Gladman

Dover Road, Deal

Flood Risk Assessment & Outline Surface Water Drainage Strategy

881053-R2(03)-FRA

MARCH 2017

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RSK GENERAL NOTES

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Title: Flood Risk Assessment & Outline Surface Water Drainage Strategy
Client: Gladman
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EXECUTIVE SUMMARY

RSK has been commissioned to undertake a Flood Risk Assessment and Outline Drainage Strategy in support of the Outline Planning Application for a proposed residential end use development. This will be contained within a proposed site totalling 4.06 hectares which is currently considered as undeveloped from a hydraulic prospective and is located at land off Dover Road, South of Deal in Kent. The existing site contains an area of managed woodland and existing equestrian paddocks, such as that shown below.

This site is located within Flood Zone 1. Therefore passes the Sequential Test as it is considered to be located within the most appropriate location for all forms of development from a flood risk prospective.

Generally the site is considered to be at low risk from all sources of flooding. The flood risk to or from the site will not increase following development provided that certain recommendations are met. These recommendations include;

- Setting finished floor levels at or above the existing ground levels,
- Surface water generated from the development site should not discharge off the site at a higher rate, and;
- Safe conveyance of surface water flows across the site without impacting the development, residents or others.

Based on the ground conditions it is thought that surface water will discharge to the chalk bedrock via deep bore soakaways. These should be connected downstream of the attenuation basin. Infiltration tests for the soakaways have been carried out within cable percussive deep boreholes into the underlying Chalk bedrock. The location, size and number of deep bore soakaways can be confirmed as part of the detailed drainage design.

The drainage strategy should be confirmed by the Lead Local Flood Authority, in this case Kent County Council prior to development.

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CONTENTS

APPENDICES

1 INTRODUCTION

RSK Land and Development Engineering Ltd (RSK) was commissioned to carry out a Flood Risk Assessment (FRA) for Gladman (the 'client'). The assessment is in support of the outline planning submission for the land at Dover Road, Deal, Kent (the 'site').

The assessment has been prepared in accordance with the National Planning Policy Framework (NPPF)[1] and its accompanying Planning Practice Guidance[2], the Interim Code of Practice for Sustainable Drainage[3], BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice[4] and the Non-statutory technical standards for sustainable drainage systems[5], with site-specific advice from the Environment Agency (EA), the Lead Local Flood Authority (LLFA), the Local Planning Authority (LPA), the architect and the client.

The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

The key definitions within the PPG are:

- "Flood risk" is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.
- "Areas at risk of flooding" means areas at risk from all sources of flooding. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the Environment Agency has notified the local planning authority as having critical drainage problems.

For this site, the key aspects that require the assessment are:

- The Environment Agency's indicative flood zone map shows that the site is located within Flood Zone 1 (**Figure 1.1);**
- The site area is in the order of 4Ha therefore surface water drainage must be considered, and sustainable drainage systems (SuDS), where possible; and

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[1] Communities and Local Government, 'National Planning Policy Framework', 2012

[2] Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', March 2014 http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

[3] DEFRA, 'Interim Code of Practice for Sustainable Drainage Systems' National SUDS Working Group, July 2004

[4] BSI, 'BS 8533-2011 Assessing and managing flood risk in development Code of practice', 2011

[5] DEFRA, 'Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems', March 2015

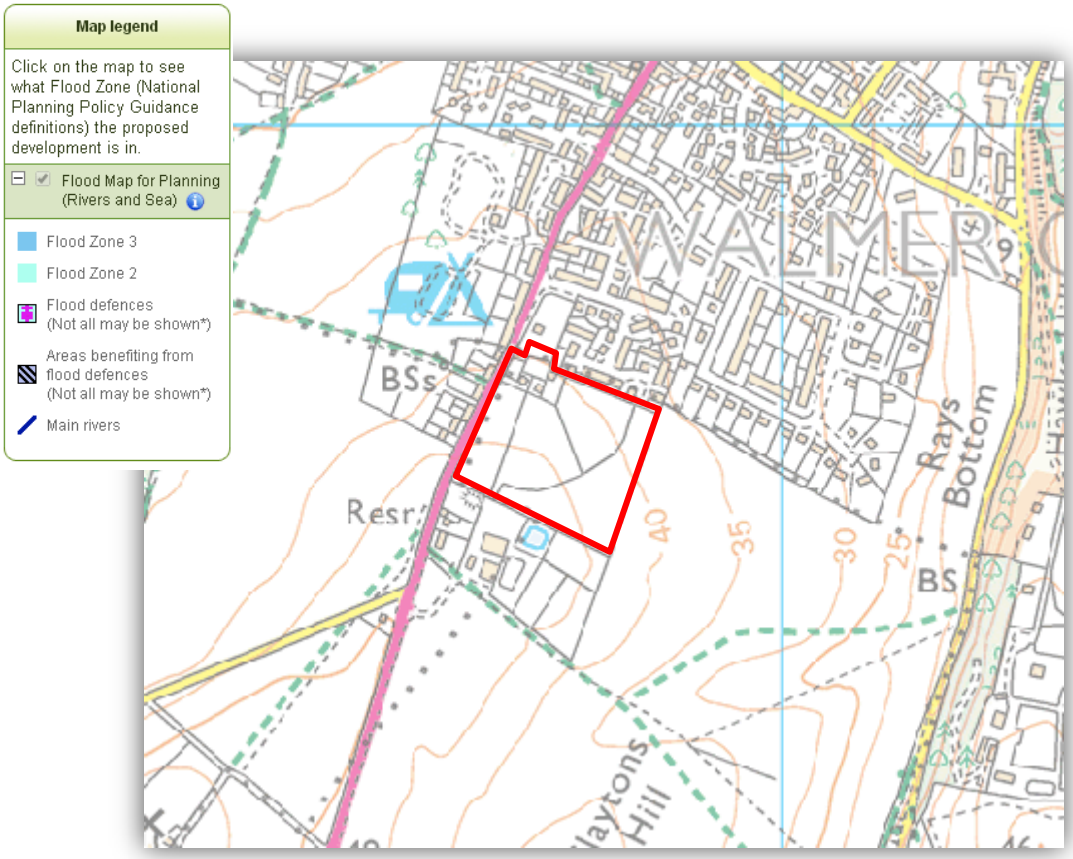

Figure 1.1: Environment Agency Flood Zone Map (accessed January 2017)

2 CONTEXT AND SCOPE OF WORK

A key element of project development is to prepare a Flood Risk Assessment to establish the flood risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the risk to a more acceptable level.

The scope of work relating to a Flood Risk Assessment is based on the guidance provided in Section 10 of the NPPF and its accompanying Planning Practice Guidance.

A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. The scope of this assessment therefore comprises the following elements:

- To review the Development Framework Plan, planning information and other studies to determine existing site conditions;
- To obtain information on the hydrology and hydrological regime in and around the site;
- To obtain the views of the Lead Local Flood Authority in terms of flood risk and drainage;
- To obtain the views of the Environment Agency including scope, location and impacts;
- To determine the extent of new flooding provision and the influence on the site;
- To assess the impact on the site from climate change effects and anticipated increases in rainfall over a 100 year period for residential uses;
- To review site surface water drainage based on the proposed layout and, if necessary, to determine the extent of infrastructure required; and
- To prepare a report including calculations and summaries of the source information and elements reviewed.

Reliance has been placed on factual and anecdotal data obtained from the sources identified. RSK cannot be held responsible for the scope of work, or any omissions, misrepresentation, errors or inaccuracies with the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

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3 SITE DESCRIPTION

3.1 Location

Site Name: Dover Road, Deal

Site Address: Dover Road,

Walmer,

Deal,

East Sussex,

CT14 7PG.

Site National Grid Reference: 636700 E, 149580 N

The existing site is located to the east of Dover Road and measures approximately 4Ha.

Generally the site is located approximately 0.75km southeast of Walmer train station and is surrounded by agricultural land and residential properties. Generally the site falls from southwest to northeast.

Table 3.1, below, provides a description of the immediate surroundings of the site on all sides.

Table 3.1: Site setting

Direction	Characteristic
Northwest	Residential properties off Dover Road which forms the site boundary. Beyond these properties is Clifford Park Caravan Site and agricultural land.
Northeast	Residential properties off Thistledown
Southwest	There are a small number of residential properties and a commercial farm shop with agricultural land beyond. In addition there is a small covered reservoir and an open reservoir located approximately 5m and 10m, respectively, from the site boundary.
Southeast	Large open agricultural field leading to Glen Road to the south east of the site.

Figure 3.1 shows a Site Location Map.

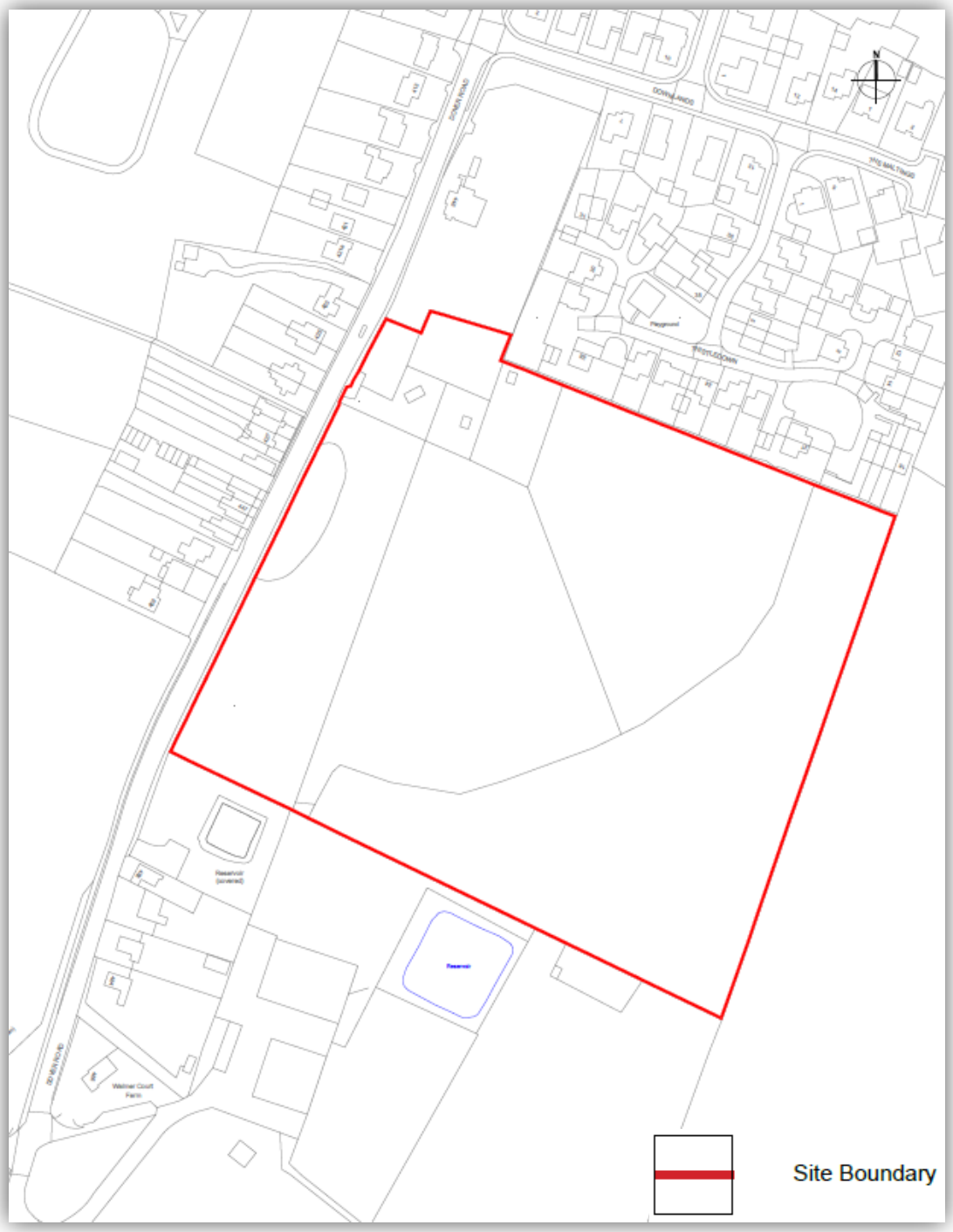

Figure 3.1: Site location plan

3.2 Land use and topography

A topographic survey has been provided for the site by Gladman and was undertaken on 12th January 2017 (**Appendix B**). Generally the site falls to the north and northeast. The highest on-site elevation is located on the south-western boundary at 47.53m above ordnance datum (AOD). The lowest on-site elevation is located to the northeast at 36.86mAOD, which shows more than a 10m fall across the site.

The site largely occupies the highpoint of a large ridge which runs north-south and falls away to the west, west of Dover Road and to the northeast within the site, towards Glen Road. Contours representing the topography of the general area can be seen within **Figure 1.1** and a more detailed representation of the on-site levels are shown by the Topographic Survey in **Appendix B**.

The approximate land use of the site is as follows:

Table 3.2: Existing site land uses

Land use	Area (Ha)	Percentage (%)
Impermeable	0.01	<1
Permeable	4.05	>99
Total	4.06	100

There is little evidence to suggest that the areas of existing hardstanding are positively drained and therefore it is assumed that most of this ground will flow overland onto the surround green space. Therefore, as rain water will drain to the surrounding ground the whole site can be considered as Greenfield.

3.3 Hydrology

There are no mapped watercourses on-site. The nearest watercourse to the proposed site is located approximately 2.72km to the northwest of the site.

As a result, the only hydraulic features within the study area are the small reservoirs discussed within **Table 3.1**, located adjacent to the southern and south-western site boundary.

It was noted in following a site walkover there were no drainage, irrigation or field boundary ditches location within the site boundary.

3.4 Geology

Based on published geological records for the area (British Geological Survey online mapping), the site exhibits the following geology:

- Split Superficial Geology:
  - Majority of the site is underlain with Head - Clay and Silt. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by subaerial slopes. This occupies the superficial geology of approximately 70% of the site.
  - To the southwest of the site, the remaining 30% (estimate) of the site does not have a superficial geological record according to the British Geological Survey.

- Bedrock: Seaford Chalk Formation - Chalk. Sedimentary Bedrock formed approximately 84 to 89 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas.

In summary, the site is underlain by Clay and Silt, Head superficial deposits over Chalk.

BGS Borehole Ref TR34NE22, located approximately 60m southwest of the site near properties east of Dover Road. This borehole states that a thin (0.4m) thick stratum of made ground was recorded over Chalk Bedrock, which marries with the mapped records described above. This borehole struck groundwater at 47.30m below ground level (bgl) which came to rest at 44.99mbgl.

This has been confirmed on-site through borehole logs, which matches the site geological description and no Groundwater was observed to depths of 6.6mbgl. As shown in **Appendix C**.

3.5 Hydrogeology

Hydrogeological information was obtained from the Environment Agency's online mapping service. These maps indicate that the site lies above Unproductive Superficial Strata, whilst only the eastern section of the site lies above a Principle Bedrock Aquifer (These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage.

The site is not located within a Groundwater Source Protection Zone (SPZ); however the site is situated between two areas which are considered SPZ's. These are both located over 0.5km to the north and south respectively and therefore do not impact on the proposed site.

This type of hydrogeology, evidence from nearby borehole logs and on-site observations suggests the Groundwater may be found at significant depths below the site and will not impact on the proposed development.

4 DEVELOPMENT PROPOSALS

The proposed development is for a residential end use. The proposed Development Framework Plan show that the site totals 4.06Ha with a proposed developable area of 2.54Ha. As a result of the proposed residential end use it is assumed that the site will contain a variety of dwellings, driveways, gardens, an access highway off Dover Road, areas of public open space and associated soft landscaping. Of the proposed developable area it has been assumed that typically an impermeable area of 55% can be expected. Therefore the approximate land uses of the proposed development site are summarised in **Table 4.1** below.

Table 4.1: Proposed site land uses

Land use	Area (Ha)	Percentage
Impermeable	1.40	55%
Permeable	1.14	45%
Total	2.54	100%

The remaining 1.52Ha within the site boundary will remain as Greenfield land. As a result, it is proposed not to positive drain the Greenfield areas as these will naturally infiltrate.

