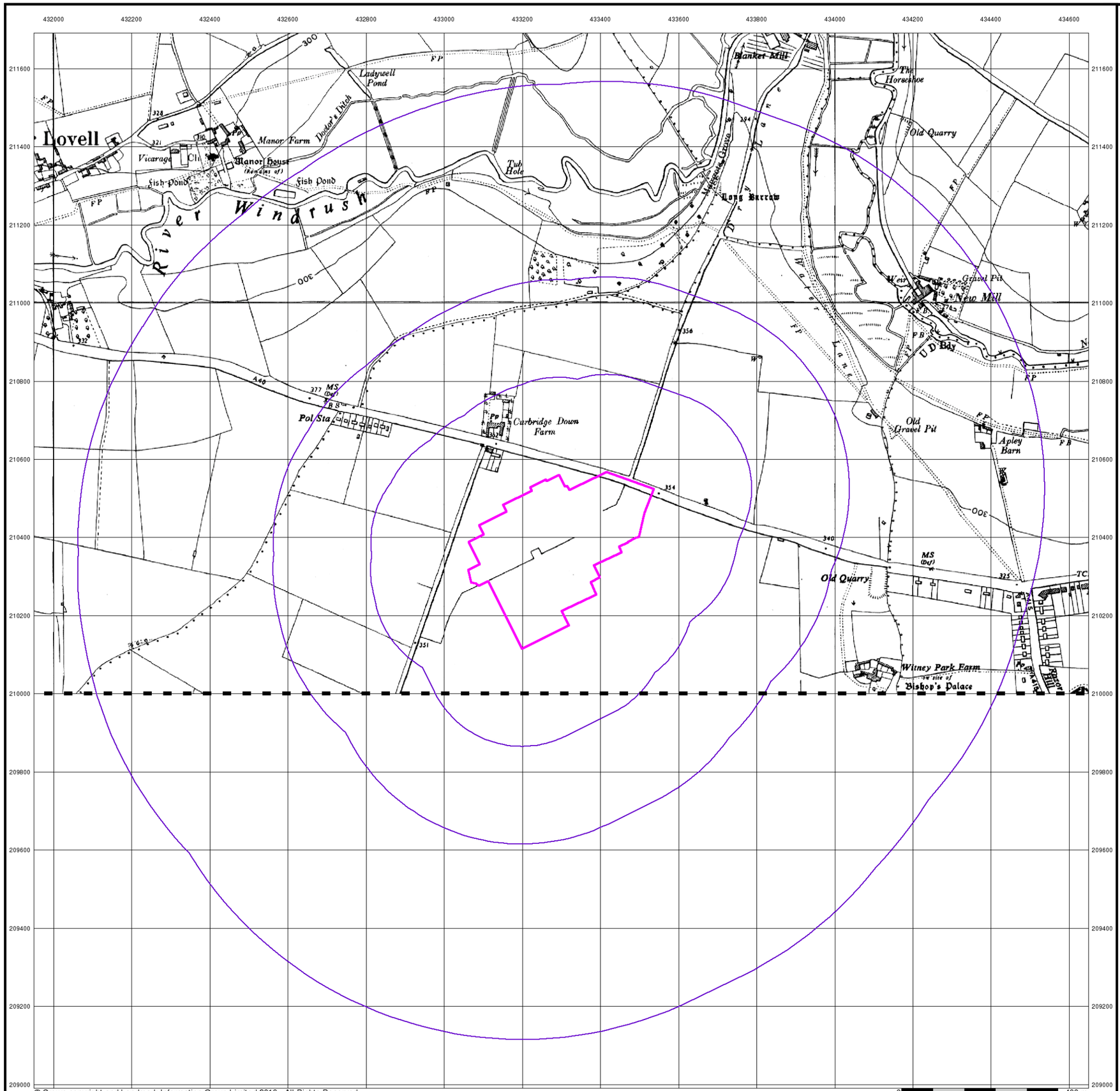
|---|---|
| Order Number: | 194077968_1_1 |
| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
| Search Buffer (m): | 1000 |

## Site Details

Windrush Industrial Park, Witney, OX29 7DX

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk




RAMBOLL

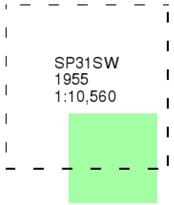
## Ordnance Survey Plan

## Published 1955

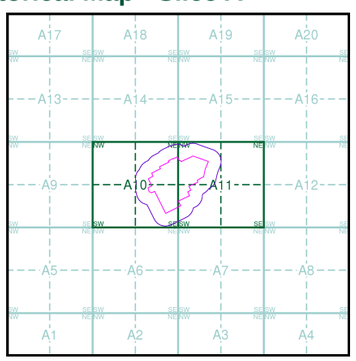
## Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

