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# FORD ENERGY RECOVERY FACILITY AND WASTE SORTING AND TRANSFER FACILITY, FORD CIRCULAR TECHNOLOGY PARK

# GEOENVIRONMENTAL DESK STUDY

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# FORD ENERGY RECOVERY FACILITY AND WASTE SORTING AND TRANSFER FACILITY, FORD CIRCULAR TECHNOLOGY PARK GEOENVIRONMENTAL DESK STUDY

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# 1. INTRODUCTION

## 1.1 Brief

1.1.1 Ford Energy from Waste (EfW) Limited, a joint venture between Grundon Waste Management Limited (Grundon) and Viridor Waste Management Limited (Viridor) (therein referred to as 'the applicants'), is proposing to build and operate a conventional energy recovery facility (ERF) at the site. Grundon, the sole owner/ operator of the existing waste transfer station (WTS), is proposing to continue this operation in a new, purpose-built facility on site. Ramboll UK Limited (Ramboll) has been appointed by the applicants to undertake a geoenvironmental desk study to support the full planning application at the site, including the ERF and waste sorting and transfer facility (WSTF) and ancillary uses.

## 1.2 Objectives and Scope of Works

1.2.1 The scope of this study is as follows:

- Review desk-based information sources including site history, geology, hydrogeology, hydrology, environmental and regulatory information, radon and ground gas, and unexploded ordnance;
- Review any relevant previous site investigation reports;
- Establish a contaminated land conceptual site model and carry out Preliminary Risk Assessment in the context of the proposed development; and
- Provide recommendations for site investigation to inform the design and construction of the development.

1.2.2 This report does not cover any issues other than those related to contaminated land. For example, no geotechnical, ecological or archaeological studies are included within the scope of this report.

## 1.3 Limitations and Constraints

1.3.1 This report has been prepared for the Client and shall not be relied upon by any third party unless that party has been granted a contractual right to rely on this report for the purpose for which it was prepared.

1.3.2 The findings and opinions in this report are based upon information derived from a variety of information sources. Ramboll has endeavoured to assess all information provided and believe these information sources to be reliable. Information from the public register was largely derived from the Envirocheck environmental database; information sources for this database include the Environment Agency (EA) and other statutory authorities.

1.3.3 This report includes summaries of information from external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon. It should be noted that some aspects considered in this study are subject to change with time. Therefore, if the development is delayed or postponed for a significant period, a review should be completed to confirm that no changes have taken place, either at the site or within relevant legislation.

1.3.4 Any substantial changes to the use of the site may require a reassessment of the implications of the risks identified. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

1.3.5 A summary of legislative context and methodologies utilised within this report is presented as Appendix A.

# 2. SITE DETAILS

## 2.1 Site Setting

2.1.1 The site location and details of the site setting are provided in Table 2-1, and a site location plan is presented as Figure 1.

**Table 2-1: Site Setting Details**

| Parameter | | Details |
|---|---|---|
| Site location | Postcode | BN18 0HY |
| | Grid Reference | 498968 103119 |
| Area of site ($Ha^2$) | | 7.11 |
| General setting | | The site boundary comprises a central, approximately rectangular portion (hereafter referred to as the 'rectangular portion'), in addition to a smaller northern portion connected to the rectangular portion by an access road (hereafter referred to as the 'northern portion'). The site boundary includes a new access road to the southeast of the 'rectangular portion' constructed under planning permission reference WSCC/027/18/F (hereafter referred to as the 'south-eastern road'). As the south-eastern access road has been constructed under a separate planning permission (WSCC/027/18/F), it has not been considered within this assessment.<br>The site is located within an area of predominantly agricultural land, with a sewage treatment works and area of sports pitches located to the south. A number of commercial and industrial estates are present in the area at a distance of approximately 500 m from the centre of the site, and the residential areas of Ford, Climping, Yapton and Her Majesty's (HM) Prison Ford are located beyond these. The Ford to Barnham Railway line is located more than 1 km to the north and the River Arun is located approximately 900 m to the east. |
| Current site use | | The rectangular portion of the site is currently partially occupied by a waste transfer station (WTS) located in the centre, two vacant former hangar buildings located in the north of the rectangular portion and a large area of hardstanding that is partly occupied by containers and portacabins. The northern portion is occupied by a RAF refuelling area and is currently not in use. The site is accessed via the new south-eastern road from Ford Road to the east of the site. |
| Current regulated activities on site | | The WTS operates as a licenced waste management facility (Grundon Waste Management Ltd, Licence Ref 402696) and accepts household, commercial and industrial waste. |
| Topography | | The topography of the site is generally flat. The topography in the vicinity of the site gently slopes down toward the north. |
| Land bounding site-use | North | The site is bounded to the north by agricultural land. Ford Lane Business Park and a number of farmhouses are located beyond the agricultural land at a distance of approximately 500 m from the centre of the site. |
| | South | The site is bounded to the south by a triangular area of sports pitches, with a sewage treatment works located beyond the sports pitches (approximately 20 m from the site boundary at its closest point). Ford Airfield (used as Ford Market) is located beyond the sewage treatment works, and a materials recovery facility (MRF) and Rudford Industrial Estate are located beyond this at a distance of approximately 500 m from the centre of the site. HM Prison Ford is located approximately 500 m to the southeast. The residential village of Climping is located approximately 1 km to the south. |

| Parameter | | Details |
|---|---|---|
| | East | The site is bounded to the east by agricultural land. The residential village of Ford is located beyond the agricultural land approximately 300 m east. Further agricultural land and the River Arun are located beyond the village of Ford. |
| | West | The site is bounded to the west by agricultural land. Ford Airfield Industrial Estate is located beyond the agricultural land at a distance of approximately 500 m. The town of Yapton is located beyond the industrial estate. |

## 2.2 Proposed Development

2.2.1 Ford EfW Ltd propose to redevelop the site as a waste treatment facility comprising a WSTF and ERF. The buildings and ancillary structures to be constructed as part of the waste management facility are anticipated to occupy 40% of the site and are summarised as follows:

- WSTF;
- ERF, including;
  - Waste reception hall;
  - Incinerator Bottom Ash (IBA) storage area;
  - Boiler hall;
  - Turbine hall and heat station;
  - Water treatment plant and dirty water pit;
  - Admin and welfare block;
  - Bunker hall, including 14 m deep fuel bunker (floor level 2 m below ground level (mbgl));
- Workshops and offices;
- Flue Gas Treatment (FGT) plant with stack;
- Air Cooled Condenser (ACC) house;
- Pump houses;
- Fire tanks;
- Electricity substation; and
- Weighbridges.

2.2.2 The remaining 60% of the site will be occupied by external areas which will include hardstanding with limited soft landscaping. External areas of the site will include access roads and operational transport routes within the site, car and heavy goods vehicle (HGV) parking spaces, HGV washing areas ramps and pedestrian routes.

2.2.3 A proposed development plan showing the general layout of the proposed development is presented as Appendix B.

## 2.3 Site Walkover

2.3.1 A site walkover survey was undertaken by a Ramboll contaminated land consultant on 11 December 2019. The principal objectives of the walkover survey were to verify information collected as part of this desk-based assessment and collect additional information relating to land contamination that cannot be obtained through remote assessment.

2.3.2 The items noted during the site walkover and discussed below are illustrated in Figure 2 and photographs taken during the site walkover are presented in Appendix C.

**Buildings Onsite**

*Site Office and Weighbridge*

2.3.3 The site office is a series of portacabins, with the weighbridge adjacent to the site. No wheel wash facilities were noted by the weighbridge (see Plate 1).

*Unit 1 (Hangar 1)*

2.3.4 The construction is steel frame with a corrugated cladding and a concrete floor. Currently, Hangar 1 is derelict, and no access was possible. A single-storey lean-to construction is located at the southern face of the hangar, which was formerly used as office space (see Plate 2 and Plate 3).

2.3.5 On the western side of the hangar a bricked extension was noted which was formerly used as the sales office and was constructed in the 1980s.

*Unit 2 (Hangar 2)*

2.3.6 Hangar 2 is located to the east of Hangar 1 and is also a steel frame, cladded structure with a concrete floor. Currently, Hangar 2 is derelict, and no access was possible. There is a single storey lean-to building on the southern portion of the hangar (see Plate 4).

2.3.7 On the northern side of Hangar 2 there are two separate, smaller single storey buildings of brick construction. These are the former store and welfare offices (see Plate 5).

*The Waste Transfer Building*

2.3.8 The main waste building is located approximately south of Hangar 2 and is currently used as an area for storing incoming waste (see Plate 6). The construction is steel frame with corrugated cladding and a concrete floor. The main entrance of the waste transfer building is from the eastern side, where the lorries enter to drop the waste. No access was possible during the site walkover. In front of the entrance is the vehicle wash down area and where the waiting lorries park.

**External Yard Area**

2.3.9 The external yard area (see Plate 7) is covered with concrete (rough mix), with vegetation noted to be growing in between the cracks. Surrounding Hangar 1 and Hangar 2 disused rails were noted within the concrete (see Plate 8). The northern external yard is used for storing empty waste bins and waste containers (see Plate 9). The southern external yard areas are currently not being utilised (see Plate 10).

2.3.10 A large earth stockpile was noted adjacent to the waste transfer building and several smaller mounds of earth were noted in relation to the construction of the new access road in the south-eastern corner of the site (see Plate 11). Currently, it is unknown when these stockpiles will be removed.

2.3.11 The external area to the east of the waste transfer building is surfaced by extensively vegetated undeveloped ground. Based on historical maps and desk studies (detailed as sections 3.2 and 5.2 respectively) this area is understood to have been occupied by a travelling crane and a pit containing autoclaves. As such, the undeveloped ground to the west of the waste transfer building is understood to be Made Ground used to backfill the former autoclave pit.

**Storage of Chemicals and Hazardous Substances**

*Underground Storage Tanks*

2.3.12 During the site walkover two manhole covers were noted, possibly indicating the presence of an interceptor or underground storage tank adjacent to Hangar 2 (northern side) (see Plate 12). In addition, directly in front of the Hangar 2 bricked lean-to an empty hollow hole covered by loose vegetation was noted. Historical desk-based information suggests the possible presence of interceptors, slurry pits or underground storage tanks (UST) (see Section 5.2 and Appendix G) in the vicinity. Due to the overgrown vegetation and uncertainty of the depth and contents of the hole it was deemed unsafe to investigate further (see Plate 13).

2.3.13 On the southern side of Hangar 2 (between Hangar 2 and the waste transfer building), a drain cover with a black pipe and white cap was noted. This may indicate the presence, or historical presence, of an underground tank or interceptor (see Plate 14).

