

**Former SSE Offices Site,
Bartons Road,
Havant,
PO9 5JB**



Desk Study Report

Client

fortitudo

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Proposed Development at Former SSE Offices Site, Bartons Road, Havant Desk Study Report

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Revision 1 – for comment

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Proposed Development at Former SSE Offices Site, Bartons Road, Havant Desk Study Report

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Proposed Development at Former SSE Offices Site, Bartons Road, Havant

Desk Study Report

EXECUTIVE SUMMARY

Area of interest	Summary of main text
Introduction	This Desk Study has been produced in order to determine the potential presence of contamination prior redevelopment of the former Southern and Scottish Electricity Offices site on Bartons Road, Havant
Site Location & Description	The current proposed development area, which is irregular in shape, occupies an area of approximately 1.7ha and is centred at National Grid Reference 472147 108016. The former postal address was Southern and Scottish Energy Bartons Road, Havant PO5 9JB. At the time of the site walkover all the buildings and structures had been demolished so that the site was level with a stockpile of crushed concrete located roughly in the centre.
Previous Planning Applications & supporting Information	A search of the Havant Council planning portal revealed that there have been 14 previous planning applications between 1990 and 2016 for the site. All relate to the use of the site as the offices for the electricity company with the most significant being between 2006 and 2008, which relate to the construction of a two storey operations and data recovery centre and then 2016 with the application to clear the site.
Previous Environmental Reports	No existing environmental reports have been made available to Forge Environmental Management Ltd and none relating to the site were identified during a search of the Havant Borough Council planning portal website
Geology	The published BGS maps indicate that the site possibly straddles a geological boundary with no drift deposits beneath the western section whilst Head should only be present beneath the eastern area. Similarly, the bedrock could be Bognor Sand Member in the west and London Clay Formation below the eastern section. However, from a historical borehole just beyond the eastern boundary it would appear the drift deposits are absent and that the Bognor Sand is the shallow bedrock
Hydrogeology	The EA aquifers maps show the site is not underlain by superficial deposits with the Bognor Sand being a Secondary A Aquifer and the London Clay being deemed to be Unproductive Strata However, the deeper principal aquifer within the chalk is within a Zone 1c SPZ as there is a potable water abstraction 1,897m to the south-west. Based upon the geology it is considered that there is potential for groundwater flooding from the underlying aquifer although there is no evidence of such flooding has ever occurred.
Hydrology	The nearest surface water course is a drainage ditch 306m to the east, which is within the East Hampshire catchment area. The site is not within an area considered to be at risk from flooring from rivers.
Radon	No radon protection measures are deemed necessary in the construction of new dwellings.

Area of interest	Summary of main text
Site History	The site was in agricultural use until between 1966 and 75 when it was first developed as offices although the buildings underwent significant extensions in the 1990's and again in the early 2000's before they were cleared prior to 2019. The surrounding area was in predominantly agricultural use from the 1880's but after the second world war when a major phase of development was undertaken until the mid 1970's, which resulted in the construction of predominantly residential, properties but there were also some commercial and industrial buildings. The adjacent football ground was built in the 1990's.
Preliminary Conceptual Site Model	The potential contaminant sources identified were: 1. Made ground of unknown provenance or impacted natural soils resulting from site development activities; 2. PCB's from either electrical equipment on the site when it was operated by an electrical company or on site migration from the adjacent electricity substation adjacent to the south-eastern boundary; and 3. On site migration from the former petrol station abutting the south-western boundary or the tanks noted within the SSE compound adjacent to the south-eastern boundary. The identified potential source has been determined to pose a very low to moderate risk to future occupiers/users or the environment.
Recommendations	• This report should be forwarded to the regulators for their review and approval to ensure they are in agreement with the findings and conclusions. • With consideration of the anticipated proposed end use of the site for apartment blocks and a residential care home it is considered unlikely due the absence of any grossly contaminative past usage and the anticipated amount of hard cover that site will not pose a significant risk to future occupiers or controlled waters. However, a limited investigation will be required to confirm this but until the proposed development details are available and the potential pathways can be assessed the full scope of the investigations cannot be proposed but it is anticipated it will comprise of 6-7 No trial pits with chemical testing of selected shallow samples.

Proposed Development at Former SSE Offices Site, Bartons Road, Havant

Desk Study Report

1.0 INTRODUCTION

1.1 Contract Details

Following receipt of an instruction from Chapman Lily Planning Limited, on behalf of Fortitudo Ltd, a desk study was undertaken upon the proposed development at the former SSE offices site on Bartons Road in Havant, as shown on the location plan in Appendix A. The purpose of this Phase 1 Desk Study report is to review the available data to assess for the potential presence of contamination to support any future planning application to develop the site.

Currently there are no detailed drawings available showing the proposed development but it is anticipated it will comprise around 174 apartments over three 4.5 storey blocks together with a car home.

1.2 Scope of Works

The scope of works undertaken by Forge Environmental Management Limited (FEML) were limited to:

- Obtaining and reviewing a GroundSure Data report for the site to provide historical and background environmental information;
- Undertake a site walkover;
- Preparation of a desk study report presenting the findings of the review.

