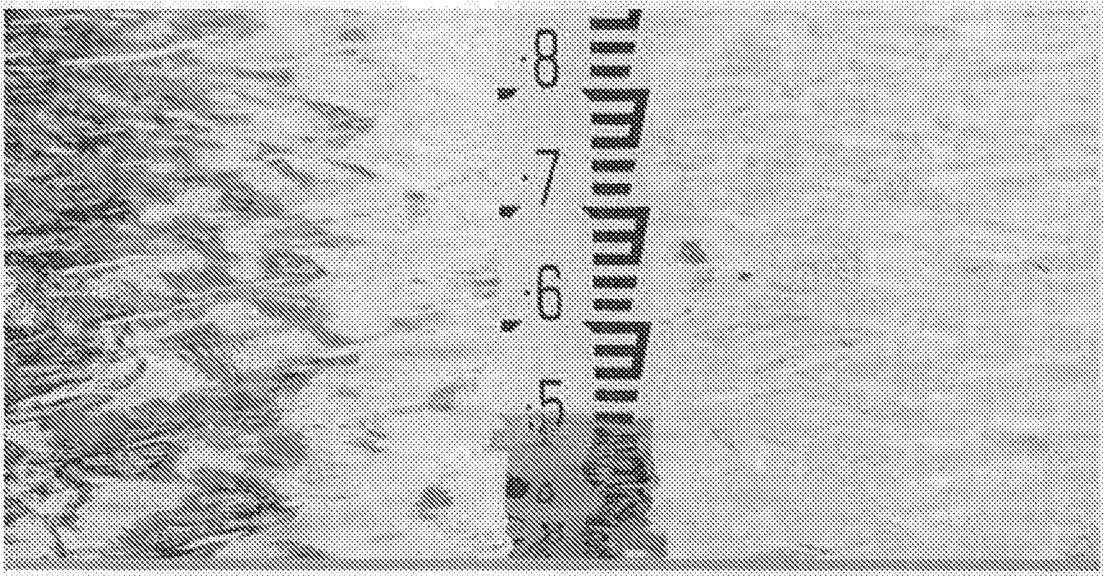
gtaCivils
Consulting Engineers



SuDS Drainage Statement

Comfort Inn, Lyminster Road, Littlehampton

Client
Mr Mousavizadeh
Comfort Inn
Arundel Hospitality Ltd
Lyminster Road, Littlehampton
Ref: 7321
Date: December 2018

Consulting Engineers
GTA Civils Ltd
Gloucester House
66a Church Walk
Burgess Hill
West Sussex RH15 9AS
[redacted]

ARUN DISTRICT COUNCIL LY/2/19/DOC

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2 Existing Site 3

3 Proposed Site & Drainage Strategy 4

Schedule of Appendices

A Site Location and Aerial Photo

B Topographic Survey Layout & Sewer Records

C Proposed Site Layout & Drainage Strategy

D Soakage Test Results

E Drainage Calculation Sheets

Preliminary issue	24th December 2018	JP	MR

Report by: John Pakenham BSc (Hons)
Checked by: Martin Roberts I Eng, ACIWEM, MCIHT

1 Introduction

1.1 This Statement has been prepared for Comfort Inn, Crossbush Service Station, Lyminster. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 GTA Civils Ltd. was appointed by the client to provide a SuDS Drainage Statement (SDS) and proposed strategy design in order to achieve Planning Approval at said property.

2 Existing Site

2.1 The application site lies within the area administered by Arun District Council (ADC). A site location map and an aerial view are shown in Appendix A.

2.2 The developable site area is 4098m^2 comprising a parking area and made ground/spoil heaps.

2.3 The topographic survey in Appendix B shows the site to be relatively flat with localised variations in level at an average of 16.00m AOD.

2.4 Geology: the BGS records show this area to be underlain by superficial deposits of sand and gravel which are themselves underlain by London clay. This was borne out by the findings of intrusive investigations (See Appendix B) which also confirmed the presence of varying depths of made ground.

2.5 Included within the land at the southern end of the site is the head of a watercourse which conveys water towards the west where it eventually discharges into tributaries of the River Arun.

2.6 The local area sewer records show that there are existing public rising mains beyond the southern boundary and that the existing hotel has its own pumped rising main which discharges at a point to the east of the site.

3 Proposed Site & Drainage Strategy

3.1 The approved layout shows proposals for 3 new accommodation blocks along with an extension to the capacity of the existing building. The proposed layouts, including drainage strategy, are shown in Appendix C.

3.2 Proposed surface water drainage: SuDS (Sustainable Urban Drainage Systems) Policy states that surface water runoff for use must be discharged according to the following hierarchy:

- Infiltration to ground;
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;
- Discharge to a combined sewer where there are absolutely no other options, and only where agreed in advance with the relevant sewerage undertaker.

3.3 The SuDS Hierarchy (infiltration, watercourses, public sewers, private sewers) was considered. Given the presence of a shallow horizon of slightly porous material, it will be possible to discharge only some of the surface water generated by the development directly to ground, via an area of permeable paving with porous sub-base, with the remainder being discharged to the watercourse at the southern end of the site at a restricted rate.

3.4 The proposed parking area will be of permeable paving with a porous sub-base of clean, coarse granular fill. This will have a 30% void ratio which will provide capacity for the storage of water while it is discharged to ground and to the water course.

3.5 The contributing (roof and parking) area of the development is 1866m^2. A soakage rate of 1 x 10^{-5}m/s has been used to provide a worst-case storage capacity, as per the findings of the site investigation (Appendix D). Calculation sheets in Appendix E show that a storage volume of 97.9m^3 is needed within the porous sub-base.

3.6 Water that does not infiltrate to ground will be conveyed to the watercourse vis an orifice-based control chamber. This will restrict flows to a potential maximum of 2.0L/S which is a low, yet practicable, rate which will allow the control of flows while minimising the likelihood of blockages.

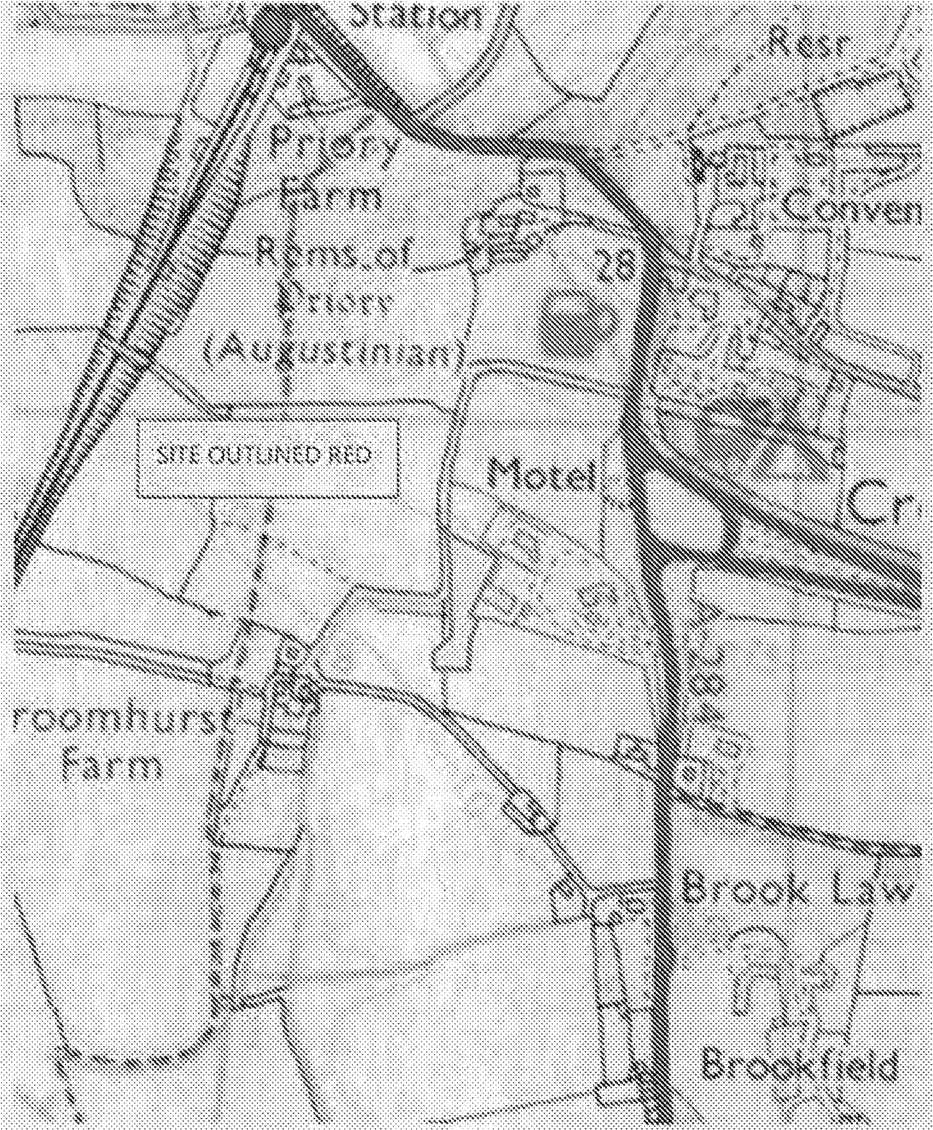
3.7 Maintenance of the SuDS system will be the overall responsibility of the Applicant. Regular inspections shall be made of the structure and manholes – in line with industry standards. A formal Maintenance Plan will be prepared during the next stage.

