



Gladman Developments Ltd.

Cross Road, Deal

Flood Risk Assessment & Outline Surface Water Drainage Strategy

881725 R1(02)-FRA



INVESTORS
IN PEOPLE



RSK



APRIL 2019

This page has been left blank intentionally

RSK GENERAL NOTES

Project No.: 881725 R1(02)-FRA
Site: Land at Cross Road, Deal
Title: Flood Risk Assessment & Outline Surface Water Drainage Strategy
Client: Gladman Developments Ltd.
Date: April 2019
Office: Wigan
Status: Final

Author	<u>R Brenton</u>	Technical reviewer	<u>K Jackson</u>
Signature		Signature	
Date:	<u>April 2019</u>	Date:	<u>April 2019</u>

Project manager	<u>C Whittingham</u>	Project Director	<u>I Clark</u>
Signature		Signature	
Date:	<u>April 2019</u>	Date:	<u>April 2019</u>

Issue No	Version/Details	Date issued	Author	Reviewed by	Approved by
--	Draft for internal review	26.02.2019	RB	CW	IC
00	Draft for client comment	26.02.2019	RB	CW	IC
01	Updated following client comments	04.04.2019	RB	CW	IC
02	Final Issue following revised layout	10.04.2019	RB	CW	IC

RSK LDE Ltd (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This page has been left blank intentionally

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 4.02 hectares which is currently considered as undeveloped from a hydraulic prospective and is accessed off Cross Road which forms the western site boundary. This site is located southwest of Deal, in Kent.

The existing site consists of arable agricultural land, 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 and will not increase the risk of flooding and can be drained safely and sustainably, provided that certain recommendations are met. These recommendations include;

- Setting finished floor levels at or above the existing ground levels;
- Safe conveyance of surface water flows across the site without impacting the development, residents or others;
- Update the drainage strategy as the development framework plan develops and new information is made available at detailed design stage, and;

- Provide sufficient treatment of surface water runoff from the site in order to reduce the risk of pollutants entering the Bedrock Aquifer which underlies the site and is considered to be within a Groundwater Source Protection Zone.

Assuming that these recommendations are met then based on the ground conditions it is thought that surface water will discharge to the chalk bedrock at the surface via infiltration basins located to the south of each land parcel.

The drainage strategy should be confirmed by the Lead Local Flood Authority, in this case Kent County Council and the Environment Agency prior to development due to the sensitive nature of the receiving aquifer.

CONTENTS

1	INTRODUCTION	1
2	CONTEXT AND SCOPE OF WORK.....	3
3	SITE DESCRIPTION	5
3.1	Location	5
3.2	Land use and topography.....	6
3.3	Hydrology	7
3.4	Geology	7
3.5	Hydrogeology	9
4	DEVELOPMENT PROPOSALS.....	11
5	LEGISLATION AND POLICY CONTEXT	13
5.1	National policy	13
5.2	Local policy	14
6	SOURCES OF INFORMATION	15
6.1	Environment Agency consultation	15
6.2	Dover District Council	16
6.3	Kent County Council.....	16
6.4	Internal Drainage Board	16
6.5	Canal & River Trust	16
6.6	Site walkover	17
6.7	Relevant studies	17
6.8	Drainage	18
7	SOURCES OF FLOOD RISK.....	21
7.1	Criteria	21
7.2	Flooding from rivers (fluvial flood risk).....	21
7.3	Flooding from the sea (tidal flood risk)	22
7.4	Flooding from the land (overland pluvial flood risk).....	23
7.5	Flooding from groundwater	24
7.6	Flooding from sewers	25
7.7	Other sources of flooding	25
7.8	Flood risk resulting from the development	27
8	PLANNING CONTEXT	29
8.1	Application of planning policy	29
8.2	Land use vulnerability.....	29
8.3	Sequential Test.....	29
9	SURFACE WATER DRAINAGE ASSESSMENT	31
9.1	Scope	31
9.2	Pre-development situation.....	31
9.3	Limiting discharge for design.....	32
9.4	Post-development situation	32
10	FLOOD MITIGATION MEASURES	39
10.1	Overview.....	39
10.2	Overland flood flow	39



10.3 Finished floor levels.....	39
10.4 Safe access/egress	39
10.5 Surface water treatment	39
11 CONCLUSIONS AND RECOMMENDATIONS	41

APPENDICES

APPENDIX A SERVICE CONSTRAINTS

APPENDIX B TOPOGRAPHIC SURVEY

APPENDIX C ENVIRONMENT AGENCY CORRESPONDENCE

APPENDIX D KENT COUNTY COUNCIL CORRESPONDENCE

APPENDIX E SOUTHERN WATER SEWER RECORDS

APPENDIX F PRE-DEVELOPMENT GREENFIELD RUNOFF CALCULATIONS

APPENDIX G LOCATION OF INFILTRATION TESTS

APPENDIX H INFILTRATION TEST RESULTS

APPENDIX I PARCEL INFILTRATION BASIN SIZING

APPENDIX J SURFACE WATER DRAINAGE STRATEGY

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 Cross 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 Guidance², the Interim Code of Practice for Sustainable Drainage³, BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice⁴ and the Non-statutory technical standards for sustainable drainage systems⁵, 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**); and
- The site area is in the order of 4.02Ha therefore surface water drainage must be considered, and sustainable drainage systems (SuDS), where possible.

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', 2019

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

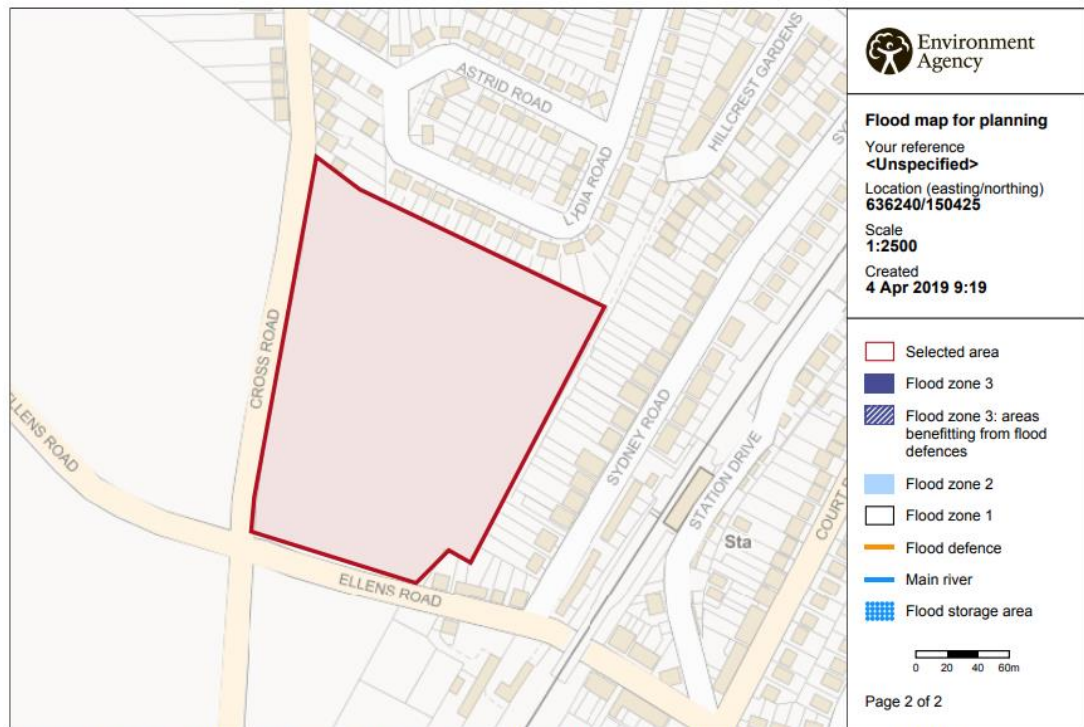


Figure 1.1: Environment Agency Flood Zone Map (accessed April 2019)

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 14 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 development framework plans, 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**.

This page has been left blank intentionally

3 SITE DESCRIPTION

3.1 Location

Site Name: Cross Road, Deal

Site Address: Cross Road,
Walmer,
Deal,
Kent,
CT14 9LA.

Site National Grid Reference: 636030 E, 150410 N

The site is located approximately 100m west of Walmer train station and is bound by highways and agricultural land to the southwest and residential development to the northeast.

The site is known to fall to the southwest.

Tables 3.1 and 3.2, below, provides a description of the immediate surroundings of the site on all sides.

Table 3.1: Site

Direction	Characteristic
North	Residential development located off Lydia Road back onto the northern boundary of the site.
West	Cross Road forms the western boundary with agricultural land located beyond.
South	Station Road forms the southern boundary. Agricultural fields and equestrian facility are located beyond.
East	Residential development located off Sydney Road back onto the eastern boundary 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 southwest. The highest on-site elevation is located on the north-eastern boundary at 30.31m AOD. The

lowest elevation is located to the southwest at 18.15m AOD, which shows more than a 12m fall across the field.

The wider topography of the area shows the high point is located approximately 250m to the northeast of the proposed site and falls towards Station Road, which forms the southern site boundary. 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 are as follows:

Table 3.3: Existing site land uses

Land use	Area (Ha)	Percentage (%)
Impermeable	0.00	0
Permeable	4.02	100
Total	4.02	100

There is little evidence to suggest that there are any impermeable areas on-site, therefore it is assumed that 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 1.5km to the northwest of the site.

As a result, the only hydraulic feature located near to the site is to the west of Cross Road, within a field, where multiple manhole covers were observed and flowing water was heard during the site walkover. The public sewer records show that this is a section of 1200mm diameter oversized pipe which appears to be online storage for the public foul sewer network.

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

3.4 Geology

Based on published geological records for the area (British Geological Survey online mapping and RSK Preliminary Risk Assessment Ref 28926-R01(00)), the site exhibits the following geology:

- Superficial Geology: None recorded,
- Split Bedrock:
 - Seaford Chalk Formation (south-western section of the site): Firm white chalk with conspicuous semicontinuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large. Estimated depth of 50-80m,

- Margate Chalk Formation (north-eastern section of the site): Marl-free smooth white chalk with little flint, weakly developed indurated iron-stained sponge beds. There are no formal subdivisions, but informally the member includes a number of laterally persistent flint and marl beds named in Robinson (1986), which can be traced outside Kent in the Southern and "Transitional" provinces where they are correlated with the named beds of Mortimore (1986) within the Newhaven Chalk Formation. Estimated depth of up to 24m.

In summary, the site is underlain by Chalk and this has been observed during the site walkover, as shown within **Figure 3.1**.



Figure 3.1: Shows the chalk at the surface along Cross Road.

The nearest BGS Borehole (Ref TR35SE51) to the site is located approximately 170m northeast of the site off Walmer Way. However, the records for this and similar boreholes are restricted. However, BGS Borehole (Ref TR34NE1/B) is located approximately 350m south of the site and shows that silty Topsoil was present to a depth of 0.38m. This is situated above silty Clay to a depth of 2.28mbgl and clayey Silt to a depth of 3.7mbgl. Finally clayey Silt with gravel, flint and chalk was observed at depths up to 4mbgl, where the borehole was complete. This borehole record matches the online BGS mapping which suggests that land southwest of Ellens Road (which forms the south-western corner of the site) has Head Formation (Clay and Silt) superficial soils present with Chalk below. As this borehole matches the online mapping, it is likely that the on-site geology will match the online mapping and will therefore be Chalk at the surface; however, this should be confirmed on-site. No groundwater was struck within this 4m borehole.

