

**Mill Rythe Holiday Village
Hayling Island
Hampshire**

**Preliminary Ground Contamination
Risk Assessment Report**



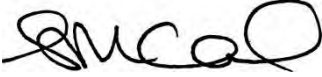
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The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated. This is standard practice in the UK, being intrinsic to Part 2A of the Environmental Protection Act 1990 as amended.

The report considers the proposed end users as the most sensitive human health receptors.

This report is not intended to be either an ecological, archaeological or flood risk assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the preliminary ground contamination risk assessment. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to demolish existing redundant holiday chalets and facilities buildings on the site at Mill Rythe Holiday Village, Havant Road, Hayling Island, Hampshire and to site 203 new static holiday caravans, to refurbish retained holiday chalets and the remainder of the central facilities building and to add a new sales area.

At the time of the walkover survey, the western part of the site was occupied by the existing holiday cabins and facilities, including indoor and outdoor swimming pools. The eastern part of the site was occupied by a disused pitch and putt golf course. A number of above ground oil and kerosene tanks were present across the site.

Historically the site was an area of marshland prior to being developed as a holiday park in the 1930s, with only limited development shown on the site since that time. The site was used by the military during World War II and modified by erecting additional structures such as Nissen huts, storage buildings and military tents. There is the potential that two Royal Observer monitoring posts were also established on the edges of the site. It is understood that historical planning applications show that the site may have been subject to more frequent demolition and maintenance of chalets and other structures. A planning application from 1963 indicates that an application was made for the use of the site as a petrol filling station. The petroleum officer has no record of tanks being installed at the site and the historical mapping for 1969 shows the proposed area of petrol filling station as a car park area.

Reference to geological datasets indicates that the site is expected to be underlain by the Raised Marine Deposits overlying the Bognor Sand Member (in the northern part of the site) and the London Clay Formation.

The Raised Marine Deposits are classed as a Secondary Undifferentiated Strata. The Bognor Sand Member and London Clay Formation are classed as a Secondary A Aquifer and an Unproductive Stratum, respectively. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

An Explosive Ordnance Desk Stop Study concludes there is a "Medium" risk of UXO being located within the site footprint and UXO risk mitigation measures are recommended.

An asbestos management survey for the site has identified a number of either confirmed or potential areas of asbestos containing materials at the site. This risk assessment has been undertaken on the basis that the asbestos identified within buildings or infrastructure to be demolished will be removed prior to demolition. Where such materials are to remain in buildings to be retained, these should be managed in accordance with the details in the report.

The preliminary contamination risk assessment has identified a number of complete potential pollutant linkages relating to proposed end users of the site.

An intrusive ground investigation is recommended in order to allow a quantitative risk assessment of the potential contamination sources that have been identified to be made.

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	WALKOVER SURVEY	2
3.	ENVIRONMENTAL AND GEO-ENVIRONMENTAL DATA REVIEW	3
3.1	Geological and Hydrogeological Information	3
3.2	Agency & Hydrological Data	4
3.3	Waste	5
3.4	Hazardous Substance	5
3.5	Industrial Land Use	5
3.6	Sensitive Land Use	5
4.	HISTORICAL MAP REVIEW	6
5.	EXPLOSIVE ORDNANCE DESK STOP STUDY	6
6.	ARCHAEOLOGICAL EVALUATION	7
7.	PLANNING APPLICATION HISTORY	7
8.	ASBESTOS SURVEY	9
9.	PRELIMINARY CONTAMINATION RISK ASSESSMENT	10
9.1	Introduction	10
9.2	Basis of Assessment	10
9.3	Potential Contamination Sources Identified	10
9.4	Preliminary Conceptual Model	11
10.	RECOMMENDATIONS	11
10.1	Ground Investigation	11
10.2	Site Specific Assessment Criteria	13
10.3	Regulatory Approval	15

FIGURES AND APPENDICES

FIGURES

- Figure 1 Site Location Plan
- Figure 2 Site Plan showing Proposed Exploratory Hole Locations

APPENDIX A

- Proposed Development Layout
- Demolition Plan

APPENDIX B

- Explosive Ordnance Desk Stop Study

APPENDIX C

- Site Plan

APPENDIX D

- Walkover Photographs

APPENDIX E

- Classification of Probability, Consequence and Risk

APPENDIX F

- Preliminary Conceptual Model

APPENDIX G

- Local Authority Correspondence

APPENDIX H

- Petroleum Officer Correspondence

APPENDIX I

- Companies House Records

APPENDIX J

- Asbestos Survey

APPENDIX K

- 1964 Planning Application Details

1. INTRODUCTION

It is proposed to demolish existing redundant holiday chalets and facilities buildings on the site at Mill Rythe Holiday Village, Havant Road, Hayling Island, Hampshire and to site 203 new static holiday caravans, to refurbish retained holiday chalets and the remainder of the central facilities building and to add a new sales area. The proposed development layout is included as Appendix A, along with a plan of the proposed buildings to be demolished.

Ashdown Site Investigation Limited was requested to provide an estimate for carrying out a preliminary ground contamination risk assessment of the site by Mr M. Catterall of A & M Architectural Partnership LLP, 40 Cambridge Road, Hasting, East Sussex, TN34 1DT. The scope of the works allowed for and the terms and conditions under which the works were to be undertaken were set out within the offer letter Q17-6080, dated 21st June 2017. The instruction to proceed was received on behalf of the client, Away Resorts Ltd., in an email dated 31st July 2017.

The objectives of the works were to:

- a) Establish the expected geology, hydrogeology and hydrology at the site;
- b) Ascertain the development history and current site use; and
- c) Develop a preliminary conceptual model of the site identifying complete potential pollutant linkages relating to end users of the proposed development works, to controlled waters beneath and in the vicinity of the site, or to other off-site sensitive receptors, if identified.

The preliminary conceptual model has been based on the findings of a walkover survey and reference to historical Ordnance Survey maps and published geological and environmental information obtained from various sources.