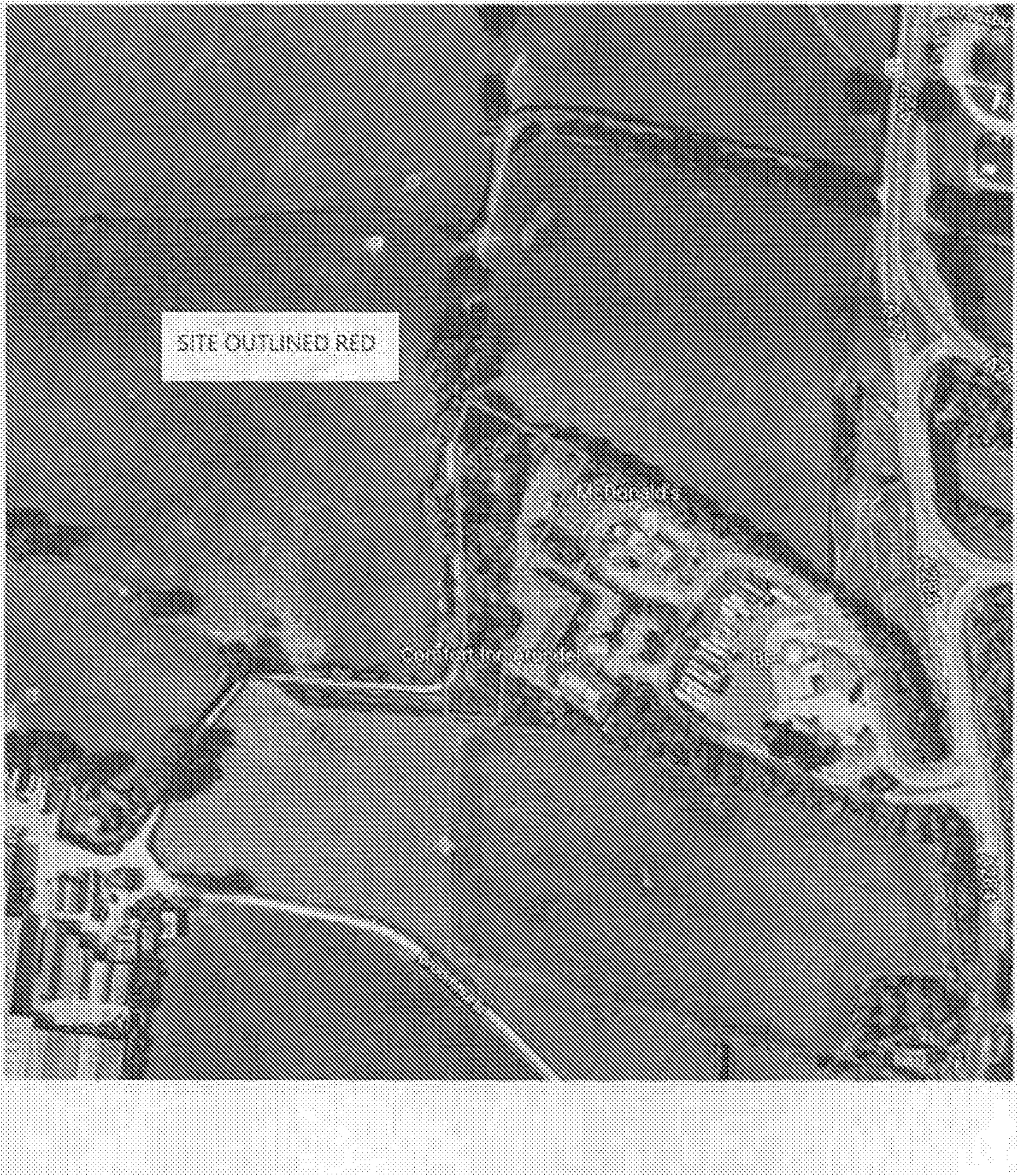
3.8 Exceedance flows: In the 1 in 1000 years event, initially the porous sub-base will fill and then overtop, resulting in a shallow overland flow. Given the relatively flat nature of the site, the presence of the watercourse at the southern boundary will act as a drain for excess flows, limiting the impact of any exceedance.

- End of Statement -

Appendix A

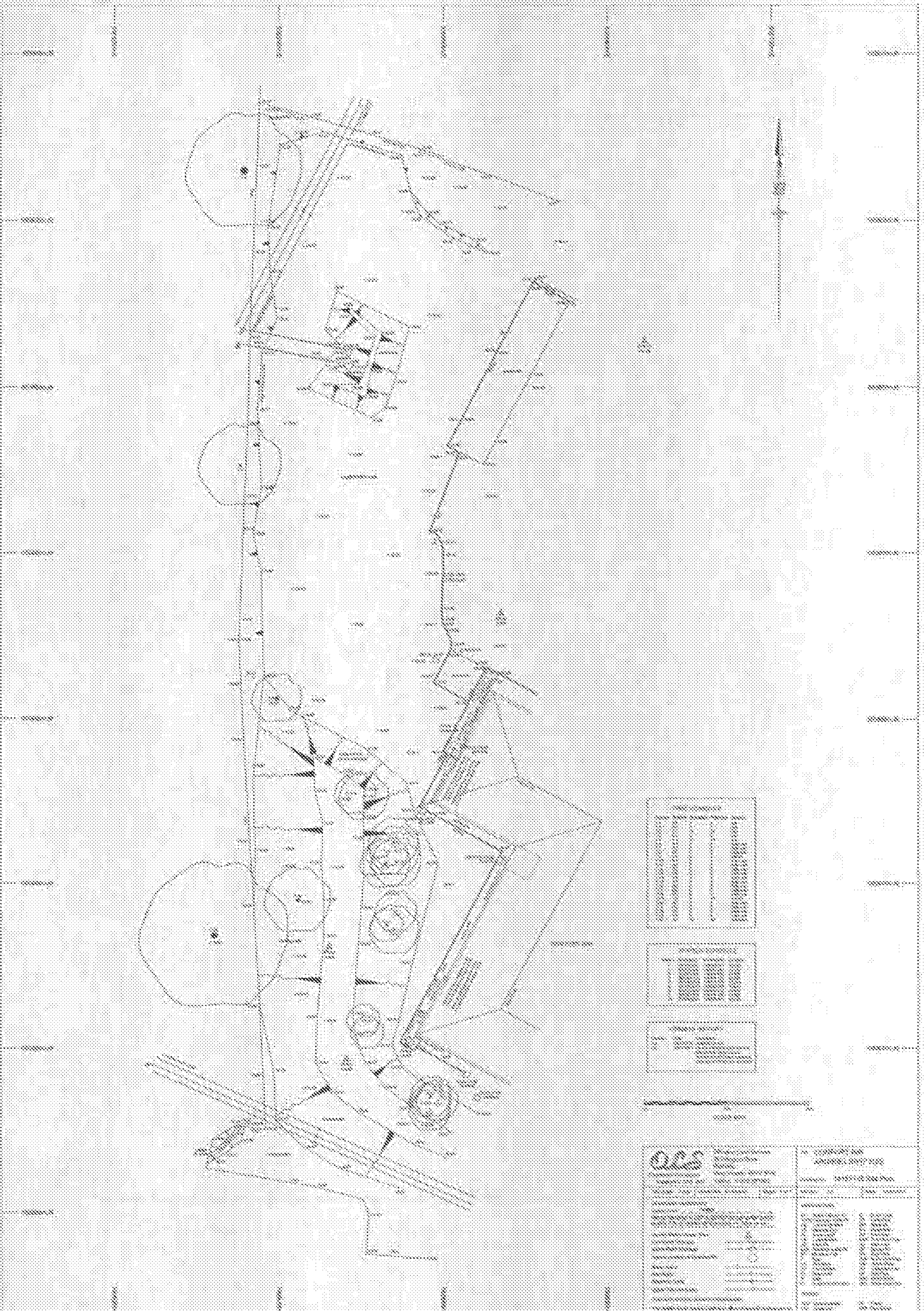
Site Location Map & Aerial Photo




SITE OUTLINED RED
McDonald's
Comfort Inn Arundel

Appendix B

Topographic Survey Layout & Sewer Records



Southern
Water

GTA Civils Ltd
Gloucester House 66A
Church Walk
Burgess Hill
West Sussex
RH15 9AS