3.5 Hydrogeology

Hydrogeological information was obtained from DEFRA's online 'Magic' mapping service. These maps indicate that the site lies above a Principal 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 located within a Groundwater Source Protection Zone (SPZ). The majority of the site is shown to be located within an Inner Zone 1. This zone is defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50-metre radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease. The remainder of the site, along the southern site boundary is designated an Outer Zone 2. This zone is defined by the 400-day travel time from a point below the water table. Additionally this zone has a minimum radius of 250 or 500 metres, depending on the size of the abstraction. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.

RSK's Preliminary Risk Assessment Ref 28926-R01(00) states that Groundwater beneath the site may be affected by saline intrusion and groundwater levels at the site may be affected by tidal variations due to the proximity to the coast to the east. It is also possible that localised perched water may be present in made ground at the site (if present).

This page has been left blank intentionally

4 DEVELOPMENT PROPOSALS

The proposed development is for a residential end use. The proposed Development Framework Plan shows that the site totals 4.02Ha with a proposed developable area of 2.81Ha. As a result of the proposed residential end use it is assumed that the site will contain a variety of dwellings, driveways, gardens, access highways off Cross 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 site are summarised in **Table 4.1** below.

Table 4.1: Proposed land uses for developable area

Land use	Area (Ha)	Percentage
Impermeable	1.51	55%
Permeable	1.23	45%
Total	2.74	100%

The remaining 1.28Ha 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.

This page has been left blank intentionally

5 LEGISLATION AND POLICY CONTEXT

5.1 National policy

Table 5.1: National legislation and policy context

Legislation	Key provisions
National Planning Policy Framework (2019)	<p>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.</p> <p>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.</p>
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	<p>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.</p> <p>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.</p>
Water Resources Act 1991	<p>Section 24 – The Environment Agency is empowered under this Act to maintain and improve the quality of ‘controlled’ waters</p> <p>Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters</p> <p>Section 88 – Discharge consents are required for discharges to controlled waters</p>
Water Framework Directive (2000)	<p>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.</p> <p>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’.</p>

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 March 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 C**.

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.

Further correspondence with the Environment Agency regarding the levels of treatment required for the proposed infiltration of surface water into an area considered to be a Groundwater Source Protection Zone has been undertaken. Their verbal response was that the infiltration based SuDS should be located as close to the southern boundary as feasible in order to reduce the encroachment of the infiltration basin into Source Protection Zone 1. In addition, as the basin will straddle both Zone 1 and 2, there will be treatment required from highways and areas of car parking. It is suggested that a petrol interceptor is incorporated within the surface water drainage strategy in order to remove all pollutants prior to discharging into the infiltration basin⁶.

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 D** 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, and;
- Kent County Council does not hold records of any unmapped culverted watercourses or private sewers in the area.

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 Environment Agency (August 2013) Groundwater protection: Principles and practice (GP3) Version 1.1. Section G13 – Sustainable drainage systems

6.6 Site walkover

A site walkover was undertaken by RSK in November 2016. There were no noticeable above ground surface water features. In the field to the west adjacent to Cross road were 2 sets of 2 manholes with flowing water heard in the southern most chamber. These were bolted down, and therefore no further information was obtained on-site. Public sewer records shows that this is an on-site, foul storage facility (oversized pipe) serving the existing public foul sewers within Cross Road. Directly adjacent to these chambers, in Cross Road, was another chamber; however, the flow directions and how the sewers connect could not be determined on site. These were later recognised to be the public foul drainage system under the highway.

6.7 Relevant studies

Table 6.1: Relevant studies

Study	Comments												
<p>SFRA: JBA Consulting on behalf of Dover District Council Strategic Flood Risk Assessment September 2007</p>	<p>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.</p> <p>The site itself has been identified as an Option 1 possible development site which continues the current rate of development within the area.</p> <p>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.</p> <p>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.</p> <p style="text-align: center;">Table 5-45 SUDS suitability</p> <table border="1" data-bbox="603 1440 1353 1814"> <thead> <tr> <th>SUDS suitability</th> <th>Reasoning</th> <th>Possible methods</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>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.</p>	SUDS suitability	Reasoning	Possible methods	Low – poor suitability	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.	Try to minimise impermeable surfaces wherever possible.	Medium – reasonable suitability	Reasonable drainage for the site, e.g. a shallow silty layer with underlying sandstone or chalk.	Minimise permeable surfaces wherever possible. Some SUDS techniques may be feasible such as swales or ponds.	High – good suitability	Well drained site, e.g. a deep silty layer with underlying sandstone or chalk where the groundwater level is low.	Infiltration devices such as soakaways or infiltration trenches. Permeable surfaces e.g. gravel. Most SUDS techniques would be suitable.
SUDS suitability	Reasoning	Possible methods											
Low – poor suitability	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.	Try to minimise impermeable surfaces wherever possible.											
Medium – reasonable suitability	Reasonable drainage for the site, e.g. a shallow silty layer with underlying sandstone or chalk.	Minimise permeable surfaces wherever possible. Some SUDS techniques may be feasible such as swales or ponds.											
High – good suitability	Well drained site, e.g. a deep silty layer with underlying sandstone or chalk where the groundwater level is low.	Infiltration devices such as soakaways or infiltration trenches. Permeable surfaces e.g. gravel. Most SUDS techniques would be suitable.											

<p>PFRA: Kent County Council Preliminary Flood Risk Assessment September 2011</p>	<p>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.</p> <p>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.</p>
<p>LFMRS: Kent County Council Local Flood Risk Management Strategy June 2013</p>	<p>The aim of the local strategy;</p> <ul style="list-style-type: none"> • 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. <p>LFMRS Objectives:</p> <ol style="list-style-type: none"> 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. <p>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.</p>

6.8 Drainage

6.8.1 Public sewer

Sewer details have been referenced from sewer record plans obtained from Southern Water (**Appendix E**). The plans indicate that there is a 225mm diameter public surface

water sewer flowing west along Station Road before discharging into the corner of the field, southwest of the proposed site.

To the west of the site is a section of 1200mm diameter oversized pipe which appears to be online storage for the foul network. This is part of a public network which apart from this storage facility, flows within Cross Road. This network consists of 200mm diameter public foul sewers which flow under the highway before turning east along Station Road within a 225mm diameter pipe.

There is no physical evidence at the surface that any highways which are immediately adjacent to the site boundaries are positively drained via highway gulleys and therefore it is likely that surface water will be conveyed within the highway with gravity towards topographic lows.

6.8.2 Private drainage

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

This page has been left blank intentionally

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 an additional 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.

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.

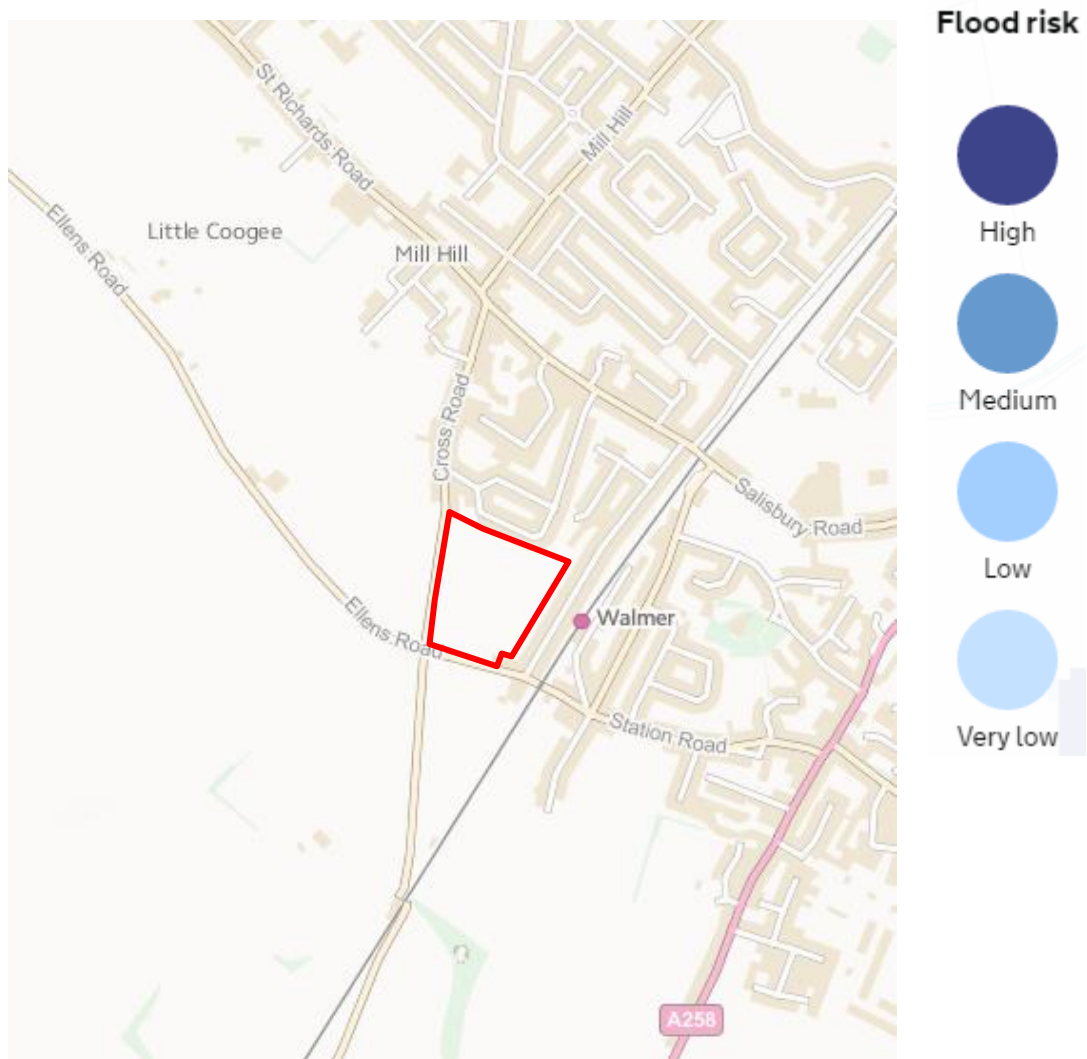


Figure 7.1: Environment Agency fluvial flood risk map

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

7.2.3 Climate change

Fluvial and coastal flooding is likely to increase as a result of climate change. However, as this risk designation is very low, the risk of this source becoming a high risk over the lifetime of the development as a result of climate change is considered 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 13m 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 the majority of the site is considered at very low risk with an area of low risk located to the south western corner of the parcel. This is due to the presence of an overland flow route and a topographical low in this area. To the south of Station Road, in the valley bottom is an area of medium-high risk; however, this is located off site and at an area lower than the site levels.