*Above Ground Storage Tanks*

2.3.14 Within the centre of the site a 5,600 litres (l) oil tank (serial number: 33588) was observed. The tank is associated with refuelling of onsite vehicles (see Plate 15). A spill kit was present adjacent to the tank. The tank appeared to be in good condition with no evidence of leaks or spillage on the surrounding concrete.

2.3.15 An above ground storage tank was observed at the western face of Hangar 1. The tank was labelled as containing gas oil (Bund 4) and is a Titan ES2500B, plastic internally bunded tank with a capacity of 2,500 litres (l) (width 1,470 mm and height 1,550 mm). The tank sits on two concrete blocks/beams approximately one metre above the ground level above a concrete block which was free of staining (see Plate 16). Based on historical maps and desk studies, this tank is understood to have originally been located at the eastern-face of Hangar 1.

2.3.16 A bunded concrete slab was observed at the western face of Hangar 1. This is understood to have been occupied by a boiler house containing a 40,000 l storage tank (containing heating oil). The boiler house and 40,000 l tank were no longer present at the time of the site walkover. The surface of the concrete slab was darker than the surrounding concrete hardstanding, however it was unclear if this was due to oil staining (see Plate 17).

2.3.17 A concrete slab (raised approximately 0.3 m above the level of the surrounding concrete hardstanding) was observed to the southeast of the waste transfer building. This is understood to have been occupied by a boiler house containing a 60,000 l storage tank (containing heating oil). The boiler house and 60,000 l tank were no longer present at the time of the site walkover. The surface of the concrete slab was darker than the surrounding concrete hardstanding in places, however it was unclear if this was due to oil staining.

*Other Chemical Storage*

2.3.18 Adjacent to the oil tank located within the centre of the site an AdBlue (exhaust fluid) tank was noted for use by the lorries and onsite machinery. On the southern portion of Hangar 1 one oil tube was noted, however its contents were not identified (see Plate 18).

**Stockpiled Waste**

2.3.19 During the site walkover areas of stockpiled waste were recorded across site. The waste included old tyres, bikes, pipe work, metal cables, plastic, brick blocks and wooden planks (see Plate 19).

Although no asbestos contaminating materials (ACMs) were noted within the stockpiled waste, there is the potential for ACM to be present onsite.

**Emissions to Air**

2.3.20 There was no evidence of any activities on site that would generate emissions to air that could be considered to present a significant environmental contamination risk to the ground. However, two disused metal piped chimneys were noted on Hangar 1 (see Plate 20).

**Polychlorinated Biphenyls (PCBs)**

2.3.21 Three electricity sub-stations were noted to be present on-site, one located on the western side of Hangar 1 and two located at Hangar 2 (northern and southern portion of the building). The age of the electricity sub-stations is unknown; however, it is likely to coincide with the construction of the Hangars. The ground in the immediate vicinity of the electrical substations was observed to be free of signs of staining or discolouration, however it is unclear if they are still in use due to the overgrown vegetation (see Plate 21 and Plate 22).

**Former RAF Area**

2.3.22 To the north of the main access road is the former RAF refuelling area used by Tarmac Limited (the previous owner) for storage. Immediately adjacent to this area is the former RAF pumping station, which was noted to be a bricked bunker sunken into the ground and surrounded by concrete hardstanding (to the south) and scrub and woodland (to the north) (see Plate 23).

2.3.23 It was noted that the bunker was filled with waste therefore access was not possible (see Plate 24).

# 3. CONSULTATIONS

3.0.1 The agencies, authorities, organisations and individuals which have been contacted and/or their records reviewed during the course of this study are listed in Table 3-1, together with a summary of the information obtained. Full responses from consultees and information received are included in Appendix D.

**Table 3-1: Summary of Regulatory Consultations**

| Regulatory Authority | Request | Date of Consultation | Responses |
|---|---|---|---|
| Arun District Council Contaminated Land Department | Pertinent environmental information | 20/01/2020 | A response was received from the Arun District Council Contaminated Land Department on 8 April 2020. Arun District Council advised that as part of their Part IIA investigations the site has been classified as a prioritised site which has been occupied by a potentially contaminative use. However, currently no initial investigations in the form of desktop studies and/or site inspections have been undertaken. The Contaminated Land Department has also confirmed that if the site is brought forward for re-development, a condition will be recommended for the submission of a human health-based assessment. The Contaminated Land Department are also unaware of any historic or current landfills within 250 m radius of the site. The Contaminated Land Department are not aware of any radon related monitoring or protective methods being utilised within buildings located within a 100 m radius of the site. In addition, the department is not aware of any water supplies located within a two km radius of the site. |
| West Sussex County Council Trading Standards | Petroleum records information | 20/01/2020 | During a telephone conversation on 22 January 2020, the Trading Standards Department at West Sussex County Council advised that they had no records of current petroleum storage tanks on site. However, the department had one record of a disconnected tank which was present on site, however no details for this tank were available |
| Environment Agency | Pertinent environmental information | 20/01/2020 | A response received from the EA on 11 February 2020 is presented as Appendix D. The EA advised that, in addition to the publicly available information detailed in Section 3.1, they held records relating to a fire on site in 2002 relating to drums of aluminium powder (logged as National Incident Recording System (NIRS) 123701). This resulted in 'very minimal contamination to surface water'. Additionally, the EA advised of a single odour complaint relating to the site made by a local resident in July 2017. Further investigation by the EA identified the sewage treatment plant to the south of the site as the source of the odour.<br>The EA were unable to provide further pertinent details relating to land contamination at the site. |

## 3.2 Site History

3.2.1 The detailed history of the site and environs have been determined with reference to the following:

i. Published literature and Ordnance Survey (OS) Maps dating from the 19th Century obtained as part of an Envirocheck report (provided in Appendix E);
ii. Historical aerial photographs viewed via Google Earth[1];
iii. Historical maps of Ford Aerodrome[2]; and
iv. BGS Geological Survey Historical Borehole Logs (Appendix F).

3.2.2 A plan of features identified from historical plans and aerial photography that are relevant to this assessment are presented as Figure 3.

**The Site**

3.2.3 The earliest historical record of 1876 showed the site to be undeveloped with the exception of the Chichester and Arundel Canal, which ran east to west through the centre of the site. The canal was noted to be disused by 1912, and the section of the canal located within the site was infilled by 1937. A historical plan of Ford Airfield[2] indicates that the rectangular portion and the northern portion of the site were occupied by a portion of Ford Airfield in the 1940s, and may have included an underground air raid bunker, historical workshop, aircraft standings and an access road. No further changes to the northern-portion were recorded in historical maps following the 1940s. The south-eastern portion of the south-eastern road was observed to follow a runway and access road since the 1940s. By 1992 the portion of runway currently occupied by the south-eastern road was removed and the existing access road was extended to occupy this location by 2000.

3.2.4 By 1974 the northern-half of the site was occupied by two hangar buildings associated with Ford Airfield. A circular tank was located in the north-western corner of the rectangular portion and two conveyors were located in the north-eastern part of the rectangular portion, to the east and south of Hangar 2. By 1984 the following features were present on the site:

- The building now used as the WTS was constructed to the south of Hangar 2;
- Access roads were present at the north-eastern corner and western side of the rectangular portion, both running east to west;
- A travelling crane and row of tanks (autoclaves) were located immediately to the east of the building now used as the WTS;
- An additional tank was located to the south of the building now used as the WTS;
- A hopper and conveyor were located between Hangar 1 and Hangar 2;
- An additional hopper and conveyors were located in the southern-half of the rectangular portion;
- A gas governor was located immediately adjacent to the north-eastern corner of the rectangular portion, to the south of the access road.

3.2.5 Aerial photography taken between 1999 and 2010 indicates that in addition to the buildings listed above, the site surface was occupied by hardstanding, with containers located across the southern-half of the rectangular portion, and waste stockpile bays located around the hangars and WTS in the northern-half of the rectangular portion. Aerial photography from 2012 onwards shows all containers, stockpile bays, tanks and plant to have been removed from the site. Hardstanding in the area historically occupied by the travelling crane and row of tanks appears to have been removed by 2012. In 2018, the western portion of the rectangular portion was being used as a skip depot.

3.2.6 The site is understood to have been owned by Tarmac Limited prior to Grundon and was operated as a tarmacadam topblock plant. While the precise dates of operation of the site by Tarmac Limited are unknown, the tarmacadam topblock plant is anticipated to have been present as early as 1974. A review of historical desk-based information[8] indicates that the tarmacadam topblock plant was decommissioned in 2010.

[1] https://www.google.co.uk/earth
[2] http://www.abct.org.uk/airfields/airfield-finder/ford-yapton

3.2.7 The area surrounding the site generally comprised undeveloped agricultural land from 1876, with some farmhouses located approximately 60 m to the north of the site. By 1937, limited residential development was present in the vicinity of the site. This predominantly comprised farmhouses, in addition to the village of Burndell 600 m to the southwest (later becoming part of Yapton). Ford Airfield was recorded to be present by 1962 (the hangars on site were constructed at a later date). This was identified as Ford Aerodrome by 1974 and the existing runways were present, however the aerodrome was noted as being disused at this time and portions of the runways to the east and west of the site had been removed. The farmhouse 60 m to the north of the site was replaced by an unidentified circular feature anticipated to have been related to Ford Airfield. By 1980, disused filter beds were situated 500 m to the west of the site. HM Prison Ford was constructed approximately 500 m to the southeast. The residential villages of Ford, Climping and Yapton were generally constructed between 1962 and 1980. Between 1984 and 1992 grain stores were constructed on the remaining portion of the runway 150 m to the west of the site. Ford Airfield Industrial Estate was constructed 500 m to the west and Rudford Industrial Estate was constructed 800 m to the south. In 1999, a sewage treatment works was constructed to the south of the site. In 2012 a materials recovery facility (MRF) was constructed 500 m to the south.

3.2.8 No significant changes to the area surrounding the site were identified following 2012.

**Envirocheck Report**

3.2.9 A summary of the environmental search information obtained from the Envirocheck report is presented in Table 3-2. Only those records which are considered to be of significance with respect to geo-environmental risks to the site have been included. The data sheets provided within the report are included in Appendix E. All distances quoted are from the approximate centre of the rectangular portion of the site. As such, certain records recorded as being located less than 250 m off-site may be located within the site boundary. This has been specified where relevant.