1.3 Previous Planning Applications

From a review of the Havant Borough Council's planning portal it was determined that there have been a number of previous planning submission to develop the site as summarised below:

Table 1.3.1 Previous Planning Applications for the SSE offices site

Planning Ref	Proposed Development	Decision
90/50018/016	Erection of housing for generator	Approved
90/50018/017	Erection of 2No. 600mm diameter microwave antenna on side of roof	Approved
92/50018/021	Relocation of training centre for two years	Approved
95/50018/022	Renew previous planning permission 90/50018/17	Approved
01/50018/023	Application to determine if planning approval is required for the siting of 10 ground based cabinets	Approval is required
02/50018/024	Installation of roof mounted 1.8m diameter satellite antenna	Approved
06/50018/025	Install telecommunication equipment on the roof top	Approved
06/50018/026	Formation of two storey data centre	Permitted subject to section 106

Table 1.3.1 Previous Planning Applications for the SSE offices site

Planning Ref	Proposed Development	Decision
06/50018/027	Construction of a two storey operation centre with data recovery and business resumption centre	Approved
07/50018/028	New cycle shed with temporary offices, storage accommodation and car parking	Approved
08/50018/029	Construction of a two storey operation centre with data recovery and business resumption centre	Approved
08/50018/030	Application to discharge conditions 1,2,4,5 & 6 of planning permission 08/50018/029	Split decision conditions 1,2,4 & 5 discharged by condition refused
App/16/00617	Application to increase the height of the fence by 600mm	Approved
APP/16/00940	Application to determine if approval is required for the demolition of the Former Southern and Scottish Offices	Approval required & approved

1.4 Previous Environmental Reports

No previous environmental reports have been made available to FEML and none were revealed from a search of the Havant Borough Council planning portal.

1.5 Report Limitations

The recommendations, interpretations and conclusions of this report are based on historical and third-party information relating to the site condition. No responsibility can be accepted for the accuracy of any third-party information or reference data used including that contained within the GroundSure report.

2.0 CURRENT SITE DESCRIPTION AND LOCATION

2.1 Site Location

The proposed development site occupies an area of approximately 1.7ha and is centred at National Grid Reference 472147 108016. The former postal address was Southern and Scottish Energy, Bartons Road, Havant, PO9 5JB. A copy of the Promap site location plan is presented in Appendices A and an aerial photograph of the site is contained in the GroundSure report in Appendix B.

2.2 Site Description

2.2.1 General Setting

The site, which is irregularly shaped, is located between Bartons Road to the north and Martins Road to the south although the current access point is in the north-eastern corner off Bartons Road. To the east is Havant and Waterloo FC football ground, public house with a car parking area and an office block, which is used by SSE Ltd and appeared to have tanks and electrical equipment behind the main building. The western boundary runs along the back of the footpath to Petersfield Road (B2149) with a former petrol station that is now a used car dealership (Solvent Used Cars) immediately adjacent to the south-western corner.

At the time of the walkover (December 2019) all the buildings and structures had been cleared from the site leaving it level at c.20m AOD with a large stockpile of crushed concrete located roughly in the central area.

The site is bounded by a low brick wall with railings on top along the northern and western boundaries just inside which is a line of tall conifer trees within a soft verge c.5m wide. The southern boundary is predominantly metal mesh panel fences behind a grass verges and some tree planting adjacent to Martins Road. The Eastern boundary is demarked by wooden boarding at the northern end that joined the corrugated metal fencing to the football ground.

Although in the immediate vicinity of the site there is the SSE offices, a used car dealer (former petrol station), a public house and the football ground the surrounding area is predominantly used for housing apart from a green space with a skate board park to the east.

2.3 Potential Sources or Signs of Contamination

2.3.1 On Site

At the time of the site walkover on the 17th December 2019 the buildings and structures had been demolished to and the concrete arisings had been crushed and stockpiled in the central area. Therefore, as the site has undergone at least one phase of development and demolition it is considered highly likely that made ground will be present. This material could have been sourced from a contaminated site or be reworked natural that could have been impacted by activities undertaken on the site.

Also given the nature of the former business (electricity company) it is possible there were transformers on site, which depending upon their age (pre 1981) could have resulted in PCB's being leaked.

2.3.2 Surrounding Area

Due to the presence of SEE offices with heavy equipment and suspected tanks there is the possibility there could be fuel stored on site, which if spilt could migrate onto the site. Also, the presence of transformers and electricity equipment could have resulted in PCB's being spilt and migrating onto the site.

The current used car dealership site appears to be a former petrol station and therefore it is likely there were/are underground storage tanks associated with this use. Therefore, if they were present, even if removed now, it is possible spillages or leakages of fuel could have the potential to impact upon the soils and groundwater beneath the study area. Although this could be limited as the likely groundwater flow direction is southwards and therefore away from the site.

2.3.3 Summary of Potential Sources of Contamination Noted from the Walkover

Resulting from the evaluation of the current use of the site the following potential sources of contamination have been identified as detailed in Table 2.3.1 below

Table 2.3.1: Potential Sources of Contamination on and off site identified from the Current Site usage.