Your ref 7321 JP/TJ
Our ref 302518
Date 26 July 2018

[redacted]

Attention: Chloe Fagan

Dear Customer

Re: **Provision of public sewer and water main record extract**

Location: **Comfort Inn, Lyminster Road, Littlehampton, West Sussex, BN17 7QQ**

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

Southern Water Southern House Capstone Road Chatham Kent ME5 7QA www.southernwater.co.uk

Southern Water Services Ltd . Registered Office: Southern House Yeoman Road Worthing BN13 3NX . Registered in England No. 2366670

VAT receipt

Ordered by:

GTA Civils Ltd
Church Walk
Burgess Hill
West Sussex
RH15 9AS

[redacted]

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

Location	Costs
Comfort Inn Lyminster Road Littlehampton West Sussex BN17 7QQ	£41.60
Net total	£41.60
VAT	£8.32
Total	£49.92
Paid	**Paid in full**

Thank you for your payment:

Received on: 25 July 2018

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

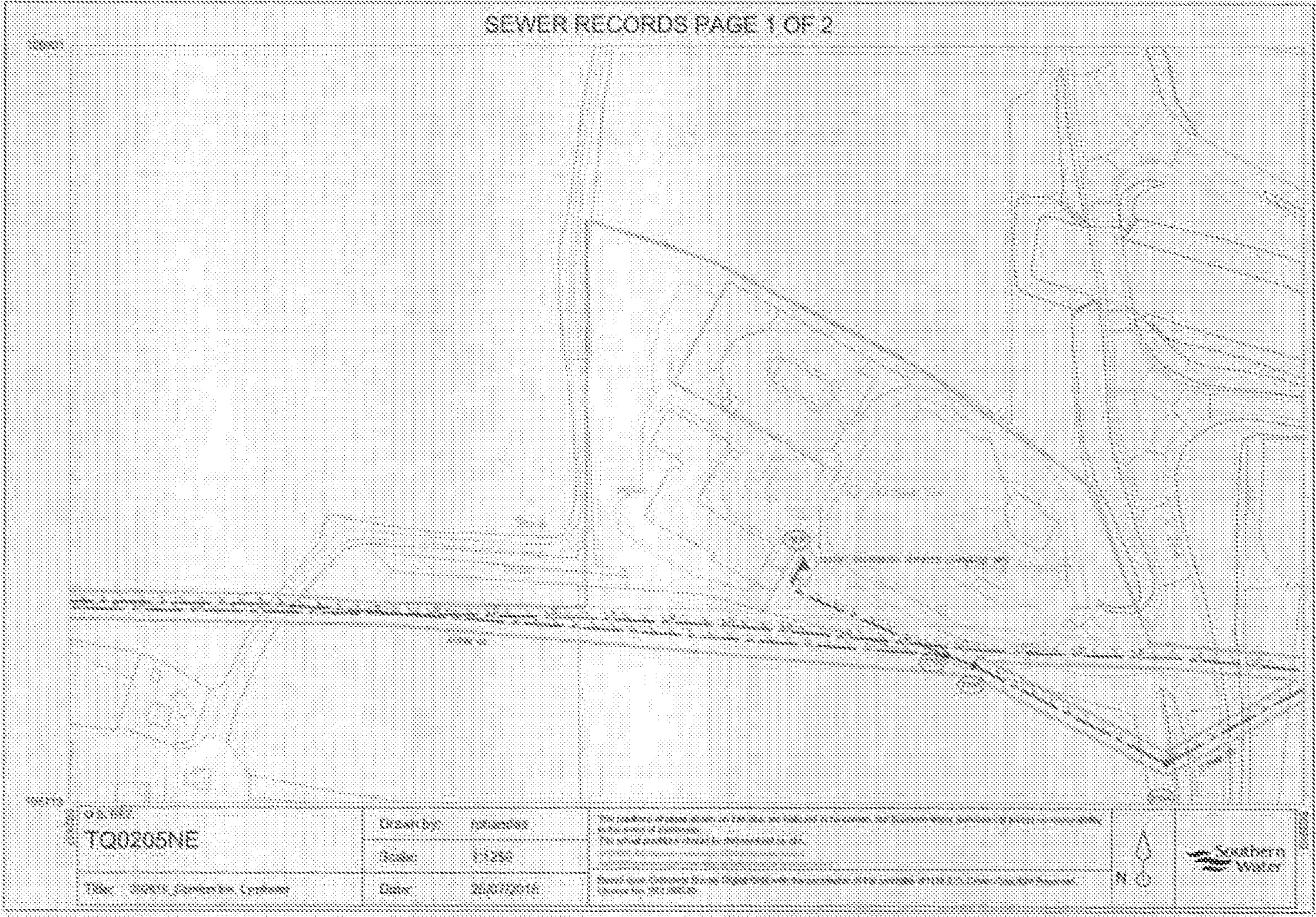
[redacted]

Web: www.southernwater.co.uk

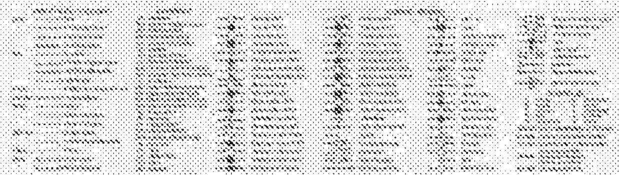
LandSearch
Southern Water Services
Southern House
Capstone Road
Chatham
Kent
ME5 7QA