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5 LEGISLATION AND POLICY CONTEXT

5.1 National policy

Table 5.1: National legislation and policy context

Legislation	Key provisions
National Planning Policy Framework (2012)	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Planning Practice Guidance (2014)	The NPPF is supported by an online Planning Practice Guidance, which provide additional guidance on flood risk.
Flood and Water Management Act 2010	The Flood and Water Management Act (FWMA) aims to implement the findings of the 2007 Pitt Review and co-ordinate control of drainage and flood issues. There are a number of increased responsibilities within the Act that affect adoption of SuDS features and the role of the Environment Agency to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Resources Act 1991	Section 24 – The Environment Agency is empowered under this Act to maintain and improve the quality of 'controlled' waters Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters Section 88 – Discharge consents are required for discharges to controlled waters
Water Framework Directive (2000)	The Water Framework Directive (WFD) requires all inland and coastal waters to reach 'good' chemical and biological status by 2015. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds Directive that have water-related features, by designating them as 'protected sites'.

5.2 Local policy

Local policies ensures that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk.

Table 5.2: Local policy context

LDF document	Key provisions and policies
Dover District Council: Local development Framework Core Strategy February 2010	There are no specific Flood Risk Assessment Policies within the Core Strategy. However, each policy discussing development within the area states that it should be undertaken in line with National Flood Risk Policy (NRM4, PPS25 (superseded by NPPF)).

6 SOURCES OF INFORMATION

6.1 Environment Agency consultation

6.1.1 Flood zone maps

The Environment Agency Flood Zone mapping study for England and Wales is available on their website at http://maps.environment-agency.gov.uk/

The current displayed map is reproduced as **Figure 1.1** and shows the site to lie wholly within Flood Zone 1, showing the site with medium risk of flooding from fluvial or tidal sources.

In December 2013, the Environment Agency released an additional form of mapping 'Risk of Flooding from Rivers and Sea', which is available at:

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap#x=357683&y=355134&scale=2

This map has been reproduced as **Figure 7.1** and shows the Environment Agency's assessment of the likelihood of flooding from rivers and the sea at any location and is based on the presence and effect of all flood defences, predicted flood levels, and ground levels.

The relevant guidance note from the Environment Agency is available online through the following link: https://www.gov.uk/planning-applications-assessing-flood-risk

6.1.2 Site specific consultation

The Environment Agency was formally consulted as part of this assessment, with request for flood related information (including flood levels) included in the consultation. Their full response to both the pre-planning enquiry and the flood data request can be found in **Appendix D**.

A summary of the received information is as follows:

- The site is located within Flood Zone 1 and therefore not modelled flood levels are available;
- Climate change allowances which state that for a large-major development within Flood Zone 2 an intermediate/basic method of estimating climate change can be used. As the site is Flood Zone 1 it is reasonable to assume that the basic method is used. As a result Table B of the guidance states up to a 700mm increase in fluvial levels within the southeast region, as the site is elevated over 30m above the nearest watercourse, climate change is not thought to impact of the proposed development;
- There is no historic flood mapping for the area
- Groundwater data has been provided and the highest recorded historic level is 13.26mAOD, within the vicinity of the site, and;
- All of the readily available information on the Environment Agencies website.

6.2 Dover District Council

Dover District Council has responded to the information request stating that they have forwarded the request on to the Environment Agency.

6.3 Kent County Council

Kent County Council has been contacted in an attempt to obtain a complete set of data to inform this assessment. The full response can be seen within **Appendix E** and a summary of the provided information is below:

- Climate change implications are not required for fluvial or tidal sources on this due to its elevation and absence of main rivers;
- The surface water drainage strategy should incorporate 20% climate change with a further analysis for 40% climate change on the 1 in 100 year event;
- Kent County Council do not hold any historic flooding records for this site;
- Kent County Council are unaware of any local discharges to watercourse;
- Kent County Council are unaware of any Groundwater flooding issues within the vicinity of the proposed site. Should infiltration be proposed they would expect to see geotechnical information that identifies the depth to the water table across the site to ensure that a sufficient unsaturated zone is provided;
- Kent County Council do not hold records of any unmapped culverted watercourses or private sewers in the area;
- There is an assumption that infiltration would be utilised for the disposal of surface water from the development, and;
- There are known sewer capacity issues in the adjacent sewer system and the Council would like to explore the opportunity to improve the highway at the site entrance.

6.4 Internal Drainage Board

There are no known Internal Drainage Boards within the study area.

6.5 Canal & River Trust

Having reviewed the Canal and Rivers Trust website, as well as online mapping there are no known assets within the vicinity of the proposed site.

6.6 Relevant studies

Table 6.1: Relevant studies

<table>
<tr><th>Study</th><th>Comments</th></tr>
<tr><td>SFRA:
JBA Consulting on behalf of Dover District Council
Strategic Flood Risk Assessment
September 2007</td><td>The principal aim of the SFRA was to map all forms of flood risk in order to provide an evidence base to locate new development. It also aims to provide appropriate policies for the management of flood risk, and identify the level of detail required for site-specific FRAs. The SFRA contains information and maps detailing flood sources and risks. Information relevant to the site is detailed in Section 7 of this report.
The site itself has been identified as an Option 1 possible development site which continues the current rate of development within the area.
Flood history shows the District has been subject to flooding from various sources of flooding in the past. However, there are no records impacting on the site or the immediately surrounding area.
Tidal flood levels around deal have been modelled and the extreme sea level projections are 6.14mAOD for the 1000year flood event, over 30metres lower than the proposed site.
Table 5-45 SUDS suitability
<table><tr><th>SUDS suitability</th><th>Reasoning</th><th>Possible methods</th></tr><tr><td>Low – poor suitability</td><td>Poorly draining soils or geological layer for the site, e.g. a clay soil layer and/or underlying chalk where the groundwater level is high.</td><td>Try to minimise impermeable surfaces wherever possible.</td></tr><tr><td>Medium – reasonable suitability</td><td>Reasonable drainage for the site, e.g. a shallow silty layer with underlying sandstone or chalk.</td><td>Minimise permeable surfaces wherever possible.
Some SUDS techniques may be feasible such as swales or ponds.</td></tr><tr><td>High – good suitability</td><td>Well drained site, e.g. a deep silty layer with underlying sandstone or chalk where the groundwater level is low.</td><td>Infiltration devices such as soakaways or infiltration trenches.
Permeable surfaces e.g. gravel.
Most SUDS techniques would be suitable.</td></tr></table>
Based on the above table the site falls within the High – good suitability section; however, the superficial soils are not as appropriate and therefore infiltration at depth should be considered.</td></tr>
<tr><td>PFRA:
Kent County Council Preliminary Flood Risk Assessment
September 2011</td><td>Preliminary Flood Risk Assessments are produced by Lead Local Flood Authorities (LLFAs) in England and Wales. A Preliminary Flood Risk Assessment (PFRA) is the first part of the planning cycle for flood risk management as set out in the Flood Risk Regulations (2009), which implement the requirements of the European (EU) Floods Directive (2007). The EU Floods Directive aims to provide a consistent approach to managing flooding across Europe.
The PFRA is produced by the LLFA (in this case Kent County Council). The PFRA considers local sources of flooding that the LLFA is responsible for: ordinary watercourses, surface water, groundwater and sewers where flooding is wholly or partially caused by rainwater or other precipitation entering or affecting the system. Information is gathered from existing sources on past floods and flood models to identify Flood Risk Areas.
The PFRA concludes that the site has not had historic flood events in the past and is considered to be at negligible to no risk of</td></tr>
</table>

Study	Comments
	Groundwater flooding.
LFRMS: Kent County Council Local Flood Risk Management Strategy June 2013	The aim of the local strategy; • to coordinate the work of the management authorities to improve the understanding of local flood risks • to ensure that we work together to provide effective solutions to local flood risks where we can • to improve the public's understanding of local flood risks in Kent and how everyone can play a part in reducing them. LFRMS Objectives: 1. Improving the understanding of the risks of flooding from surface runoff, groundwater and ordinary watercourses in Kent. 2. Reducing the risk of flooding on people and businesses in Kent. 3. Ensuring that development in Kent takes account of flood risk issues and plans to effectively manage any impacts. 4. Providing clear information and guidance on the role of the public sector, private sector and individuals in flood risk management in Kent and how those roles will be delivered and how authorities will work together to manage flood risk. 5. Ensuring that emergency plans and responses to flood incidents in Kent are effective and that communities understand the risks and their role in an emergency. New development should manage runoff in a sustainable manner, where possible using natural processes. Local plans and strategies should adopt policies that encourage new developments to use these techniques. Some planning authorities in Kent have developed specific policies and local guidance to encourage the use of SuDS that has proven to be very effective as it provides a clear picture to potential developers of what is required for all developments in the authority. KCC will work with any planning authorities that would like to develop such guidance.

6.7 Drainage

6.7.1 Public sewer

Sewer details have been referenced from sewer record plans obtained from Southern Water (**Appendix F**). The plans indicate that there are no Southern Water owned assets within the site boundary. The nearest public sewer shown is located approximately 25m to the northeast within Thistledown. These are 150mm diameter public foul sewers which drains waste water from the residential properties at this location to the north with a head depth of 2.1mbgl.

In addition the records show a 150mm diameter public foul sewer located approximately 45m northwest of the site within Dover Road. This system also flows to the north within a 225mm diameter pipe at a depth of 2.21mbgl.

There is no physical evidence at the surface that Dover Road is positively drained via highway gullies and there it is likely that surface water will be conveyed within the highway with gravity towards topographic lows.

6.7.2 Private drainage

No details of the site's existing on-site drainage were provided. During a site walkover, there was no evidence of private drainage anywhere else on-site.

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7 SOURCES OF FLOOD RISK

7.1 Criteria

In accordance with the NPPF and advice from the Environment Agency, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case assumed to be 100 years). To consider the effects of climate change, Kent County Council has recommended that a climate change figure of 20% is used with and addition assessment of a up to a 40% increase in rainfall intensity over the lifetime of a More Vulnerable development in Flood Zone 1 (Higher Central category). The increase in river flows as a result of climate change is not required as part of this assessment as there are no watercourses which impact on the site.

The flood risk elements that need to be considered for any site are defined in BS 8533 as the “Forms of Flooding” and are listed as:

- Flooding from Rivers (fluvial flood risk);
- Flooding from the Sea (tidal flood risk);
- Flooding from the Land;
- Flooding from Groundwater;
- Flooding from Sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from Reservoirs, Canals and other Artificial Structures.

The following section reviews each of these in respect of the subject site.

7.2 Flooding from rivers (fluvial flood risk)

7.2.1 Main River

The latest Environment Agency published flood zone map (**Figure 1.1**) shows that the site lies within Flood Zone 1, representing less than a 1 in 1000 year or greater probability of flooding from fluvial sources. It also shows that the site is located outside the influence of a Main River, or the sea.

7.2.2 Ordinary Watercourse

The latest ‘Risk of Flooding from Rivers and Sea’ flood map (**Figure 7.1**) indicates that the site is considered to be at ‘very low’ risk of fluvial flooding.

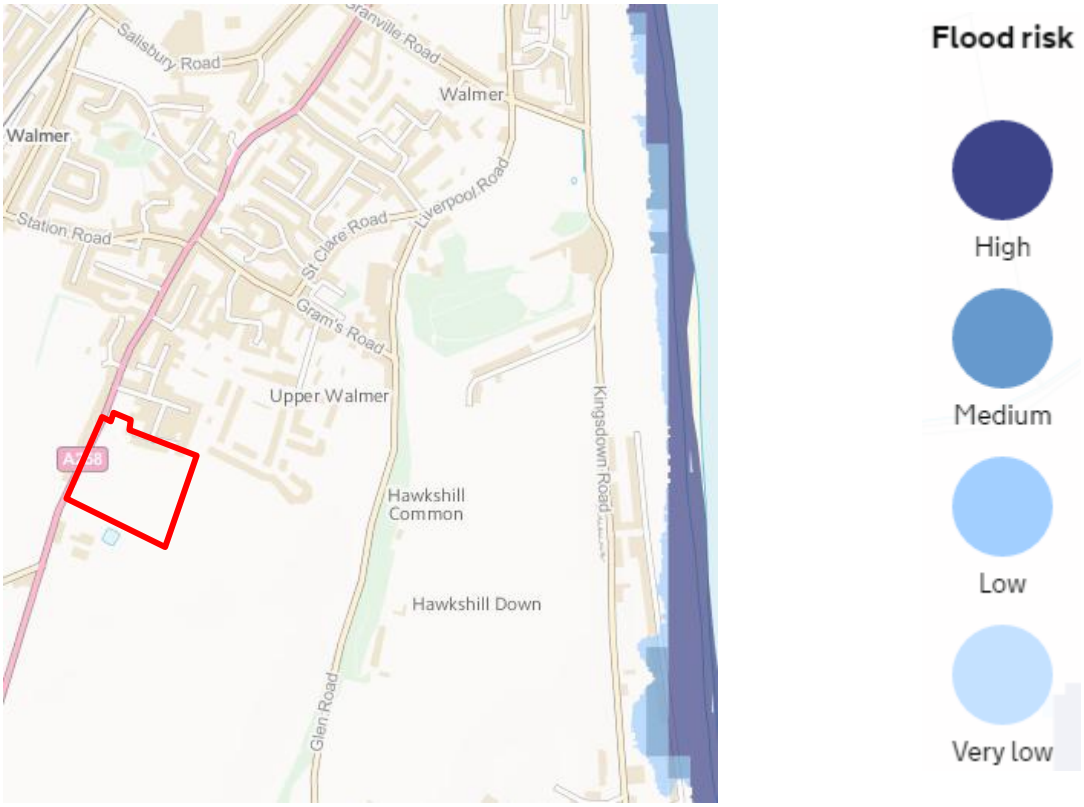

Figure 7.1: Environment Agency fluvial flood risk map

As the site is remote from the nearest watercourse, the risk of flooding from this source is considered to be **very low**.

7.3 Flooding from the sea (tidal flood risk)

The site is not considered to be at risk from tidal flooding due to its elevated position above the coast line (approximately 30m above the areas at risk of tidal flooding).

7.4 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

The Environment Agency's surface water flood map (**Figure 7.2**) shows that the site is considered at very low risk from this source.

Figure 7.3: Environment Agency surface water flood risk map

More detailed modelling of the site was undertaken; however, the outputs do not alter the risk designation to the site and therefore the model has not been included.

7.4.1 Climate change

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. These increased flows have been incorporated into the surface water drainage strategy.

7.5 Flooding from groundwater

Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

A nearby borehole log located approximately 50m to the southwest of the proposed site indicates that Groundwater was struck recorded at a depth of 47.30mbgl with a resting level of 44.99mbgl. As a result, the risk of Groundwater emergence at the surface is considered as very low. This should be confirmed on-site during the ground investigation phase.

In addition, during the operational phase, the absence of basement features within the proposals further minimises the potential hazards posed by groundwater flooding.

The resultant groundwater flood risk is considered to be **very low**.

7.5.1 Climate change

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. The change in flood risk is likely to be low as a result of climate change.

7.6 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption[6]. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the sewer network as well as any proposed drainage.

However, due to the lack of recorded public sewers and evidence of private sewer networks within the area the risk posed to the site from existing sewers can be considered **very low**.

7.6.1 Climate change

The impact of climate change is likely to be negative regarding flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and potential flooding. This would increase the frequency of sewer flooding in general but is not significant in terms of the proposed development.

7.7 Other sources of flooding

7.7.1 Reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

The Environment Agency reservoir flood map (reproduced as **Figure 7.4**) shows the largest area that might be flooded if a reservoir were to fail. As there is no area shown

[6] WRC, 'Sewers for Adoption' 7th Edition, 2012

to be at risk from this source within the vicinity of the site, the risk is considered to be **very low.**

Figure 7.4: Environment Agency reservoir flood risk map

7.7.2 There are two small reservoirs located adjacent to the proposed site boundary. These have previously been used for agricultural irrigation but are currently redundant. The western most reservoir has planning permission for conversion into a dwelling and the eastern most has been drained. As a result, there is no risk from these two structures within the current situation.

7.7.3 Canals

There are no Canal & River Trust owned canals or assets within the study area.

7.7.4 Blockages of artificial drainage systems

There is a possibility that flooding may result due to culverts and/or sewers being blocked by debris or structural failure. This can cause water to backup and result in localised flooding, as well as placing areas with lower ground levels at risk.

However, as there are no known culverts or other artificial drainage systems on or within the immediate vicinity of the site the risk of flooding from this source is considered to be **very low**.

Climate change is unlikely to affect the flooding risk to the site from such blockages.

7.8 Flood risk resulting from the development

In theory any development can increase flood risk downstream, if it is not designed properly. This potential is much increased where the site is on Greenfield land, as

development tends to increase impermeable surfaces, resulting in increased runoff from the site.

The proposed development will use the latest best practice guidance to ensure that flood risk is not increased as a result of the development. This will require the provision of a suitable surface water management plan to ensure that the surface water generated from the site does not exceed the pre-development rates; this is investigated further in **Section 9** of this report.

