

LAND AT NORWAY LANE, NORTH OF THE A259, RUSTINGTON

Flood Risk Assessment

PREPARED FOR: MR. T. CASTLE

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SLR



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APPENDICES

Appendix 01: Topographic Survey

Appendix 02: Southern Water Asset Plan

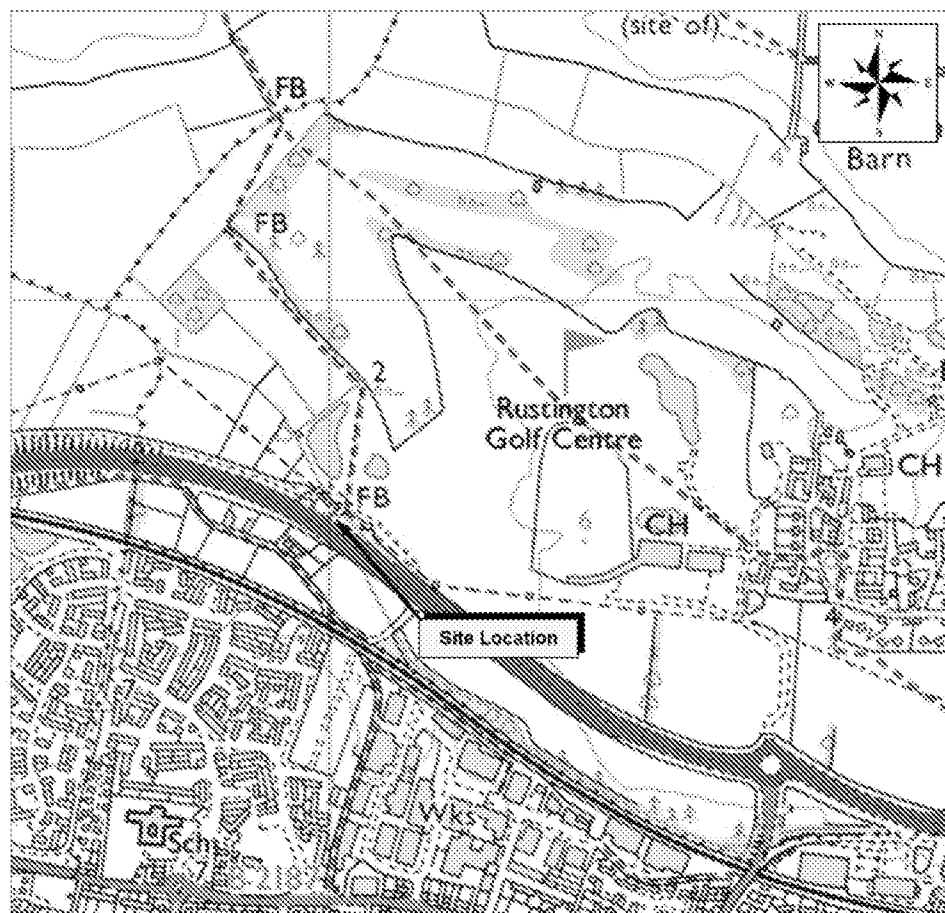
Appendix 03: Environment Agency Flood Data

1.0 INTRODUCTION

1.1 Context

SLR Consulting Limited (SLR) has been retained by Mr. T. Castle to complete a Flood Risk Assessment (FRA) to support a retrospective planning application for the siting of a static and mobile caravan on land at Norway Lane, North of the A259, Rustington (the Site). A site location plan is provided as Figure 1-1.

Figure 1-1
Site Location Plan



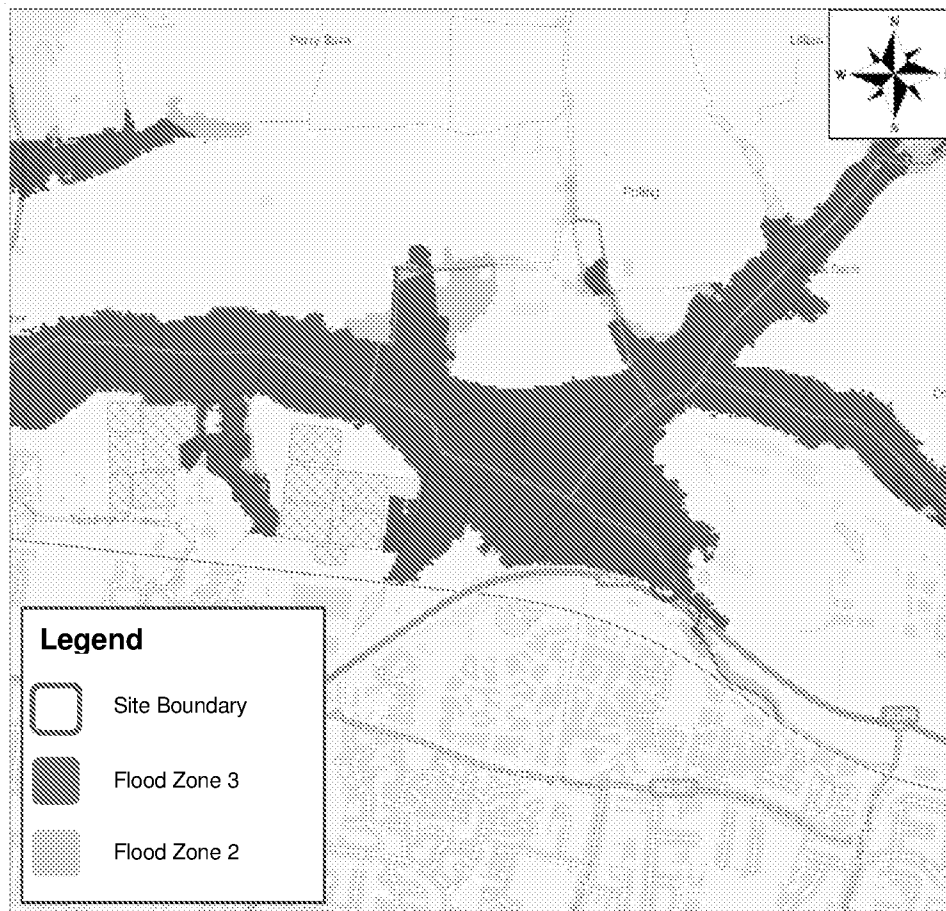
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1.2 Background and Aims

With reference to the indicative Flood Map for Planning (Rivers and Sea)¹ the Site lies within an area at risk of fluvial or tidal flooding. An extract of the Flood Map for Planning is provided by Figure 1-2.

¹ Government Digital Service (Accessed on 17 August 2018) <https://flood-map-for-planning.service.gov.uk/>

Figure 1-2
 Extract of the Flood Map for Planning



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Therefore, with reference to footnote 20 of the National Planning Policy Framework² (NPPF), any planning application for development on the Site must be accompanied by a site-specific FRA.

1.3 Best Practice

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to the management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)³, the British Standards Institution (BSI) BS8533⁴ and the Environment Agency's National Standing Advice on Development and Flood Risk⁵.

² National Planning Policy Framework, Department for Communities and Local Government (Updated July 2018)

³ CIRIA Report C624, Development and flood risk – guidance for the construction industry (October 2004)

⁴ BS8533:2017, Assessing and managing flood risk in development – Code of Practice (December 2017)

⁵ Department for Environment, Food & Rural Affairs and Environment Agency (2015). Flood risk assessment: local planning authorities (Accessed 17 August 2018 at <https://www.gov.uk/guidance/flood-riskassessmentlocal-planning-authorities>)

2.0 SITE DETAILS

2.1 Existing Site Description

The Site is accessed off the A259 which forms the southern boundary of the Site. To the north and east of the Site is a tributary of the Black Ditch, classified by the Environment Agency as a Main River⁶. Beyond this watercourse is Rustington Golf Course. Arable/agricultural land forms the western boundary of the Site.

The Site is currently occupied by a static and mobile caravan along with a utility vehicle. The location of these elements of the development is shown on the topographic survey enclosed at Appendix 01.

2.2 Topography

A topographic survey of the Site was completed by Paul Gough Land Surveys in August 2017 to Ordnance Datum and is enclosed at Appendix 01. The survey indicates ground levels across the Site vary from approximately 1.61m Above Ordnance Datum (AOD) in the south eastern part of the Site to 3.54m AOD at the access off the A259, in the western part of the Site. However, the majority of the Site (including the current location of the static and mobile caravan along with a utility vehicle) is predominantly set at or above 2.65m AOD.

2.3 GEOLOGY AND HYDROGEOLOGY

2.3.1 Geology

Geological mapping published by the British Geological Survey⁷ (BGS) indicates the bedrock geology at the Site consists of the *New Pit Chalk Formation - Chalk*. This is overlain by superficial deposits of *Raised Beach Deposits, 1 - Sand And Gravel*.

