

Appendix C. Geotechnical Report Extract



**Chesswood Middle School
Chesswood Road
Worthing
West Sussex**

**Combined Geotechnical and
Ground Contamination Risk Assessment**



Report No. LW25208

August 2014

Report prepared for the benefit of:

W Stirland Ltd
Redmoor Estate
Birdham
Chichester
West Sussex
PO20 7HT

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the combined geotechnical and 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 construct a new two storey standalone classroom block at Chesswood Road, Worthing, West Sussex. The existing hard play areas are also to be re-developed with a new informal hard play area adapted on the eastern part of the existing car park. An additional parking area is also proposed which is to be located to the east of the existing playing fields, accessed from Ladydell Road to the east.

The site comprised part of an open field at the time of the earliest historical map referenced in 1875. The site's history includes the use of greenhouses for a nursery, removal of the greenhouses and the subsequent school located on site.

The site currently comprises a single storey brick building, with additional temporary single storey classrooms located to the west. Hard surfaced play areas were noted to the west and east of the main school building with a grassed surfaced playing field beyond to the east. An asphalt surfaced car park was located by the entrance to the site, situated just south of the main school building.

The site is expected to be underlain by the River Terrace Deposits and/ or Raised Beach Deposits overlying the London Clay Formation over most of the site area and Lambeth Group deposits at its north easternmost extent. The ground investigation confirmed a shallow thickness of made ground in turn overlying River Terrace Deposits extending to depths of between 1.80m and 2.1m below ground level. The River Terrace Deposits were in turn underlain by Raised Beach Deposits. Neither the London Clay Formation nor the Lambeth Group soils were penetrated by the boreholes.

The River Terrace Deposits are classified as a Secondary B Aquifer, the Raised Beach Deposits and Lambeth Group deposits as a Secondary A Aquifer and the London Clay Formation as an Unproductive Stratum. 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. Standing water depths between 1.40m and 2.30m below ground level were recorded across the site.

Although the preliminary contamination risk assessment (desk study) identified potentially significant pollutant linkages, the ground investigation did not identify any elevated concentrations of the identified potential contaminants that would be considered to pose a significant risk to end users of the site or controlled waters beneath the site.

Precautions against shrinkage and heave for any new foundation system should assume a medium volume change potential for the fine grained River Terrace Deposits and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

A net allowable bearing capacity of 125kN/m² may be assumed for spread (pad or strip) foundations up to 1.0m across bearing within the River Terrace Deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm.

A DS-1 Design Sulfate Class and an AC-1 ACEC classification may be assumed as a minimum for the design of concrete in contact with the ground.

In view of the variable thickness of made ground and the presence of soils of medium volume change potential and medium compressibility soils underlying the site, it is recommended that ground floors for all sensitive structures should be suspended. However ground bearing floors may be employed subject to the conditions within this report being met.

It is recommended that, for the River Terrace Deposits or made ground soils, a CBR value of no greater than 4.5% should be adopted for preliminary pavement design. The subgrade is not likely to be susceptible to frost heave.

It is considered that the River Terrace Deposits and Raised Beach Deposits may be capable of discharging surface water run-off to the ground via soakaways, though the design of soakaway geometries should be carefully considered to ensure they are capable of half emptying within a 24hour period, as is recommended by the BRE 365 Guide.

2. SITE CONTEXT

2.1 Walkover Survey

The site comprises a 'T-shaped' plot of land located at Chesswood Road, Worthing, West Sussex and is centred on the approximate Ordnance Survey national grid reference TQ 1544 0354. A site location plan and site walkover plan are presented as Figure 1 and Figure 2, respectively. Photographs taken during the walkover survey are included in Appendix A.

The site is bounded along its north western boundary by a railway line and, with the exception of its frontage onto Chesswood Road to the south east, by residential properties on all other boundaries. Access onto the site was from Chesswood Road and through the asphalt surfaced car park within the southernmost part of the site.

At the time of the walkover survey, the north eastern section of the site largely comprised an open playing field, with an area of asphalt playground located adjacent to the central section of the site. The railway line is separated from this section of the site by a wire and mesh fence, with the railway line being approximately 1m higher than the site and set back from the boundary of the site by approximately 2.5m. A temporary portacabin is located adjacent to the south east of the asphalt playground area.

A single storey school building occupied the central part of the site, with an asphalt car park located along the southernmost boundary adjacent to Chesswood Road. A gas fired boiler room was located within the south western part of the main school building, with an electricity substation located adjacent to the south west corner of the school building.

The south western area of the site comprised an area of asphalt playground with a gardening storage building located on the boundary between the site and the residential properties to the south east. Two temporary portacabin classrooms were located in this area. A small garden area occupied the south westernmost part of the site.

2.1.1 Potential Contamination Sources Identified by Walkover Survey

The walkover survey identified the following potential source of contamination:

On Site

- Potential for localised Polychlorinated Biphenyl Compounds (PCB) from electricity substation located on site.

No significant off-site sources of contamination were identified by the Walkover Survey.

2.2 Expected Geology

The data presented in the GeoInsight section of the accompanying Geo-Environmental Data has been reviewed. Reference has also been made to the British Geological Survey lexicon of named rock units and British Geological Survey mapping data.

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

Table 1. Expected Geological Strata

Type	Stratum
Superficial Deposits	River Terrace Deposits (formerly denoted Brickearth)
	Raised Beach Deposits
Bedrock Deposits	London Clay Formation
	Lambeth Group

2.2.1 Alluvium

Although not identified directly beneath the site, Alluvium deposits are indicated 100m to the south of the site. Alluvium is a term for any material that has been transported and laid down by rivers. It can variably comprise sand and gravel, and, where deposited on flood plains may include compressible organic clay and silt. Peat and sand horizons may be present within the deposits, indicating localised changes within the depositional regime. In view of the potential presence of organic materials within these deposits and the coarse grained nature of the River Terrace Deposits and Storm Beach Deposits there is considered to be a potential risk to the site from ground gas migration from the Alluvium soils.

2.2.2 River Terrace Deposits

The River Terrace Deposits (formerly denoted Brickearth in this area) generally comprise well graded sandy fine to coarse gravel of flint. Locally sand or gravel strata may predominate. The gravels normally include a high proportion of sub-angular flint and chert.

2.2.3 Raised Beach Deposits

The Raised Beach Deposits consist of marine sand, silt, and pebbly sand, with sandy gravel and 'clean' flint shingle. For the most part the deposit is thinly bedded, calcareous, silty, fine to medium grained sand containing a few flint or chalk pebbles. The thickness of the deposit is highly variable and can differ a great deal over relatively small distances.

2.2.4 London Clay Formation

The London Clay Formation, which underlies the drift deposits over the majority of the site with the exception of its north easternmost extent, 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.

2.2.5 Lambeth Group

The Lambeth Group (formerly named the Woolwich and Reading Beds) comprises a complex and laterally variable sequence of sedimentary deposits including clay, silt, sand and gravel. Inter-laminated clay and sand deposits are common in the lower part of the succession. The component formations are the Upnor Formation, Reading Formation and Woolwich Formation.

It is shown to directly underlie the superficial deposits over the north easternmost extent of the site and elsewhere may be anticipated beneath the London Clay Formation deposits.

2.2.6 Geological Structure

The data identifies the fold axis of a major syncline as being present on site; the axis trends in an east-west direction crossing the southern part of the site where the existing school building is located.

2.2.7 Mining, Extractions and Natural Cavities

No significant risks from mining, natural cavities or extractions are reported on or in the vicinity of the site.

2.2.8 Ground Workings

A large area of brick works is shown to the north east of the site at a distance of some 25m at its closest extent. Such ground workings may present a risk of gas generation associated with degradation of organic material that may be incorporated in to backfill of the ground workings.

2.2.9 Natural Ground Subsidence

The maximum hazard rating of natural subsidence within the site boundary (including a 50m buffer zone) is very low. This hazard rating is based on the interrogation of the six British Geological Survey (BGS) natural ground stability datasets (GeoSure). These are reviewed individually in the table below.

Table 2. Natural Ground Subsidence Hazards

Section	Risk Assessment (GroundSure)	Remarks & ASI Ltd Assessment
Soil Volume Change Potential (Shrink-Swell)	Moderate	Can be mitigated by appropriate engineering techniques.
Landslides	Very Low	No significant risk has been identified.
Ground Dissolution of Soluble Rocks	Null	
Compressible Deposits	Negligible	
Collapsible Deposits	Low	
Running Sands	Low	

2.2.10 Radon Gas

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 BGS to be necessary in the

construction of new dwellings. It is recommended that discussions with building control should be undertaken to determine if they have any specific requirements in this connection.

2.2.11 Background Mean Soil Concentrations of Metals

The GroundSure GeoInsight report provides information on background chemistry of the soils in the area of the site. The following estimated mean concentrations of metals are reported. It should be noted that the data set may not reflect higher concentrations of contaminants that may be present within made ground soils or natural soils that may have been affected by current or historical uses of the site.