Copies of the historical maps and geo-environmental data referred to in this report are included in a separate volume¹.

An Explosive Ordnance Desk Stop Study² has been prepared for the site and is included in Appendix B.

This revised report takes into account comments made by Mr. J Driver, Environmental Control Officer, Havant Borough Council in respect of the original version of the preliminary ground contamination risk assessment report. A copy of the comments is included in Appendix G.

¹ Geo-Environmental Data and Historical Maps (Ashdown Site Investigation Limited, Report Number R17-12377/map, dated August 2017.

² EOD Contracts Limited, Project No. 17323, dated 11th August 2017.

2. WALKOVER SURVEY

The site comprises the existing Mill Rythe Holiday Village, accessed off Havant Road, Hayling Island, Hampshire, and is centred on the approximate Ordnance Survey national grid reference SU 7321 0084. A site location plan and site plan are presented as Figure 1 and Appendix C, respectively. Photographs taken during the walkover survey are included in Appendix D.

The site is bounded by Mill Rythe, which forms part of the wider Emsworth Channel estuary, to the north and open land to the south, east and west. A golf course lies further to the south, and Mill Rythe Junior School lies further to the west.

At the time of the walkover survey the western part of the site was occupied by existing holiday cabins, leisure and play facilities, including an outdoor swimming pool, staff accommodation blocks and the main central complex building which housed the restaurant and bar, indoor pool, entertainment and office/administration facilities. The eastern part of the site was occupied by a disused pitch and putt golf course. The "Boathouse Bar", which formed part of the main complex, was noted to be roofed with corrugated suspected asbestos cement panels.

A laundry building was located to the south east of the Boathouse Bar.

Several of the holiday cabins, the staff accommodation and both the indoor and outdoor pools were heated by oil-fired heating systems. Above ground oil tanks were present at several locations as shown on the site plan (Appendix C). Oil staining of the ground immediately adjacent to the fill points of all of the tanks was clearly visible.

Heating for the Boathouse Bar was kerosene-fired, with the kerosene tank located adjacent to the south-eastern elevation of the building. Remaining buildings were heated by gas-fired heating with the gas supplied by large propane tanks located within a compound adjacent to the car park in the south west of the site.

An electricity substation was located adjacent to a footpath to the south east of the central complex building.

A pond was located in the westernmost part of the site with a second, larger, pond located within the north easternmost part of the site. The larger pond received water from a drainage ditch running from west to north east inside the northern boundary of the site. A valve in the north easternmost corner of the site controlled flow of water to or from Mill Rythe.

Parts of the area inside the northern and eastern boundaries were extensively overgrown with brambles. Immediately to the west of the footpath inside the eastern boundary several mounds of earth, demolition spoil and green waste were noted to be present within the undergrowth. Further stockpiles of earth and demolition spoil were present within the south eastern corner of the site. A number of small campfire areas were noted in the eastern part of the site.

The site is generally level with a large number of semi-mature to mature trees present within the western part.

3. ENVIRONMENTAL AND GEO-ENVIRONMENTAL DATA REVIEW

3.1 Geological and Hydrogeological Information

3.1.1 Expected Geology, Aquifer Designation & Groundwater Vulnerability

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata, Aquifer Designation and Description

Type	Stratum	Aquifer Designation	Source Protection Zone
Superficial	Raised Marine Deposits	Secondary Undifferentiated Aquifer	The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.
Bedrock	Bognor Sand Member (northern part of the site)	Secondary A Aquifer	
	London Clay Formation	Unproductive Stratum	

The Raised Marine Deposits comprises gravel (shingle), sand, silt and clay commonly charged with organic debris (plant and shell) and now above the level of the present shoreline as a result of earth movement or a general fall in sea level.

The Bognor Sand Member, shown in the northern part of the site, comprises silty fine and medium grey-green and brown, glauconitic sand interbedded with sandy and silty clay which may in part be cemented. The base of the Member may be marked by a pebble bed, including rounded gravel of flint. It represents a relatively thin stratum, reaching a maximum thickness of some 10.0m.

The London Clay Formation comprises a blue grey silty clay, which tends to weather to brown near to the upper surface. With depth, the clay becomes very stiff/hard, is frequently fissured and can contain some inclusions and beds of weak mudstone and siltstone.

3.1.2 Groundwater and Surface Water Abstraction Licences

The surface water features and groundwater and surface water abstraction licences closest to the site are presented in the following table.

Table 2. Groundwater and Surface Water

Section	Discussion
Groundwater	No groundwater abstraction licences are indicated within 1km of the site.
Surface Water	The nearest recorded surface water feature is the boating lake, located in the west of the site.
	The closest surface water abstraction licence is recorded to lie 647m to the south of the site. The abstraction is for spray irrigation.
	An inland river is shown along the northern boundary of the site.

3.1.3 Flooding

The site lies within an Environment Agency Flood Zone 3. It is also within an area where the British Geological Survey report "Potential for Groundwater Flooding to Occur at Surface". The GeoSmart Groundwater Flood Risk (GW5) Map (GeoSmart, 2017)³ concurs, and states that the risk of groundwater flooding at the Site is 'moderate'.

Based on the susceptibility of the site to flooding, further flood assessment should be considered.

3.1.4 Mining, Natural Ground Subsidence & Radon

Table 3. Natural Ground Subsidence Hazards

Section	Risk Assessment
Coal Mining Affected Areas	In an area that might not be affected by coal mining
Non-Coal Mining Areas of Great Britain	No Hazard
Potential for Collapsible Ground Stability Hazards	Very Low
Potential for Compressible Ground Stability Hazards	Moderate
Potential for Ground Dissolution Stability Hazards	No Hazard Identified
Potential for Landslide Ground Stability Hazards	Very Low
Potential for Running Sand Ground Stability Hazards	Moderate
Potential for Shrinking or Swelling Clay Ground Stability Hazards	Low
Radon Affected Areas	The site is reported to be within an area where between 1% and 3% of properties are above the action level requiring radon gas protection measures to be installed in new buildings. However, no radon protective measures are reported by the British Geological Survey to be necessary in the construction of new dwellings.
Radon Protection Measures	No radon protection measures are reported by the British Geological Survey to be necessary in the construction of new dwellings or extensions.