However, we understand that Made Ground overlays the superficial deposits.

The National Soils Resources Institute, Soilscales website⁸ indicates that the regional soils consist of '*loamy and clayey soils of coastal flats with naturally high groundwater*'.

2.3.2 Hydrogeology

Review of the online MAGIC mapping⁹ indicates that the New Pit Chalk Formation is classified as a *Principal* aquifer comprising 'layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.'

The superficial deposits are classified as a *Secondary A* aquifer with 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.'

The Site is not located within a Groundwater Source Protection Zone (SPZ). Groundwater SPZs have been developed by the Environment Agency to map the catchment areas of abstractions that are used for public drinking water supply.

⁶ A 'Main River' is a watercourse shown to be designated as main on the Environment Agency's statutory flood map, usually a larger stream or river with a significant effect on the overall drainage of a catchment area.

⁷ BGS website (Accessed on 17 August 2018) <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁸ Cranfield University Soilscales map (Accessed on 17 August 2018) <http://www.landis.org.uk/soilscales/>

⁹ Defra online interactive maps (Accessed on 17 August 2018) <http://magic.defra.gov.uk/MagicMap.aspx>

2.4 Hydrological Features

As discussed at Section 2.1, a tributary of the Black Ditch flows along the northern and eastern boundary of the Site, in a general north westerly direction. The tributary outfalls into the Black Ditch some 420m to the north west of the Site.

With reference to the topographic survey enclosed at Appendix 01, the invert level of the tributary is set at approximately 0.4m AOD, some 0.5m below the top of bank.

3.0 PLANNING POLICIES

3.1 Anticipated Lifetime of Development

In line with PPG and best practice guidance (BS8533), a conservative 100 years lifetime of development has been assumed for the residential development.

3.2 Vulnerability

With reference to *Table 2: Flood risk vulnerability classification* at PPG Paragraph 066, 'caravans, mobile homes and park homes intended for permanent residential use' are classified as a 'Highly vulnerable' use.

3.3 Planning Context

Arun District Council adopted their Local Plan¹⁰ in July 2018 which sets out their long term strategy to achieve sustainable development by setting the broad policies that will steer and shape new development to 2031.

The current policies relating to flood risk and sustainable water management are outlined below:

Policy W DM2: Flood risk

Development in areas at risk from flooding, identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood Risk Assessment (SFRA), will only be permitted where all of the following criteria have been satisfied:

- a. The sequential test in accordance with the National Planning Policy Guidance has been met.*
- b. A site specific Flood Risk Assessment demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall.*
- c. The sustainability benefits to the wider community are clearly identified.*
- d. The scheme identifies adaptation and mitigation measures.*
- e. Appropriate flood warning and evacuation plans are in place; and*
- f. New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas.*

The reports prepared as part of the criteria above must take into account contingency allowances, taking climate change into account as set out in Flood Risk Assessments: climate change allowances section of the NPPG.

In locations where strategic flood defence or resilient and resistant construction measures are necessary within the site itself, proposals will be required to demonstrate how measures have been incorporated as an intrinsic part of the scheme in a manner which is compatible with the latest Strategic Flood Risk Assessment.

All development proposals must take account of relevant Surface Water Management Plans, Catchment Flood Management Plans and related Flood Defence Plans and strategies such as the Lower Tidal River Arun Strategy. The council may require financial contributions from development on sites where measures to address flood risk or to improve the environmental quality of watercourses have been identified by these Plans and Strategies.

¹⁰ Arun District Council, July 2018. Arun Local Plan 2011 – 2031

Policy W DM3: Sustainable Urban Drainage Systems

To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include:

- ✧ Green roofs*
- ✧ Permeable driveways and parking*
- ✧ Soakaways*
- ✧ Water harvesting and storage features including water butts.*

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.*
- b. Effectively manage water (including its quality)*
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and*
- d. Provide amenity for local residents (ensuring a safe environment)*
- e. Retain the existing drainage network of the site and the wider area,*
- f. Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.*

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.*
- g. Undertake up to six months groundwater monitoring within the winter period.*
- h. Undertake winter percolation testing in accordance with BRE365.*
- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.*
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.*

The measures set out at Section 8.0 of this assessment demonstrates that the development is consistent with the above policies.

4.0 POTENTIAL SOURCES OF FLOOD RISK

4.1 Data Sources

In assessing the flood risk to the Site, the following data sources have been considered:

- ✧ The details discussed at Section 2.0;
- ✧ Details of the development (enclosed at Appendix 01);
- ✧ Southern Water asset plan (enclosed at Appendix 02);
- ✧ The flood maps published on the Government Digital Service; and
- ✧ Site specific flood information provided by the Environment Agency (enclosed at Appendix 03).

4.2 Screening Study

There are a number of potential sources of flooding that an FRA should consider and these include:

- ✧ Flooding from rivers or fluvial flooding;
- ✧ Flooding from the sea or tidal flooding;
- ✧ Flooding from land;
- ✧ Flooding from groundwater;
- ✧ Flooding from sewers; and
- ✧ Flooding from reservoirs, canals, and other artificial sources.

The flood risk from each of these potential sources is discussed in more detail below.

4.2.1 Flooding from Rivers or Fluvial Flooding & Sea or Tidal Flooding

With reference to the indicative Flood Map for Planning (Rivers and Sea)¹¹ published by the Environment Agency, the Site lies within an area at risk of flooding from fluvial and/or tidal sources.

Flooding from this source has therefore been considered further at Section 5.0.

4.2.2 Flooding from Surface Water and Overland Flow

Surface water modelling has been undertaken by the Environment Agency to establish areas at risk of surface water flooding based upon latest hydrological techniques and surface terrain data.

An extract from the Long Term Flood Risk Information¹² showing areas potentially at risk of flooding from surface water has been provided as Figure 4-1 below. The Environment Agency defines the surface water flood risk categories as:

- ✧ Very Low: less than 1 in 1,000 (0.1% AEP¹³) chance of flooding in any given year;
- ✧ Low: less than 1 in 100 (1% AEP) but greater than or equal to 1 in 1,000 (0.1% AEP) chance of flooding in any given year;

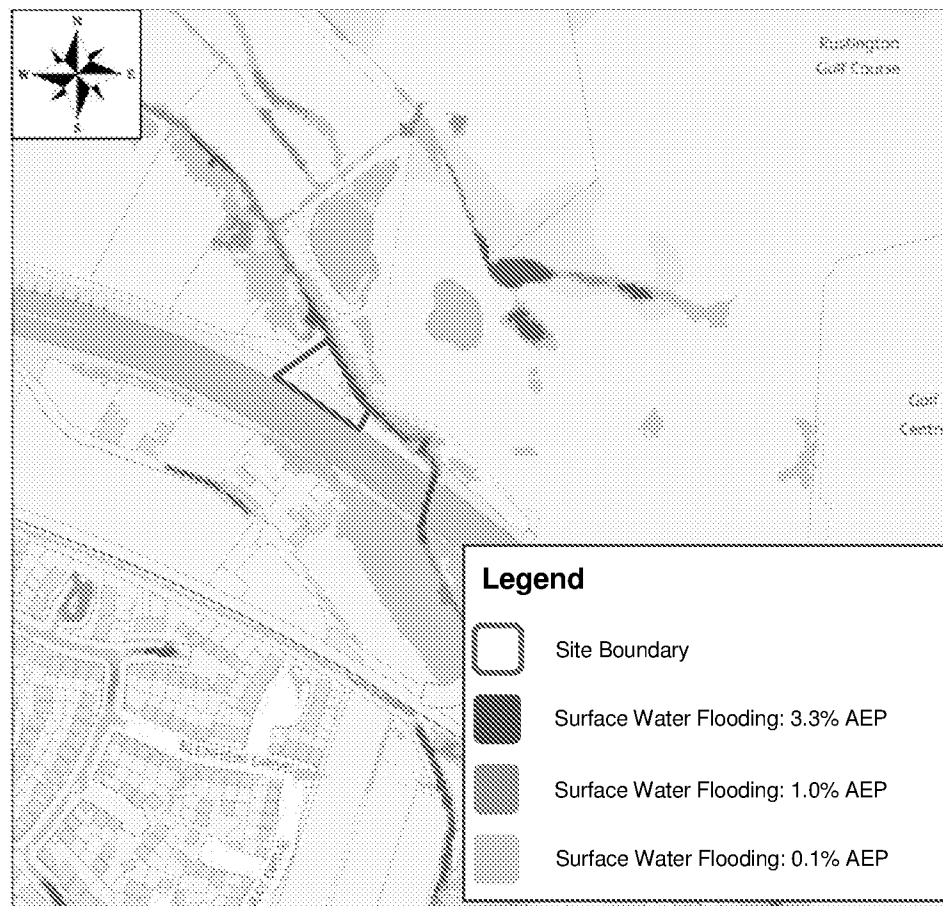
¹¹ Environment Agency Flood Map for Planning Tool (Accessed on 17 August 2018) <https://flood-map-for-planning.service.gov.uk/>

¹² Government Digital Service (Accessed 14 August 2018) <https://flood-warning-information.service.gov.uk/longterm-flood-risk/>

¹³ AEP – Annual Exceedance Probability

- ✧ Medium: between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) chance of flooding in any given year; and
- ✧ High: greater than 1 in 30 (3.3% AEP) chance of flooding in any given year.