Table 3. Background Mean Soil Concentrations of Metals

Metal	Mean Soil Concentration (mg/kg)	Remarks & ASI Ltd Assessment
Arsenic	<15	The mean soil concentrations indicated are not considered to be significantly elevated for the proposed use.
Cadmium	<1.8	
Chromium	60 – 90	
Nickel	15 – 30	
Lead	<150	

2.2.12 Potential Contamination Sources identified by Geological Data Review

The following potential sources of contamination have been identified from the geological data review:

Off Site

- Potential for ground gas migration from Alluvium deposits indicated to the south of the site.
- Potential for ground gas migration from brick works to the north east of the site.

2.3 Hydrogeology

2.3.1 Groundwater Vulnerability & Soil Classification

The Environment Agency designates aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The River Terrace Deposits expected beneath the site are classified as a Secondary B Aquifer. Secondary B Aquifers are typically lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

The Raised Beach Deposits and Lambeth Group deposits expected beneath the site are classified as Secondary A Aquifers. Secondary A Aquifers are characterised by 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.

The London Clay Formation expected beneath the site is classified as an Unproductive Stratum. Unproductive Strata are deposits with low permeability that have negligible significance for water supply or river base flow.

2.3.2 Groundwater Source Protection Zones and Abstraction Licences

No groundwater abstraction licences are indicated within 2km of the site.

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.

2.4 Hydrology

2.4.1 Surface Water Features

No significant surface water features are recorded within 250m of the site.

2.4.2 Surface Water Abstraction Licences

No surface water abstraction licences are indicated within 2km of the Site.

2.4.3 Flooding

There are no Zone 2 or 3 floodplains, flood defences, areas benefiting from flood defences or areas used for flood storage within 250m of the site.

The British Geological Survey reports a moderate susceptibility to groundwater flooding within 50m of the site. The BGS consider the confidence rating of their data in this area to be moderate.

3. SITE HISTORY

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 4. Summary of Significant Features Identified on Historical Maps

Map Details	On-Site	In the Vicinity of the Site	Significant Potential Contamination Sources
1875 1:2,500	The site comprises part of an open field.	A railway line is shown immediately to the north west of the site. Nursery buildings are shown approximately 60m south of the site boundary. Chesswood road is shown directly south of the site boundary.	
1898 1:2,500	Nursery buildings are now shown across the site. A road leading to an underpass to the railway is shown on the Western part of the site.	Nursery buildings are now shown directly north, east and south of the site. Residential housing is shown directly west and approximately 110m south of the site. "Homefield Park" is shown approximately 40m southwest of the site. A pond is shown approximately 120m southwest of the site boundary.	Potential for petroleum hydrocarbon contamination associated with potential use of paraffin heaters within greenhouses
1912 1:2,500	Increase in size and number of nursery buildings on site.	Increase in nursery buildings are shown in the vicinity of the site.	Potential for petroleum hydrocarbon contamination associated with potential use of paraffin heaters within greenhouses.
1932 1:2,500	No significant changes are shown on site.	Residential housing is shown 20m north east of the site boundary.	

LW25208

Map Details	On-Site	In the Vicinity of the Site	Significant Potential Contamination Sources
1938 1:10,560	No significant changes are shown on site.	Nursery buildings directly north of the railway have been removed and have been replaced with roads. A hospital is shown southwest of the site.	
1943 1:2,500	Some nursery buildings have been removed from site.	Nursery buildings directly south of the site have been removed and have been replaced with residential buildings. Residential housing is shown directly north of the site.	Potential for metal, PAH compound and asbestos contamination within made ground soils from demolition works.
1950 1:10,560	All glass house buildings have been removed from site. Small structures are shown to remain located centrally on the site and adjacent to the railway underpass.	No significant changes are shown off site.	Potential for metal, PAH compound and asbestos contamination within made ground soils from demolition works.
1952 1:1,250	Site shown as comprising an allotment, nursery and Romano – British Burial Ground. An unidentified building is shown across the middle of the site.	Tank shown approximately 105m southwest of the site has been removed and is now shown as a paddling pool.	Reference to online information records the burial ground to be an archaeological feature dating, approximately, to the 4 th century.
1981 1:10,000	A school building is shown on site.	An additional hospital building is shown approximately 250m southwest of the site.	
1994 1:1,250	The school is labelled as "Lyndhurst Middle School".	No significant changes are shown within the vicinity of the site.	
2002 1:10,000	The school building on site has increased in size with two additional buildings at the western end of the site.	Buildings from the hospital, southwest of the site, have been removed with additional buildings being shown approximately 250m from the site.	
2014 1:10,000	No significant changes are shown on site.	No significant changes are shown within the vicinity of the site.	

3.1 Potential Contamination Sources identified by Historical Map Review

The following potential sources of contamination were identified from the historical map review:

On Site

- Potential for petroleum hydrocarbon contamination associated with potential use of paraffin heaters within greenhouses.
- Potential for metal, PAH compound and asbestos contamination within made ground soils from demolition and redevelopment works.

Off Site

- No significant off-site sources of contamination were identified by the historical map review.

4. ENVIRONMENTAL DATA REVIEW

Records of potentially contaminative activities, authorisations, pollution incidents and land uses recorded by the regulatory authorities and compiled by GroundSure in their EnviroInsight Report have been reviewed. Data are supplied by the British Geological Survey (BGS), Environment Agency, Health Protection Agency, The Coal Authority and Local Authorities.

Ashdown Site Investigation Ltd. (ASI Ltd.) has commented, where appropriate, on the potential risks identified both to and from the site.

Table 5. Environmental Permits, Incidents and Registers

Section	Remarks	ASI Ltd Assessment
Records of Category 3 or 4 Radioactive Substances Licences	There is one entry within 400m of the site. This refers to Allergy Therapeutics Ltd, which is 397m from the site.	In view of the distance from the site, this entry is not considered to pose a significant risk.

Table 6. Current Land Uses

Section	Remarks	ASI Ltd Assessment
Current Industrial Data	There are 15 entries within 250m of the site. The closest is Premier Computer Services which is shown 84m south of the site. Three entries for Electrical Substations are shown within 250m of the site boundary at 147m, 150m and 167m respectively.	In view of the distances from the site, these entries are not considered to pose a significant risk.

No landfills or other waste sites considered to pose a significant risk have been identified on or in the vicinity of the site.

No recorded environmentally sensitive sites have been identified in the vicinity of the site.

4.1 Potential Contamination Sources Identified by Environmental Data Review

No significant sources of contamination were identified either on or off site by the environmental data review.

6. GROUND INVESTIGATION

6.1 Introduction

The ground investigation comprised the excavation of a series of dynamic sampler and hand augered boreholes together with hand dug pits. The fieldwork was carried out on 8th July 2014. The exploratory hole locations are shown on Figure 3.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix C, together with notes to assist in the interpretation of the records.

6.2 Exploratory Holes

6.2.1 Dynamic Sampler Boreholes

Dynamic Sampler Boreholes

Five boreholes (designated WS1 to WS5) were drilled each to a depth of 3.00m below ground level.

The boreholes were formed by a series of 1.0m long, open ended, hollow steel tubes of between 35mm and 100mm diameter, each containing a removable plastic liner. The tubes, progressively reducing in diameter, were driven into the ground by means of a track-mounted drop weight. Each tube was extracted from the ground using a hydraulically operated jack and the enclosed sample was recovered in its plastic liner.

The system enables sub-samples to be taken for detailed examination and laboratory testing.

6.2.2 Trial Pits

Three trial pits (designated HD1 to HD3) were dug within the proposed hardstanding areas using hand tools to depths of between 0.80m and 0.95m below ground level to enable in situ testing to be carried out.

6.2.3 Hand Auger Boreholes

A single borehole (designated HA1) was bored to a depth of 1.00m. The hand auger enables disturbed soil samples to be taken using a cutting tool twisted into the soil by hand.

6.3 Sampling

Disturbed samples of soil were taken at the depths shown in the exploratory hole records and were collected in plastic bags, plastic tubs or amber jars fitted with gas tight lids.

On collection the amber jars were stored in cool boxes with cooling blocks to maintain temperatures below 4°C until transferred to refrigerators upon return to the office and subsequently forwarded to the external accredited chemical testing laboratory.

6.4 In Situ Testing

The depths of in situ testing, together with the test results, are either given on the exploratory hole records or are summarised separately in Appendix C. Notes providing additional information on the tests performed are included in the appendix.

6.4.1 DPSH Dynamic Probe (Super Heavy) Testing

Dynamic Probe Tests

Continuous dynamic probe tests were made adjacent to each of the dynamic sampler boreholes. Probing was undertaken in accordance with BS EN ISO 22476-2:2005 using a super heavy DPSH-B probing geometry.

The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

The blow counts recorded and the calculated dynamic point resistances, which account for inertia of the anvil and driving rods, are presented on the probe records and/or separately in Appendix C.