It should be noted that the assessment provided within the data represents a generic assessment only. A site specific assessment would require the undertaking of an intrusive ground investigation.

3.2 Agency & Hydrological Data

The data has been reviewed and none of the entries within this section are considered to pose a significant risk to the site.

³ GeoSmart Information Limited, 2017. National Groundwater Flood Risk Map (GW5)

3.3 Waste

The data has been reviewed and none of the entries within this section are considered to pose a significant risk to the site.

3.4 Hazardous Substance

The data has been reviewed and none of the entries within this section are considered to pose a significant risk to the site.

3.5 Industrial Land Use

The data has been reviewed and any entries referring to locations on, or in close proximity to, the site that may pose a potential risk are discussed within the following table.

Table 4. Industrial Land Use Data

Section	Discussion
Contemporary Trade Directory Entries	UK Biofuels Ltd (inactive) petroleum products manufacturers located on site.

The companies house records for the entry have been obtained and are presented in Appendix I. The registered address for the company is identified as 25 North Shore Road, Hayling Island (a domestic property, the home of one of the directors). It therefore appears likely that the entries in the trade directories refer to the registered address of the business, which may have changed to Mill Rythe after incorporation, as opposed to representing an operating address for the manufacture of petroleum products.

The company was only incorporated in 2012 and it is considered likely that any evidence of petroleum manufacturing would have been identified during the walkover survey.

3.6 Sensitive Land Use

The site is listed as being located within Chichester Harbour Area of Outstanding Natural Beauty. Chichester and Langstone Harbours (Ramsar Site and Special Protection Area) is recorded to be 1m north of the site. Chichester Harbour (Site of Special Scientific Interest) is recorded to be 1m north of the site. Solent Maritime (Special Area of Conservation) is recorded to be 8 m north of the site.

Information provided by the Environmental Control Officer identifies the lake in the north eastern corner of the site as a habitat of "principal importance".

A Preliminary Ecological Appraisal⁴ for the site has been undertaken. In relation to the ponds, Section 6.3 of the report states "Ponds are a Habitat of Principal Importance for Nature Conservation in England if they meet one or more of the relevant criteria (e.g. contain species of high conservation importance, such as great crested newt). An initial site visit does not allow ponds to be assessed for these criteria and as such, there is potential for the ponds on site to qualify as Habitats of Principal Importance for Nature Conservation in England."

⁴ Middlemarch Environmental Ltd., Report No. RT-MME-123420-01, dated September 2016

The site is located within a nitrate vulnerable zone (NVZ). The development proposals are not considered to pose a significant risk to the NVZ.

4. HISTORICAL MAP REVIEW

Historical Ordnance Survey maps covering the area of the site have been reviewed and are summarised in the following table.

It is noted that each map presents information applicable at the time of the survey (or revision date) and is subject to surveying and cartographic errors and/or advances. Revisions to maps are made at irregular intervals and it is possible that significant developments may have taken place on or within the vicinity of the site that are not shown on the maps.

'In the Vicinity of the Site' generally refers to features of relevance within approximately 250m of the site boundary, but may also include more distant features if considered to be pertinent to the assessment of the development history.

Table 5. Summary of Significant Features Identified on Historical Maps

Map Details	On-Site	In the Vicinity of the Site
1871 1:10,560	The site comprises area of marshland that extends to the west, south and east of the site.	A sea wall extends along the northern boundary of the site, with an area labelled as Mud beyond the sea wall to the north.
1938 1:10,560	The central part of the site is shown as developed with the area labelled as a "Holiday Camp".	No significant changes.
1962 1:10,560	Further development is shown on the site, with a swimming pool now shown to be present along the northern boundary of the site and further structures within the central part of the site.	No significant changes.
1969 1:2,500	The site is shown to be developed, with the buildings on the site on their approximate footprints (with the exception of the central complex buildings). A pond and a drain is shown in the north eastern part of the site.	No significant changes.
1993 1:2,500	A series of building are infilled and the central complex building is shown on its current footprint. The pond in the north eastern part of the site is shown to have been extended.	No significant changes.

5. EXPLOSIVE ORDNANCE DESK STOP STUDY

The report concludes that there is evidence that Hayling Island was a subject of direct attack during the Portsmouth Blitz.

Due to the lack of a bombing map for Hayling Island, the UXO report concludes there is a "Medium" risk of UXO being located within the site footprint and UXO risk mitigation measures are recommended.

6. ARCHAEOLOGICAL EVALUATION

Section 3.7 of the written scheme of Investigation for an Archaeological Evaluation⁵ discussed the “modern” historical background to the site.

It notes that the site was opened in the late 1930s as Sunshine Holiday Camp (as noted in Section 4). It also states that the site was modified by erecting additional structures such as Nissen huts, storage buildings and military tents and that potentially two Royal Observer monitoring posts may have been established on the edges of the site.

In the absence of detailed mapping in this time as to where these temporary huts and buildings were located, and given that asbestos materials could feasibly have been utilised within the construction of these structures, there is the potential for made ground containing asbestos containing materials to be present anywhere on the site.

7. PLANNING APPLICATION HISTORY

The planning application history for the site is included in the Officer Report⁶ and is presented in the following table.