Southern Water

SEWER RECORDS PAGE 1 OF 2



SEWER RECORDS PAGE 2 OF 2



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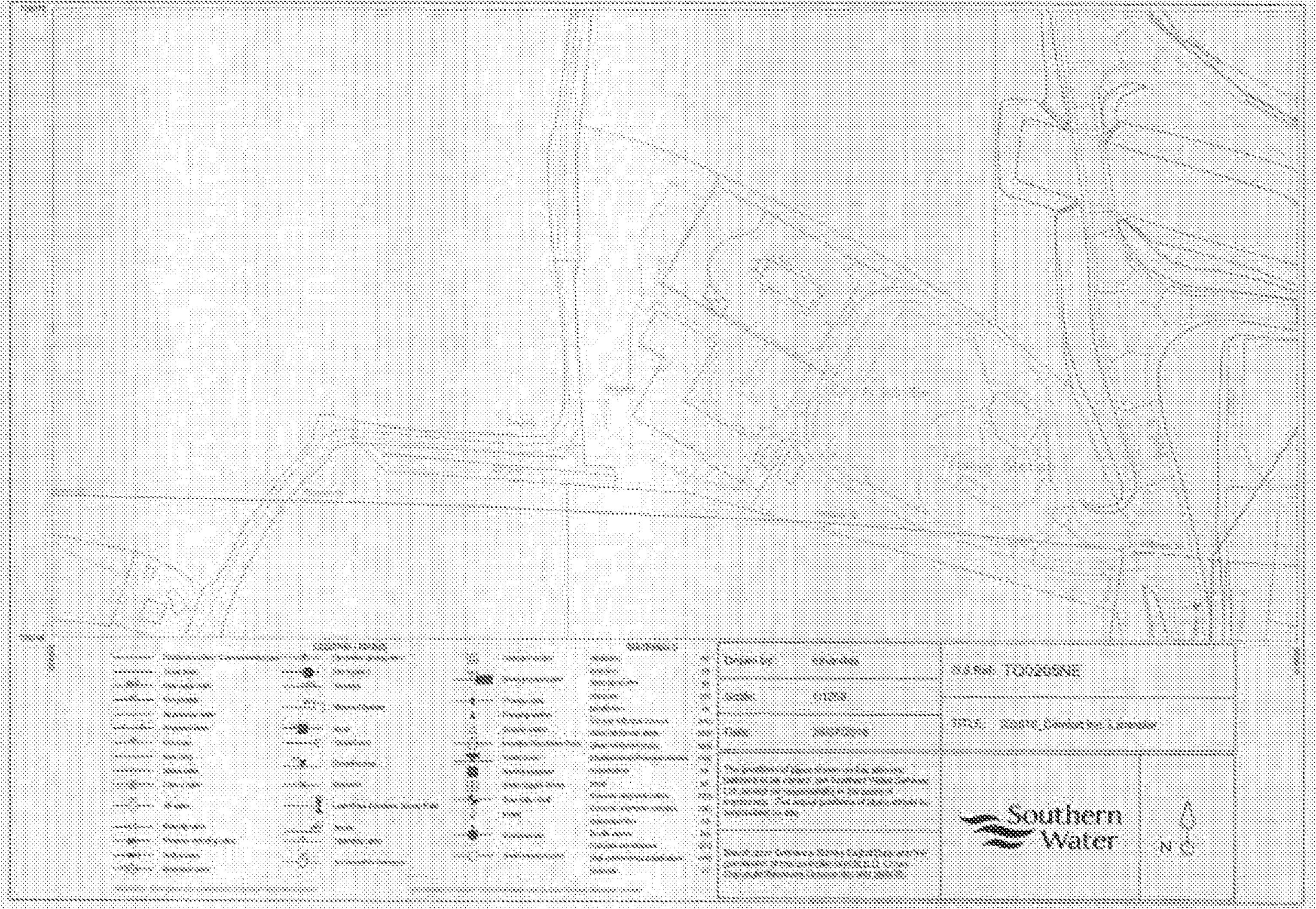
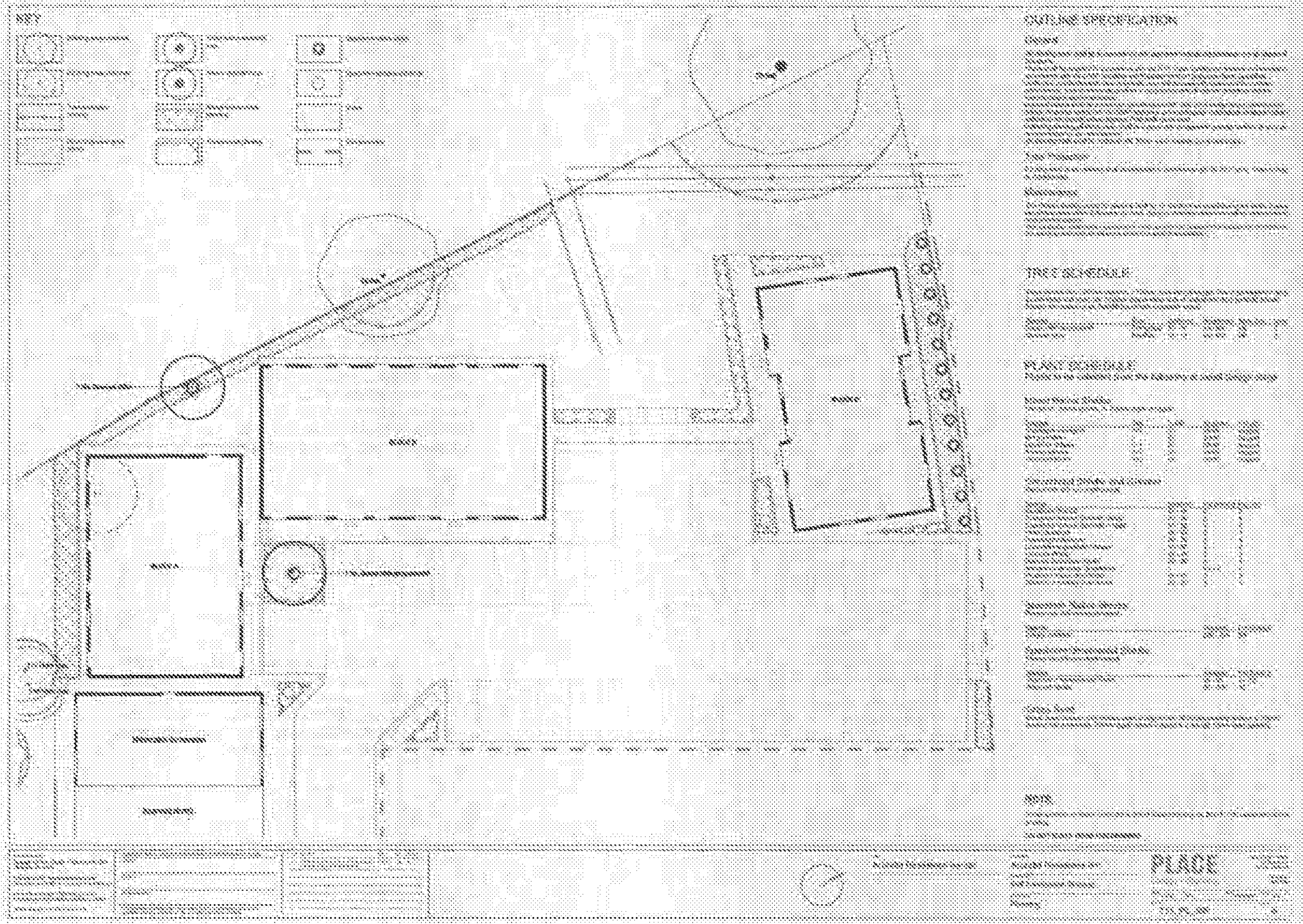
Title:	[illegible]
Date:	[illegible]