6.4.2 Undrained Shear Strength

Undrained shear strength determinations were made in situ within the fine grained soils using a Geonor hand shear vane.

Additionally undrained shear strength determinations were made within samples of the fine grained soils held in the dynamic sampler liners using a hand penetrometer.

6.4.3 California Bearing Ratio Tests

CBR Testing

Testing to determine the in situ California Bearing Ratio (CBR) of soils was conducted from ground level adjacent to boreholes WS2, WS4 and WS5 and each of the hand dug pits using a Transport Road Laboratory (TRL) cone penetrometer.

6.4.4 Soakage Testing

Soakage Testing

Falling head soakage tests were undertaken in boreholes WS2 and WS5 at depths of 3.00m below ground level. The tests were carried out in general accordance with The Soakaway Design Guide published by Kent County Council (2000).

Falling head soakage tests were also carried out within hand dug pits HD2 and HD3 at depths of 0.95m and 0.85m, respectively. The tests were carried out in general accordance with Building Research Establishment (BRE) Digest 365 (1991), other than the pits were filled only once rather than the three times suggested by the digest.

6.5 Installations

Gas and groundwater monitoring standpipes were installed to depths of 3.00m in boreholes WS1, WS2 and WS3. Descriptions of the installations are shown on the exploratory hole records in Appendix C.

The concentrations of gases and depths to groundwater were recorded within the standpipes on three occasions between 18th and 30th July 2014. The readings are presented in Appendix C.

6.6 Laboratory Testing

Laboratory testing was scheduled by Ashdown Site Investigation Ltd. Results from the laboratory tests are provided in Appendix D.

6.6.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377:1990 Parts 1 to 8 'Methods of test for soils for civil engineering purposes'. Notes to assist with the interpretation of the tests are contained within Appendix D.

The types and numbers of tests carried out are detailed in the following table.

Table 10. Geotechnical Testing

Type of test	No. of samples tested
Index Properties and Moisture Content	5
Particle Size Distribution	1

6.6.2 Chemical Testing

Chemical testing of selected samples was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control. The types and numbers of tests undertaken are detailed in the following table.

Table 11. Chemical Testing

Determinand	No. of soil samples tested
Arsenic	6
Cadmium	6
Chromium	6
Lead	6
Mercury	6
Nickel	6
Copper	6
Zinc	6

LW25208

Determinand	No. of soil samples tested
Selenium	6
Hexavalent Chromium	6
Water Soluble Boron	6
pH	6
Soil Organic Matter	6
Speciated Polycyclic aromatic hydrocarbons (PAH) US Environmental protection Agency Suite	6
Speciated Petroleum Hydrocarbons (equivalent carbon weight fractions)	2
Asbestos Screen	2
PCB (7 Congeners)	1
BRE SD1 Suite A	3

7. GROUND CONDITIONS

7.1 Stratigraphy

7.1.1 Surface Covering

Surface Covering

Boreholes WS1, WS2 and WS5, and trial pits HD2 and HD3 were excavated through a surface covering of topsoil some 100mm to 250mm thick. The topsoil encountered at HD3 was recorded to contain gravel of clinker. The topsoil recovered at HA1 was recorded to be 700mm in thickness.

Borehole WS3 was excavated through 50mm of asphalt over 70mm sub-base.

No surfacing materials were encountered at the remaining exploratory hole positions.

7.1.2 Made Ground

Made Ground

With the exception of HD3 and HA1, where it was not encountered, made ground, generally comprising gravelly sandy silty clay containing a variable proportion of flint, brick and chalk was recorded to depths of between 0.30m and 0.70m. Gravel of clinker was recorded within the made ground in HD2 only.

7.1.3 River Terrace Deposits

River Terrace Deposits

Underlying the made ground/surfacing, the investigation progressed into undisturbed firm to stiff gravelly clay deposits to the full depth of the shallower hand dug pits and hand auger borehole that were excavated to depths of between 0.80m and 1.00m, and to depths of between 1.80m and 2.10m in the remaining deeper boreholes.

These soils are considered to represent the River Terrace Deposits indicated on the published geological map.

7.1.4 Raised Beach Deposits

Beneath the River Terrace Deposits, the dynamic sampler boreholes encountered generally medium dense gravelly sand. These soils continued to the full depth of the investigation and are considered to be representative of the Raised Beach Deposits indicated on the published geology map.

7.1.5 London Clay Formation

The investigation did not penetrate into the underlying deposits of the London Clay Formation.

7.2 Stability

Instability was recorded locally within the coarse grained Raised Beach Deposits.

7.3 Groundwater Conditions

Ground Water Conditions

Groundwater was recorded standing at depths of between 1.2m and 2.1m below ground level on completion of boreholes WS1 to WS4. The remain positions were recorded to be dry on completion.

Standing water depths of between 1.40m and 2.30m were recorded in the standpipes during the monitoring visits.

8. GEOTECHNICAL ASSESSMENT

The geotechnical assessment has been prepared in connection with the development proposals shown on the drawing produced by W. Stirland (Reference FS-101, dated May 2014).

In summary this drawing indicates the proposed development to comprise the erection of a new building off the north east corner of the existing school building, re-development of the existing hard play areas including an adjustment to the southern car park to accommodate a new informal hard play area and a new car park in the far north eastern extent of the site.

At the time of writing, no details were available concerning the specific loads likely to be applied to the foundations.

8.1 Foundations

8.1.1 Soil Shrinkage/Heave Potential

The undisturbed sand and gravel soils of the Raised Beach Deposits may be considered to be non-plastic and hence non-shrinkable.

The overlying fine grained soils of the River Terrace Deposits have been classified as clays of low to medium plasticity and with modified plasticity indices of up to 27% the soils may be expected to exhibit up to a medium volume change potential.

It is recommended that the design of precautions against shrinkage and heave for any new foundation system should assume a medium volume change potential for the fine grained River Terrace Deposits and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

Whilst this report has been prepared to provide advice to assist designers in undertaking detailed design, the report itself does not represent a detailed design statement. Detailed foundation design, including assessment of minimum founding depths for spread foundations, and requirements for placement of void formers etc., should take into account the volume change potential of the soil and the presence of trees (previous, present and proposed).

It is recommended that an arboriculturalist should be consulted to establish the species and maturity of existing trees in any areas where shallow foundations are proposed. It would be prudent to review any available historical photographs or detailed site plans (if available) to establish the location of any felled trees that may affect foundation design. The information obtained from the arboricultural survey, information on proposed planting schemes and the findings of this report should be provided to the structural engineer responsible for the design of foundation systems.

8.1.2 Spread Foundations

Unless evidence exists to the contrary, all made ground and any soils disturbed by the construction or removal of any previously existing foundations or services should be regarded as being variable in nature and state of compaction and, as such, unsuitable as a founding medium for shallow footings. New footings should be constructed so as to bear below such soils and onto undisturbed, competent, natural deposits.

For design purposes, a net allowable bearing capacity of 125kN/m² may be assumed for spread (pad or strip) foundations up to 1.0m across bearing within the River Terrace Deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm. In general a minimum depth to formation of 0.90m should be adopted, although foundations should be deepened where made ground is found to extend below this depth or where there is a requirement to protect foundations against seasonal soil volume changes induced by trees.

Care must be taken to ensure that new foundations do not undermine or impose additional loading (vertical or lateral) on existing foundations. Similarly, the construction of new foundations should be undertaken carefully and monitored in those situations where temporary works could affect existing foundations.

8.2

Groundwater

Groundwater

Standing water depths between 1.40m and 2.30m below ground level were recorded across the site, during the monitoring visits. Excavations beneath the water table, and particularly within coarse grained soils, are likely to require active groundwater control to maintain adequately dry working conditions and excavation stability.

Where excavations are proposed to extend significantly below the groundwater table it is recommended that trial pumping from proposed formation depths should be undertaken in advance of detailed design to fully establish requirements for groundwater control at this site.

It is possible that heavy precipitation during construction could lead to the ingress of perched groundwater or surface water run-off into excavations. In such circumstances it would be expected that water within excavations would be adequately managed by either pumping from sumps or natural drainage, or a combination of the two.

8.3 Stability of Excavations

All unsupported excavations within Raised Beach Deposits must be assumed to be subject to short term instability. In particular, excavations below the water table are likely to be problematic without adequate groundwater control, as discussed above.

It would be expected that unsupported excavations within the fine grained River Terrace Deposits may remain stable for a short period of time.

Where excavations are required to remain stable in the medium or long term within the fine grained River Terrace Deposit soils, or in any case where stable excavations are required within the Raised Beach Deposits, excavations should either be suitably supported or side slopes should be battered back to a safe angle of repose.

Where personnel access is required into any excavation, its stability must be assessed by a suitably qualified, experienced and responsible person. In any case where excavation sides are not battered back to a safe angle of repose, it is recommended that personnel access into unsupported excavations greater than 1.2m depth should be prohibited.

Particular attention must be paid to ensuring the stability of nearby structures, services and neighbouring sites as well as the adjacent railway.