**Table 3-2: Summary of Significant Information from the Envirocheck Report**

| Data Type | Distance (m) | | | | Comments |
|---|---|---|---|---|---|
| | On site | <250 | 250-500 | 500-1000 | |
| Contaminated land register enquiries | 0 | 0 | 0 | 0 | None |
| EA discharge consents | 0 | 2 | N/R | N/R | A trade discharge – mineral workings to an old/unknown river. This feature is located within the north-eastern part of the site and was revoked in January 1998. The nearest off-site feature is located 237 m to the south (down-hydraulic gradient) and as such is not anticipated to be of relevance to this assessment. |
| Integrated pollution prevention and control | 0 | 0 | 3 | 0 | The nearest recorded feature relates to a wastewater treatment plant 309 m to the south (down-hydraulic gradient) and as such is not anticipated to be of relevance to this assessment. |
| Local authority pollution prevention and control | 0 | 1 | 0 | N/R | The nearest record relates to a cement blending, packing, loading and use activity located southeast of Hangar 1 on site. The permit is dated October 1992 and has been revoked. |
| Pollution incidents | 0 | 0 | 0 | 2 | Two Category 3 – Minor Incidents occurred approximately between 850 m and 950 m east of the site. The nearest involved deposition of inert |

| Data Type | | Distance (m) | | | | Comments |
|---|---|---|---|---|---|---|
| | | On site | <250 | 250-500 | 500-1000 | |
| | | | | | | suspended solids in March 1994 in the River Arun, and the second relates to a sewage smell (with some dead fish noted) in a tributary of the River Arun in September 1995. No further information is provided. Due to the distance, age and Minor classification of these incidents, they are not anticipated to be of relevance to this assessment. |
| Prosecutions or enforcement actions | | 0 | 0 | 0 | 0 | None |
| Recorded landfill sites | | 0 | 1 | 0 | N/R | The nearest record relates to a bank east of Hangar 2 located on the eastern site boundary constructed from deposited waste including inert waste. Deposition took place between November 1985 and September 1986. |
| Licenced waste management facilities | | 0 | 1 | 2 | 4 | The nearest feature relates to a WTS operated by Grundon, located on the site. Accepted waste includes household, commercial and industrial waste. The nearest off-site feature is located 340 m to the south and as such is not anticipated to be of relevance to this assessment. |
| Potentially infilled land | | 0 | 1 | 0 | 3 | The nearest potentially infilled land is located 390 m to the north. This is located in a residential area with additional intervening residential properties between it and the site. This infilled land is anticipated to be related to the residential property (such as an infilled pond) and is not anticipated to be of relevance to this assessment. |
| Environmental permits | Part A(1) | 0 | 0 | 0 | 0 | None |
| | Part A(2) | 0 | 0 | 0 | 0 | None |
| | Part B | 0 | 0 | N/R | N/R | None |
| Control of Major Accident Hazard Sites (COMAH) | | 0 | 0 | 0 | 0 | None |
| Fuel stations | | 0 | 0 | 0 | 0 | None |
| Contemporary trade directory entries | | 0 | 0 | 8 | N/R | The nearest active entries up-hydraulic gradient of the site include blinds retailer, 472 m north; precision engineers, 487 m north; and scrap metal merchants, 493 m west. Due to the nature of these entries and the distance from the site, they are not anticipated to present a risk to the site or the proposed development. |
| Points of interest – manufacturing and production | | 0 | 0 | 1 | N/R | The nearest record relates to a road haulage service 478 m to the southwest. Due to the nature of this feature and the distance from the site, it is not anticipated to be of relevance to this assessment. |
| Registered radioactive substances | | 0 | 0 | 0 | 0 | Information on certain radioactive substance authorisations is not publicly available. |

| Data Type | Distance (m) | | | | Comments |
|---|---|---|---|---|---|
| | On site | <250 | 250-500 | 500-1000 | |
| Radon affected area (Y/N) | N | - | - | - | Envirocheck report notes the site to be in a Lower probability radon area (less than 1% of homes estimated to be at or above the Action Level). |
| Designated ecological sites | 0 | 0 | 0 | 0 | None |

N/R Not relevant (where features have been identified, but are considered to be significantly beyond the distance to site where a pollutant linkage and an impact to the proposed development might be expected)

## 3.3 Unexploded Ordnance

3.3.1 A Zetica Unexploded Bomb (UXB) risk map for the site is presented in Appendix E. A review of the UXB map shows the site to be in an area where UXB risk is assessed as low; however Ford Aerodrome is marked as a strategic bombing target during the Second World War. The airfield was attacked by the German Luftwaffe (Air Force) on 18 August 1940 and suffered heavy damage[2]. Given the site's historical use as a military airfield and the records of enemy action at the site, unexploded ordnance risks will need to be considered further in relation to future intrusive works and mitigation measures should be adopted through consultations with a specialist.

3.3.2 A detailed unexploded ordnance (UXO) risk assessment was undertaken by Fellows in 2018 for a site adjacent to the northwest, operated by Wates/Redrow[3]. This risk assessment identified a Medium risk for German air-dropped weapons at the site. The following measures were recommended to be undertaken for all intrusive works at the site;

i. A UXO watching brief to be provided to all site personnel;
ii. Provision of a UXO engineer to oversee intrusive ground investigation works, including the use of a down-hole magnetometer to determine the possible presence of UXO; and
iii. Provision of a down-hole magnetometer survey during piling or deep excavations, with CPT probing to be undertaken to a minimum depth of 10 mbgl where deep piling is required.

3.3.3 Based on the recommendations made by the Fellows (2018) UXO risk assessment, it is anticipated that a detailed UXO risk assessment will need to be undertaken for the site prior to commencement of intrusive works. Although, parts of the site have already been developed it would be prudent to undertake a detailed UXO risk assessment and initiate control measures as per the recommendations by Fellows as the degree and nature of works for the proposed development may be different from that already undertaken.

### Underground Pipelines

3.3.4 The linesearch database lists pipelines distributing crude oil and refined hydrocarbon products owned and/or operated by a number of UK pipeline operators, including BPA, BP, ConocoPhilips, Esso, Government Pipelines and Storage System, Sabic, Shell and Total. According to the LinesearchbeforeUdig (LSBUB) database, there are no records of underground pipelines on the site or within 250 m. The LSBUD database indicated that Southern Gas Network (SGN) and Scottish and Southern Electricity Networks (SSE) both have assets within the site. Plans indicating the location of these services are presented in Appendix E. In addition, plans obtained by the client and presented to Ramboll indicate the presence of assets owned by Portsmouth Water, BT Openreach and Southern Water at the site. These plans have been included in Appendix E.

[3] Fellows (2018). Detailed Unexploded Ordnance Risk Assessment, Ref 2078

# 4. ENVIRONMENTAL SETTING

## 4.1 Geology and Hydrogeology

4.1.1 The solid and drift British Geological Survey (BGS) map (Sheet 317 & 322, Chichester and Bognor)[4] indicates that the site is underlain by superficial deposits of River Terrace Deposits (sand, silt and clay), which is in turn underlain by bedrock of the Lewes Nodular Chalk Formation (chalk). Made Ground is present across the site.

4.1.2 A review of historical borehole logs from in the vicinity of the site was undertaken using the BGS Geology of Britain Viewer. The following borehole logs were reviewed and are presented as Appendix F:

- SU90SE18 – 85 m south of the rectangular portion of the site boundary at 5.5 m Above Ordnance Datum (mAOD);
- SU90SE37 – 375 m east of the rectangular portion of the site boundary at 3.4 mAOD; and
- SU90SE16 – 480 m north of the rectangular portion of the site boundary at 4.6 mAOD.

4.1.3 A summary of ground conditions in the area of the site as described within the historical borehole logs is presented as Table 4-1.

**Table 4-1: Summary of Ground Conditions Identified by BGS Borehole Logs**

| Stratum | Description | Depth to Base (mbgl) | Proven Thickness (m) |
|---|---|---|---|
| Made Ground | "Made up ground" OR Soil OR Brown soil | 0.2 to 0.6 | 0.2 to 0.6 |
| River Terrace Deposits | Sandy clay and gravel OR Clay, silty, reddish brown, with angular to well rounded flint pebbles and gastropod shell fragments | 1.1 to 6.4 | 0.9 to 5.8 |
| Lewes Nodular Chalk Formation | Clay/chalk marl OR Chalk, rubbly, with matrix of olive silt and fine sand and some rounded flint pebbles to 5.5 m, greyish white, with nodular flints | >30 | >23.6 |

4.1.4 According to the Department for the Environment, Food and Rural Affairs (DEFRA)[5], the River Terrace Deposits are classified as a Secondary A Aquifer. The Lewes Nodular Chalk Formation is classified as a Principal Aquifer. Principal Aquifers contain layers of rock or superficial deposits that have high intergranular or fracture permeability – meaning that they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. The EA's Catchment Data Explorer[6] indicates that groundwater beneath the site forms part of the Littlehampton Anticline (West) (understood to relate to the Principal Aquifer of the Lewes Nodular Chalk Formation).

4.1.5 The EA classifies the Littlehampton Anticline (West) as being of 'Poor' quantitative quality and 'Good' chemical quality with an overall 'Poor' quality in 2016 under the Water Framework Directive (WFD) scheme.

4.1.6 Historical boreholes on site recorded groundwater levels ranging from 2.0 mbgl (1.4 mAOD) at SU90SE37, 4.21 mbgl (0.39 mAOD) at SU90SE16 and 5.87 mbgl (-0.37 mAOD) at SU90SE18. Due to the limited detail provided in the historical logs for SU90SE37 and the significantly elevated groundwater level presented for the location in relation to the other historical boreholes, the elevated groundwater level is not anticipated to be representative of the groundwater table and has been

[4] British Geological Survey (1996). England and Wales Sheet 317 & 322, Chichester and Bognor Solid and Drift Geology, 1:50,000 series
[5] https://magic.defra.gov.uk/MagicMap.aspx
[6] http://environment.data.gov.uk/catchment-planning/

discounted from calculation of hydraulic gradient in the vicinity of the site. Historical groundwater levels in SU90SE16 and SU90SE18 indicate that groundwater is shallower in the southeast than in the northwest. This is consistent with the location of the River Arun to the east of the site.

4.1.7 Groundwater level monitoring has been undertaken at the site in a total of 29 monitoring visits between July 2015 and February 2020 by Enzygo Limited (Enzygo), Grundon and Ramboll. The details of the groundwater level monitoring are presented in the Ramboll Water Quality Assessment (Ref 1620007830-RAM-XX-XX-RP-YE-00006). The shallowest recorded depth to groundwater at the site was 2.45 mbgl (4.27 mAOD) recorded by Ramboll in February 2020.