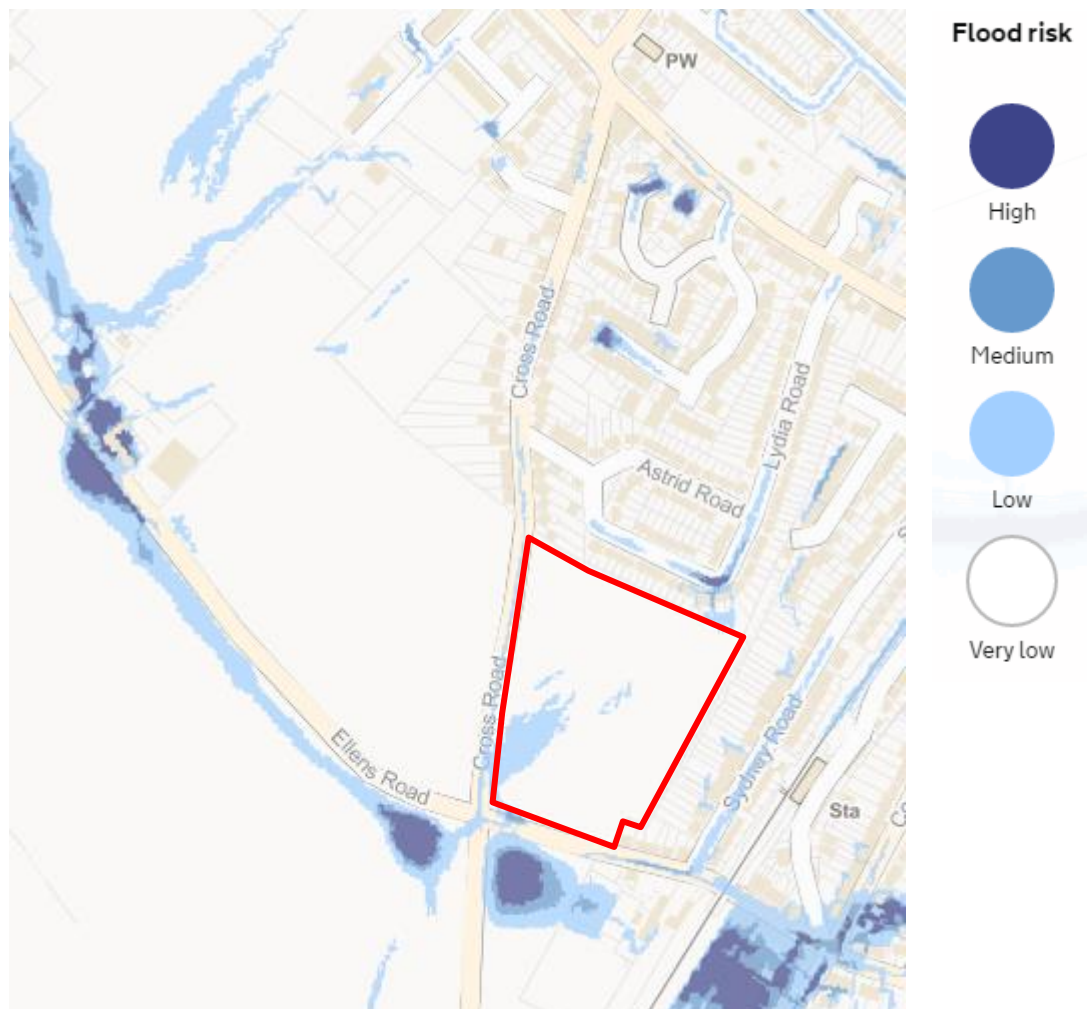


Figure 7.2: Environment Agency surface water flood risk map

As a result, surface water will likely pond locally within this area; however, there is minimal impact to the site as flows will be contained within these lows or within the highways. Should, under extreme events, surface water flooding be greater than that shown, flows will remain within the highways or flow with the topography to the southwest, away from site.

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.

Environment Agency provided groundwater monitoring data from Ripple Nurseries located approximately 1.5km southwest of the proposed site, states that the highest recorded level that the Groundwater has reached was on 26th March 2014 at 13.26mAOD. This is the highest recorded level of Groundwater in the area and is 4.89m below the lowest point on the proposed site. As a result, the site is considered to be at low risk of Groundwater emergence. 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 **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.

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 Adoption⁷. 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.

The sewers which have been described within Cross Road are unlikely to flood as they have a public foul storage facility to the west. In addition, this is a foul system which provided that only foul flows enter the network, the risk is considered low as it would not be as affected by intense rainfall events. The surface water system located within Station Road; however, is at higher risk of surcharging as a result of increased surface water flows within the network. Should this occur, it is likely that flows will be retained within the highway and under extreme events would flow into the existing agricultural field to the south, which is where the existing sewer discharge is located. As this field is a minimum of 0.5m lower than the on-site levels, the risk to the site is considered **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 that the site is not affected by reservoir flooding.

⁷ WRC, 'Sewers for Adoption' 7th Edition, 2012

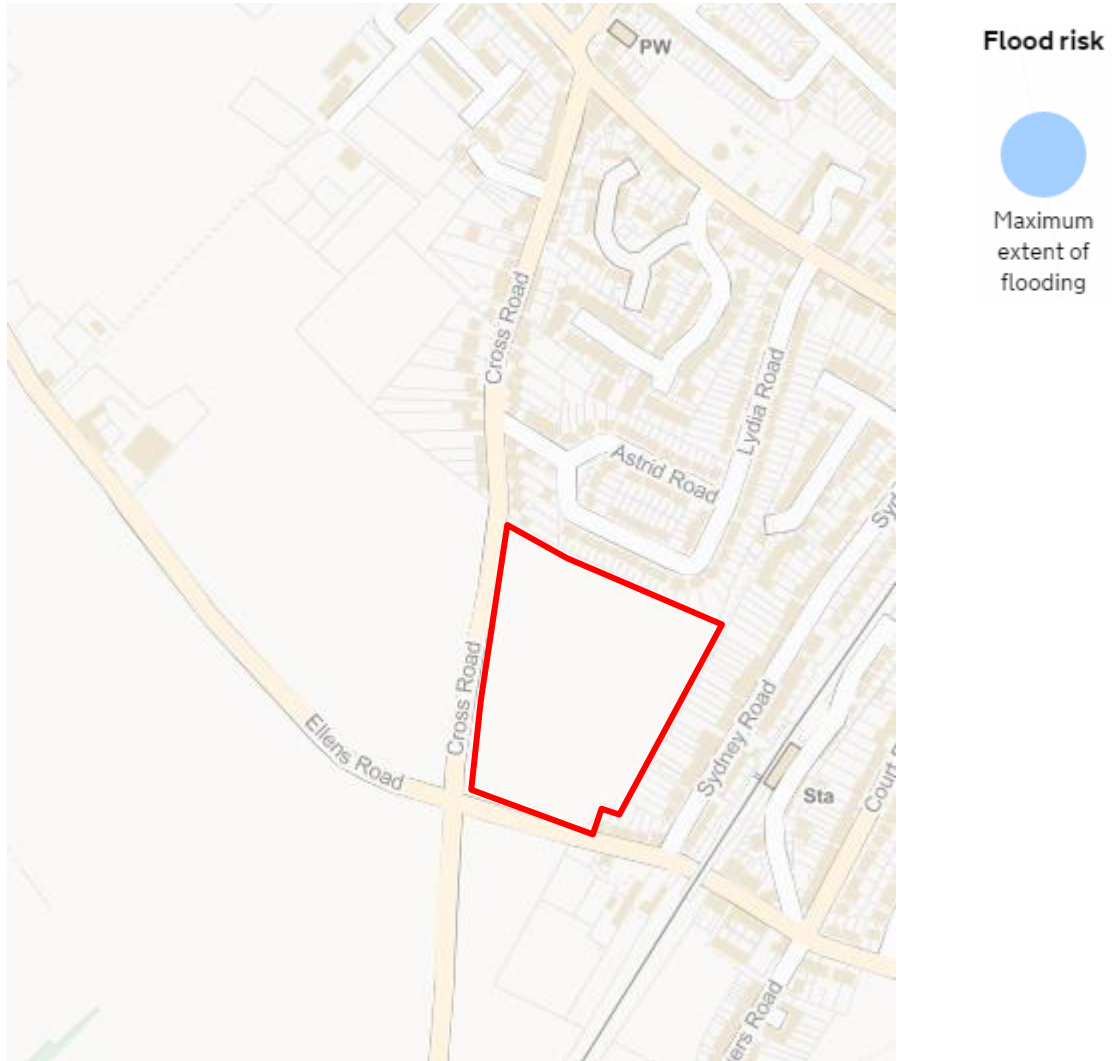


Figure 7.4: Environment Agency reservoir flood risk map

Reservoir flooding is also extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained. According to the Environment Agency Reservoir flood maps the risk to the site from this source can be considered as **low**.

7.7.2 Climate change

Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this site.

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.

As there are no drainage features such as those mentioned on-site, the risk of flooding from this source is considered to be **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 increase the risk off-site; this is investigated further in **Section 9** of this report.

This page has been left blank intentionally

8 PLANNING CONTEXT

8.1 Application of planning policy

Section 14 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 development should 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 (see Section 6.7). 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 H⁸ 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 4.02Ha and is considered as 100% Greenfield as the existing does not contain significant impermeable area.

The loH 124 method⁹ has been used to estimate the Greenfield surface water runoff for the site. Calculations are contained in **Appendix F** and have been summarised within **Table 9.1**.

Table 9.1: loH 124 surface water runoff (Greenfield) estimation

Return period	Peak flow (l/s)
QBar	1.8
1 in 1 year	1.5
1 in 30 year	4.0
1 in 100 year	5.7

⁸ HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'

⁹ 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 infiltration basin and other on site features could be utilised in order to attenuate and discharge surface water.

The site is located on an area of Chalk based geology, which has been observed at the surface within highway verge adjacent to the site, on Cross Road (**Figure 3.1**). According to CIRIA Report C753 the typical infiltration coefficient for chalk is between $3 \times 10^{-8} - 3 \times 10^{-6}$ m/s. It is understood from on-site observation and infiltration testing that the local geology will receive surface water at a rate of 3.73×10^{-3} m/s at the location of the proposed infiltration basin, which is considered a good rates for infiltration based SuDS.

This should be agreed by the Lead Local Flood Authority and the Environment Agency.

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 will be considered vital to provide improvements to water quality through appropriate source treatment as the site is located within Groundwater Source Protection Zones 1 and 2. The Environment Agency has been contacted in order to determine the number of levels of treatment required in order to allow surface water disposal into the underlying bedrock aquifer. Their response has been discussed within Section 6.1.2. Water quality has been assessed in line with CIRIA guidance within Section 9.4.4. 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 Off site 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 3.73×10^{-3} m/s at the location of the proposed infiltration basin, which is considered a good rates for infiltration based SuDS;

- 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*”. Based on the proposed location of the infiltration basins and an assumed maximum depth of infiltration basin including 300mm of freeboard from the surface, of 1.5m depth, the proposed infiltration basin should be feasible. During the site investigations, trial pits were excavated on-site to depths of up to 3.1m below ground level and no Groundwater was present in any of the excavations. Therefore Groundwater depth should not limit the use of shallow infiltration based SuDS, and;
- Source Protection Zones - As discussed above, the site is located within a Groundwater Source Protection Zone 1 and a small area to the south of the site is within Zone 2. This means that any water discharged into the bedrock aquifer at this location will require multiple levels of treatment prior to discharge. The Environment Agency has been contacted with regard to discharging surface water into the Bedrock Aquifer at this site. Their verbal response was that the proposed infiltration based SuDS should be located as close to the southern boundary as feasible in order to reduce the encroachment of the infiltration basin into Source Protection Zone 1. Treatment will be required for the development in order to not increase the risk of pollutants entering the aquifer below which is discussed within Section 9.4.4. In addition to this assessment, correspondence with the Environment Agency suggests that a petrol interceptor is incorporated within the surface water drainage strategy in order to remove all pollutants prior to discharging into the infiltration basin¹⁰.