Table 6. Planning Applications

Planning Application Reference	Application Dates	Notes
91/54406/002	New general manager's house and car port in south western corner of site.	
92/54406/004	Renewal of temporary Planning Permission 88/50376/2 for the siting of 4 staff caravans.	
92/54406/005	Double car port at General Managers house	
92/54406/006	Retention of existing abseiling tower in northwest area of site adjacent to Chichester Harbour.	
93/54406/010	Arched entrance sign letters on wrought iron work	
93/54406/008	Extensions to provide glazed reception area concourse, ballroom extension and children's amusement building	
94/54406/011	Two Halogen floodlights mounted on existing columns to illuminate existing arch entrance sign.	
94/54406/012	Extensions to York and Wells chalet blocks	
94/54406/014	New bedroom accommodation; enlarged restaurant; improved indoor pool; sports hall; outdoor sports facilities; floodlights; car parking and landscaping	
95/54406/015	Outdoor all weather 4 lane bowls rink including floodlighting.	
95/54406/016	Two floodlights attached to piers of entrance archway to illuminate archway sign	
97/54406/017	Renewal of temporary planning permission 92/54406/4 for the siting of 4 staff caravans	
97/54406/018	Infill extension under existing roof canopy to one side of chalet block	

⁵ Archaeology South-East, ASE Project No. 170598, dated August 2017.

⁶ Havant Borough Council, Planning Application No. APP/16/01237

Planning Application Reference	Application Dates	Notes
98/54406/019	Siting of new mobile home for additional staff dwelling to south east of Holiday Village	
98/54406/020	Siting of new mobile home for additional staff dwelling to south east of Holiday Village	
99/54406/021	Infill extension to east elevation of staff chalet block (south east of main building)	
99/54406/022	Infill extensions to east and west elevations of 'Norfolk' and 'Nutley' chalet blocks (on eastern side of site)	Withdrawn
00/54406/023	Alterations to existing chalets including landscaping, UPVC cladding and internal layout changes.	
08/54406/024	Internal alterations to and external refurbishment of "Dover" block, Mill Rythe Holiday Village, Hayling Island. Replacement of 24No. one bed short stay units with 8No. one and two bed medium stay flats	
APP/11/01080	Change of use of part of the land for the siting of 31 static caravans	
APP/16/01193	Use of land for Linear High Ropes Course.	

Section x) of the Officers Report refers specifically to contamination and notes that the site was likely to have first been developed in 1932 and that a significant number of applications have been submitted and approved.

This section notes that the planning application references outlined above are not comprehensive and that numerous applications refer to demolition, construction and alterations of chalets and service buildings at the site.

The comments also note that a historical consent (no. 518) refer to conversion of air raid shelters, which corresponds with the details provided in Section 6 that the site had a military usage during World War II.

Given that the site appears likely to have been subject to frequent demolition and redevelopment and that robust waste management protocols were unlikely to have been in place at the time of the historical works, there is the potential for made ground, including the potential presence of asbestos containing materials, to be present anywhere across the site, including within areas that are currently undeveloped.

The Local Authority response refers to a historical planning application for the site as a Petrol Filling Station. Discussions with Jonathan Driver of Havant B.C. confirmed the existence of a 1964 planning application for the use of the site as a filling station. A specific request was made with the Planning Officer in reference to the 1964 application, a copy of the details provided are included in Appendix K.

The planning application shows that a filling station area, including the installation of a 4,000-gallon 3 compartment tank, a 3 pump island and a wash down area was proposed in the southern part of the site.

To further clarify the status of the site in relation to petroleum products, a search was made with the Hampshire County Council Petroleum Officer to ascertain whether the site had ever been used as a petrol filling station. The comments from the Petroleum Officer are included in Appendix H.

The Petroleum Officer confirms that they have “no records pertaining to petrol storage” at the site. The petroleum officer does note that the site was used during the war by the military (as discussed in Section 6).

Havant Borough Building Control have been contacted by the client’s agent who also confirm that they have no records of the scheme.

The 1969 historical map shows the area of the site as a car park, which is the current usage of this part of the site.

In the absence of any evidence of the development being put in place, it would appear that the proposed scheme was not implemented.

8. ASBESTOS SURVEY

An Asbestos Management Re-Inspection Survey Report⁷ for the site is presented in Appendix J.

A number of confirmed asbestos containing materials and presumed areas of asbestos containing materials were identified by the survey.

This risk assessment has been undertaken on the assumption that where infrastructure to be demolished has been identified to contain asbestos materials, these will be fully removed appropriately by licensed contractors and disposed of in accordance with legal requirements prior to demolition to avoid any potential contamination of the site.

Where asbestos materials have been identified within buildings that are to be retained, these should be managed in accordance with the recommendations made in the report.

⁷ Amiante STR Ltd., Report No. J4850, dated 22nd August 2017

9. PRELIMINARY CONTAMINATION RISK ASSESSMENT

9.1 Introduction

A preliminary risk assessment considers the potential sources of contamination identified, the receptors that may be present in view of the development proposals and the contaminant pathways by which these may be linked. A complete pollutant linkage is only deemed to exist where all three are present and a site is considered suitable for use where no complete pollutant linkages are identified.

Where a complete pollutant linkage is deemed to be present, an assessment of the level of risk associated with the pollutant linkage has been carried out in line with guidance⁸.

The level of risk is determined using the risk matrix presented in the following table. Classifications of probability, consequence and risk are presented in Appendix E.

Table 7. Risk Assessment Matrix

		Probability			
		Very Low	Low	Moderate	High
Consequence	Very Minor	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

9.2 Basis of Assessment

The assessment of risk has been undertaken on the basis that the proposed development for a holiday leisure complex will include the provision and retention of holiday complex buildings along with areas soft landscaping where direct soil contact with soil and soil derived dust may occur.

9.3 Potential Contamination Sources Identified

The following potential sources of contamination have been identified by the preliminary contamination risk assessment:

- Above ground oil tanks, tank fill points and oil fired boiler room;
- Electricity substation;
- Campfires in the north eastern part of the site;
- Mounds of earth in the north eastern part of the site;
- Potential for contaminated made ground across the site from historical demolition at the site and historical maintenance of chalets; and
- Laundrette in the southern part of the site.

