

Foul and Surface Water Drainage Report and Maintenance Manual

11-15 South Street, Havant

For

JNP Developments and Investments Ltd.

Rev – **P3**

Reference **C2244**

Date **July 2023**

Revision	Date of Issue	Comments	Prepared By	Checked By
P1	01.08.2023	Initial Issue	SFC	CS
P2	27.09.2023	Revised to LLFA comments	SFC	CS
P3	17.11.2023	Revised to LLFA comments	SFC	CS

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1 Introduction

- 1.1.1 CGS Civils Ltd have been appointed by JNP Development s and Investments Ltd to undertake a drainage strategy report for a proposed development at 11-15 South Street, Havant.
- 1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere.
- 1.1.3 The existing site comprises commercial buildings and hard standings. The proposed development will consist of residential properties with some commercial space being preserved.
- 1.1.4 The proposed development is located at OS Grid Reference SU 7182 0618 and the post code is PO9 1FH
- 1.1.5 The total red line boundary is approximately 0.196 ha and the proposed development will result in a total of 0.174 ha of impermeable area, 0.133 ha of which being roof areas with the remaining 0.041 being hard-paved areas (including permeable paving).
- 1.1.6 The proposed site will make use of an existing access from South Street at the western end of the site.
- 1.1.7 The proposed site plan can be found in **Appendix A**.

Fig 1. Site Location



2 Site Geology

2.1 British Geological Survey information

2.1.1 The British Geological Survey shows superficial deposits of Head (Clay and Gravel) overlying Chalk.

2.1.2 E.A. data shows the site to be at potential risk of solution features.

2.1.3 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.

Borehole BGSID425503 (Located approx. 300m north of the site) indicates the presence of variable clayey strata to a depth of 14 metres.

Borehole BGSID425625 (located approx.. 300m west of the site) indicates the presence of variable clayey strata overlying chalk at around 7m depth or deeper.

Fig 2. British Geological Survey - Bedrock

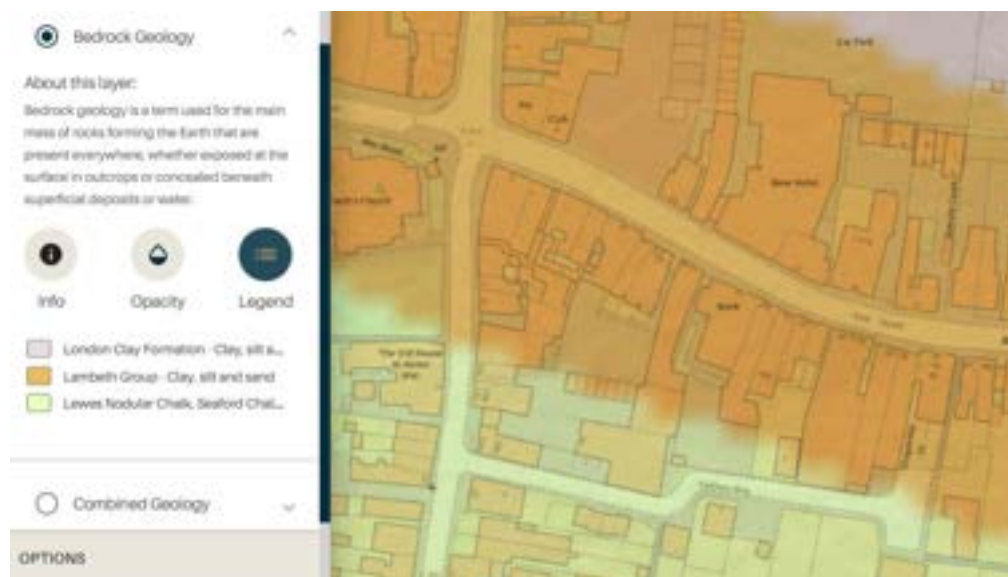


Fig 2.1 British Geological Survey – Superficial Deposits



2.2 Geological Assessment

- 2.2.1 At the time of preparing this report an intrusive site investigation had not been carried out.
- 2.2.2 The site is recorded by the British Geological Survey as being underlain by the Lewes Nodular Chalk Formation. It is further recorded by the Environment Agency as being in an area of 'Solution Risk' (**See Appendix D**) whereby underlying chalk can be dissolved slowly over time as water moves through the ground, causing sinkholes which may suddenly collapse. Such areas are therefore potential hazards so generally any soakaways in these areas are specified to be at minimum 10 metres (sometimes 12 or 15 metres) from any buildings.
- 2.2.3 The northern part of the site is shown to be underlain by Lambeth Group Clay, however this specifically refers to bedrock that is present at the surface. The Lewes Nodular Chalk was deposited before the Lambeth group, and as such it can be expected that chalk (and solution hazards) may be present at greater depth here.
- 2.2.4 The face-to-face distance between the northern and southern rows of buildings is 18m, therefore a 10 metre clearance is not possible to achieve.
- 2.2.5 The layout constraints and possibility of solution features preclude the option of disposing of surface water through infiltration, so mandatory Winter groundwater monitoring should not be necessary.