## Map Name(s) and Date(s)




## Historical Map - Slice A

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| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
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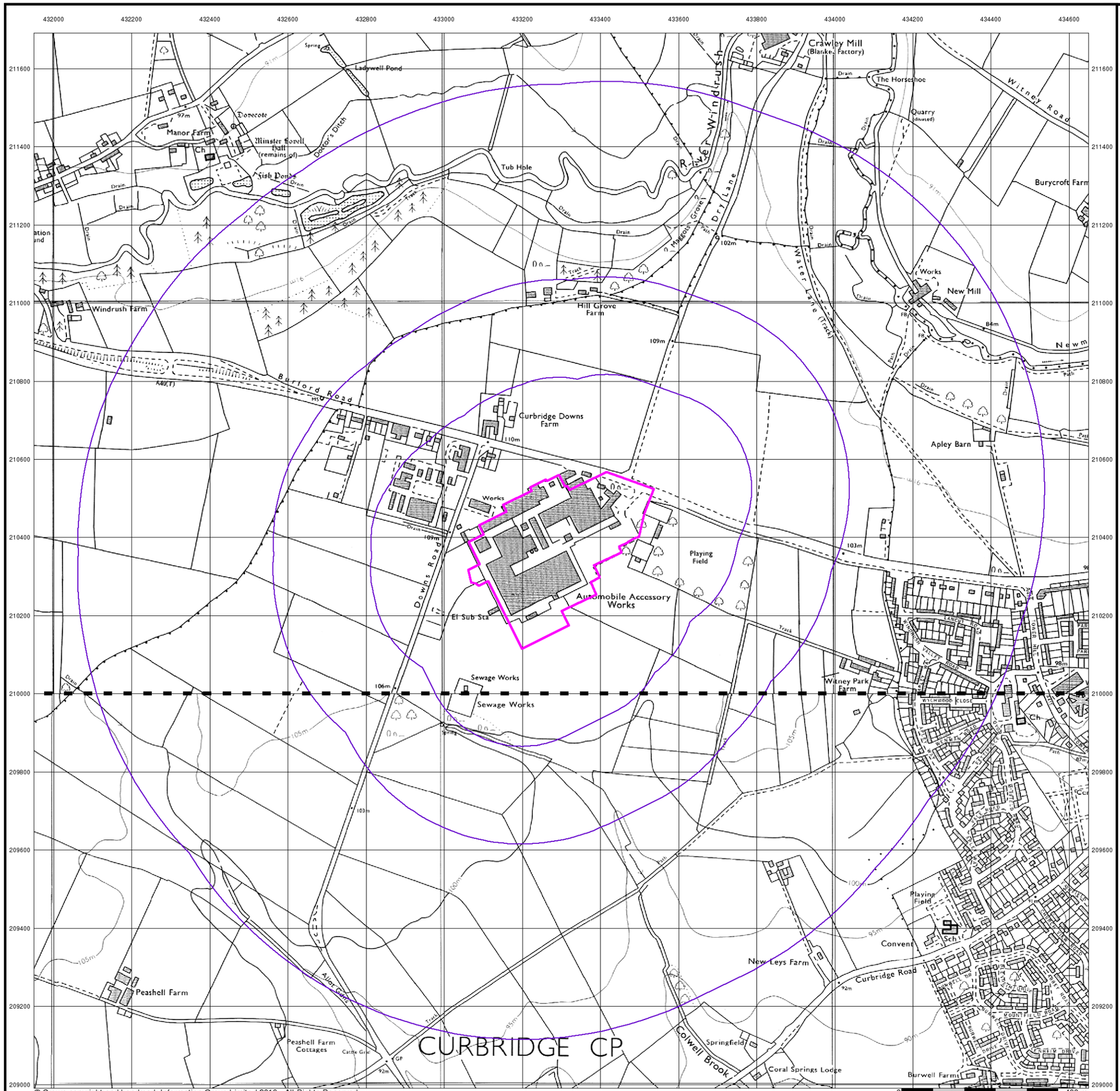
Fax: 0844 844 9951
Web: www.envirocheck.co.uk






RAMBOLL

## Ordnance Survey Plan

### Published 1975 - 1977

### Source map scale - 1:10,000

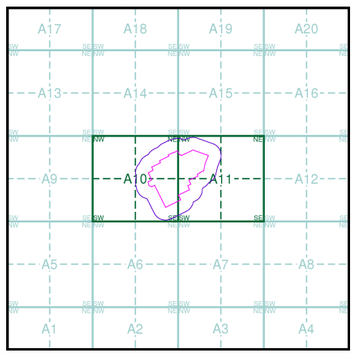
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

## Map Name(s) and Date(s)

SP31SW
1977
1:10,000

SP30NW
1975
1:10,000

## Historical Map - Slice A




## Order Details

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| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
| Search Buffer (m): | 1000 |

## Site Details

Windrush Industrial Park, Witney, OX29 7DX

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk


RAMBOLL

## 10k Raster Mapping

**Published 1999**

**Source map scale - 1:10,000**

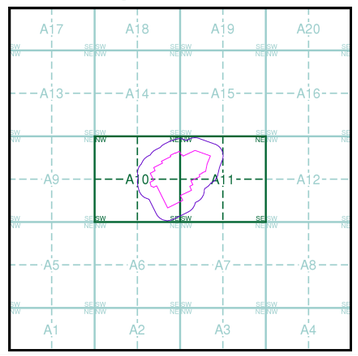
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

## Map Name(s) and Date(s)

SP31SW
1999
1:10,000

SP30NW
1999
1:10,000

## Historical Map - Slice A




## Order Details

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|---|---|
| Order Number: | 194077968_1_1 |
| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
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## Site Details

Windrush Industrial Park, Witney, OX29 7DX


Landmark INFORMATION GROUP

Tel: 0844 844 9952
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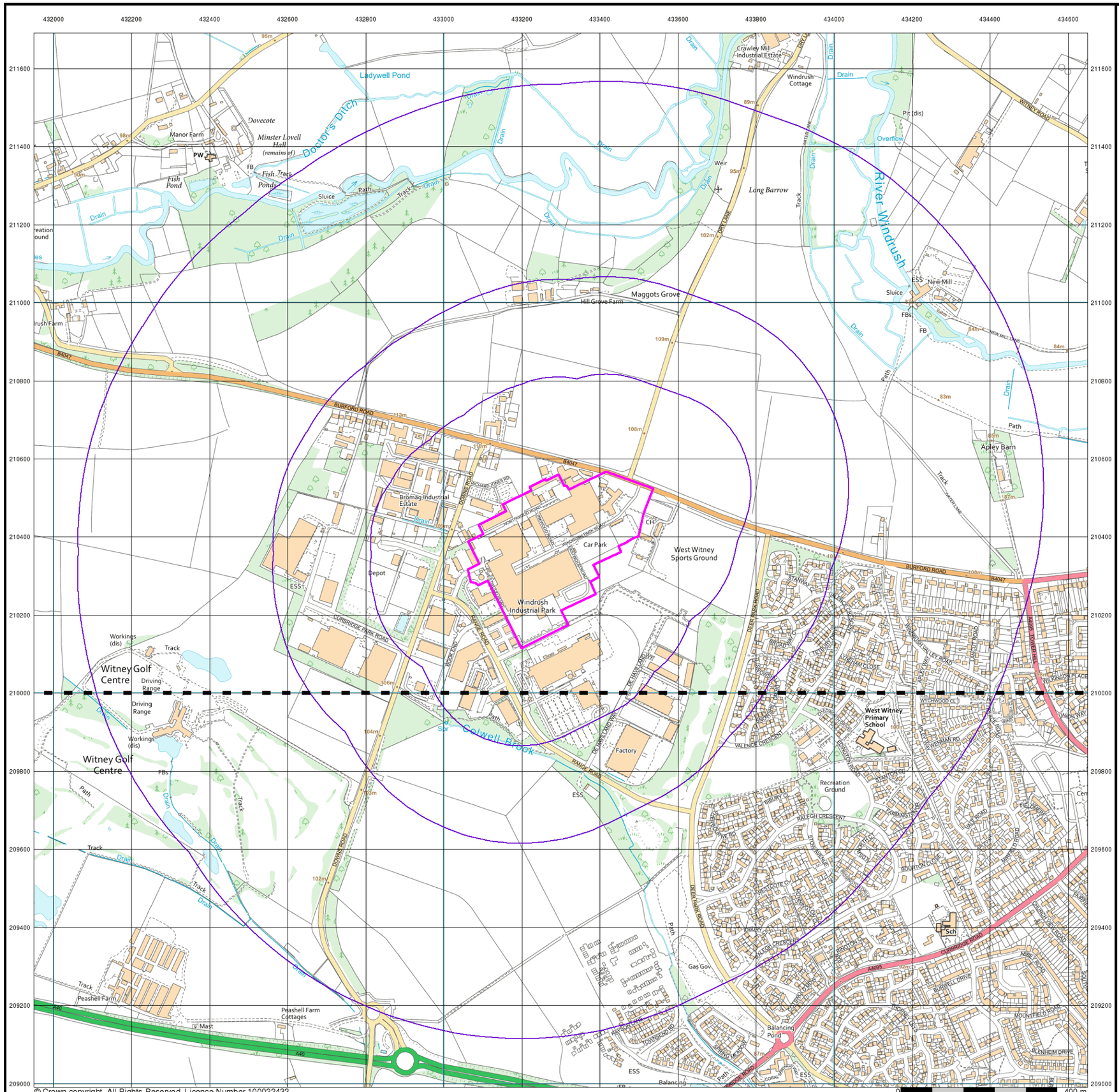