8.4 Aggressivity to Concrete

In consideration of the soils encountered beneath the site and its historical usage it is considered that 'natural ground conditions' may be assumed for the purpose of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the expected low to medium permeability of the natural soils and the noted occurrence of groundwater seepages, 'mobile groundwater' conditions should be assumed.

Assessment of the Chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1 of Table C1 of the Building Research Establishment Special Digest No 1 "Concrete in aggressive ground", 2005. The results of the pH tests indicate that the underlying soils are slightly alkaline.

In accordance with the digest, a DS-1 Design Sulfate Class and an AC-1 ACEC classification may be assumed as a minimum for the design of concrete in contact with the ground.

8.5 Ground Floors

In view of the variable thickness of made ground and the presence of soils of medium volume change potential and medium compressibility soils underlying the site, it is recommended that ground floors for all sensitive structures should be suspended.

Current guidance suggests that ground bearing floor slabs may, however, be considered where made ground soils are not present or are to be removed from beneath building footprints and the depth of foundations required to protect against seasonal soil volume changes close to trees is less than 1.5m. In such circumstances further works should be undertaken to demonstrate, that close to the time of construction, no significant soil desiccation is present. If ground bearing floors are adopted it is recommended that the potential for differential movement, both between the floor slab and walls and across the floor slab itself, should be anticipated. Such floors should be fully debonded from walls. Formations should be adequately proof rolled and any excessively soft materials excavated and replaced with a suitable, well graded granular fill. The depth of any fill should be limited to a maximum of 600mm unless placed to an engineering specification designed to limit internal settlement of the fill materials to a tolerance to be advised by the designer.

The detailing of services through, or under, ground-bearing floors should incorporate flexible connections and, where appropriate, enhanced falls.

8.6 Pavement Design

Pavement Design

Cone penetrometer tests undertaken to establish the California bearing ratio (CBR) of the in situ soils indicated CBR values ranging between 4% and 197% but typically in the range 6% to 20% in the underlying River Terrace Deposits at the time of the investigation. It is noted that CBR values are, in part, dependent on the moisture content of the tested soils and are consequently subject to seasonal variation.

The former Department of the Environment, Transport and the Regions Design Manual for Roads and Bridges, Volume 7 (Pavement Design & Maintenance), Section 2, Part 2 1994 provides a useful correlation between plasticity indices and equilibrium (long term) CBR values. This guidance suggests a design equilibrium CBR value of 4.5% to 5.0% would be applicable to the natural soils for the construction of thin pavement under poor to average

construction conditions and assuming a low (lower than 1m below formation level) groundwater table.

Based upon review of the in situ test results and the quoted guidance it is recommended that, for the River Terrace Deposits or made ground soils, a CBR value of no greater than 4.5% should be adopted for preliminary pavement design.

All formations should be proof rolled and any excessively large, soft, degradable or otherwise unsuitable materials thus identified should be removed and be replaced with well compacted coarse grained fill. Prepared subgrades should be protected from severe adverse weather by ensuring they are graded to falls to prevent ponding, and they should be reasonably protected from trafficking during construction.

The subgrade may be assumed not to be susceptible to frost heave.

8.7 Drainage

Drainage & Soakaway

In situ soakage testing was carried out within the shallow hand dug pits in general accordance with the requirements of BRE 365 'Soakaway Design'. From the results of the soakage tests, calculations were made to determine the infiltration rate that could be expected for soakaways constructed into the near surface River Terrace Deposits.

For the test conducted within trial pit HD3 the soil infiltration rate (f) was calculated by dividing the volume of water lost between 75% and 25% of the initial test depth by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period (time taken for the water level to fall between 75% and 25% of the initial test depth), and its base area. This figure was then divided by the test duration to give the soil infiltration rate in metres per second.

During the test performed within trial pit HD2, the water level within the test pit did not fall below 25% of the initial test depth and calculation of the soil infiltration rate in accordance with the BRE digest was not possible. For this test, the soil infiltration rate has therefore been calculated by dividing the volume of water lost during the test by the product of the average surface area of the trial pit in contact with water during the test period and the test duration in seconds.

In addition, in situ soakage testing was undertaken within two dynamic sampler boreholes in accordance with 'The Soakaway Design Guide' published by Kent County Council (July 2000) to ascertain the infiltration rate of the coarser grained soils of the Raised Beach Deposits. From the results of the test carried out within borehole WS5 calculations were made in accordance with the guide to estimate the infiltration rate that could be expected for soakaways constructed to discharge into the underlying soils within the test zone. For the test carried out within borehole WS2 the water level could not be raised significantly above the base of the casing and as such the infiltration rate for this test has been calculated by dividing the volume of water lost during the test by the product of the average surface area of the sides in contact with water during the test period and the test duration in seconds.

The following infiltration rates were derived from the tests:

HD2 **$f = 2.7 \times 10^{-6} \text{ m/s}$**

HD3 **$f = 5.2 \times 10^{-5} \text{ m/s}$**

LW25208

WS2 $f = 3.8 \times 10^{-5} \text{ m/s}$

WS5 $f = 2.7 \times 10^{-6} \text{ m/s}$ under 2m head of water assumed

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

It is considered that the River Terrace Deposits and Raised Beach Deposits are likely to be capable of discharging surface water run-off to the ground via soakaways, though the design of soakaway geometries should be carefully considered to ensure they are capable of half emptying within a 24hour period, as is recommended by the BRE 365 Guide.

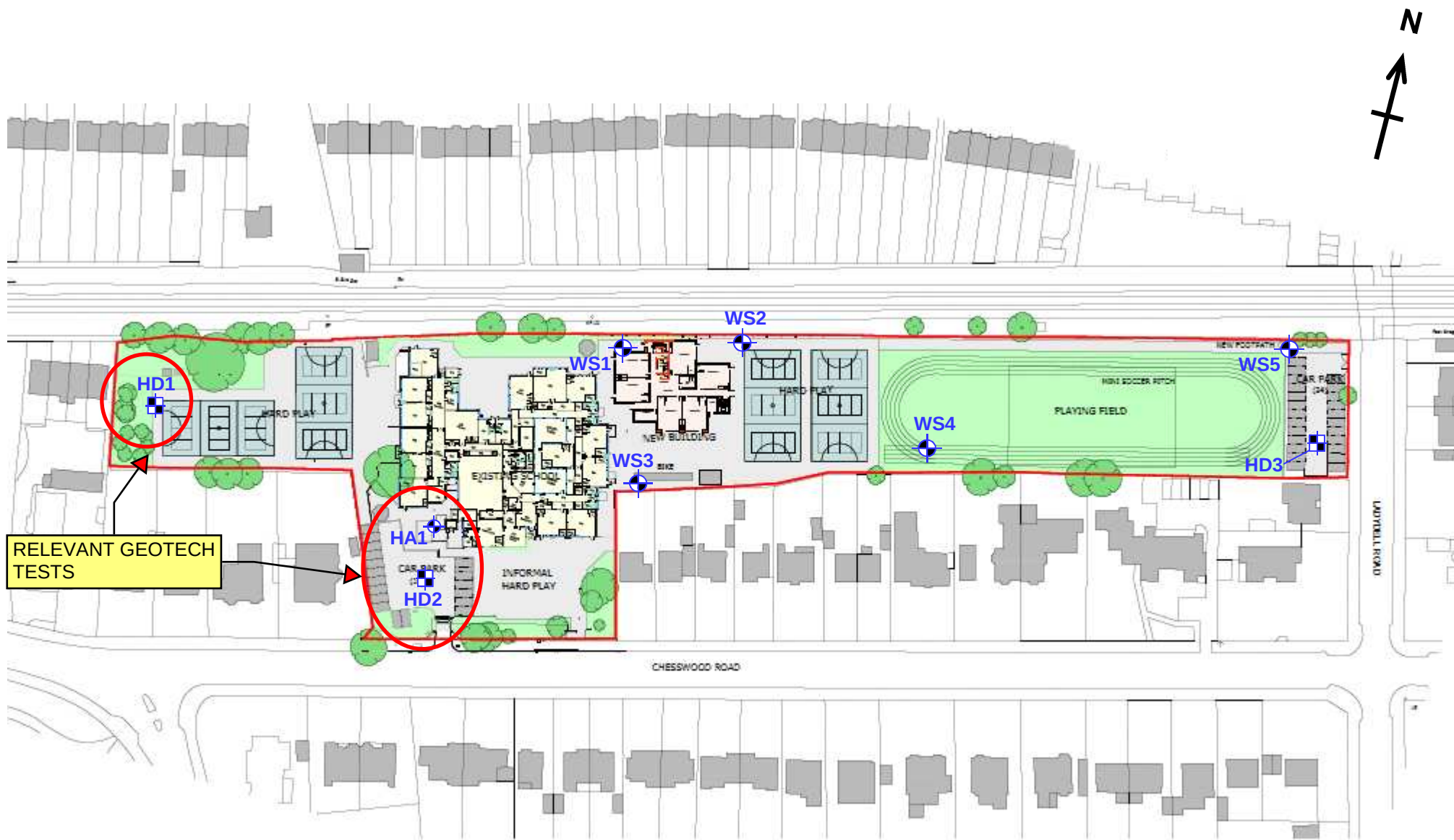
To minimise the risk of subsidence, soakaways should be constructed a minimum of 5.0m away from proposed or existing buildings.