From the information available regarding the study area’s underlying Chalk bedrock geology and recorded infiltration rates, infiltration is considered a viable option as part of the drainage strategy, provided that treatment can be provided within the site boundary, prior to discharge.

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

Discharging surface water directly to a public surface water sewer is not deemed feasible at this location as the surface water sewer is located to the southwest of the site and discharges onto the adjacent field, south of the proposed site. In order to not increase flooding to others, this discharge option is not considered feasible.

9.4.2 Storage estimates

Based on the current Development Framework Plan the proposed residential developable area for the site is 2.74Ha. An estimate of the required infiltration basin has been produced based on a 55% impermeability figure for the developable, (in line with Gladman requirements). An additional 10% impermeable area has been included to

¹⁰ Environment Agency (August 2013) Groundwater protection: Principles and practice (GP3) Version 1.1. Section G13 – Sustainable drainage systems

account for urban creep in line with the LLFA requirements resulting in a total impermeable area of 1.66Ha. In addition, the rainfall used for a M5-60 event has been assumed as 26.25mm, in line with the Lead Local Flood Authorities requirements. This is considered conservative as the FSR data for the site's location provided from Windes mapping is 21.7mm.

For the purposes of storage sizing, no outfalls have been assumed with the only surface water discharge being to ground. A Preliminary Risk Assessment for the site has been undertaken by RSK Environment Limited (December 2016) which describes the underlying geology on-site. The Chalky Bedrock is at the surface with no superficial strata and therefore infiltration should be used based on a chalk. According to CIRIA Report C753 the typical infiltration coefficient for chalk is between 3×10^{-8} – 3×10^{-6} . Based on measured infiltration rates on-site rates of 3.73×10^{-3} m/s at the location of the proposed infiltration basin. This equates to 13.428m/hr; which gives a good infiltration rate. These rates have been calculated from primary raw data. The locations of the tests undertaken across the site can be seen within **Appendix G**. The results of these tests can be seen within **Appendix H**, the test undertaken within the locations of the proposed infiltration basin is 'test 7'.

To determine the volume of attenuation storage that would be required on the site, the WinDes '4-Stage Design Guide' tool has been used. The WinDes '4-Stage Design Guide' tool allows for an attenuation figure to be calculated based upon basin dimensions, rainfall values and permitted infiltration rates with a 1:4 slope to the base, benching and 1:6 to the surface in line with CIRIA guidance. These volumes can be later revised at detail design.

The infiltration basin required to drain the proposed impermeable area has a surface area **320m²**.

This provides a total volume within the pond **195.2m³**. When this is analysed it shows that the maximum filtration expected could be up to 674.2l/s from the basin which results in the basin filling by up to 1.171m 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 4 minutes.

These calculations above have been provided within **Appendix I**. It is proposed that this infiltration basin could be incorporated within the public open space located to the southwest of the site.

The size, depth and volume of this pond should be refined 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, permeable paving and an infiltration basin which should be located accordingly depending on, locality of proposed buildings and topography. 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 and into swales which can be

located within areas of public open space. SuDS should be designed to convey surface water conveniently from impermeable areas, through the site to the infiltration based SuDS basin. 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 attenuation location are outlined in the Indicative Drainage 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 Manual¹¹.

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

- It is considered that infiltration rates observed will be sufficient for this site. Therefore an infiltration basin will be incorporated into the drainage design on each land parcel, as shown within the Indicative Drainage Strategy within **Appendix J**;
- Catchpit manholes and trapped gulleys could be incorporated into all traditional drainage runs in order to remove suspended sediment where possible;
- Permeable paving could be incorporated within all minor roads, shared surfaces, 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 basins. 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 and within public open space 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. Swales have been incorporated into the surface water drainage strategy as a method of conveyance, treatment as well as in order to reduce the flow rate of the surface water;
- As the site is within Groundwater Source Protection Zone 1 and 2 then water quality is considered in **Section 9.4.4**. In summary CIRIA guidance within the SUDS Manual – C753 advises that residential developments have a low pollution hazard level (Table 26.2 within 'The SUDS Manual – C753, 2015');
- The SuDS feature of an infiltration basin has been incorporated into the Outline Drainage Strategy which should accommodate the required volumes without overtopping. The sized infiltration 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 swales located within areas of public open space. This will convey flows into an infiltration basin located on the southern boundary, within each land parcel. The infiltration basin will be capable of attenuating surface water flows up to the 1 in 100 year plus 40% climate change event, as well as infiltrating flows into the surrounding Chalk Bedrock. As there are falls of up to 16 metres across the site, this should be

¹¹ CIRIA, 'The SUDS Manual – C753', 2015

achievable without significant groundworks; however, this should be confirmed at detailed design stage.

9.4.4 Water Quality

As the site is largely located within a area of Groundwater Source Protection Zone 1 with a small area of Zone 2 along the southern boundary of the site, it is required that surface water resulting from the development is treated prior to discharge into the infiltration basin. The proposed SuDS including permeable paving, swales and infiltration basins will provide three levels of treatment, trapped gulleys and catchpit manholes will provide a fourth level prior to entry into a petrol interceptor which should be designed in order to remove any further pollutants from the system before entering the final level of treatment a infiltration basin. As a result, the surface water resulting from the proposed development should be sufficiently treated prior to discharging into the ground via the proposed infiltration based SuDS, in line with The SuDS Manual and the Environment Agency’s Groundwater Protection: Principles and Practice (GP3).

The SuDS Manual contains guidance on how to assess water quality, stating *“Determining the hazard posed by the land use activities at a site and the extent to which underlying soil layers and/or proposed treatment components reduce the associated risk can be done using a variety of methods that vary in complexity and data requirements.”*

In accordance with Table 4.3 of the SuDS Manual, the proposed development for the site can be summarised with the following pollution hazard levels and management requirements for discharge to the receiving Groundwater:

- Residential roofs – **Very Low** Pollution Hazard – Simple Index Approach, and;
- Individual property driveways, roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (schools, offices) – **Low** Pollution Hazard – Simple Index Approach.

It is therefore considered appropriate to use the Simple Index Approach for the purpose of this assessment.

Table 26.1 of the SuDS Manual indicates that for the Simple Index Approach:

- Simple pollution hazard indices should be based on land use (e.g., Table 26.2), and;
- Risk reduction for Surface Water should be done using Simple SuDS hazard mitigation indices (e.g., Table 26.3).

Extracts of Tables 26.2 and 26.4 are replicated as Table 9.3 and 9.4, highlighting the relevant features applicable to this site.

Table 9.3: Extract of SuDS Manual Table 26.2: Pollution hazard indices for different land use classifications

Land use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, roofs, residential car parks, low	Low	0.5	0.4	0.4

Land use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
traffic roads, non-residential car parking with infrequent change (schools, offices)				

Table 9.4: Extract of Table 26.3 and 26.4: Indicative SuDS mitigation indices for discharges to Groundwater

Land use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
A soil with good attenuation potential of at least 300mm	0.4	0.3	0.3
Permeable pavement	0.7	0.6	0.7
Swale	0.5	0.6	0.6
Proprietary Treatment Systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for the inflow concentrations relevant to the contributing area.		

The SuDS Manual States:

Total SuDS mitigation index \geq pollution hazard index

(for each contaminant type) (for each contaminant type)

In conclusion, any one SuDS feature (Table 9.4) is shown to be in excess of the requirement for residential roofs. By combining more than one SuDS element into the design of the site potential pollutants from, individual property driveways, roofs, residential car parks, low traffic roads and non-residential car parking with infrequent change will also be managed. It should be noted that all surface water runoff will pass through a treatment train of at least two features and a petrol interceptor in line with the Environment Agency requirements. Permeable paving, swales, an infiltration basin, trapped gulleys and catchpit manholes as well as a petrol interceptor are proposed and therefore the water quality treatment requirements are considered to be met.

This page has been left blank intentionally

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 transport the surface water resulting from the proposed development into the infiltration basins located at the topographic low to the southwest 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.

10.5 Surface water treatment

The site is located within a Groundwater Source Protection Zone 1 and 2 and therefore sufficient treatment must be provided in order to allow the safe and unpolluted disposal of surface water into the ground via infiltration based drainage design. This has been assessed within Section 9.4.4 and as a result, multiple levels of treatment has been provided within the proposed drainage strategy, including an infiltration basin, swales, trapped gulleys and a catch pit manhole as well as a petrol and oil interceptor in order to minimise the pollutants discharging to ground.

This page has been left blank intentionally

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.

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 Hierarchy, infiltration based drainage should first be assessed. As a result of the Chalk based Bedrock geology at the site and the recorded infiltration rates it is considered that infiltration based SuDS is feasible. This should be confirmed by the Lead Local Flood Authority and the Environment Agency. In addition, multiple levels of treatment should be provided prior to infiltrating into the ground as a result of the site being located within a Groundwater Source Protection Zone 1 and 2. Provided that the proposed treatment elements are provided for the site, the risk of unmanaged pollutants entering the aquifer below is considered low.

The proposed development will increase the impermeable surfacing on-site which will result in an increase of surface water runoff. The site is considered to be Greenfield in terms of drainage. Therefore by conveying surface water resulting from the proposed development towards an infiltration basin, located in the southwest 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.

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;
- The site is far enough inland / elevated not to be at risk of any tidal flooding event;
- Flood risk from surface water is considered very low across the whole site; with additional modelling suggesting that there are low risk flow paths crossing the site, towards the southwest where shallow ponding occurs. However, surface water flow routing has been considered within the proposed drainage strategy and the areas shown to pond are not located within proposed developable

areas. As a result the risk of surface water flooding to the site is considered to be low;

- Flood risk from Groundwater is considered to be low as the highest historic Groundwater record within 1.5km of the site, was in 2014 and was approximately 4.89m below the lowest elevation of the site. As a result, the risk of emergence is low. During site investigations, no Groundwater was observed within the trial pits. It is recommended that prior to, or, during construction that Groundwater levels are monitored to observe the actual risk;
- The risk of flooding from sewers is low as there are no public surface water sewers within the site boundary or elevated above the site. As a result, only blockage or failure of the foul system within Cross Road or extreme flooding of the surface water sewer within Station Road to the south which may cause any impact on the proposed development within the study area;
- The site is not at risk of reservoir flooding. The Environment Agency mapping does not show a risk and there are no known reservoirs within the vicinity of the proposed site.
- There are no Canal & River Trust assets within the study area and therefore the site is not at risk from this source;
- There are no known artificial sources other than the public foul water storage facility within the western land parcel; however, this is publically maintained and therefore is unlikely a risk of failure and therefore the risk from this source is considered low;
- The site should be developed in line with the SuDS hierarchy and positive infiltration testing has been undertaken for the site;
- The proposed infiltration basin has been positioned within the lowest area on-site which is also located within Groundwater Source Protection Zone 2;
- The basin has been calculated to provide sufficient attenuation for 1 in 100 year event inclusive of 40% climate change factor from the impermeable area inclusive of 10% urban creep, and;
- The site wide design must incorporate multiple levels of treatment, suggested to be permeable paving, trapped gulleys, catchpit manholes, swales, petrol interceptor and infiltration basin in order to reduce the risk of pollution to the groundwater.

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.