0 400 m

RAMBOLL

# VectorMap Local

## Published 2019

## Source map scale - 1:10,000

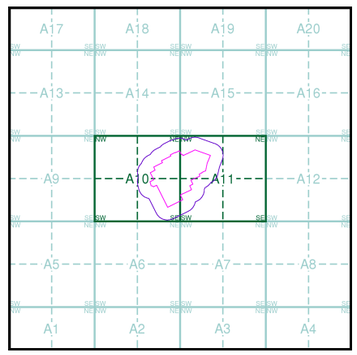
VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

## Map Name(s) and Date(s)

SP31SW
2019
Variable

SP30NW
2019
Variable

## Historical Map - Slice A




## Order Details

| | |
|---|---|
| Order Number: | 194077968_1_1 |
| Customer Ref: | 170000Witney |
| National Grid Reference: | 433290, 210370 |
| Slice: | A |
| Site Area (Ha): | 11.94 |
| Search Buffer (m): | 1000 |

## Site Details

Windrush Industrial Park, Witney, OX29 7DX

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

# APPENDIX 4
# LEGISLATIVE BACKGROUND AND DERIVATION OF ASSESSMENT CRITERIA

# LEGISLATIVE BACKGROUND

The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the Environmental Protection Act 1990 (EPA), as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently revoked with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380) (as amended), which came into force in August 2006, and consolidated the previous regulations and amendments. Revised statutory guidance ("the Guidance") for local authorities on how to implement the regime, including the decision-making process on whether land is contaminated land in the legal sense, has been published by Defra and entered into force in April 2012.

Under Part 2A of the EPA Section 78A(2), "contaminated land" is defined as "land which appears… to be in such a condition, by reason of substances in, on or under the land, that –

a) significant harm is being caused or there is a significant possibility of such harm being caused; or

b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused".

"Significant harm" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land. The presence of a contaminant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. Under the Guidance, a 'significant contaminant linkage' is one which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. Should the authority consider that there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action is taken to stop it, the land should be deemed a Category 1: Human Health. Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Both Category 1 and Category 2 cases would be capable of being determined as contaminated land under Part 2A on the grounds of significant possibility of significant harm to human health. If the legal test for significant possibility of significant harm is not met, the authority should place the land into Category 3. If the local authority considers that there is no risk or that the level of risk posed is low, the land should be placed into Category 4.

For six common contaminants (benzo(a)pyrene, cadmium, arsenic, benzene, hexavalent chromium and lead), a set of screening values have been developed and endorsed for use by Defra (the Category 4 Screening Levels, or C4SLs) that describe a level of risk just below the Category 3/4 boundary set in the Statutory Guidance, i.e. where concentrations are below the C4SL, there is no risk or the level of risk is acceptably low.

The pollution of controlled waters is defined in Section 78A(9) of the Act as "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter". The new Guidance stresses that the Part 2A regime is designed to identify and deal with 'significant pollution' and not lesser levels of pollution. As with human health risk, Categories 1 and 2 comprise land where the local authority considers that a significant possibility of significant pollution of controlled waters exists and Categories 3 and 4 comprises cases where the authority considers that a significant possibility of such pollution does not exist. The local authority should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters.

# GENERIC ASSESSMENT CRITERIA

**Water**

In the absence of relevant published water assessment criteria, the potential risk to human health from contaminated surface and groundwater and the potential risk to the aquatic environment from entry of pollutants (either directly or via a groundwater pathway) has been assessed using commonly accepted UK guidelines including the Water Supply (Water Quality) (England) Regulations 2000 (known as the Drinking Water Standards, or DWS) and the Environmental Quality Standards (EQS) defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC).

Revised EQS were published in December 2009 under the Priority Substances Directive (PSD) (2008/105/EC), a daughter directive of the WFD. The PSD establishes EQS for Priority Substances which have been set at levels of concentration which are safe for the aquatic environment and for human health. A list of such dangerous substances (including those from other European legislation e.g. the Dangerous Substances Directive (76/464/EC)) and EQS has been established and is listed in the August 2010 Direction to the Environment Agency, the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Direction 2010. The EQS are detailed in Part 4 (Specific Pollutants) and Part 5 (Priority Substances) of the Directions.

For those determinants included in the analytical suite which do not have a corresponding UK drinking water or environmental screening criteria, reference is made to international guidance in accordance with Environment Agency guidance.

A Ramboll GAC has also been derived for the contaminant volatilisation pathway from groundwater to human receptors. This has been calculated using the RBCA Tool Kit V2.6 model. The RBCA model has been altered where necessary to reflect the current UK approach to human health risk assessment, as detailed above.

# GROUND GAS ASSESSMENT

Ground gases can be produced as a result of the decomposition of organic materials and may also originate from natural sources, such as coal seams and organic-rich soils. The principal components of ground gas are methane and carbon dioxide, although other gases may be present in trace concentrations. Ground gas can present a hazard to site occupants and property as result of flammable/explosive hazards, physiological effects, odour and effects on vegetation.

There is no single specific guidance document relating to ground gas measurement methods, risk assessment, and gas protection measures. Several documents have been published since the early 1990s to provide guidance for new developments, some of which have been more recently revised.