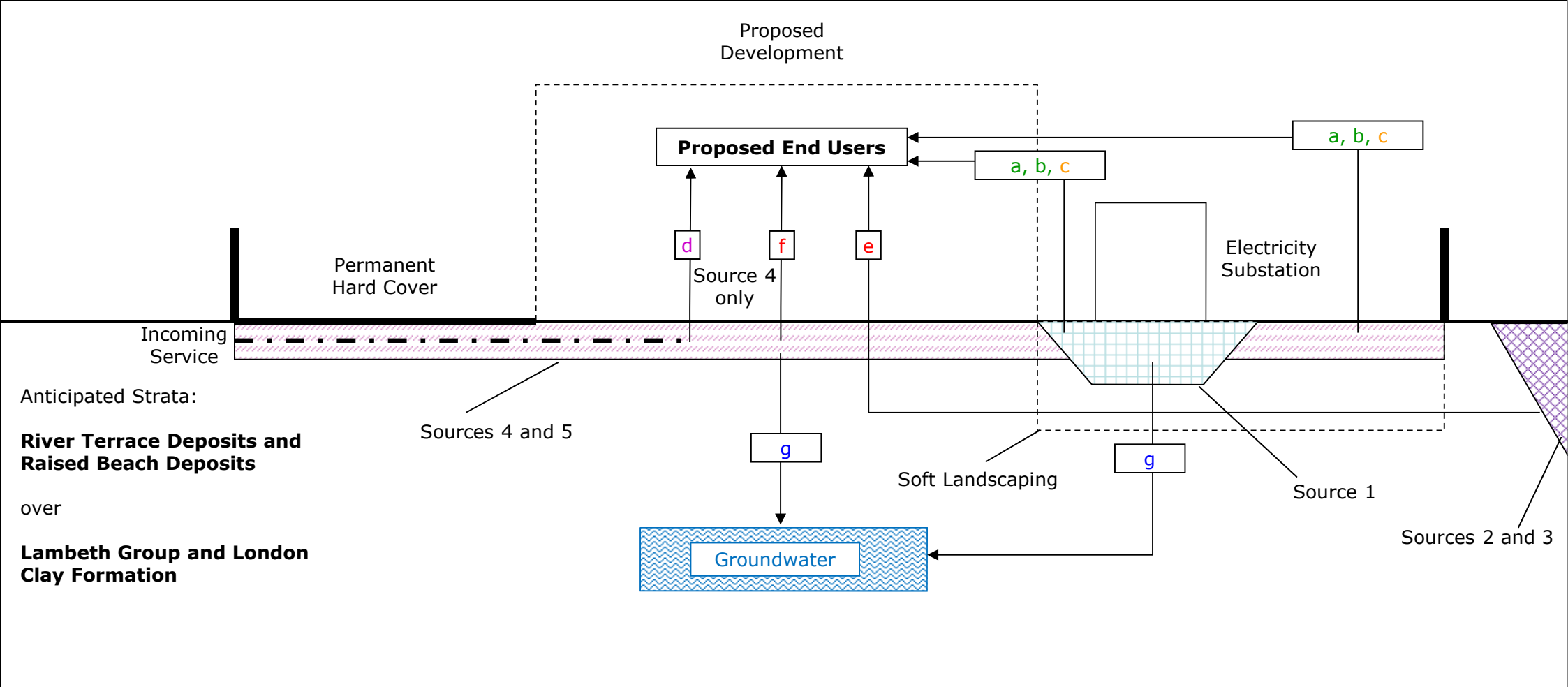
5m Away

In the event that discharge to ground via soakaways is proposed, it is recommended that designers refer to Pollution Prevention Guidance Notes (PPGs) published by the Environment Agency for advice on legal requirements and good practice to reduce risks to groundwater. In particular reference should be made to PPGs 1 and 3, providing general advice on the prevention of pollution and the use and design of oil separators in surface water drainage systems, respectively. The Local Authority and/or relevant water company should be consulted in relation to consent for discharge of water from rooftops, areas of hardstanding and roadways to drains.

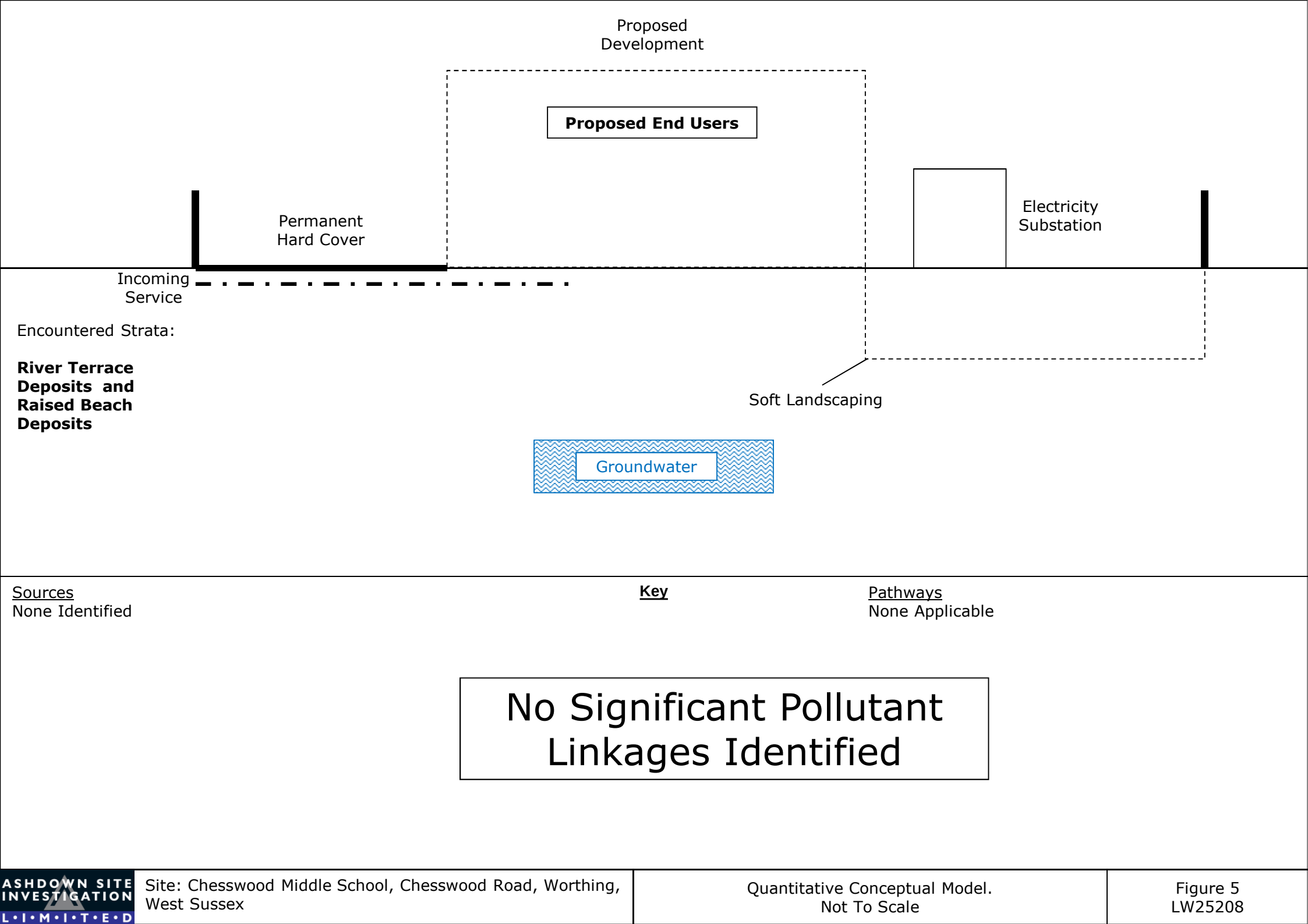
FIGURES

- Figure 1 Site Location Plan
 - Figure 2 Site Walkover Plan
 - Figure 3 Borehole Location Plan showing Proposed Development Layout
 - Figure 4 Preliminary Conceptual Model
 - Figure 5 Quantitative Conceptual Model
-