4.1.8 The site is not located within a groundwater Source Protection Zone (SPZ)[5]. The site is not located within a Nitrate Vulnerable Zone (NVZ) or Drinking Water Protected Area (DWPA), however the River Arun located approximately 900 m to the east is classified as a surface water DWPA and is linked to a Special Protected Area (SPA) and a Special Area of Conservation (SAC)[5]. The SPA and SAC are 10 km upstream from the site and are not considered to be relevant to this study.

4.1.9 According to the Coal Authority, the site is not located in a Coal Mining Affected Area. The BGS has stated that the site is located in an area where there is no hazard from other (non-coal) mining activities.

4.1.10 There are licenced groundwater abstractions at seven locations within 2 km of the site, as detailed in Table 4-2. All distances quoted are from the approximate centre of the rectangular portion of the site.

**Table 4-2: Summary of Licensed Groundwater Abstractions**

| Licence Holder | Distance from Site | Abstraction Source | Purpose of Abstraction |
|---|---|---|---|
| Tarmac Ltd | On site | Groundwater | Construction: process water |
| Tarmac Heavy Building Materials Ltd | On site | Groundwater | Construction: process water |
| Mr A Langmead | 586 m north | Groundwater | General farming and domestic |
| Mr R Hague | 600 m northeast | Groundwater | Agriculture |
| Keith Langmead Ltd | 886 m northeast | Groundwater | Spray irrigation - direct |
| Mr A C Langmead | 886 m northwest | Groundwater | Spray irrigation - storage |
| Mr A Clay | 1681 m west | Groundwater | Agriculture: horticultural watering |

4.1.11 While no end dates were supplied for the groundwater abstraction licences listed above, it is noted that the abstractions location on site (located to southeast of Hangar 2) were associated with the historical owner of the site (Tarmac Limited) and as such are unlikely to still be operational. It is uncertain if the Tarmac Limited abstraction boreholes have been decommissioned and as such a preferential pathway to groundwater may exist if decommissioning was not undertaken. All other abstractions were located up- or cross-hydraulic gradient from the site and are therefore not anticipated to be relevant to this assessment, with the exception of R Hague, 600 m to the northeast of the site. Due to the distance of this abstraction from the site and the use of the abstraction for agricultural purposes, the risk to this abstraction location is anticipated to be low.

4.1.12 The groundwater abstractions recorded within 2 km of the site all relate to non-potable uses as summarised in Table 4-2. There may be the potential for smaller (unlicensed) abstractions to be

present in the vicinity of the site. Where private water supplies are for drinking water, SPZs typically extend around such private supplies to a 50 m radius.

## 4.2 Hydrology

4.2.1 The nearest surface water feature to the site is a drain located approximately 350 m to the east of the rectangular portion. The nearest major surface watercourse is the River Arun located approximately 900 m east of the site at its nearest point. The River Arun generally flows towards the south and enters the English Channel 3.7 km to the southeast. The EA currently classifies the River Arun as being of 'Moderate' ecological quality and 'Good' chemical quality with an overall 'Moderate' quality in 2016 under the WFD classification scheme[6].

4.2.2 There are licenced surface water abstractions at nine locations within 2 km of the site, as detailed in Table 4-3. All distances quoted are from the approximate centre of the rectangular portion of the site.

**Table 4-3: Summary of Licensed Surface Water Abstractions**

| Licence Holder | Distance from Site | Abstraction Source | Purpose of Abstraction |
|---|---|---|---|
| Keith Langmead Ltd | 1336 m northeast | Surface water | Spray Irrigation - Storage |
| Keith Langmead Ltd | 1336 m northeast | Surface water | Spray Irrigation - Storage |
| A C Langmead Ltd | 1336 m northwest | Surface water | Spray Irrigation - Storage |
| T Luckin and Sons | 1560 m north | Surface water | Spray Irrigation - Direct |
| T Luckin and Sons | 1560 m north | Surface water | Spray Irrigation - Direct |
| Messrs T Luckin and Son | 1560 m north | Surface water | Spray Irrigation |
| Adviserate T/A Southdown Flowers | 1796 m northwest | Surface water | Spray Irrigation |
| T Luckin and Son | 1839 m northeast | Surface water | Spray Irrigation - Direct |
| J A Longhurst | 1968 m northeast | Surface water | Spray Irrigation |

4.2.3 According to the EA, the site is located within Flood Zone 1 (low probability of flooding)[7]. 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).

4.2.4 A summary of the Geological and Hydrogeological is provided in Table 4-4 and a summary of the surface water bodies is presented in Table 4-5.

[7] https://flood-map-for-planning.service.gov.uk/

**Table 4-4: Geological and Hydrogeological Summary**

| Geological Strata | Details | Approximate Thickness (m) | Aquifer Status | | | | Groundwater Body - WFD | WFD Status - Chemical | | Protection | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Designation | Vulnerability | Local Information Available | Soluble Rock Risk | | Current Cycle | Objective | SPZ | DrWPA | NVZ |
| Made Ground (MG) | Brown soil | 0.2 to 0.6 | Unclassified | Unclassified | No | No | No | N/A | N/A | N/A | N/A | N/A |
| River Terrace Deposits | Sandy clay and gravel or clay with flint pebbles and gastropod shell fragments | 0.9 to 5.8 | Secondary A | Medium | No | No | No | N/A | N/A | N/A | N/A | N/A |
| Lewes Nodular Chalk Formation | Clay/Chalk marl and weathered chalk with flint pebbles | >23.6 | Principal | High | No | Yes | GB40701G504900 | 2016 | Poor | No | Yes | Yes |

**Table 4-5: Surface Waterbodies**

| Location | Name of River / Stream | Waterbody | Operational Catchment | Management Catchment | Waterbody Type | WFD Status - Chemical | | WFD Status - Ecological | | Linked Protected Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current Cycle | Objective | Current Cycle | Objective | |
| 900 m east of site | River Arun | Arun | Arun Lower Transitional and Coastal (TraC) | South East TraC | Transitional | 2016 | Good | 2016 | Moderate | Yes |

# 5. PREVIOUS STUDIES

5.0.1 The site has been the subject of several previous phases of desk-based assessment and ground investigation, which have been reviewed as part of this Geoenvironmental Desk Study. The reports reviewed included the following:

* Golder Associates (2012) Former Tarmac Topblock Site, Ford, Arundel, West Sussex BN18 0HY Phase 1 Environmental Assessment (Ref 12514190632.500/B.O)[8];
* Enzygo (2015) Geoenvironmental Report (Ref CRM.049.009.GE.R001A)[9]; and
* Enzygo (2018) Factual Report (Ref CRM.049.009.GE.R.002 A)[10].

## 5.2 Golder Associates (2012) Phase 1 Environmental Assessment

5.2.1 A Phase 1 desk-based geoenvironmental assessment was undertaken by Golder Associates in September 2012 on behalf of Grundon. In addition to a review of available records from the UK regulatory authority database, Golder Associates carried out a site walkover to identify site features that could potentially impact ground conditions. The historical and environmental setting identified by Golder Associates generally agreed with those detailed in Sections 3 and 4 of this report. Additionally, Golder Associates identified a number of potential areas of concern based on their site walkover. A summary of potential areas of concern (PAOC) for the site produced by Golder Associates is replicated in Table 5-1. A plan indicating the locations of the PAOCs and other site features identified by Golder Associates is presented in Appendix G.

**Table 5-1: Summary of PAOCs identified by Golder Associates (2012)**

| PAOC | Name | Contaminant of Concern | Location |
|---|---|---|---|
| 1 | Former gas oil tank (60,000 l) | Gas oil | 3 |
| 2 | Above ground storage tank previously containing gas oil (2,500 l) | Hydrocarbons | 12 |
| 3 | Former oil stores | Hydrocarbons | 11 |
| 4 | Aerated block plant containing soluble oil, mould oil storage vessels, and oil store, PFA silo and anhydrite silo | Soluble oil, mould oil, oil store, PFA, aluminium and anhydrite silo | 8 |
| 5 | Sub-station adjacent to Hangar 2 | PCBs | 16 |
| 6 | Manhole covers possibly indicating presence of interceptor or slurry pit | Hydrocarbons | 18 |
| 7 | Sub-station adjacent to aerated block plant | PCBs | 16 |
| 8 | Infilled slurry pit and hydrochloric acid (HCL) store and delivery point | Various | 4 |
| 9 | Former autoclaves | Various | 5 |
| 10 | Former gas oil tank (40,000 l) | Gas oil | 7 |
| 11 | Historic landfill | Various | 2 |
| 12 | Former RAF refuelling area | Aviation fuel | 1 |

[8] Golder Associates (2012) Former Tarmac Topblock Site, Ford, Arundel, West Sussex BN18 0HY Phase 1 Environmental Assessment (Ref 12514190632.500/BO)

[9] Enzygo (2015) Geoenvironmental Report (Ref CRM.049.009.GE.R001A)

[10] Enzygo (2018) Factual Report (Ref CRM.049.009.GE.R.002 A)

| PAOC | Name | Contaminant of Concern | Location |
|---|---|---|---|
| 13 | Pallet storage area and possible former RAF bunker | Unknown | 6 |
| 14 | Previous location of above-ground storage tank previously containing gas oil (2,500 l) | Hydrocarbons | 13 |

## 5.3 Enzygo (2015) Geoenvironmental Report

5.3.1 An intrusive ground investigation and Phase 2 geoenvironmental report was undertaken by Enzygo Limited (Enzygo) in September 2015 on behalf of Grundon[9]. The geoenvironmental report included a review of the 2012 Golder Associates Phase 1 Environmental Assessment[8], which was used to produce a preliminary ground investigation and to inform the design of the intrusive ground investigation. Additionally, the ground investigation was undertaken only on the rectangular portion of the site and did not investigate the northern portion where the RAF refuelling area was identified by the Golder Associates (2012) geoenvironmental assessment. A second, supplementary ground investigation was undertaken by Enzygo in 2018 for geotechnical purposes, which also included three rounds of gas and groundwater level monitoring undertaken in January and February 2018.

5.3.2 The 2015 ground investigation comprised advancement of eight boreholes (BH1 to BH8) to a depth of 10 mbgl and excavation of 15 trial pits (TP1 to TP15) to a maximum of 3.3 mbgl. An additional nine boreholes (BH101 to BH109) were advanced during the 2018 ground investigation. Gas and groundwater monitoring standpipes were installed in boreholes BH1, BH2, BH6A, BH7 and BH8, and in BH101 to BH108. Gas and groundwater level monitoring was undertaken on four return visits in July and August 2015, and on three return visits in January and February 2018. The exploratory hole location plans prepared by Enzygo for the 2015 and 2018 ground investigations are presented in Appendix G.