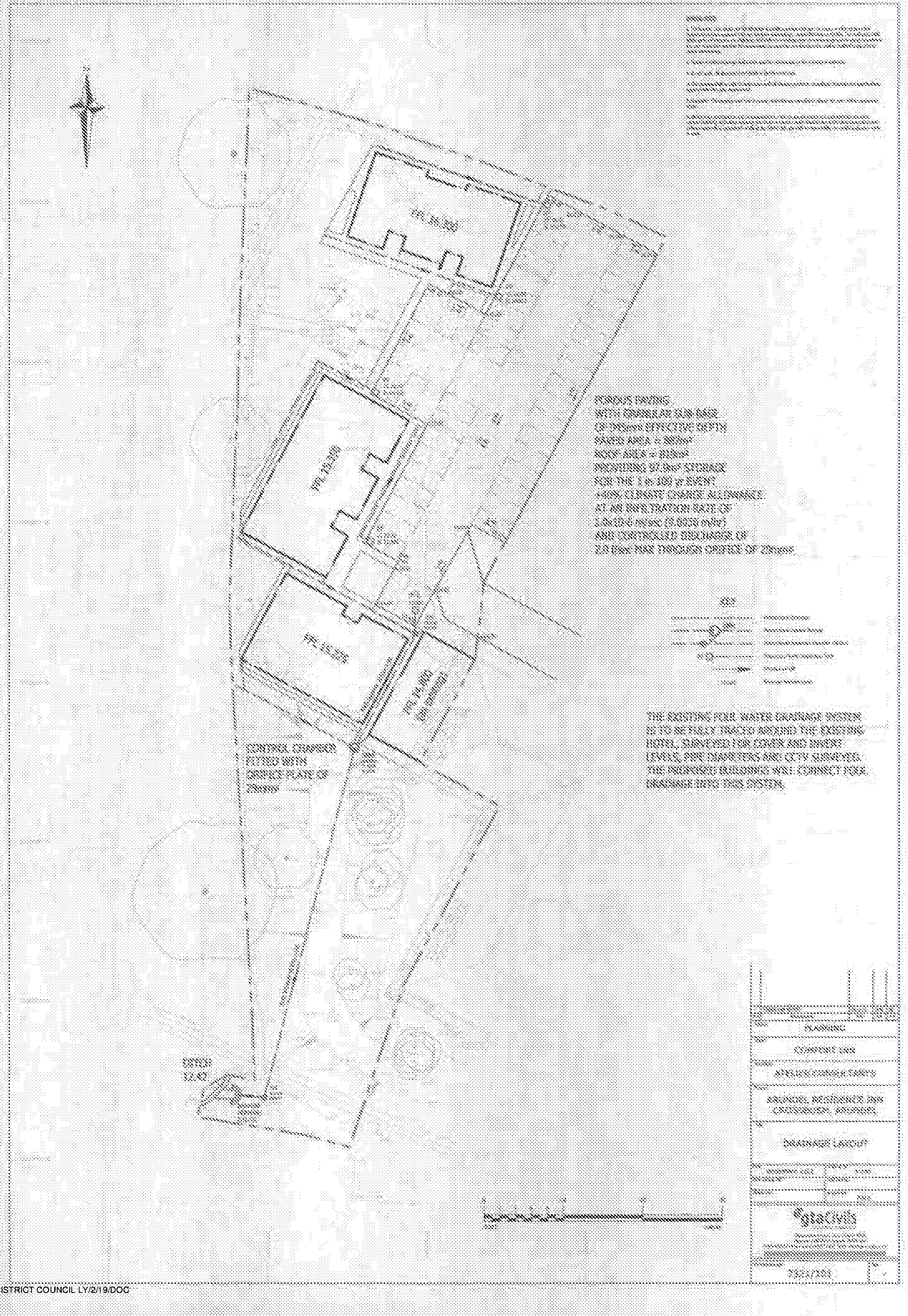
Southern Water


Southern Water
N
O.S.Ref: TQ0205NE
Scale: 1:1250

Appendix C

Proposed Site Layout & Drainage Strategy


KEY
OUTLINE SPECIFICATION
TREE SCHEDULE
PLANT SCHEDULE
PLACE


FFL 16.000
FFL 15.500
FFL 15.225
FFL 14.800
POROUS PAVING
WITH GRANULAR SUB-BASE
OF 395mm EFFECTIVE DEPTH
PAVED AREA = 865m²
ROOF AREA = 310m²
PROVIDING 97.9m³ STORAGE
FOR THE 1 in 100 yr EVENT
+40% CLIMATE CHANGE ALLOWANCE
AT AN INFILTRATION RATE OF
2.4x10-6 m/sec (0.0086 m/hr)
AND CONTROLLED DISCHARGE OF
2.0 l/sec MAX THROUGH ORIFICE OF 29mm
KEY
THE EXISTING FOUL WATER DRAINAGE SYSTEM
IS TO BE FULLY TRACED AROUND THE EXISTING
HOTEL, SURVEYED FOR COVER AND INVERT
LEVELS, PIPE DIAMETERS AND CCTV SURVEYED.
THE PROPOSED BUILDINGS WILL CONNECT FOUL
DRAINAGE INTO THIS SYSTEM.
CONTROL CHAMBER
FITTED WITH
ORIFICE PLATE OF
29mm
DITCH
12.42
PLANNING
COMFORT INN
ATELIER CONSULTANTS
ARUNDEL RESIDENCE INN
CROSSBUSH, ARUNDEL
DRAINAGE LAYOUT
gtaCivils
7321/201

ARUN DISTRICT COUNCIL LY/2/19/DOC

Appendix D

Site Investigation

Site Adjacent to Comfort Inn
Arundel
West Sussex

In Situ Infiltration Testing Report

ASHDOWN SITE INVESTIGATION
L•I•M•I•T•E•D

Report No. R18-12799

April 2018

Report prepared for the benefit of:

Arundel Residence Inn Ltd
Lyminster Road
Littlehampton
BN17 7QQ

Document Control		
Report Section	**Prepared By**	**Approved By**
In Situ Infiltration Testing Report	[redacted] Lucy Griffiths BSc FGS	[redacted] Rebecca Webb BSc FGS

Revisions		
Revision No.	**Revision Date**	**Notes**

Limitations

This report was prepared specifically for the Client's project and may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned.

1. INTRODUCTION

It is understood that a surface water management strategy is to be implemented for a proposed new development at land adjacent to Comfort Inn, Arundel, West Sussex.

Ashdown Site Investigation Limited was requested to provide an estimate for carrying out in situ infiltration testing at the site by Peter Southgate of Atelier Consultants, Old Rectory Cottage, 55C Kingston Lane, Southwick BN42 4SP. The scope of the works allowed for and the terms and conditions under which the works were to be undertaken were set out within the offer letter Q18-6868 dated 12th February 2018. The instruction to undertake the works was received on behalf of the client, Arundel Residence Inn Ltd., in an email dated 22nd February 2018.

The objectives of the works were to:

a) Investigate the shallow ground and groundwater conditions at exploratory hole locations prescribed by others; and
b) Provide calculated soil infiltration rates to assist others in undertaking design of infiltration systems.

2. GROUND INVESTIGATION

The ground investigation comprised the excavation of four dynamic sampler boreholes and two hand dug trial pits. The boreholes were drilled to depths of between 2.60m and 6.00m, and the trial holes were excavated to depths of 0.65m and 0.80m below existing ground level. In situ soakage testing was carried out within exploratory holes WS01, WS02, TP01 and TP02. The fieldwork was carried out on 6th March 2018. The exploratory hole locations are shown on Figure 1.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the appended exploratory hole records. Notes to assist interpretation of the records are also appended.

2.1 Installations

Groundwater monitoring standpipes were installed to respective depths of 6.00m and 4.00m in boreholes BH01 and BH02. Descriptions of the installations are shown on the appended exploratory hole records.

Groundwater data loggers were installed within the standpipes on the 6th March 2018 and collected on the 10th April 2018. The data loggers were programmed to collect readings at 15 minute intervals. The results of the groundwater monitoring are appended to this report.

3. GROUND CONDITIONS

3.1 Stratigraphy

3.1.1 Surface Covering

Each of the exploratory holes was excavated through a surface cover of topsoil some 100mm to 160mm in thickness.

3.1.2 Made Ground/Reworked Ground

Made ground/reworked ground, generally comprising slightly gravelly slightly sandy silty clay was recorded to depths of between 0.30m and 1.20m below ground level. The gravel fraction comprised variable quantities of flint, concrete and brick.

At the base of the made ground/reworked soils in borehole WS01 and TP01, organic material and relict topsoil was encountered to depths of 0.50m below ground level.

3.1.3 Raised Beach Deposits

Underlying the made ground/reworked ground, exploratory holes TP02, BH02 and WS02, located in the central and southern part of the site, progressed into undisturbed gravelly sandy clay soils considered to be representative of the Raised Beach Deposits indicated to underlie the site on published geological mapping datasets. These soils persisted to the full depths of these exploratory hole positions.

3.1.4 London Clay Formation

Underlying the made ground/reworked ground, within exploratory holes BH01, WS01 and TP01, located in the northern part of the site, clay soils were encountered to the full depth of these positions. These soils are considered to be representative of the London Clay Formation deposits indicated to underlie the site on published geological maps.

3.2 Stability

Each of the exploratory holes was recorded to remain stable for the duration of the investigation.

3.3 Groundwater

Each of the exploratory holes were recorded to remain dry for the duration and on completion of drilling/ excavation.

Groundwater within the standpipe installed at the position of borehole BH01 rose steadily over the monitoring period to a depth of some 2.55m below ground level. At the position of borehole BH02 the water was recorded close to ground level during several intervals over the monitoring period. However, during collection of the datalogger it water was noted ponding at surface at this position, and there remains the possibility that peaks water levels observed during the monitoring period may have been influenced by percolation of surface water into the standpipe installation.

4. STORMWATER INFILTRATION SYSTEMS

In situ infiltration testing[1] was carried out in both trial pits. During each test performed, the water level within the test pit did not fall below 75% to 25% of the initial test depth and calculation of the soil infiltration rate in accordance with the BRE digest was not possible. For each test, the soil infiltration rate has therefore been calculated by dividing the volume of water lost during the test by the product of the average surface area of the trial pit in contact with water during the test period and the test duration in seconds.

In situ infiltration testing[2] was also undertaken within boreholes WS01 and WS02.

The infiltration rates derived from the tests are summarised in the following table.

Table 1. Calculated Infiltration Rates

Exploratory Hole	**Test Response Zone Depth (m)**		**Stratum**	**Infiltration Rate (f) (m/sec)**
	Top	Bottom		
WS01 Borehole	2.00	3.00	London Clay Formation	Negligible – the water level fell only 10mm during the test period of 185 minutes
WS02 Borehole	1.00	2.60	Raised Beach Deposits	Negligible – the water level fell only 20mm during the test period of 190 minutes
TP01 Trial pit	0.50	0.80	London Clay Formation	1.9×10^{-8}
TP02 Trial pit	0.35	0.65	Raised Beach Deposits	1.0×10^{-6}

The results from the infiltration tests indicate that the underlying natural soils possess poor to negligible infiltration characteristics. The results should be provided to engineers responsible for the design of the drainage system.