APC N°	Details	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Landfill gases/vapours
1	<u>On site</u> Made ground of unknown provenance or impacted natural soils resulting from site development activities	Possible	Possible	Possible
2	<u>On site & Off site</u> Possible presence of leaked PCB's	Possible	n/a	n/a
3	<u>Off Site</u> On site migration of leaked/spilt fuels from the adjacent former petrol station or the SSE tanks	n/a	Possible	Possible

3.0 ENVIRONMENTAL SETTING

3.1 Published Geology

The 1:50,000 BGS scale Digital Geological Map, as reported in the GroundSure Data, indicates that the site is underlain by Head superficial deposits resting the either the Bognor Sand Member or the London Clay Formation.

A full copy of the GroundSure Data report is contained in Appendix B but a summary is detailed in Table 3.1.1 with further information provided in the following sub-sections.

Table 3.1.1: Summary Geology

Shallow depth soils anticipated	<i>Made Ground – anticipated across the whole site</i>
Superficial deposits within 50m	<i>Head– comprising clay, silt sand and gravel</i>
Solid Geology within 50m	<i>Bognor Sand Member – consisting of sand; or London Clay Formation – comprising of clay, silt and sand</i>

From the BGS web site (www.bgs.ac.uk/geologyofbritain) it would appear that the site possibly straddles a geological boundary with no drift deposits beneath the western section whilst the Head is only present beneath the eastern area.

If present the Head (fragmented material that usually is weathered bedrock that has moved down a slope) deposits will typically comprise a mixture of clay, silt, sand and gravel.

Also, the solid geology maps show the site is possibly on a boundary with the Bognor sand being in the west and the London clay to the east, although this is described as consisting of a mixture of clay, silt and sand.

The BGS also hold records for boreholes sunk in the area, which identified a borehole located in Leigh Park that is very close to the north-eastern boundary. This borehole encountered:

6" (150mm) topsoil;
30' 0" (9.1m) Medium dense to dense silty fine sand (Bognor Sand Member); on
Stiff to very stiff sandy clay (London Clay)

Based upon the above it is possible that the superficial head deposits are not present below the site and that the London Clay is not the shallow bedrock as the outcrop is further to the east.

3.1.1 Artificial and Made Ground

The BGS map shows that there is no artificial ground or landslip material beneath the site. Although it is known that the site has been developed therefore it is anticipated that some made ground will be present.

3.1.2 Superficial and Drift Ground

As mentioned above the BGS online map viewer indicates the eastern section of the site is underlain by superficial deposits consisting of clay, silt, sand and gravel known as Head, for which the BGS Lexicon lithological generic description is

"Head is poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes. Solifluction is the slow viscous downslope flow of waterlogged soil and other

unsorted and unsaturated superficial deposits. The term gelifluction is restricted to the slow flow of fluidized superficial deposits during the thawing of seasonally frozen ground. The flow is initiated by meltwater from thawing ice lenses. Polymict deposit: comprises gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material."

However, as discussed above the available borehole information indicates that the drift deposits may actually be absent below the site.

3.1.3 Bedrock and Solid Geology

The BGS maps indicate there could be a geological boundary running roughly north/south through the site with the Bognor Sand Member to the west and the London Clay Formation outcropping to the east. However, a historic borehole sunk adjacent to the eastern boundary indicates that the London Clay outcrops further east of the site as at the borehole location it was revealed a being overlain by c.9m of the sand.

For the Bognor Sand Member the BGS Lexicon describes as:

"Glaucconitic bioturbated or cross-bedded fine- and medium-grained sands, partially cemented."

The BGS lithology for the London Clay is:

"The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels"

3.2 Hydrogeology

With reference to the GroundSure Data for the drift deposits the map indicates that there is no superficial aquifer below the site, which is consistent with the borehole log that did not identify any Head soils.

Immediately adjacent to the eastern boundary the superficial deposits are present and have been classified by the Environment Agency as a 'Secondary Aquifer (Undifferentiated Layers)' the definition of which is:

"Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type"

The underlying bedrock has been identified as a Secondary (A) Aquifer, which is the classification given when:

"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"

25m to the east, which is where it is suspected the London Clay Formation outcrops the shallow bedrock has been determined as Unproductive Strata, which is defined as:

"These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow"

There are no licensed groundwater abstractions within 1km with the nearest being a well located 1,897m to the south-west where Portsmouth Water Ltd take 35,770,000m³/year for drinking water, which it is believed is being abstracted from the deeper principal aquifer within the chalk bedrock.

Therefore, although the shallow bedrock aquifer is not considered to be sensitive due to the potable water abstraction from the deeper confined aquifer (protected by the London Clay) this stratum below the site is designated as a 1c (inner catchment) Source Protection Zones (SPZ). Historically, deeper aquifers have not been considered as they were deemed to be protected by the overlying cohesive soils, which would prevent to downward migration of pollution or bacterial. However, with the increased use of deep piles and ground source heating and cooling techniques these deeper water sources now need to be considered

The soils have been deemed to have a High Leaching Potential (HU), which is defined as:

"Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information"

There are no licensed discharge consents to groundwater within a 500m radius of the site.