Figure 4-1
Extract of the Environment Agency Surface Water Flood Map



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Based upon this mapping, the Site lies predominantly within an area shown to be at 'Very Low' risk of surface water flooding with the exception of land adjacent to the tributary of the Black Ditch which is shown to be at 'Low' to 'High' risk of flooding from surface water.

However, the surface water flooding described above is expected to be a result of out of bank flow from the tributary. As the extent of the surface water flooding shown is less than that from fluvial and/or tidal sources, flooding from surface water is not considered the primary source of flooding at the Site. Moreover, the flood risk management measures outlined at Section 7.0 are considered sufficient to address the flood risk from surface water.

The flood risk from this source has not therefore been considered further.

4.2.3 Flooding from Groundwater

As discussed at Section 2.3.2, groundwater level may be high at the Site. However, groundwater level at the Site is likely to be moderated by the tributary of the Black Ditch and is therefore not expected to rise above the bank level of the tributary during 'normal' conditions.

As such, with the bank of the tributary set at approximately 0.9m AOD (see Section 2.4), groundwater level is expected to be some 1.75m below the majority of the Site and some 0.71m below the lowest point of the Site.

The flood risk from this source has not therefore been considered further.

4.2.4 Flooding from Sewers

The public foul sewers in Rustington are operated and maintained by Southern Water. In response to a formal request Southern Water has provided details of their assets in the vicinity of the Site. Southern Water asset records are enclosed at Appendix 02.

As shown by the plans enclosed at Appendix 02, the nearest public sewer to the Site is located some 200m to the south of the Site. Manhole cover levels nearest to the Site were not provided by Southern Water. However, the closest manhole for which a cover level has been provided is located some 221m to the south of the Site and is set at 5.916m AOD.

Should the sewer(s) fail or become overwhelmed, floodwater would flow north towards the Site. However, while the Site is at a lower elevation than the cover levels of the Southern Water, the propagation of floodwater onto the Site is expected to be impeded by the railway line and A259.

The flood risk from this source has not therefore been considered further.

4.2.5 Flooding from Reservoirs, Canals and other Artificial Sources

Based upon Environment Agency mapping¹⁰, the Site lies outside an area denoted as being at risk of flooding from a breach (failure) of a raised reservoir embankment.

The flood risk from this source is not significant and has not therefore been considered further.

4.3 Flood Risk Screening Summary

A summary of potential sources of flooding and the flood risk arising from them is presented in Table 4-1 and discussed in further detail at Section 5.0.

Table 4-1
Potential Sources of Flooding

Potential Source of Flooding	Primary Flood Risk at the Site
Rivers or Fluvial & Sea or Tidal	Yes
Surface Water or Overland Flow (Pluvial)	No
Groundwater	No
Sewers	No
Reservoirs, Canals and other Artificial Sources	No

5.0 ASSESSMENT OF FLOOD RISK

5.1 Potential Sources of Flood Risk

The flood screening assessment reported in Section 4.0 indicates that the Site could be at risk of flooding from fluvial and/or tidal sources. The flood risks to the Site from these sources are evaluated below.

5.2 Flooding from Rivers or Fluvial Flooding & Sea or Tidal Flooding

In response to a formal data request, the Environment Agency has provided site specific modelled flood levels extracted from the Lower Tidal River Arun Strategy model completed in 2010 by Atkins. That study assessed the flood level at the Site under both the defended and undefended scenarios for a range of AEP fluvial and tidal events. A copy of the information provided is enclosed at Appendix 03.

The flood levels provided within Tables 1 to 4 have been compared against the topographic survey of the current Site. This comparison, shown on Drawing Nos. 001 to 004, indicates that the Site would remain predominantly dry during all 'present day' fluvial and tidal events assessed for both defended and undefended scenarios. Propagation of floodwater would be limited to land adjacent to the tributary of the Black Ditch. As such, the A259, the access to the Site and the location of the static and mobile caravan along with a utility vehicle would remain dry during a fluvial and tidal event with less than or equal to a 0.1% annual probability of occurrence within and without accounting for the benefits of existing flood defences.

5.3 Flood Zone

The assessment of flood risk in this report is based on the definitions provided by *Table 1: Flood zones* at PPG Paragraph 065 and is summarised below:

- ✧ *Zone 1 - Low Probability* (Flood Zone 1) is defined as land which could be at risk of flooding from fluvial or tidal flood events with less than 0.1% annual probability of occurrence (1:1,000 year) i.e. considered to be at 'low probability' of flooding.
- ✧ *Zone 2 - Medium Probability* (Flood Zone 2) is defined as land which could be at risk of flooding with an annual probability of occurrence between 1% (1:100 year) and 0.1% (1:1,000 year) from fluvial sources and between 0.5% (1:200 year) and 0.1% (1:1,000 year) from tidal sources i.e. considered to be at 'medium probability' of flooding.
- ✧ *Zone 3a - High Probability* (Flood Zone 3a) is defined as land which could be at risk of flooding with an annual probability of occurrence greater than 1% (1:100 year) from fluvial sources and greater than 0.5% (1:200 year) from tidal sources i.e. considered to be at 'high probability' of flooding.
- ✧ *Zone 3b - the Functional Floodplain* (Flood Zone 3b) is defined as land where water has to flow or be stored in times of flood. Local Planning Authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain in agreement with the EA. In the absence of definitive information, it is often defined as land that would flood with an annual probability of occurrence of 5% (1:20 year) or greater.

In assessing the flood zone, the protection afforded by any flood defence structures has to be discounted.

Therefore, with reference to the assessment of the flood risk discussed in Section 5.2, the development lies within Flood Zone 1.

6.0 POLICY STATUS FOR DEVELOPMENT

6.1 Flood Risk Compatibility

As discussed at Section 3.2, the development is classified a '*Highly Vulnerable*' use and, with reference to Section 5.3, lies in Flood Zone 1. Therefore, with reference to PPG Table 3: *Flood risk vulnerability and Flood Zone 'compatibility'* (reproduced as Table 6-1), the flood risk vulnerability of the development is deemed appropriate and compatible for the Flood Zone in which it sits. This is in accordance with NPPF and the Exception Test need not be applied in this instance.

Table 6-1
Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	x	x	x	✓

Key: ✓ Development is appropriate x Development should not be permitted

6.2 Sequential Test

NPPF Paragraph 101 advises that the aim of the Sequential Test is to '*steer new development to areas with the lowest probability of flooding*'. Furthermore it states:

'Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding.'

As discussed in Section 5.3, the development is located within Flood Zone 1, the lowest flood risk zone. The development is therefore deemed to satisfy the requirements of the NPPF 'Flood Risk' Sequential Test.

7.0 CLIMATE CHANGE

7.1 Peak River Flow and Sea Level Allowances

As discussed at Section 5.2, flood levels provided by the Environment Agency (Tables 1 to 4 enclosed at Appendix 03) have been compared against the topographic survey of the current Site. When accounting for climate change, this comparison (Drawing Nos. 001 to 004) indicates that the existing flood defences would protect the development from flooding during a 1% AEP fluvial event. However, during a 0.5% AEP tidal event inclusive of an allowance for climate change, the existing defences would be overtopped and allow floodwater to propagate across the Site to a level of 3.13m AOD (or a maximum depth of approximately 1.6m).

Additionally, when discounting the benefits afforded by the existing flood defences, the Site would flood to a level of 2.90m AOD (or a maximum depth of approximately 1.4m) and 3.00m AOD (or 1.5m depth) during a 1% AEP fluvial and 0.5% AEP tidal events respectively, inclusive of an allowance for climate change.

As the flood level at the Site would be greatest during a 0.5% AEP tidal event inclusive of an allowance for climate change under the defended scenario (i.e. 3.13m AOD), this flood level has been adopted as the design flood level for the flood risk management measures set out at Section 8.0.

7.2 Peak Rainfall Intensity Allowance

The most recent advice on climate change is provided by the Environment Agency¹³. An extract of *Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)* is reproduced as Table 7-1.

Table 7-1
 Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Allowance Category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

In line with Table 7-1, an increase in rainfall intensity of 40% over the lifetime of the development (see Section 3.1) should be taken into account when development Surface Water Drainage Strategy for the Site. However, as discussed at Section 8.5, the roofs of the static caravans and touring caravans along with the roof of the utility vehicle would be shed directly to ground to mimic existing drainage patterns. Any uplift in rainfall intensity will therefore continue to drain to ground.