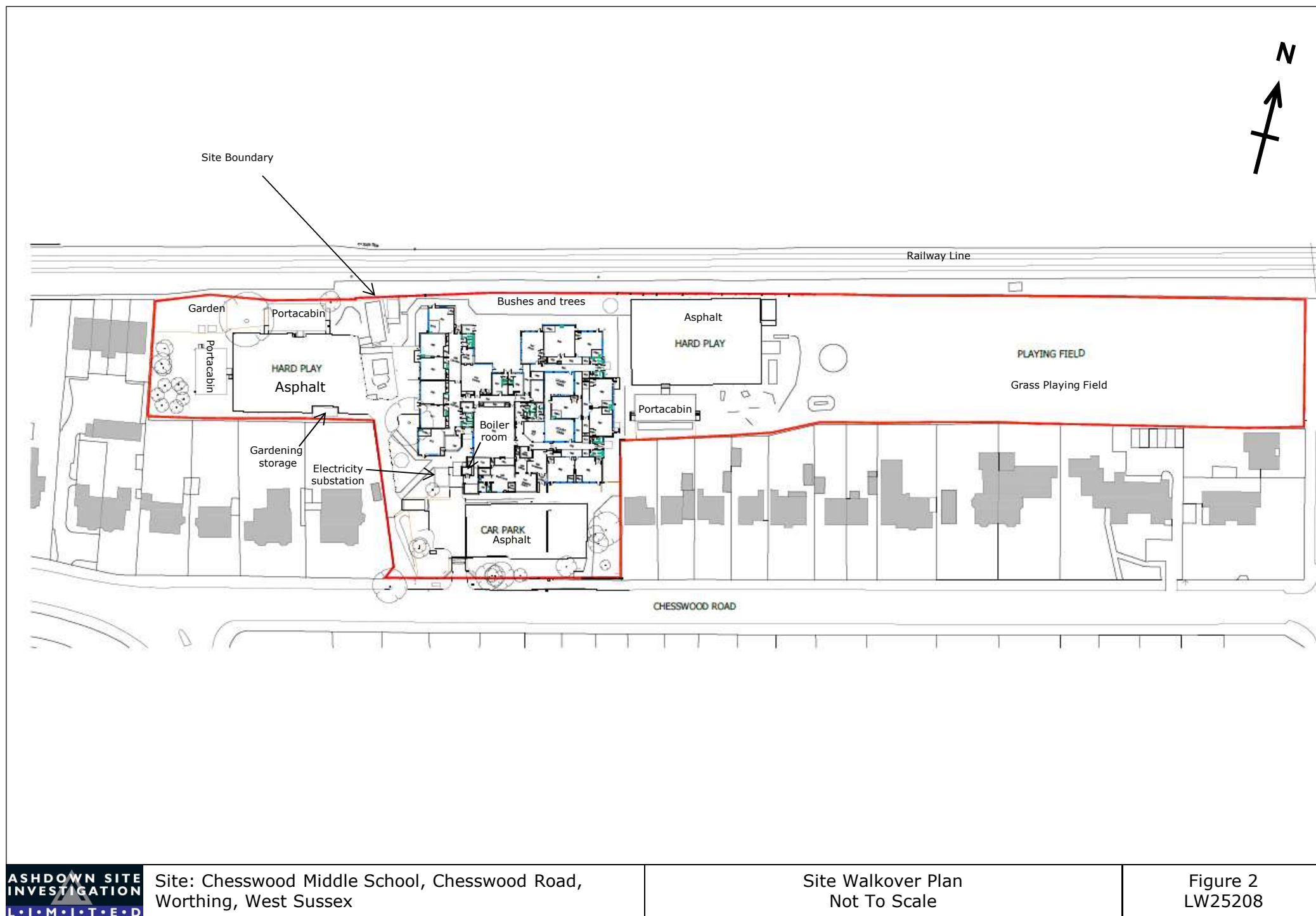




Sources	Key	Pathways
1) Potential for localised PCB contamination from electricity substation located on site		a. Dermal contact with soil (Indoor & Outdoor);
2) Potential for ground gas migration from Alluvium deposits indicated to the south of the site		b. Direct soil and dust ingestion;
3) Potential for ground gas migration from brick works to the north east of the site.		c. Inhalation of indoor and outdoor soil dust;
4) Potential for petroleum hydrocarbon contamination associated with potential use of paraffin heaters within greenhouses.		d. Contamination of incoming services;;
5) Potential for metal, PAH compound and asbestos contamination within made ground soils from demolition and redevelopment works.		e. Inhalation of ground gases;
		f. Inhalation of soil vapours; and
		g. Migration through soils and groundwater flow.







APPENDIX C

Exploratory Hole Notes

In Situ Testing Notes

Exploratory Hole Records

DPSH Dynamic Probe Records

Summary of In Situ TRL Cone Penetrometer (CBR) Test Results

Summary of Borehole Falling Head Soakage Test Results

Summary of Trial Pit Falling Head Soakage Test Results

Summary of Gas Analyses and Water Depths

Borehole No.: WS1

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/14

End Date: 08/07/14

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J T	0.30						Topsoil over. MADE GROUND: Brown slightly gravelly sandy clay. Gravel is fine to medium flint and brick.
	J T	0.50					0.70	
	D H	1.00		100				Firm to stiff orange brown and grey sandy CLAY with occasional iron staining. Chesswood Middle School. (River Terrace Deposits)
	V	1.10		120				
	H	1.50		75			1.90	Medium dense brown very clayey very gravelly SAND. Gravel is fine to medium flint. (River Terrace Deposits)
	D	1.60					2.70	
	D	2.20					3.00	Medium dense orange brown silty very gravelly fine to medium SAND. Gravel is fine to coarse flint. (Raised Beach Deposits)
	D	2.85						End of Borehole

Remarks:

Standing water depth at 2.00m on completion of borehole.

Borehole unstable below 2.50m on completion.

Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: JG



GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS2

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/14

End Date: 08/07/14

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J T	0.30					0.40	Topsoil over, MADE GROUND: Brown slightly gravelly silty clay. Gravel is fine to medium flint and rare brick.
	D H	1.00		100				Firm to stiff brown slightly gravelly sandy CLAY with iron staining. Gravel is fine to medium flint. (River Terrace Deposits)
	V	1.10		110				
	D H	1.50		155			1.80	
	D	1.90					2.05	Firm brown sandy gravelly CLAY. Gravel is fine flint and chalk. (River Terrace Deposits)
	D	2.50					3.00	Medium dense brown gravelly fine to medium SAND. Gravel is fine to medium flint. (Raised Beach Deposits)
								End of Borehole

Remarks:

Standing water depth at 2.10m on completion of borehole.

Borehole unstable below 2.30m on completion.

Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel
surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas
tap and security cover concreted flush with ground surface.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: JG



GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS3

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/14

End Date: 08/07/14

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J T	0.20					0.12	Asphalt (50mm) over, MADE GROUND: Grey sandy fine to coarse gravel of limestone (sub base).
							0.30	MADE GROUND: Grey brown slightly gravelly sandy clay. Gravel is fine to coarse brick.
	D	0.80		110				Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to medium flint. (River Terrace Deposits)
	V	1.00		130				
	H	1.10						
	D H	1.50		75			1.80	
	D	1.90						Medium dense orange brown slightly gravelly fine to medium SAND. Gravel is fine to medium flint. (Raised Beach Deposits)
							3.00	
								End of Borehole

Remarks:

Standing water depth at 1.20m on completion of borehole.

Borehole stable on completion.

Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: JG



GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS4

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/14

End Date: 08/07/14

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J T	0.40					0.60	MADE GROUND: Grey brown fine to coarse gravel of flint and chalk.
	D	0.80						Firm to stiff brown slightly gravelly sandy CLAY with much iron staining. Gravel is fine to medium flint. (River Terrace Deposits)
	H	1.00		100				
	V	1.10		130				
	D H	1.60		210			2.10	Medium dense green brown slightly gravelly fine to medium SAND. Gravel is fine to medium flint. (Raised Beach Deposits)
	D	2.20	2.70				3.00	
								End of Borehole

Remarks:

Standing water depth at 2.00m on completion of borehole.

Borehole stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: JG



GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS5

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/14

End Date: 08/07/14

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 15 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							0.00	Ground Level
	J T	0.25					0.40	Topsoil over, MADE GROUND: Brown slightly gravelly sandy clay. Gravel is fine to medium flint and fine to coarse brick.
	D	0.75						Firm to stiff brown slightly gravelly sandy CLAY. Gravel is fine to medium flint. (River Terrace Deposits)
	H V	1.00 1.00		170 >130				
	D H	1.50		120			1.80	
	D	2.10						Medium to dense brown slightly gravelly fine to medium SAND. Gravel is fine to medium flint. (Raised Beach Deposits)
	D	2.90					3.00	
								End of Borehole

Remarks:

Boerhole dry on completion.