The British Geology Society has determined that the site is within an area of potential risk of groundwater surfacing flooding from the underlying unconfined aquifers (Clearwater Flooding). This potential is defined as:

"this means that although given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding".

The BGS has a Moderate confidence in this rating but as there is no evidence to indicate the area has been subjected to groundwater flooding this has been deemed not to be an issue at the site and not considered further.

3.3 Hydrology

From the information provided by Ordnance Survey Mastermap Water Network Map (contained in the Groundsure report) the nearest water feature is drainage ditch associated with a "Works" 305m to the east. Beyond this is an unnamed stream (c.500m) that flows south-west.

There is no biological or chemical quality data available for any rivers within 1,500m radius of the site within the GroundSure report.

The Environment Agency flood maps confirm that the site is not within an area that is at risk of flooding from rivers.

There are no licensed surface water abstractions within 2km of the site.

One licensed discharge consent to surface water is listed 305m to the south-east, which is for "miscellaneous discharges - surface water" with the receiving waters being Freshwater River.

3.4 Radon

Based upon the radon potential dataset from the Health Protection Agency (HPA) the site is not in a radon affected area, as less than 1% of homes are above the Action Level.

Therefore, no radon protection measures are necessary in the construction of new properties or extensions.

3.5 Designated Environmentally Sensitive Sites

The GroundSure Data indicates that the site is within a DEFRA designated nitrogen vulnerable zone. No other environmentally sensitive sites were identified within 1km of the site apart from three designated ancient woodlands. These were:

- 465m north-west (Great Copse);
- 793m north (Wakeford Copse); and
- 857m east (unknown name).

3.6 Environmental Searches

The GroundSure database search provides details of information collated from various regulatory bodies, local authorities and other organisations. The full GroundSure Data report is enclosed as Appendix B. However, in addition to the items discussed above Table 3.6.1 below summaries other salient points identified.

Table 3.6.1: Summary of the GroundSure Environmental Searches

Data Type	On Site	0m to 250m	251m to 500m	Discussion/Comments
<i>Environmental Permits, Incidents and Registers</i>				
<i>Records of Historic IPC Authorisations</i>	0	0	0	
<i>Records of Part A(1) and IPPC Authorised Activities</i>	0	0	0	-
<i>Records of Red List Discharge Consents</i>	0	0	0	-
<i>Records of List 1 Dangerous Substances Inventory sites</i>	0	0	0	-

Data Type	0n Site	0m to 250m	251m to 500m	Discussion/Comments
<i>Records of List 2 Dangerous Substances Inventory sites</i>	0	0	0	-
<i>Records of Part A(2) and Part B Activities and Enforcements</i>	0	2	0	11m west at Motorwork Havant Ltd at Westleigh Service Station has a Part B permit for a waste oil burner <0.4MW – no enforcements. 21m west also at Motorworks Havant had a now revoked (26/11/2007) Type B permit for Petrol Vapour Recovery. No enforcement action.
<i>Records of Category 3 or 4 Radioactive Substances Authorisations</i>	0	0	0	
<i>Records of Water Industry Referrals</i>	0	0	0	-
<i>Records of Planning Hazardous Substance Consents and Enforcements</i>	0	0	0	-
<i>Record of COMAH and NIHHS sites</i>	0	0	0	-
<i>Environment Agency Recorded Pollution Incidents (list 2)</i>	0	2	0	101m south-west on 15 th May 2003 biodegradable material or waste had a minor (category 3) impact on land. 142m north-west on 16 th August 2002 "other" pollutant had no impact (category 4) on water, land or air.
<i>Sites Determined as Contaminated Land under Part IIA EPA 1990</i>	0	0	0	-
Landfill and Other Waste Sites				
<i>Environment Agency Registered Landfill Sites</i>	0	0	0	-
<i>Environment Agency Historic Landfill Sites</i>	0	0	0	-
<i>BGS/DoE Landfill Site Survey</i>	0	0	0	-
<i>Records of Landfills in Local Authority and Historical Mapping Records</i>	0	0	0	-
<i>Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites</i>	0	0	0	-
<i>Environment Agency Licensed Waste Sites</i>	0	0	0	-
Current Land Uses				
<i>Current Industrial Sites</i>	0	11	-	The nearest is 3m south-east and was an electricity substation, which also accounted eight of the other identified locations. The other two were the second hand cars 35m west (West Leigh Service Station) and 244m on Monterey Drive where there is an "airlines and airlines services" business.
<i>Records of Petrol and Fuel Sites</i>	0	1	1	17m to the west was a service station but it is now obsolete. Another closed petrol station was on Stock Health Road 477m to the west
<i>National Grid Underground Electricity Cables</i>	0	0	0	
<i>National Grid Gas Transmission Pipelines</i>	0	0	0	-

Information supplied by the British Geological Survey relating natural hazards for a search area of 50m around site is included within the GroundSure Data. Again, full details are contained in Appendix B but the most pertinent points relating to the site are highlighted in Table 3.6.2 overleaf.