8.0 FLOOD RISK MANAGEMENT MEASURES

8.1 Flood Protection Measures

As discussed at Section 5.3, the development is located in Flood Zone 1 and is afforded protection against flooding by existing defences under 'present day' hydrological conditions. However, when accounting for the impacts of climate change peak river flow and sea level, the existing flood defences would be overtopped during a 0.5% AEP tidal event and allow floodwater to propagate across the Site to a level of 3.13m AOD (the design flood level).

It is therefore recommended that the finished floor level of the static and mobile caravan be raised to a minimum of 300mm above the 0.5% AEP defended tidal level of 3.13m AOD. Based on the survey ground levels the static and mobile caravan will be raised as set out below.

Table 8-1
Finished Floor Level

Development Element	Minimum Surveyed Ground Level (m AOD)	0.5% AEP Defended Tidal Flood Level (m AOD) +CC ¹	Minimum Freeboard (mm)	Finished Floor Level	
				Elevation (m AOD)	Distance above Ground (mm)
Static Caravan	2.84	3.13	300	3.43	590
Touring Caravan	2.67				760

¹ +CC – Inclusive of an allowance for climate change

8.2 Safe Access and Egress

With reference to the indicative Flood Map for Planning (Rivers and Sea), an extract of which is provided as Figure 1-2, and Drawing Nos. 001 to 004, dry access and egress to/from the Site is available off the A259.

8.3 Flood Warning

With reference to the Environment Agency's Flood Warning or Alert Area Map¹⁴, general early notification of possible (fluvial and tidal) flooding, known as 'Flood Alerts' and/or more specific 'Flood Warnings' are provided for the Site.

It is therefore recommended that the Site subscribe to this service which aims to provide a minimum 2 hour warning of an impending flood. Residents at the Site would therefore have sufficient time to evacuate the Site.

8.4 Flood Emergency Plan

It will be important to document the flood risk to the Site and, more importantly, the actions to take should a flood warning be issued. This should be in the form of a Flood Emergency Plan. Production of such a Plan would normally be secured by a planning condition.

¹⁴ Government Digital Service (Accessed on 17 August 2018) <https://www.fws.environment-agency.gov.uk>

8.5 Surface Water Drainage Strategy

Provision of water butts on selected downpipes from roof guttering will also provide a degree of attenuation storage and promote water re-use for irrigation.

On-site access arrangements will be formed from permeable material, such as crushed concrete or compacted gravel. As such, any surface water runoff from the access route would be shed directly to ground to mimic existing drainage patterns.

Therefore, development of the Site will not increase surface water runoff.

9.0 CONCLUSIONS

9.1 Background

SLR Consulting Limited has been appointed to develop a Flood Risk Assessment in support of a retrospective planning application for the siting of a static and mobile caravan on land at Norway Lane, North of the A259, Rustington.

9.2 Assessment of Flood Risk

With reference to the indicative flood maps published on the Government Digital Service and site specific flood information licensed from the Environment Agency, the development is considered to lie within Flood Zone 1 as defined by PPG Table 1.

However, the existing defences would be overtopped during a 0.5% AEP tidal event inclusive of an allowance for climate change and allow floodwater to propagate across the Site to a level of 3.13m AOD. This has been assessed to result in the greatest flood risk at the Site, when considering both fluvial and tidal sources under the undefended and defended scenarios).

9.3 Sequential and Exception Tests

The development is classified a '*Highly Vulnerable*' use and, as it lies in Flood Zone 1, is deemed appropriate and compatible for the Flood Zone in which it sits. The Exception Test need not therefore be applied in this instance.

Moreover, as the development lies in Flood Zone 1, the lowest flood risk zone, is deemed to satisfy the requirements of the 'Flood Risk' Sequential Test.

9.4 Flood Risk Management Measures

It is proposed that the static and touring caravans be raised a minimum of 300mm above the design flood level. Dry access and egress is provided to/from the A259 and it is recommended that residents subscribe to the Environment Agency's Flood Warning Service to inform the evacuation of the Site.

10.0 Closure

The information reported herein is based on the interpretation of data collected during the environmental assessment.

SLR has relied upon data obtained by third parties in the preparation of this report. SLR has not had the opportunity to verify if this data is correct. SLR therefore cannot guarantee conclusions reached based upon this data.

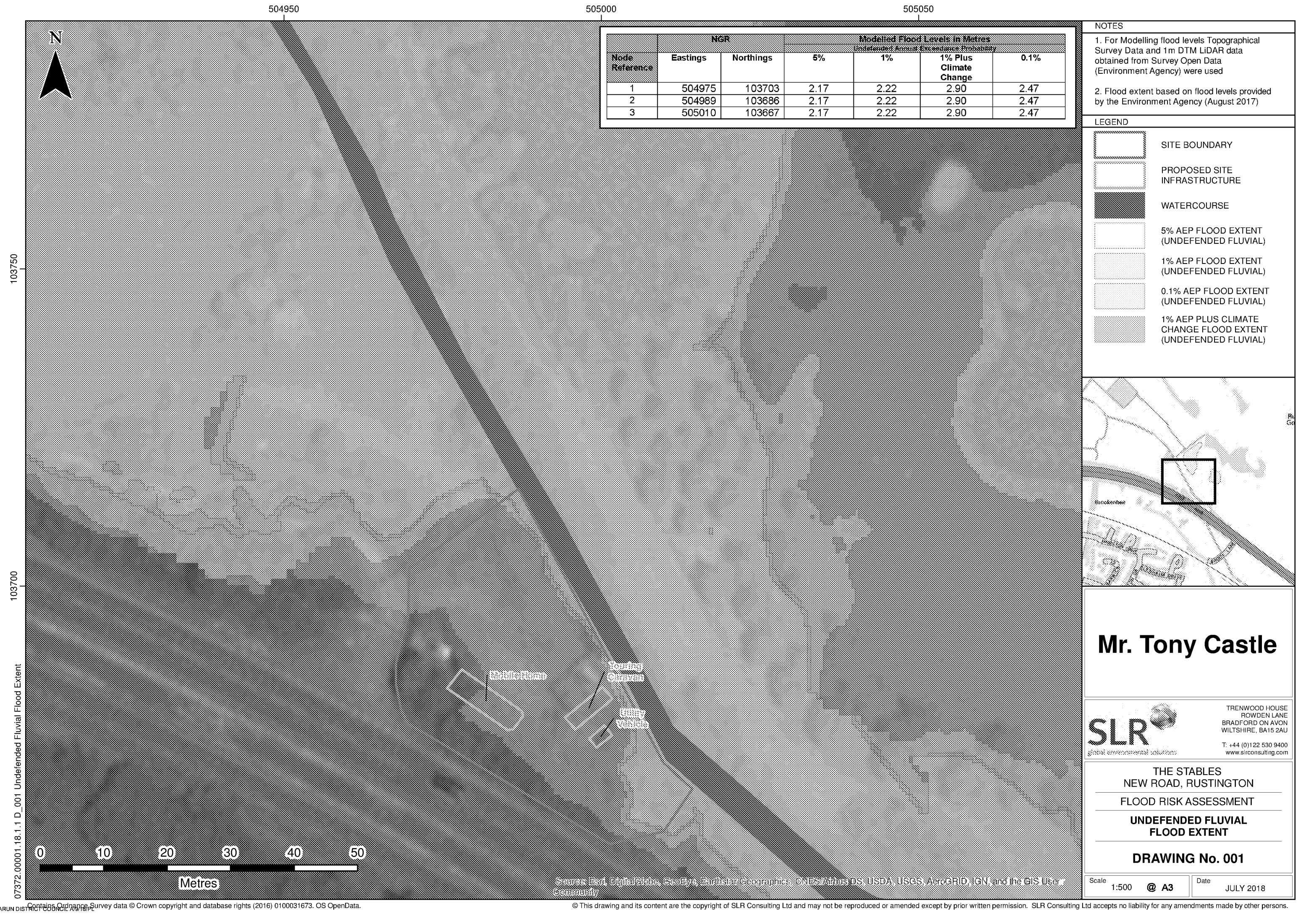
It should be noted that where budget costs are provided within this report, these are based upon the information available at the time of reporting and are provided for guidance only; a detailed survey would be required to accurately confirm the cost. It should also be noted that the cost associated with the introduction and application of new legislation, not in existence at the time of this report, could escalate substantially.