2.3 Hydrogeology Setting

- 2.3.1 The Environment Agency (EA) mapping service indicates the aquifer designation for the bedrock and superficial drift geology and the groundwater vulnerability in the area. The mapping, as included in **Appendix D**, provides the following information for the site:

Geology Map	Site Description
Aquifer Designation (Bedrock)	Principal / Secondary A
Aquifer Designation (Superficial Drift)	Secondary A
Groundwater Vulnerability	Medium – High (With solution risk)
Groundwater Source Protection Zone	Zone 1

- 2.3.2 The site will not pose a risk to the groundwater on site as there will be no discharge of any hazardous materials to ground.

3 Existing Drainage

- 3.1.1 The majority of surface water from gullies and downpipes currently discharges to the public surface water sewers in Twittens Way and South Street. Downpipes on the rear elevations of the buildings on South Street connect into the foul network.
- 3.1.2 Foul sewage discharges to the public foul sewer in South Street.
- 3.1.3 The impermeable area of the existing site is 2194m². This area would generate the following flow rates:
- 1 in 1 year storm = 22.1 L/S
 1 in 30 year storm = 31.2 L/S (With 5m³ flooding)
 1 in 100 year storm = 31.2 L/S (With 10m³ flooding)
 (Assuming 150mm outlet pipe and all areas positively drained. See **Appendix C** for calculation).
- 3.1.4 Existing Public Sewers are shown on the Drainage Layout in **Appendix B** of this report.

4 Proposed Drainage Strategy

4.1 SuDS Hierarchy

- 4.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Discharge Destination	
Discharge to Ground	NO
Discharge to Watercourse	NO
Discharge to Surface Water Sewer	YES
Discharge to Other Sewer	NO

4.2 Surface Water Drainage

- 4.2.1 Based upon the information gathered from the British Geological Survey, along with the E.A. data suggesting an elevated risk of solution features, and dimensional constraints, discharge to ground through infiltration is not considered viable. It is therefore proposed that all surface water runoff is to be discharged to the existing surface water sewer at a restricted discharge rate of 2.0 L/s up to and including the 1 in 100 year storm (+45% for the predicted effects of climate change and including a 10% addition for the effect of Urban Creep).
- 4.2.2 All roof areas are to be collected into a positive drainage network before being discharged into the local public surface water sewer via a new manhole. The network will make use of a geocellular attenuation tank which has been designed to cater for the critical 1 in 100 year storm plus an allowance of 45% for the predicted effects of climate change.
- 4.2.3 Due to level constraints, Permavoid will be used to create a shallow storage feature that can support vehicular loads with minimal cover.
- 4.2.4 Permeable paving will be used to drain the majority of the hard paved areas, with channel drains picking up other areas.
- 4.2.5 The porous sub-base of the permeable paving will supplement the storage capacity of the tank. Water will move freely from the sub-base to the tank.
- 4.2.6 Greenfield QBAR for the site would be 0.49L/s so in order to provide an attenuation system that will have an acceptable risk of blockage the rate of 2.0L/s is proposed as recommended by the UK SuDS tool.

4.2.7 Some downpipes on roofs fronting onto Twittens way will have to be connected directly to the public surface water sewer. The total roof area to which this applies is 72m², which is less than the total amount of impermeable area that has been completely removed from the local network (286m²), so the site still provides a net benefit. (See **drawing C2244/102 in Appendix B** of this report for a full breakdown of existing and proposed surface areas).

4.2.8 The proposed attenuation design will result in the following discharge rates with zero flooding:

1 in 1 year storm	= 1.8 L/S
1 in 30 year storm (+35%CCA)	= 2.0 L/S
1 in 100 year storm (+45%CCA +10%UC)	= 2.0L/S

This demonstrates that total surface water runoff surface water runoff rates are reduced for all relevant storm durations.

4.2.9 RWPs serving the existing roofs to the rear of properties fronting onto South Street currently discharge to the foul sewer. These will all be diverted into the new surface water system, removing surface water flows from the foul network. The roof area in question is approximately 70m², equating to a 1 in 1 year flow rate of 1.1L/S and a 1 in 100 year rate of 3.5 L/S.

4.2.10 Hydraulic calculations have been carried out and can be found at **Appendix C** of this report.

4.2.11 Section 106 consent for surface and foul drainage pending. The straightforward and absolute reduction in both foul and surface water total flow rates represent a significant improvement for the local public sewer network.