Table 3.6.2: Summary of the BGS Searches

Potential Hazard	Hazard Rating	Hazard Description and Comments
Shrink-Swell	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.
Landslide	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
Soluble Rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.
Compressible Ground	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
Collapseable Rocks	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapseable deposits.
Running Sand	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property no significant increase in insurance risk due to running sand problems is likely.

The GroundSure report also contains information relating to mining in the area which is summarised in Table 3.6.3 below.

Table 3.6.3: Summary of the Mining Searches

Potential Hazard	Comments
Coal Mining	The database search did not identify any coal mining areas within 75m of the site.
Non-Coal Mining	The database search did not identify any non-coal mining areas within 50m of the site
Brine Affected Area	There are no brine affected areas within 75m of the site.

3.7 Summary Sources On and Off Site Determined From Environmental Setting

No landfills have been identified within 250m of the site therefore the on-site migration of landfill gases is not considered to represent a risk at the site, so based upon this gas monitoring is currently not deemed to be necessary as part of any future site investigations.

A former petrol station was identified 17m to the west of the site, which although likely to be generally down gradient for groundwater from the site it is close enough to have the potential to impact upon the soil or groundwater quality beneath it.

The presence of an electricity sub-station adjacent to the south-eastern boundary (3m) it has to be considered, as the date of installation is unknown, to have the potential to have allowed PCB's to leak, which could have migrated onto the site.

In some areas of the UK the underlying natural soils are known to contain naturally occurring elevated levels of contamination, namely metals and radon gas, which could pose a risk to human health. However, from the HPA database it is known that the area does not have natural radon gas levels that have been shown to impact upon the recorded levels within properties. Also, from the BGS on-line Contamination Distribution in Soil maps it has been concluded that the natural background arsenic, cadmium, copper, nickel and lead concentrations are below the current published human health assessment criteria (LQM/CIEH S4UL and DEFRA C4SL) of a residential development.

Resulting from the evaluation of the environmental setting of the site no additional potential sources of contamination have been identified although it has reaffirmed two APC's identified in Section 2 as shown in table 3.7.1 below.

Table 3.7.1: Potential Sources of Contamination on and off site identified from the Site's Environmental Setting

APC N°	Details	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Landfill gases/vapours
2	<u>On site & Off site</u> Possible presence of leaked PCB's	Possible	n/a	n/a
3	<u>Off Site</u> On site migration of leaked/spilt fuels from the adjacent former petrol station	n/a	Possible	Possible

4.0 SITE HISTORY

4.1 Historical Maps Review

From a review of the available historic maps, copies of which are shown in Appendix C, it has been determined that the site was in agricultural use until between 1966 and 1975 when it was first developed as offices. The building layout underwent a significant change in the 1990's and again in the early 2000's before they were all cleared.

The surrounding area was predominantly in agricultural use from the 1880's until after the second world war when a major phase of development was undertaken which by the mid 1970's had resulted in the area being urbanised with a mixture of residential, commercial and industrial buildings, although the adjacent football ground was not built until the 1990's.

Table 4.1.1 below details the salient points noted on the available historic maps relating to the site and immediate surrounding area.

Table 4.1.1: Key points noted from the Historic Maps

Map edition & scale	Date	On Site	Surrounding area
Country Series 1:10,560	1886	The site was occupying parts of three adjoining fields. A row of trees was shown along the western boundary	Although not named roads were present to the west and south along the approximate alignments of Petersfield Road and Martins Road, respectively. The surrounding area was predominantly in agricultural use with a few properties associated with West Leigh (S), Leigh Green plus West Leigh House (E) and Leigh Park Farm (N). The London to Southampton Western Railway line was running north-east/south-west 750m to the west.
Country Series 1:10,560	1885-96 & 1895-98	The only change noted was that more trees were indicated within the site boundary.	The road along the southern boundary was named "West Leigh Road". Leigh Green and the properties were no longer shown. A small area 400m to the south-east was labelled as "Old Gravel Pit".
Country Series 1:10,560	1907, 1910, 1910-14 & 1914	No changes to the site layout were identified	No major developments or changes in land use were noted within the vicinity of the site. Although the gravel pit to the south-east was no longer identified.
Country Series 1:10,560	1930-31 & 1938	No alterations or developments were noted within the site boundary	Some minor changes such as c.50m south there was an area of "Allotment Gardens" and West Leigh Cottage c.400m to the east. Further afield "Denvilles" had been developed with properties and access roads on the eastern side of the railway c.1250m SE. There were also new properties c.1,400m to the south.