In addition, the development should not be precluded on drainage grounds; provided that the strategy is confirmed in writing by the Local Planning Authority which will require the necessary treatment based SuDS in order to protect the groundwater below.

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". 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.

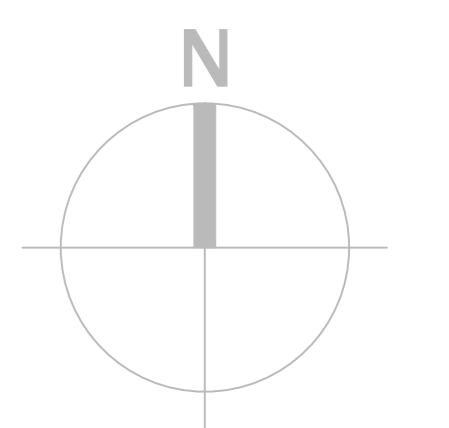
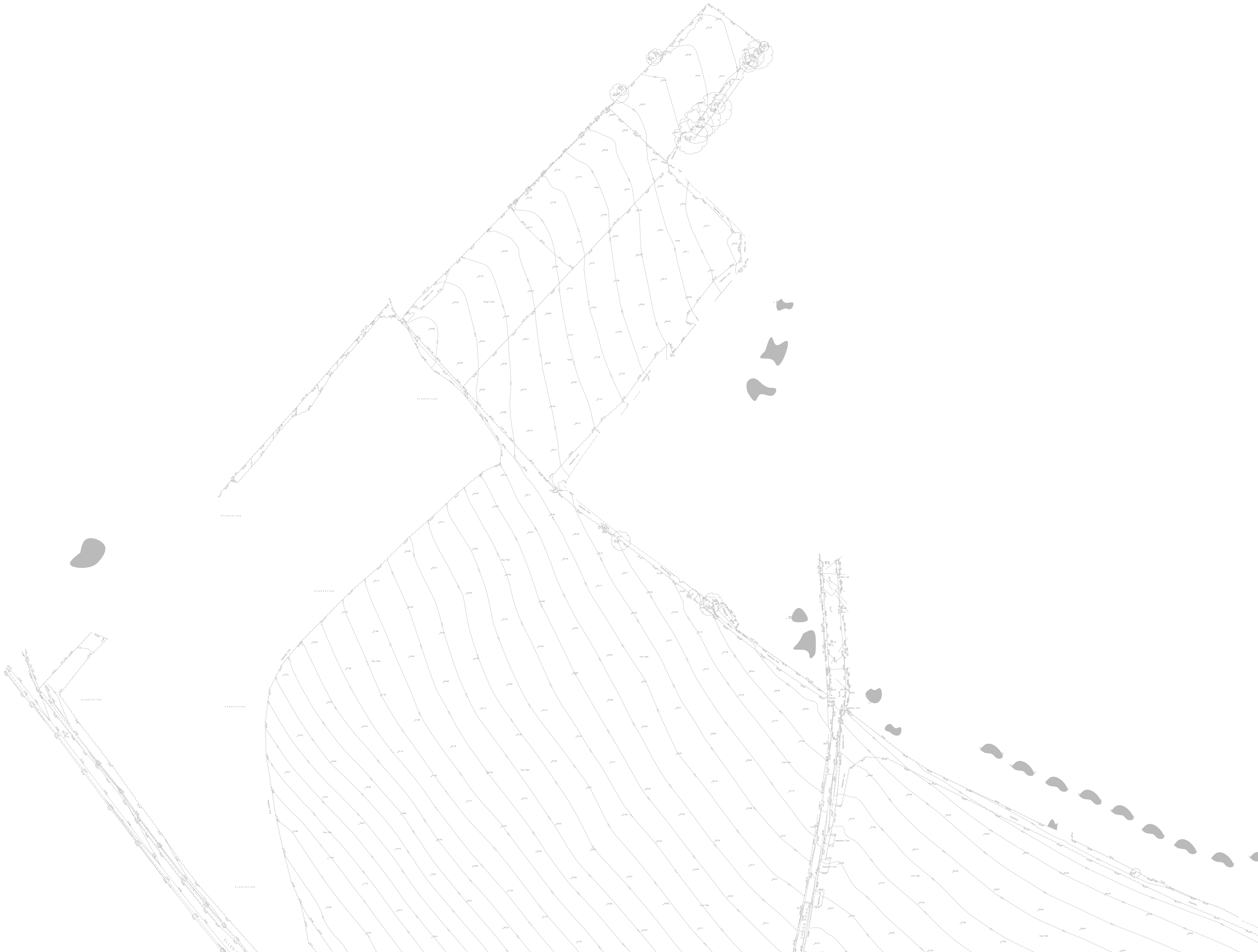
8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the 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

This page has been left blank intentionally



NOTES

THIS SURVEY IS ORIGINATED BY ORDINANCE SURVEY AND NOT BY THE SURVEY ACT TO A PLAIN GROUND. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE UNCORRECTED.

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

LEGEND

- SPOT LEVEL
- SURVEY STATION
- BURNING
- BUILDING/SHED
- TREE (NEGATIVE ONLY)
- MEASURED DEPTH OF UNDERGROUNTH
- CONTOUR
- RAIL
- OVERHEAD CABLE
- TYNNE

ABBREVIATIONS

- AS ARCH LEVEL
- AV AIR VANE
- B BUILDING
- BW BUILDING WIDTH
- BH BENCH MARK
- BS BENCH STATION
- CS CLOSURE
- CS2 CLOSURE POINT
- CA CHAIN AND FENCE
- CCY CABLE TELEVISION
- CH CHAIN
- CH2 CHAIN POINT
- CPY CABLE TELEVISION POINT
- CM CABLE MARK
- DN DOWNHOLE
- DM DOWNHOLE MARK
- EM ELECTRIC METER POINT
- EP ELECTRIC POINT
- EL ELECTRIC LIGHT
- ES ELECTRIC SWITCH
- ET ELECTRIC TOWER
- EA ELECTRIC ARCADE
- EPY ELECTRIC POINT
- EP2 ELECTRIC POINT
- EP3 ELECTRIC POINT
- EP4 ELECTRIC POINT
- EP5 ELECTRIC POINT
- EP6 ELECTRIC POINT
- EP7 ELECTRIC POINT
- EP8 ELECTRIC POINT
- EP9 ELECTRIC POINT
- EP10 ELECTRIC POINT
- EP11 ELECTRIC POINT
- EP12 ELECTRIC POINT
- EP13 ELECTRIC POINT
- EP14 ELECTRIC POINT
- EP15 ELECTRIC POINT
- EP16 ELECTRIC POINT
- EP17 ELECTRIC POINT
- EP18 ELECTRIC POINT
- EP19 ELECTRIC POINT
- EP20 ELECTRIC POINT
- EP21 ELECTRIC POINT
- EP22 ELECTRIC POINT
- EP23 ELECTRIC POINT
- EP24 ELECTRIC POINT
- EP25 ELECTRIC POINT
- EP26 ELECTRIC POINT
- EP27 ELECTRIC POINT
- EP28 ELECTRIC POINT
- EP29 ELECTRIC POINT
- EP30 ELECTRIC POINT

STATION CO-ORDINATES

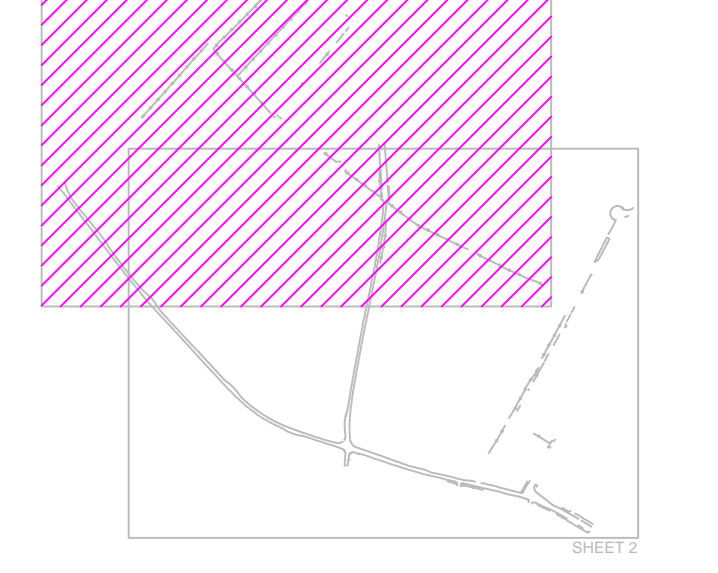
STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN01	100000.00	100000.00	00.00	Bench Mark
STN02	100000.00	100000.00	00.00	Bench Mark
STN03	100000.00	100000.00	00.00	Bench Mark
STN04	100000.00	100000.00	00.00	Bench Mark

TREE SCHEDULE

No.	DATE	SPREAD	HEIGHT
1001	10/01	2	15
1002	10/01	3	15
1003	10/01	4	15
1004	10/01	5	15
1005	10/01	6	15
1006	10/01	7	15
1007	10/01	8	15
1008	10/01	9	15
1009	10/01	10	15
1010	10/01	11	15
1011	10/01	12	15
1012	10/01	13	15
1013	10/01	14	15
1014	10/01	15	15
1015	10/01	16	15
1016	10/01	17	15
1017	10/01	18	15
1018	10/01	19	15
1019	10/01	20	15
1020	10/01	21	15
1021	10/01	22	15
1022	10/01	23	15
1023	10/01	24	15
1024	10/01	25	15
1025	10/01	26	15
1026	10/01	27	15
1027	10/01	28	15
1028	10/01	29	15
1029	10/01	30	15

THIS QUANTITY MEASURED APPROXIMATELY 1.5M ABOVE GROUND LEVEL. THESE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE. TREE SIZE MAY VARY BY GRADE TO THE CANOPY. TREE HEIGHT ESTABLISHED FROM GROUND LEVEL.