Ashdown Site Investigation Ltd.
April 2018

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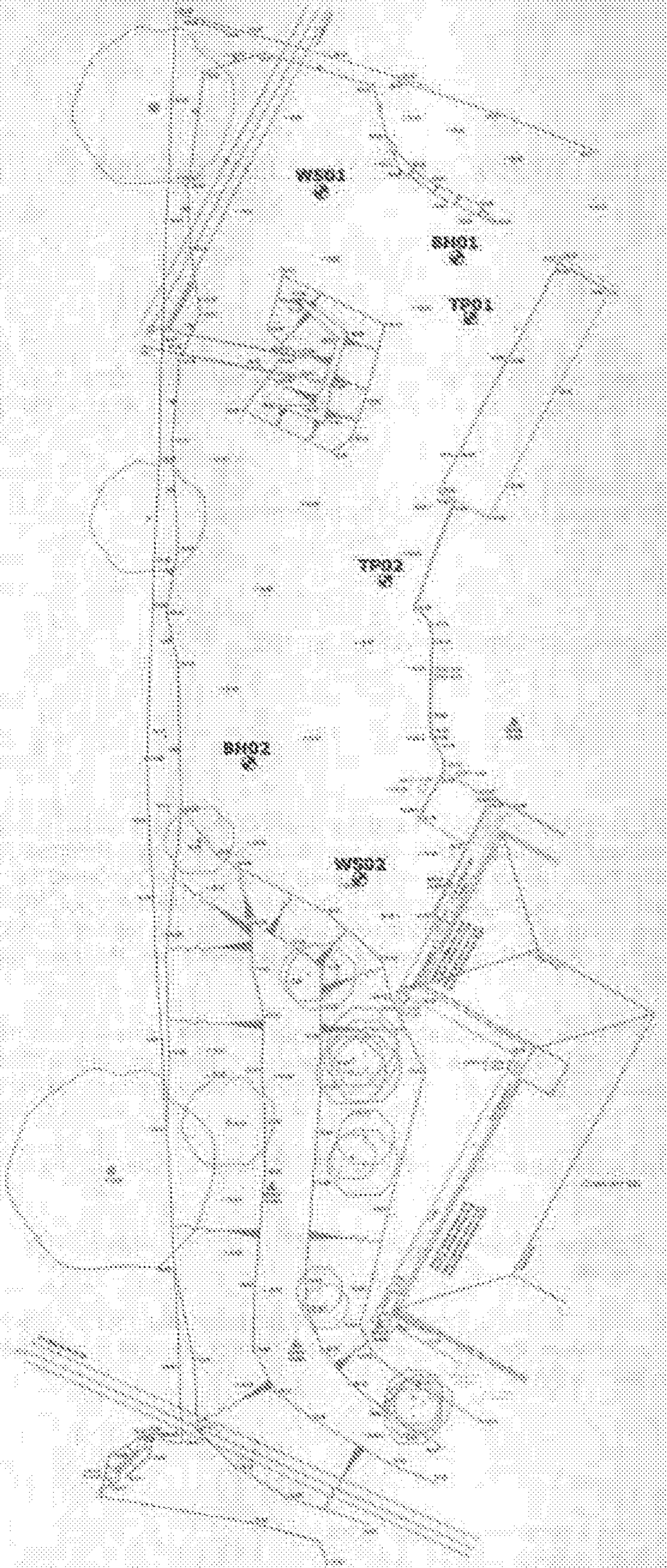
[1] Conducted in general accordance with the requirements of BRE 365, Soakaway Design.

[2] Conducted in accordance with The Soakaway Design Guide, published by Kent County Council, July 2000.

APPENDICES

Figure 1 Site Plan
Exploratory Hole Notes
Exploratory Hole Records
Summary of Trial Pit Falling Head Soakage Test Results
Summary of Borehole Falling Head Soakage Test Results
Groundwater Monitoring Results



ASHDOWN SITE INVESTIGATION
L·I·M·I·T·E·D

[illegible]

[illegible]	Date	[illegible]
[illegible]	April 2019	[illegible]

Site

[illegible]
West Sussex

Site Plan

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: - also known as 'U100' or 'U4' - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Uo	Sample not obtained.
U*	Full penetration of sample not obtained.
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample.
R	Root Sample.
B	Bulk Disturbed Sample.
W	Water Sample.
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
Vi	Vial Sample

In situ Testing

S	Standard penetration test (SPT): In the borehole record the depth of the test is that at the start of the normal 450mm penetration. The number of blows per 75mm penetration is recorded, with the initial 150mm for seating blows being recorded followed by the blows recorded for the remaining 300mm of the test. The total blows to achieve the standard penetration of 300mm, discounting the seating blows, is noted as the N value on the log. Where the full penetration of the test cannot be achieved (a refusal) the number of blows achieved and the penetration achieved will be reported.
C	Standard Penetration Test (SPT) conducted usually in coarse grained soils or weak rocks using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone fitted in place of the sampler. Variations in test results are indicated by the same symbols as for the SPT (above).
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: See "In Situ Testing Notes" for full description. Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column. In sand the number of blows is approximately equivalent to the SPT "N" value.

Excavation Method

CP	Cable Percussion Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1:2002+A1:2013) and Part 2 Principles of classification (BS EN 14688-2:2004+A1:2013) as well as the BS5930:2015 code of Practice for Ground Investigations.

Fine Grained Soils

The consistency of fine grained soils given in the report is based on visual inspection of the samples and the strength is based on results of in situ and/or laboratory undrained shear strength tests when carried out.

The consistency is determined on the following basis:

Consistency	**Manual Test**
Very Soft	Soil exudes between fingers when squeezed in hand
Soft	Soils can be moulded by light finger pressure
Firm	Cannot be moulded by finger but rolled to 3mm threads without breaking/crumbling
Stiff	Crumbles/breaks when rolled to 3mm thick threads but can be moulded into a lump again
Very Stiff	Cannot be moulded and crumbles under pressure, can be indented by thumbnail

The terms used for the designation of the undrained shear strength are as follows:

Undrained Shear Strength	
Extremely to Very Low	<20 kPa
Low	20-40 kPa
Medium	40-75 kPa
High	75-150 kPa
Very High	150-300 kPa
Extremely high	300-600 kPa

Note: The undrained shear strength of the soils is measured either by laboratory testing or in the field using hand shear vane.

It is recognised that any coarse grained soil that has in excess of approximately 35% fine grained soil (clay and silt) can often be expected to behave as a fine grained soil despite the dominance of coarse grained material within the soil mass. To reflect this, it is the soil type that dominates the behaviour of the soil mass that appears on the exploratory hole records.

Coarse Grained Soils

The relative densities of coarse grained soils (sand and gravel) given in the report are based on field estimations and the results of the Standard Penetration Test (SPT) and equivalent correlation from other testing. The classification in terms of "N" Values is as follows:

SPT 'N' Value	**Relative Density**
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Greater than 50	Very Dense

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1:2003) as well as the BS5930:2015 code of Practice for Ground Investigations.

The description of rock mass includes the type of rock, structure, discontinuities and weathering.

The unconfined compressive strength of rock material is determined on the following basis:

Term	**Field Identification**	**Unconfined Compressive Strength (MPa)**
Extremely Weak	Indented by thumbnail	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, peeled by pocket knife	1 to 5
Weak	Peeled by pocket knife with difficulty, shallow indentations made by firm blow with geological hammer	5 to 25
Medium Strong	Cannot be peeled or scraped with knife, can be fractured with single firm blow of geological hammer	25 to 50
Strong	Requires more than one blow of geological hammer to fracture	50 to 100
Very Strong	Requires may blows of geological hammer to fracture it	100 to 250
Extremely Strong	Can only be chipped with geological hammer	Greater and 250

The terms describing discontinuity and bedding spacing are as follows:

Bedding Thickness	
Very Thick	>2000mm
Thick	2000-600mm
Medium	600-200mm
Thin	200-60mm
Very Thin	60-20mm
Thickly Laminated	20-6mm
Thinly Laminated	<6mm

Discontinuity Spacing	
Very Wide	>2000mm
Wide	2000-600mm
Medium	600-200mm
Close	200-60mm
Very Close	60-20mm
Extremely Close	<20mm

Chalk

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk. See additional chalk classification notes.

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex		
Job Number: R18-12789		
Start Date: 06/03/2018 **End Date:** 06/03/2018	**Borehole Number:** BH01	Sheet 1 of 2

Backfill	Samples and In Situ Testing: Sample/Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth	Stratum Description
						0.00	Topsoil
	D	0.30				0.10	MADE GROUND/ Reworked: Brown, orange brown and occasionally grey gravelly slightly sandy silty clay. Gravel is angular to subrounded fine to coarse flint with occasional concrete and brick. Sand is fine to coarse.
	D	0.80				0.80	Orange brown mottled grey CLAY. (London Clay Formation)
	D	1.50					
	D	2.50					with selenite crystals below 2.60m depth.
							Becoming dark grey brown below 3.00m depth.
	D	3.50					
	D	4.20					
	D	4.80				5.00	

Continued on next sheet

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 6.00m depth, 6.00m to 1.00m slotted pipe with gravel surround, 1.00m to ground level plain pipe with bentonite seal, completed with end cap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

[illegible]

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: R18-12799

Start Date: 06/03/2018

End Date: 06/03/2018

Borehole Number: BH01

Sheet 2 of 2

Standpipe	Samples and In situ Testing: Sample/Test Type	Depth from (m)	Depth to (m)	Test Result	Legend	Depth	Stratum Description
							Dark grey CLAY with occasional selenite crystals. (London Clay Formation)
						6.00	End of Borehole at 6.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 6.00m depth; 6.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with end cap and security cover (cemented flush with ground surface).

