

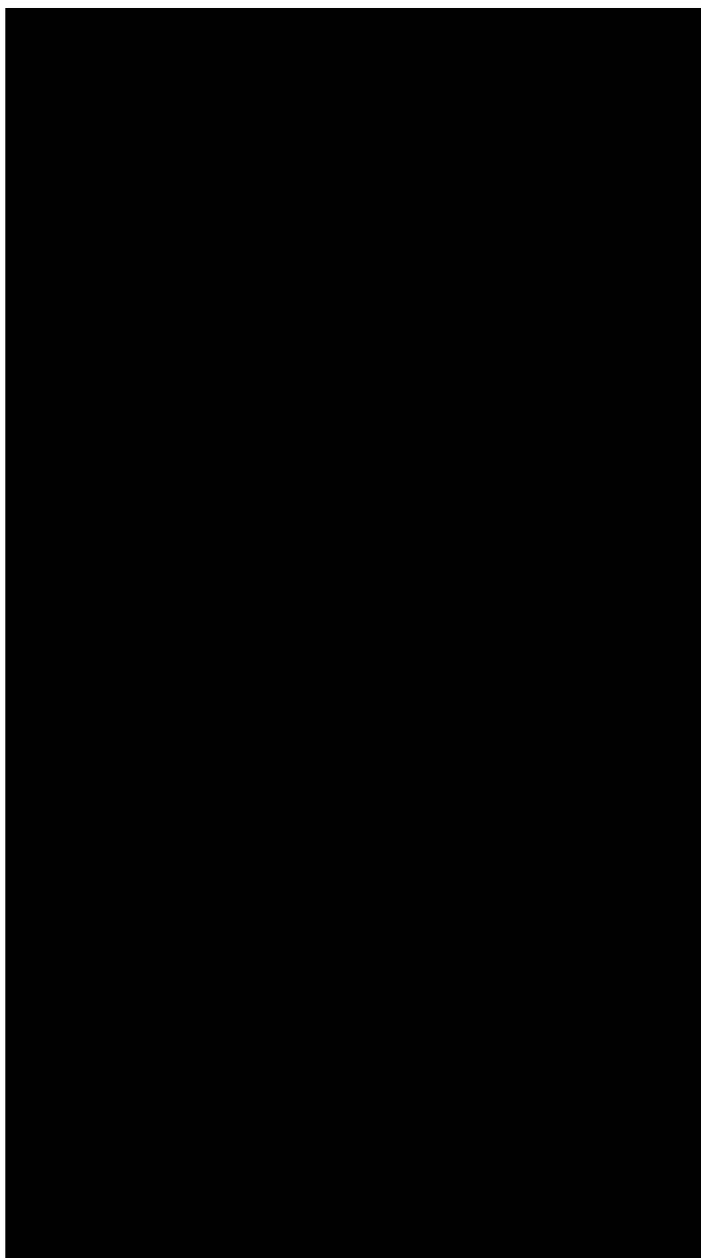


Drainage Strategy & Impact Assessment

The Former Kings Beach Hotel
Pagham, West Sussex



Contact Details



Contents

1. Introduction	2
2. Development Description & Location	2
3. Surface Water Catchment.....	2
4. Surface Water Strategy.....	3
5. Surface Water Quality Impact on Pagham Harbour	4
6. Existing Foul Water Drainage Provision	5
7. Foul Water Strategy	5
8. Foul Water Impact on Pagham Harbour	6

Appendices

Appendix A	Aerial Photograph & Proposed Site Layout
Appendix B	BGS Report & Sewer Plan
Appendix C	Surface Water Assessment
Appendix D	Conditions & Limitations

1. Introduction

- 1.1. Instructions were received from Punch Partnerships (PML) Ltd to set out the Drainage Strategy (DS) and provide Impact Assessment (IA) for a planning application for the development of three residential dwellings on land at the former Kings Beach Hotel, Pagham, West Sussex.
- 1.2. The assessment has been reviewed by A P Traves BSc CEng MStructE MCIHT.
- 1.3. The client's attention is drawn to the conditions and limitations contained in Appendix D.
- 1.4. This report addresses Pagham Harbour water quality impact raised in the planning officers report P/94/15/PL. The report also addresses the surface water drainage hierarchy as discussed with the LPA Drainage Engineer.

2. Development Description & Location

- 2.1. The development site comprises a small L shaped parcel of land around the rear of the former Kings Beach Hotel, Pagham, West Sussex (grid reference SZ890974). The site extents are indicated on the annotated aerial photograph in Appendix A.
- 2.2. The southern part of the site comprises impervious commercial use parking pavement and garages. The eastern part of the site comprises a second area of commercial parking pavement. The central part of the site comprise rough grass and light vegetation.
- 2.3. It is proposed to develop three residential dwellings. The proposed layout is identified on PLC Architects' drawing 17.3030.100 contained in Appendix A of this report.

3. Surface Water Catchment

- 3.1. The existing eastern hardstand comprises some 175m² of pavement and the southern hardstand and garages have a footprint of some 260m² of an effective gross site area of approximately 1,400m², not including the existing pavement areas which are common access/egress with the former hotel building and not changing use. Existing run-off rate 0.014 x 435 = 6.1 l/sec.
- 3.2. The existing garages and impervious parking drain to gullies and discharge to the public surface water sewer. A copy of the local sewer plan is contained in Appendix B. This public surface water sewer is culverted westwards along Sea lane and then southwards outfalling into Pagham Lagoon.
- 3.3. Surface water discharge has defined receptor hierarchy and infiltration must be considered as the tier 1 option. A BGS Infiltration SuDS Georeport has been obtained to consider the potential for infiltration discharge. This is discussed in paragraphs 3.4-3.10 below.
- 3.4. The BGS Infiltration SuDS Georeport for the site is contained in Appendix B and identifies particular attributes described in the following paragraphs:
- 3.5. Section 1 of Part 2 of the SuDS Georeport indicates there are very significant constraints to infiltration SuDS in respect of persistent shallow groundwater.
- 3.6. Section 2 of Part 2 of the SuDS Georeport indicates that groundwater is likely to be less than 3m below the ground surface for at least part of the year. This classification is determined from the bedrock and superficial deposits generic permeabilities site topography and superficial deposit thickness. Some superficial deposits are indicated to be present with spatially variable permeability between low and high characteristic, and the overall deposit thickness is indicated to be less than 3m and hence the permeability of the superficial deposits is likely to determine the permeability of the ground. Bedrock permeability is indicated to be spatially variable between very low and moderate characteristic.
- 3.7. Section 3 of Part 2 of the SuDS Georeport considers the impact of increased infiltration upon potential ground stability hazards (soluble rocks, landslides, shallow mining, running sands, swelling clays, compressible ground and collapsible ground). Increased infiltration is reported to be unlikely to cause geohazards with respect to the listed characteristics, except running sand.
- 3.8. Section 4 of Part 2 of the SuDS Georeport considers groundwater quality protection. The report identifies that the site is not in a Source Protection Zone (SPZ). The report also identifies that the predominant flow mechanism through the unsaturated zone is through fractures, a process which

has little potential for contamination removal and breakdown. No made ground is reported to be at the site, thus potential contamination mobilisation in fill is not applicable.

- 3.9. Section 5 of Part 2 of the SuDS Georeport considers the geological mapping at the site location. Superficial deposits are indicated as undifferentiated River Terrace Deposits consisting of sands, silts and clays. The bedrock under the site is indicated to comprise the London Clay Formation consisting of clay, silt and sand.
- 3.10. The BGS infiltration SuDS Georeport indicates within the report limitations that the report is based on 1:50,000 digital geological maps and not site-specific data. It also identifies that the report is not an alternative for an on-site investigation or soakaway test which might reach a different conclusion.
- 3.11. The local sewer plan indicates the disposition of the public surface water sewers. This area of the town can be described in terms of three character areas for surface water sewers:
 - The seafront (Beach Road, Well Road etc) There is only a Foul Water (FW) system in this area and this is a vacuum system. These streets are in immediate proximity to the shingle beach and at lowest elevation. The lack of surface water sewers, proximity to the beach and shingle nature of the beach are indicative that surface water drainage in this area is into the underlying gravel and shingle.
 - Back land (St Thomas Drive and northwards) The lack of public surface water drains and watercourses within this urban area are indicative that surface water in this area drains by infiltration to the underlying soil.
 - Intermediate land (including Sea Lane and The Parade) The presence of surface water sewers in these areas indicates that infiltration drainage was not possible or practicable.

4. Surface Water Strategy

- 4.1. The site is at a low elevation (approx. 4.5m AOD) and in a coastal location. The underlying bedrock geology is of poor permeability and overlain by less than 3m of superficial deposits of better permeability. For this reason groundwater levels perch on the bedrock and saturate the shallow superficial deposits to less than 3m below ground level for at least part of the year. Depending upon the level of permeability and the antecedent rainfall clearly this could come to within 2m of ground level. The invert level of soakaways should preferably be located at least 1m above this groundwater level. It is therefore unlikely that the site is suitable for traditional soakaways, but subject to soil permeability may be suited to shallower attenuation storage and infiltration infrastructure such as permeable pavements and infiltration blankets. National SuDS drainage policy and guidance requires that a Tier 1 (infiltration) strategy is provided where possible. The proposal should therefore be conditioned to
 - Determine site soil permeability
 - If the soil permeability is sufficient to meet 24 hour half drain down requirements then groundwater level (GWL) monitoring should be undertaken to determine the seasonal high GWL
 - If the soil permeability and GWL are appropriate to an infiltration design then an infiltration solution (Tier 1) should be submitted for subsequent approval and construction
- 4.2. If a Tier 1 (infiltration) strategy is not viable, Tier 2 (discharge to watercourse) is not possible as there are no watercourses on site and a Tier 3 (discharge to surface water sewer) would have to be adopted. The proposed eastern plot (House 1) comprises 170m² of roof/pavement i.e. less than the impervious area it replaces. The other two proposed plots comprise some 465m² of roof/pavement which will require peak flow rate mitigation to 3.6 l/sec such that it does not exceed the current brownfield discharge rate. To achieve this a class B or C permeable pavement would provide shallow attenuation storage with an exfiltration box and perforated pipe regulating discharge rate to the public surface water sewer. In practice the pavement for the eastern plot would also be of class B or C permeable construction so would also achieve some further flow regulation leading to a net post development peak discharge rate below the current 6.1 l/sec existing brownfield peak discharge rate.
- 4.3. Whether the site soils inform a Tier 1 infiltration or tier 3 surface water sewer discharge, the surface water drainage system will be designed to accommodate a 1 in 100 year +30% climate change

rainfall event. With respect to the Non-statutory Technical Standards for Sustainable Drainage Systems (NTS SuDS) the design accords with requirement S3, S5/6 and S7-9. Design and construction details will accord with Building Regulations and Sewers for Adoption, as appropriate, so according with S10-11 and S13-14. The design does not include pumping so S12 is not applicable.