This report is for the exclusive use of those parties listed in Section 1.0 of this report and their exclusive agents; no warranties or guarantees are expressed or should be inferred by any third parties. Any such party relies upon the report at their risk.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

DRAWING NO. 001

Undefended Fluvial Flood Extent



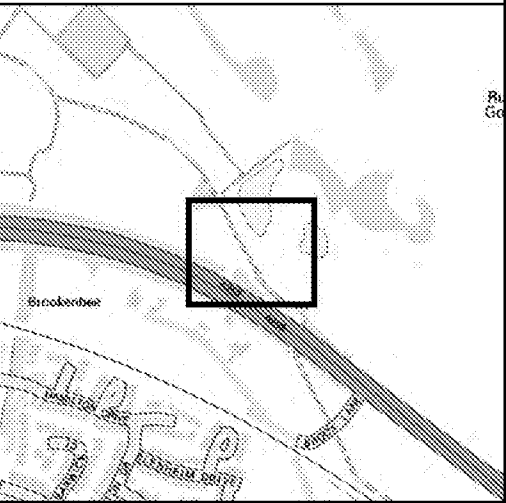
Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	504975	103703	2.17	2.22	2.90	2.47
2	504989	103686	2.17	2.22	2.90	2.47
3	505010	103667	2.17	2.22	2.90	2.47

NOTES

1. For Modelling flood levels Topographical Survey Data and 1m DTM LIDAR data obtained from Survey Open Data (Environment Agency) were used

2. Flood extent based on flood levels provided by the Environment Agency (August 2017)

- LEGEND
- SITE BOUNDARY
 - PROPOSED SITE INFRASTRUCTURE
 - WATERCOURSE
 - 5% AEP FLOOD EXTENT (UNDEFENDED FLUVIAL)
 - 1% AEP FLOOD EXTENT (UNDEFENDED FLUVIAL)
 - 0.1% AEP FLOOD EXTENT (UNDEFENDED FLUVIAL)
 - 1% AEP PLUS CLIMATE CHANGE FLOOD EXTENT (UNDEFENDED FLUVIAL)



Mr. Tony Castle



SLR
global environmental solutions

TRENWOOD HOUSE
ROWDEN LANE
BRADFORD ON AVON
WILTSHIRE, BA15 2AU

T: +44 (0)122 530 9400
www.slrconsulting.com

THE STABLES
NEW ROAD, RUSTINGTON

FLOOD RISK ASSESSMENT

UNDEFENDED FLUVIAL
FLOOD EXTENT

DRAWING No. 001

Scale

1:500 @ A3

Date

JULY 2018

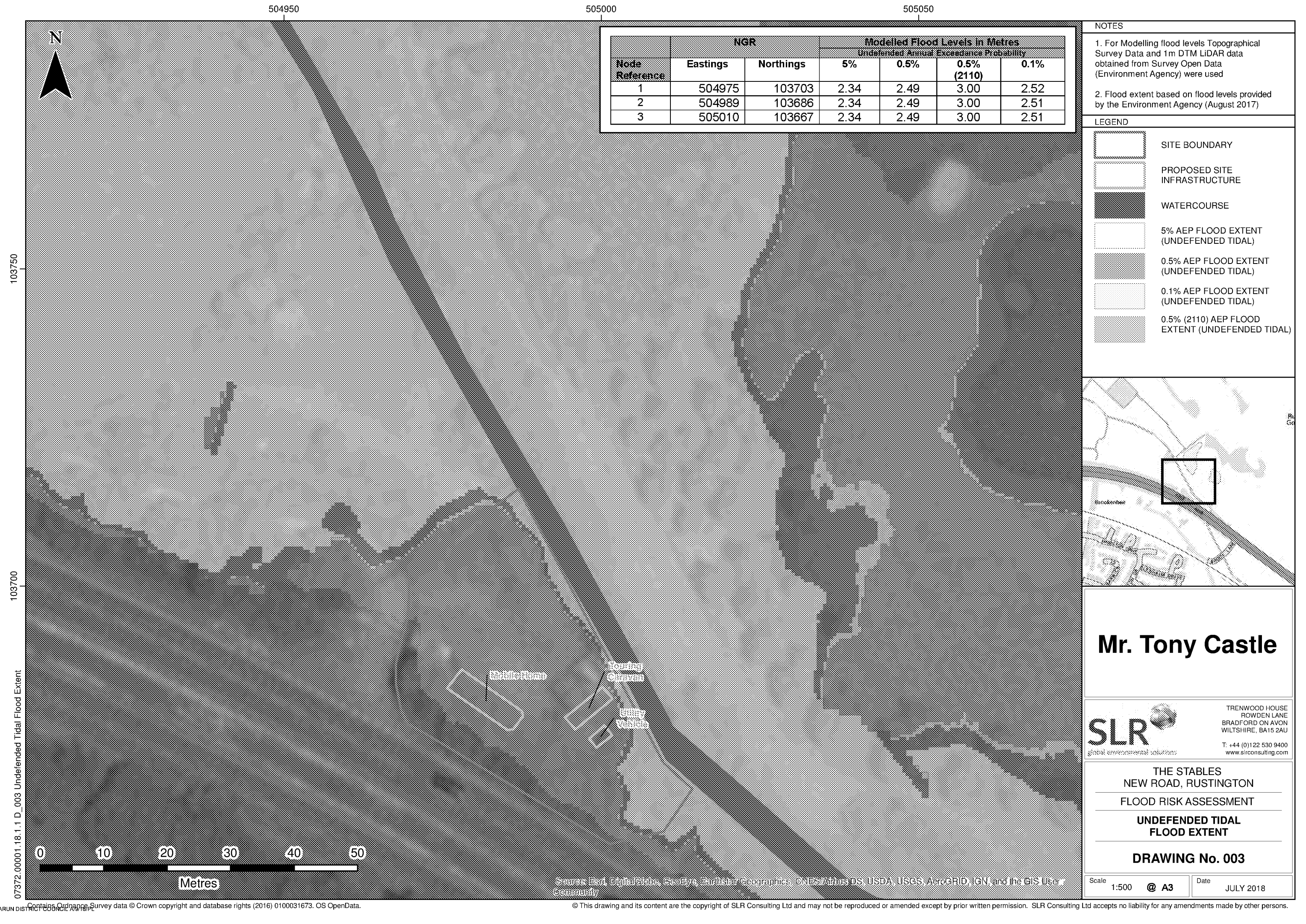
DRAWING NO. 002

Defended Fluvial Flood Extent



DRAWING NO. 003

Undefended Tidal Flood Extent



Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	2.34	2.49	3.00	2.52
2	504989	103686	2.34	2.49	3.00	2.51
3	505010	103667	2.34	2.49	3.00	2.51

NOTES

1. For Modelling flood levels Topographical Survey Data and 1m DTM LiDAR data obtained from Survey Open Data (Environment Agency) were used

2. Flood extent based on flood levels provided by the Environment Agency (August 2017)

LEGEND

SITE BOUNDARY

PROPOSED SITE INFRASTRUCTURE

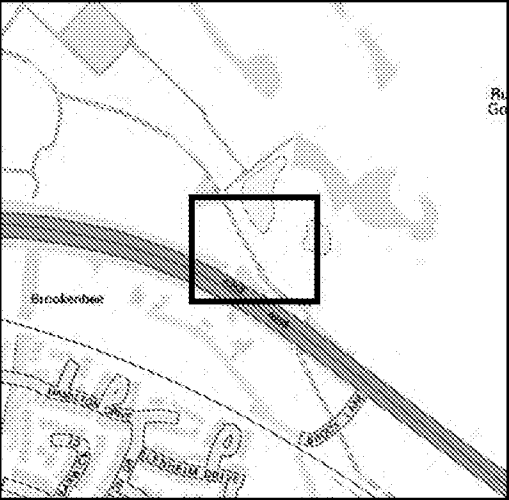
WATERCOURSE

5% AEP FLOOD EXTENT (UNDEFENDED TIDAL)

0.5% AEP FLOOD EXTENT (UNDEFENDED TIDAL)

0.1% AEP FLOOD EXTENT (UNDEFENDED TIDAL)

0.5% (2110) AEP FLOOD EXTENT (UNDEFENDED TIDAL)



Mr. Tony Castle

SLR

global environmental solutions

TRENWOOD HOUSE
ROWDEN LANE
BRADFORD ON AVON
WILTSHIRE, BA15 2AU
T: +44 (0)122 530 9400
www.slrconsulting.com