Map edition & scale	Date	On Site	Surrounding area
Provisional 1:10,560	1963 & 1966	The site was still open fields.	There had been substantial developments to the south, south-east, west and north-west. Predominantly these were residential properties although to the South-east there was a "Works". The developments extended to the roads along the southern, which had been called "Bartons Road", and western boundaries.
National Grid 1:10,000	1975	The site was shown to have been developed with "offices" comprising a larger L-shaped block and a smaller rectangular building to the south with a large area that could have been a car park.	It would appear that the petrol station was present immediately adjacent to the south-western boundary. There had been further development with the site being surrounded by buildings apart from an open area to the east. The road to the south had been renamed as "Martin Road" and the road to the west was also identified as "Petersfield Road". To the north Barton Road had been realigned to run along the boundary and join Petersfield at a new junction.
National Grid 1:10,000	1991	The building layout appeared unchanged	No significant changes were noted that could impacted on the study area.
National Grid 1:10,000	2001	The offices layout had changed into a C shape, which was most likely to have been an extension to the original building but it could have been new development. Also, the smaller rectangular building was shown to have doubled in length.	The football ground was shown immediately to the east. Also, to the south-east the large area of works buildings had been developed into a residential area with new service roads.
National Grid 1:10,000	2010	The large building footprint appeared unaltered but the rectangular building to the south had been extended.	New large rectangular buildings were shown immediately adjacent to the south-eastern boundary.
National Grid 1:10,000	2019	The site was shown as having been cleared of buildings	The map did not appear to indicate any major changes to buildings or their usages in the vicinity of the current site.

4.2 GroundSure Historical Industrial Sites Search

Within the GroundSure report although it does not include historic plans but it does contain a summary of identified locations of potential contaminative past uses and historical tanks in the vicinity of the site. The full report is contained in Appendix C but Table 4.1.2 below contains details of the search results.

Table 4.1.2: Key historical features noted from the GroundSure database search

Description	Location	Date	Discussion
Potentially Contaminative Uses within 250m of the site boundary.	53-56m SE	1963-1991	Unspecified works
Historical Tank Database within 500m of the site boundary	361m E	1968-1993	Unspecified tanks
	446-449m N	1887-1932	Tanks / Unspecified tanks
	461m N	1887-1909	Unspecified tanks
Historical Energy Features Database within 200m of the site boundary.	35-59m S	1973-1997	Electricity substation
	85m N	1974	Electricity substation
	129m SE	1995-1997	Electricity substation

Description	Location	Date	Discussion
	183m E	1991	Electricity substation
	184m NE	1974	Electricity substation
	186m E	1973	Electricity substation
	200m N	1974	Electricity substation
Historical Petrol and Fuel Sites Database within 500m of the site boundary.	-	-	No data found
Historical Garage and Motor Vehicle Repair Database within 500m of the site boundary.	0-2m SW	1973-1997	Garage
	434-436m W	1969-1993	Garage
Potentially Infilled Land within 250m of the site.	82m NW	1907-1938	Pond
	152m SE	1866	Pond
	180-184m SE	1895-1931	Pond
	200m E	1866	Pond
	246m S	1907	Pond

4.3 Potential Historical Contaminative Sources

Prior to the use of the site as offices in the 1970's it was in agricultural use therefore it is possible that pesticides and herbicides were used across it. However due to the time lapse since the land was farmed (nearly 50 years) it is considered that any residues from the chemicals used are likely to have broken down as they are generally designed to be non-persistent in the environment (DEFRA publication CLAN4/04). Therefore, it has been deemed that there will not be residual pesticides or herbicides present across the site that could pose a potential risk to future occupiers and as such this scenario has not been considered further within this report.

No licensed landfills have been identified with 250m of the site, the distance below which the Environment Agency recommend a gas risk assessment is undertaken. Although a number of potential infilled ponds were identified but due to their small size (i.e. limited volume of fill) and time since they were filled (1938 was the last date they were identified) they are not considered to represent significant sources of landfill gases. Therefore, they are not considered to pose a risk to the site. However, if during any subsequent site investigations areas of deep made ground are revealed on the site this assessment will be reviewed based upon the additional information.

The development of the site of the site in the 1970's and the subsequent extensions/alterations are considered likely to have introduced made ground or disturbed the natural soils. Therefore, it is possible that this could have introduced contamination to either the existing soils or within any imported contaminated material from unknown sources, which was previously identified as an APC during the site walkover.

Also, the previously identified APC's relating the adjacent petrol stations and electricity substations have again been confirmed as being potential usages that could impact upon the site.

Table 4.2.1, overleaf, summaries the potential source of contamination identified from the historical searches, which is a re-identification of APC.

Table 4.2.1: Potential Sources of Contamination on and off site identified from the Site History

APC N°	Details	Metals, semi-metals, non-metals, inorganic chemicals and others	Organic chemicals	Landfill gases/vapours
1	<u>On site</u> Made ground of unknown provenance or impacted natural soils resulting from site development activities	Possible	Possible	Possible
2	<u>On site & Off site</u> Possible presence of leaked PCB's from adjacent substation	Possible	n/a	n/a
3	<u>Off Site</u> On site migration of leaked/spilt fuels from the adjacent former petrol station	n/a	Possible	Possible

5.0 PRELIMINARY CONCEPTUAL SITE MODEL: POTENTIAL SOURCE-PATHWAY-RECEPTOR RELATIONSHIPS

5.1 General

Prior to commencing any intrusive site investigation works it is appropriate to undertake a qualitative risk assessment with respect to any potential sources, pathways and receptor relationships which may exist on site. A guide to Qualitative Risk Assessment is provided in 'Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008'. This approach is comparable to a Tier 1 human health risk assessment and identifies where a potential pollutant linkage relationship exists and if present, an estimate of the risk that defined receptors will suffer harm.