- 4.4. Water butts should be installed to intercept roof water run-off. These will reduce the annual volume of surface water discharge but will not make any material contribution to regulation of critical run-off as these tend to be full during winter months as there is minimal demand for irrigation in these months.
- 4.5. In summary source control will be provided by:
 - Infiltration as outlined in paragraph 4.1 or attenuation storage as outlined in paragraph 4.2.
 - Provision of water butts as outlined in paragraph 4.4.
- 4.6. The surface water strategy mimics the existing run-off regime. There will therefore be no adverse impact on flood flow rates outside the site.
- 4.7. The uses comprises generally low and very low pollution hazard levels (C753 Table 26.2) and do not require groundwater risk screening.
- 4.8. Simple index approach calculations are contained in Appendix C. These demonstrate that the proposed filtration within the site ditch/swale can provide the mitigation necessary.
- 4.9. A schedule of O&M maintenance requirements for the SuDS infrastructure is also contained in Appendix C.

5. Surface Water Quality Impact on Pagham Harbour

- 5.1. The existing baseline is a peak flow rate of 6.1 l/sec from commercial parking/garage use with no water quality treatment discharging into Pagham Lagoon. The residual pollution indices to C753 Simple Index method are: (Refer to Appendix C for calculations)
 - Roofs:

Total Suspended Solids	0.3
Metals	0.2
Hydro Carbons	0.05
 - Commercial parking:

Total Suspended Solids	0.5
Metals	0.4
Hydro Carbons	0.4
- 5.2. On the basis that site soils are suitable for (Tier 1) infiltration a class A (infiltration) permeable pavement is proposed, the residual pollution indices to C753 Simple Index method are: (Refer to Appendix C for calculations)
 - Roofs-residential:

Total Suspended Solids	0
Metals	0
Hydro Carbons	0
 - Residential parking:

Total Suspended Solids	0
Metals	0
Hydro Carbons	0

Furthermore that stratigraphic dip is to the south (towards the sea) so groundwater in the superficial deposits would migrate towards the sea and not north towards to the harbour. I.e. The proposal would thus provide a net water quality benefit to Pagham Lagoon and any subsequent exfiltration to Pagham Harbour by virtue of removal of this load.

- 5.3. On the basis that site soils are not suitable for infiltration a class B/C permeable pavement is proposed retaining discharge to the public surface water sewer (Tier 3), the residual pollution indices to C753 Simple Index method are: (Refer to Appendix C for calculations)

• Roofs-residential:	
Total Suspended Solids	0
Metals	0
Hydro Carbons	0
• Residential parking:	
Total Suspended Solids	0
Metals	0
Hydro Carbons	0

The proposal would thus provide a net water quality benefit to Pagham Lagoon and any subsequent exfiltration to Pagham Harbour by virtue of the introduction of on site surface water treatment of this load.

6. Existing Foul Water Drainage Provision

- 6.1. The former Kings Beach Hotel is connected to the public Foul Water (FW) sewer. There are several FW sewer sub-networks adjacent to the site which in all cases discharge to the Kings Beach Pagham Waste Water Pumping Station, approximately 100m north of the site. It is not known to which sub-network the site is connected, although this is currently believed to be the immediate spine running north from MH0407 in the rear of 2 The Parade. The pumping station in turn discharges to Pagham Wastewater Treatment Works and then outfalls to Pagham Rife which flows into Pagham Harbour. The Pagham WWTW catchment plan is contained in Appendix B.

7. Foul Water Strategy

- 7.1. Foul water discharge also operates on a hierarchy with Tier 1 being connection to the public foul sewer. There is already a foul sewer connection from the former hotel as set out in paragraph 6.1 and it is proposed that the new dwellings also connect to the public foul sewer (Tier 1)
- 7.2. The process for new sewer connections is changing on 1 April 2018 and connection of the three proposed dwellings will not be made until at least this date so the new process shall be used to inform the strategy, together with the memorandum of understanding between the LPA and Southern Water.
- 7.3. Under the new process the developer deals with the foul drainage on the site and makes lateral connection to the public sewer either by S106 agreement with Southern Water or requisitioning the connection directly from Southern Water. With respect to network impact Southern Water will make a fixed per plot Infrastructure Charge (IC) to provide an income stream for their own reinforcement and upgrade works throughout the network as may be necessary.
- 7.4. The LPA have a Memorandum of understanding: sewerage capacity (and treatment)-September 2017 with Southern Water. This sets out in the areas of agreement that: *"With respect to capacities of the waste water treatment works in the District, impacts to water quality and expected phasing and timings, the parties agree that: 1) Environment permits at Pagham Wastewater Treatment Works (WWTW) are sufficient to accommodate growth proposed in policy SD1 of the Arun Local Plan (2011-2031), whilst continuing to ensure water quality objectives in Pagham Harbour are met."*
- 7.5. It is implicit from 7.3 and 7.4 that the network can accommodate the flow from the proposed development.
- 7.6. The nearest alternative foul sewer catchment is located some 800m to the East of the site. The feasibility distance for alternative connections is set out in Environment Agency environment permit applications to be no more than 30m per plot i.e. 90m for the application site. It is therefore apparent that connection to the next nearest network is beyond the feasibility distance by an order of magnitude.

8. Foul Water Impact on Pagham Harbour

- 8.1. The Habitats Regulation Assessment for the Arun Local Plan: Supplementary Work Stage 3 Report – February 2017 considers the impact of foul water discharge into Pagham Harbour SPA/Ramsar. The report outlines the following statements:

"Effluent discharges are strictly regulated and acceptable loads are determined and consented by the Environmental Agency."

"The Environmental Agency's Review of Consents (RoC) under the Habitats Directive, completed in late 2007, determined sustainable levels of water abstraction and waste water discharge that can be met without adverse effects on the ecological integrity of European sites. For Pagham Harbour 115 water quality discharge consents, waste management licences and abstraction licences were reviewed, to determine if they were adversely affecting the SPA/Ramsar's ecological features. The review specifically examined nutrient enrichment and reduction in freshwater flows and concluded that none of the consents posed a risk to, or actual impact on, Pagham Harbour SPA/Ramsar. As such the Agency did not propose to revoke or modify any of the permissions under the Habitats Regulations."

"The magnitude of the impact is likely to be relatively minor given that Pagham WWTW contributes around 6% of the total nitrogen load; Sidlesham STW contributes 19%, 50% is from offshore waters and the remainder is from riverine diffuse sources."

"Due to the sensitivity and environmental designations at the receiving waterbody, Pagham Rife and Pagham Harbour, the agency expects any future environmental permit limits to be demanding, especially for phosphorus."

- 8.2. The LPA have a Memorandum of understanding: sewerage capacity (and treatment) – September 2017 with Southern Water. This sets out in the areas of agreement that: *"With respect to capacities of the waste water treatment works in the District, impacts to water quality and expected phasing and timings, the parties agree that: 1) Environment permits at Pagham Wastewater Treatment Works (WWTW) are sufficient to accommodate growth proposed in policy SD1 of the Arun Local Plan (2011-2031), whilst continuing to ensure water quality objectives in Pagham Harbour are met."*
- 8.3. The Memorandum explicitly states that this will continue *"to ensure water quality objectives in Pagham Harbour are met"*. It is implicit from this that there will be no adverse impact from the proposed development on water quality in Pagham Harbour.

Appendix A

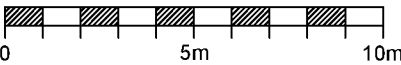
Aerial Photograph & Proposed Site Layout



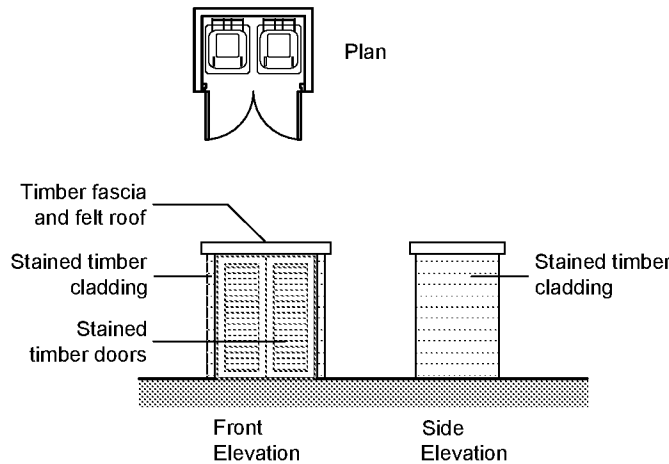
Aerial photograph of the site.

GENERAL NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE OTHER RELEVANT CONSULTANT'S DRAWINGS.
2. ALL FINISHES ARE TO CONFORM TO THE CURRENT BUILDING REGULATIONS.
3. REFER TO A SEPARATE DOCUMENT FOR THE DESIGNER'S RISK ASSESSMENT.
4. ALL WORKS OR MATERIALS INDICATED ON THIS DRAWING ARE TO BE TO THE LATEST RELEVANT BRITISH STANDARDS AND CARRIED OUT IN ACCORDANCE WITH THE BRITISH STANDARDS CODES OF PRACTICE OR RECOGNIZED INSTITUTE OR TRADE ASSOCIATION RECOMMENDATIONS AND PUBLICATIONS.