Borehole collapsed to 2.20m on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: JG

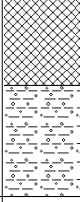
Trial Pit No.: HD1

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/2014

End Date: 08/07/2014

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T B	0.50	0.80			0.35	MADE GROUND: Light brown slightly gravelly silty clay with fine roots. Gravel is fine to coarse flint, brick and concrete.
						Firm orange brown slightly gravelly CLAY with some fine roots. Gravel is fine to medium flint. (River Terrace Deposits)
					0.80	
						End of Pit



**GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS**
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

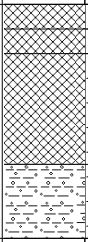
Trial Pit No.: HD2

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/2014

End Date: 08/07/2014

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T B J T	0.40 0.70 0.90	0.90			0.10	Topsoil.
					0.20	MADE GROUND: Brown slightly gravelly clay with some fine roots. Gravel is fine to medium flint, brick, concrete and chalk.
					0.65	MADE GROUND: Orange brown slightly gravelly clay with some fine roots. Gravel is fine to coarse brick, clinker, flint and chalk. becoming gravelly with occasional cobbles of flint below 0.40m depth.
					0.95	Firm orange brown slightly gravelly clay with occasional pockets of sand. Gravel is fine to medium flint. (River Terrace Deposits)
						End of Pit

Remarks:

Trial pit dry and stable on completion.

Excavation Method: Hand Dug

Dimensions: 0.30m x 0.30m

Made By: SW



GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

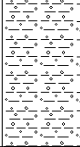
Trial Pit No.: HD3

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/2014

End Date: 08/07/2014

Samples and Testing				Strata		
Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
	From (m)	To (m)				
					0.00	Ground Level
J T	0.20	0.85			0.25	Topsoil with occasional fine to medium gravel of flint, brick, clinker and chalk and some fine roots.
B	0.60					Firm to stiff orange brown gravelly CLAY. Gravel is fine to coarse flint and chalk. (River Terrace Deposits)
J T	0.85					becoming slightly gravelly towards base.
					0.85	End of Pit

Borehole No.: HA1

Site Name: Chesswood Middle School, Chesswood Road, Worthing, W. Sussex

Job No.: LW25208

Start Date: 08/07/2014

End Date: 08/07/2014

Standpipe Installation	Samples and Testing				Strata	
	Sample Type	Depths		Vane/ Pen Test N Value	Legend	Depth / Reduced Level
		From (m)	To (m)			
						0.00
						Ground Level
						Topsoil.
	J T	0.70	1.00			0.70
						1.00
						Firm to stiff orange brown gravelly CLAY. Gravel is fine to coarse flint and chalk. (River Terrace Deposits)
						End of Borehole

Remarks:

Borehole dry and stable on completion.

Excavation Method: Hand Auger

Borehole Diameter:

Made By: SW

ASHDOWN SITE INVESTIGATION LIMITED

Site: Chesswood Middle School, Chesswood Road,
Worthing, West Sussex

Report No.: LW25208
Sheet No.: 1 of 1

- Borehole Falling Head Soakage Test Results

SUMMARY OF BOREHOLE FALLING HEAD SOAKAGE TEST RESULTS

Borehole WS2	
Time (mins)	Depth to water (m bgl)
0	0.95
1	0.97
2	1.02
3	1.06
4	1.11
5	1.15
7	1.23
10	1.34
20	1.61
30	1.74
45	1.88
60	Dry*
Borehole Depth (m bgl)	3.00
Casing Depth (m bgl)	1.00
Borehole Diameter (mm)	80.00
Casing Diameter (mm)	105.00

Borehole WS5	
Time (mins)	Depth to water (m bgl)
0	0.00
1	0.03
2	0.07
3	0.09
4	0.14
5	0.16
7	0.21
10	0.26
21	0.40
30	0.48
45	0.54
60	0.58
Borehole Depth (m bgl)	3.00
Casing Depth (m bgl)	1.00
Borehole Diameter (mm)	80.00
Casing Diameter (mm)	105.00

Notes: bgl – below ground level.

* WS2 – borehole collapsed to 2.00m bgl during soakage test.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Chesswood Middle School, Chesswood Road,
Worthing, West Sussex

Report No.: LW25208
Sheet No.: 1 of 1

- Trial Pit Falling Head Soakage Test Results

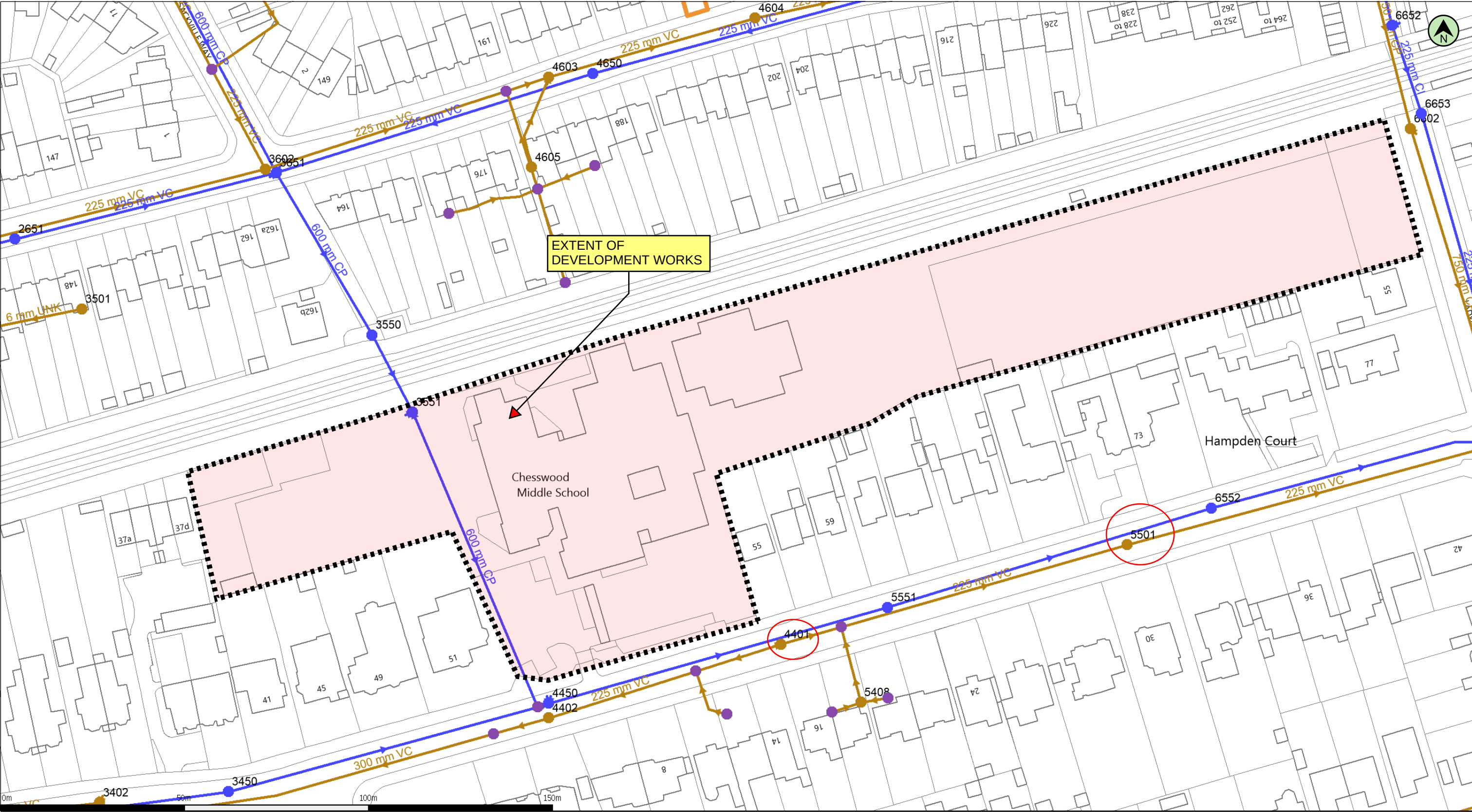
SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

Trial Pit HD2		Trial Pit HD3	
Time (mins)	Depth to water (m bgl)	Time (mins)	Depth to water (m bgl)
0	0.70	0	0.50
1	0.71	1	0.55
2	0.71	2	0.58
6	0.72	4	0.62
10	0.72	9	0.69
50	0.74	16	0.74
112	0.77	23	0.79
		40	Dry
Pit Length - 0.30m Pit Width - 0.30m Pit Depth - 0.95m bgl		Pit Length - 0.30m Pit Width - 0.30m Pit Depth - 0.85m bgl	

Remarks: bgl - below ground level.