The current anticipated development will comprise 174 apartments in three 4.5 storey blocks and a care home based upon this it is considered appropriate to use the end use of "residential without vegetable uptake". Although when the proposed development layout plans are available it may be possible to zone the site, for example into the apartment area and residential care home area depending upon the amount of hard cover and soft land landscaping within each.

5.2 Contaminant Sources

5.2.1 Site Sourced Contamination

The following has been identified through the desk study phase of this report as the area of potential concern (APC):

1. Made ground of unknown provenance or impacted natural soils resulting from site development activities;
2. Possible presence of PCB's from possible historic electricity transformers and cables when the site was operated by an Electricity Company

5.2.2 Cross Boundary Contaminant Migration

2. Possible on-site migration of PCB's from the electricity substation adjacent to the south-eastern boundary;
3. Possible on-site migration of hydrocarbons from the former petrol station adjacent to the south-western boundary or from the tanks noted within the SSE compound adjacent to the south-eastern boundary.

5.3 Potential Receptors

The likely receptors identified from the desk study have been detailed below.

5.3.1 Human Health

- 0-6 year old child residing in one of the new residential properties – **critical receptor**.

- Adult resident within one of the proposed properties or the care home;
- Worker within the care home;
- Site operatives during the construction phase.

5.3.2 Controlled Waters

- Surface water, - The nearest open surface water feature is a stream/drainage ditch associated with a "works" 306m to the east. However, as the site is within an urban area with a surface water drainage system that will collect and control the runoff, with reference to the "Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008", the surface water sensitivity has been deemed to be Very Low (L2 i.e. "no surface water within general area of the site (at least 250m) or closed drainage within the site)
- Groundwater – the shallow bedrock has been designated as Secondary A (undifferentiated) aquifer however, the deeper aquifer has been designated as a Zone 1c SPZ with a potable water abstraction being 1,897m from the site.

As the deep Principal aquifer is protected by the overlying London Clay, which separates it from the shallow Secondary aquifer the groundwater sensitivity assessment has been based upon the shallower aquifer, which has not been identified as having any usages. Therefore, the groundwater's sensitivity in the vicinity of the site is considered to be L1 (Low). If however, to proposed foundations for the development extend through the clay layer this assessment will need to be revised.

5.3.3 Other Environmental Receptors

- Flora and fauna – although currently detailed landscaping details are not available it is likely some green areas will be required. Therefore, this receptor has been included for completeness although due to the absence of topsoil across the site any future planting will need to be placed within prepared areas (e.g. sedum roofs or tree pits) that will require the import of a suitable growth medium. As such the geochemical properties of the current made ground is unlikely to have the potential to impact upon the grass, shrubs or trees as it will not be in direct contact with their roots.

5.4 **Potential Pathways**

5.4.1 Human Health

- Soil ingestion.
- Dermal contact.
- Inhalation of contaminant vapours/dust.

5.4.2 Buildings and services

- Direct contact with underlying contaminants.

5.4.3 Groundwater

- Migration of any contamination into the underlying secondary A aquifer

5.4.4 Surface water

- Due to the hard cover nature of the likely proposed development any surface water runoff will be collected and discharged into the urban drainage system via gullies and roof guttering down pipes. Therefore, as the runoff will not be able to come into contact with any made ground below the site and because its discharge will be controlled by the Local Water Authority, Council and/or Highway Authority it is not considered to be a significant route for contamination to leave the site;
- Infiltration of rainwater into the underlying aquifers, and then its lateral movement via groundwater. However, as with run off the presence of significant amounts of hard surfacing over the site will prevent the infiltration of rainwater, which will be collected and discharged into the drainage system, therefore this is also considered to be very limited potential pathway.

5.4.5 Flora and fauna

- Plant root uptake.

5.5 **Summary of Source – Pathway – Receptor Relationship**

Table 5.5.1, overleaf, highlights the source-pathway-receptor relationships that are considered viable across the site at this stage. This assessment forms the basis of the Tier 1 risk assessment. A qualitative risk estimation has been included in the table, the risk estimation is as per Annex 4 of 'Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008', (Appendix E).