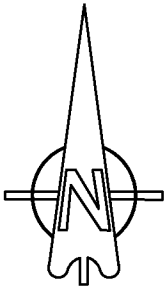
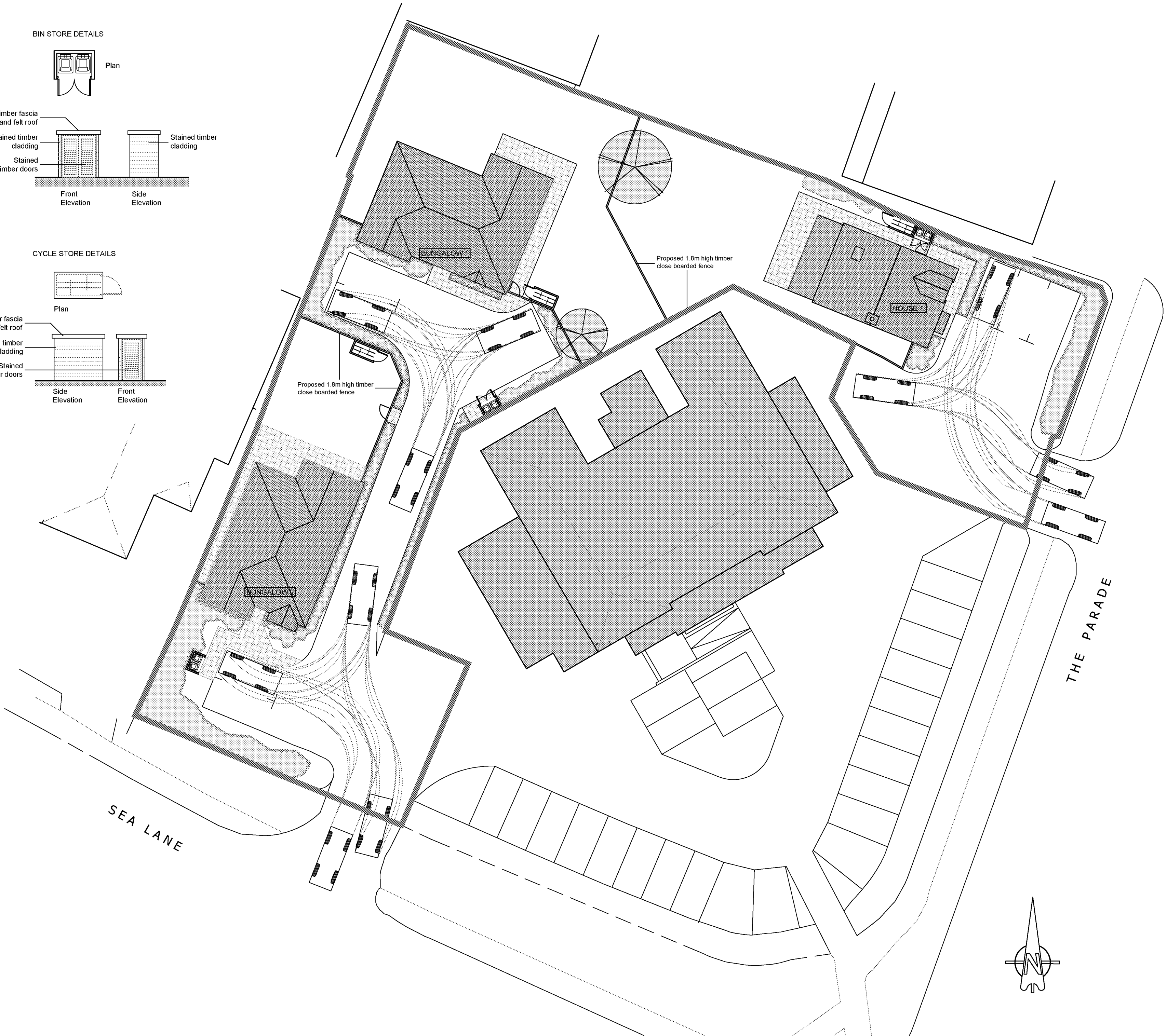
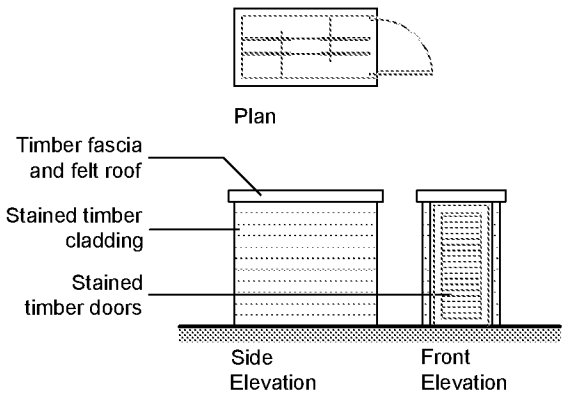
1:200 scale



BIN STORE DETAILS



CYCLE STORE DETAILS



P2	Dec 2017	Swept path added, boundary amended	LW	
Revision	Date	Description	Dwn	Chkd

Project:
Proposed Mixed Use Development at
The Former King's Beach Hotel, Pagham

Drawing Title:
Proposed Site Layout

Drawn By	Date	Checked By	Date	Approved By	Date
KW	Dec 17				
Drawing No	17.3030.100	Revision	P2	Scale	1:200@A2

PLC ARCHITECTS © COPYRIGHT RESERVED 2017
NOT TO BE SCALED. DIMENSIONS TO BE CHECKED ON SITE
SCALING ONLY FOR LOCAL AUTHORITY PURPOSES

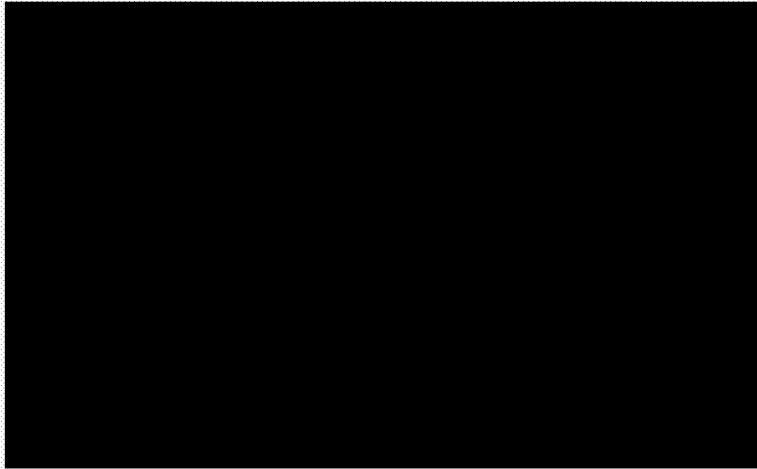
Appendix B

BGS Report & Sewer Plan



**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports



Infiltration SuDS GeoReport:

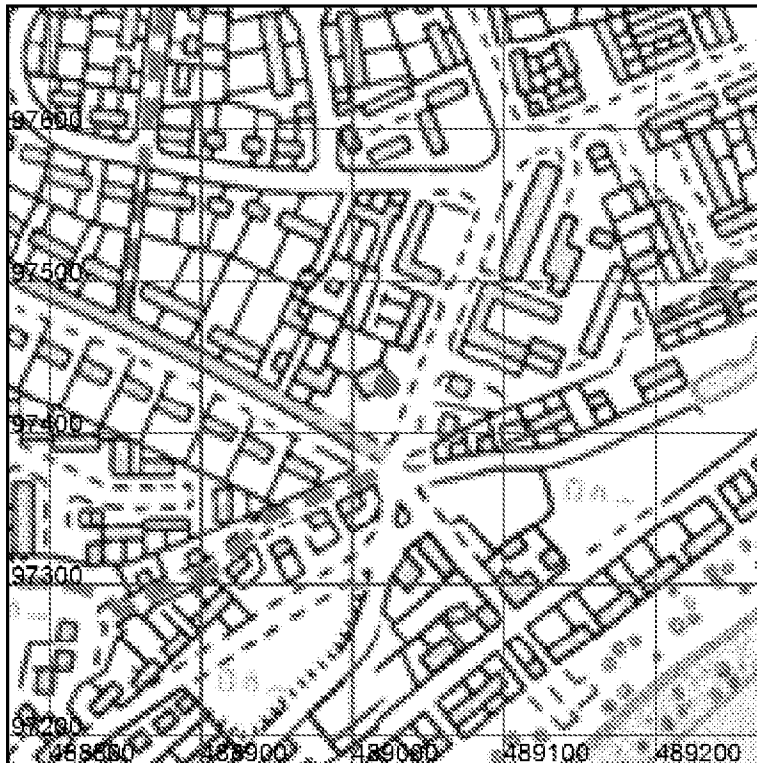
This report provides information on the suitability of the subsurface for the installation of infiltration sustainable drainage systems (SuDS). It provides information on the properties of the subsurface with respect to significant constraints, drainage, ground stability and groundwater quality protection.

Report Id: GR_217638/1

Client reference: The Parade, Pagham



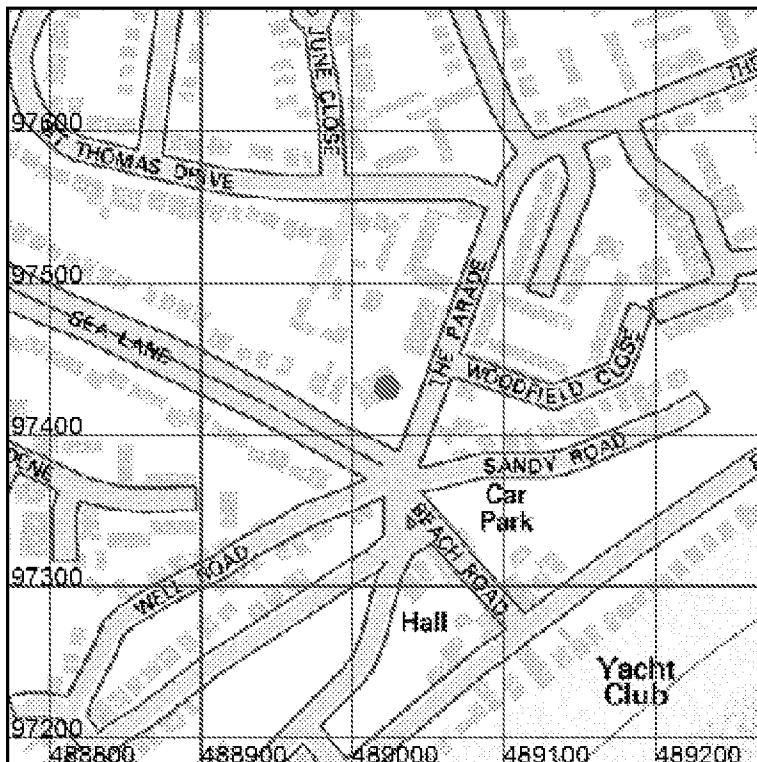
Search location



Point centred at:
489023,97431

Search location indicated in
red

This product includes mapping data licensed from Ordnance Survey.
© Crown Copyright and/or database right 2018. Licence number 100021290 EUL
Scale: 1:5 000 (1cm = 50 m)



Contains Ordnance Survey data © Crown Copyright and database right 2018
OS Street View: Scale: 1:5 000 (1cm = 50 m)



Assessment for an infiltration sustainable drainage system

Introduction

Sustainable drainage systems (SuDS) are drainage solutions that manage the volume and quality of surface water close to where it falls as rain. They aim to reduce flow rates to rivers, increase local water storage capacity and reduce the transport of pollutants to the water environment. There are four main types of SuDS, which are often designed to be used in sequence. They comprise:

- **source control:** systems that control the rate of runoff
- **pre-treatment:** systems that remove sediments and pollutants
- **retention:** systems that delay the discharge of water by providing surface storage
- **infiltration:** systems that mimic natural recharge to the ground.