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8 PLANNING CONTEXT

8.1 Application of planning policy

Section 10 of the NPPF includes measures specifically dealing with development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map. The main study requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

8.2 Land use vulnerability

Planning Practice Guidance includes a list of appropriate land uses in each flood zone dependent on vulnerability to flooding. In applying the Sequential Test, reference is made to **Table 8.1** below, reproduced from Table 3 of Planning Practice Guidance.

Table 8.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	**Appropriate**	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to Table 2 of the Planning Practice Guidance, the proposed development, based on its residential use, is classed as 'More Vulnerable'. This classification of development is appropriate for areas within Flood Zone 1 and therefore appropriate for the subject site.

8.3 Sequential Test

The Sequential Test is required to assess flood risk and the Planning Practice Guidance recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

According to the NPPF, if there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development (see Planning Practice Guidance Table

2) can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.

The development proposal is for a residential end use to be developed on the site. With reference to **Table 8.1** above, this development would be appropriate for areas within Flood Zone 1, subject to the implementation of an appropriate surface water drainage strategy. Therefore the proposed development passes the Sequential Test and does not require the Exception Test to be satisfied.

9 SURFACE WATER DRAINAGE ASSESSMENT

9.1 Scope

As development will be located in Flood Zone 1 but it is greater than 1ha in size, the NPPF requires such development to focus on the management of surface water run-off. This section discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere within the catchment, as well as the type of potential SuDS features that could be incorporated as part of the Development Framework Plan.

The NPPF states that SuDS should be considered wherever practical. The use of SuDS is also encouraged by regional and local policy. In accordance with local and national guidance, the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to Greenfield rates (Preferred Standard).

In addition, Building Regulations Part H[7] requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined). Infiltration techniques should therefore be applied wherever they are appropriate.

9.2 Pre-development situation

The existing site area is 4.06Ha and is considered as 100% Greenfield as the existing impermeable area is not thought to be positively drained.

The IoH 124 method[8] has been used to estimate the Greenfield surface water runoff for the site. Calculations are contained in **Appendix G**.

Table 9.1: IoH 124 surface water runoff (Greenfield) estimation (site wide)

Return period	Peak flow (l/s)
QBar	1.8
1 in 1 year	1.6
1 in 30 year	4.2
1 in 100 year	5.8

[7] HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'

[8] Institute of Hydrology (IoH), 'Flood Estimation for small catchments - Report 124', 1994

9.3 Limiting discharge for design

The Greenfield discharge rates from the existing site in total have been calculated and the results have been provided within **Table 9.1.** However, as the underlying geology is Chalk it is assumed that infiltration based SuDS in the form of an attenuation basin discharging into a deep borehole soakaways and other on site features could be utilised in order to attenuate flows and discharge them in the most sustainable method of surface water disposal. As a result, the limiting factor for the disposal of surface water from the development is the rate at which the ground will receive water which is called the infiltration rate.

The site is located on an area of Chalk based geology, according to CIRIA Report C753 the typical infiltration coefficient for chalk is between 3 x 10^{-8} – 3 x 10^{-6}m/s. Based on Borehole Soakaway Tests undertaken by RSK on 08.02.2017 a infiltration coefficient of 4.05 x 10^{-6} m/s (0.01458m/hr) has been provided, (See **Appendix H**).

These are the rates which have been confirmed on-site following infiltration testing and therefore should be used to develop the detailed design of the drainage of the site as well as being agreed by the Lead Local Flood Authority.

9.4 Post-development situation

The proposed development is for a residential use. As explained within **Section 4** of this assessment the proposed development area will be approximately 55% impermeable, which will result in an increase in surface water across the site. It will therefore be necessary to manage surface water on-site as the discharge rate achievable with chalky soils will not be sufficient to allow flows created from a 1 in 100 year event inclusive of up to 40% climate change to freely discharge into the surrounding ground.

It may be considered to provide improvements to water quality through appropriate source treatment; this could be achieved through trapped gullies within the highways, an attenuation basin and a catch pit at the location of the infiltration borehole. However the SuDS Hierarchy should be considered in order to determine whether this proposed discharge location is considered the most appropriate and sustainable method of surface water disposal from the site.

9.4.1 Discharge options

9.4.1.1 Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed site. The effectiveness of infiltration is completely dependent on the physical conditions at the site. Potential obstacles include:

- Local variations in permeability preventing infiltration – It is understood from on-site observation and infiltration testing that the local geology will receive surface water at a rate of 4.05 x 10^{-6} m/s at the location of the proposed deep borehole soakaways;
- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H2 states that these *"should not be built in*

ground where the water table reaches the bottom of the device at any time of the year". Groundwater within the area is known to be at significant depths and was not observed at depths up to 6.6mbgl within the area and therefore is not considered to be a constraint; and

- Source Protection Zones - As discussed above, the site is not located within a Groundwater Source Protection Zone.

From the observed Chalk bedrock geology, and measured infiltration rates, infiltration based SuDS is considered a viable option at depth as part of the drainage strategy subject to confirmation from the Lead Local Flood Authority and the Environment Agency.

9.4.1.2 Discharge to watercourse

Discharging surface water directly to a local watercourse is not considered feasible as there are no watercourses on, or within the vicinity of the study area.

9.4.1.3 Discharge to surface water sewer

There are no public sewers on or immediately surrounding the site. As a result, it is not considered appropriate to discharge surface water to a sewer.

9.4.2 Storage estimates

To determine the approximate volume of attenuation storage that would be required on the site, the WinDes 'Quick Storage' calculation has been used. WinDes 'Quick Storage' calculations provide a range of volumes as an approximation of the storage requirement. These volumes can be later revised at detail design stage once the actual infiltration rates on-site are known.

Based on current Development Framework Plan the proposed residential development area for Dover Road, Deal, is 2.54Ha. An estimate of the required attenuation pond has been produced based on a 55% impermeability figure for the developable area of the land parcel (in line with Gladman requirements). As a result the impermeable area used for the calculations is 1.4Ha.

For the purposes of storage sizing, no outfalls have been assumed with the only surface water discharge being to ground. The observed geology on site can be seen within the Borehole Logs within **Appendix C**. This shows Head Formation superficial strata is present containing Silty Clay which will not likely produce infiltration rates sufficient to utilise infiltration based SuDS at the surface. However, the bedrock substrata from 2.5mbgl is of a Chalky nature and therefore infiltration should be used based on a chalk, and only the base of the pond infiltrating. According to CIRIA Report C753 the typical infiltration coefficient for chalk is between 3×10^{-8} – 3×10^{-6} m/s. Based on measured infiltration rates on-site which were undertaken using a deep borehole infiltration test methodology a figure of a 4.05×10^{-6} m/s has been used. This equates to 0.01458m/hr; which when conservatively rounded gives a usable infiltration rate of 0.01m/hr.

As the superficial strata does not lend itself to infiltration based SuDS, the proposed method of infiltration will be into the Chalk bedrock through a borehole soakaway at a minimum depth of 2.5m.

In order to size the attenuation basin with an infiltration based discharge, a 4 stage design guide within MicroDrainage has been used. An infiltration basin has been selected and has been assumed to be 1.2m deep (backfilled to ensure connection with the permeable strata) with size slopes of 1:6 down to the benching and 1:4 to the base, in line with CIRIA guidance. This means that the pond requires a surface area 1840m^2.

This provides a total volume within the pond **1,375m^3**. When this is analysed it shows that the maximum filtration expected could be up to 2.5l/s from the basin which results in the basin filling by up to 1.116m depth and therefore remains within bank during a 1 in 100 year event inclusive of 40% climate change. The half drain time shown for this type of event, pond size and infiltration rates equates to 5446 minutes. It is proposed that an attenuation basin of a similar size and depth would be appropriate with an overflow to several deep borehole soakaways, which would provide a sufficient infiltration rate, storage and could reduce the half drain time stated. These calculations have been provided within **Appendix I**. The number, depth and diameter of deep borehole soakaways will be determined at detailed design stage.

These volumes are provided to demonstrate the feasibility of a proposed drainage strategy for the development; however the final attenuation volume will be determined during subsequent detailed design work and should be agreed by the Lead Local Flood Authority.

9.4.3 Proposed drainage strategy

The proposed SuDS for the site could include a combination of swales, French drains, permeable paving, an infiltration basin and/or an attenuation basin which should be located accordingly depending on, locality of proposed buildings and outfall locations. Based on the current Development Framework Plan, and falls across the site, conveyance of surface water to the lowest point on site has been proposed, within the highways, into an attenuation basin prior to discharge into the deep borehole soakaway. The SuDS should be designed to convey surface water conveniently from impermeable areas, through the site to the outfall location where attenuation and infiltration based SuDS basin should be provided. For the proposed development, sufficient storage should be provided to retain up to the 1 in 30 year event below ground and the 1 in 100 plus climate change event on-site prior to discharge. The possible SuDS measures including flow routes and possible outfall locations are outlined in the Indicative Surface Water Strategy as attached in **Appendix J**.

The dimensions, volumes and location of the SuDS features will need to be revised as the Development Framework Plan develops and during the detailed planning stage. Detailed design of individual features is not part of the scope of this report. Preliminary design criteria have been based upon guidance given in The SuDS Manual[9].

In principle, the strategy contains the following features and criteria:

- Infiltration techniques are suitable for this site, subject to approval from the Lead Local Flood Authority and Environment Agency. Therefore multiple deep borehole soakaways will be incorporated into the drainage design, as shown within **Appendix J**.

[9] CIRIA, 'The SUDS Manual - C697', 2007

- Permeable paving could be incorporated within all minor roads, parking areas and driveways. This will be used to collect and store runoff from the houses and surrounding hardstanding areas before joining the on-site surface water network that flows into the proposed attenuation basin. Main roads will not be constructed using permeable paving due to ownership and future maintenance issues, where responsibility will most likely lie with the highway authority;
- Swales could be considered alongside roads to convey runoff through the drainage network to the various attenuation features, this helps to reduce the time on concentration whilst providing a level of treatment. However, based on falls across the site, swales may not be achievable, and;
- The SuDS feature of an attenuation basin with overflow into a deep borehole soakaway has been incorporated into the Outline Drainage Strategy which should accommodate the required volumes without overtopping. The sized attenuation basin has been shown within **Appendix J** is indicative and are based on maximum required volume and should comply with safety and maintenance guidelines in the SuDS Manual.

The SuDS features should have a preliminary design to accommodate the 1 in 30 year event fully underground within the on-site pipe network which will convey surface water flows into the attenuation feature capable to attenuate up to the 1 in 100 year plus 40% climate change event, prior to discharging into deep soakaway boreholes. As there are falls of up to 9 metres across the site, this should be achievable without significant groundworks; however, this should be confirmed at detailed design stage.

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10 FLOOD MITIGATION MEASURES

10.1 Overview

The site is currently proposed to be a residential end use development. As a result, is considered to be More Vulnerable. However, as the site is at low risk from all sources of flooding, it is not proposed that additional mitigation measures should be incorporated into the design. There are elements of best practice which should be considered at an early stage as outlined below.

10.2 Overland flood flow

Conveyance measures and flow controls should be provided in order to convey the surface water resulting from the proposed development into the infiltration basin located at the topographic low in the northeast corner of the site. Surface flows may be generated due to drainage capacity exceedance, which can also be conveyed into the SuDS features via surface flows along the new roads.

10.3 Finished floor levels

As this site will not be affected by fluvial flooding there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows will be avoided by careful design of finished levels.

As a result it is recommended that the proposed site levels should be set at or above the existing ground levels.

10.4 Safe access/egress

As the site lies outside of the 1 in 1000 year climate change flood extent, safe access and egress will be available up to this storm event.

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11 CONCLUSIONS AND RECOMMENDATIONS

This FRA complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

The proposed development site lies in an area designated by the Environment Agency as Flood Zone 1, and is outlined to have a chance of flooding of less than 1 in 1,000 (<0.1%) in any year.

NPPF sets out a Sequential Test, which states that preference should be given to development located within Flood Zone 1. This flood risk assessment demonstrates that the requirements of the Sequential Test have been met, with the location of the site within Flood Zone 1 means that any form of classification of development is considered to be acceptable.

This flood risk assessment has concluded that:

- There are no historic records of flooding within the site boundary;
- The location at which the proposed development is located within Flood Zone 1, and as such is at a very low risk of flooding from fluvial sources. This is because there are no watercourses within the vicinity of the study area;
- The site is far enough inland not to be at risk of any tidal flooding event;
- Flood risk from surface water is considered low across the whole site; additional flows resulting from the proposed development have been incorporated into the drainage strategy;
- Flood risk from Groundwater is considered to be very low as Groundwater has been recorded within the vicinity at significant depths below the ground level, on-site. In addition, no Groundwater was observed during on-site observations to a depth of up to 6.6mbgl;
- The risk of flooding from sewers is very low as there are no public sewers thought to impact on the development within the study area;
- The site is at negligible risk from reservoir flooding. The Environment Agency mapping does not show a risk to the site and the two minor reservoirs located to the south of the site, have been decommissioned and therefore do not pose a risk to the site;
- There are no Canal & River Trust assets within the study area and therefore the site is not at risk from this source, and;
- There are no known artificial sources such as culverts within the site boundary and therefore the risk from this source is considered low.

As safe pedestrian and vehicular access, to and from the development, will be achievable under all conditions, a formal evacuation plan is not required.

Following the SuDS Heirachy, infiltration based drainage should first be assessed. As a result of the Chalk based Bedrock geology which underlies the site at observed depths of around 2.5mbgl, and on-site infiltration testing of a feasible rate, it is considered that

infiltration based SuDS is the preferred drainage option from the site. This should be confirmed by the Lead Local Flood Authority and the Environment Agency.

The proposed development will increase the impermeable surfacing on-site which will result in an increase of surface water runoff. As the existing impermeable areas are not known to be positively drained the whole site is considered to be Greenfield in terms of drainage. Therefore by conveying surface water resulting from the proposed development towards an attenuation basin with an overflow to a deep borehole soakaway, located in the north-eastern section of the site at the lowest topographic area, falls are ensured to be achievable. Through correctly sizing the basin in order to retain surface water flows to the 1 in 100 year rates inclusive on 40% climate change the risk of flooding downstream will not be exacerbated.

Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds as the development will not be at risk from existing sources and will not result in an increase in flooding downstream.

APPENDIX A
SERVICE CONSTRAINTS

RSK Group service constraints

1. This report and the Drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Gladman (the "client") in accordance with the terms of a contract between RSK and the "client" dated December 2016. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable Civil Engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the

Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B
TOPOGRAPHIC SURVEY

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NOTES

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCES.

ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM GENERATED BY ACTIVE GPS NETWORK.