PLOT LOCATIONS



Rev	Date	Revision notes	By

DO NOT SCALE

INFORMATION

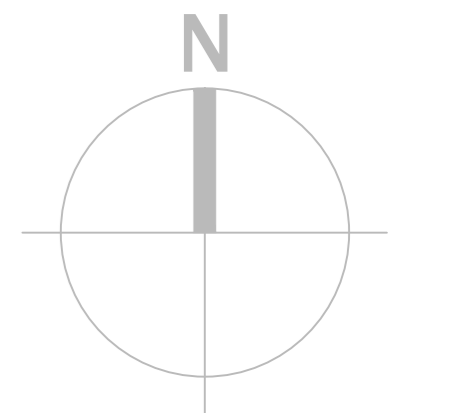
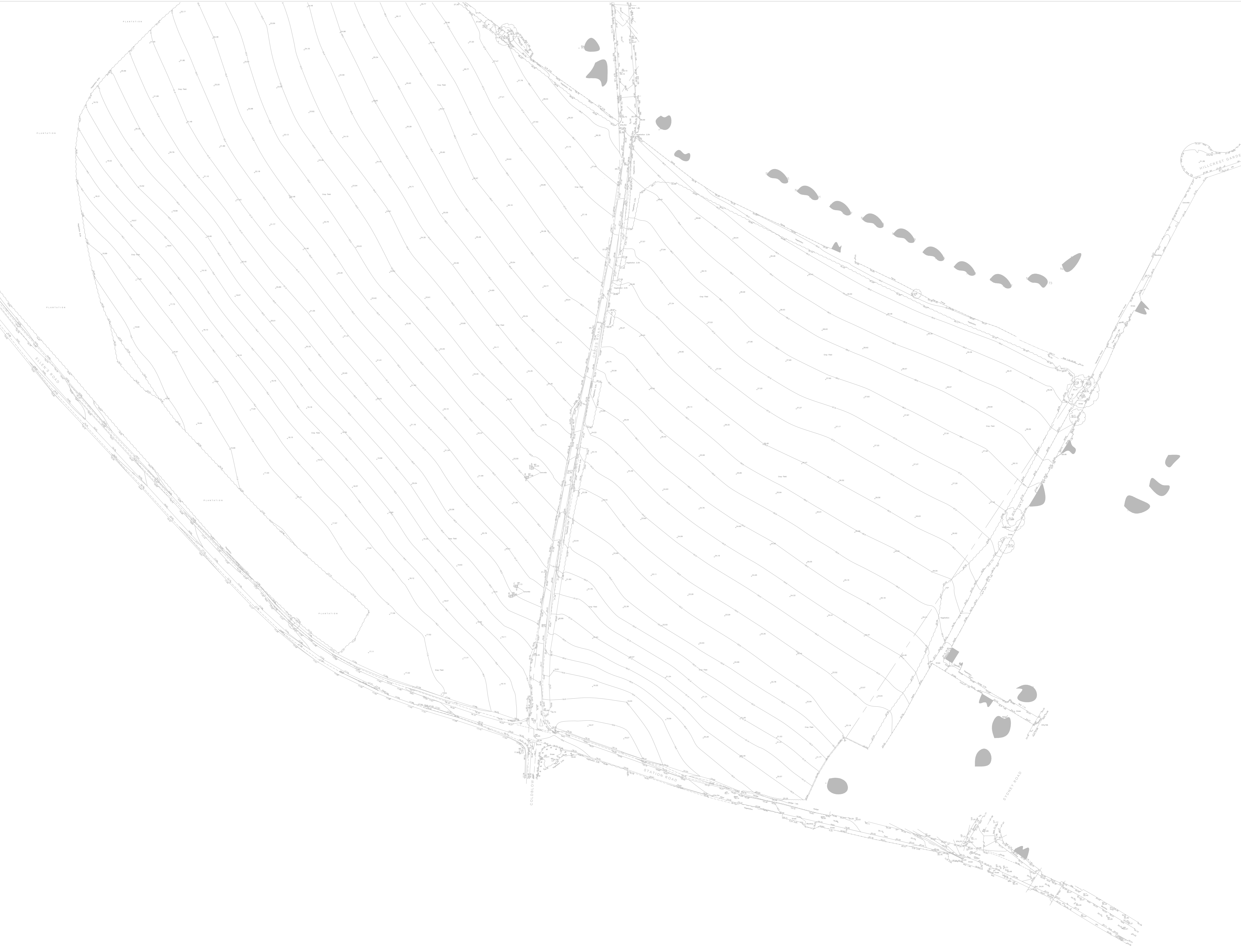
Project: Cross Road, Deal

Title: TOPOGRAPHICAL SURVEY AS OF 12.01.17 SHEET 1 OF 2

M:\AutoCAD Files\Standard\image\Drawing_block_RGB_new.jpg

Drawn By: JH/JW Publish Date: 23.01.17 Scale(s): 1:500 Sheet Size: A0

Project no: 2016-127 Drawing no: Topo_04_2D Revision: 0



NOTES

THIS SURVEY IS DERIVED FROM ORDNANCE SURVEY DATA. THE SURVEY IS TO A PLANE AND HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE UNCORRECTED.

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

LEGEND

- SPOT LEVEL
- SURVEY STATION
- BURNING
- RAILINGS
- TREE (NEGATIVE ONLY)
- MEASURE OF UNDERGIRTH
- CONTOUR
- DALE
- OVERHEAD CABLE
- FENCE

ABBREVIATIONS

- AS APPROX LEVEL
- AV VALVE
- BL BUILDING
- BS BENCH MARK
- CA CHAIN LAM FENCE
- CC CABLE TELEVISION COUPLER
- CD CLOTHES DRYER
- CF CHIMNEY
- CH CHIMNEY
- CM CABLE TELEVISION POINT
- CO COUPLER
- CP CABLE TELEVISION POINT
- CR CURB
- CS CABLE TELEVISION POINT
- CT CABLE TELEVISION POINT
- CU CURB
- CV CURB
- DA DRAINAGE
- DE DETENTION
- DI DETENTION
- DN DOWN
- EA ELECTRIC ARRESTOR
- ES ELECTRIC SUPPLY POINT
- ET ELECTRIC TELEPHONE
- EX EXISTING
- GA GATE
- GL GULLY
- GP GULLY POINT
- GR GRASS
- HA HARDWARE
- HS HOUSE
- IS IRON
- KS KITCHEN SINK
- LS LETTER BOX
- MA MAIN
- MB MANHOLE
- MC MANHOLE
- MD MANHOLE
- ME MANHOLE
- MF MANHOLE
- MG MANHOLE
- MH MANHOLE
- MI MANHOLE
- MM MANHOLE
- MO MANHOLE
- MP MANHOLE
- MS MANHOLE
- MT MANHOLE
- MU MANHOLE
- MX MANHOLE
- MY MANHOLE
- MZ MANHOLE
- NA NORTH
- NS NORTH
- NT NORTH
- NU NORTH
- NV NORTH
- NW NORTH
- NY NORTH
- NZ NORTH
- PA PAINT
- PC PAVEMENT
- PD PAVEMENT
- PE PAVEMENT
- PF PAVEMENT
- PG PAVEMENT
- PH PAVEMENT
- PI PAVEMENT
- PJ PAVEMENT
- PK PAVEMENT
- PL PAVEMENT
- PM PAVEMENT
- PN PAVEMENT
- PO PAVEMENT
- PP PAVEMENT
- PQ PAVEMENT
- PR PAVEMENT
- PS PAVEMENT
- PT PAVEMENT
- PV PAVEMENT
- PW PAVEMENT
- PX PAVEMENT
- PY PAVEMENT
- PZ PAVEMENT
- RA RAILING
- RB RAILING
- RC RAILING
- RD RAILING
- RE RAILING
- RF RAILING
- RG RAILING
- RH RAILING
- RI RAILING
- RJ RAILING
- RK RAILING
- RL RAILING
- RM RAILING
- RN RAILING
- RO RAILING
- RP RAILING
- RS RAILING
- RT RAILING
- RV RAILING
- RW RAILING
- RX RAILING
- RY RAILING
- RZ RAILING
- SA SAND
- SB SAND
- SC SAND
- SD SAND
- SE SAND
- SF SAND
- SG SAND
- SH SAND
- SI SAND
- SJ SAND
- SK SAND
- SL SAND
- SM SAND
- SN SAND
- SO SAND
- SP SAND
- SQ SAND
- SR SAND
- SS SAND
- ST SAND
- SV SAND
- SW SAND
- SX SAND
- SY SAND
- SZ SAND
- TA TACTILE PAVING
- TB TACTILE PAVING
- TC TACTILE PAVING
- TD TACTILE PAVING
- TE TACTILE PAVING
- TF TACTILE PAVING
- TG TACTILE PAVING
- TH TACTILE PAVING
- TI TACTILE PAVING
- TJ TACTILE PAVING
- TK TACTILE PAVING
- TL TACTILE PAVING
- TM TACTILE PAVING
- TN TACTILE PAVING
- TO TACTILE PAVING
- TP TACTILE PAVING
- TR TACTILE PAVING
- TS TACTILE PAVING
- TV TACTILE PAVING
- TW TACTILE PAVING
- TX TACTILE PAVING
- TY TACTILE PAVING
- TZ TACTILE PAVING

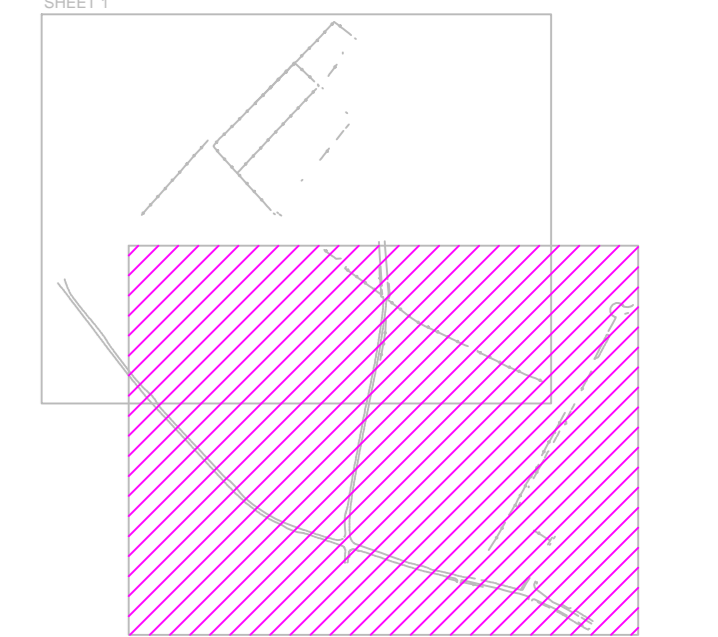
STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
ST100	85440.17	10380.83	20.97	Burney Nest
ST101	85440.17	10380.83	20.97	Burney Nest
ST102	85440.17	10380.83	20.97	Burney Nest
ST103	85440.17	10380.83	20.97	Burney Nest

TREE SCHEDULE

No.	DATE	SPERMATOPHYTES	HEIGHT
1001	12.01	2	15
1002	12.01	2	15
1003	12.01	2	15
1004	12.01	2	15
1005	12.01	2	15
1006	12.01	2	15
1007	12.01	2	15
1008	12.01	2	15
1009	12.01	2	15
1010	12.01	2	15
1011	12.01	2	15
1012	12.01	2	15
1013	12.01	2	15
1014	12.01	2	15
1015	12.01	2	15
1016	12.01	2	15
1017	12.01	2	15
1018	12.01	2	15
1019	12.01	2	15
1020	12.01	2	15
1021	12.01	2	15
1022	12.01	2	15
1023	12.01	2	15
1024	12.01	2	15
1025	12.01	2	15
1026	12.01	2	15
1027	12.01	2	15
1028	12.01	2	15
1029	12.01	2	15
1030	12.01	2	15

PLOT LOCATIONS



Rev	Date	Revision notes	By
		DO NOT SCALE	

INFORMATION

Project: Cross Road, Deal

Title: TOPOGRAPHICAL SURVEY AS OF 12.01.17 SHEET 2 OF 2

M:\AutoCAD Files\Standard\Images\Drawing_block_RGB_new.jpg

Drawn By	Publish Date	Scale(s)	Sheet Size
JH/JW	23.01.17	1:500	A0
Project no.	Drawing no.	Revision	
2016-127	Topo_02_2D	0	



APPENDIX C

ENVIRONMENT AGENCY CORRESPONDENCE

This page has been left blank intentionally

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

DO YOU KNOW WHAT TO DO?



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 private 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>

RSK Land & Development Engineering Ltd is registered in England at Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR, UK

Registered number: 4723837

This message contains confidential information and is intended only for the individual named. If you are not the named addressee, you should not disseminate, distribute or copy this e-mail. Please notify the sender immediately by e-mail if you have received this e-mail by mistake and delete this e-mail from your system. E-mail transmission cannot be guaranteed to be secure or error-free as information could be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. The sender therefore does not accept liability for any errors or omissions in the contents of this message, which arise as a result of e-mail transmission. If verification is required, please request a hard-copy version.