This report focuses on infiltration SuDS. It provides subsurface information on the properties of the ground with respect to drainage, ground stability and groundwater quality protection. It is intended principally for those involved in the preliminary assessment of the suitability of the ground for infiltration SuDS, and those involved in assessing proposals from others for sustainable drainage, but it may also be useful to help house-holders judge whether or not further professional advice should be sought. If in doubt, users should consult a suitably-qualified professional about the results in this report before making any decisions based upon it.

This GeoReport is structured in two parts:

- **Part 1. Summary data.**

Comprises three maps that summarise the data contained within Part 2.

- **Part 2. Detailed data.**

Comprises a further 24 maps in four thematic sections:

- **Very significant constraints.** Maps highlight areas where infiltration may result in adverse impacts due to factors including: ground instability (soluble rocks, non-coal shallow mining and landslide hazards); persistent shallow groundwater, or the presence of made ground, which may represent a ground stability or contamination hazard.
- **Drainage potential.** Maps indicate the drainage potential of the ground, by considering subsurface permeability, depth to groundwater and the presence of floodplain deposits.
- **Ground stability.** Maps indicate the presence of hazards that have the potential to cause ground instability resulting in damage to some buildings and structures, if water is infiltrated to the ground.
- **Groundwater protection.** Maps provide key indicators to help determine whether the groundwater may be susceptible to deterioration in quality as a result of infiltration.



This report considers the suitability of the subsurface for the installation of infiltration SuDS, such as soakaways, infiltration basins or permeable pavements. It provides subsurface data to indicate whether, and which type of infiltration system may be appropriate. It does not state that infiltration SuDS are, or are not, appropriate as this is highly dependent on the design of the individual system. This report therefore describes the subsurface conditions at the site, allowing the reader to determine the suitability of the site for infiltration SuDS.

The map and text data in this report is similar to that provided in the '*Infiltration SuDS Map: Detailed*' national map product. For further information about the data, consult the '*User Guide for the Infiltration SuDS Map: Detailed*', available from <http://nora.nerc.ac.uk/16618/>.



PART 1: SUMMARY DATA

This section provides a summary of the data on the following pages.

In terms of the drainage potential, is the ground suitable for infiltration SuDS?	
© Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	Highly compatible for infiltration SuDS. The subsurface is likely to be suitable for free-draining infiltration SuDS.
	Probably compatible for infiltration SuDS. The subsurface is probably suitable although the design may be influenced by the ground conditions.
	Opportunities for bespoke infiltration SuDS. The subsurface is potentially suitable although the design will be influenced by the ground conditions.
	Very significant constraints are indicated. There is a very significant potential for one or more hazards associated with infiltration.
Is ground instability likely to be a problem?	
© Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	Increased infiltration is very unlikely to result in ground instability.
	Ground instability problems may be present or anticipated, but increased infiltration is unlikely to result in ground instability
	Ground instability problems are probably present. Increased infiltration may result in ground instability.
	There is a very significant potential for one or more geohazards associated with infiltration.
Is the groundwater susceptible to deterioration in quality?	
© Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	The groundwater is not expected to be especially vulnerable to contamination.
	The groundwater may be vulnerable to contamination.
	The groundwater is likely to be vulnerable to contaminants.
	Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.



PART 2: DETAILED DATA

This section provides further information about the properties of the ground and will help assess the suitability of the ground for infiltration SuDS.

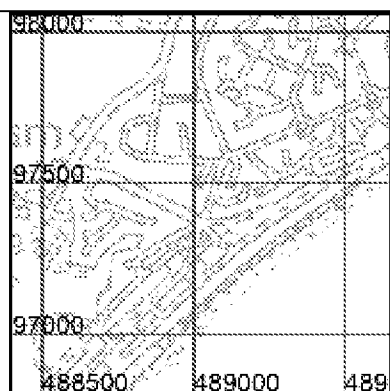
Section 1. Very significant constraints

Where maps are overlain by grey polygons, geological or hydrogeological hazards may exist that could be made worse by infiltration. The following hazards are considered:

- soluble rocks
- landslides
- shallow mining
- shallow groundwater
- made ground

For more information read 'Explanation of terms' at the end of this report.

Soluble rock hazard



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



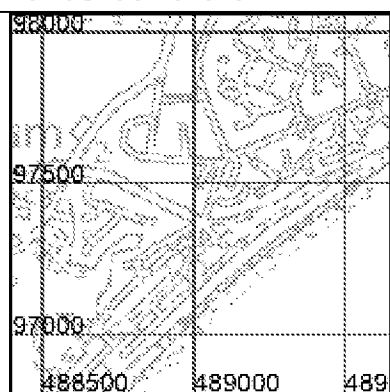
Very significant soluble rock hazard.

Soluble rocks are present with a very significant possibility of localised subsidence that could be initiated or made worse by infiltration. The site investigation should consider whether the potential for or the consequences of subsidence as a result of infiltration are significant.



Very significant soluble rock hazards are not present; however this hazard may still need to be considered.
See Part 3.

Landslide hazard



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number
100021290 EUL



Very significant landslide hazard.

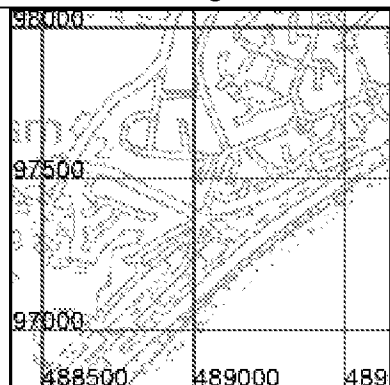
Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail. The site investigation should consider whether the potential for or the consequences of landslide as a result of infiltration are significant.



Very significant landslide hazards are not present; however this hazard may still need to be considered.
See Part 3.



Shallow mining hazard



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number
100021290 EUL



Very significant mining hazard.

Shallow mining is likely to be present with a very significant possibility of localised subsidence that could be initiated or made worse by increased infiltration. Also, infiltration may increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of subsidence and/or remobilisation of pollutants as a result of infiltration are significant.



Very significant mining hazards are not present; however this hazard may still need to be considered. See Part 3.

Persistent shallow groundwater



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number
100021290 EUL



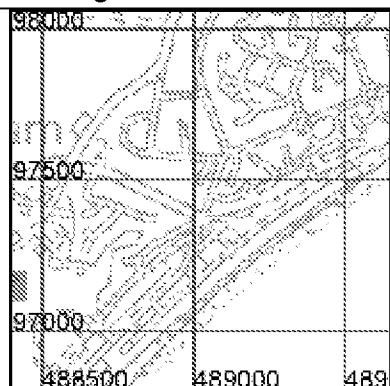
Very high likelihood of persistent or seasonally shallow groundwater.

Persistent or seasonally shallow groundwater is likely to be present. Infiltration may increase the likelihood of soakaway inundation, or groundwater emergence at the surface. The site investigation should consider whether the potential for or the consequences of groundwater level rise as a result of infiltration are significant.



See Part 2 for the likely depth to water table.

Made ground



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number
100021290 EUL



Made ground present.

Made ground is present at the surface. Infiltration may affect ground stability or increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of ground instability and/or pollutant leaching as a result of infiltration are significant.



None recorded



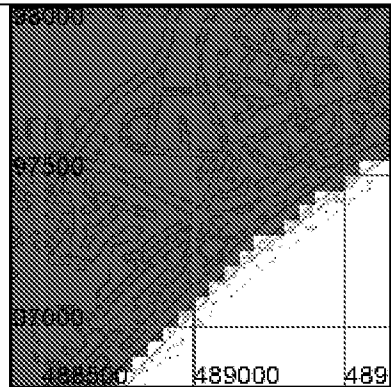
Section 2. Drainage potential

The following pages contain maps that will help you assess the drainage potential of the ground by considering the:

- depth to water table
- permeability of the superficial deposits
- thickness of the superficial deposits
- permeability of the bedrock
- presence of floodplains

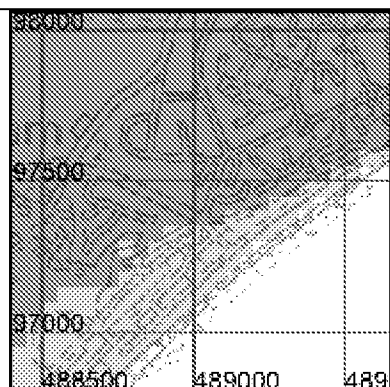
Superficial deposits are not present everywhere and therefore some areas of the *superficial deposit permeability* map may not be coloured. Where this is the case, the *bedrock permeability* map shows the likely permeability of the ground. Superficial deposits in some places are very thin and hence in these places you may wish to consider both the permeability of the superficial deposits and the permeability of the bedrock. The *superficial thickness* map will tell you whether the superficial deposits are thin (< 3 m thick) or thick (>3 m). Where they are over 3 m thick, the permeability of the bedrock may not be relevant.

For more information read 'Explanation of terms' at the end of this report.

Depth to groundwater table	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	 Groundwater is likely to be more than 5 m below the ground surface throughout the year.
	 Groundwater is likely to be between 3 and 5 m below the ground surface for at least part of the year.
	 Groundwater is likely to be less than 3 m below the ground surface for at least part of the year.



Superficial deposit permeability



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Superficial deposits are likely to be **free-draining**.



The superficial deposit permeability is **spatially variable**, but likely to permit moderate infiltration.

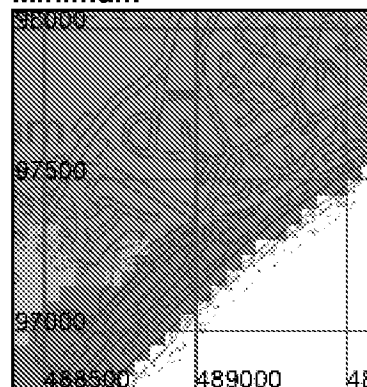


Superficial deposits are likely to be **poorly draining**.

These maps show the permeability range that is summarised above.