The following guidance documents were used in this assessment:

| **Ground Gas** | **Reference Documents** |
|---|---|
| Methane and Carbon Dioxide | • Assessing Risks Posed by Hazardous Ground Gases to Buildings. Report C665, Construction Industry Research and Information Association (CIRIA), 2007.<br>• Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. BSi 8485:2015.<br>• The Building Regulations, Approved Document C: Site preparation and resistance to contaminants and moisture, (2004 as amended)<br>• Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present. Report Edition No. 4, NHBC, March 2007. |
| Oxygen | • Waste Management Paper 27 – Guidelines for Building Houses near Landfill Sites. Department of the Environment 1991. |

It is recommended in CIRIA C665 that six rounds of ground gas monitoring are conducted over a period of three months in order to sufficiently understand a site's ground gas regime.

**Methane and Carbon Dioxide**

Guidance on undertaking ground gas risk assessment is provided in CIRIA Report C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings" (2007). The guidance consolidates the requirement for good practice in site investigation, collection of relevant data and monitoring programmes in the context of a risk based approach to gas contaminated ground.

Two semi-quantitative methods are set out in the guidance for the assessment of ground gas risk; one method for low rise housing with gardens (the NHBC "traffic light" system) and the other for all remaining development types, including commercial/industrial development (the "Modified Wilson and Card System").

With the exception of low rise housing, the method applicable for all developments is the Modified Wilson and Card Classification. This makes no assumption that an underfloor void is present within the development. The method by Wilson and Card was developed based on the method proposed in CIRIA publication R149 (1995).

This method uses gas concentrations and borehole flow rates to define a characteristic situation for the site, by calculating a Site Gas Screening Value (SGSV). The SGSV is calculated using a worst case scenario (i.e. the maximum gas concentration and flow rates detected) across the entire site during the monitoring period. The SGSV is calculated for both methane and carbon dioxide, and the 'Characteristic Situation' is derived by comparison with a table relevant to each method. It is important to note that SGSVs are not absolute thresholds but guideline values.

The NHBC traffic light system described in Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present (NHBC, March 2007). The guidance defines a series of 'Traffic Light' scenarios specific to a low-rise housing development with a clear ventilated sub floor void. The Traffic Lights include 'Typical Maximum Concentrations' which are provided for screening purposes and risk-based Gas Screening Values (GSVs) for consideration for situations where the Typical Maximum Concentrations are exceeded.

It is important to note that GSVs are not absolute thresholds but guideline values. The method makes a number of assumptions regarding the proposed structures and designers should ensure the design is appropriate to the ground gas condition identified.

The Building Regulations, Approved Document C (2004) states that where methane concentrations do not exceed 1% and that the floor of the building to be constructed is suspended and ventilated, no further protection needs to be provided. Above 1% by volume there is a need to consider possible measures to prevent gas ingress into new buildings.

Approved Document C also states that there is a need to consider possible measures to prevent gas ingress into new buildings if concentrations of carbon dioxide above 1.5% are detected in the ground, and that measures are definitely required at concentrations above 5%.

**Oxygen**

Waste Management Paper 27 (WMP27) states that a minimum concentration of 18% oxygen is required to prevent asphyxiation.

# APPENDIX 5
# LABORATORY CERTIFICATES OF ANALYSIS

# Exova Jones Environmental

Registered Office: Exova Environmental UK Limited, 10 Lower Grosvenor Place, London, SW1W 0EN. Reg No. 11371415

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781


Ramboll Environment and Health UK Ltd
Artillery House
11-19 Artillery Row
London
SW1P 1RT

| | |
|---|---|
| **Attention :** | Robert Hodgson |
| **Date :** | 25th February, 2019 |
| **Your reference :** | 1700003663 |
| **Our reference :** | Test Report 19/2578 Batch 1 |
| **Location :** | Windrush Industrial Park Whitney |
| **Date samples received :** | 16th February, 2019 |
| **Status :** | Final report |
| **Issue :** | 1 |

Eighteen samples were received for analysis on 16th February, 2019 of which sixteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:**

**Lucas Halliwell**
**Project Co-ordinator**

**Client Name:** Ramboll Environment and Health UK Ltd
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson
**JE Job No.:** 19/2578

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

| J E Sample No. | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 75-84 | 85-94 | 95-104 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BHL | BHE | BHF | BHM | BHD | BHN | BHC3 | BHP | BHH1 | BHH | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | | | |
| Sample Date | 14/02/2019 10:00 | 14/02/2019 10:40 | 14/02/2019 11:15 | 14/02/2019 12:00 | 14/02/2019 12:30 | 14/02/2019 13:10 | 14/02/2019 14:00 | 14/02/2019 15:50 | 15/02/2019 08:30 | 15/02/2019 08:30 | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | | | |
| Dissolved Manganese # | 15 | 158 | <2 | <2 | <2 | <2 | 11 | 271 | 73 | 12 | <2 | ug/l | TM30/PM14 |
| Methyl Tertiary Butyl Ether # | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ug/l | TM15/PM10 |
| Benzene # | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.7 | <0.5 | 16.2 | <0.5 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 6 | <5 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| p/m-Xylene # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 3 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 3 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 99 | 106 | 105 | 103 | 105 | 103 | 102 | 105 | 97 | 98 | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 95 | 99 | 99 | 99 | 102 | 98 | 99 | 100 | 95 | 100 | <0 | % | TM15/PM10 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 14 | <10 | ug/l | TM36/PM12 |
| >C6-C8 # | 51 | <10 | <10 | <10 | <10 | <10 | 78 | <10 | 202 | 2357 | <10 | ug/l | TM36/PM12 |
| >C8-C10 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM36/PM12 |
| >C10-C12 # | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | ug/l | TM5/PM16/PM30 |
| >C12-C16 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| >C16-C21 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| >C21-C35 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| Total aliphatics C5-35 # | 51 | <10 | <10 | <10 | <10 | <10 | 78 | <10 | 202 | 2371 | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 18 | <10 | ug/l | TM36/PM12 |
| >EC7-EC8 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM36/PM12 |
| >EC8-EC10 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM36/PM12 |
| >EC10-EC12 # | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 116 | <5 | <5 | ug/l | TM5/PM16/PM30 |
| >EC12-EC16 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| >EC16-EC21 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| >EC21-EC35 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | ug/l | TM5/PM16/PM30 |
| Total aromatics C5-35 # | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 116 | 18 | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Total aliphatics and aromatics(C5-35) # | 51 | <10 | <10 | <10 | <10 | <10 | 78 | <10 | 318 | 2389 | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Sulphate as SO4 # | 36.1 | 37.1 | 20.5 | 22.1 | 38.0 | 37.0 | 44.4 | 5.4 | 26.2 | 21.1 | <0.5 | mg/l | TM38/PM0 |
| Nitrate as N # | <0.05 | 0.13 | 2.88 | 3.64 | 3.85 | 3.04 | 0.65 | <0.05 | 0.10 | <0.05 | <0.05 | mg/l | TM38/PM0 |
| Nitrite as N # | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | mg/l | TM38/PM0 |
| Ammoniacal Nitrogen as NH4 # | <0.03 | 0.36 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.08 | 0.05 | 0.03 | <0.03 | mg/l | TM38/PM0 |
| Sulphide | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | TM107/PM0 |
| Dissolved Iron II | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.13 | 0.09 | <0.02 | mg/l | TM48/PM0 |
| Dissolved Iron III | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.13 | 0.11 | <0.02 | mg/l | TM30/TM48/PM0 |
| pH # | 7.66 | 7.67 | 7.84 | 7.74 | 7.71 | 7.70 | 7.51 | 7.63 | 7.50 | 7.50 | <0.01 | pH units | TM73/PM0 |