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: R18-12789

Start Date: 06/03/2018

End Date: 06/03/2018

Borehole Number: **BH02**

Sheet 1 of 1

Backfill	Sample/Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth	Stratum Description
						0.00	Topsoil
						0.10	MADE GROUND/ Reworked: Dark brown grey slightly gravelly slightly sandy silty clay. Gravel is angular to rounded fine to coarse flint. Sand is fine to coarse.
	D	0.50					
	D	1.10					
						1.20	Brown mottled orange and grey slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. Sand is fine to medium. (Raised Beach Deposits)
	D	1.80					
	D	2.20				2.20	Brown and orange brown mottled grey gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse. (Raised Beach Deposits)
	D	2.80					
	D	3.20					
	D	3.80					
						4.00	End of borehole at 4.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 4.00m depth - too dense.
Standpipe installed to 4.00m depth; 4.00m to 1.00m slotted pipe with gravel surround, 1.00m to ground level plain pipe with bentonite seal; completed with end cap and security cover cemented flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

[illegible]

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: 818-12799

Start Date: 05/03/2018

End Date: 05/03/2018

Trial Pit Number: TP01 Sheet 1 of 1

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
				▨	0.00	Topsoil.
D	0.20			▨	0.10	MADE GROUND/ Reworked: Light brown mottled light grey and orange brown gravelly silty clay. Gravel is angular to subrounded fine to coarse flint with occasional cobbles.
D	0.40			▨	0.30	Relict topsoil: Dark brown gravelly slightly sandy silty clay.
D	0.80			▤	0.50	Light brown CLAY with occasional subrounded to rounded fine to coarse gravel of flint. (London Clay Formation)
					0.80	End of trial pit at 0.80m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: HDP

Pit Length: 0.30m

Pit Width: 0.28m

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: R18-12793

Start Date: 05/03/2018

End Date: 06/03/2018

Trial Pit Number: **TP02**

Sheet 1 of 1

Samples and In Situ Testing						
Sample No/ Type	Depth (metres)	Depth (Blows)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
				▨	0.00	Topsoil.
				▨	0.10	MADE GROUND/ Reworked: Dark brown gravelly sandy clay. Gravel is angular to subangular fine to coarse flint. Sand is fine to coarse.
				▤	0.35	Orange brown and brown gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse flint. Sand is fine to coarse. (Raised Beach Deposits)
D	0.60					
					0.65	End of trial pit at 0.65m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.65m depth - too dense.

Excavation Method: HDA

Pit Length: 0.28m

Pit Width: 0.25m

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: R18-12799

Start Date: 06/03/2018

End Date: 06/03/2018

Borehole Number: WS01

Sheet 1 of 1

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
						0.00	Topsoil.
						0.10	MADE GROUND/ Reworked: Brown very gravelly slightly sandy silty clay. Gravel is angular to subangular fine to coarse flint.
						0.20	Organic material (bark chippings).
	D	0.30	0.50			0.35	Relict topsoil.
						0.50	Grey mottled orange brown CLAY with occasional angular to subangular fine to coarse gravel of flint. (London Clay Formation)
	D	0.60					
	D	1.20					with rare gravel of flint below 1.30m depth.
	D	1.80					
							with no flint gravel and becoming light grey below 2.00m depth.
	D	2.20					
	D	2.80					
						3.00	End of borehole at 3.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

[illegible]

Site Name: Site Adjacent to Comfort Inn, Arundel, West Sussex

Job Number: R18-12799

Start Date: 06/03/2018
End Date: 06/03/2018

Borehole Number: **WS02**

Sheet 1 of 1

	Samples and In Situ Testing						
Backfill	Sample/Test Type	Depth from (m)	Depth to (m)	Test Result	Legend	Depth	Stratum Description
					▨	0.00	Topsoil.
					▨	0.10	MADE GROUND/ Reworked: Dark brown grey slightly gravelly slightly sandy silty clay. Gravel is angular to subrounded fine to coarse flint.
	D	0.50			▨		
					▨	1.00	Orange brown gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse. (Raised Beach Deposits)
	D	1.20			▨		
	D	1.50			▨		
					▨		with no gravel between 1.00m and 1.70m depth.
					▨		becoming slightly gravelly below 1.80m depth.
					▨	1.90	Brown mottled grey slightly sandy silty CLAY. Sand is fine to medium. (Raised Beach Deposits)
	D	2.10			▨		
					▨	2.20	Orange brown gravelly silty CLAY. Gravel is angular to subangular fine to coarse flint. (Raised Beach Deposits)
	D	2.60				2.60	End of borehole at 2.60m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 2.60m depth - too dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

Site: Site Adjacent to Comfort Inn, Arundel, West Sussex
Report No.: R18-12799
Sheet No.: 1 of 1

SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

TP01	
Time (mins)	Depth to water (m bgl)
0	0.50
1	0.50
2	0.50
4	0.50
8	0.50
10	0.50
12	0.50
18	0.50
25	0.50
38	0.51
60	0.55
80	0.55
100	0.56
120	0.57
140	0.57
180	0.60
200	0.61
220	0.61
Pit Length - 0.30m Pit Width - 0.28m Pit Depth - 0.80m bgl	

TP02	
Time (mins)	Depth to water (m bgl)
0	0.35
1	0.35
2	0.35
4	0.36
6	0.36
10	0.36
12	0.36
18	0.36
20	0.37
30	0.37
45	0.38
60	0.38
90	0.38
Pit Length - 0.28m Pit Width - 0.25m Pit Depth - 0.65m bgl	

Remarks: bgl - below ground level.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Site Adjacent to Comfort Inn, Arundel, West Sussex
Report No.: R18-12799
Sheet No.: 1 of 1

SUMMARY OF BOREHOLE FALLING HEAD SOAKAGE TEST RESULTS

WS01	
Time (mins)	Depth to water (m bgl)
0	0.12
1	0.12
2	0.12
4	0.12
6	0.12
12	0.12
24	0.12
36	0.13
40	0.13
60	0.13
80	0.13
100	0.13
120	0.13
185	0.13
Borehole Depth (m bgl)	3.00
Casing Depth (m bgl)	2.00
Borehole Diameter (mm)	92.00
Casing Diameter (mm)	105.00

WS02	
Time (mins)	Depth to water (m bgl)
0	0.00
1	0.00
2	0.00
5	0.00
10	0.00
15	0.00
22	0.00
35	0.00
40	0.01
60	0.01
80	0.02
130	0.02
150	0.02
190	0.02
Borehole Depth (m bgl)	2.60
Casing Depth (m bgl)	1.00
Borehole Diameter (mm)	92.00
Casing Diameter (mm)	105.00

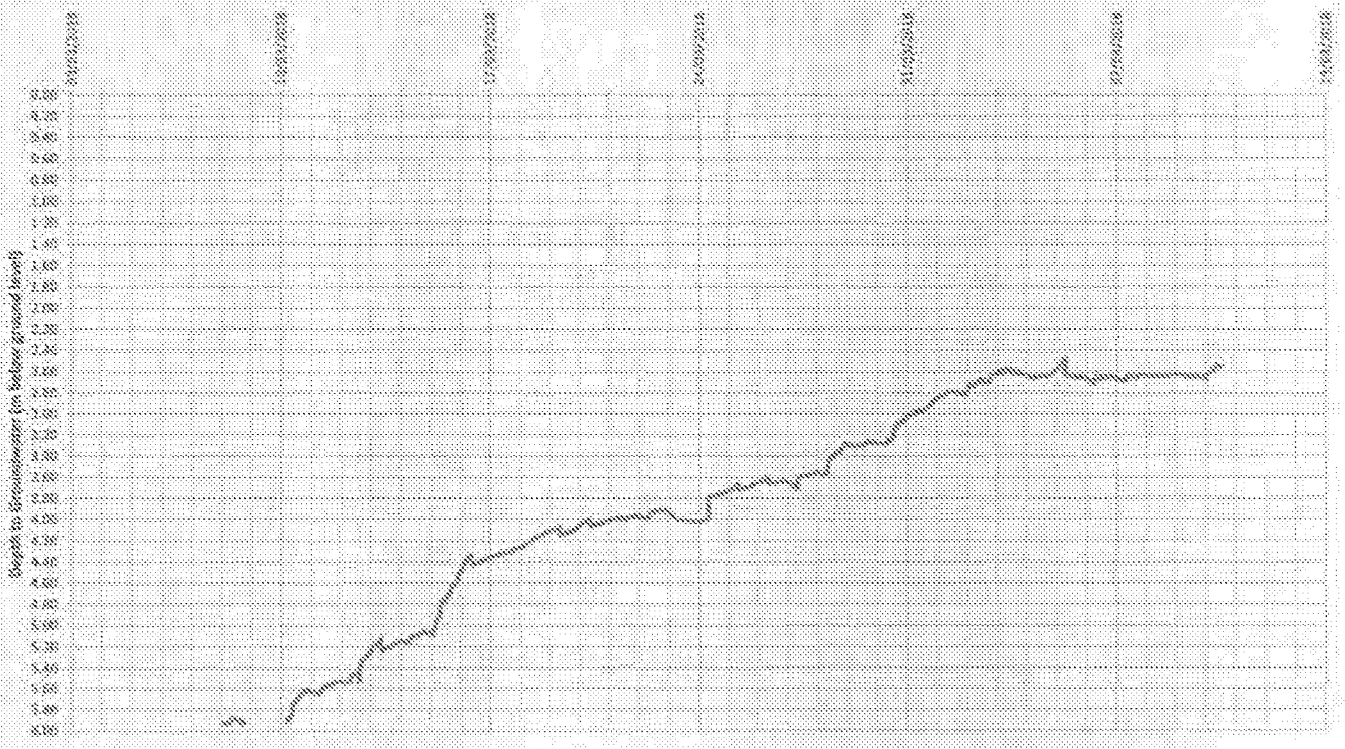
Notes: bgl – below ground level.