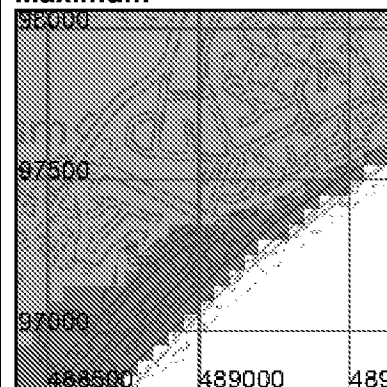
- Very Low
- Low
- Moderate
- High
- Very High

Minimum



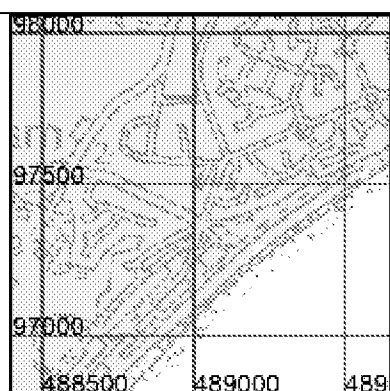
© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Maximum



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Superficial deposit thickness



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



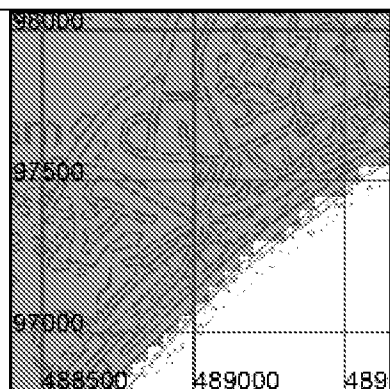
The thickness of superficial deposits is **< 3 m** and hence the permeability of the ground may be dependent on both the superficial deposits (where present) and underlying bedrock (see below).



The thickness of superficial deposits is **> 3 m** and hence the permeability of the superficial deposits is likely to determine the permeability of the ground.



Bedrock permeability



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Bedrock deposits are likely to be **free-draining**.



The bedrock permeability is **spatially variable**, but likely to permit moderate infiltration.



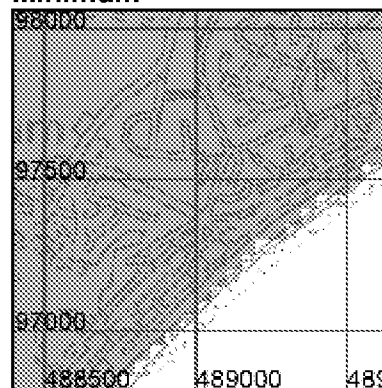
Bedrock deposits are likely to be **poorly draining**.

These maps show the permeability range that is summarised above.

Key

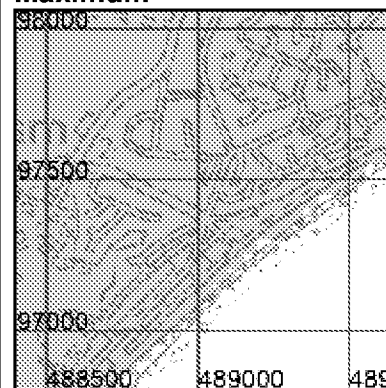
- Very Low
- Low
- Moderate
- High
- Very High

Minimum



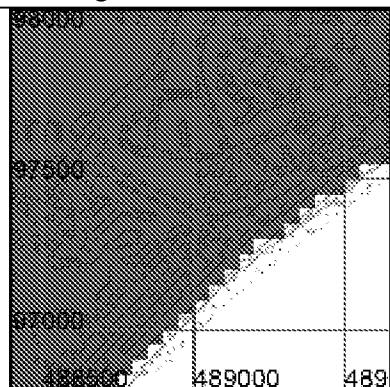
© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Maximum



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Geological indicators of flooding



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Superficial floodplain deposits or low-lying coastal areas have been identified. Groundwater levels may rise in response to high river or tide levels, potentially causing inundation of subsurface infiltration SuDS.

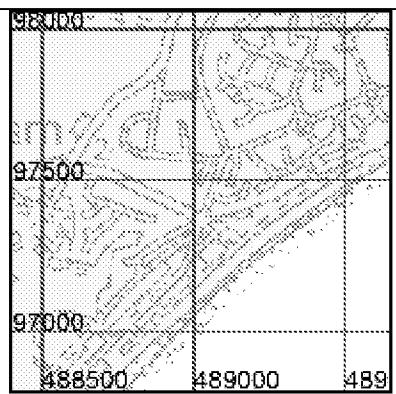


Section 3. Ground stability

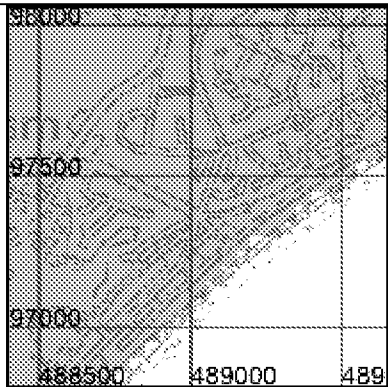
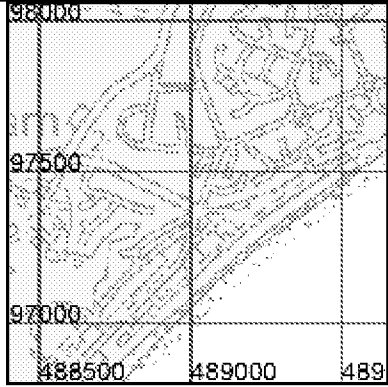
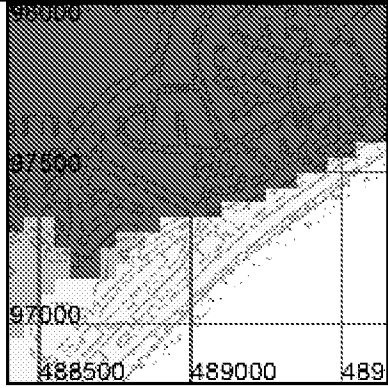
The following pages contain maps that will help you assess whether infiltration may impact the stability of the ground. They consider hazards associated with:

- soluble rocks
- landslides
- shallow mining
- running sands
- swelling clays
- compressible ground, and
- collapsible ground

In the following maps, geohazards that are identified in green are unlikely to prevent infiltration SuDS from being installed, but they should be considered during design. For more information read 'Explanation of terms' at the end of this report.

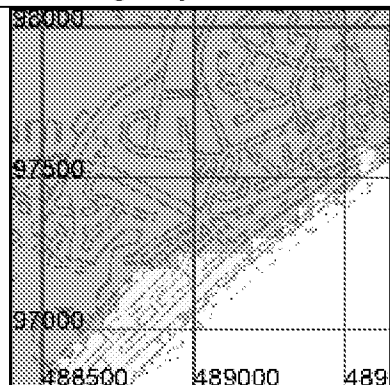
Soluble rocks	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	 Increased infiltration is unlikely to result in subsidence.
	 Increased infiltration is unlikely to cause localised subsidence, but potential impacts should be considered.
	 Increased infiltration may result in localised subsidence. The potential for or the consequences of subsidence associated with soluble rocks should be considered.
	 Very significant possibility of localised subsidence that could be initiated or made worse by infiltration.



Landslides	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	 Increased infiltration is unlikely to lead to slope instability.
	 Slope instability problems may be present or anticipated, but increased infiltration is unlikely to cause instability
	 Slope instability problems are probably present or have occurred in the past, and increased infiltration may result in slope instability.
	 Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail.
Shallow mining	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	 Increased infiltration is unlikely to lead to subsidence.
	 Shallow mining is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
	 Shallow mining could be present with a significant possibility that localised subsidence could be initiated or made worse by increased infiltration.
	 Shallow mining is likely to be present, with a very significant possibility that localised subsidence may be initiated or made worse by increased infiltration.
Running sand	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	 Increased infiltration is unlikely to cause ground collapse associated with running sands.
	 Running sand is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
	 Significant possibility for running sand problems. Increased infiltration may result in a geohazard.



Swelling clays



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Increased infiltration is unlikely to cause shrink-swell ground movement.

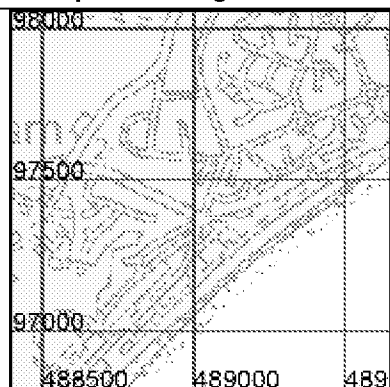


Ground is susceptible to shrink-swell ground movement. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.



Ground is susceptible to shrink-swell ground movement. Increased infiltration may result in a geohazard.

Compressible ground



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

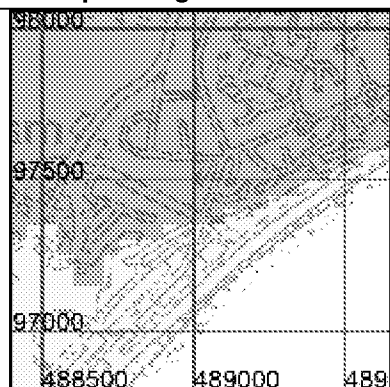


Increased infiltration is unlikely to lead to ground compression.



Compressibility and uneven settlement hazards are probably present. Increased infiltration may result in a geohazard.

Collapsible ground



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Increased infiltration is unlikely to result in subsidence.



Deposits with potential to collapse when loaded and saturated are possibly present in places. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.



Deposits with potential to collapse when loaded and saturated are probably present in places. Increased infiltration may result in a geohazard.

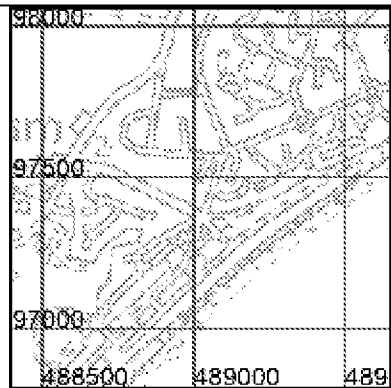
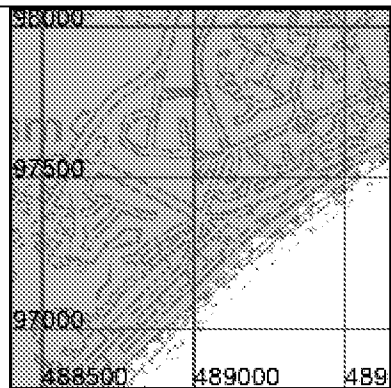


Section 4. Groundwater quality protection

The following pages contain maps showing some of the information required to ensure the protection of groundwater quality. Data presented includes:

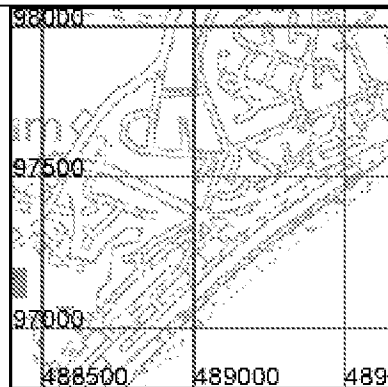
- groundwater source protection zones (Environment Agency data)
- predominant flow mechanism
- made ground

For more information read 'Explanation of terms' at the end of this report.