**Client Name:** Ramboll Environment and Health UK Ltd
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson
**JE Job No.:** 19/2578

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

| J E Sample No. | 105-114 | 115-124 | 135-144 | 145-154 | 155-164 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BHH2 | BHQ | BHJ | BHK | BHB | | | | | | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | | | | | | | | |
| Sample Date | 15/02/2019 10:00 | 15/02/2019 10:40 | 15/02/2019 12:35 | 15/02/2019 13:25 | 15/02/2019 14:10 | | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | | | | | | | | |
| Dissolved Manganese # | 32 | <2 | 260 | 178 | 263 | | | | | | <2 | ug/l | TM30/PM14 |
| Methyl Tertiary Butyl Ether # | <0.1 | <0.1 | <0.1 | <0.1 | 7.6 | | | | | | <0.1 | ug/l | TM15/PM10 |
| Benzene # | <0.5 | <0.5 | <0.5 | <0.5 | 160.9 | | | | | | <0.5 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | | | | | | <5 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| p/m-Xylene # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 106 | 107 | 106 | 107 | 108 | | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 100 | 100 | 100 | 101 | 102 | | | | | | <0 | % | TM15/PM10 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <10 | <10 | <10 | <10 | 108 | | | | | | <10 | ug/l | TM36/PM12 |
| >C6-C8 # | <10 | <10 | <10 | <10 | 160 | | | | | | <10 | ug/l | TM36/PM12 |
| >C8-C10 # | <10 | <10 | <10 | <10 | 61 | | | | | | <10 | ug/l | TM36/PM12 |
| >C10-C12 # | <5 | <5 | <5 | <5 | <5 | | | | | | <5 | ug/l | TM5/PM16/PM30 |
| >C12-C16 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >C16-C21 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >C21-C35 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| Total aliphatics C5-35 # | <10 | <10 | <10 | <10 | 329 | | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <10 | <10 | <10 | <10 | 144 | | | | | | <10 | ug/l | TM36/PM12 |
| >EC7-EC8 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM36/PM12 |
| >EC8-EC10 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM36/PM12 |
| >EC10-EC12 # | 91 | <5 | 101 | 654 | 453 | | | | | | <5 | ug/l | TM5/PM16/PM30 |
| >EC12-EC16 # | <10 | <10 | <10 | <10 | 200 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >EC16-EC21 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >EC21-EC35 # | <10 | <10 | <10 | <10 | <10 | | | | | | <10 | ug/l | TM5/PM16/PM30 |
| Total aromatics C5-35 # | 91 | <10 | 101 | 654 | 797 | | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Total aliphatics and aromatics(C5-35) # | 91 | <10 | 101 | 654 | 1126 | | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Sulphate as SO4 # | 42.8 | 24.5 | 43.9 | 4.7 | 1.2 | | | | | | <0.5 | mg/l | TM38/PM0 |
| Nitrate as N # | 2.61 | 3.65 | 5.23 | 0.18 | <0.05 | | | | | | <0.05 | mg/l | TM38/PM0 |
| Nitrite as N # | <0.006 | <0.006 | 0.594 | <0.006 | <0.006 | | | | | | <0.006 | mg/l | TM38/PM0 |
| Ammoniacal Nitrogen as NH4 # | <0.03 | <0.03 | 1.38 | 1.59 | 0.90 | | | | | | <0.03 | mg/l | TM38/PM0 |
| Sulphide | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | | <0.01 | mg/l | TM107/PM0 |
| Dissolved Iron II | 0.04 | 0.02 | <0.02 | 0.26 | 0.53 | | | | | | <0.02 | mg/l | TM48/PM0 |
| Dissolved Iron III | <0.02 | <0.02 | <0.02 | 0.57 | 15.11 | | | | | | <0.02 | mg/l | TM30/TM48/PM0 |
| pH # | 7.43 | 7.69 | 7.69 | 7.92 | 7.47 | | | | | | <0.01 | pH units | TM73/PM0 |

**Client Name:** Ramboll Environment and Health UK Ltd
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson
**JE Job No.:** 19/2578

**Report : Product**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
H=$H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

| J E Sample No. | 71-74 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BHG | | | | | | | | | | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V | | | | | | | | | | | | |
| Sample Date | 14/02/2019 14:30 | | | | | | | | | | | | |
| Sample Type | Product | | | | | | | | | | | | |
| Batch Number | 1 | | | | | | | | | | | | |
| Date of Receipt | 16/02/2019 | | | | | | | | | | | | |
| Whole Oil Trace | See Attached | | | | | | | | | | | | |