THE STABLES
NEW ROAD, RUSTINGTON

FLOOD RISK ASSESSMENT

UNDEFENDED TIDAL
FLOOD EXTENT

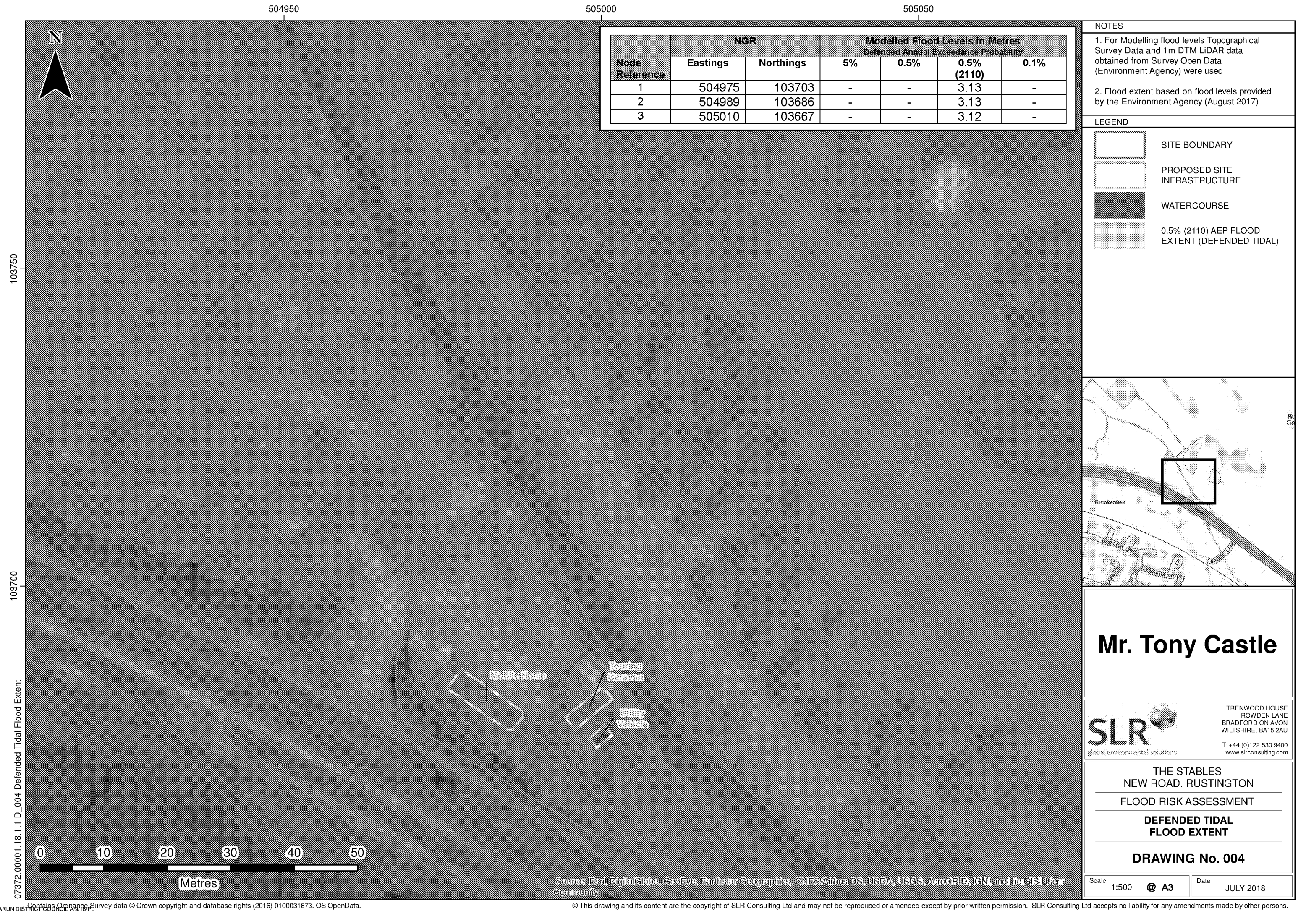
DRAWING No. 003

Scale
1:500 @ A3

Date
JULY 2018

DRAWING NO. 004

Defended Tidal Flood Extent



Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	-	-	3.13	-
2	504989	103686	-	-	3.13	-
3	505010	103667	-	-	3.12	-

NOTES

1. For Modelling flood levels Topographical Survey Data and 1m DTM LIDAR data obtained from Survey Open Data (Environment Agency) were used

2. Flood extent based on flood levels provided by the Environment Agency (August 2017)

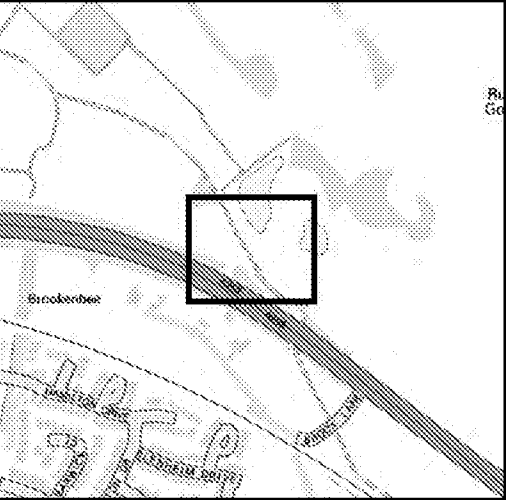
LEGEND

SITE BOUNDARY

PROPOSED SITE INFRASTRUCTURE

WATERCOURSE

0.5% (2110) AEP FLOOD EXTENT (DEFENDED TIDAL)



Mr. Tony Castle

SLR

global environmental solutions

TRENWOOD HOUSE
ROWDEN LANE
BRADFORD ON AVON
WILTSHIRE, BA15 2AU

T: +44 (0)122 530 9400
www.slrconsulting.com

THE STABLES
NEW ROAD, RUSTINGTON

FLOOD RISK ASSESSMENT

DEFENDED TIDAL
FLOOD EXTENT

DRAWING No. 004

Scale
1:500 @ A3

Date
JULY 2018

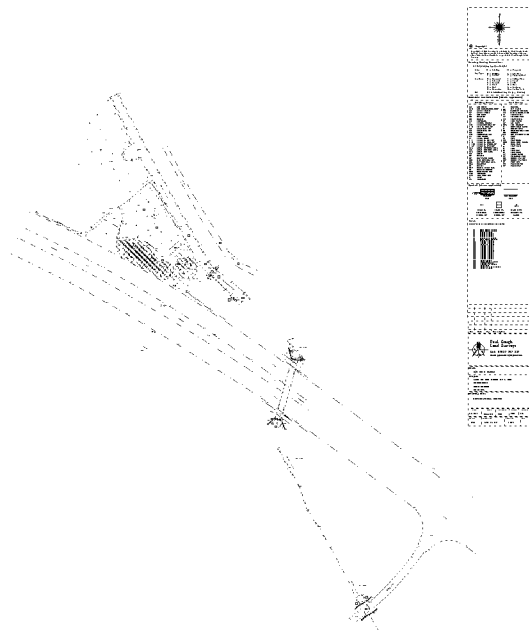
ARUN DISTRICT COUNCIL 18.1.1 D_004 Defended Tidal Flood Extent

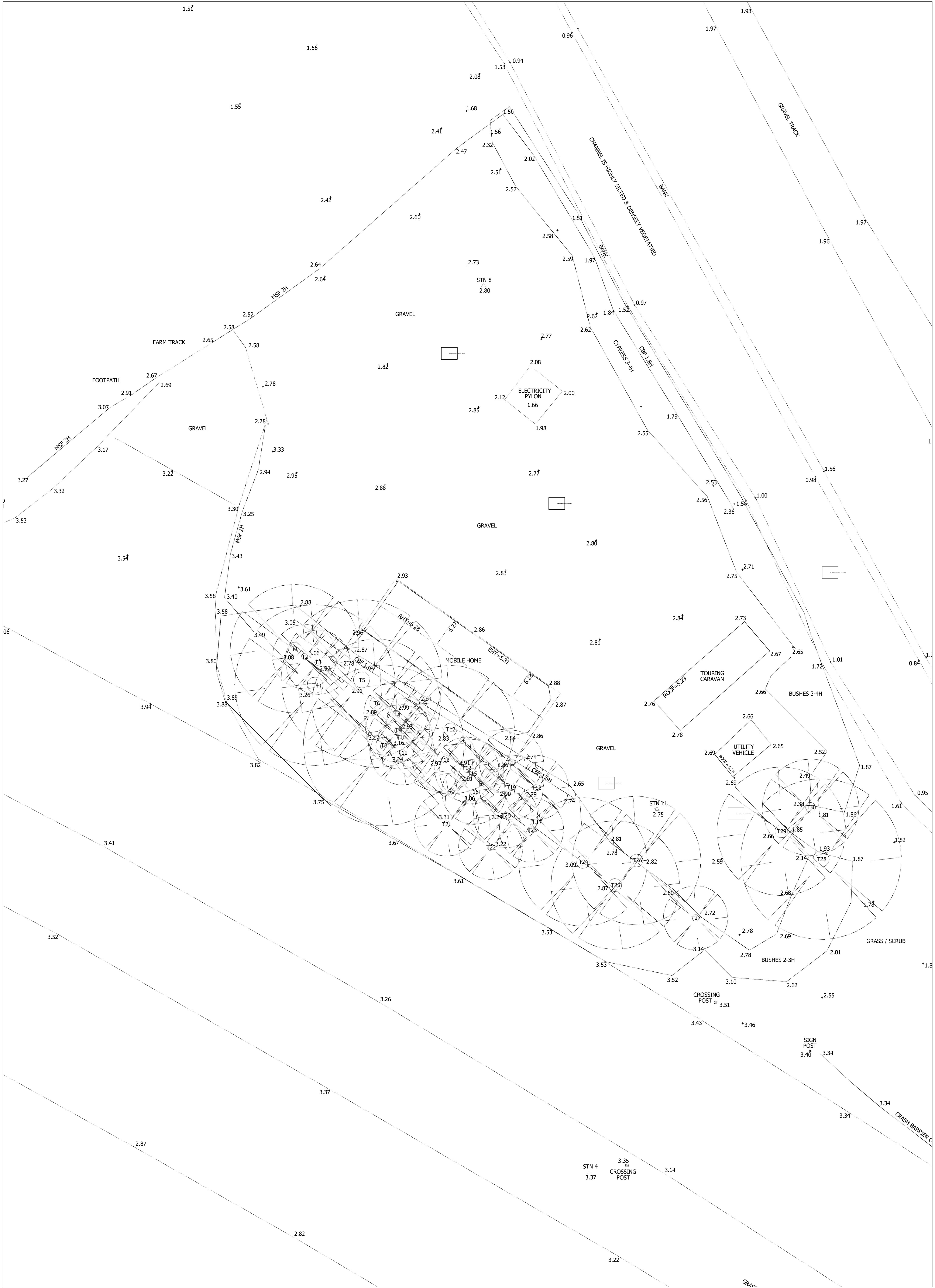
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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APPENDIX 01