Groundwater source protection zones	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL Derived in part from Source Protection Zone data provided under licence from the Environment Agency © Environment Agency 2018.	☐ Groundwater is not within a source protection zone.
	☒ Source protection zone IV
	☒ Source protection zone III
	☐ Source protection zone II
	☒ Source protection zone I.
Predominant flow mechanism	
 © Crown Copyright and/or database right 2018. All rights reserved. Licence number 100021290 EUL	☐ Water is likely to percolate through the unsaturated zone to the groundwater through either the pore space in granular media or through porespace and fractures; these processes have some potential for contaminant removal and breakdown.
	☒ Water is likely to percolate through the unsaturated zone to the groundwater through fractures, a process which has little potential for contaminant removal and breakdown.



Made ground



Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.

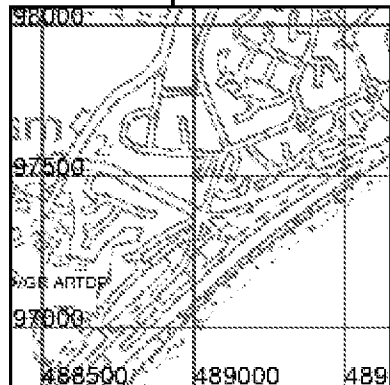
© Crown Copyright and/or database
right 2018. All rights reserved.
Licence number 100021290 EUL



Section 5. Geological Maps

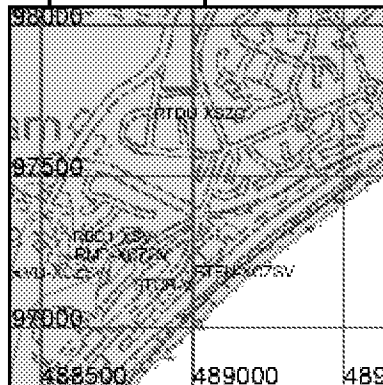
The following maps show the artificial, superficial and bedrock geology within the area of interest.

Artificial deposits



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Superficial deposits



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL

Bedrock



© Crown Copyright and/or database right 2018. All rights reserved.
Licence number 100021290 EUL



Fault

Coal, ironstone or mineral vein

Note: Faults and Coals, ironstone & mineral veins are shown for illustration and to aid interpretation of the map. Not all such features are shown and their absence on the map face does not necessarily mean that none are present

Key to Artificial deposits:

Map colour	Computer Code	Rock name	Rock type
	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

Key to Superficial deposits:

Map colour	Computer Code	Rock name	Rock type
	BTFU-XCZSV	BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED)	CLAY, SILT, SAND AND GRAVEL
	RBD1-XSV	RAISED BEACH DEPOSITS, 1	SAND AND GRAVEL
	RMD-XCZSV	RAISED MARINE DEPOSITS	CLAY, SILT, SAND AND GRAVEL
	RTDU-XSZC	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND, SILT AND CLAY
	STOB-V	STORM BEACH DEPOSITS	GRAVEL



Key to Bedrock geology:

Map colour	Computer Code	Rock name	Rock type
	LC-XCZS	LONDON CLAY FORMATION	CLAY, SILT AND SAND



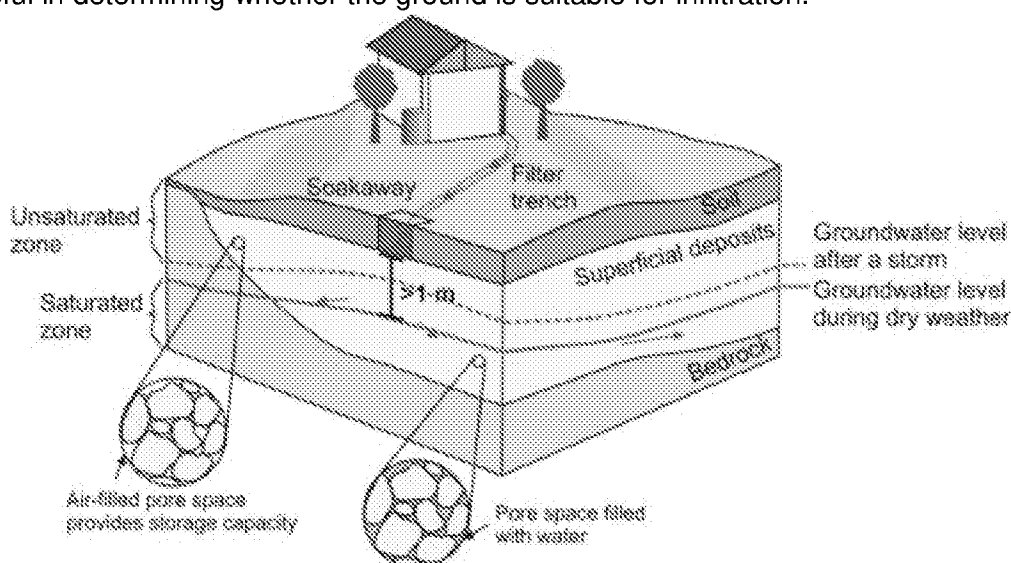
Limitations of this report:

- This report is concerned with the potential for infiltration-to-the-ground to be used as a SuDS technique at the site described. It only considers the subsurface beneath the search area and does NOT consider potential surface or subsurface impacts outside of that area.
- This report is NOT an alternative for an on-site investigation or soakaway test, which might reach a different conclusion.
- This report must NOT be used to justify disposal of foul waste or grey water.
- This report is based on and limited to an interpretation of the records held by the British Geological Survey (BGS) at the time the search is performed. The datasets used (with the exception of that showing depth to water table) are based on 1:50 000 digital geological maps and not site-specific data.
- Other more specific and detailed ground instability information for the site may be held by BGS, and an assessment of this could result in a modified assessment.
- To interpret the maps correctly, the report must be viewed and printed in colour.
- The search does NOT consider the suitability of sites with regard to:
 - previous land use,
 - potential for, or presence of contaminated land
 - presence of perched water tables
 - shallow mining hazards relating to coal mining. Searches of coal mining should be carried out via The Coal Authority Mine Reports Service: www.coalminingreports.co.uk.
 - made ground, where not recorded
 - proximity to landfill sites (searches for landfill sites or contaminated land should be carried out through consultation with local authorities/Environment Agency)
 - zones around private water supply boreholes that are susceptible to groundwater contamination.
- This report is supplied in accordance with the GeoReports Terms & Conditions available separately, and the copyright restrictions described at the end of this report

Explanation of terms

Depth to groundwater

In the shallow subsurface, the ground is commonly unsaturated with respect to water. Air fills the spaces within the soil and the underlying superficial deposits and bedrock. At some depth below the ground surface, there is a level below which these spaces are full of water. This level is known as the groundwater level, and the water below it is termed the groundwater. When water is infiltrated, the groundwater level may rise temporarily. To ensure that there is space in the unsaturated zone to accommodate this, there should be a minimum thickness of 1 m between the base of the infiltration system and the water table. An estimate of the *depth to groundwater* is therefore useful in determining whether the ground is suitable for infiltration.



Groundwater flooding

Groundwater flooding occurs when a rise in groundwater level results in very shallow groundwater or the emergence of groundwater at the surface. If infiltration systems are installed in areas that are susceptible to groundwater flooding, it is possible that the system could become inundated. The susceptibility map seeks to identify areas where the geological conditions and water tables indicate that groundwater level rise could occur under certain circumstances. A high susceptibility to groundwater flooding classification does not mean that groundwater flooding has ever occurred in the past, or will do so in the future as the susceptibility maps do not contain information on how often flooding may occur. The susceptibility maps are designed for planning; identifying areas where groundwater flooding might be an issue that needs to be taken into account.



Geological indicators of flooding

In floodplain deposits, groundwater level can be influenced by the water level in the adjacent river. Groundwater level may increase during periods of fluvial flood and therefore this should be taken into account when designing infiltration systems on such deposits. The *geological indicators of flooding* dataset shows where there is geological evidence (floodplain deposits) that flooding has occurred in the past.

For further information on flood-risk, the likely frequency of its recurrence in relation to any proposed development of the site, and the status of any flood prevention measures in place, you are advised to contact the local office of the Environment Agency (England and Wales) at www.environment-agency.gov.uk/ or the Scottish Environment Protection Agency (Scotland) at www.sepa.org.uk.

Artificial ground

Artificial ground comprises deposits and excavations that have been created or modified by human activity. It includes ground that is worked (quarries and road cuttings), infilled (back-filled quarries), landscaped (surface re-shaping), disturbed (near surface mineral workings) or classified as made ground (embankments and spoil heaps). The composition and properties of artificial ground are often unknown. In particular, the permeability and chemical composition of the artificial ground should be determined to ensure that the ground will drain and that any contaminants present will not be remobilised.

Superficial permeability

Superficial deposits are those geological deposits that were formed during the most recent period of geological time (as old as 2.6 million years before present). They generally comprise relatively thin deposits of gravel, sand, silt and clay and are present beneath the pedological soil in patches or larger spreads over much of Britain. The ease with which water can percolate through these deposits is controlled by their permeability and varies widely depending on their composition. Those deposits comprising clays and silts are less permeable and thus infiltration is likely to be slow, such that water may pool on the surface. In comparison, deposits comprising sands and gravels are more permeable allowing water to percolate freely.

Bedrock permeability

Bedrock forms the main mass of rock forming the Earth. It is present everywhere, commonly beneath superficial deposits. Where the superficial deposits are thin or absent, the ease with which water will percolate into the ground depends on the permeability of the bedrock.



Natural ground instability

Natural ground instability refers to the propensity for upward, lateral or downward movement of the ground that can be caused by a number of natural geological hazards (e.g. ground dissolution/compressible ground). Some movements associated with particular hazards may be gradual and of millimetre or centimetre scale, whilst others may be sudden and of metre or tens of metres scale. Significant natural ground instability has the potential to cause damage to buildings and structures, especially when the drainage characteristics of a site are altered. It should be noted, however, that many buildings, particularly more modern ones, are built to such a standard that they can remain unaffected in areas of significant ground movement.

Shrink-swell

A shrinking and swelling clay changes volume significantly according to how much water it contains. All clay deposits change volume as their water content varies, typically swelling in winter and shrinking in summer, but some do so to a greater extent than others. Contributory circumstances could include drought, leaking service pipes, tree roots drying-out the ground or changes to local drainage patterns, such as the creation of soakaways. Shrinkage may remove support from the foundations of buildings and structures, whereas clay expansion may lead to uplift (heave) or lateral stress on part or all of a structure; any such movements may cause cracking and distortion.