Please see attached notes for all abbreviations and acronyms

| LOD/LOR | Units | Method No. |
|---|---|---|
| | None | TM1/PM0 |

**Client Name:** Ramboll Environment and Health UK Ltd **VOC Report :** **Liquid**
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson
**JE Job No.:** 19/2578

| J E Sample No. | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 75-84 | 85-94 | 95-104 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BHL | BHE | BHF | BHM | BHD | BHN | BHC3 | BHP | BHH1 | BHH | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | | | |
| Sample Date | 14/02/2019 10:00 | 14/02/2019 10:40 | 14/02/2019 11:15 | 14/02/2019 12:00 | 14/02/2019 12:30 | 14/02/2019 13:10 | 14/02/2019 14:00 | 14/02/2019 15:50 | 15/02/2019 08:30 | 15/02/2019 08:30 | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | | | |
| VOC MS | | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ug/l | TM15/PM10 |
| Chloromethane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Vinyl Chloride # | 1.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 16.7 | 4.0 | 25.4 | 1989.3 ++ | <0.1 | ug/l | TM15/PM10 |
| Bromomethane | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| Chloroethane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Trichlorofluoromethane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethene (1,1 DCE) # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | 14 | <3 | ug/l | TM15/PM10 |
| Dichloromethane (DCM) # | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | ug/l | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | 3 | 19 | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| cis-1-2-Dichloroethene # | 31 | <3 | <3 | 5 | <3 | <3 | 167 | 7 | 434 | 6777 ++ | <3 | ug/l | TM15/PM10 |
| 2,2-Dichloropropane | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| Bromochloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Chloroform # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,1,1-Trichloroethane # | 2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Carbon tetrachloride # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,2-Dichloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Benzene # | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.7 | <0.5 | 16.2 | <0.5 | ug/l | TM15/PM10 |
| Trichloroethene (TCE) # | 70 | <3 | <3 | <3 | <3 | <3 | 44 | <3 | 9 | 13 | <3 | ug/l | TM15/PM10 |
| 1,2-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 5 | <2 | ug/l | TM15/PM10 |
| Dibromomethane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Bromodichloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| cis-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 6 | <5 | ug/l | TM15/PM10 |
| trans-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,1,2-Trichloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Tetrachloroethene (PCE) # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,3-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Dibromochloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,2-Dibromoethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Chlorobenzene # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| p/m-Xylene # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 3 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 3 | <1 | <1 | <1 | ug/l | TM15/PM10 |
| Styrene | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Bromoform # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane | <4 | <4 | <4 | <4 | <4 | <4 | <4 | <4 | <4 | <4 | <4 | ug/l | TM15/PM10 |
| Bromobenzene # | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichloropropane # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Propylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 2-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 4-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| tert-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| sec-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 4-Isopropyltoluene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,3-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,4-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| n-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,2-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,2,4-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Hexachlorobutadiene | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Naphthalene | 3 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 99 | 106 | 105 | 103 | 105 | 103 | 102 | 105 | 97 | 98 | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 95 | 99 | 99 | 99 | 102 | 98 | 99 | 100 | 95 | 100 | <0 | % | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ramboll Environment and Health UK Ltd
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson
**JE Job No.:** 19/2578

**VOC Report :** **Liquid**

| J E Sample No. | 105-114 | 115-124 | 135-144 | 145-154 | 155-164 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BHH2 | BHQ | BHJ | BHK | BHB | | | | | | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | V H HN HCL N P G | | | | | | | | |
| Sample Date | 15/02/2019 10:00 | 15/02/2019 10:40 | 15/02/2019 12:35 | 15/02/2019 13:25 | 15/02/2019 14:10 | | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | 16/02/2019 | | | | | | | | |
| VOC MS | | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | <0.1 | <0.1 | <0.1 | <0.1 | 7.6 | | | | | | <0.1 | ug/l | TM15/PM10 |
| Chloromethane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Vinyl Chloride # | 1.7 | 0.5 | 0.9 | 0.2 | <0.1 | | | | | | <0.1 | ug/l | TM15/PM10 |
| Bromomethane | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| Chloroethane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Trichlorofluoromethane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethene (1,1 DCE) # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Dichloromethane (DCM) # | <5 | <5 | <5 | <5 | <5 | | | | | | <5 | ug/l | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| cis-1-2-Dichloroethene # | 10 | 27 | 10 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 2,2-Dichloropropane | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| Bromochloromethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Chloroform # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1-Trichloroethane # | <2 | <2 | 3 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Carbon tetrachloride # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dichloroethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Benzene # | <0.5 | <0.5 | <0.5 | <0.5 | 160.9 | | | | | | <0.5 | ug/l | TM15/PM10 |
| Trichloroethene (TCE) # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Dibromomethane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Bromodichloromethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| cis-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | | | | | | <5 | ug/l | TM15/PM10 |
| trans-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,2-Trichloroethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Tetrachloroethene (PCE) # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Dibromochloromethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dibromoethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Chlorobenzene # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| p/m-Xylene # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | | | | | | <1 | ug/l | TM15/PM10 |
| Styrene | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Bromoform # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | <3 | <3 | 14 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane | <4 | <4 | <4 | <4 | <4 | | | | | | <4 | ug/l | TM15/PM10 |
| Bromobenzene # | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichloropropane # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Propylbenzene # | <3 | <3 | <3 | <3 | 24 | | | | | | <3 | ug/l | TM15/PM10 |
| 2-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 4-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| tert-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| sec-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 4-Isopropyltoluene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,4-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| n-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,4-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Hexachlorobutadiene | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Naphthalene | <2 | <2 | <2 | <2 | <2 | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | | | | | | <3 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 106 | 107 | 106 | 107 | 108 | | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 100 | 100 | 100 | 101 | 102 | | | | | | <0 | % | TM15/PM10 |