LEGEND

30.29	SPOT LEVEL
	SURVEY STATION
	SAPLING
	BUSHES/SHRUB
	TREE (INDICATIVE ONLY)
	HEDGE/AREA OF UNDERGROWTH
99.95	CONTOUR
	GATE
	OVERHEAD CABLE
	FENCE

ABBREVIATIONS

ArL	ARCH LEVEL	LB	LETTER BOX
AV	AIR VALVE	LP	LAMPOST
B	BOLLARD	MH	MANHOLE
BB	BELLSHA BEACON	MKR	MARKER
BH	BOREHOLE	OHC	OVERHEAD CABLE
BL	BED LEVEL	OpL	OPENING LEVEL
BS	BUS STOP	OSBM	OS BENCHMARK
BT	BT COVER	P	POST
C/B	CLOSED BOARD FENCE	P/R	POST AND RAIL FENCE
C/L	CHAIN LINK FENCE	P/W	POST AND WIRE FENCE
CATV	CABLE TELEVISION COVER	PEC	PEDESTRIAN CROSSING
CC	CONTROL CABIN	PM	PARKING METER
COL	COLUMN	RE	RODDING EYE
Conc/p	CONCRETE PANEL FENCE	RWL	RETAINING WALL
CPY	CANOPY	SAP	SAPLING
CrL	CROWN LEVEL	SEC	SECURITY CAMERA
Csty	CABLE STAY	SGY	STRIP GULLY
CTV	CABLE TELEVISION POINT	SoL	SOFFIT LEVEL
CYR	CYCLE RACK	SP	SIGNPOST
DK	DROPPED KERB	SpL	SPRINGING LEVEL
DP	DOWNPIPE	SV	STOP VALVE
EIP	ELECTRIC INLET POINT	TIPit	TRIAL PIT
EL	ELECTRIC INSPECTION COVER	TCB	TELEPHONE BOX
EP	ELECTRICITY SUPPLY POLE	TE/?	TREE + NUMBER
ER	EARTH ROD	THL	THRESHOLD LEVEL
FH	FIRE HYDRANT	TL	TRAFFIC LIGHT
G	GULLY	ToF	TOP OF FENCE
G/DP	GULLY AND DOWNPIPE	ToW	TOP OF WALL
GP	GATE POST	TP	TELEPHONE POLE
GpI	GAS PIPE	W/M	WIRE MESH FENCE
GV	GAS VALVE	W/P	WOODEN PANEL FENCE
IC	INSPECTION CHAMBER	WLV	WATER LEVEL
IL	INVERT LEVEL	WM	WATER METER
I/R	IRON RAILING FENCE	WO	WASH OUT
KO	KERB OUTLET		

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	636514.87	149394.51	49.75	Survey Nail
STN/2	636544.62	149493.82	48.08	Survey Nail
STN/50	636689.30	149787.44	36.83	Survey Nail
STN/51	636631.90	149676.97	40.28	Survey Nail
STN/53	636584.22	149582.65	43.27	Survey Nail

TREE SCHEDULE

No.	DIAM.	SPREAD Ø	HEIGHT
TE/1	0.30	8	8
TE/2	0.20	4	4
TE/3	0.20	4	4
TE/4	0.40	4	4
TE/5	0.30	4	4
TE/6	0.30	4	4
TE/7	0.30	4	4
TE/8	0.60	6	4
TE/9	0.40	6	4
TE/10	0.40	6	4
TE/11	0.40	6	4
TE/12	0.60	6	4
TE/13	0.40	6	4
TE/14	0.40	6	4
TE/15	0.20	6	4
TE/16	0.60	6	4
TE/17	0.60	6	4
TE/18	0.60	6	4
TE/19	0.60	6	4
TE/20	0.60	6	4
TE/21	0.30	6	4
TE/22	0.30	6	4
TE/23	0.60	6	4
TE/24	0.30	6	4
TE/25	0.30	6	4
TE/26	0.30	6	4
TE/27	0.60	6	4
TE/28	0.60	6	4
TE/29	0.60	6	4
TE/30	0.60	6	4
TE/31	0.20	6	4
TE/32	0.60	6	4
TE/33	0.20	6	4
TE/34	0.60	6	4
TE/35	NUMBER	NOT	USED
TE/36	0.60	6	4
TE/37	0.60	6	4
TE/38	0.60	6	4
TE/39	0.40	6	4
TE/40	0.40	6	4
TE/41	0.40	6	4
TE/42	0.40	4	6
TE/43	0.40	8	8
TE/44	0.30	8	8
TE/45	0.20	4	4
TE/46	0.20	6	6
TE/47	0.30	6	6
TE/48	0.30	6	6
TE/49	0.40	6	6
TE/50	0.60	6	6
TE/51	0.50	10	8
TE/52	0.25	6	6
TE/53	0.20	5	10
TE/54	0.85	12	12
TE/55	0.20	4	10
TE/56	0.70	12	16
TE/57	0.25	6	10
TE/58	0.50	14	16
TE/59	0.30	5	8
TE/60	0.15	5	8
TE/61	0.15	5	8
TE/62	0.25	6	8
TE/63	0.70	8	10
TE/64	0.20	6	8
TE/65	0.20	6	8
TE/66	0.40	8	8
TE/67	0.30	8	8
TE/68	0.50	8	10
TE/69	0.20	8	8
TE/70	0.20	8	8
TE/71	0.70	10	10
TE/72	0.40	6	8
TE/73	0.40	8	12
TE/74	0.30	8	12
TE/75	0.40	8	12
TE/76	0.20	8	12
TE/77	0.20	8	12
TE/78	0.35	8	12
TE/79	0.15	8	12
TE/80	0.15	8	12
TE/81	0.15	8	12
TE/82	0.40	8	12
TE/83	0.20	8	12
TE/84	0.40	14	11
TE/85	0.35	14	16
TE/86	0.50	14	8
TE/87	0.90	20	14
TE/88	0.60	8	8
TE/89	0.70	14	15
TE/90	0.20	4	5

TREE DIAMETER MEASURED APPROXIMATELY 1.5M ABOVE GROUND LEVEL. TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE. TREE BOLE MAY NOT SIT CENTRALLY TO THE CANOPY. TREE HEIGHT ESTIMATED FROM GROUND LEVEL.

Rev	Date	Revision notes	By
*	*	*	*

DO NOT SCALE

Status

INFORMATION

Project

DOVER ROAD,
DEAL

Title

TOPOGRAPHICAL SURVEY
AS OF 12.01.17
SHEET 1 OF 1

GLADMAN
Gladman House, Alexandria Way
Congleton Business Park
Congleton, Cheshire
CW12 1LB
Tel: 01260 288800
Fax: 01260 288801
www.gladman.co.uk

Drawn By	Publish Date	Scale(s)	Sheet Size
JW/JH	17.01.17	1:500	A0

Project no.	Drawing no.	Revision
2016-124	Topo_01_2D	0

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APPENDIX C
BOREHOLE LOGS

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BOREHOLE LOG

Contract:	Client:	Borehole:
124 Dover Road	**Gladman Developments Ltd**	**BH1**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
28927	**08.02.17** End: **08.02.17**	**37.61**	**E:636803.0 N:149626.0**	**1** of **1**

Depth (m)	Samples & Testing: No	Type	Results	Backfill	Water	Description of Strata	Depth (Thickness)	Material Graphic Legend
						Soft to firm light brown silty CLAY with occasional rootlets. (HEAD DEPOSITS)	(1.00) 1.00	
						Soft to firm light brown silty gravelly CLAY. Gravel is fine subrounded of chalk fragments. (HEAD DEPOSITS)	(1.50) 2.50	
						Recovered as structureless CHALK composed of silty subangular to subrounded, fine to medium GRAVEL. Gravel is extremely weak, low density and white. Occasional subangular to subrounded, fine to medium flint gravel. (SEAFORD CHALK FORMATION)	(0.50) 3.00	
						Recovered as structureless CHALK composed of silty, slightly sandy subangular to rounded GRAVEL. Gravel is weak, low density and white. (SEAFORD CHALK FORMATION)	(3.60) 6.60	
						Borehole terminated at 6.60m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable Percussion	**Dando 2000**	**Mark Bass**	**SFoschini**	MKR

AGS

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APPENDIX D
ENVIRONMENT AGENCY CORRESPONDENCE

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Robert Brenton

From: KSL Enquiries [KSLE@environment-agency.gov.uk]
Sent: 06 December 2016 11:11
To: Robert Brenton
Subject: KSL 29204 SD and KSL 29208 SD - Cross Road, Deal and Dover Road, Deal
Attachments: 2016-127 101 Location Plan.pdf; RIPPLE NURSERY.XLSX; VICTORIA PARK LOGGER DATA.XLSX; VICTORIA PARK.XLSX; KSL climate change guidance.doc.Sept.2016.pdf

Dear Robert,

KSL 29204 SD and KSL 29208 SD - Cross Road, Deal and Dover Road, Deal

Thank you for your request for information that was received on 08 November 2016.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

This site is located in an area of Flood Zone 1 where we do not have modelled flood levels.

We can confirm that we have no record of flooding (from rivers and/or the sea) for the two locations specified. You may wish to check with the Lead Local Flood Authority for this area, Kent County Council, who hold detailed records for surface water flooding.

Please be aware that you can access our flood map(s) for free here.

Please see our responses to your enquiries below in dark blue. These responses are relevant for both Dover Road, and Cross Road in Deal.

- Information on the recently published climate change guidance for this area
  -Please find Climate Change Document attached in PDF format.

- Information on surface water flood risk including flow pathways and depths
  -Please refer to the Lead Local Flood Authority for this area- Kent County Council- who hold information on surface water and surface water flooding.

- Information on historic flooding from all sources
  -We hold no record of historic flooding at either site from rivers and/or sea. Both sites are located in Flood Zone 1. Please refer to the Lead Local Flood Authority- Kent County Council- for historic flooding data from surface and groundwater.

- Any data on existing surface water discharges to the surrounding watercourse or sewers
  -We do not hold this data.

- Any data on groundwater flooding
  -Please find attached requested groundwater data in Excel spreadsheets.
  The most appropriate data for both requests are from the following sites:

  1) Ripple Nurseries- Groundwater manual dip data only, entire available record.
  2) Victoria Park- Groundwater manual dip data and logged data, entire available record for both.

  Limitations of the data:

Ripple Nurseries – This is an active borehole within the grounds of a plant nursery. It has, on occasion, been measured whilst the borehole pump was running. The regularity of abstraction has reduced over the years as the nursery has become less and less active, but it does not detract from the fact that the pumping will have had an effect on the results collected i.e. potentially have drawn the water level down during pumping.

Victoria Park – It will be very clear from the logger data that this site is tidally effected, the tidal cycle can be clearly seen within the data. Please ensure the dip data is used in conjunction with the logger data.

- Any information on reservoir flooding;
  -Dover Road, Deal: Reservoir flood maps are freely available as open data from: https://flood-warning-information.service.gov.uk/long-term-flood-risk.
  To use the system: enter the post code and choose the correct address, then select 'View map of river and sea flood risk'. This will then take you to the reservoir flood maps.

  -Cross Road, Deal: We hold no records of any reservoirs within 20 metres of this site, therefore we do not hold any information on reservoir flooding.

- Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records
  -We hold no records of main rivers or ordinary watercourses within 20 metres of both sites. We do not hold information on private sewers – please refer to the relevant Water Company/ Local Authority who may hold this information.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?
-Please refer to the Lead Local Flood Authority- Kent County Council- who deal with SuDS enquiries.

I trust this information is of use. If you have any further questions or require any additional information, please do not hesitate to contact me and I will be happy to help.

Please refer to the Open Government Licence which explains the permitted use of this information.

If you have any further queries or if you'd like us to review the information we have provided under the Freedom of Information Act 2000 and Environmental Information Regulations 2004 please contact us within two months and we will happily do this for you.

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive:
http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=KSL

Kind Regards,

Sasha

Sasha David
Customers & Engagement Officer
Kent South London and East Sussex

Environment Agency | 02084746848 | Orchard House | Endeavour Park | London Road | West Malling | Kent | ME19 5SH
www.gov.uk/floodsdestroy

From: RBrenton@rsk.co.uk [mailto:RBrenton@rsk.co.uk]
Sent: 08 November 2016 15:32
To: DDC DevelopmentControl
Cc: CWhittingham@rsk.co.uk
Subject: Cross Road, Deal Information Request

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Cross Road,
Walmer,
Deal,
East Sussex,
CT14 9LA.

Grid reference – 636020 E, 150570 N

I would like all the flooding information and advice you have including the following, if available:

- Information on the recently published climate change guidance for this area
- Information on surface water flood risk including flow pathways and depths
- Information on historic flooding from all sources
- Any data on existing surface water discharges to the surrounding watercourse or sewers
- Any data on groundwater flooding
- Any information on reservoir flooding;
- Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind regards,

Robert Brenton
Assistant Hydrologist BSc (Hons) FdSc

RSK
Land & Development Engineering
14, Beecham Court, Pemberton Business Park, Wigan, UK, WN3 6PR

Switchboard: +44 (0) 1942 493255
Fax: +44 (0) 1942 493171

Flood risk assessments: Climate change allowances

Its essential landuse planning decisions are based on the latest evidence and quality site specific Flood Risk Assessments. A key part of this is using the latest climate change allowances and using local evidence and data.

We encourage early pre applications discussions and you should complete this form and email back to kslplanning@environment-agency.gov.uk for sites in high risk flood zones. You should also discuss proposed developments with the local planning authority and refer to their local plan flood risk policies and Strategic Flood Risk Assessment. Guidance on producing a Flood Risk Assessment.

To obtain the latest flood map and data please email our customers and engagement team kslenquiries@environment-agency.gov.uk

1) The climate change allowances

The National Planning Practice Guidance refers planners, developers and advisors to the Environment Agency guidance on considering climate change in Flood Risk Assessments (FRAs). This guidance was updated in February 2016 and is available on Gov.uk and should be read in conjunction with this document. The guidance can be used for planning applications, local plans, neighbourhood plans and other projects. It provides climate change allowances for peak river flow, peak rainfall, sea level rise, wind speed and wave height. The guidance provides a range of allowances to assess fluvial flooding, rather than a single national allowance. It advises on what allowances to use for assessment based on vulnerability classification, flood zone and development lifetime. For proposed development in the tidal Thames flood zone you should continue to use the Thames Estuary 2100 (TE2100) plan and latest flood models.

2) Assessment of climate change impacts on fluvial flooding

Table A below indicates the level of technical assessment of climate change impacts on fluvial flooding appropriate for new developments depending on their scale and location. This should be used as **a guide only**. Ultimately, the agreed approach should be based on expert local knowledge of flood risk conditions, local sensitivities and other influences. **For these reasons we recommend that applicants and / or their consultants should contact the Environment Agency at the pre-planning application stage to confirm the assessment approach, on a case by case basis**. **Table A** defines three possible approaches to account for flood risk impacts due to climate change, in new development proposals:

- **Basic:** Developer can add an allowance to the 'design flood' (i.e. 1% annual probability) peak levels to account for potential climate change impacts.
- **Intermediate:** Developer can use existing modelled flood and flow data to construct a stage-discharge rating curve, which can be used to interpolate a flood level based on the required peak flow allowance to apply to the ‘design flood’ flow. See Appendix 1.
- **Detailed:** Perform detailed hydraulic modelling, through either re-running Environment Agency hydraulic models (if available) or construction of a new model by the developer.

Table A – Indicative guide to assessment approach

vulnerability classification	flood zone	development type		
		minor	small-major	large-major
essential infrastructure	Zone 2	Detailed		
	Zone 3a	Detailed		
	Zone 3b	Detailed		
highly vulnerable	Zone 2	Intermediate/ Basic	Intermediate/ Basic	Detailed
	Zone 3a	Not appropriate development		
	Zone 3b	Not appropriate development		
more vulnerable	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Detailed	Detailed
	Zone 3b	Not appropriate development		
less vulnerable	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Basic	Detailed
	Zone 3b	Not appropriate development		
water compatible	Zone 2	None		
	Zone 3a	Intermediate/ Basic		
	Zone 3b	Detailed		

Notes:

- Minor: 1-9 dwellings/ less than 0.5 ha | Office / light industrial under 1ha | General industrial under 1 ha | Retail under 1 ha | Gypsy/traveller site between 0 and 9 pitches
- Small-Major: 10 to 30 dwellings | Office / light industrial 1ha to 5ha | General industrial 1ha to 5ha | Retail over 1ha to 5ha | Gypsy/traveller site over 10 to 30 pitches
- Large-Major: 30+ dwellings | Office / light industrial 5ha+ | General industrial 5ha+ | Retail 5ha+ | Gypsy/traveller site over 30+ pitches | any other development that creates a non residential building or development over 1000 sq m.

The assessment approach should be agreed with the Environment Agency as part of pre-planning application discussions to avoid any wasted work.

3) Specific local considerations in Kent and South London

Where the Environment Agency and the applicant and / or their consultant has agreed that a '**basic**´ level of assessment is appropriate the figures in Table B below can be used as a precautionary allowance for potential climate change impacts on peak 'design' (i.e. 1% annual probability) fluvial flood level rather than undertaking detailed modelling.

Table B – Local precautionary allowances for potential climate change impacts

River basin	Central	Higher Central	Upper
Thames	500mm	700mm	1000mm
South East	700mm	850mm	1400mm

For proposed developments in the tidal Thames flood zone you should continue to use the Thames Estuary 2100 (TE2100) plan and latest flood models.

4) Fluvial food risk mitigation

Read the guidance on Gov.uk to find out which allowances to use to **assess** the impact of climate change on flood risk.

For planning consultations where we are a statutory consultee and our Flood risk standing advice **does not** apply we use the following benchmarks to inform flood risk **mitigation** for different vulnerability classifications. **These are a guide only**.

We recommend you contact us at the pre-planning application stage to confirm this on a case by case basis. We can provide you with a free basic opinion and more detailed advice is subject to cost recovery.

For planning consultations where we are not a statutory consultee or our Flood risk Standing advice applies we recommend local planning authorities and developers use these benchmarks but we do not expect to be consulted.

- For development classed as '**Essential Infrastructure**' our benchmark for flood risk mitigation is for it to be designed to the '**upper end**' climate change allowance for the epoch that most closely represents the lifetime of the development, including decommissioning.

- For **highly vulnerable** in flood zone 2, the '**higher central'** climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **upper end** allowance.

- For **more vulnerable developments** in flood zone 2, the '**central**' climate change allowance is our minimum benchmark for flood risk mitigation, and in flood zone 3 the '**higher central**' climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** (in flood zone 2) and the **upper end** allowance (in flood zone 3).