Landslides (slope stability)

A landslide is a relatively rapid outward and downward movement of a mass of ground on a slope, due to the force of gravity. A slope is under stress from gravity but will not move if its strength is greater than this stress. If the balance is altered so that the stress exceeds the strength, then movement will occur. The stability of a slope can be reduced by removing ground at the base of the slope, by placing material on the slope, especially at the top, or by increasing the water content of the materials forming the slope. Increase in subsurface water content beneath a soakaway could increase susceptibility to landslide hazards. The assessment of landslide hazard refers to the stability of the present land surface. It does not encompass a consideration of the stability of excavations.

Soluble rocks (dissolution)

Some rocks are soluble in water and can be progressively removed by the flow of water through the ground. This process tends to create cavities, potentially leading to the collapse of overlying materials and possibly subsidence at the surface. The release of water into the subsurface from infiltration systems may increase the dissolution of rock or destabilise material above or within a cavity. Dissolution cavities may create a pathway for rapid transport of contaminated water to an aquifer or water course.



Compressible ground

Many ground materials contain water-filled pores (the spaces between solid particles). Ground is compressible if a building (or other load) can cause the water in the pore space to be squeezed out, causing the ground to decrease in thickness. If ground is extremely compressible the building may sink. If the ground is not uniformly compressible, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The compressibility of the ground may alter as a result of changes in subsurface water content caused by the release of water from soakaways.

Collapsible deposits

Collapsible ground comprises certain fine-grained materials with large pore spaces (the spaces between solid particles). It can collapse when it becomes saturated by water and/or a building (or other structure) places too great a load on it. If the material below a building collapses it may cause the building to sink. If the collapsible ground is variable in thickness or distribution, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The subsurface underlying a soakaway will experience an increase in water content that may affect the stability of the ground. This hazard is most likely to be encountered only in parts of southern England.

Running sand

Running sand conditions occur when loosely-packed sand, saturated with water, flows into an excavation, borehole or other type of void. The pressure of the water filling the spaces between the sand grains reduces the contact between the grains and they are carried along by the flow. This can lead to subsidence of the surrounding ground. Running sand is potentially hazardous during the drainage system installation. During installation, excavation of the ground may create a space into which sand can flow, potentially causing subsidence of surrounding ground.

Shallow mining hazards (non coal)

Current or past underground mining for coal or for other commodities can give rise to cavities at shallow or intermediate depths, which may cause fracturing, general settlement, or the formation of crown-holes in the ground above. Spoil from mineral workings may also present a pollution hazard. The release of water into the subsurface from soakaways may destabilise material above or within a cavity. Cavities arising as a consequence of mining may also create a pathway for rapid transport of contaminated water to an aquifer or watercourse. The mining hazards map is derived from the geological map and considers the potential for subsidence associated with mining on the basis of geology type. Therefore if mining is known to occur within a certain rock, the map will highlight the potential for a hazard within the area covered by that geology.



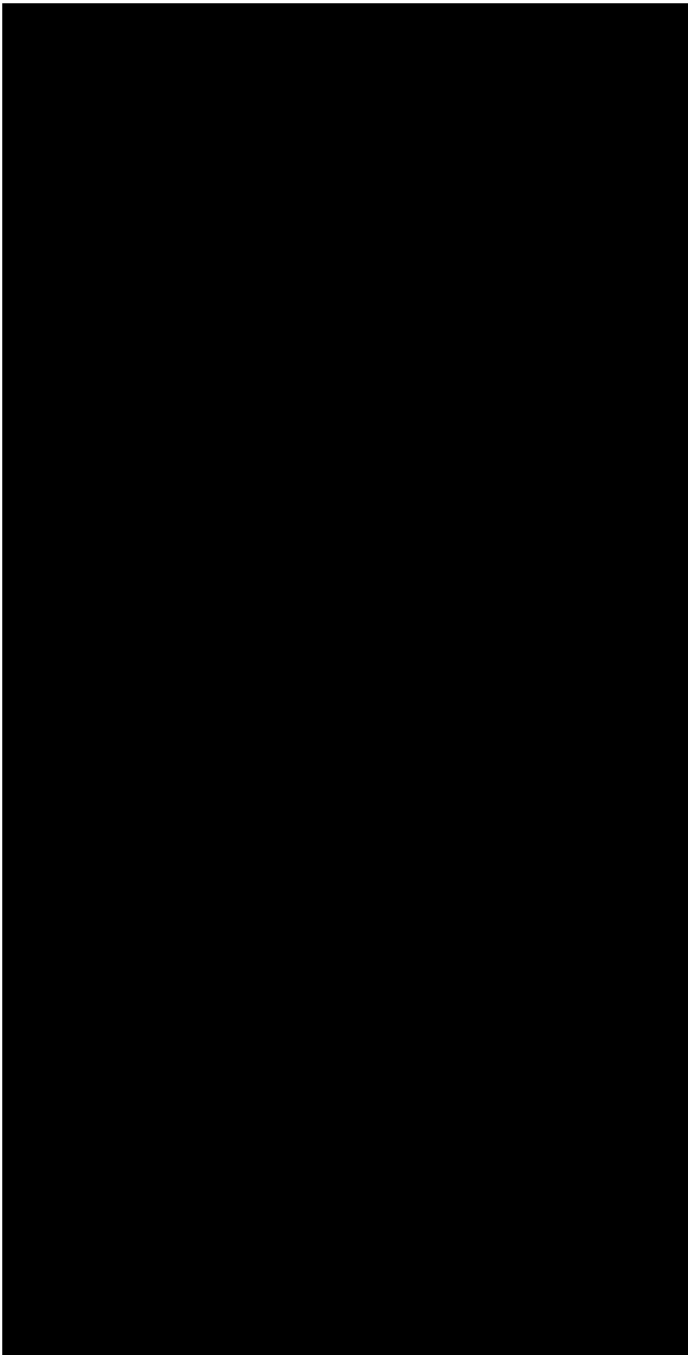
For more information regarding underground and opencast **coal mining**, the location of mine entries (shafts and adits) and matters relating to subsidence or other ground movement induced by **coal mining** please contact the Coal Authority, Mining Reports, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG; telephone 0845 762 6848 or at www.coal.gov.uk. For more information regarding other types of mining (i.e. non-coal), please contact the British Geological Survey.

Groundwater source protection zones

In England and Wales, the Environment Agency has defined areas around wells, boreholes and springs that are used for the abstraction of public drinking water as source protection zones. In conjunction with Groundwater Protection Policy the zones are used to restrict activities that may impact groundwater quality, thereby preventing pollution of underlying aquifers, such that drinking water quality is upheld. The Environment Agency can provide advice on the location and implications of source protection zones in your area (www.environment-agency.gov.uk/)



Contact Details





Terms and Conditions

General Terms & Conditions

This Report is supplied in accordance with the GeoReports Terms & Conditions available on the BGS website at <https://shop.bgs.ac.uk/georeports> and also available from the BGS Central Enquiries Desk at the above address.

Important notes about this Report

- The data, information and related records supplied in this Report by BGS can only be indicative and should not be taken as a substitute for specialist interpretations, professional advice and/or detailed site investigations. You must seek professional advice before making technical interpretations on the basis of the materials provided.
- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, and better access to sampling locations.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
- Data may be compiled from the disparate sources of information at BGS's disposal, including material donated to BGS by third parties, and may not originally have been subject to any verification or other quality control process.
- Data, information and related records, which have been donated to BGS, have been produced for a specific purpose, and that may affect the type and completeness of the data recorded and any interpretation. The nature and purpose of data collection, and the age of the resultant material may render it unsuitable for certain applications/uses. You must verify the suitability of the material for your intended usage.
- If a report or other output is produced for you on the basis of data you have provided to BGS, or your own data input into a BGS system, please do not rely on it as a source of information about other areas or geological features, as the report may omit important details.
- The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
- Note that for some sites, the latest available records may be quite historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

Copyright:

Copyright in materials derived from the British Geological Survey's work, is owned by the Natural Environment Research Council (NERC) and/ or the authority that commissioned the work. You may not copy or adapt this publication, or provide it to a third party, without first obtaining NERC's permission, but if you are a consultant purchasing this report solely for the purpose of providing advice to your own individual client you may incorporate it unaltered into your report to that client without further permission, provided you give a full acknowledgement of the source. Please contact the BGS Copyright Manager, British Geological Survey, Environmental Science Centre, Nicker Hill, Keyworth, Nottingham NG12 5GG. Telephone: 0115 936 3100.

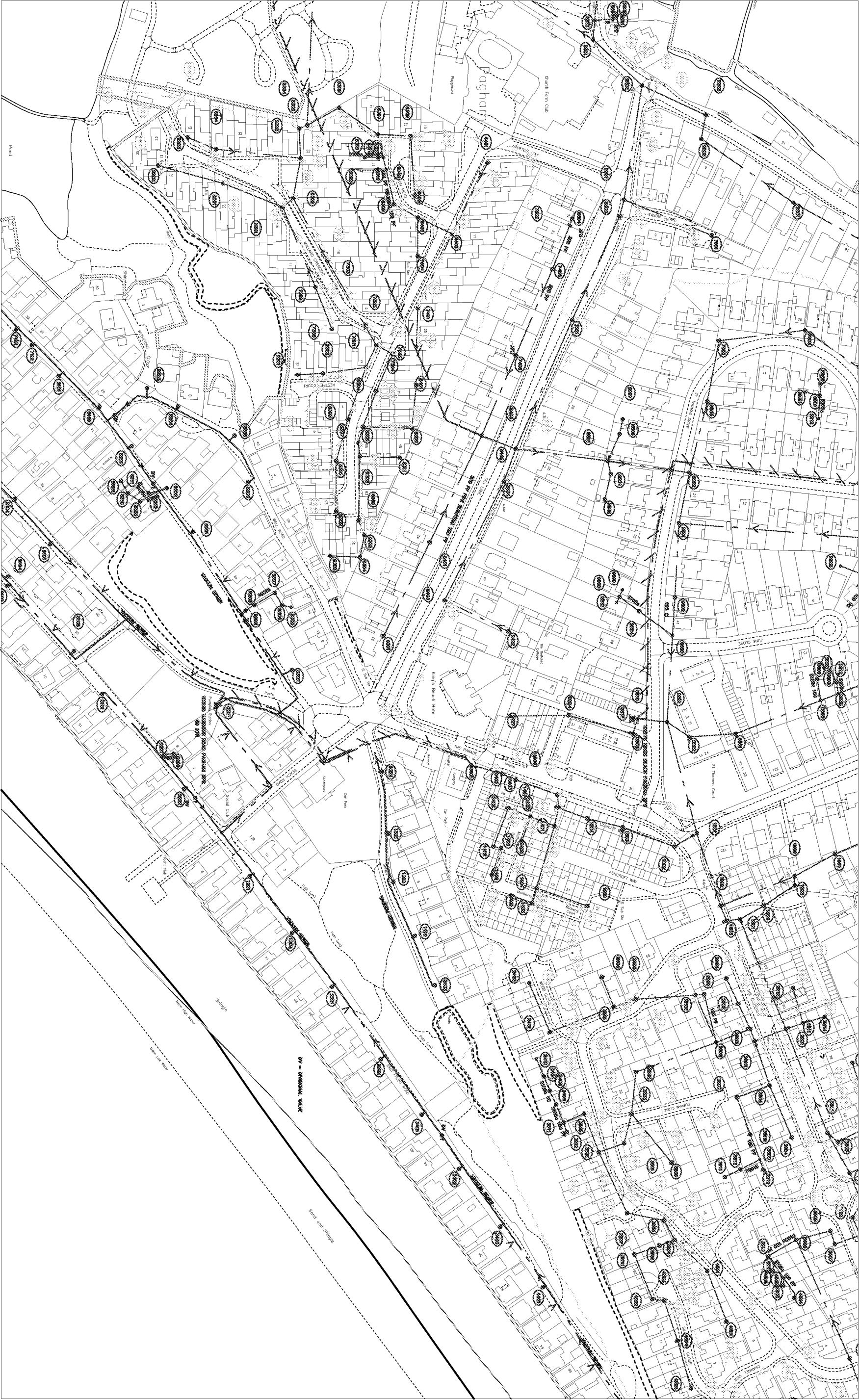
© NERC 2018 All rights reserved.