5.3.3 Representative soil and groundwater samples from the 2015 ground investigation were sent to a chemical testing laboratory and screened for metals, pH, sulphate, cyanide, phenols, speciated polycyclic aromatic hydrocarbons (PAH), banded total petroleum hydrocarbons (TPH), organic carbon, volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCBs) and asbestos. No soil or groundwater samples were subjected to chemical testing as part of the 2018 ground investigation.

5.3.4 Ground conditions were generally in line with the anticipated ground conditions detailed in Section 4. A summary of ground and groundwater conditions identified by Enzygo in the 2015 and 2018 ground investigations is replicated in Table 5-2.

**Table 5-2: Summary of Ground Conditions Encountered by Enzygo.**

| Strata | Summary Description | Depth to top of Strata (mbgl) | Thickness (m) |
|---|---|---|---|
| General Made Ground | Made Ground (concrete 120 mm to 250 mm thick) over lean concrete (150 mm to 200 mm) over black ashy sandy fine angular gravel. | 0.0 | 0.15 to 2.0 |
| Made Ground Backfilled slurry pit (TP12, TP13 and TP14) | Large concrete blocks (300 mm + square), rebar, cable in a sandy gravel matrix over large concrete blocks with abundant 6 mm rebar in grey sandy gravelly size concrete matrix black sandy gravelly clay with brick fragments | 0.0 | 0.65 to 1.2 |
| Made Ground backfilled pit (TP15) | Dark grey sandy gravelly topsoil with brick and concrete fragments over large concrete blocks with rebar, metal pipe, brick in a topsoil matrix | 0.0 | In excess of 1.5 |

| Strata | Summary Description | Depth to top of Strata (mbgl) | Thickness (m) |
|---|---|---|---|
| Made Ground (demolished autoclaves (TP9, TP10 and TP11) | Large concrete blocks (300 mm + square), rebar, pieces of plastic, wire metal roots, wood fragments in a sandy matrix. Slight discernible hydrocarbon odour over firm brown, grey and black sandy gravelly clay over concrete lean mix. | 0.0 | 2.1 to 3.0 |
| Superficial materials (River Terrace Deposits) | Firm locally soft orange brown sandy clay over medium dense orange brown and yellow brown slightly clayey slightly gravelly medium sand and gravel. Gravel is medium to coarse rounded flint. | 0.15 to 2.0 | 0.9 to 4.35 |
| Chalk | Structureless chalk composed of sub-angular to rounded medium to coarse gravel size light brown highly weathered weak fragments with subrounded cobble size weathered weak fragments . Some matrix of soft light brown clayey sand size fragments | 2.3 to 4.5 | In excess of 18.2 |
| Groundwater | Seepages within Made Ground at 1.4 mbgl. Water strike at depths between 5.5 mbgl and 9.0 mbgl during ground investigations. Hydraulic gradient generally appears to be towards the east to southeast. | N/A | N/A |

5.3.5 Enzygo carried out groundwater monitoring on four return visits in July and August 2015 in the monitoring standpipes installed during the 2015 ground investigation. Groundwater levels recorded during this period were found to range from 5.31 mbgl (1.41 mAOD) in the southwestern corner of the site at BH2 to 5.8 mbgl (0.87 mAOD) at BH8 at the eastern boundary of the site. Groundwater levels recorded during this period indicated a hydraulic gradient towards the east of the site.

5.3.6 Enzygo assessed the potential risk to human health at the site by comparing the results of soil chemical testing with generic assessment criteria (GAC) for a commercial land use, derived from the Contaminated Land Exposure Assessment (CLEA)[11] and Soil Guideline Values (SGV) published by Land Quality Management and the Chartered Institute of Environmental Health (LQM/CIEH).

5.3.7 No contaminants were found to exceed the relevant GAC in the soil samples subjected to testing. Asbestos was not detected in the samples tested. As such, the risk to human health was generally considered to be low and was dismissed by Enzygo. Organic contaminants were noted by Enzygo to be present in soils at elevated concentrations. Although no human health GACs were exceeded by organic contaminants, organic contaminants have the potential to infiltrate into drinking water supply pipes and thereby present a risk to human health. Additionally, elevated sulphate concentrations recorded by Enzygo were noted to have the potential to impact buried concrete structures.

5.3.8 Enzygo assessed the potential risk to controlled water receptors at the site by comparing the results of groundwater chemical testing with GACs derived from the freshwater Environmental Quality Standards (EQS), UK Drinking Water Values (DWV) and World Health Organisation (WHO) values for drinking water[12]. A summary of the exceedances of the relevant GACs for contaminants identified by Enzygo is replicated in Table 5-3. The locations of the boreholes in which these exceedances were recorded are presented in Appendix G.

[11] Environment Agency (2008) Updated technical background to the CLEA model SC050021_SR3

**Table 5-3: Summary of Elevated Groundwater Contaminants identified by Enzygo (2015).**

| Contaminant | EQS (µg/l) (Enzygo) | DWV (µg/l) (Enzygo) | WHO Values (µg/l) (Enzygo) | Groundwater GACs | Location and Groundwater Level | Concentration (µg/l) |
|---|---|---|---|---|---|---|
| Anthracene | 0.02 | N/A | N/A | 0.01 (minimum reporting value) | BH2, 5.63 mbgl (1.09 mAOD) | 0.07 |
| | | | | | BH6, 5.8 mbgl (0.87 mAOD) | 0.03 |
| | | | | | BH7, 5.76 mbgl (0.84 mAOD) | 6.26 |
| | | | | | BH8, 5.77 mbgl (0.72 mAOD) | 1.74 |
| Fluoranthene | 0.02 | N/A | N/A | 0.075 (General Quality of GW Body) | BH2, 5.63 mbgl (1.09 mAOD) | 0.03 |
| | | | | | BH6, 5.8 mbgl (0.87 mAOD) | 0.08 |
| | | | | | BH7, 5.76 mbgl (0.84 mAOD) | 27 |
| | | | | | BH8, 5.77 mbgl (0.72 mAOD) | 12.4 |
| Benzo(a) pyrene | 0.03 | N/A | 0.01 | 0.00005 (minimum reporting value) | BH2, 5.63 mbgl (1.09 mAOD) | 0.25 |
| | | | | | BH6, 5.8 mbgl (0.87 mAOD) | 0.05 |
| | | | | | BH7, 5.76 mbgl (0.84 mAOD) | 18.5 |
| | | | | | BH8, 5.77 mbgl (0.72 mAOD) | 9.59 |
| TPH C8 to C10 | 20 | N/A | 10 | 300 (CL:AIRE[13]) | BH2, 5.63 mbgl (1.09 mAOD) | 30 |
| | | | | | BH7, 5.76 mbgl (0.84 mAOD) | 33.3 |
| | | | | | BH8, 5.77 mbgl (0.72 mAOD) | 23.6 |

* All GAC values obtained from Enzygo (2015)[9] geoenvironmental report. It is noted that the GACs utilised by Enzygo do not match with the existing EQS, DWS or WHO values for these contaminants

5.3.9 Enzygo concluded that the spike in contamination at BH7 (located next to a former fuel Above Storage Tank (AST) suggested a historical leakage, though no evidence of spillage was observed on the hardstanding at the time of the ground investigation. Enzygo also concluded that as concentrations decreased significantly towards the site boundaries (contaminant concentrations at BH8 at the eastern boundary of the site were approximately half the concentrations at BH7, and significantly lower at BH6 in the south-eastern corner), the risk to surface water receptors could be dismissed. As the fuel AST located near BH7 was no longer present and no evidence of spillage could be seen on the site hardstanding, the organic contaminant impact was considered by Enzygo to be a residual risk.

5.3.10 It is noted that Enzygo did not screen groundwater samples against GACs for sensitive groundwater receptors, despite the presence of elevated contaminant concentrations in the Chalk and the significant distance to the nearest potential surface water receptors. Additionally, it is noted that the GAC values provided by Enzygo differ from the current EQS, DWV or WHO values for these

[13] CL:AIRE (2017). Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological assessment methodologies

contaminants. As such, GACs derived from General Quality of Groundwater Body, minimum reporting values for hazardous substances and specific GACs for petroleum hydrocarbons[13] have been included in Table 5-3. It is noted that the groundwater GACs for anthracene and benzo(a)pyrene are more conservative than those used by Enzygo, and as such potential PAH impact in groundwater may be more extensive than reported. This will be taken account of as part of the design of additional ground investigation work as detailed in the recommendations.

5.3.11 It is noted that the Enzygo ground investigations did not undertake chemical testing of soil leachate samples. Therefore, leachate testing is proposed to be undertaken during further ground investigations at the site.

5.3.12 Seven rounds of ground gas monitoring undertaken by Enzygo on a weekly basis in July and August 2015 and in January and February 2018 did not identify significant concentrations of ground gas and no flow was detected. No significant sources of ground gas were identified by the Golders (2012) desk study. As such, Enzygo classified the site as CS1 and dismissed the risk to human health and buildings from ground gas. It is noted that Enzygo did not carry out ground gas monitoring during a period of falling atmospheric pressure in accordance with BS 8576:2013[14] and CIRIA C665[15]. As such, the classification of CS1 may not be representative of the worst-case scenario for ground gas generation at the site. Therefore, additional ground gas monitoring (during falling and raising atmospheric pressures) is proposed to be undertaken during further ground investigations at the site.

5.3.13 In summary, the conceptual site model prepared by Enzygo and revised based on the results of the ground investigation dismissed all risks to human health and controlled surface water receptors, with the exception of risk to human health from infiltration of organic contaminants into drinking water supply pipes and risk to buildings and structures from aggressive ground conditions. These were identified as Moderate risk. Enzygo did not screen groundwater samples against current GACs relevant to groundwater. The risks identified by Enzygo's revised version of the conceptual model are taken into consideration by Ramboll's conceptual site model (presented as Section 6).

## 5.4 2018 to 2020 Groundwater Level Monitoring

5.4.1 In addition to the gas and groundwater monitoring visits undertaken by Enzygo, Grundon Waste Management Ltd carried out 24 groundwater level monitoring visits between March 2018 and December 2019. Ramboll also carried out a groundwater monitoring visit on 18 February 2020 to investigate groundwater levels at the site during a winter period. This visit took place immediately following Storm Dennis (15 February 2020).

5.4.2 A summary of average, maximum and minimum groundwater levels recorded by Enzygo and Grundon Waste Management Ltd in 2018 and 2019 is presented as Table 5-4, in addition to the data recorded by Ramboll in February 2020. Full groundwater monitoring data obtained at the site between 2015 and 2020 is presented as Appendix H.