- For **water compatible** or **less vulnerable** development (e.g. commercial), the '**central**' climate change allowance for the epoch that most closely represents the lifetime of the development is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** (particularly in flood zone 3) to inform built in resilience.

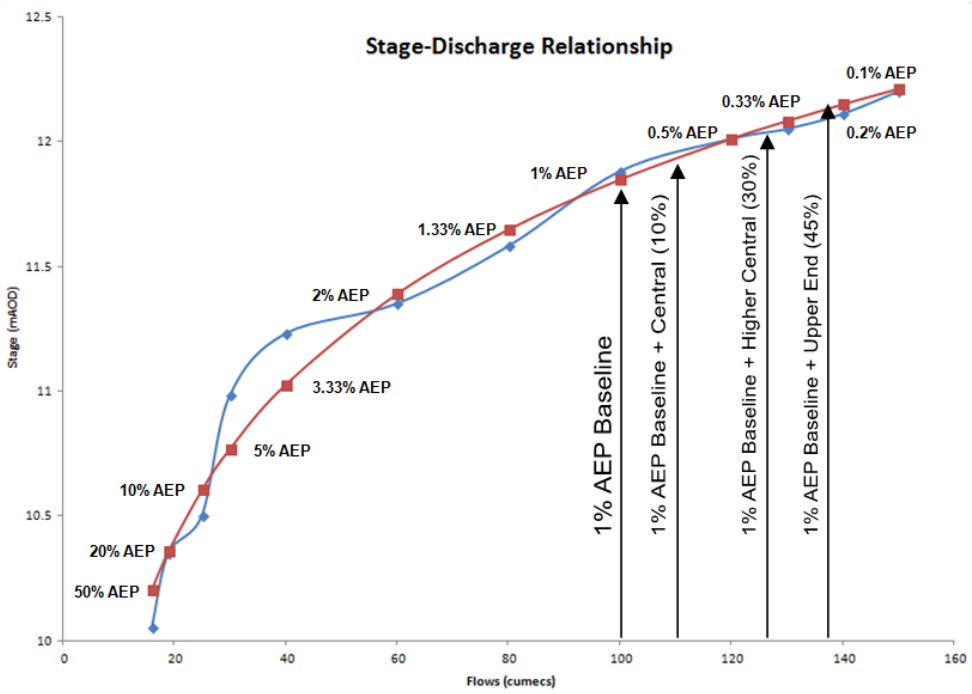
There may be circumstances where local evidence supports the use of other data or allowances. Where you think this is the case we may want to check this data and how you propose to use it.

Appendix 1 – Further information on the Intermediate approach

1) The methodology the chart is based on does not produce an accurate stage-discharge rating and is a simplified methodology for producing flood levels that can be applied in low risk small-scale development situations;

2) The method should not be applied where there is existing detailed modelled climate change outputs that use the new allowances. In such circumstances, the 'with climate change' modelled scenarios should be applied.

An example stage-discharge relationship is shown below:



APPENDIX E
KENT COUNCTY COUNCIL CORRESPONDENCE

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Robert Brenton

From: SUDS@kent.gov.uk
Sent: 30 November 2016 12:01
To: Robert Brenton
Cc: Colin Whittingham
Subject: RE: Dover Road, Deal Information Request

Good morning Robert.

Thank you for your enquiry. Please accept our apologies for the delayed response.

I will address your questions as presented:

- Information on the recently published climate change guidance for this area,
  The revised tidal/fluvial guidance would have no implications for this site owing to its elevation and absence of any main rivers in the vicinity. However, any sustainable drainage scheme should be designed to take the recently revised guidance into account. This will mean that the system should be designed to accommodate the critical 1 in 100 year storm with a 20% allowance for climate change, with an additional analysis undertaken to understand the flooding implication for a greater climate change allowance of 40%.
- Information on surface water flood risk including flow pathways and depths,
  In the absence of any site-specific surface water modelling for the area, we would refer you to the updated Flood Map for Surface Water, produced and maintained by the Environment Agency. This can be found at https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=636590&northing=149615&address=100062285833&map=SurfaceWater
- Information on historic flooding from all sources,
  We do not hold any information for this specific site. We would suggest that the Local Authority and Environment Agency are also consulted on this issue as they may hold information we are unaware of. For a general overview of the area, our Surface Water Management Plan should be referred to: http://www.kent.gov.uk/about-the-council/strategies-and-policies/environment-waste-and-planning-policies/flooding-and-drainage-policies/surface-water-management-plans/deal-surface-water-management-plan
- Any data on existing surface water discharges to the surrounding watercourse or sewers,
  We are unaware of any existing discharges to watercourses in this area. However, we would expect this information to be provided within any detailed surface water management strategy for the site.
- Any data on groundwater flooding,
  We are unaware of any groundwater flooding issues in this area. However, if soakaways are to be utilised, we would expect to see geotechnical information that identifies the depth to the water table across the site to ensure that a sufficient unsaturated zone is provided.
- Any information on reservoir flooding; and,
  We would refer you to the Environment Agency for this information: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=636590&northing=149615&address=100062285833&map=SurfaceWater
- Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records.
  We do not hold this information.
- Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?
  Without any site specific information we are unable to provide any detailed guidance. However, when considering options for development of this site, we would recommend that our masterplanning for SuDS guidance is referred to as early in the design process as possible. We would further recommend that full regard is given to our Drainage and Planning Policy Statement; this outlines how we approach our role as

statutory consultee, and provides detail on our 10 Sustainable Drainage policies. At this site there would be an assumption that infiltration would be utilised to dispose of any surface water runoff without any discharge to the existing sewer network.

We would welcome the opportunity to discuss this site with you further. There are known capacity issues in the adjacent sewer system, and we would like to explore opportunities to provide minor highways improvement works at the site entrance. Please contact me on this e-mail address and I will be happy to discuss this with you.

Please let me know if I can be of any further assistance?

Kind regards,

Joe Williamson

Joseph Williamson | Flood Risk Project Officer | **Kent County Council**
Environment Planning and Enforcement, Invicta House, County Hall, Maidstone, Kent, ME14 1XX
t: 03000 413481 | **e:** joseph.williamson@kent.gov.uk | www.kent.gov.uk

---

From: RBrenton@rsk.co.uk [mailto:RBrenton@rsk.co.uk]
Sent: 08 November 2016 15:31
To: Flood - GT
Cc: CWhittingham@rsk.co.uk
Subject: Dover Road, Deal Information Request

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Dover Road,
Walmer,
Deal,
East Sussex,
CT14 7PG.

Grid reference – 636700 E, 149580 N

I would like all the flooding information and advice you have including the following, if available:

- Information on the recently published climate change guidance for this area,
- Information on surface water flood risk including flow pathways and depths,
- Information on historic flooding from all sources,
- Any data on existing surface water discharges to the surrounding watercourse or sewers,
- Any data on groundwater flooding,
- Any information on reservoir flooding; and,
- Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind regards,

Robert Brenton
Assistant Hydrologist BSc (Hons) FdSc

RSK
Land & Development Engineering
14, Beecham Court, Pemberton Business Park, Wigan, UK, WN3 6PR

Switchboard: +44 (0) 1942 493255
Fax: +44 (0) 1942 493171

http://www.rsk.co.uk

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APPENDIX F
SOUTHERN WATER SEWER RECORDS

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Order received: 8 November 2016
Order completed: 15 November 2016

Drainage and water enquiry

Commercial

Order reference: LS/U1240417
Your reference: SF24377832000 LKS/Deal 1 2016-124

Search address:

Land to The East of Dover Road
Deal
Kent
CT14 7NA

Ordered by:

Searchflow
42 Kings Hill Avenue
West Malling
Kent
ME19 4AJ

For enquiries regarding the information provided in this report, please contact the LandSearch team:

Tel: 0845 270 0212
0330 303 0276 (individual consumers)

Email: searches@southernwater.co.uk

Web: www.southernwater.co.uk

LandSearch
Southern Water Services
Southern House
Capstone Road
Chatham
Kent
ME5 7QA

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

Southern Water

What you need to know about...

Private sewer transfer

On 1 October 2011, ownership of private sewers and lateral drains changed in accordance with The Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The contents of this search may not reflect these changes.

For further information please visit our website: www.southernwater.co.uk/sewer-ownership-changes.

Records searched

The following records were searched in compiling this report: the Map of Public Sewers, the Map of Waterworks, water and sewerage billing records, the Register of Properties subject to Internal Foul Flooding, the Register of Properties subject to Poor Water Pressure and the Drinking Water Register. Should the property not fall entirely within Southern Water's region, a copy of the records held by the relevant water company was searched.

Moving house

All customers
There can be a lot to do and remember when you're moving home. Our online forms make it easy for you to let us know about your move. Whether you are moving within our area, moving into our area or moving out of the area, please let us know by visiting: www.southernwater.co.uk/moving-house.

Wastewater-only customers
Your water might be supplied by a separate company. If so, you'll only receive a wastewater bill from us. If your water is not supplied by Southern Water, you can find out how to contact your water company by visiting our website: www.southernwater.co.uk/wastewater-only-customers.

Your order summary

	Maps	
1.1	Where relevant, please include a copy of an extract from the public sewer map.	Map provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks.	Map provided
	Drainage	
2.1	Does foul water from the property drain to a public sewer?	No
2.2	Does surface water from the property drain to a public sewer?	No
2.3	Is a surface water drainage charge payable?	No
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	No
2.4.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	No
2.5.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?	No
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has any sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is the building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?	No
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.	See answer
	Water	
3.1	Is the property connected to mains water supply?	No
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	No
3.3	Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is the property at risk of receiving low water pressure or flow?	No
3.5	What is the classification of the water supply for the property?	See answer
3.6	Please include details of the location of any water meter serving the property.	See answer
	Charging	
4.1.1	Who is responsible for providing the sewerage services for the property?	Southern Water
4.1.2	Who is responsible for providing the water services for the property?	Southern Water
4.2	Who bills the property for sewerage services?	See answer
4.3	Who bills the property for water services?	See answer
4.4	What is the current basis for charging for sewerage and/or water services at the property?	No Charge
	Trade effluent information	
4.5	Is there a consent on this property to discharge trade effluent under Section 118 of the Water Industry Act (1991) into the public sewerage system?	No

Maps

Public sewer map

Q. 1.1: Where relevant, please include a copy of an extract from the public sewer map.

A.: A copy of an extract from the public sewer map is provided.

Guidance Notes:

The Water Industry Act 1991 defines public sewers as those which the Company has responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purpose only.

Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an “as constructed” record. It is recommended these details be checked with the developer.

Map of waterworks

Q. 1.2: Where relevant, please include a copy of an extract from the map of waterworks.

A.: A copy of an extract of the map of waterworks is provided.

Guidance Notes:

Assets other than vested water mains may be shown on the plan for information only.

The Company is not responsible for private supply pipes connecting the property to the public water main and does not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Drainage

Foul water

Q. 2.1: Does foul water from the property drain to a public sewer?

A.: The Company's records indicate that foul water from the property does not drain to the public sewerage system.

Guidance Notes:

The Company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these.

The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

The copy extract will show known public sewers in the vicinity of the property. It should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

If foul water does not drain to the public sewerage system the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.

The connection status of the property may have been determined by reference to billing records.

Surface water

Q. 2.2: Does surface water from the property drain to a public sewer?

A.: The Company's records indicate that surface water from the property does not drain to the public sewerage system. If the property was constructed after 6 April 2015 the surface water drainage may be served by a Sustainable Drainage System. Further information may be available from the developer.

Guidance Notes:

The Company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these.

The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

The copy extract will show known public sewers in the vicinity of the property. It should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

In some cases company records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the Company.

If surface water does not drain to the public sewerage system the property may have private facilities in the form of a soakaway or private connection to a watercourse.

The connection status of the property may have been determined by reference to billing records.

Surface water drainage charge

Q. 2.3: Is a surface water drainage charge payable?

A.: Records confirm that a surface water drainage charge is not payable for the property. If the property was constructed after 6 April 2015 the surface water drainage may be served by a Sustainable Drainage System. Further information may be available from the developer.

Guidance Notes:

Where surface water from a property does not drain to the public sewerage system no surface water drainage charges are payable.

Where surface water drainage charges are payable but if on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for rebate of the surface water drainage charge. Details can be obtained from the Company.

Public sewers within the boundary of the property

Q. 2.4: Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

A.: The public sewer map indicates that there are no public sewers, disposal mains or lateral drains within the boundaries of the property. However, from 1 October 2011 there may be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may further prevent or restrict development of the property. It is therefore recommended that investigations are made into the drainage arrangements of the property as the owner may be liable for repairs to the drainage system.

Guidance Notes:

The approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a public sewer within the boundary of the property may restrict further development within it.

Southern Water Services has a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of Southern Water Services or its contractors needing to enter the property to carry out work.

Please note if the property was constructed after 1 July 2011 any sewers and/or lateral drain within the boundary of the property are the responsibility of the householder.

Public pumping station within the boundary of the property

Q. 2.4.1: Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?

A.: The public sewer map included indicates that there is no public pumping station within the boundaries of the property. Any other ancillary apparatus is shown on the public sewer map and referenced on the legend.

Guidance Notes:

The approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a pumping station within the boundary of the property may restrict further development within it.

Southern Water Services has a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of Southern Water Services or its contractors needing to enter the property to carry out work.

It should be noted that only private pumping stations installed before 1 July 2011 will be transferred into the ownership of Southern Water Services.

Public sewers near to the property

Q. 2.5: Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

A.: The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of a building within the property.

Guidance Notes:

From 1 October 2011 there may be additional lateral drains and/or public sewers which are not recorded on the public sewer map but are also within 30.48 metres (100 feet) of a building within the property.

The presence of a public sewer within 30.48 metres (100 feet) of a building within the property can result in the local authority requiring a property to be connected to the public sewer.

The measure is estimated from the Ordnance Survey record, between a building within the boundary of the property and the nearest public sewer.

Public sewers near to the property

Q. 2.5.1: Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?

A.: The public sewer map included indicates that there is no public pumping station within 50 metres of any buildings within the property. Any other ancillary apparatus is shown on the public sewer map and referenced on the legend.

Guidance Notes:

The measure is estimated from the Ordnance Survey record, between a building within the boundary of the property and the nearest pumping station.

It should be noted that only private pumping stations installed before 1 July 2011 will be transferred into the ownership of Southern Water Services.

Public adoption of sewers and lateral drains

Q. 2.6: Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

A.: Records indicate that the sewers serving the development, of which this property forms part, are not the subject of an application for adoption under Section 104 of the Water Industry Act 1991. Where the property is part of an established development it would not normally be subject to an adoption agreement under Section 104 of the Water Industry Act 1991.

Guidance Notes:

This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to a public sewer.

Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.

Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991.

Any sewers and/or lateral drains within the boundary of the property are not the subject of an adoption agreement and remain the responsibility of the householder. Adoptable sewers are normally those situated in the public highway.

Building over a public sewer, disposal main or drain

Q. 2.7: Has the sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

A.: There are no records in relation to any approval or consultation about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However, the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain.

Guidance Notes:

Buildings or extensions erected over a sewer in contravention of Building Control may have to be removed or altered.

From 1 October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership and the sewerage undertaker may not have approved or been consulted about any plans to erect a building or extension on the property or in the vicinity of these.

Risk of flooding due to overloading public sewers

Q. 2.8: Is the building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?

A.: The building is not recorded as being at risk of internal flooding due to overloaded public sewers. From 1 October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a building may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

Guidance Notes:

A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

“Internal flooding” from the public sewers is defined as flooding, which enters a building or passes below a suspended floor.

For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

“At Risk” properties are defined as properties that have suffered or are likely to suffer internal flooding from the public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the sewerage undertaker’s reporting procedure.

Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included.

Buildings may be at risk of flooding but not identified where flooding incidents have not been reported to the sewerage undertaker.

Public sewers are defined as those for which the sewerage undertaker holds statutory responsibility under the Water Industry Act 1991.

It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the sewerage undertaker. This report excludes flooding from the private sewers and drains and the sewerage undertaker makes no comment upon this matter.

Sewage treatment works

Q. 2.9: Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

A.: The nearest sewage treatment works is 6.19 kilometres West North West of the property. The name of the sewage treatment works is BETTESHANGER WTW, which is the responsibility of Southern Water Services, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX.

Guidance Notes:

The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.

The sewerage undertaker's records were inspected to determine the nearest sewage treatment works.

It should be noted that there may be a private sewage treatment works closer than the one detailed above that have not been identified.

Water

Connection to mains water supply

Q. 3.1: Is the property connected to mains water supply?

A.: Records indicate that the property is not connected to mains water supply and water is therefore likely to be provided by virtue of a private supply.