⁸ Contaminated Land Risk Assessment: A guide to good practice, CIRIA C552, 2001.

9.4 Preliminary Conceptual Model

The preliminary conceptual model for the proposed development is presented in Appendix F.

10. RECOMMENDATIONS

10.1 Ground Investigation

It is recommended that a ground investigation is undertaken to assess the potential sources of contamination identified so that a quantitative assessment of any risks can be made.

The following works are proposed. Suggested exploratory hole locations, as discussed below, are shown on Figure 2:

- 107 hand dug trials pit to depths of up to 0.3m bgl.

The trial pits will assess the presence and extent of any made ground soils from historical demolition and development. Where encountered, made ground soils will be tested for concentrations of heavy metals (including lead) and polycyclic aromatic hydrocarbon (PAH) compounds and screened for the presence of asbestos.

Should any other visual or olfactory evidence of suspected contamination be encountered within any of the trial pits then appropriate testing will be undertaken, with the trial pits extended or replaced with boreholes as considered necessary to assess the potential for unexpected contamination at the site.

- Sampling of bonfire remnants in the north east of the site.

One sample of the shallow soils from each of the bonfire remnants will be obtained and tested for concentrations of heavy metals and PAH compounds. The locations of these samples are not shown on Figure 2.

- 5 samples from each mound in the north east of the site.

Five samples will be taken from within each of the mounds and tested for concentrations of heavy metals and PAH compounds and screened for the presence of asbestos. The locations of these samples are not shown on Figure 2.

- 2 boreholes to depths of 3.0m adjacent to the above ground tank in the northern part of the site.
- 4 boreholes to depths of 3.0m adjacent to the 2No 2,500 litre oil tank and boiler house in the west of the site.
- 1 borehole to a depth of 3.0m adjacent to the kerosene tank next to the Boathouse Bar.
- 2 boreholes to depths of 3.0m adjacent to the oil tank to the north of the central complex building.
- 1 borehole to a depth of 3.0m adjacent to the oil filling point.

- 4 boreholes to depths of 3.0m adjacent to electricity substation and 2,500 litre oil tank to the south east of the central complex building.
- 2 boreholes to depths of 3.0m adjacent to the oil tank and boiler room to the east of the central complex building.

Regular samples of any made ground soils encountered, together with the undisturbed soils will be obtained from each of the boreholes. Boreholes will be extended if soils suspected of being contaminated are encountered at significant depths, though it may not be possible to always extend boreholes to the base of any contamination.

Where any visual or olfactory evidence of suspected petroleum hydrocarbon contamination is encountered, samples will be tested for total concentrations of petroleum hydrocarbons with the results speciated by aromatic and aliphatic equivalent carbon weight fractions.

Where no visual or olfactory evidence of suspected petroleum hydrocarbon contamination is encountered, representative samples from each borehole will be tested for total concentrations of petroleum hydrocarbons with the results speciated by equivalent carbon weight fractions.

Similarly, where any visual evidence of polychlorinated biphenyl (PCB) contamination is encountered in the boreholes adjacent to the substation, these will be tested for concentrations of PCB compounds (with the results speciated by 7 PCB compounds). Where no evidence of suspected PCB contamination is encountered, representative samples from each borehole in this area will be tested for concentrations of PCB congeners.

- 4 boreholes to depths of 3.0m adjacent to laundry building.

Regular samples of any made ground soils and natural soils will be obtained from each of the boreholes. Boreholes will be extended if soil suspected of being contaminated is encountered at significant depths, though it may not be possible to always extend boreholes to the base of any contamination.

Where visual or olfactory evidence of volatile organic compound (VOC) contamination is encountered, samples will be obtained and tested for concentrations of a wide range of VOC including trichloroethylene (TCE) and tetrachloroethylene (PCE).

Where no visual or olfactory evidence of VOC contamination is encountered, representative samples from each borehole will be tested for concentrations of a range of VOC.

Further intrusive works are likely to be required following the demolition of buildings to fully assess the risk posed by the point sources of petroleum hydrocarbon contamination. Such additional works should be specified in the quantitative ground contamination risk assessment report.

To assess the potential risk to the ponds and the wider sensitive water features in the vicinity of the site, water samples from each of the ponds should be obtained on three occasions and tested for concentrations of heavy metals, PAH compounds and petroleum hydrocarbons. The results of the testing should initially be compared to published drinking water standards (DWS) to provide conservative screening assessment of the water quality.

10.2 Site Specific Assessment Criteria

To provide an assessment of the risk posed from the contaminants discussed above, the results of laboratory testing should be compared to soil screening values (SSVs).

The Local Authority in their response commented that:

"It would be advisable for the applicant to consider including the production of site specific assessment criteria (SSAC) within scope of the proposed Phase 2 (intrusive investigation) works, as the exposure scenarios relevant to the site do not readily align with scenarios for which general assessment criteria have been calculated."

A series of what are considered to be relatively conservative assumptions regarding possible use of the site have been made to generate SSAC that would be more representative of the end users of the site than generic residential screening values.

As with the generic residential land use, the most sensitive receptor has been considered to be a child aged 0 – 6 coming to the site for six weeks per year (42 days) i.e. spending part of the Easter and summer holidays at the park. For children aged 0-1 it was assumed they would spend 2 hours per day outdoors, with children aged 1-2 spending a total of 5 hours, as this allows for periods of daytime naps. The other age brackets have been assumed to spend 10 hours per day outdoors i.e. it is assumed they will have breakfast then play outside until lunchtime, then play outside again until dinner, with potentially some time after dinner also spent outside.

Given the usage of the site, consumption of home grown fruit and vegetables (and attached soil) was not considered to be a viable pathway.

Soil to skin adherence factors, soil consumption rates, body weights and exposed skin fractions were all considered to be as per the generic residential land use.

The fraction of hard or vegetative cover for the site was conservatively assumed to be 0.5, the same as the generic allotment or public open space park land use. The air dispersion values used were those published in the CLEA report for Southampton for a 2ha source area (the site is actually around 10 ha).