**Table 5-4: Summary of Groundwater Level Monitoring 2018 to 2020**

| Location | 2018-2019 Groundwater Levels (mbgl) [mAOD] | | | February 2020 Groundwater Levels (mbgl) [mAOD] |
|---|---|---|---|---|
| | Average | Maximum | Minimum | |
| BH1 | N/M | N/M | N/M | N/M |
| BH2 | 4.49 | 5.32 | 3.62 | 2.45 |

[14] British Standards Institute (2013) BS 8576: 2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

[15] CIRIA (2007). C665 Assessing risks posed by hazardous ground gases to buildings

| Location | 2018-2019 Groundwater Levels (mbgl) [mAOD] | | | February 2020 Groundwater Levels (mbgl) [mAOD] |
|---|---|---|---|---|
| | Average | Maximum | Minimum | |
| | [2.18] | [4.26] | [1.4] | [4.27] |
| BH6A | 5.19<br>[1.48] | 6.02<br>[3.01] | 4.34<br>[0.65] | 3.66<br>[3.01] |
| BH7 | 5.19<br>[1.42] | 7.84**<br>[3.05] | 4.5<br>[-1.24] | 3.55<br>[3.05] |
| BH8 | 5.14<br>[1.35] | 5.83<br>[2.83] | 4.34<br>[0.66] | 3.66<br>[2.83] |
| BH101 | 4.55<br>[2.2] | 5.49<br>[4.3] | 3.62<br>[1.26] | 2.66<br>[4.3] |
| BH102 | 5.06<br>[1.67] | 5.82<br>[3.07] | 4.41<br>[0.91] | 3.66<br>[3.07] |
| BH103 | 5.04<br>[1.45] | 5.68<br>[2.71] | 4.48<br>[0.81] | 3.78<br>[2.71] |
| BH104 | 4.97<br>[1.97] | 5.75<br>[3.67] | 4.27<br>[1.19] | 3.27<br>[3.67] |
| BH105 | 4.7<br>[2.03] | 5.69<br>[6.45] | 4.15<br>[1.04] | 0.28*<br>[6.45] |
| BH106 | 0.63*<br>[5.7] | 0.73*<br>[5.8] | 0.52*<br>[5.59] | Flooded |
| BH107 | 4.11<br>[2.89] | 5.71<br>[6.83] | 0.17*<br>[1.29] | Borehole not found |
| BH108 | 4.53<br>[2.13] | 5.36<br>[3.82] | 3.77<br>[1.3] | 2.84<br>[3.82] |

* These values are considered to be anomalous due to flooding of the relevant locations and are not considered to be representative of the groundwater table

** This value is significantly lower than groundwater levels recorded at this location on other visits or at other locations during the same visit and is anticipated to be anomalous. As such it is not considered to be representative of the groundwater table

N/M not measured

5.4.3 The monitoring wells nearest to the proposed bunker include BH6A, BH7, BH8, BH103 and BH104, at which minimum depth to groundwater ranged from 4.27 mbgl (1.19 mAOD) to 4.5 mbgl (-1.24 mAOD). On 18 February 2020, minimum depths to groundwater at these locations ranged from 3.27 mbgl (3.67 mAOD) to 3.78 mbgl (2.71 mAOD). The shallowest recorded depth to groundwater at the site was 2.45 mbgl (4.27 mAOD), recorded by Ramboll in February 2020. As such, contaminated groundwater may be encountered at a shallower depth than recorded by Enzygo. Given the proposed construction of a waste bunker to approximately 2 mbgl, the potential for the bunker excavation to interact with groundwater is anticipated to be minimal. Dewatering of the excavation, if required, would be limited and therefore the potential for contaminants present in groundwater to migrate towards the excavation would be limited. However, should the bunker be deeper than the proposed 2 mbgl, dewatering will be required, and there will be the potential for contaminants to migrate towards the excavation and enter the chalk aquifer underlying the site.

5.4.4 Groundwater levels recorded at the site between 2018 and 2020 are presented as a graph in Appendix H. Groundwater levels recorded between 2018 and 2020 indicate that groundwater levels are at their highest in February and March, with greater fluctuations potentially occurring from year to year. The highest groundwater levels at the site are shown to have occurred on 18 February 2020 (immediately following Storm Dennis).

# 6. PRELIMINARY CONTAMINATION RISK EVALUATION

## 6.1 Conceptual Site Model

6.1.1 The information presented in the previous sections of this report has been collated and evaluated to develop a conceptual site model for the site in accordance with CLR 11[16].

6.1.2 Potential pollutant linkages are identified using the source-pathway-receptor framework detailed in Appendix A. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways between them.

6.1.3 This qualitative hazard assessment has then been undertaken in accordance with CLEA land use definitions. Further details of which are provided in Appendix A including definition of risk categories.

### Potential Sources

6.1.4 The potential contamination sources are summarised in Table 6-1.

**Table 6-1: Summary of Potential Sources**

| Source | Key Potential Contaminants |
|---|---|
| **On-site** | |
| Made Ground associated with historical site uses (Chichester Canal infill, Ford Airfield, Tarmac Topblock manufacture) | Heavy metals, asbestos, total petroleum hydrocarbons (TPH), phenols, polycyclic aromatic hydrocarbons (PAH), ground gas, sulphate, sulphide, glycols |
| Former boiler house and associated former gas oil tank (60,000 l), PAH groundwater impact identified by Enzygo (2015) | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) |
| Existing above ground storage tanks (2,500 l tank formerly containing gas oil, 5,600 l tank noted to be present by Ramboll in 2019) | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) |
| Former oil stores, former gas oil tank (40,000 l), former location of gas oil tank (2,500 l) | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) |
| Aerated block plant containing soluble oil, mould oil storage vessels and oil store, PFA silo and anhydrite silo | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pulverised fuel ash (PFA), sulphate |
| Electricity substations | PCBs |
| Infilled slurry pit, HCL store and delivery point | Heavy metals, asbestos, TPH, PAH, ground gas, low pH conditions |
| Former autoclave pit (and Made Ground infill) | Heavy metals, asbestos, TPH, PAH, ground gas |
| Possible UST or interceptor | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) |
| Historical landfill | Heavy metals, asbestos, TPH, PAH, ground gas, low pH conditions |
| Former RAF refuelling area | TPH, PAH, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), glycols |
| Pallet storage area and possible former RAF bunker | Heavy metals, asbestos, TPH, PAH, ground gas |
| Waste storage and stockpiled waste | Heavy metals, asbestos, TPH, PAH, VOCs, acids, ground gas |

[16] EA / DEFRA (2004). Contaminated Land Report 11: Model Procedures for the Management of Land Contamination

| Source | Key Potential Contaminants |
|---|---|
| Asbestos in fabric of buildings | Asbestos |
| **Off-site** | |
| Agricultural land | Herbicides and pesticides |
| Sewage works | Heavy metals, faecal coliforms, pathogens |

6.1.5 Based on the results of the Enzygo (2015) ground investigation, many of the potential contaminant sources above are not anticipated to impact the ground conditions at the site, and can be considered to present a significantly lower risk to sensitive receptors at and around the site. Table 6-2 presents a refined summary of potential sources based on existing ground investigation data.

**Table 6-2: Summary of Impacts to Ground Conditions (Based on Enzygo 2015 Ground Investigation and 2018 to 2020 Groundwater Monitoring)**

| Source | Comment |
|---|---|
| Soil impacts | The Enzygo (2015) ground investigation did not identify asbestos in the 24 soil samples subjected to testing. It is noted that the potential remains for asbestos to be present in Made Ground at locations not targeted by the ground investigation. Asbestos was noted to be present within the fabric of buildings at the site.<br>No contaminant was found to exceed the human health GACs for a commercial land use in the 24 soil samples subjected to testing. As such, the risk to human health was anticipated to be low.<br>Elevated organic contaminant concentrations were recorded in some of the soil samples, suggesting that there may be some risk to drinking water supply pipes placed in Made Ground. |
| Groundwater impacts | Exceedances of the controlled water GACs for PAH and TPH were recorded in the Chalk. The highest concentrations of each contaminant were recorded at the location of the former boiler room and 60,000 l oil tank (BH7). Concentrations of each contaminant reduced by approximately half at the site boundary to the east, with significantly lower concentrations identified at the south-eastern corner of the site boundary. As such, the risk to the surface water receptors located at a significant distance from the site was anticipated to be low. Enzygo did not assess risk to groundwater beneath the site.<br>No soil leachate testing was undertaken as part of the 2015 ground investigation. As such, there may be the potential for contaminants in soil to become mobilised and impact groundwater through potential soft landscaped areas.<br>The shallowest depth to groundwater at the site was recorded as 2.45 mbgl (4.27mAOD) on 18 February 2020. Given the proposed construction of a waste bunker to approximately 2 mbgl, the potential for the bunker excavation to interact with groundwater is anticipated to be minimal. Dewatering of the excavation, if required, would be limited and therefore the potential for contaminants present in groundwater to migrate towards the excavation would be limited. |
| Ground gas and vapour impacts | The Enzygo (2015) ground investigation carried out ground gas monitoring on seven return visits and classified the site as CS1 based on the results of gas monitoring. As such, the risk to human health and buildings from ground gas at the site and surrounding properties was anticipated to be low. Presence of volatiles (Volatile Organic Compounds (VOCs)) in soil and groundwater may pose a risk to human health via vapour inhalation.<br>The Enzygo (2015) ground investigation did not carry out ground gas monitoring during a period of falling atmospheric pressure. As such, the classification of CS1 may not be representative of the worst-case scenario for ground gas generation at the site. Therefore, further ground gas monitoring should be undertaken during rising and falling atmospheric pressures. |

### Potential Receptors

6.1.6 The specific receptors that could potentially be affected by contamination hazards at the site are summarised in Table 6-3.

**Table 6-3: Summary of Potential Receptors**

| Receptor | Comments |
|---|---|
| **On-site** | |
| Future site staff | Future staff of the proposed ERF and WSTF and parking area |
| Construction/maintenance workers | Workers involved in redevelopment, construction and future maintenance work |
| Buildings and structures | Building materials used below ground (e.g. foundations, drainage structures, water supply pipes) may be impacted by aggressive ground conditions and water supply pipes may be impacted by TPH contaminated soils or groundwater |
| Secondary A Aquifer of River Terrace Deposits | Permeable superficial deposits anticipated to be present beneath the site. May form a source for unlicensed water supplies in the area of the site |
| Principal Aquifer of the Lewes Nodular Chalk Formation | Principal Aquifer underlying the River Terrace Deposits. No potable groundwater abstractions have been recorded in the vicinity of the site and the site is not located in a groundwater source protection zone |
| **Off-site** | |
| Future residential site users | Proposed residential properties to be constructed adjacent to northwest of site |
| Surface Water (River Arun) | River Arun, 900 m to the east of the site |

### Potential Pathways

6.1.7 In order for potential contaminants to pose a risk to the identified receptors there has to be a viable pathway for the contaminant. The potential pathways are summarised in Table 6-4.