Topographic Survey



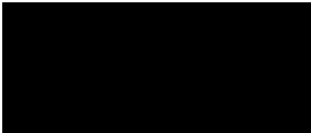


APPENDIX 02

Southern Water Asset Plan



SLR Consulting Limited
Treenwood House
Rowden Lane
Bradford on Avon
Wiltshire
BA15 2AU

Your ref Rustington
Our ref 279005
Date 05 February 2018
Contact 

Attention: Caroline Jeanne

Dear Customer

Re: Provision of public sewer and water main record extract

Location: The Stables, New Road, Rustington

Thank you for your order regarding the provision of extracts of our sewer and/or water main records. Please find enclosed the extracts from Southern Water's records for the above location.

We confirm payment of your fee in the sum of £49.92 and enclose a VAT receipt for your records.

Customers should be aware that there are areas within our region in which there are neither sewers nor water mains. Similarly, whilst the enclosed extract may indicate the approximate location of our apparatus in the area of interest, it should not be relied upon as showing that further infrastructure does not exist and may subsequently be found following site investigation. Actual positions of the disclosed (and any undisclosed) infrastructure should therefore be determined on site, because Southern Water does not accept any responsibility for inaccuracy or omission regarding the enclosed plan. Accordingly it should not be considered to be a definitive document.

Should you require any further assistance regarding this matter, please contact the LandSearch team.

Yours faithfully

LandSearch

VAT receipt

Ordered by:

SLR Consulting Limited
Rowden Lane
Bradford on von
Wiltshire
BA15 2AU

VAT registration number: 813 0378 56

Order reference: 279005

Your reference: Rustington

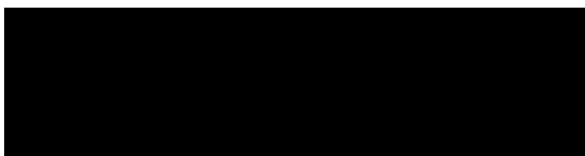
Receipt for provision of an extract from the public sewer and/or water main records.

Location	Costs
The Stables New Road Rustington	£41.60
Net total	£41.60
VAT	£8.32
Total	£49.92
Paid	Paid in full

Thank you for your payment:

Received on: 30 January 2018

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



Web: www.southernwater.co.uk

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

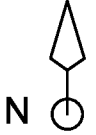


SEWER RECORDS PAGE 1 OF 2

103956



103378

504512	O.S. REF. TQ0403NE	Drawn by: kumaria	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement	 N	
	Title: 279005_The Stables, New Road,	Scale: 1:2500			
		Date: 05/02/2018	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.		

505456

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
5301X	6.112	2.601	150	VC	CIRC																		
5350X	6.103	3.404	600	UNK	CIRC																		
5355X	6.073	4.28	150	VC	CIRC																		
5401X	5.431	2.648	150	VC	CIRC																		
5402X	5.314	1.73	225	VC	CIRC																		
5403X			150	VC	CIRC																		
5404X	5.945	2.408	150	VC	CIRC																		
5405X	5.479	2.178	150	VC	CIRC																		
5406X	5.171	2.006	150	VC	CIRC																		
5407X	5.913	2.793	150	VC	CIRC																		
5450X	5.802	3.566	525	UNK	CIRC																		
5451X	5.787	3.305	600	UNK	CIRC																		
5452X	5.474	3.198	600	UNK	CIRC																		
5453X	5.2	3.095	600	UNK	CIRC																		
5454X	5.293	2.902	675	UNK	CIRC																		
5455X	5.489	3.34	375	UNK	CIRC																		
5456X	5.922	3.744	150	VC	CIRC																		
5502X	4.788	1.48	225	VC	CIRC																		
5503X	4.354	1.338	225	VC	CIRC																		
5551X	4.781	2.784	675	UNK	CIRC																		
5552X	4.369	2.637	675	UNK	CIRC																		
5553X	4.524	2.584	675	UNK	CIRC																		
5554X	4.039	2.491	675	UNK	CIRC																		
6301X	6.207	4.097	150	VC	CIRC																		
6350X	6.216	4.045	150	VC	CIRC																		
6401X	4.862	3.462	150	VC	CIRC																		
6402X	4.866	2.136	150	VC	CIRC																		
6403X	6.36	4.26	150	VC	CIRC																		
6404X	5.44	3.26	150	VC	CIRC																		
6405X	5.09	3.1	150	VC	CIRC																		
6450X	4.866	3.876	150	VC	CIRC																		
6451X	5.311	3.611	225	VC	CIRC																		
6452X	5.287	3.887	150	VC	CIRC																		
6501X	1.075	1.075	225	VC	CIRC																		
6502X	3.401	0.936	225	VC	CIRC																		
6503X	3.83	2.52	UNK	UNK	CIRC																		
6504X	3.185	0.717	225	VC	CIRC																		
6505X	3.112	0.685	225	VC	CIRC																		
6506X	4.21	2.46	150	VC	CIRC																		
6550X			150	UNK	CIRC																		
6602X	3.265	0.684	UNK	VC	CIRC																		
660PX			150	PE	CIRC																		
7301X	6.284	4.564	150	VC	CIRC																		
7501X	4.55	3.12	150	VC	CIRC																		
7502X	4.41	2.99	150	VC	CIRC																		
8302X	6.382	4.722	150	VC	CIRC																		
8303X	6.262	4.59	150	VC	CIRC																		
8400X	6.312	3.587	150	VC	CIRC																		
8401X	5.949	3.822	150	VC	CIRC																		
8402X	5.682	4.009	150	VC	CIRC																		
8403X	6.104	4.376	150	VC	CIRC																		
8404X	5.887	4.201	150	VC	CIRC																		
8405X	5.653	4.391	150	VC	CIRC																		
8406X	5.616	4.248	150	VC	CIRC																		
8407X	5.671	4.466	150	VC	CIRC																		
8502X			100	VC	CIRC																		
930PX		3.778	150	DI	CIRC																		
9313X	5.988	2.825	225	VC	CIRC																		
9402X	5.89	3.015	150	VC	CIRC																		
9403X	6.06	3.289	150	VC	CIRC																		
9404X	6.106	4.015	150	VC	CIRC																		
9405X	5.916	4.237	150	VC	CIRC																		

LINE STYLES / COLOURS

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

MATERIALS

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

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Min-e (SW)
Flushing ch. Min-e (F&C)
Flushing ch. No-e (SW)
Flushing ch. No-e (F&C)
Demanction Chamber

LEGEND - SEWERS

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Emptying valve
Penstock chamber
Demiboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change In sewer (s)
Change In sewer
Reflex valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Outfall
Emptying valve
Catchpit
Soakaway
Inlet
Balancing Pond

Wastewater treatment works
Marine treatment works
Outfall headworks
Vent
Vent column
Tidal storage tank
Blank end
Head of Public Sewer
Micro Pumping Station

SHAPES (S)

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

NODE REFERENCING SYSTEM

1st digit:	hundred metre easting identifier
2nd digit:	hundred metre northing identifier
3rd digit:	sewer type identifier
4th digit:	next sequential node

Drawn by: kumaria

Title: 279005_ The Stables, New Road,

Date: 05/02/2018



504500

FOUO

AK CI SI CO DI BAC GRP GRE	Drawn by: kumaria Scale: 1:2500 Date: 05/02/2018
PVC PE ST CSB CSU GI DS CPS HPE ??	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd. accept no responsibility in the event of inaccuracy. The actual positions of pipes should be determined on site. Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. W11298530

Drawn by: kumaria	O.S.Ref: TQ0403NE
Scale: 1:2500	
Date: 05/02/2018	TITLE: 279005_The Stables, New Road,
The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd. accept no responsibility in the event of inaccuracy. The actual positions of pipes should be determined on site.	
Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.	
	