The model was initially run for arsenic, copper and benzo(a)pyrene. The calculated SSAC were 255mg/kg, 33,000mg/kg and 4.72mg/kg, respectively.

As a "reality check", these SSAC have been compared to the published 'Suitable For Use Levels' (S4ULs), calculated as a joint project between LQM and CIEH⁹. The SSAC are comparable in magnitude to those S4UL calculated for the public open space park (POS_{park}) land use.

Given that the POS_{park} land use assumes only periodic visits and no backtracking of dust into buildings, the calculated SSAC would appear to be insufficiently conservative.

To balance the robustness of the calculated screening values and a sufficiently, but not overly, conservative approach to the quantitative ground contamination risk assessment, a reasonable approach is instead considered to be the use of published S4ULs for the 'Public Open Space near

⁹ The LQM/CIEH Suitable 4 Use Levels, 2015.

R17-12377/ds

Residential Housing' (POS_{resi}) generic land use¹⁰ and, in the absence of an S4UL for lead, the use of the published C4SL value for the same land use.

These values are lower than the POS_{park} values and the SSAC, but the assumptions of the model allow for tracking back of soil derived dust into residential buildings, something which would be expected to take place in the holiday park.

The following tables summarise the S4ULs against which an assessment would be made for concentrations of heavy metals, PAH compounds and petroleum hydrocarbons.

Table 8. S4ULs for Heavy Metals

Contaminant	S4UL (mg/kg)	Contaminant	S4UL (mg/kg)
Arsenic	79	Lead	630
Water Soluble Boron	21000	Mercury	120
Cadmium	120	Nickel	230
Chromium	1500	Selenium	1100
Hexavalent Chromium	7.7	Zinc	81000
Copper	12000		

Table 9. S4ULs for PAH Compounds

Contaminant	S4UL (mg/kg)	Contaminant	S4UL (mg/kg)
Naphthalene	4900	Benz(a)anthracene	29
Acenaphthylene	15000	Chrysene	57
Acenaphthene	15000	Benzo(b)fluoranthene	7.1
Fluorene	9900	Benzo(k)fluoranthene	190
Phenanthrene	3100	Benzo(a)pyrene	5.7
Anthracene	74000	Indeno(123-cd)pyrene	82
Fluoranthene	3100	Dibenz(ah)anthracene	0.57
Pyrene	7400	Benzo(ghi)perylene	640

Table 10. S4ULs for Petroleum Hydrocarbons (equivalent carbon weight fractions) for 1% organic content

Petroleum Hydrocarbon Fraction	S4UL (mg/kg)	Petroleum Hydrocarbon Fraction	S4UL (mg/kg)
Aliphatic EC 5-6	570000	Aromatic EC 5-7	56000
Aliphatic EC >6-8	600000	Aromatic EC >7-8	56000
Aliphatic EC >8-10	13000	Aromatic EC >8-10	5000
Aliphatic EC >10-12	13000	Aromatic EC >10-12	5000
Aliphatic EC >12-16	13000	Aromatic EC >12-16	5100
Aliphatic EC >16-35	250000	Aromatic EC >16-21	3800
Aliphatic EC >35-44	250000	Aromatic EC >21-35	3800
		Aromatic EC >35-44	3800

Where full speciation of petroleum hydrocarbons by aromatic and aliphatic fractions is not undertaken, the results of the testing can still be compared with the more stringent of the

¹⁰ SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

screening values for the respective equivalent carbon weight fraction and, where the concentration recorded is found to be lower, then it can be concluded that no significant risk is present.

It is noted that S4ULs have not been published for all contaminants which may be a concern (notably VOCs and PCBs). Should detectable concentrations of these contaminants be identified reference will be made to other published soil screening values as appropriate to determine the level of risk posed.

10.3 Regulatory Approval

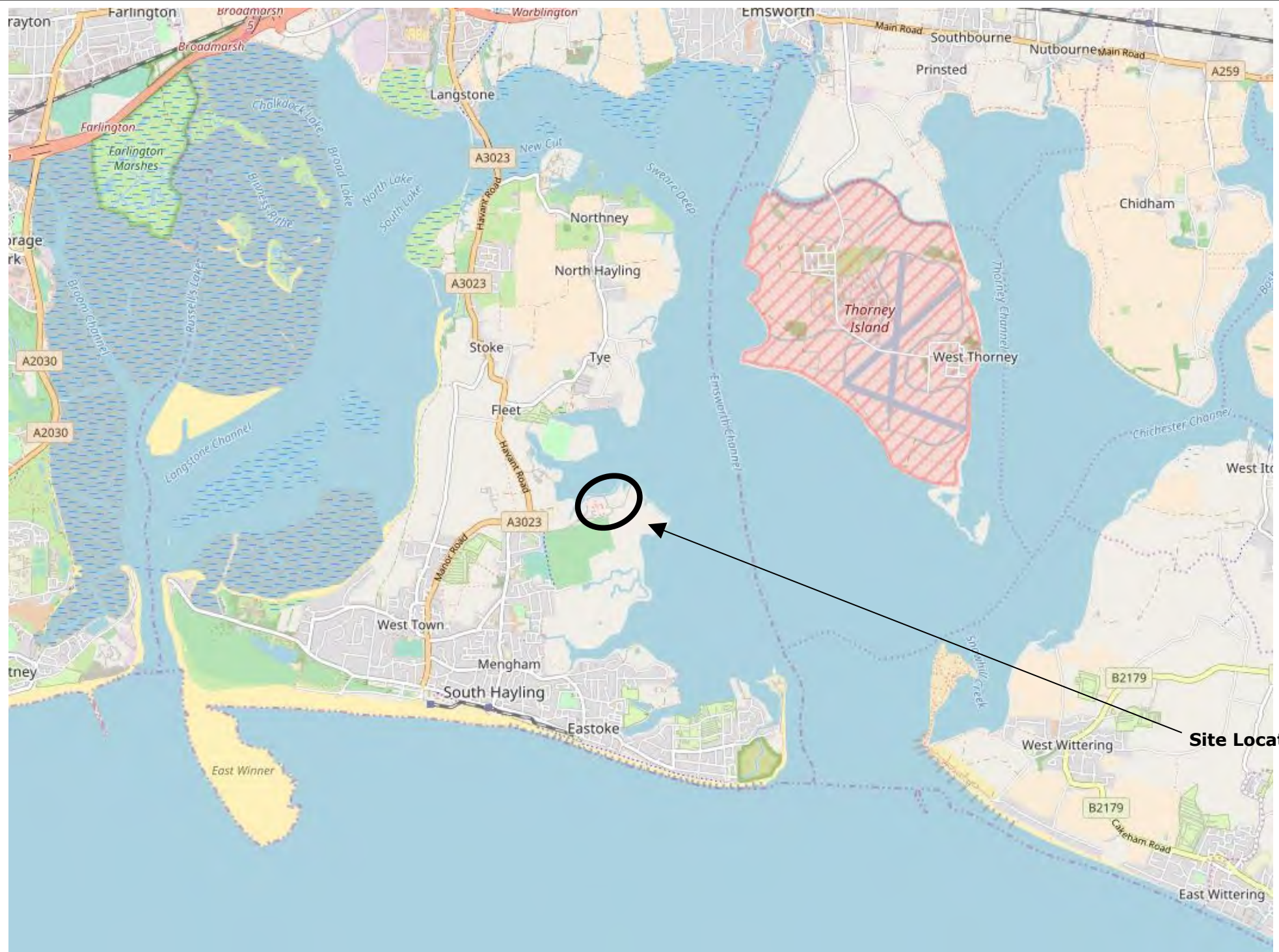
It is recommended that this report is forwarded to the Local authority for their approval of the revised conceptual model and the intrusive works proposed prior to undertaking any intrusive works at the site.