**Table 6-4: Summary of Potential Pathways**

| Receptor | Pathway | Comments |
|---|---|---|
| Human health | Direct contact with contaminated soils | The pathway to future site staff is expected to be minimised by the presence of concrete foundations and hardstanding beneath the proposed buildings and external areas of the site. The proposed development is anticipated to include areas of soft landscaping, however as the site is proposed for a commercial land use, the risk of exposure of future site staff to contaminants in soil is anticipated to be low. Construction and future maintenance workers have the potential to come into contact with soil and groundwater during site enabling works and activities. |
| Human health | Inhalation and ingestion of dusts/fibres and inhalation of gas and vapours | The pathway to future site staff is expected to be minimised by the presence of concrete foundations and hardstanding beneath the proposed buildings and external areas of the site. The proposed development is not currently understood to include areas of soft landscaping, and as such no additional risk of exposure to contaminated soil in soft landscaping is expected. Construction and future maintenance workers to accidental ingestion and inhalation of dust, fibres, vapour and ground gases. |

| Receptor | Pathway | Comments |
|---|---|---|
| Human health | Accumulation of asphyxiating/explosive gases in confined spaces | Confined spaces on the site are expected to consist of above-ground industrial workspace, and a waste bunker with a depth of approximately 2 mbgl. Above-ground workspace is anticipated to be well ventilated with a low risk to site staff, however there may be increased risk to site staff required to enter the waste bunker. Construction and maintenance workers may be exposed to accumulation of harmful vapour and ground gases if working in confined spaces such as the waste bunker or excavations and utility spaces. |
| Human health | Permeation of contaminants into drinking water pipes and subsequent human consumption | The Enzygo ground investigation identified a potential risk to human health from infiltration of organic contaminants into drinking water supply pipes and risk to buildings and structures from aggressive ground conditions. This may occur where water supply pipes are laid in soils that contain certain contaminants at concentrations high enough to allow their permeation through the pipes. |
| Human health | Uptake of contaminants via root uptake and subsequent ingestion of affected plants and soil attached to plants | The proposed development comprises an entirely industrial/commercial land use and is not expected to feature growth of plants for human consumption. As such, no exposure to contaminants via root uptake and consumption of plants is anticipated. Proposed residential properties to the northwest of the site may include private gardens with root uptake by plants meant for human consumption. Hydraulic gradient is anticipated to be towards the southeast and east, and as such the residential properties are anticipated to be up-hydraulic gradient of the site. Perched water was recorded at 1.4 mbgl on the site, with the groundwater table recorded at a minimum depth of 2.45 mbgl (4.27 mAOD) on site (at BH2) during groundwater monitoring visits. As such, contaminant migration from the site is anticipated to be significantly below the maximum root depth of plants intended for consumption. |
| Secondary A and Principal Aquifers | Leaching and vertical migration of contaminants to groundwater | The site is directly underlain by predominantly granular Made Ground, which is in turn directly underlain by the Secondary Aquifer of the River Terrace Deposits and the Principal Aquifer of the Lewes Nodular Chalk Formation. The upper River Terrace Deposits comprise a predominantly cohesive layer up to 4.35 m thick across the site which may have the potential to act as an aquitard, however historical groundwater monitoring carried out by Enzygo suggests that this has not formed a barrier to contaminant migration.<br>PAH and TPH impacts have been identified in groundwater at the site within the Chalk. The highest concentrations have all been identified at the location of the former boiler house and 60,000 l tank, with concentrations declining significantly towards the site boundaries. The expected source of the contamination has been removed at the time of writing of this report.<br>Concrete foundations and hardstanding beneath buildings and external spaces on the site are anticipated to be present across the majority of the site surface. currently, the surface waters are proposed to discharge via separators, however the specifics of the layout/locations and sizes of the separators will be designed post-planning consent. In the event that drainage to natural ground is proposed, there may be pathways for rainfall infiltration, leaching and contaminant migration into natural ground and groundwater. it should be noted that no soakaways have been proposed for the site. |

| Receptor | Pathway | Comments |
|---|---|---|
| | Migration of contaminants via preferential pathways (i.e. piled foundations, drinking water supply pipes). | There may be preferential pathways for vertical leaching and contaminant migration in the event that piled foundations form part of the development. It is noted that the River Terrace Deposits include a predominantly cohesive layer up to 4.35 m thick across the site, which may form an aquitard through which preferential pathways may be introduced by piling and bunker excavations, however organic contaminants (TPH and PAH) are already present in groundwater, suggesting that this has not formed a barrier to contaminant migration. This suggests that hydraulic continuity may already exist between Made Ground and the Chalk, in which case the *additional* risk due to preferential pathways would be limited. |
| Water environment | Migration of contaminants via surface runoff and within groundwater to surface water courses | The River Arun is located a significant distance from the site boundary, and contaminant concentrations in groundwater were observed to significantly decrease towards the site boundaries. As such, the risk to surface water receptors from groundwater contamination originating at the site is anticipated to be low. |
| Buildings and structures (construction materials) | Damage to building materials or services through direct contact with contaminated soil/groundwater | Aggressive ground conditions or contaminants such as hydrocarbons may affect subsurface construction materials such as foundations or drainage structures. Low pH values which may occur due to migration of acidic contaminants (such as those stored in the former HCL store) may also affect subsurface construction materials. |

## 6.2 Qualitative Risk Assessment

6.2.1 The pollutant linkages and risk ratings associated with the proposed development as assessed following interpretation of the results of the ground investigation are summarised in Table 6-5.

**Table 6-5: Preliminary Qualitative Risk Assessment**

| Hazard | Pathway | Potential Receptor | Potential Consequence | Probability of Risk | Level of Risk |
|---|---|---|---|---|---|
| On-site sources – historical and existing Made Ground, former and existing gas oil storage tanks, aerated block plant and storage vessels, electricity substations, slurry pit and HCL, former autoclave pit, historical landfill, former RAF refuelling area, possible former RAF bunker, waste storage, asbestos in buildings Heavy metals, asbestos, TPH, phenols, PAH, sulphate, sulphide, glycols, VOCs, SVOCs, PCBs, low pH conditions, ground gas. | Dermal contact/ingestion of soils/dust/inhalation of dusts | Future site staff | Mild | Unlikely | Very low |
| | | Construction/maintenance workers | Mild | Low likelihood | Low |
| | | Adjacent residential site users | Medium | Unlikely | Low |
| | Inhalation of asbestos fibres | Future site staff | Medium | Unlikely | Low |
| | | Construction/maintenance workers | Medium | Low likelihood | Moderate/low |
| | | Adjacent residential site users | Medium | Unlikely | Low |
| | Accumulation and inhalation of gas/vapours in confined spaces | Future site staff | Medium | Low likelihood | Moderate/low |
| | | Construction/maintenance workers | Medium | Low likelihood | Moderate/low |
| | | Buildings and structures (internal spaces) | Medium | Low likelihood | Moderate/low |
| | | Adjacent residential site users | Medium | Unlikely | Low |
| | Permeation of contaminants into drinking water pipes | Future site staff via water supply pipes | Medium | Likely | Moderate |
| | Leaching and vertical migration of contaminants in groundwater | Secondary A aquifer (River Terrace Deposits | Medium | Low likelihood | Moderate/low |
| | | Principal aquifer (Lewes Nodular Chalk Formation) | Medium | Low likelihood | Moderate/low |
| | | Surface water course (River Arun) | Medium | Unlikely | Low |
| | Contaminant migration via surface runoff | Surface water courses | Medium | Unlikely | Low |
| | Migration of contaminants via preferential pathways (i.e. piled foundations) | Secondary A aquifer (River Terrace Deposits) | Medium | Low likelihood | Moderate/Low |
| | | Principal aquifer (Lewes Nodular Chalk Formation) | Medium | Low likelihood | Moderate/low |

| Hazard | Pathway | Potential Receptor | Potential Consequence | Probability of Risk | Level of Risk |
|---|---|---|---|---|---|
| | Damage to building materials or services through direct contact with contaminated soil/groundwater | Buildings and structures (construction materials) | Mild | Low likelihood | Low |
| Off-site sources – agricultural land, sewage works<br>Heavy metals, faecal coliforms, pathogens | Leaching and vertical migration of contaminants onto site in soils and groundwater | Secondary A aquifer (River Terrace Deposits | Medium | Unlikely | Low |
| | | Principal aquifer (Lewes Nodular Chalk Formation) | Medium | Unlikely | Low |
| | Accumulation and inhalation of gas and vapours | Future site staff | Medium | Unlikely | Low |
| | | Construction/maintenance workers | Medium | Unlikely | Low |
| | | Buildings and structures (internal spaces) | Medium | Unlikely | Low |

Notes
Assessment completed assuming site in current condition. Should site levels be significantly altered during development, a reassessment would be required
Assessment completed assuming no remediation/mitigation in place
Should the development proposals alter significantly a review of this risk assessment may be required, in particular if new areas of soft landscaping are required
Given the use of appropriate personal protective equipment (PPE) and on-site health and safety precautions, risk to site development workers would be reduced to low

# 7. CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Conclusions

7.1.1 Ford EfW Ltd, Grundon and Viridor (the applicants) propose to construct an ERF and WSTF at the site, comprising two-storey process buildings (with integrated welfare and offices), ancillary buildings and structures, access roads and vehicle parking spaces. This Geoenvironmental Desk Study has been prepared in support of a planning application for the proposed development.

7.1.2 The site has historically been used as an RAF airfield and a tarmacadam topblock manufacturing plant (Tarmac Limited). Most recently the site has been partially in use as a waste transfer station (WTS), with the northern portion of the site occupied by former RAF hangars and currently disused. Historical ground investigation information indicates the site to be underlain by Made Ground, River Terrace Deposits and Lewes Nodular Chalk Formation. Groundwater has been recorded to minimum depths of 3.27 mbgl (3.67 mAOD) to 3.78 mbgl (2.71 mAOD) in the vicinity of the proposed bunker excavation, with a minimum depth to groundwater of 2.45 mbgl (4.27 mAOD) recorded on the site. The nearest surface water feature to the site is the River Arun, 900m to the east. The site is not located in a groundwater source protection zone (SPZ) and no potable groundwater abstractions have been identified in the vicinity of the site.