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

APPENDIX 03

Environment Agency Flood Data



Environment
Agency

N



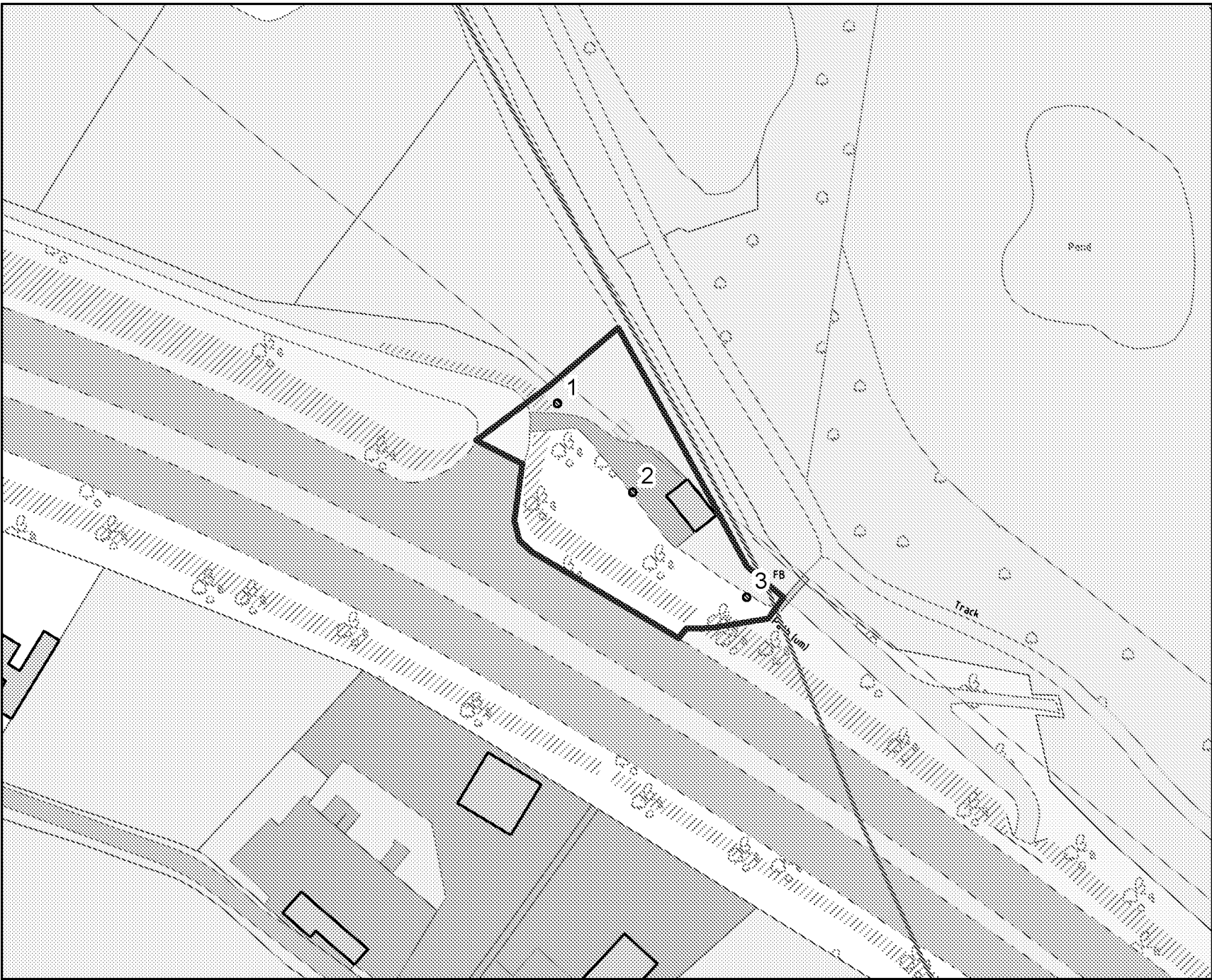
Legend

- Site Nodes
- ▬ Site Boundary
- ▬ Main River

Scale: 1:1,000

00.0250.05

Kilometers



Product 4 Flood Risk Data Requested by: Caroline Jeanne

Site: The Stables, New Road, Rustington.

Table 1: Water Levels: Fluvial Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	504975	103703	2.17	2.22	2.90	2.47
2	504989	103686	2.17	2.22	2.90	2.47
3	505010	103667	2.17	2.22	2.90	2.47

Table 2: Water Levels: Fluvial Defended

Node Reference	NGR		Modelled Flood Levels in Metres							
	Eastings	Northings	Defended Annual Exceedance Probability							
			20%	5%	2%	1.3%	1%	1% + CC	0.4%	0.1%
1	504975	103703	-	-	-	-	-	-	-	2.38
2	504989	103686	-	-	-	-	-	-	-	2.38
3	505010	103667	-	-	-	-	-	-	-	2.38

Table 3: Water Levels: Tidal Undefended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	2.34	2.49	3.00	2.52
2	504989	103686	2.34	2.49	3.00	2.51
3	505010	103667	2.34	2.49	3.00	2.51

Table 4: Water Levels: Tidal Defended

Node Reference	NGR		Modelled Flood Levels in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	-	-	3.13	-
2	504989	103686	-	-	3.13	-
3	505010	103667	-	-	3.12	-

Office Address: Guildbourne House, Chatsworth Road, Worthing BN11 1LD.

www.gov.uk/government/organisations/environment-agency

Table 5: Water Depth: Fluvial Undefended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	1%	1% Plus Climate Change	0.1%
1	504975	103703	0.25	0.30	0.99	0.56
2	504989	103686	0.20	0.25	0.93	0.50
3	505010	103667	0.17	0.22	0.90	0.47

Table 6: Water Depth: Fluvial Defended

Node Reference	NGR		Modelled Flood Depth in Metres							
	Eastings	Northings	Defended Annual Exceedance Probability							
			20%	5%	2%	1.3%	1%	1% + CC	0.4%	0.1%
1	504975	103703	-	-	-	-	-	-	-	0.16
2	504989	103686	-	-	-	-	-	-	-	0.28
3	505010	103667	-	-	-	-	-	-	-	0.39

Table 7: Water Depth: Tidal Undefended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	0.34	0.49	1.00	0.51
2	504989	103686	0.62	0.77	1.27	0.79
3	505010	103667	0.19	0.34	0.85	0.36

Table 8: Water Depth: Tidal Defended

Node Reference	NGR		Modelled Flood Depth in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			5%	0.5%	0.5% (2110)	0.1%
1	504975	103703	-	-	1.21	-
2	504989	103686	-	-	1.15	-
3	505010	103667	-	-	1.12	-

All levels taken from: The Lower Tidal River Arun Strategy completed in 2010 by Atkins.

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

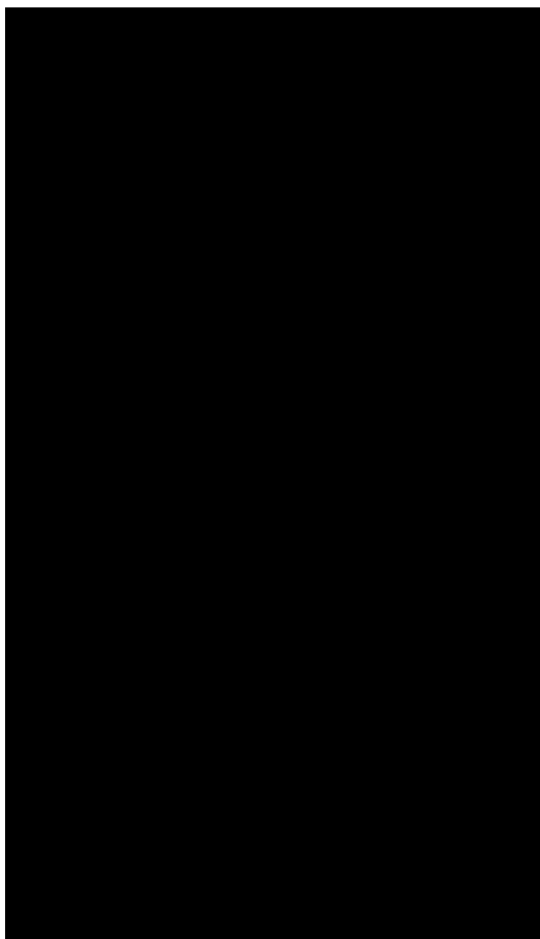
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