Guidance Notes:

The situation should be checked with the current owner of the property.

The connection status of the property may have been determined by reference to billing records.

Details of private supplies are not kept by the water undertaker.

Water mains, resource mains or discharge pipes

Q. 3.2: Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

A.: The map of waterworks does not indicate any water mains, resource mains or discharge pipes within the boundaries of the property.

Guidance Notes:

The boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

The presence of a public water main within the boundary of the property may restrict further development within it.

Water undertakers have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the water undertaker or its contractors needing to enter the property to carry out work.

Adoption of water mains and services pipes

Q. 3.3: Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?

A.: Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

Guidance Notes:

This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to the mains water supply.

Risk of low water pressure or flow

Q. 3.4: Is the property at risk of receiving low water pressure or flow?

A.: Records confirm that the property is not recorded by the water undertaker as being at risk of receiving low water pressure or flow.

Guidance Notes:

“Low water pressure” means water pressure below the regulatory reference level which is the minimum pressure when demand on the system is not abnormal.

The reference level of service is a flow of 9 litres/minute at a pressure of 10 metres head on the customer’s side of the main stop tap (mst). The reference level of service must be applied on the customer’s side of a meter or any other company fittings that are on the customer’s side of the main stop tap.

The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served.

For two properties, a flow of 18 litres/minute at a pressure of 10 metres head on the customers side of the mst is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or Institute of Plumbing handbook.

Water companies include properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level). Refer to list below:

Abnormal demand: This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand which are normally expected. Companies exclude properties which are affected by low pressure only on those days with the highest peak demands. During the year companies may exclude, for each property, up to five days of low pressure caused by peak demand.

Planned maintenance: Companies exclude low pressures caused by planned maintenance. It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low pressure incidents that are excluded because of planned maintenance are actually caused by maintenance.

One-off incidents: This exclusion covers a number of causes of low pressure; mains bursts; failures of company equipment (such as PRVs or booster pumps); firefighting; and action by a third party. However, if problems of this type affect a property frequently, they cannot be classed as one-off events and further investigation will be required before they can be excluded.

Low pressure incidents of short duration: Properties affected by low pressures which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur during the course of the year, may be excluded.

Water hardness

Q. 3.5: What is the classification of the water supply for the property?

A.: The water supplied to the property has an average water hardness of 292 mg/l calcium carbonate which is defined as "Hard" by Southern Water.

Guidance Notes:

The hardness of water depends on the amount of calcium in it – the more it contains, the harder the water is.

There is no UK or European standard set for the hardness of drinking water. More information on water hardness can be found on the Drinking Water Inspectorates' website: http://www.dwi.gov.uk/

Water hardness can be expressed in various indices for example the hardness settings for dishwashers are commonly expressed in Clark's degrees, but check with the manufacturer as there are also other units. The following table explains how to convert mg/l calcium and mg/l calcium carbonate classifications.

To Convert from:	To Clark degrees	To French degrees	To German degrees
mg/l calcium	multiply by 0.18	multiply by 0.25	multiply by 0.14
mg/l calcium carbonate	multiply by 0.07	multiply by 0.10	multiply by 0.056

Water meters

Q. 3.6: Please include details of the location of any water meter serving the property.

A.: Records indicate that the property is not served by a water meter.

Guidance Notes:

Where the property is not served by a water meter and the customer wishes to consider this method of charging they should contact the water undertaker for their area.

If a property is measured (metered) upon change of occupation this property will remain as a metered property.

Charging

Sewerage undertakers

Q. 4.1.1: Who is responsible for providing the sewerage services for the property?

A.: Southern Water is responsible for providing the sewerage services for the property.

Water undertaker

Q. 4.1.2: Who is responsible for providing the water services for the property?

A.: Southern Water is responsible for providing the water services for the property.

Sewerage bills

Q. 4.2: Who bills the property for sewerage services?

A.: The property is not billed for sewerage services.

Water bills

Q. 4.3: Who bills the property for water services?

A.: The property is not billed for water services.

Current basis for sewerage and water charges

Q. 4.4: What is the current basis for charging for sewerage and/or water services at the property?

A.: There are no charges currently made for water or sewerage to the property.

Guidance Notes:

Measured (metered) charges can apply where the buyer makes a change of use of the property or where the buyer uses water: where the principal use of the premises is not as a home; where there is garden watering other than by hand; which automatically replenishes a pond or swimming pool with a capacity in excess of 10,000 litres; in a bath with a capacity in excess of 230 litres; in a power shower; in a reverse osmosis unit.

If a property is measured (metered) upon change of occupation this property will remain as a metered property.

Where the property is not served by a water meter and the customer wishes to consider this method of charging they should contact the water undertaker for their area.

Water and sewerage companies' full charges are set out in their charges schemes which are available from the companies free of charge upon request.

Trade effluent information

Q. 4.5: Is there a consent on this property to discharge trade effluent under Section 118 of the Water Industry Act (1991) into the public sewerage system?

A.: The trader operating at this commercial property does not hold either a Trade Effluent Consent, or an acknowledgement of a trade effluent discharge, as issued by Southern Water.

Guidance Notes:

Please note, any existing consent is dependent on the business being carried out at the property and will not transfer automatically upon change of ownership.

Any change of ownership from the current incumbent of a property will require the negotiation of a new trade effluent consent or a new acknowledgement between the new incumbent and Southern Water.

Where consent or acknowledgement details have been provided, this does not represent a direct copy of the original.

Other Information

Additional meter information

No further information.

Appendix one: Terms and expressions

"the 1991 Act" means the Water Industry Act 1991**(i)**;
"the 2000 Regulations" means the Water Supply (Water Quality) Regulations 2000**(ii)**;
"the 2001 Regulations" means the Water Supply (Water Quality) Regulations 2001**(iii)**;
"adoption agreement" means an agreement made or to be made under Section 51A(1) or 104(1) of the 1991 Act**(iv)**;
"bond" means a surety granted by a developer who is a party to an adoption agreement;
"bond waiver" means an agreement with a developer for the provision of a form of financial security as a substitute for a bond;
"calendar year" means the twelve months ending with 31 December;
"discharge pipe" means a pipe from which discharges are made or are to be made under Section 165(1) of the 1991 Act;
"disposal main" means (subject to Section 219(2) of the 1991 Act) any outfall pipe or other pipe which:
(a) is a pipe for the conveyance of effluent to or from any sewage disposal works, whether of a sewerage undertaker or of any other person; and
(b) is not a public sewer;
"drain" means (subject to Section 219(2) of the 1991 Act) a drain used for the drainage of one building or any buildings or yards appurtenant to buildings within the same curtilage;
"effluent" means any liquid, including particles of matter and other substances in suspension in the liquid;
"financial year" means the twelve months ending with 31 March;
"lateral drain" means:
(a) that part of a drain which runs from the curtilage of a building (or buildings or yards within the same curtilage) to the sewer with which the drain communicates or is to communicate; or
(b) (if different and the context so requires) the part of a drain identified in a declaration of vesting made under Section 102 of the 1991 Act or in an agreement made under Section 104 of that Act**(v)**;
"licensed water supplier" means a company which is the holder for the time being of a water supply licence under Section 17A(1) of the 1991 Act**(vi)**;
"maintenance period" means the period so specified in an adoption agreement as a period of time:
(a) from the date of issue of a certificate by a sewerage undertaker to the effect that a developer has built (or substantially built) a private sewer or lateral drain to that undertaker's satisfaction; and
(b) until the date that private sewer or lateral drain is vested in the sewerage undertaker;
"map of waterworks" means the map made available under section 198(3) of the 1991 Act**(vii)** in relation to the information specified in subsection (1A);
"private sewer" means a pipe or pipes which drain foul or surface water, or both, from premises, and are not vested in a sewerage undertaker;
"public sewer" means, subject to Section 106(1A) of the 1991 Act**(viii)**, a sewer for the time being vested in a sewerage undertaker in its capacity as such, whether vested in that undertaker:
(a) by virtue of a scheme under Schedule 2 to the Water Act 1989**(ix)**;
(b) by virtue of a scheme under Schedule 2 to the 1991 Act**(x)**;
(c) under Section 179 of the 1991 Act**(xi)**; or
(d) otherwise;
"public sewer map" means the map made available under Section 199(5) of the 1991 Act**(xii)**;
"resource main" means (subject to Section 219(2) of the 1991 Act) any pipe, not being a trunk main, which is or is to be used for the purpose of:
(a) conveying water from one source of supply to another, from a source of supply to a regulating reservoir or from a regulating reservoir to a source of supply; or
(b) giving or taking a supply of water in bulk;
"sewerage services" includes the collection and disposal of foul and surface water and any other services which are required to be provided by a sewerage undertaker for the purpose of carrying out its functions;
"sewerage undertaker" means the company appointed to be the sewerage undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated;
"surface water" includes water from roofs and other impermeable surfaces within the curtilage of the property;
"water main" means (subject to Section 219(2) of the 1991 Act) any pipe, not being a pipe for the time being vested in a person other than the water undertaker, which is used or to be used by a water undertaker or licensed water supplier for the purpose of making a general supply of water available to customers or potential customers of the undertaker or supplier, as distinct from for the purpose of providing a supply to particular customers;
"water meter" means any apparatus for measuring or showing the volume of water supplied to, or of effluent discharged from any premises;
"water supplier" means the company supplying water in the water supply zone, whether a water undertaker or licensed water supplier;
"water supply zone" means the names and areas designated by a water undertaker within its area of supply that are to be its water supply zones for that year; and
"water undertaker" means the company appointed to be the water undertaker under Section 6(1) of the 1991 Act for the area in which the property is or will be situated.

In this report, references to a pipe, including references to a main, a drain or a sewer, shall include references to a tunnel or conduit which serves or is to serve as the pipe in question and to any accessories for the pipe.

(i) 1991 c.56.
(ii) S.I. 2000/3184. These Regulations apply in relation to England.
(iii) S.I. 2001/3911. These Regulations apply in relation to Wales.
(iv) Section 51A was inserted by Section 92(2) of the Water Act 2003 (c. 37). Section 104(1) was amended by Section 96(4) of that Act.
(v) Various amendments have been made to Sections 102 and 104 by section 96 of the Water Act 2003.
(vi) Inserted by Section 56 of and Schedule 4 to the Water Act 2003.
(vii) Subsection (1A) was inserted by Section 92(5) of the Water Act 2003.
(viii) Section 106(1A) was inserted by Section 99 of the Water Act 2003.
(ix) 1989 c.15.
(x) To which there are various amendments made by Section 101(1) of and Schedule 8 to the Water Act 2003.
(xi) To which there are various amendments made by Section 101(1) of and Schedule 8 to the Water Act 2003.
(xii) Section 199 was amended by Section 97(1) and (8) of the Water Act 2003.

Appendix two: A guide to new development

The information contained below is for general guidance only. It is recommended that Southern Water's Developer Services department be contacted for further details concerning new infrastructure development.

Wastewater information

Sewer requisitions

It may be necessary for a developer to request that Southern Water provides a public sewer to connect a development site to the existing public system. The developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development served by the new sewer.

Sewer diversions

If a public sewer crosses private land, it may be possible for the landowner/developer to request the sewer be diverted. In the majority of cases Southern Water will allow the developer to undertake this work under close supervision. Whether Southern Water or the developer undertakes the diversionary works the costs are the responsibility of the developer.

Building-over sewers

Public sewers are afforded statutory protection and consequently there is no right to build over or in close proximity to a public sewer. If an existing public sewer either crosses a development site or is located in close proximity to a development site it is essential that a developer contact Southern Water.

Sewer connections

A developer can serve notice on Southern Water that it wishes to make a connection to the public sewerage system. The developer must provide 21 days' notice and the work will be supervised by Southern Water.

Water information

Water requisitions

It may be necessary for a developer to request that Southern Water provides both:

(a) a public water main to connect a development site to the existing public system and,
(b) on-site public water mains to serve the individual properties.

In both cases the developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development.

It is possible for the developer to lay the on-site mains themselves under a Self-Lay Agreement. Further details are available from Southern Water.

Water main diversions

The building over or in close proximity to public water mains is not permitted. A developer must request that Southern Water undertakes a diversion of a water main that is affected by a development.

Water connections

A developer can request a new connection to a public water main. This work will be undertaken by Southern Water.

Contact us

For specific information on Southern Water's Developer Services service, including details on how to contact the right person, please visit our website: www.southernwater.co.uk/developers-and-builders-overview.

Appendix three: Terms and conditions

The Customer the Client and the Purchaser are asked to note these terms, which govern the basis on which this drainage and water report is supplied.

Definitions
"The Company" means the water service company operating within the Southern Water drainage area that provides information to Southern Water for this commercial search Report.
"Order" means any request completed by the Customer requesting the Report.
"Report" means the drainage and/or water report prepared by The Company in respect of the Property.
"Property" means the address or location supplied by the Customer in the Order.
"Customer" means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.
"Client" means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.
"Purchaser" means the actual or potential purchaser of the Property including their mortgage lender.

1.0 Agreement
1.1 Southern Water agrees to supply the Report subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client.
1.2 The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

2.0 The Report
Whilst Southern Water will use reasonable care and skill in producing the Report, it is provided to the Client on the basis that they acknowledge and agree to the following:
2.1 The information contained in the Report can change on a regular basis so Southern Water cannot be responsible to the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.
2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as a substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.
2.3 The information contained in the Report is based upon the accuracy of the address supplied by the Customer or Client.
2.4 The Report provides information as to the location and connection of existing services, and details of trade effluent consents. It should not be relied upon for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Southern Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.
2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes.

3.0 Liability
3.1 Southern Water shall not be liable to the Client for any failure defect or non-performance of its obligations arising from any failure of or defect in any machine, processing system or transmission link or anything beyond Southern Water's reasonable control or the acts or omissions or any party for whom Southern Water is not responsible.
3.2 Where a Report is requested for an address falling within a geographical area where Southern Water and another Company separately provide water and sewerage services, then it shall be deemed that liability for the information given by Southern Water or the Company as the case may be will remain with Southern Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Southern Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement, Southern Water will therefore not be liable in any way for the accuracy of that information.
3.3 Where the Customer sells this Report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever (save to the extent provided by clause 3.4) and the Customer shall indemnify Southern Water in respect of any claim (other than a claim covered by clause 3.4) by the Client.
3.4 Southern Water shall accept liability for death or personal injury arising from its negligence.
3.5 The entire liability of Southern Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses.

4.0 Copyright and confidentiality
4.1 The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Southern Water. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided.
4.2 The Customer or Client is entitled to make copies of the Report (other than any maps contained in the, or attached to the Report, where no copying is permitted).
4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.
4.4 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.
4.5 The Customer and the Client agree to indemnify Southern Water or the Company as the case may be against any losses, costs, claims and damage suffered by Southern Water or the Company as the case may be, as a result of any breach by either of them of the terms of paragraphs 4.1 to 4.4 inclusive.

5.0 Payment
5.1 Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Southern Water, without any set off, deduction or counterclaim. Unless the Customer or Client has an account with Southern Water for payment for Reports, payments for Reports must be received in full by Southern Water before the Report is produced. For Customers or Clients with accounts, payment terms will be as agreed with Southern Water.

6.0 General
6.1 If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.
6.2 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.
6.3 Nothing in this notice shall in any way restrict your statutory or any other rights of access to the information contained in the Report.

These Terms and conditions are available in larger print for those with impaired vision.

Appendix four: Complaints procedure

When we get it wrong
You deserve the highest standard of service from us, but sometimes we make mistakes. If we do, please let us know and we will investigate and review your concerns.

Whilst we always try to resolve all complaints straight away, if this is not possible and you are not happy with the course of action taken by us, you can ask us to escalate the issue internally or take your complaint to an independent third party.

How you contact us
Firstly please call us and we will try to sort out your problem straight away.

You can call us between 8am and 5pm, Monday to Friday on 0845 270 0212 or 0330 303 0276 (individual consumers);

Email us at searches@southernwater.co.uk; or

Write to us at LandSearch, Southern Water Services, Southern House, Capstone Road, Chatham, Kent, ME5 7QA.

What you can expect
You will receive a full, fair and courteous response from someone who can effectively deal with your problem.

If we can remedy the problem straight away we will do it but if we cannot immediately resolve your problem we will keep you informed of actions being taken.

The process
We will try to resolve any telephone contact or complaint at the time of the call, however, if that isn't possible, we will take the details of your complaint and we will investigate and get back to you within 10 working days.

We will respond to written complaints within 10 working days of the date received, but we will always aim to respond more quickly. Depending on the scale of investigation required, we will keep you informed of the progress and update you with new timescales if necessary.