Table 5.5.1: Potential Source – Pathway – Receptor Relationships

APC N ^o	Source	Pathway (s)	Receptor	Classification of Consequence	Classification of Probability	Classification of Risk
1	<u>On site</u> Made ground of unknown provenance or impacted natural soils resulting from site development activities	Oral ingestion	Future Occupiers/Workmen	Medium	Likely	Moderate Risk
		Vapour and dust inhalation	Future Occupiers/Workmen	Medium	Likely	Moderate Risk
		Dermal contact	Future Occupiers/Workmen	Medium	Likely	Moderate Risk
		Landfill & radon gas	Future Occupiers/buildings	Medium	Unlikely	Low Risk
		Downward migration	Groundwater	Medium	Unlikely	Low Risk
		Surface water runoff	Poole Harbour	Medium	Unlikely	Low Risk
		Direct contact	Buildings and Underground Services	Medium	Likely	Moderate Risk
		Uptake via root system	On-site flora	Mild	Unlikely	Very Low Risk
2	<u>On site & Off site</u> Possible presence of leaked PCB's from historic electrical equipment on site or the substation adjacent to the south-eastern boundary	Oral ingestion	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Vapour and dust inhalation	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Dermal contact	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Landfill & radon gas	Future Occupiers/buildings	Medium	Unlikely	Low Risk
		Downward migration	Groundwater	Medium	Unlikely	Low Risk
		Surface water runoff	Poole Harbour	Medium	Unlikely	Low Risk
		Direct contact	Buildings and Underground Services	Medium	Low likelihood	Moderate/Low Risk
		Uptake via root system	On-site flora	Mild	Unlikely	Very Low Risk
3	<u>Off site</u> On site migration of leaked/spilt fuels from the former petrol station adjacent to the south-western boundary or the tanks within the current SSE substation adjacent to the south-eastern boundary	Oral ingestion	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Vapour and dust inhalation	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Dermal contact	Future Occupiers/Workmen	Medium	Low likelihood	Moderate/Low Risk
		Landfill & radon gas	Future Occupiers/buildings	Medium	Unlikely	Low Risk
		Downward migration	Groundwater & then Poole harbour	Medium	Unlikely	Low Risk
		Surface water runoff	Poole Harbour	Medium	Unlikely	Low Risk
		Direct contact	Buildings and Underground Services	Medium	Low likelihood	Moderate/Low Risk
		Uptake via root system	On-site flora	Mild	Unlikely	Very Low Risk

5.6 Uncertainties and Assumptions

The results of the desk study searches have indicated that future occupiers, site users, building materials and the environment may possibly be at risk from the potential presence of contaminated made ground and to a lesser extent from PCB's or hydrocarbons that may have leached onto the site.

Therefore, it is considered that based upon the proposed future end use of the site, the identified potential contaminant sources and associated exposure scenarios are considered to warrant an intrusive investigation to more adequately characterise the risks posed so as identify mitigation/remediation works that may be necessary to protect human health. These works can also be used to determine the condition of the underlying groundwater quality to ensure controlled waters are protected.

6.0 CONCLUDING DISCUSSION

6.1 Conclusions

The desk study has revealed the following:

- The published geological maps indicate that the eastern section of the site is underlain by superficial Head material, although an available borehole log indicates the drift deposits are absent. Underlying this is Bognor Sand over London Clay;
- The British Geological Survey (BGS) states that the property is not within a radon affected area and therefore no radon protection measures are necessary in the construction of new dwellings;
- The underlying shallow sand bedrock has been classified as a Secondary A (undifferentiated) Aquifer. The underlying London Clay has been deemed Unproductive Strata but the deeper confined Principal aquifer is within a 1C SPZ but it is considered this is protected by the overlying London Clay and therefore the groundwater waste sensitivity is considered to be Low;
- The nearest surface water feature is 306m to the east therefore as the site is within an urban area surface water has been assessed as having a Very Low sensitivity;
- The site was open agricultural fields until the 1970's when the site was first developed as offices. Prior to the site clearance, approved in 2016 by Havant Council, the buildings underwent a number of significant redevelopments in the 1990's and 2000's;
- From the results of the Desk Study has identified the following potential contaminant source:
 - (i) Made ground of unknown provenance or impacted natural soils resulting from site development activities;
 - (ii) PCB's from either electrical equipment on the site when it was operated by an electrical company or on-site migration from the adjacent electricity substation adjacent to the south-eastern boundary; and
 - (iii) On-site migration of hydrocarbons from the former petrol station abutting the south-western boundary or the tanks noted within the SSE compound adjacent to the south-eastern boundary.
- Based upon the qualitative assessment of the site's environmental setting and condition it is considered that there is a very low to moderate risk to human health or other environmental receptors.

7.0 RECOMMENDATIONS

Based upon the findings of the desk study the following actions are recommendations:

- This report should be forwarded to the regulators for their review and approval to ensure they are in agreement with the findings and conclusions.
- With consideration of the anticipated proposed end use of the site for apartment blocks and a residential care home it is considered unlikely due the absence of any grossly contaminative past usage and the anticipated amount of hard cover that site will not pose a significant risk to future occupiers or controlled waters. However, a limited investigation will be required to confirm this but until the proposed development details are available and the potential pathways can be assessed the full scope of the investigations cannot be proposed but it is anticipated it will comprise of 6-7 No trial pits with chemical testing of selected shallow samples

APPENDICES

- A DRAWINGS
- B GROUNDSURE ENVIRONMENTAL SETTING DATA
- C HISTORICAL MAPS
- D SITE WALKOVER PHOTOGRAPHS
- E ANNEX 4 OF R&D66: 2008

APPENDIX A - Drawings

APPENDIX B – GroundSure Environmental Setting Data

APPENDIX C – Historical Maps

APPENDIX D – Site Walkover Photographs

APPENDIX E – Annex 4 of R&D66: 2008