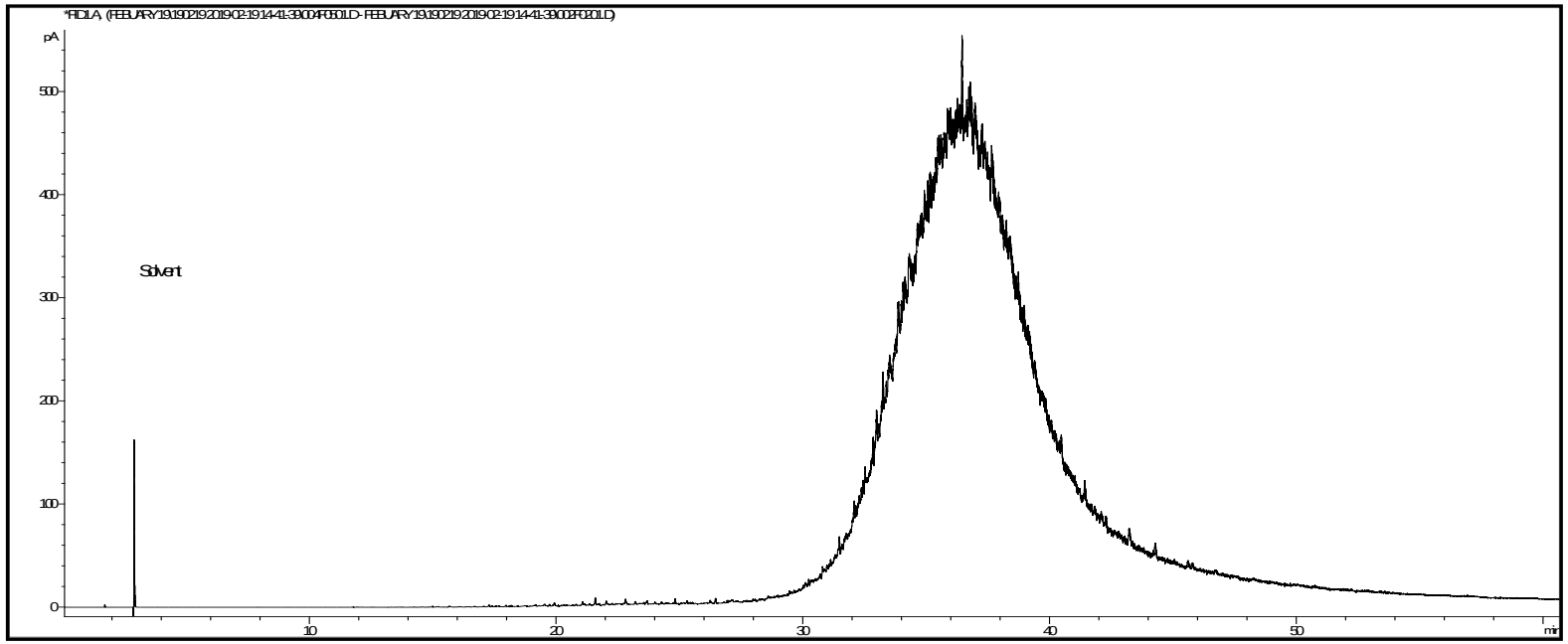
Please see attached notes for all abbreviations and acronyms

| | | | |
|---|---|---|---|
| **Client Name:** | Ramboll Environment and Health UK Ltd | **JE Job No.:** | 19/2578 |
| **Reference:** | 1700003663 | **JE Sample No.:** | 72 |
| **Location:** | Windrush Industrial Park Whitney | **Sample Identity:** | BHG |
| **Contact:** | Robert Hodgson | **Depth:** | |

| | | | |
|---|---|---|---|
| **Description:** | Brown Oil | **% Diesel:** | - |
| **Carbon Range:** | 16-35 | **% Petrol:** | - |
| **Boiling Point Range (°C):** | 287-491 | **Estimated % Weathering of Petrol:** | - |
| **Pristane/Phytane Ratio:** | N/A | **Toluene/$nC_8$ ratio of Petrol:** | - |
| **$nC_{17}$/Pristane Ratio:** | N/A | **Age of Petrol (years) (schmidt et al 2002):** | - |
| **Age of Diesel (+/- 2 years)*:** | N/A | | |

**Interpretation:** Possible Hydraulic Oil

**Chromatogram:**




*The age of release estimated in this report is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996). Age estimation should be treated with caution as it can be influenced by site specific factors that the laboratory are not aware of.

**Client Name:** Ramboll Environment and Health UK Ltd
**Reference:** 1700003663
**Location:** Windrush Industrial Park Whitney
**Contact:** Robert Hodgson

| J E Job No. | Batch | Sample ID | Depth | J E Sample No. | Analysis | Reason |
|---|---|---|---|---|---|---|
| No deviating sample report results for job 19/2578 | | | | | | |

**Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.**
**Only analyses which are accredited are recorded as deviating if set criteria are not met.**

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

***JE Job No.:*** 19/2578

**SOILS**

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

**WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

**DEVIATING SAMPLES**

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

**SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

**DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

**BLANKS**

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa. |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| ++ | Result outside calibration range, results should be considered as indicative only and are not accredited. |
| * | Analysis subcontracted to an Exova Jones Environmental approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

**JE Job No:** 19/2578

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM1 | Modified USEPA 8015B method for the determination of carbon banding in oil and product samples by GC-FID. | PM0 | No preparation is required. | | | AR | |
| TM5 | Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID. | PM16/PM30 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex. | Yes | | | |
| TM5/TM36 | please refer to TM5 and TM36 for method details | PM12/PM16/PM30 | please refer to PM16/PM30 and PM12 for method details | Yes | | | |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | | |
| TM15 | Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | | |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 | PM14 | Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required. | Yes | | | |
| TM30/TM48 | Calculation of Fe (III) based on Iron and Fe(II) | PM0 | No preparation is required. | | | | |
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | | |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr) | PM0 | No preparation is required. | Yes | | | |
| TM48 | Determination of Ferrous Iron by reaction with Sodium Carbonate and Morfamquat Sulphate which is analysed spectrophotometrically. | PM0 | No preparation is required. | | | | |

**JE Job No:** 19/2578

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM73 | Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser. | PM0 | No preparation is required. | Yes | | | |
| TM107 | Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser | PM0 | No preparation is required. | | | | |
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# APPENDIX 6
# GAS AND GROUNDWATER MONITORING RESULTS

Gas Monitoring Data

| | | | |
|---|---|---|---|
| Site: | Windrush Industrial Park, Witney | Date: | 13/02/2019 |
| Order Number: | 1700003663 | Weather: | Sun with cloud, cool, slight breeze |
| Sampler: | R Hodgson / L Shotliff | Equipment: | GFM430, MiniRae Lite |