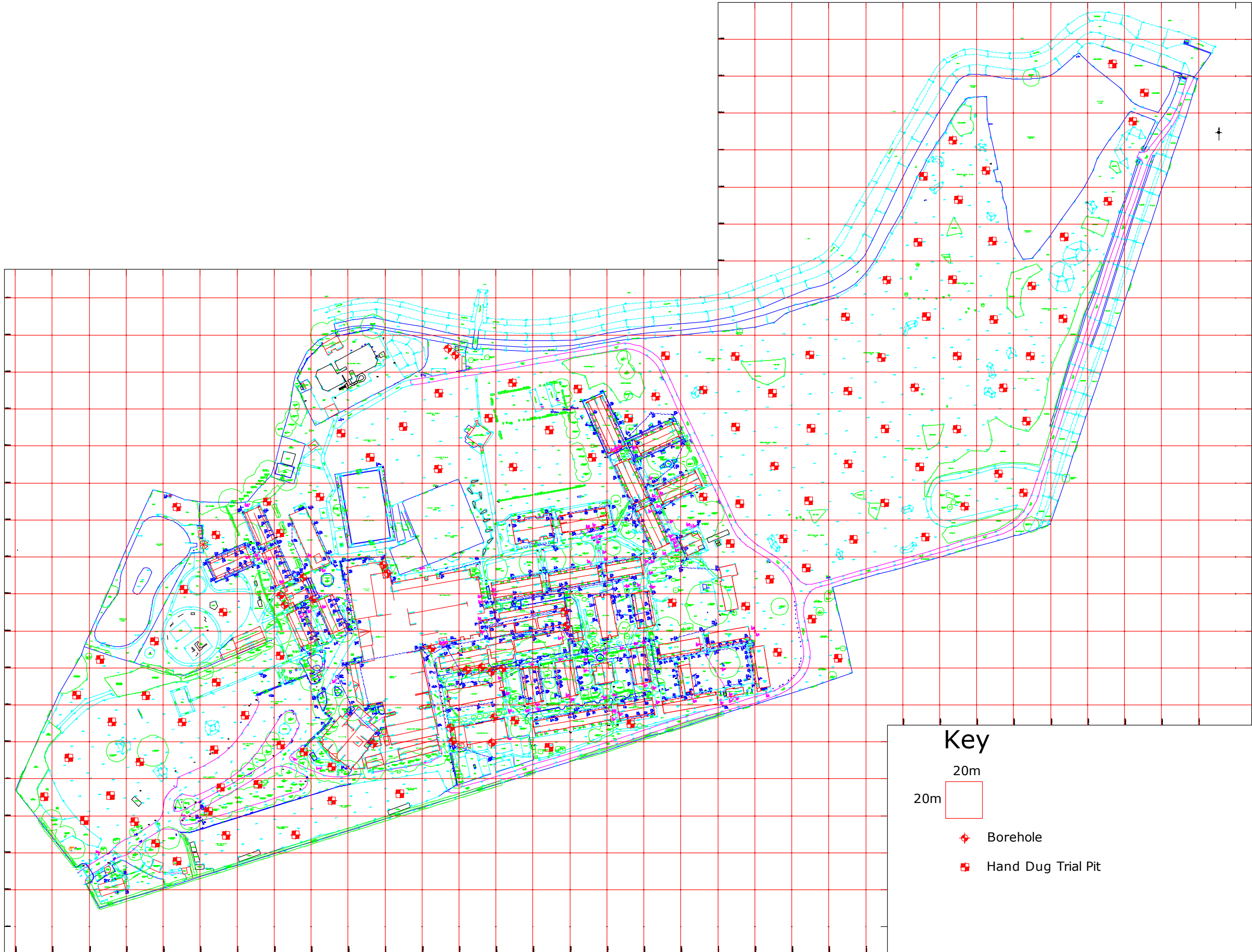
**Ashdown Site Investigation Ltd.
August 2017**