If you are still not satisfied with our response or action we will refer the matter to a Senior Manager for resolution. At your request we will liaise with a third party representative acting on your behalf.

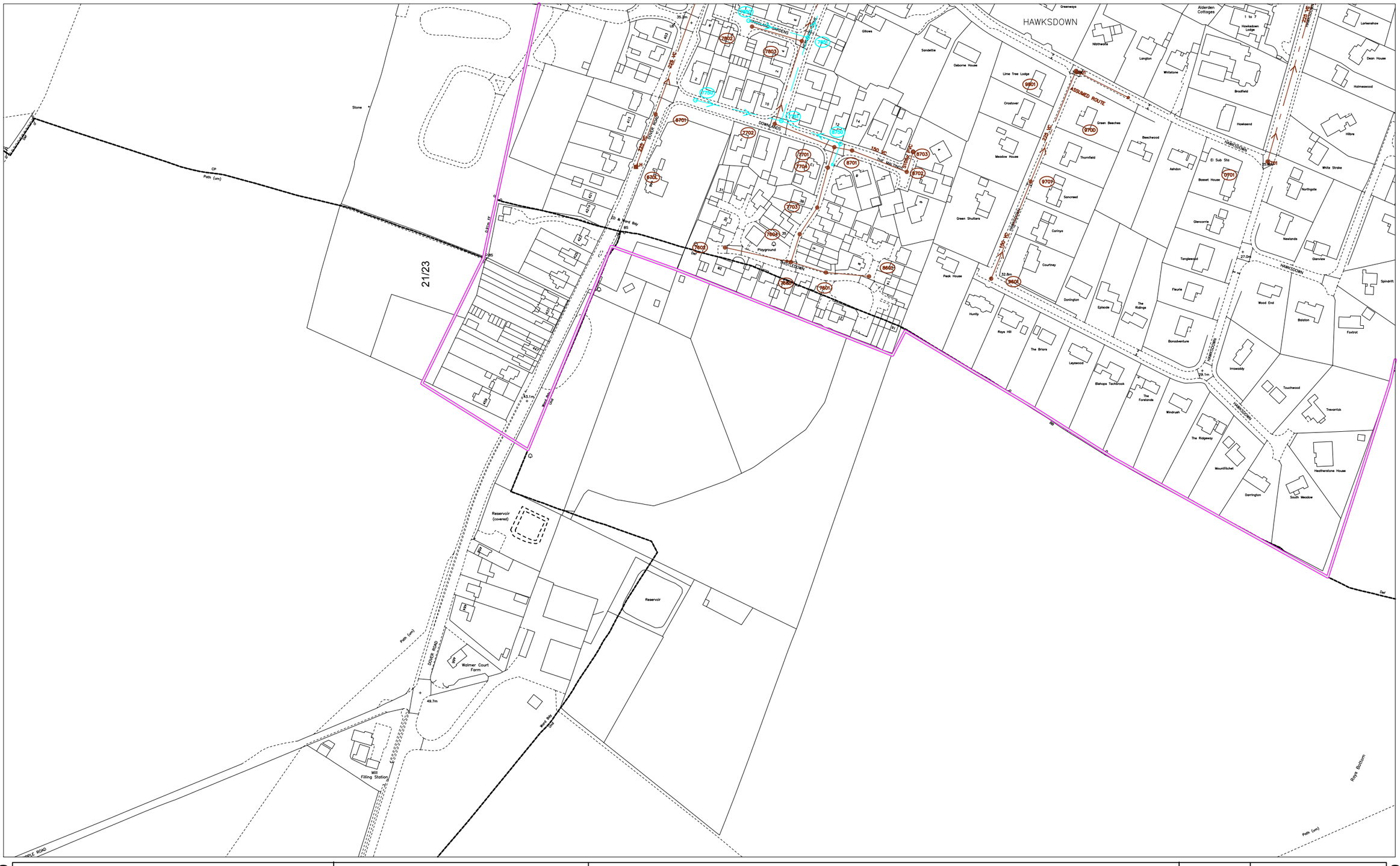
Our commitment to you
If we do not respond to your complaint within 10 working days of receipt of your contact, we will compensate you in line with Southern Water's Customer services — Guaranteed standards of service for business customers.

If we find your complaint to be justified, or we have made any errors that substantially change the outcome in your search result, we will refund the search fee. We will also provide you with a revised search and undertake the necessary action to put things right as soon as practically possible. You will be kept informed of the progress of any action required.

If you remain dissatisfied
While we aim to resolve your complaint first time, in the event that we are unable to resolve the issue to your satisfaction, ultimately you can contact a third party. Please make sure that you have followed the process above first, if not, your complaint will be passed back to us.

SEWER RECORDS PAGE 1 OF 2

149856



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636237

637179

O.S. REF. TR3649NE	Drawn by: chakrap	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 determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may Include Bonded Asbestos Cement
	Scale: 1:2500	
Title: Land to The East of Dover Road	Date: 15/11/2016	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

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Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape
0701X			225	VC	CIRC
6701X	37.205	34.855	225	VC	CIRC
670LX	38.325	36.115	225	VC	CIRC
7601X	36.91	33.1	150	VC	CIRC
7602X	38.69	36.59	150	VC	CIRC
7603X	37.69	35.54	150	VC	CIRC
7604X	37.2	32.64	150	VC	CIRC
7701X			UNK	UNK	CIRC
7702X			UNK	UNK	CIRC
7703X	36.76	32.34	150	VC	CIRC
7704X	36.12	32.21	150	VC	CIRC
7750X			UNK	UNK	CIRC
7751X			UNK	UNK	CIRC
775DX			UNK	UNK	CIRC
7802X		33.23	UNK	UNK	CIRC
7803X		31.1	UNK	UNK	CIRC
7850X		33.53	UNK	UNK	CIRC
7851X			UNK	UNK	CIRC
8601X	35.75	33.35	150	VC	CIRC
8701X			UNK	UNK	CIRC
8702X			150	VC	CIRC
8703X			UNK	PVC	CIRC
8750X			UNK	UNK	CIRC
9601X			150	VC	CIRC
9701X			225	VC	CIRC
9801X			UNK	UNK	CIRC

22/23

LINE STYLES / COLOURS

- Brown — Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main
- Red — Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain
- Orange — Building Over Agreement Area
- Dark Blue — Treated Effluent
- Purple — Sludge
- Sewer Catchment
- Section 104 Area
- Light Blue — Surface Water
- Surface Water Rising Main
- Yellow — Private
- Green — Access Shaft
- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chlorkde
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

LEGEND - SEWERS

- Manhole (SW)
- Manhole (F&C)
- Lamp hole (SW)
- Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- Blind shaft (SW)
- Blind shaft (F&C)
- Ejector station (SW)
- Ejector station (F&C)
- Watertight door (SW)
- Watertight door (F&C)
- Flushing ch. Mn-e (SW)
- Flushing ch. Mn-e (F&C)
- Flushing ch. No-e (SW)
- Flushing ch. No-e (F&C)
- Demarcation Chamber
- Washout (SW)
- Washout (F&C)
- Rodding Eye (SW)
- Rodding Eye (F&C)
- Gauging point (SW)
- Gauging point (F&C)
- Intercept chamber (SW)
- Intercept chamber (F&C)
- Storm Tank (SW)
- Storm Tank (F&C)
- Vortex chamber (SW)
- Vortex chamber (F&C)
- Label ellipse
- Dummy/S24 manhole
- Outfall
- Penstock chamber
- Damboards
- Storm Overflow
- Backdrop manhole
- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- Anode
- Valve
- Closed Valve
- Air Valve
- Hatch box (SW)
- Hatch box (F&C)
- Direction arrow
- Emptying valve
- Catchpit
- Soakaway
- Inlet
- Balancing Pond
- Wastewater treatment works
- Marine treatment works
- Outfall headworks
- Vent
- Vent column
- Tidal storage tank
- Blank end
- Head of Public Sewer
- Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

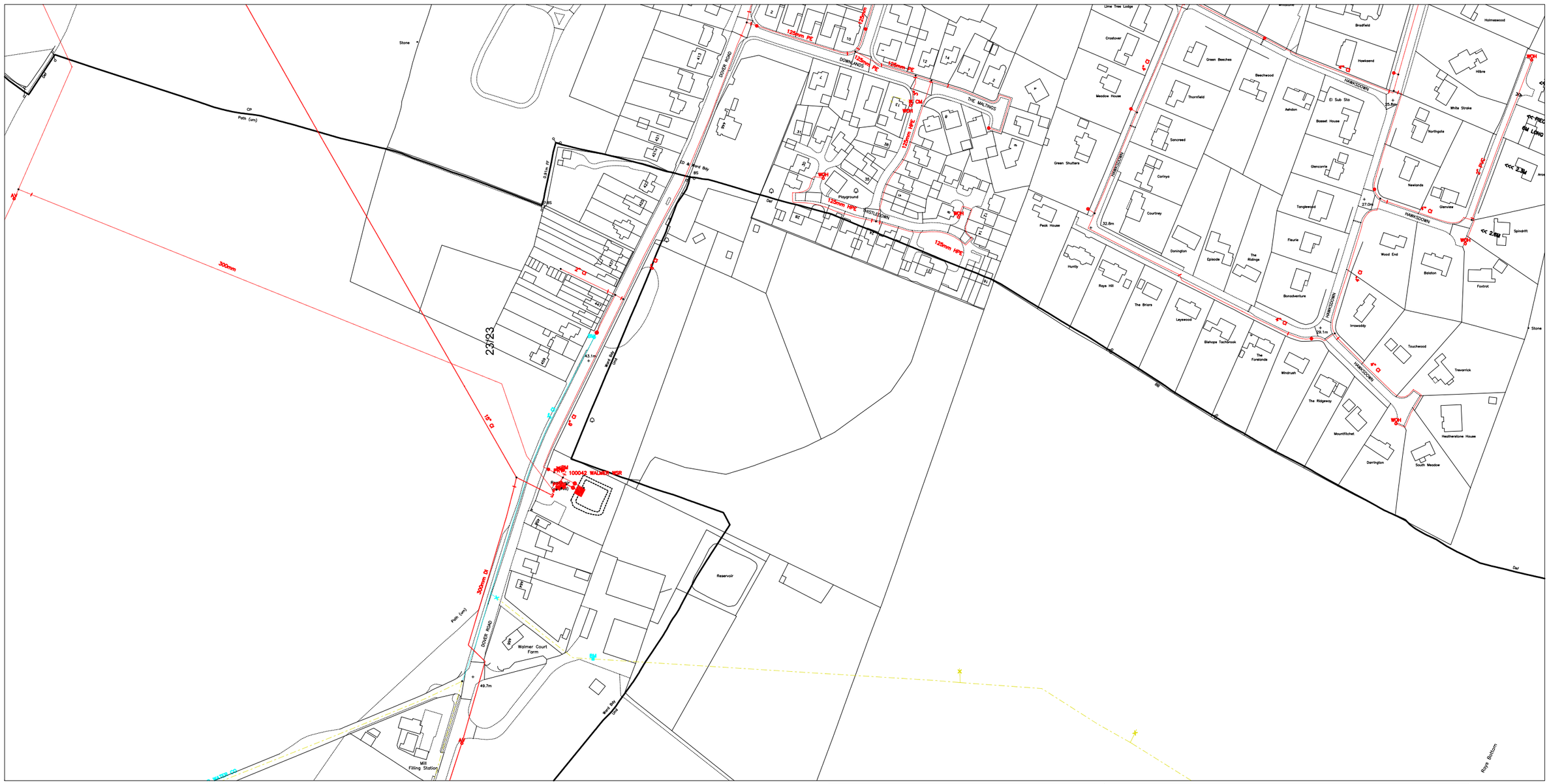
NODE REFERENCING SYSTEM

- 1st digit: hundred metre easting identifier
- 2nd digit: hundred metre northing identifier
- 3rd digit: sewer type identifier
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- 4th digit: next sequential node

Drawn by:	chakrap
Title:	Land to The East of Dover Road
Date:	15/11/2016

Southern Water

149810



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637189

LEGEND - MAINS

- Distribution Main / Communication pipe
- Trunk Main
- RAW — Raw water main
- NP — Non potable
- Abandoned main
- P P — Proposed Main
- FM — Fire main
- Non SWS
- Sluice valve
- Closed valve
- AV — Air valve
- Butterfly valve
- Pressure reducing valve
- Reflux valve
- mv — Motorised valve
- Clockwise closing valve
- Fire Hydrant
- WO — Washout
- WOH — Washout hydrant
- M — Meter
- Capped end
- EP — Emptying plug
- Stopcock
- SP — Leak Noise Correlator Survey Point
- AN — Anode
- TC — Telemetry cable
- AP — Access point / hatchbox

MATERIALS

D	Dialysis machine	
BPT	Break pressure tank	
	Change node	
	Pumping station	
	Booster station	
	Insertion Flow Meter Point	
	Water tower	
	Service reservoir	
	Water Supply Works	
	Bore hole / Well	
	Intake	
	Customer site	
	Swab insertion point	

Alkathene	AK
Cast iron	CI
Spun (grey) iron	SI
Concrete	CO
Ductile iron	DI
Bonded Asbestos Cement	BAC
Glass reinforced plastic	GRP
Glass reinforced epoxy	GRE
(Unplasticised) Polyvinyl chloride	PVC
Polyethylene	PE
Steel	ST
Concrete segments bolted	CSB
Concrete segments unbolted	CSU
Galvanised iron	GI
Ductile sleeve	DS
Concrete pre-stressed	CPS
High performance polyethelene	HPE
Unknown	??

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

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

Drawn by:	chakrap
Scale:	1:2500
Date:	15/11/2016

O.S.Ref: TR3649NE

TITLE: Land to The East of Dover Road

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 of pipes should be determined on site.

Southern Water

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APPENDIX G
GREENFIELD RUNOFF CALCULATIONS

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ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.150
Area (ha)	4.060	Urban	0.000
SAAR (mm)	768	Region Number	Region 7

Results	**l/s**
QBAR Rural	1.8
QBAR Urban	1.8
Q1 year	1.6
Q1 year	1.6
Q30 years	4.2
Q100 years	5.8

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APPENDIX H
INFILTRATION TEST RESULTS

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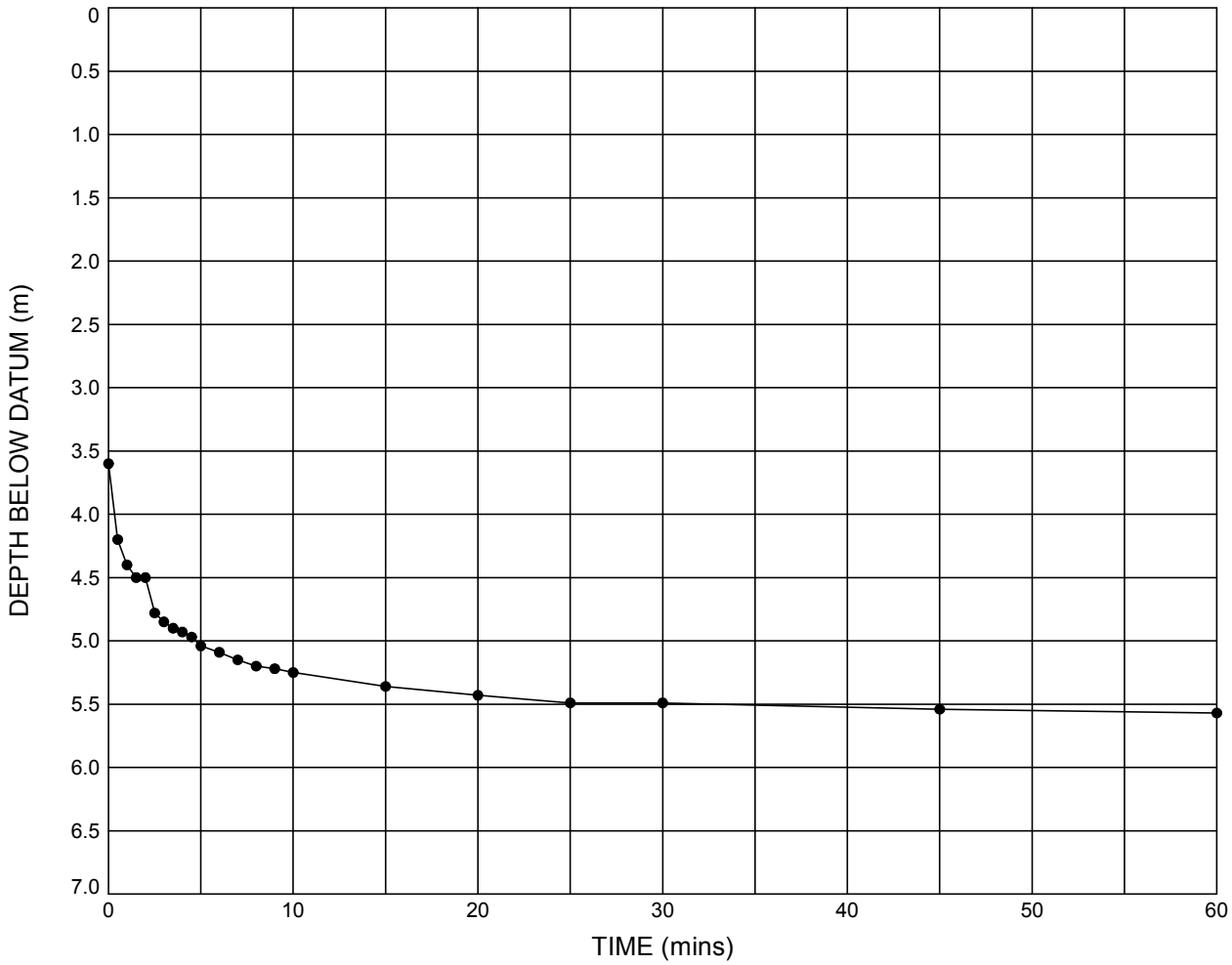
BOREHOLE SOAKAWAY TEST