| Monitoring Well | Time | Flow Rate (l/hour) | $CH_4$ (% vol) | $CO_2$ (% vol) | $O_2$ (% vol) | $H_2S$ (ppm) | CO (ppm) | Atm Pressure (mBar) | PID (ppm) | Depth to Water (m bgl) | Depth to Base (m bgl) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BHB | 15:20 | 0.0 | <0.1 | 0.7 | 19.1 | <1 | <1 | 1015 | <0.1 | 1.62 | 6.60 | |
| BHC3 | 13:15 | 0.0 | <0.1 | <0.1 | 21.0 | <1 | <1 | 1015 | <0.1 | 5.56 | 15.83 | |
| BHD | 09:00 | 0.0 | <0.1 | 1.0 | 10.5 | <1 | <1 | 1015 | <0.1 | 4.22 | 9.58 | |
| BHE | 09:45 | 3.2 | <0.1 | 0.7 | 19.1 | <1 | <1 | 1015 | <0.1 | 1.72 | 4.95 | Flow reduced to 0.0 l/hr during monitoring |
| BHF | 10:20 | 0.0 | <0.1 | 0.5 | 19.9 | <1 | <1 | 1015 | <0.1 | 1.41 | 3.85 | |
| BHG | 12:45 | 0.0 | <0.1 | 4.0 | 3.1 | <1 | <1 | 1015 | <0.1 | 1.49* | Not Recorded* | *Free-product recorded between 0.84m and 1.49m bgl |
| BHH | 14:50 | 0.0 | <0.1 | <0.1 | 20.9 | <1 | <1 | 1015 | <0.1 | 2.59 | 6.89 | |
| BHH1 | 14:20 | 0.0 | <0.1 | 2.1 | 19.4 | <1 | <1 | 1015 | <0.1 | 1.96 | 6.44 | |
| BHH2 | 14:35 | -7.0 | <0.1 | 3.6 | 13.5 | <1 | <1 | 1015 | <0.1 | 1.77 | 7.07 | Flow increased to 0.0 l/hr during monitoring |
| BHJ | 16:00 | 0.0 | <0.1 | 1.2 | 17.7 | <1 | <1 | 1015 | <0.1 | 1.26 | 2.15 | |
| BHK | 16:15 | 0.0 | <0.1 | 0.5 | 19.9 | <1 | <1 | 1015 | <0.1 | 1.49 | 3.00 | |
| BHL | 09:55 | 0.0 | <0.1 | <0.1 | 20.9 | <1 | <1 | 1015 | <0.1 | 1.71 | 4.32 | |
| BHM | 11:10 | 0.0 | <0.1 | 0.5 | 20.0 | <1 | <1 | 1015 | <0.1 | 1.60 | 5.48 | |
| BHN | 09:20 | 0.0 | <0.1 | 0.4 | 19.1 | <1 | <1 | 1015 | <0.1 | 1.99 | 5.08 | |
| BHP | 14:10 | 2.6 | <0.1 | 0.7 | 19.4 | <1 | <1 | 1015 | <0.1 | 1.66 | 4.88 | Flow reduced to 0.0 l/hr during monitoring |
| BHQ | 10:35 | -3.8 | <0.1 | 0.9 | 18.6 | <1 | <1 | 1015 | <0.1 | 1.35 | 4.00 | Flow increased to 0.0 l/hr during monitoring |

Atmospheric Pressure Trend: Steady
Local weather station: Brize Norton

| Date: | Barometric pressure: |
|---|---|
| 11/02/2019 | 1026mb |
| 12/02/2019 | 1032mb |
| 13/02/2019 | 1032mb |
| 14/02/2019 | 1032mb |
| 15/02/2019 | 1026mb |

Groundwater Monitoring Data

| | | | |
|---|---|---|---|
| Site: | Windrush Industrial Park, Witney | Date: | 14/02/2019 - 15/02/2019 |
| Order Number: | 1700003663 | Weather: | Sun with cloud, cool, slight breeze |
| Sampler: | R Hodgson | Equipment: | Peristaltic pump, SmarTROLL MP with flow-cell (s/n 17361) |

| Monitoring Well | Ground Level (m AOD) | Depth to Water (m bgl) | Depth to Base (m bgl) | Depth to Water (m AOD) | pH | Temp (°C) | SPC (µS/cm) | RDO (mg/l) | ORP (mV) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| BHB | Not Recorded | 1.62 | 6.60 | Not Recorded | 6.96 | 10.74 | 1301.10 | 0.06 | -91.3 | Pale orange-brown with slight hydrocarbon odour. |
| BHC3 | 105.58 | 5.56 | 15.83 | 100.02 | 6.78 | 12.90 | 929.73 | 0.70 | 83.2 | Very pale white, slightly chalky appearance. |
| BHD | 106.90 | 4.22 | 9.58 | 102.68 | 7.09 | 12.62 | 735.78 | 6.89 | 70.8 | Very pale white, slightly chalky appearance. |
| BHE | 107.38 | 1.72 | 4.95 | 105.66 | 7.14 | 9.98 | 956.08 | 0.10 | -77.6 | Clear, colourless. |
| BHF | 107.86 | 1.41 | 3.85 | 106.45 | 7.38 | 8.27 | 588.66 | 5.24 | 44.3 | Clear, colourless. |
| BHG | 108.02 | 1.49* | Not Recorded* | 106.53 | Not Recorded | Not Recorded | Not Recorded | Not Recorded | Not Recorded | *Free-product recorded between 0.84m and 1.49m bgl. Product is a dark brown, viscous oil with a moderate hydrocarbon odour. Sample collected from product layer only, groundwater was not sampled. |
| BHH | 107.69 | 2.59 | 6.89 | 105.10 | 6.80 | 11.29 | 910.03 | 0.19 | -6.3 | Pale white, slightly cloudy appearance. |
| BHH1 | 107.55 | 1.96 | 6.44 | 105.59 | 6.83 | 10.55 | 869.77 | 0.42 | 21.5 | Clear, colourless. |
| BHH2 | 108.34 | 1.77 | 7.07 | 106.57 | 6.76 | 9.65 | 1061.3 | 0.29 | 57.7 | Clear, colourless. |
| BHJ | 104.24 | 1.26 | 2.15 | 102.98 | 7.12 | 8.77 | 2117.4 | 0.54 | 58.4 | Clear, colourless. Monitoring well ran dry during sampling, flow rate adjusted accordingly. |
| BHK | 104.54 | 1.49 | 3.00 | 103.05 | 7.43 | 10.50 | 471.59 | 0.61 | -97.8 | Clear, colourless. Monitoring well ran dry during sampling, flow rate adjusted accordingly. |
| BHL | 107.40 | 1.71 | 4.32 | 105.69 | 7.38 | 11.88 | 746.92 | 1.08 | 66.0 | Clear, colourless. |
| BHM | 106.76 | 1.60 | 5.48 | 105.16 | 7.12 | 14.26 | 615.99 | 5.33 | 64.7 | Clear, colourless. |
| BHN | 107.24 | 1.99 | 5.08 | 105.25 | 7.07 | 11.94 | 725.10 | 2.39 | 68.1 | Clear, colourless. |
| BHP | 107.51 | 1.66 | 4.88 | 105.85 | 7.00 | 10.45 | 1082.3 | 3.21 | -28.8 | Clear, colourless. Monitoring well ran dry during sampling, flow rate adjusted accordingly. |
| BHQ | 107.84 | 1.35 | 4.00 | 106.49 | 7.08 | 9.00 | 720.80 | 7.52 | 66.5 | Clear, colourless. |