Before printing think about your responsibility and commitment to the ENVIRONMENT!

For the latest news follow us on:  

This e-mail, including any attachments, is intended for the above addressee(s) only and may contain marked material up to RESTRICTED and should be handled accordingly.

If you are not the intended recipient (or authorised to receive it on behalf of the addressee), please notify the sender immediately by return e-mail and then delete the message without copying it or disclosing it to anyone.

Precautions have been taken to ensure that this is a virus-free message but recipients are responsible for carrying out their own checks. This Council accepts no responsibility for loss or damage to any hardware, software or data resulting from this e-mail.

By communication with this Council by e-mail, you consent to such correspondence being monitored or read by any other officer of the Council.

All GCSx (Government Connects Secure Extranet) traffic may be subject to recording and/or monitoring in accordance with relevant legislation.

This message has been scanned and no issues discovered.

Click [here](#) to report this email as spam

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else.

We have checked this email and its attachments for viruses. But you should still check any attachment before opening it.

We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

Click [here](#) to report this email as spam

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.

Environment Agency - Kent and South London area

4) Fluvial food risk mitigation

Read the guidance on [Gov.uk](https://www.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.

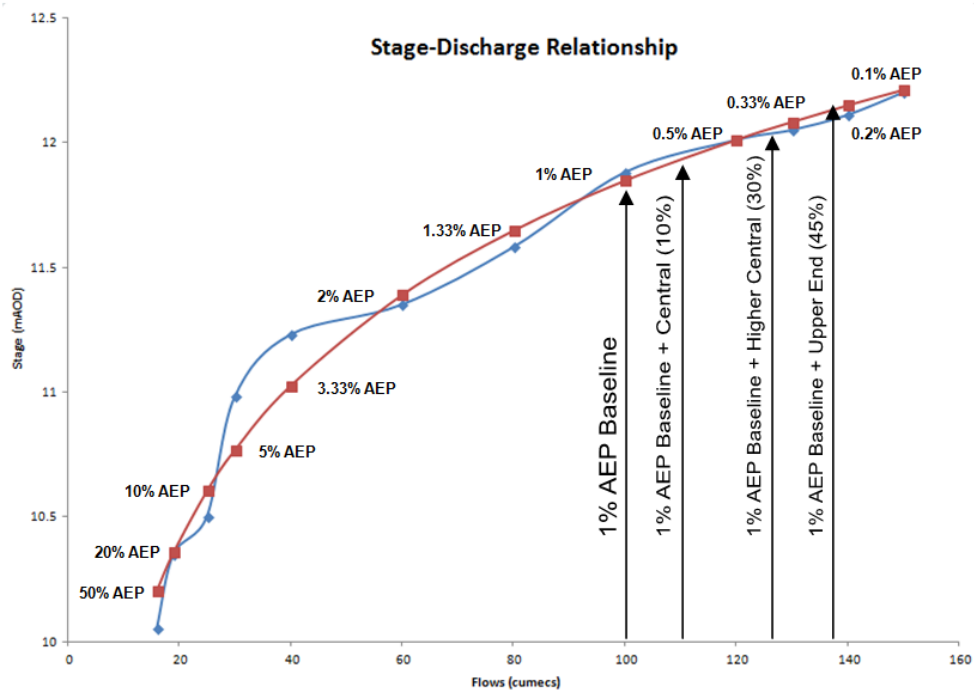
- For development classed as '**Essential Infrastructure**' our benchmark for flood risk mitigation is for it to be designed to the '**upper end**' climate change allowance for the epoch that most closely represents the lifetime of the development, including decommissioning.
- For **highly vulnerable**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

KENT COUNTY COUNCIL CORRESPONDENCE

This page has been left blank intentionally

Robert Brenton

From: SUDS@kent.gov.uk
Sent: 30 November 2016 11:38
To: Robert Brenton
Cc: Colin Whittingham
Subject: RE: Cross 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?eastings=636174&northing=150613&address=100060889577&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?eastings=636174&northing=150613&address=100060889577&map=SurfaceWater>
- Any information on culverted watercourses or private 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.

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



Please consider the environment before printing this email

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: 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; and,
- Any information on culverted watercourses or private 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.



APPENDIX E

SOUTHERN WATER SEWER RECORDS

This page has been left blank intentionally

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

Drainage and water enquiry

Commercial

Order reference: LS/U1240385
Your reference: SF24378477000 LKS/Deal 2 2016-127

Search address:

Land off Cross Road
Deal
Kent
CT14 9LA

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

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?	Yes
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?	Yes
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
-----	---	----

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.

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.

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.

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 indicates that there are 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.

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 276mg/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.

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.

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 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 of 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.

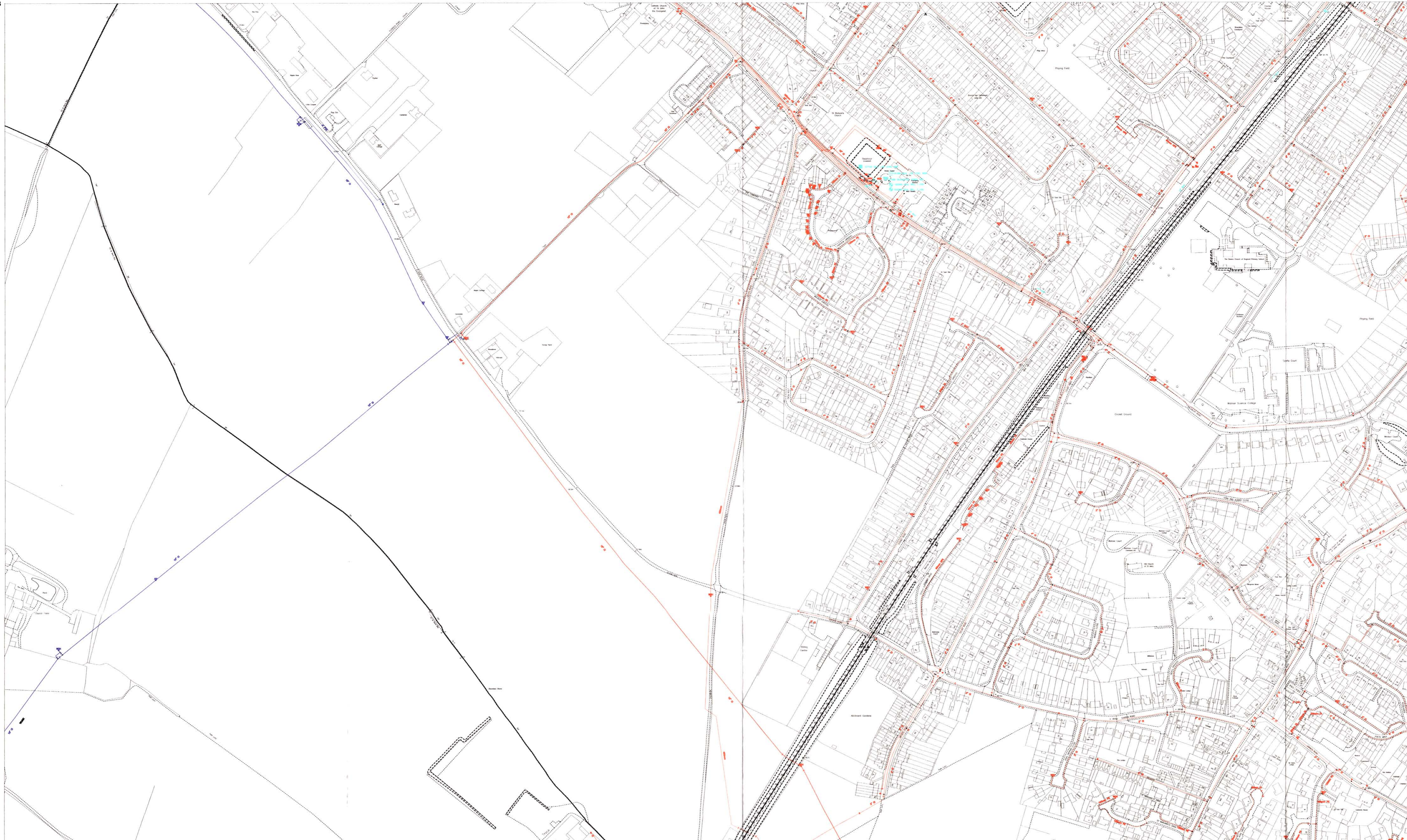
6.0 General

- 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.

SOUTHERN WATER SERVICES LIMITED

151123



149957
635134

LEGEND - MAINS	
	Clockwise closing valve
	Fire Hydrant
	Washout
	Washout hydrant
	Meter
	Capped end
	Emptying plug
	Stopcock
	Leak Noise Correlator Survey Point
	Air valve
	Butterfly valve
	Pressure reducing valve
	Reflux valve

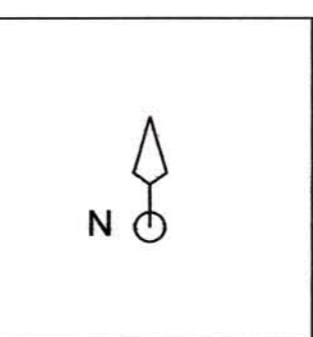
MATERIALS	
	Alkathene
	Cast iron
	Spun (grey) iron
	Concrete
	Ductile iron
	Bonded Asbestos Cement
	GFRP
	Glass reinforced plastic
	Glass reinforced epoxy
	(Unplasticised) Polyvinyl chloride
	PVC
	Polyethylene
	Steel
	Concrete segments bolted
	Concrete segments unbolted
	Galvanised iron
	GI
	Ductile sleeve
	DS
	Concrete pre-stressed
	MSF
	High performance polyethylene

O.S. Ref.	Drawn by: chakrap
TR3650NW	Scale: 1:2500
	Date: 15/11/2016
Title: U1240385_Land off	

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 position of pipes must be determined on site.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

Based upon Ordnance Survey Digital Data with the permission of the Controller of H.M.S.O. Crown Copyright Reserved Licence No. WU298530