Test position: BH1

Ground Level: **37.61** National Grid Co-ordinates: **E:636803.0 N:149626.0**

PLOT OF DEPTH OF WATER BELOW DATUM AGAINST TIME



Effective depth, De	=	**3.06**	m
Effective storage volume, V_{p75-25}	=	**0.027037**	m^3
Surface area, a_{p50}	=	**0.738667**	m^2
Time, t_{p75-25}	=	**9035**	secs
Infiltration coefficient, f	=	**4.05×10^{-6}**	m/s

Test hole details:

Measurement datum was **GL**
Hole depth at start of test: **6.66**mBGL
Borehole diameter: **150**mm

Legend:

Test 1 (08/02/2017)

Compiled By	Date	Checked By	Date
	27/02/17		**16/02/17**

Contract: **124 Dover Road**

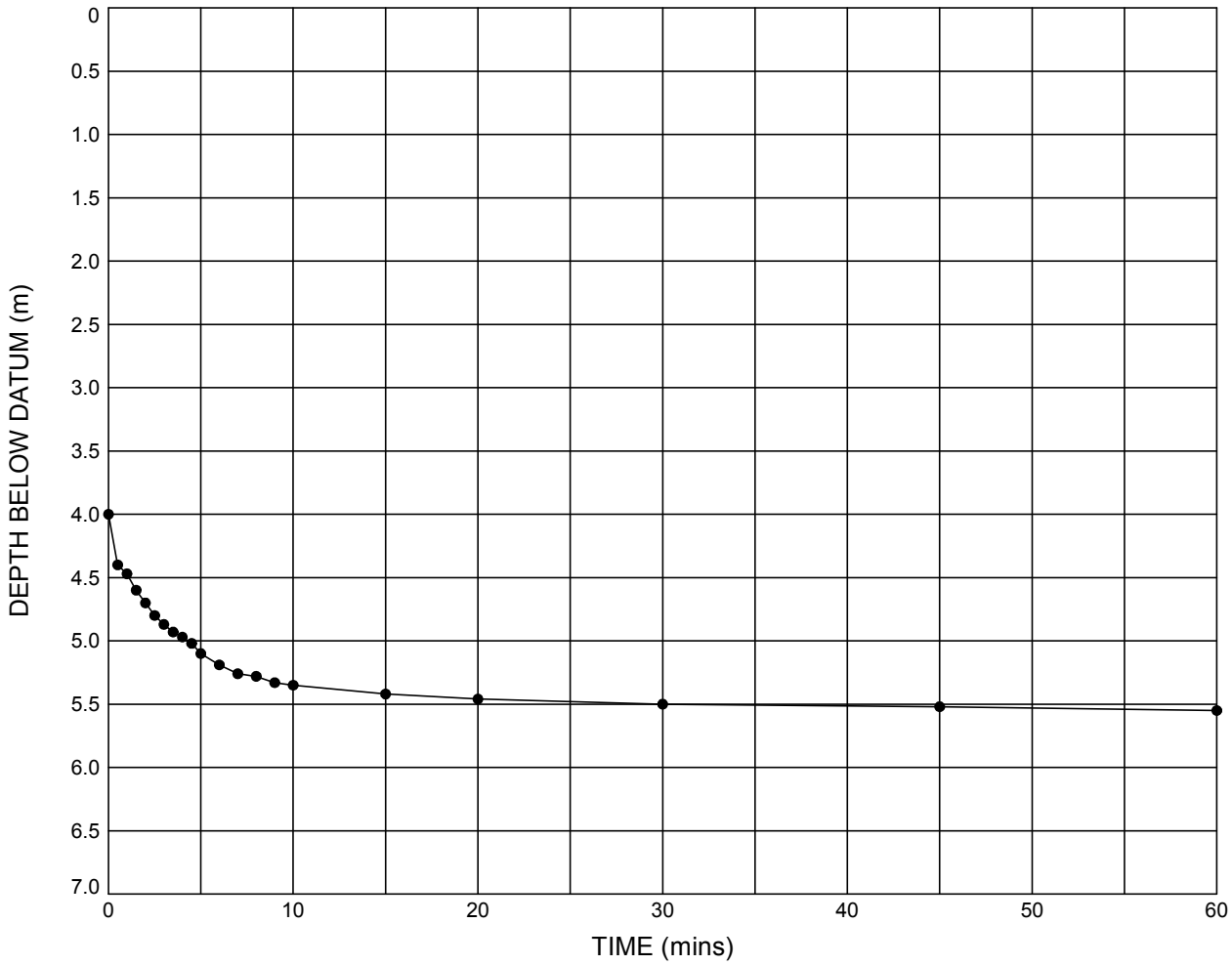
Contract Ref: **28927**

BOREHOLE SOAKAWAY TEST

Test position: BH1

Ground Level: **37.61** National Grid Co-ordinates: **E:636803.0 N:149626.0**

PLOT OF DEPTH OF WATER BELOW DATUM AGAINST TIME



Effective depth, De	=	**2.66**	m
Effective storage volume, V_{p75-25}	=	**0.023503**	m^3
Surface area, a_{p50}	=	**0.644419**	m^2
Time, t_{p75-25}	=	**23966**	secs
Infiltration coefficient, f	=	**1.52×10^{-6}**	m/s

Test hole details:

Measurement datum was **GL**
Hole depth at start of test: **6.66**mBGL
Borehole diameter: **150**mm

Legend:

Test 2 (08/02/2017)

Compiled By	Date	Checked By	Date
	27/02/17		**27/02/17**

Contract: **124 Dover Road**

Contract Ref: **28927**

APPENDIX I
ATTENUATION BASIN SIZING

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 5446 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.207	0.407	1.5	397.8	O K
30 min Summer	9.314	0.514	1.6	520.5	O K
60 min Summer	9.417	0.617	1.7	645.9	O K
120 min Summer	9.513	0.713	1.8	769.4	O K
180 min Summer	9.564	0.764	1.9	837.4	O K
240 min Summer	9.600	0.800	1.9	886.7	O K
360 min Summer	9.651	0.851	2.0	957.5	O K
480 min Summer	9.686	0.886	2.0	1007.1	O K
600 min Summer	9.712	0.912	2.0	1044.6	Flood Risk
720 min Summer	9.732	0.932	2.0	1074.2	Flood Risk
960 min Summer	9.762	0.962	2.1	1118.1	Flood Risk
1440 min Summer	9.797	0.997	2.1	1170.4	Flood Risk
2160 min Summer	9.815	1.015	2.3	1200.5	Flood Risk
2880 min Summer	9.818	1.018	2.4	1204.1	Flood Risk
4320 min Summer	9.804	1.004	2.3	1180.5	Flood Risk
5760 min Summer	9.786	0.986	2.1	1154.2	Flood Risk
7200 min Summer	9.764	0.964	2.1	1120.2	Flood Risk
8640 min Summer	9.741	0.941	2.0	1087.1	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	152.569	27
30 min Summer	99.930	42
60 min Summer	62.176	72
120 min Summer	37.240	132
180 min Summer	27.163	192
240 min Summer	21.682	250
360 min Summer	15.759	370
480 min Summer	12.548	490
600 min Summer	10.507	610
720 min Summer	9.084	730
960 min Summer	7.215	968
1440 min Summer	5.207	1446
2160 min Summer	3.751	2164
2880 min Summer	2.969	2880
4320 min Summer	2.132	3848
5760 min Summer	1.685	4792
7200 min Summer	1.402	5544
8640 min Summer	1.207	6304

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	9.720	0.920	2.0	1056.5	Flood Risk
15 min Winter	9.249	0.449	1.6	445.7	O K
30 min Winter	9.366	0.566	1.7	583.3	O K
60 min Winter	9.478	0.678	1.8	723.9	O K
120 min Winter	9.583	0.783	1.9	863.0	O K
180 min Winter	9.638	0.838	1.9	939.7	O K
240 min Winter	9.678	0.878	2.0	995.6	O K
360 min Winter	9.734	0.934	2.0	1076.1	Flood Risk
480 min Winter	9.772	0.972	2.1	1132.8	Flood Risk
600 min Winter	9.801	1.001	2.3	1176.0	Flood Risk
720 min Winter	9.821	1.021	2.4	1209.5	Flood Risk
960 min Winter	9.850	1.050	2.4	1259.3	Flood Risk
1440 min Winter	9.885	1.085	2.4	1319.9	Flood Risk
2160 min Winter	9.909	1.109	2.5	1362.0	Flood Risk
2880 min Winter	9.916	1.116	2.5	1374.8	Flood Risk
4320 min Winter	9.907	1.107	2.5	1358.8	Flood Risk
5760 min Winter	9.884	1.084	2.4	1317.8	Flood Risk
7200 min Winter	9.864	1.064	2.4	1283.0	Flood Risk
8640 min Winter	9.843	1.043	2.4	1246.7	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	1.064	7064
15 min Winter	152.569	27
30 min Winter	99.930	42
60 min Winter	62.176	72
120 min Winter	37.240	130
180 min Winter	27.163	188
240 min Winter	21.682	248
360 min Winter	15.759	366
480 min Winter	12.548	484
600 min Winter	10.507	602
720 min Winter	9.084	718
960 min Winter	7.215	954
1440 min Winter	5.207	1420
2160 min Winter	3.751	2116
2880 min Winter	2.969	2796
4320 min Winter	2.132	4108
5760 min Winter	1.685	5192
7200 min Winter	1.402	5624
8640 min Winter	1.207	6560

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	9.822	1.022	2.4	1211.3	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	1.064	7464

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APPENDIX J
INDICATIVE DRAINAGE STRATEGY

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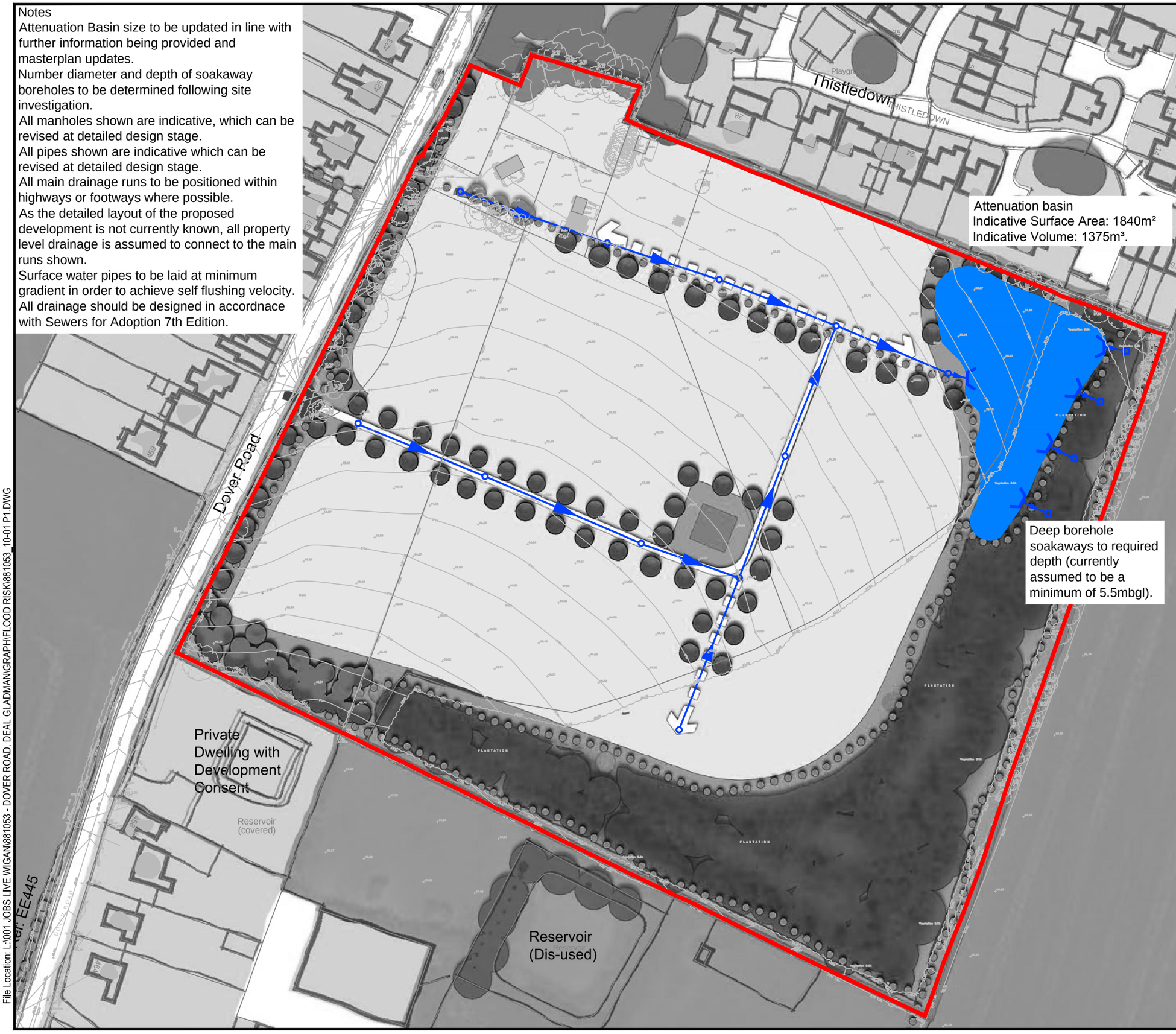
Notes
Attenuation Basin size to be updated in line with further information being provided and masterplan updates.
Number diameter and depth of soakaway boreholes to be determined following site investigation.
All manholes shown are indicative, which can be revised at detailed design stage.
All pipes shown are indicative which can be revised at detailed design stage.
All main drainage runs to be positioned within highways or footways where possible.
As the detailed layout of the proposed development is not currently known, all property level drainage is assumed to connect to the main runs shown.
Surface water pipes to be laid at minimum gradient in order to achieve self flushing velocity.
All drainage should be designed in accordnace with Sewers for Adoption 7th Edition.



Notes
Do not scale from this drawing
Layout provided by Gladman
Drawing is indicative and subject to change following layout revisions
Soakage testing should be undertaken and drawing is subject to change

Key
- Proposed Surface Water Pipes
- Attenuation Basin
- Proposed Surface Water Manhole
- Proposed Surface Water Headwalls
- Proposed Deep Borehole Soakaway
- Red Line Boundary

Rev.	Date	Amendment	Drawn	Chkd.	Appd.
P1		Issued for Discussion	RB	IC	IC

RSK
LAND & DEVELOPMENT ENGINEERING LTD
Spring Lodge
172 Chester Road
Helsby
Cheshire, WA6 0AR
United Kingdom
Tel: +44 (0) 1928 726006
Fax: +44 (0) 1928 725633
Email: lde@rsk.co.uk
Web: www.rsk.co.uk

Client
Gladman

Project Title
Dover Road
Deal

Status
For Discussion

Drawing Title
Surface Water Drainage Strategy

Drawn	Date	Checked	Date	Approved	Date
RB	Feb 17	IC	Feb 17	IC	Feb 17

Scale	Orig Size	Dimensions
1:1000	A3	m

Project No.	Drawing File
881053	

Drawing No.	Rev.
10-01	P1

Scale
0 25 50 75 100m

File Location: L:\001 JOBS LIVE WIGAN\881053 - DOVER ROAD, DEAL GLADMAN\GRAPH\FLOOD RISK\881053_10-01 P1.DWG
Ref: EE445