This product includes mapping data licensed from the Ordnance Survey® with the permission of the Controller of Her Majesty's Stationery Office. © Crown Copyright 2018. All rights reserved. Licence number 100021290 EUL



**Report issued by
BGS Enquiry Service**

97700



O.S. REF. SZ8997SW		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. WARNING: BAC, PPSW are considered to be correct. However, the actual positions should be determined on site. WARNING: The actual positions should be determined on site.
Drawn by:	kumaria	
Scale:	1:2500	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298550.
Date:	23/01/2018	
Title: 277598_The Former Kings Beach		

4885550

489494

Catchment Map:
Pagham Wastewater Treatment Works



Appendix C

Surface Water Assessment

Date: 25/01/2018

Site Ref former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment

Existing car park

Is discharge to: SPZ1? ☐ N Drinking Water Protection Zone ? ☐ N

Is site in close proximity to an area with sensitive environmental designation? ☐ Y
if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y

Land Use

car parks -infrequent turn over

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments
To surface water discharge ☐ N

Component

1 N/A

2 N/A

3 N/A

mitigation index

add stage

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	0.50
0	0	0	
0	0	0	0.50
0	0	0	
0.5	0.4	0.4	

Land Use

car parks -infrequent turn over

Hazard

low

TSS index	Metals index	HydroCar index	residual
0.5	0.4	0.4	

Treatments
To groundwater discharge ☐ Y

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0.5	0.4	0.4	

Is a groundwater risk screening required?

☐ N

Date: 25/01/2018

Site Ref

former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment

Existing commercial roofs (to sewer)

Is discharge to: SPZ1? ☐ N ☐ Drinking Water Protection Zone ? ☐ Y ☐

Is site in close proximity to an area with sensitive environmental designation? ☐ Y ☐

if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y ☐

Land Use

roofs-non-residential

Hazard

low

TSS index	Metals index	HydroCar index
0.3	0.2	0.05

Treatments

To surface water discharge ☐ Y ☐
Component

1 N/A

2 N/A

3 N/A

mitigation index add stage

X1 N/A

Enhanced mitigation index stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	0.50
0	0	0	
0	0	0	0.50
0	0	0	
0.3	0.2	0.05	

Land Use

roofs-non-residential

Hazard

low

TSS index	Metals index	HydroCar index	residual
0.3	0.2	0.05	

Treatments

To groundwater discharge ☐ N ☐
Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0.3	0.2	0.05	

Is a groundwater risk screening required?

☐ N ☐

Date: 25/01/2018

Site Ref

former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment

proposed use

Is discharge to: SPZ1? ☐ N Drinking Water Protection Zone ? ☐ N

Is site in close proximity to an area with sensitive environmental designation? ☐ Y

if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y

Land Use

driveways (individual)

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge ☐ N

Component

1 N/A

2 N/A

3 N/A

mitigation index add stage

X1 N/A

Enhanced mitigation index stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	0.50
0	0	0	
0	0	0	0.50
0	0	0	
0.5	0.4	0.4	

Land Use

driveways (individual)

Hazard

low

TSS index	Metals index	HydroCar index	residual
0.5	0.4	0.4	

Treatments

To groundwater discharge ☐ Y

Infiltration surface

1 Permeable pavement

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.6	0.7	1.00
0	0	0	

Is a groundwater risk screening required?

☐ N

Date: 25/01/2018

Site Ref former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment proposed use

Is discharge to: SPZ1? ☐ N Drinking Water Protection Zone ? ☐ N

Is site in close proximity to an area with sensitive environmental designation? ☐ Y
if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y

Land Use	Hazard	TSS index	Metals index	HydroCar index
roofs-residential	very low	0.2	0.2	0.05

*2 residential roofs remove gross solids and sediments

Treatments
To surface water discharge ☐ N

Component		TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1 N/A		0	0	0	1.00
2 N/A		0	0	0	0.50
3 N/A		0	0	0	0.50
mitigation index	basic OK	0	0	0	
X1 N/A		0	0	0	0.50
Enhanced mitigation index	stage missing	0	0	0	
Residual pollution index		0.2	0.2	0.05	

Land Use	Hazard	TSS index	Metals index	HydroCar index	residual
roofs-residential	very low	0.2	0.2	0.05	

*2 residential roofs remove gross solids and sediments

Treatments
To groundwater discharge ☐ Y

Infiltration surface	TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1 Permeable pavement	0.7	0.6	0.7	1.00
Final residual pollution index	0	0	0	

Is a groundwater risk screening required? ☐ N

Date: 25/01/2018

Site Ref

former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment

proposed use

Is discharge to: SPZ1? ☐ N Drinking Water Protection Zone ? ☐ N

Is site in close proximity to an area with sensitive environmental designation? ☐ Y

if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y

Land Use

driveways (individual)

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge ☐ Y

Component

1 Permeable pavement

2 N/A

3 N/A

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.6	0.7	1.00
0	0	0	0.50
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	

Land Use

driveways (individual)

Hazard

low

TSS index	Metals index	HydroCar index	residual
0	0	0	

Treatments

To groundwater discharge ☐ N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

☐ N

Date: 25/01/2018

Site Ref

former Kings Beach Hotel

SuDS Water Quality Management CIRIA C753 Ch26
Simple Index Approach
Catchment

proposed use

Is discharge to: SPZ1? ☐ N Drinking Water Protection Zone ? ☐ N

Is site in close proximity to an area with sensitive environmental designation? ☐ Y

if so how close? m

Is an additional treatment component required due to sensitivity? ☐ Y

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0.2	0.2	0.05

**2 residential roofs remove gross solids and sediments*
Treatments

To surface water discharge ☐ Y

Component

1 Permeable pavement

2 N/A

3 N/A

mitigation index

basic OK

X1 N/A

Enhanced mitigation index

stage missing

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.7	0.6	0.7	1.00
0	0	0	0.50
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	0.50
0.7	0.6	0.7	
0	0	0	

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0	0	0

residual

**2 residential roofs remove gross solids and sediments*
Treatments

To groundwater discharge ☐ N

Infiltration surface

1 N/A

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	

Is a groundwater risk screening required?

☐ N

Appendix D

Conditions & Limitations

OPUS
ENGINEER'S INSPECTION
CONDITIONS AND LIMITATIONS

1. The report is a record of a visual inspection carried out by, or under the direction of a Chartered Structural Engineer and must not be misinterpreted as a Structural Survey such as would be carried out by a Chartered Surveyor. The report is not a Valuation Survey.
2. The inspection is strictly limited to the items requested and these will be detailed in Clause 1 of the report. No consideration will be given to any other aspects or parts of the building.
3. The report is confidential to the Client(s) stated in Clause 1 and has been prepared to their instructions for their own purposes only and it is not permitted to disclose this report to any other parties (except the Clients own Solicitors, Surveyors, Building Societies or Estate Agents) without the prior consent of Opus.
4. The copyright of this report remains the property of Opus.
5. No liability for the contents of this report is accepted to any parties other than the Client(s) stated in Clause 1.1. No parties other than the client stated in Clause 1.1 should rely upon this report.
6. Unless specifically stated otherwise:-
 - a) Trial holes will not be excavated prior to the preparation of the report and the depth and construction of the foundations and type of sub-soil will not be inspected.
 - b) All external observations will be carried out by eye from the ground level only. Internal inspection is made within the limits of ready accessibility and it is not normal practice to lift floor coverings or floor boards, remove fixtures, panels or plaster, or move heavy items of furniture or bulky goods or materials.
 - c) No inspection will be made of any roof voids, floor joists, wall cavities, drainage pipework or any other hidden or inaccessible parts.
 - d) No timbers will be checked for damp, rot, infestation by wood-boring insects or other defects.
 - e) It should not be construed that any parts of the construction comply with the requirements of the Building Regulations Act or standard practice either current or as current at the time of original construction. No enquiries to any Authorities will be made.
 - f) No testing or enquiries into the presence of or susceptibility to pollution, contamination, radiation, methane, radon or other gases or hazardous substances has been carried out.
7. Unless specifically stated otherwise in the report, any recommendations for works given in the report are outline only and are to be confirmed or modified as appropriate at detailed design stage.
8. Where trial holes are specifically included in our instructions the condition of the footing and the founding soil relates only to the point of excavation and does not necessarily confirm a continuation of the same conditions throughout the non-inspected areas of the structure. Whilst such trial pits will usually provide a reasonable indication as to the general state of the foundations and ground conditions, these cannot be determined with complete certainty.
9. Under the Construction (Design & Management) Regulations latest edition, the Client has obligations for ensuring Health and Safety arising from any construction work. If it is proposed to proceed with construction work based upon information or recommendations contained in this report, these regulations probably apply. Further details of any issues arising from our report or the Clients obligations generally are available on request.
10. Unless dealt with more specifically above the Association of Consulting Engineers Conditions of Engagement Short Form Agreement 2002 apply.



www.opusinternational.co.uk