Ashdown Site Investigation Limted

Site: Comfort Inn, Arundel, West Sussex

Report No. R18-12793

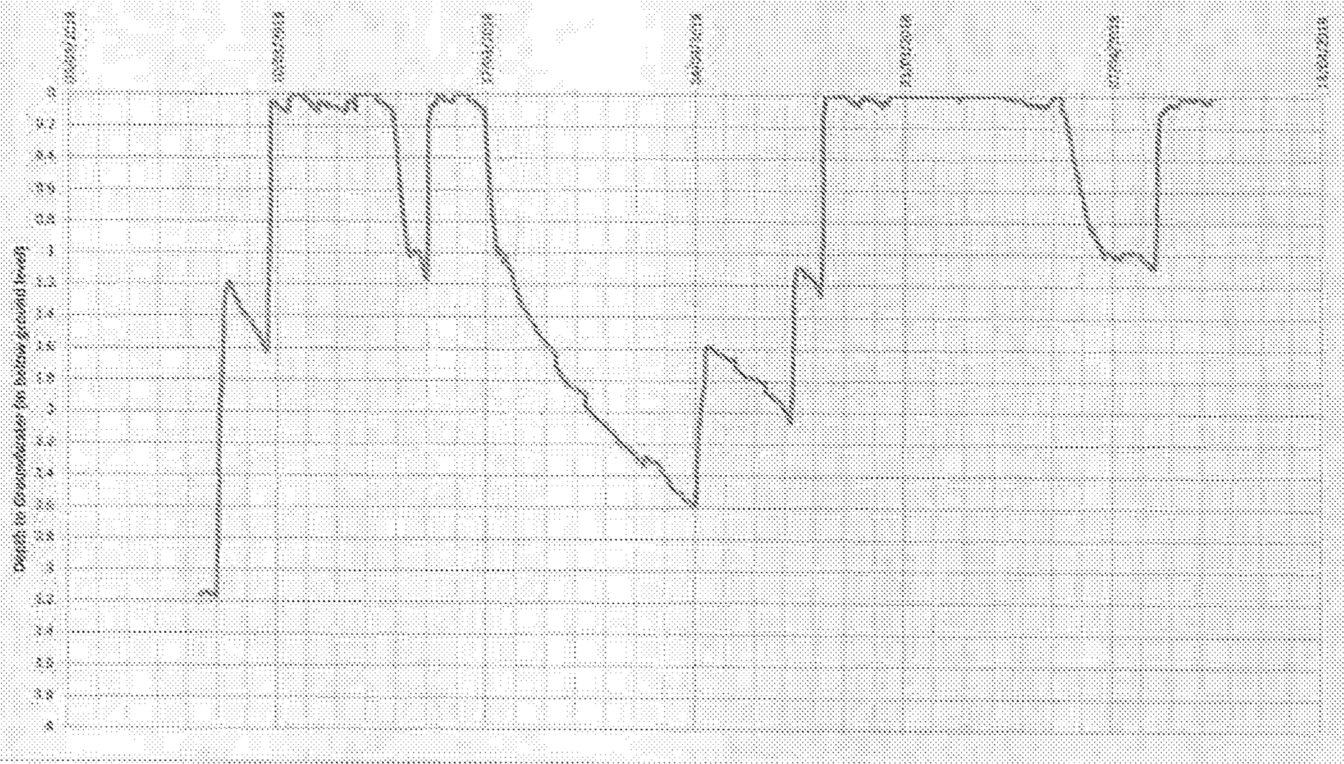
Summary of Standing Groundwater Depths - BH01



Ashdown Site Investigation Limted

Site: Comfort Inn, Arundel, West Sussex	Report No. R18-12799

Summary of Standing Groundwater Depths - BH02



Appendix E

Drainage Calculation Sheets

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

Half Drain Time : 444 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	14.217	0.592	0.2	1.3	1.6	38.3	O K
30 min Summer	14.309	0.684	0.3	1.4	1.7	51.6	O K
60 min Summer	14.391	0.766	0.3	1.5	1.8	64.7	O K
120 min Summer	14.458	0.833	0.3	1.6	1.9	76.3	O K
180 min Summer	14.485	0.860	0.3	1.6	1.9	81.3	O K
240 min Summer	14.496	0.871	0.3	1.6	1.9	83.3	O K
360 min Summer	14.500	0.875	0.3	1.6	2.0	84.6	O K
480 min Summer	14.499	0.874	0.3	1.6	1.9	84.4	O K
600 min Summer	14.495	0.870	0.3	1.6	1.9	83.6	O K
720 min Summer	14.490	0.865	0.3	1.6	1.9	82.6	O K
960 min Summer	14.476	0.851	0.3	1.6	1.9	80.3	O K
1440 min Summer	14.444	0.819	0.3	1.6	1.9	74.0	O K
2160 min Summer	14.396	0.771	0.3	1.5	1.8	65.6	O K
2880 min Summer	14.350	0.725	0.3	1.5	1.7	58.1	O K
4320 min Summer	14.267	0.642	0.2	1.4	1.6	45.5	O K
5760 min Summer	14.196	0.571	0.2	1.3	1.5	36.0	O K
7200 min Summer	14.135	0.510	0.2	1.2	1.4	28.3	O K
8640 min Summer	14.083	0.458	0.2	1.2	1.4	23.3	O K
10080 min Summer	14.038	0.413	0.2	1.1	1.3	18.6	O K
15 min Winter	14.253	0.628	0.2	1.4	1.6	43.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.672	0.0	49.0	19
30 min Summer	84.240	0.0	64.0	33
60 min Summer	54.369	0.0	69.7	62
120 min Summer	33.854	0.0	86.6	122
180 min Summer	25.262	0.0	97.2	182
240 min Summer	20.365	0.0	108.8	240
360 min Summer	15.028	0.0	119.6	330
480 min Summer	12.095	0.0	124.3	388
600 min Summer	10.213	0.0	131.0	452
720 min Summer	8.890	0.0	136.8	516
960 min Summer	7.135	0.0	146.4	654
1440 min Summer	5.222	0.0	160.7	926
2160 min Summer	3.814	0.0	176.1	1360
2880 min Summer	3.047	0.0	187.6	1732
4320 min Summer	2.217	0.0	204.7	2504
5760 min Summer	1.766	0.0	217.5	3224
7200 min Summer	1.482	0.0	228.1	3960
8640 min Summer	1.285	0.0	237.2	4664
10080 min Summer	1.139	0.0	245.3	5352
15 min Winter	124.672	0.0	44.8	18

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Model Details

Storage is Online Cover Level (m) 14.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00360	Width (m)	18.4
Membrane Percolation (mm/hr)	4000	Length (m)	49.2
Max Percolation (l/s)	1005.9	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	13.625	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.029 Discharge Coefficient 0.600 Invert Level (m) 13.625

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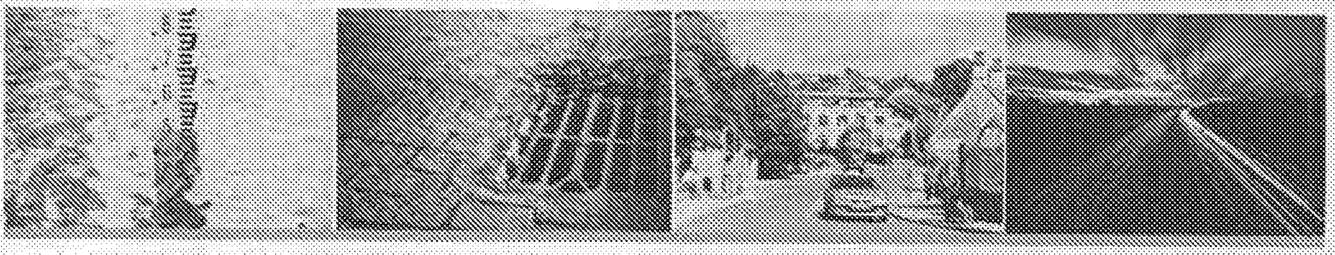

Drainage - Flood Risk - Highways - Transport

gtaCivils
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