FIGURES

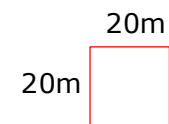
Figure 1 Site Location Plan

Figure 2 Site Plan showing Proposed Exploratory Hole Locations





Key



- ◆ Borehole
- Hand Dug Trial Pit

ASHDOWN SITE INVESTIGATION

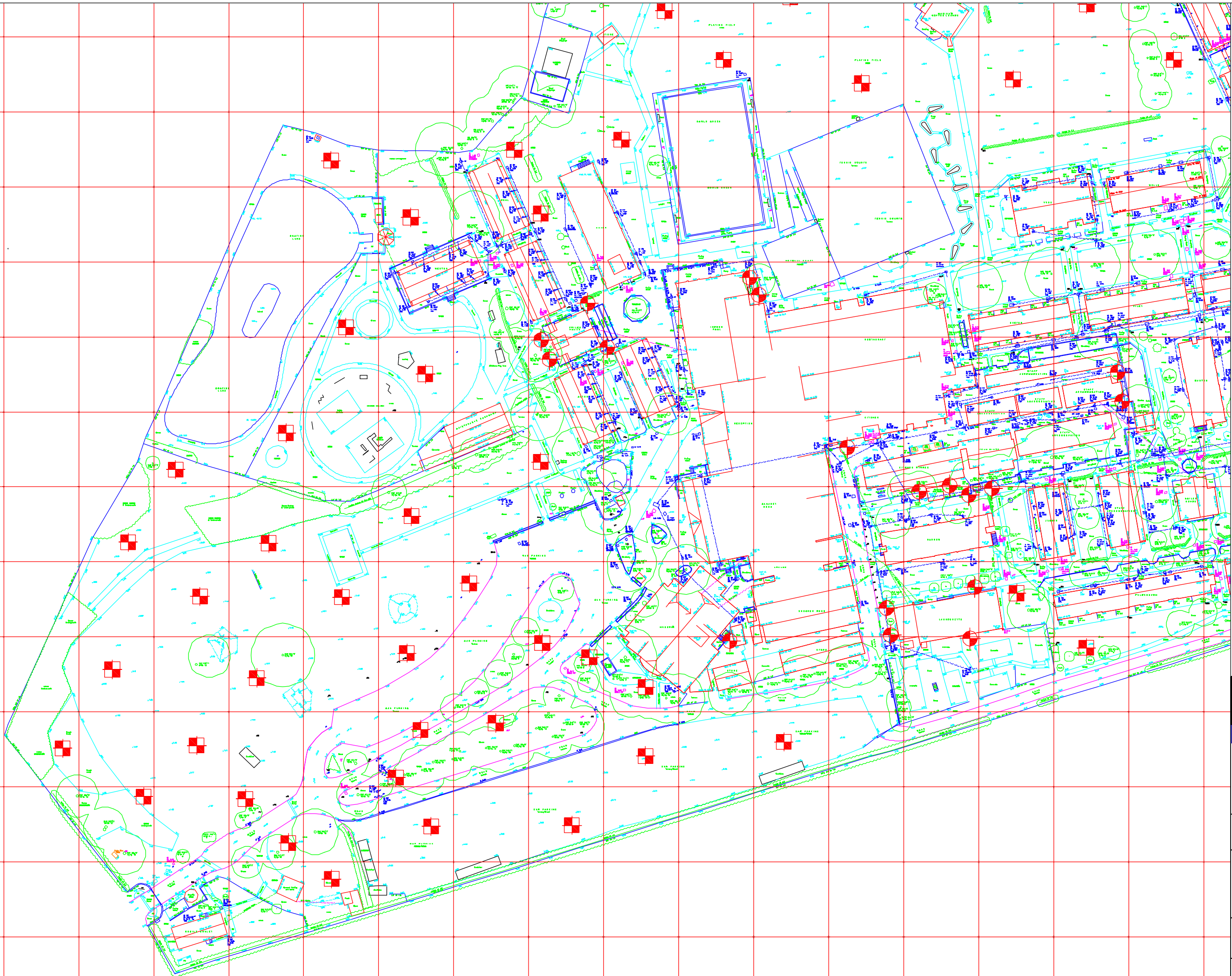
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DRAWN BY:	DATE:	SCALE (at A3):
SC	Feb 2018	NTS

SITE:
Mill Rythe Holiday Village, Hayling Island,
Hampshire

REPORT REF.:	FIGURE NO.:
R17-12377/ds	2

DRAWING TITLE:
Site Plan showing Proposed Exploratory
Hole Locations



DRAWN BY: SC	DATE: Feb 2018	SCALE (at A3): NTS
SITE: Mill Rythe Holiday Village, Hayling Island, Hampshire		
REPORT REF.: R17-12377/ds	FIGURE NO.: 2a	
DRAWING TITLE: Site Plan showing Proposed Exploratory Hole Locations - Area 1		

DRAWING TITLE:
Site Plan showing Proposed Exploratory
Hole Locations - Area 1



**ASHDOWN SITE
INVESTIGATION**
L · I · M · I · T · E · D

DRAWN BY: SC	DATE: Feb 2018	SCALE (at A3): NTS
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SITE:
Mill Rythe Holiday Village, Hayling Island,
Hampshire

REPORT REF.: R17-12377/ds	FIGURE NO.: 2b
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DRAWING TITLE:
Site Plan showing Proposed Exploratory
Hole Locations - Area 2



DRAWING TITLE:
Site Plan showing Proposed Exploratory
Hole Locations - Area 3



ASHDOWN SITE INVESTIGATION

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DRAWN BY: SC	DATE: Feb 2018	SCALE (at A3): NTS
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SITE:
Mill Rythe Holiday Village, Hayling Island,
Hampshire

REPORT REF.: R17-12377/ds	FIGURE NO.: 2d
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DRAWING TITLE:
Site Plan showing Proposed Exploratory
Hole Locations - Area 4