630708



Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0101X	29.95	27.39	225	VC	CIRC	4102X	21.55	16.975	300	VC	CIRC	7007X	15.571	225	VC	CIRC	
0102X	29.91	28.34	300	VC	CIRC	4103X	21.51	16.91	300	VC	CIRC	7008X	15.154	225	VC	CIRC	
0103X	29.91	28.34	300	VC	CIRC	4104X	21.475	16.8375	300	VC	CIRC	7009X	14.737	225	VC	CIRC	
1001X	31.335	225	VC	CIRC	4105X	21.425	16.75	300	VC	CIRC	7010X	15.072	14.422	225	VC	CIRC	
1002X	31.225	29.005	225	VC	CIRC	4106X	21.365	16.7175	150	VC	CIRC	7011X	15.038	14.308	225	VC	CIRC
1003X	31.195	225	VC	CIRC	4107X	21.305	16.685	150	VC	CIRC	7012X	15.041	225	VC	CIRC		
1004X	31.165	225	VC	CIRC	4108X	21.245	16.6525	150	VC	CIRC	7013X	14.765	13.455	225	VC	CIRC	
1005X	31.135	225	VC	CIRC	4109X	21.185	16.62	150	VC	CIRC	7014X	14.765	13.455	225	VC	CIRC	
1006X	31.105	225	VC	CIRC	4110X	21.125	16.5875	150	VC	CIRC	7015X	14.765	13.455	225	VC	CIRC	
1007X	31.075	225	VC	CIRC	4111X	21.065	16.555	150	VC	CIRC	7016X	14.765	13.455	225	VC	CIRC	
1008X	31.045	225	VC	CIRC	4112X	21.005	16.5225	150	VC	CIRC	7017X	14.765	13.455	225	VC	CIRC	
1009X	31.015	225	VC	CIRC	4113X	20.945	16.49	150	VC	CIRC	7018X	14.765	13.455	225	VC	CIRC	
1010X	30.985	225	VC	CIRC	4114X	20.885	16.4575	150	VC	CIRC	7019X	14.765	13.455	225	VC	CIRC	
1011X	30.955	225	VC	CIRC	4115X	20.825	16.425	150	VC	CIRC	7020X	14.765	13.455	225	VC	CIRC	
1012X	30.925	225	VC	CIRC	4116X	20.765	16.3925	150	VC	CIRC	7021X	14.765	13.455	225	VC	CIRC	
1013X	30.895	225	VC	CIRC	4117X	20.705	16.36	150	VC	CIRC	7022X	14.765	13.455	225	VC	CIRC	
1014X	30.865	225	VC	CIRC	4118X	20.645	16.3275	150	VC	CIRC	7023X	14.765	13.455	225	VC	CIRC	
1015X	30.835	225	VC	CIRC	4119X	20.585	16.295	150	VC	CIRC	7024X	14.765	13.455	225	VC	CIRC	
1016X	30.805	225	VC	CIRC	4120X	20.525	16.2625	150	VC	CIRC	7025X	14.765	13.455	225	VC	CIRC	
1017X	30.775	225	VC	CIRC	4121X	20.465	16.23	150	VC	CIRC	7026X	14.765	13.455	225	VC	CIRC	
1018X	30.745	225	VC	CIRC	4122X	20.405	16.1975	150	VC	CIRC	7027X	14.765	13.455	225	VC	CIRC	
1019X	30.715	225	VC	CIRC	4123X	20.345	16.165	150	VC	CIRC	7028X	14.765	13.455	225	VC	CIRC	
1020X	30.685	225	VC	CIRC	4124X	20.285	16.1325	150	VC	CIRC	7029X	14.765	13.455	225	VC	CIRC	
1021X	30.655	225	VC	CIRC	4125X	20.225	16.1	150	VC	CIRC	7030X	14.765	13.455	225	VC	CIRC	
1022X	30.625	225	VC	CIRC	4126X	20.165	16.0675	150	VC	CIRC	7031X	14.765	13.455	225	VC	CIRC	
1023X	30.595	225	VC	CIRC	4127X	20.105	16.035	150	VC	CIRC	7032X	14.765	13.455	225	VC	CIRC	
1024X	30.565	225	VC	CIRC	4128X	20.045	16.0025	150	VC	CIRC	7033X	14.765	13.455	225	VC	CIRC	
1025X	30.535	225	VC	CIRC	4129X	19.985	15.97	150	VC	CIRC	7034X	14.765	13.455	225	VC	CIRC	
1026X	30.505	225	VC	CIRC	4130X	19.925	15.9375	150	VC	CIRC	7035X	14.765	13.455	225	VC	CIRC	
1027X	30.475	225	VC	CIRC	4131X	19.865	15.905	150	VC	CIRC	7036X	14.765	13.455	225	VC	CIRC	
1028X	30.445	225	VC	CIRC	4132X	19.805	15.8725	150	VC	CIRC	7037X	14.765	13.455	225	VC	CIRC	
1029X	30.415	225	VC	CIRC	4133X	19.745	15.84	150	VC	CIRC	7038X	14.765	13.455	225	VC	CIRC	
1030X	30.385	225	VC	CIRC	4134X	19.685	15.8075	150	VC	CIRC	7039X	14.765	13.455	225	VC	CIRC	
1031X	30.355	225	VC	CIRC	4135X	19.625	15.775	150	VC	CIRC	7040X	14.765	13.455	225	VC	CIRC	
1032X	30.325	225	VC	CIRC	4136X	19.565	15.7425	150	VC	CIRC	7041X	14.765	13.455	225	VC	CIRC	
1033X	30.295	225	VC	CIRC	4137X	19.505	15.71	150	VC	CIRC	7042X	14.765	13.455	225	VC	CIRC	
1034X	30.265	225	VC	CIRC	4138X	19.445	15.6775	150	VC	CIRC	7043X	14.765	13.455	225	VC	CIRC	
1035X	30.235	225	VC	CIRC	4139X	19.385	15.645	150	VC	CIRC	7044X	14.765	13.455	225	VC	CIRC	
1036X	30.205	225	VC	CIRC	4140X	19.325	15.6125	150	VC	CIRC	7045X	14.765	13.455	225	VC	CIRC	
1037X	30.175	225	VC	CIRC	4141X	19.265	15.58	150	VC	CIRC	7046X	14.765	13.455	225	VC	CIRC	
1038X	30.145	225	VC	CIRC	4142X	19.205	15.5475	150	VC	CIRC	7047X	14.765	13.455	225	VC	CIRC	
1039X	30.115	225	VC	CIRC	4143X	19.145	15.515	150	VC	CIRC	7048X	14.765	13.455	225	VC	CIRC	
1040X	30.085	225	VC	CIRC	4144X	19.085	15.4825	150	VC	CIRC	7049X	14.765	13.455	225	VC	CIRC	
1041X	30.055	225	VC	CIRC	4145X	19.025	15.45	150	VC	CIRC	7050X	14.765	13.455	225	VC	CIRC	
1042X	30.025	225	VC	CIRC	4146X	18.965	15.4175	150	VC	CIRC	7051X	14.765	13.455	225	VC	CIRC	
1043X	29.995	225	VC	CIRC	4147X	18.905	15.385	150	VC	CIRC	7052X	14.765	13.455	225	VC	CIRC	
1044X	29.965	225	VC	CIRC	4148X	18.845	15.3525	150	VC	CIRC	7053X	14.765	13.455	225	VC	CIRC	
1045X	29.935	225	VC	CIRC	4149X	18.785	15.32	150	VC	CIRC	7054X	14.765	13.455	225	VC	CIRC	
1046X	29.905	225	VC	CIRC	4150X	18.725	15.2875	150	VC	CIRC	7055X	14.765	13.455	225	VC	CIRC	
1047X	29.875	225	VC	CIRC	4151X	18.665	15.255	150	VC	CIRC	7056X	14.765	13.455	225	VC	CIRC	
1048X	29.845	225	VC	CIRC	4152X	18.605	15.2225	150	VC	CIRC	7057X	14.765	13.455	225	VC	CIRC	
1049X	29.815	225	VC	CIRC	4153X	18.545	15.19	150	VC	CIRC	7058X	14.765	13.455	225	VC	CIRC	
1050X	29.785	225	VC	CIRC	4154X	18.485	15.1575	150	VC	CIRC	7059X	14.765	13.455	225	VC	CIRC	
1051X	29.755	225	VC	CIRC	4155X	18.425	15.125	150	VC	CIRC	7060X	14.765	13.455	225	VC	CIRC	
1052X	29.725	225	VC	CIRC	4156X	18.365	15.0925	150	VC	CIRC	7061X	14.765	13.455	225	VC	CIRC	
1053X	29.695	225	VC	CIRC	4157X	18.305	15.06	150	VC	CIRC	7062X	14.765	13.455	225	VC	CIRC	
1054X	29.665	225	VC	CIRC	4158X	18.245	15.0275	150	VC	CIRC	7063X	14.765	13.455	225	VC	CIRC	
1055X	29.635	225	VC	CIRC	4159X	18.185	15.0	150	VC	CIRC	7064X	14.765	13.455	225	VC	CIRC	
1056X	29.605	225	VC	CIRC	4160X	18.125	14.9675	150	VC	CIRC	7065X	14.765	13.455	225	VC	CIRC	
1057X	29.575	225	VC	CIRC	4161X	18.065	14.935	150	VC	CIRC	7066X	14.765	13.455	225	VC	CIRC	
1058X	29.545	225	VC	CIRC	4162X	18.005	14.9025	150	VC	CIRC	7067X	14.765	13.455	225	VC	CIRC	
1059X	29.515	225	VC	CIRC	4163X	17.945	14.87	150	VC	CIRC	7068X	14.765	13.455	225	VC	CIRC	
1060X	29.485	225	VC	CIRC	4164X	17.885	14.8375	150	VC	CIRC	7069X	14.765	13.455	225	VC	CIRC	
1061X	29.455	225	VC	CIRC	4165X	17.825	14.805	150	VC	CIRC	7070X	14.765	13.455	225	VC	CIRC	
1062X	29.425	225	VC	CIRC	4166X	17.765	14.7725	150	VC	CIRC	7071X	14.765	13.455	225	VC	CIRC	
1063X	29.395	225	VC	CIRC	4167X	17.705	14.74	150	VC	CIRC	7072X	14.765	13.455	225	VC	CIRC	
1064X	29.365	225	VC	CIRC	4168X	17.645	14.7075	150	VC	CIRC	7073X	14.765	13.455	225	VC	CIRC	
1065X	29.335	225	VC	CIRC	4169X	17.585	14.675	150	VC	CIRC	7074X	14.765	13.455	225	VC	CIRC	
1066X	29.305	225	VC	CIRC	4170X	17.525	14.6425	150	VC	CIRC	7075X	14.765	13.455	225	VC	CIRC	
1067X	29.275	225	VC	CIRC	4171X	17.465	14.61	150	VC	CIRC	7076X	14.765	13.455	225	VC	CIRC	
1068X	29.245	225	VC	CIRC	4172X	17.405	14.5775	150	VC	CIRC	7077X	14.765	13.455	225	VC	CIRC	
1069X	29.215	225	VC	CIRC	4173X	17.345	14.545	150	VC	CIRC	7078X	14.765	13.455	225	VC	CIRC	
1070X	29.185	225	VC	CIRC	4174X	17.285	14.5125	150	VC	CIRC	7079X	14.765	13.455	225	VC	CIRC	
1071X	29.155	225	VC	CIRC	4175X	17.225	14.48	150	VC	CIRC	7080X	14.765	13.455	225	VC	CIRC	
1072X	29.125	225	VC	CIRC	4176X	17.165	14.4475	150	VC	CIRC	7081X	14.765	13.455	225	VC	CIRC	
1073X	29.095	225	VC	CIRC	4177X	17.105	14.415	150	VC	CIRC	7082X	14.765	13.455	225	VC	CIRC	
1074X	29.065	225	VC	CIRC	4178X	17.045	14.3825	150	VC	CIRC	7083X	14.765	13.455	225	VC	CIRC	
1075X	29.035	225	VC	CIRC	4179X	16.985	14.35	150	VC	CIRC	7084X	14.765	13.455	225	VC	CIRC	
1076X	29.005	225	VC	CIRC	4180X	16.925	14.3175	150	VC	CIRC	7085X	14.765	13.455	225	VC	CIRC	
1077X	28.975	225	VC	CIRC	4181X	16.865	14.285	150	VC	CIRC	7086X	14.765	13.455	225	VC	CIRC	
1078X	28.945	225	VC	CIRC	4182X	16.80											