Based on the review of all the available sources, the following data gaps have been identified as follows:

- No historical ground investigation has been undertaken at the northern portion of the site, in the location of the former RAF refuelling area;
- Limited ground investigation has been undertaken in the north-western portion of the site;
- The potential for the predominantly cohesive layer of the River Terrace Deposits to form an aquitard which may limit mobilisation of contaminants to groundwater and through which piling/bunker excavation may form a preferential pathway is uncertain;
- Soil leachate testing has not been undertaken as part of the historical ground investigation at the site; leaching and vertical migration of contaminants onto site in soils and groundwater;
- Ground gas monitoring has not been undertaken during a period of falling atmospheric pressure (and as such may not be representative of worst-case ground gas scenario on site).

7.1.3 In addition to the data gaps identified above, the following contaminant risks have been identified at the site which require further ground investigation:

- Moderate risk to future site staff from infiltration of organic contaminants into drinking water supply pipes beneath the site;
- Moderate/low risk to future site staff and construction workers from accumulation of ground gas/volatile vapours in buildings and enclosed spaces;
- Moderate/low risk to construction and future maintenance workers from asbestos fibres in Made Ground;
- Moderate/low risk of further mobilisation of contaminants in the River Terrace Deposits and Lewes Nodular Chalk Formation at the Enzygo (2015) ground investigation location BH7 in the event that significant dewatering is required in the proposed basement bunker excavation or that other construction activities interfere with groundwater conditions.

7.1.4 The above data gaps and risks are proposed to be investigated during ground investigation post planning which can be secured by an appropriately worded planning condition.

7.1.5 The Enzygo (2015) ground investigation also identified a moderate/low risk to building and construction materials from aggressive ground conditions at the site.

## 7.2 Recommendations

7.2.1 It is recommended that a ground investigation be designed and undertaken in accordance with BS5930:2015[17] and BS10175:2011 + A2:2017[18]. The proposed ground investigation should verify the existing conceptual site model and include a programme of sampling and monitoring to fill in the data gaps identified above. It is recommended that this ground investigation should comprise the scope set out below, be undertaken post planning and be secured through an appropriately worded planning condition. The works could be combined with any geotechnical ground investigation needed:

- Advancement of shallow boreholes (anticipated to be maximum 10 m depth) to provide information on gas and groundwater conditions in the northwest of the site and in locations where existing wells are found to be unsuitable for monitoring purposes;
- Advancement of deep boreholes (depth to be confirmed) to provide information on ground, ground gas and groundwater conditions in relation to anticipated piles forming part of foundation design):
- A series of machine-dug trial pits excavated to 1 m-2 m into the natural ground across the site;
- Geoenvironmental testing of soil and groundwater samples obtained from the ground investigation, to include testing of soil samples as soil leachate and WAC testing. Groundwater analysis and historical data to be reviewed against current GACs;
- Falling head/soakaway testing to be undertaken in the natural ground in the trial pits to confirm the permeability of the River Terrace Deposits.
- Six rounds of ground gas monitoring to be undertaken over a period of three months, with at least one round to be undertaken during a period of falling atmospheric pressure; and
- A programme of long-term groundwater monitoring to be undertaken in line with the piling works programme and excavation and construction of the waste bunker.

7.2.2 The results of the ground investigation should be reported in a geo-environmental interpretative report. This report should include an assessment of the risk to drinking water supply pipes from organic contaminants in accordance with the UK Water Industry Regulations (UKWIR)[19] and an assessment of soil leachate data against appropriate GACs for groundwater.

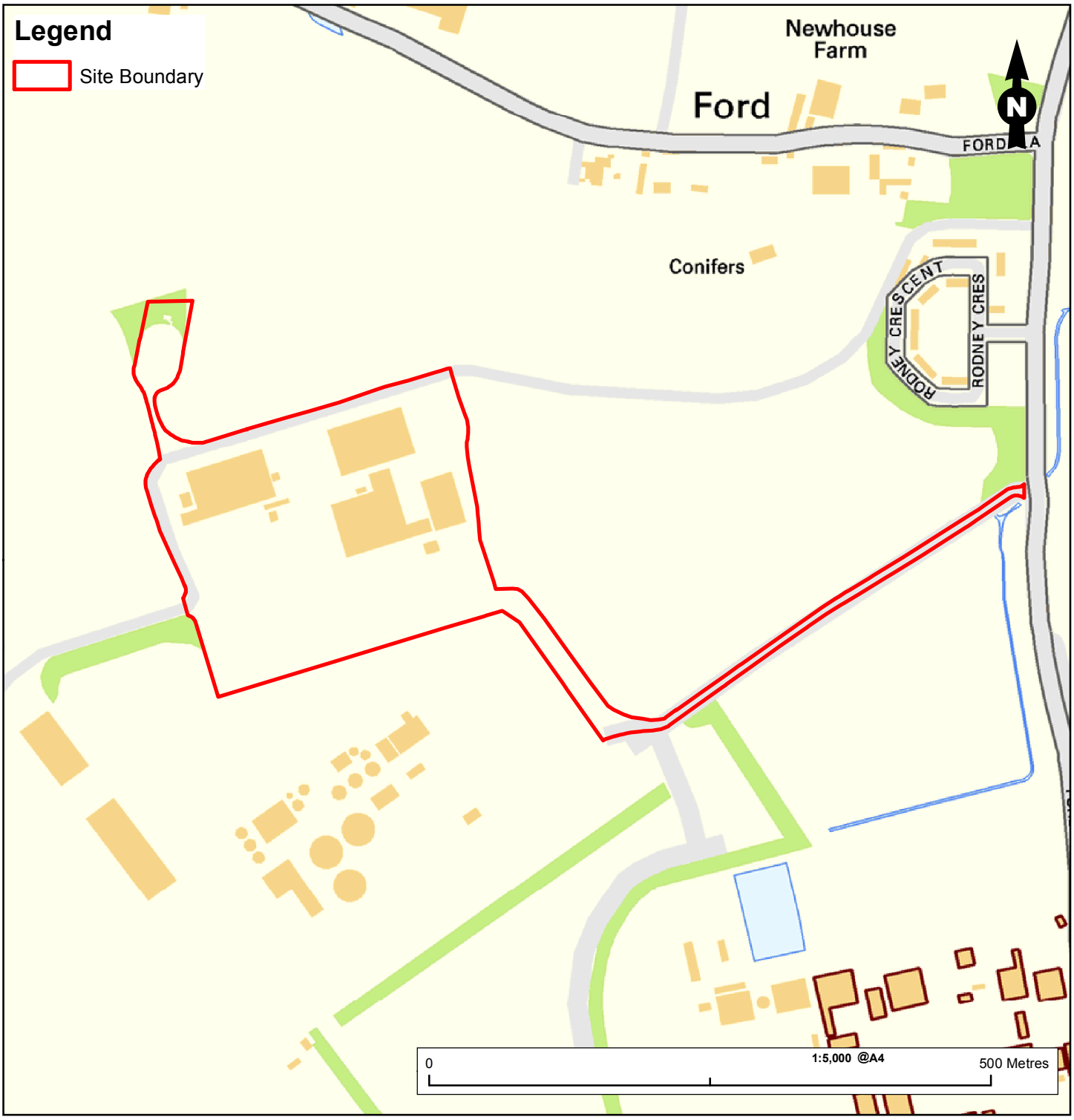
7.2.3 A detailed UXO risk assessment specific to the site should be undertaken in advance of intrusive works being undertaken.

[17] British Standards Institute (2015) BS 5930:2015 Code of Practice for Ground Investigation

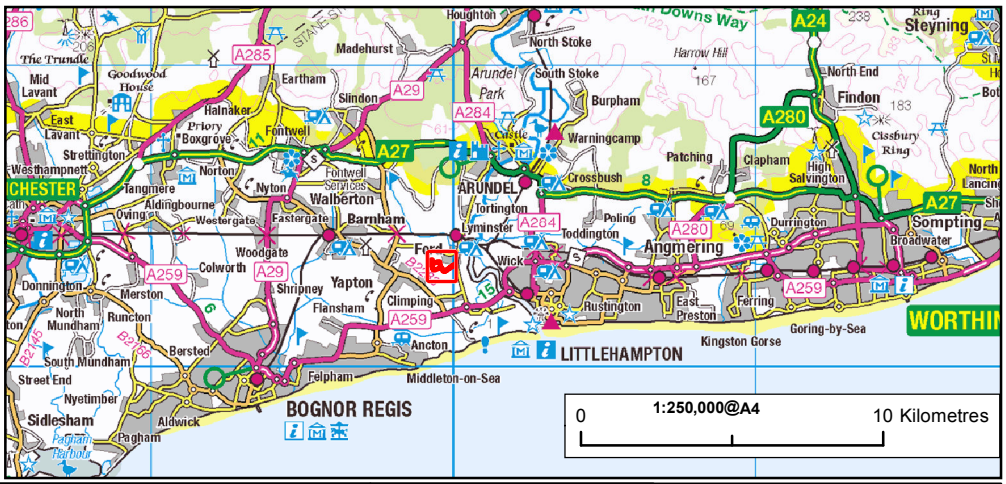
[18] British Standards Institute (2013) BS 10175: 2011+A2: 2017 Investigation of Potentially Contaminated Sites – Code of Practice

[19] UKWIR (2010 and 2014 Update); Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites 10/WM/03/21

# FIGURES





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|---|---|---|---|
| Figure Title: Figure 1: Site Location | Project Name: Ford Energy Recovery Facility and Waste Sorting and Transfer Facility, Ford Circular Technology | Date: January 2020 | RAMBOLL |
| | | Scale: As shown | |
| Project Number: 1620007830 | Client: Ford EfW Ltd, Grundon & Viridor | Issue: 01 | Prepared By |

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## Legend

- Site boundary
- Hanger 1
- Hanger 2
- Adblue storage
- Chimmey
- Deep hole
- Earth bund
- Electricity sub station
- Flytipped waste
- Former RAF refuelling pumping station
- Gas Governor
- New access road
- Porta Cabins
- Possibly a UST or interceptor
- Potential historic sub station
- Tank
- Toliet Cabins
- Wash down area
- Waste bin storage area
- Waste bins and containers
- Waste transfer building
- Weighbridge

N

Drawn at A3
1:1,400

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Client

**Ford EfW Ltd, Grundon and Viridor**

Project Title

**Ford Energy Recovery Facility and Waste Sorting and Transfer Facility, Ford Circular Technology Park**

Project Number

**1620007830**

Figure Title

**Site Walkover Feature Plan**

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