Appendix D. Southern Water Sewer Records





(c) Crown copyright and database rights 2024 Ordnance Survey 100031673

Date: 06/03/24

Scale: 1:1000

Map Centre: 515485,103559

Data updated: 12/01/24

Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2024 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

nicola.tildesley@westsussex.gov.uk



Appendix E. Greenfield Runoff Rates



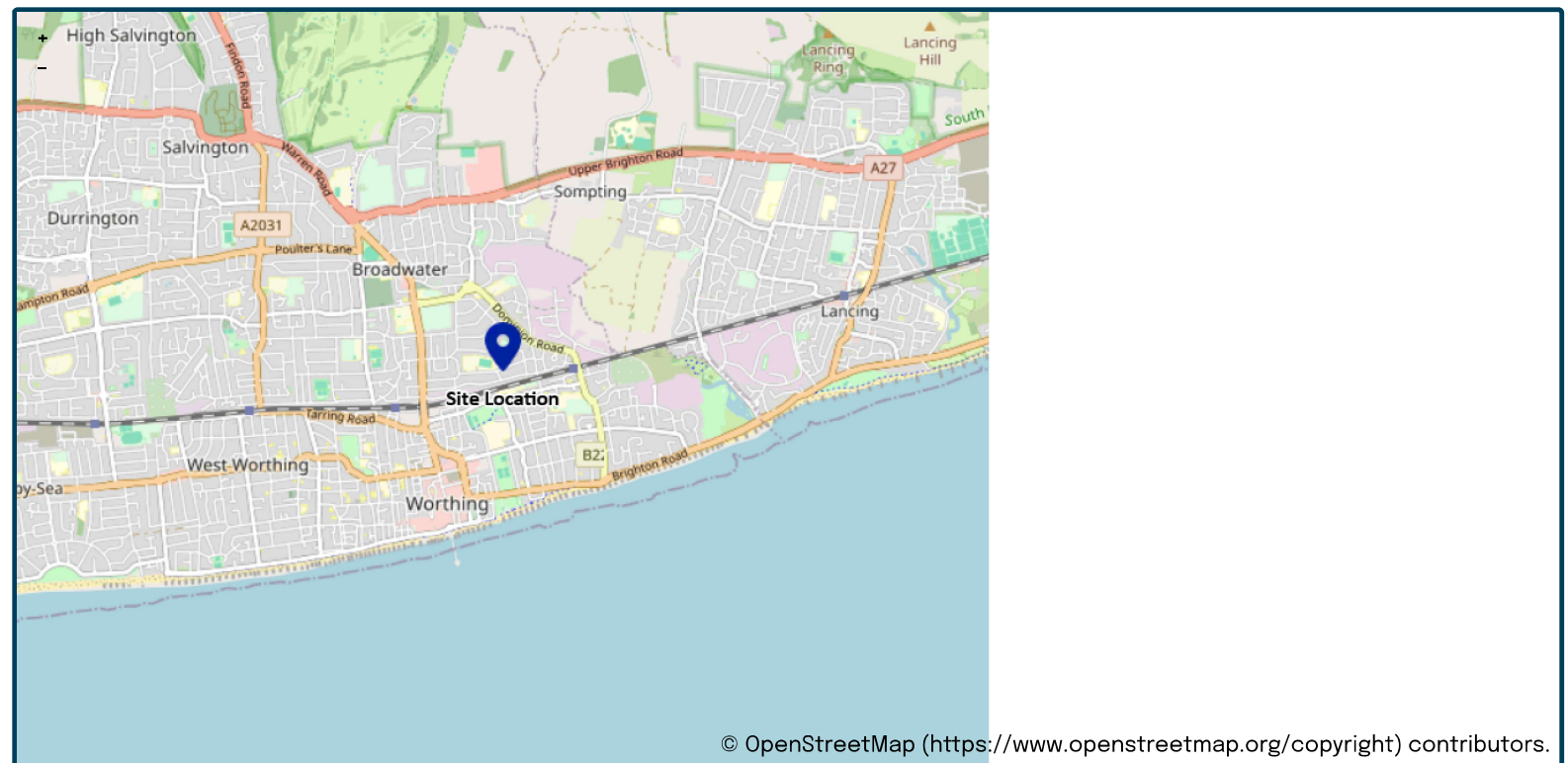
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	24/06/2026
Calculated by	Matt Stewart
Reference	Homefield Primary School
Model version	2.2.3

Location

Site name	Homefield Primary School
Site location	



Site easting (British National Grid)	515377
Site northing (British National Grid)	103527

Site details

Total site area (ha)	1	ha
----------------------	--------------------------------	----

Greenfield runoff

Method

Method	FEH statistical (2025)
--------	------------------------

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	757	mm
BFIHOST19scaled	0.553	
QMed-QBar conversion	1.136	☒ 1.136
QMed (l/s)	2.7	l/s
QBar (FEH statistical 2025) (l/s)	3.1	l/s

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	7	☒ 7
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

Results

Method	FEH statistical (2025)	
Flow rate 1 year (l/s)	2.6	l/s
Flow rate 2 year (l/s)	2.7	l/s
Flow rate 10 years (l/s)	5.0	l/s
Flow rate 30 years (l/s)	7.1	l/s
Flow rate 100 years (l/s)	9.8	l/s
Flow rate 200 years (l/s)	11.5	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix F. Southern Water Engagement Meeting (09/01/2026)



MEETING NOTES

Homefield PS Expansion & SSC

SUBJECT	MEETING PLACE	DATE AND TIME	MINUTES BY
RIBA 2 Southern Water Engagement Meeting	MS Teams	09 January 2026 at 11:00-11:30	AtkinsRéalis - EP
MEETING NO	PRESENT	REPRESENTING	
001	Neil Packham (NP) Chris Connor (CC) Moustafa Abdelwahab (MA) Elisa Domenichini (ED) Richard Christmas (RC) Bunmi Shekoni (BS) Aisha Akinlawon (AA) Ellen Patterson (EP) Apologies Neil Ward (NW)	Southern Water AtkinsRéalis (C&S) AtkinsRéalis (C&S) AtkinsRéalis (Architecture) AtkinsRéalis (Architecture) AtkinsRéalis (PM) AtkinsRéalis (PM) AtkinsRéalis (PM) Norse Group (MEP)	

Item	Description and Action	Deadline	Responsible
1.	Welcome and Introductions	-	Note
2.	Project Overview		
2.1	CC highlighted that this project involves the development and expansion of Homefield Primary School to meet the school's expansion needs. A key element of the scheme is the construction of a new block next to the existing school building, within the current playground area. Refurbishment works are also proposed within the existing school block.	-	Note
3.	Canopy		

NEXT MEETING	TBC		
DISTRIBUTION	Present and Apologies List		
DATE ISSUED	13 January 2026	FILE REF	Homefield PS – Southern Water Engagement Meeting

NOTE TO RECIPIENTS:
These meeting notes record AtkinsRéalis understanding of the meeting and intended actions arising therefrom. Your agreement that the notes form a true record of the discussion will be assumed unless adverse comments are received in writing within five days of receipt.

MEETING NOTES

Item	Description and Action	Deadline	Responsible
3.1	CC noted that one of the school's requirements is a canopy linking the new block to the existing school block. RC highlighted that this canopy is to protect children when moving from one building to the other during inclement weather.	-	Note
3.2	RC/ED raised that the canopy would be 3m wide if possible and run from the reception entrance of the new block to the side entrance of the current school block. The canopy will cross over a section of the sewer. The canopy is proposed to be constructed on posts/pillars and be removable to assist Southern Water if access to the sewer pipe is required. However, RC highlighted that any removal would need to be carried out by a contractor, rather than quickly by the school.	-	Note
3.3	NP noted that the canopy does not pose much of an issue as it is a lightweight removable structure and only covers a section of the sewer where it crosses over. CC raised that there are possible LV or HV cables located near the sewer pipe and where the canopy pillars will be. These cables are yet to be confirmed, and a survey is currently being arranged to obtain more information. CC noted that due to difficulties with relocating HV cables, if they are identified as HV, the canopy pillars/posts might need to be positioned to consider both the sewer and cables. NP raised that ideally there will be a 3m distance from canopy pillars to the sewer pipe, however due to the possible location of HV cables in the area which also need to be avoided, NP confirmed Southern Water can work with the team to look for a compromise if required.	-	Note
3.4	NP does not believe that the pedestrian canopy will cause concern, however requested that design for canopy and footings around the sewer are shared. NP raised that the canopy should be shown on plans when section 106 application is submitted. NP confirmed that a meeting between AtkinsRéalis and NP/Southern Water can be accommodated if required prior to application Section 106 being submitted.	-	Note
3.5	NP confirmed unless the ground level is reducing Southern Water are not too concerned with the ground coverage over the sewer pipe. If ground cut out is required, NP noted that the ground will be reinstated how it was found.	-	Note
4	Services		

MEETING NOTES

Item	Description and Action	Deadline	Responsible
4.1	BS raised that the survey information shows existing services - crossing the sewer. NP noted that these existing services would have been in place prior to new processes. NP confirmed that a letter of consent from Southern Water would be required, if any new utilities need to run across the sewer including LV cables. NP noted that new services require a minimum clearance of 1.5m either above or below the sewer pipe.	-	Note
4.2	NP confirmed that the process for obtaining a letter of consent from Southern Water can be initiated via email with NP. NP requested as much information as possible to be provided via email, the process can take around 10 days however it depends case by case and on how much information is given.	-	Note

Appendix G. Exceedance Flood Routing Plan



Drawing Number	Revision
100124937-ATRL-XX-00-DR-C-00030	P01

Appendix H. Below Ground Drainage Layout