4.3 Water Quality

- 4.3.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.
- 4.3.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.
- 4.3.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:
- The pollution hazard at a particular site (i.e., the pollution source)
 - The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
 - The sensitivity of the receiving environment
- 4.3.4 The EA website indicates that the site does not lie within a Source Protection Zone.
- 4.3.5 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Fig 5. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	Hazard Characterisation	Risk Reduction	
		For Surface Water	For Groundwater
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

- 4.3.6 As per Table 26.1 Simple Index approach will be used as a design method for this site.
- 4.3.7 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.
- Residential Roofs
 - Individual Property driveways and residential car parks
- 4.3.8 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index $\geq$ pollution hazard index

4.3.9 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Fig 6. Pollution Hazard Indices for Different Land Use Classifications

Table 26.2 Pollution hazard indices for different land use classifications				
Land Use	Pollution Hazard Level	Total Suspended solids (TSS)	Metals	Hydro-Carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (Typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

4.3.10 From Table 26.2 the following information is tabulated in Table 1

Table 1: Pollution hazard index and destination of runoff for the proposed site

Table 1: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roof	Surface Water	Very Low	0.2	0.2	0.05
Individual driveways, residential car parks	Surface water	Low	0.5	0.4	0.4

4.3.11 The SuDS mitigation index will be obtained from Table 26.3 (for surface water) of the SuDS manual.

Figure 7 Indicative SuDS Mitigation Indices for discharges to surface waters.

4.3.12 SuDS mitigation index are tabulated in Table 5 as follows:

Table 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS Components	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 2: SuDS mitigation index

Mitigation Indices						
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual driveways, residential car parks	Surface water	Table 26.3 (for surface waters)	Permeable Pavement	0.7	0.6	0.7
Residential Roof	Surface Water	Table 26.3 (for surface waters)	Downstream Defender	0.3	0.2	0.2

4.3.13 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

4.4 Foul water drainage

- 4.4.1 The foul water will discharge into the local foul sewer indirectly via an existing lateral on site. This is subject to the agreement of Southern Water.
- 4.4.2 As previously discussed, some roofs which currently discharge to the foul network will instead be served by the proposed surface water network.
- 4.4.3 A CCTV survey has been undertaken, showing the lateral to be in fair condition.

4.5 Construction Phase Drainage

- 4.5.1 It is an offence to cause or knowingly permit the entry of any polluting, poisonous or noxious material in the water environment. If the pollution is serious enough to lower the ecological status of the water body as set out in terms by the Water Framework Directive (2000/60/EC) than prosecution may occur.
- 4.5.2 Remediation of any damage caused will not require the polluter to be prosecuted first. If the water pollution is serious enough to be classed an environmental damage, the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.
- 4.5.3 If any pollution has not been reported or the polluter has not taken actions to prevent any further damage; they would then be causing an offence. Third parties (e.g., Private water supply users, landowners, recreation users and the public) who may be affected by possible damage may also report the risk of any environmental damage to the enforcing authority.
- 4.5.4 The principles of SuDS (Sustainable Drainage Systems) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or the water quality shall:
- Soakaway where soils allow
 - Consider and manage erosion
 - Remove pollutants in surface water
 - Retain any silts on site and prevent silts from discharging to watercourses or drains
 - Keep runoff rates at existing greenfield runoff
 - Prevent accidental spillages reaching watercourse
- 4.5.5 As infiltration on site is viable, the temporary drainage for the development will be in the form of land drains which will discharge into the ground.
- 4.5.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.
- 4.5.7 Any potential hazardous substances will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

5 Maintenance

5.1 Introduction

- 5.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the developer will appoint a maintenance firm to take on the responsibility of these duties.
- 5.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

5.2 SuDS at South Street, Havant

- 5.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Permeable Paving with Porous Sub-base overlying a Geocellular Attenuation tank. These complemented by a Hydro-brake and a Downstream Defender.**
- 5.2.2 The SuDS features have been designed for easy maintenance and comprise:
- Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
 - Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
 - Remedial work – repairing damage where necessary

5.3 SuDS Drainage Maintenance Specification

5.3.1 Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for permeable paving		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rate and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5.4 General Drainage Maintenance Specification

5.4.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	Frequency
Inlet Structures	Monthly
Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.	
Strim vegetation 1m min surround to structures and keep area free from silt and debris	
Inspections Chambers and below ground control chambers.	Annually
Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	
Undertake inspection after leaf fall in Autumn	
Occasional Maintenance	As necessary
Check topsoil levels are 20mm above edges of chambers to avoid mower damage.	
Remedial Work	As required
Repair physical damage if necessary	

5.4.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work	As required
Repair physical damage if necessary	
Monitoring	Annually
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	
Survey inside of pipe runs for sediment build up and remove if necessary.	
	Every 5 years or as required

6 Summary and Conclusions

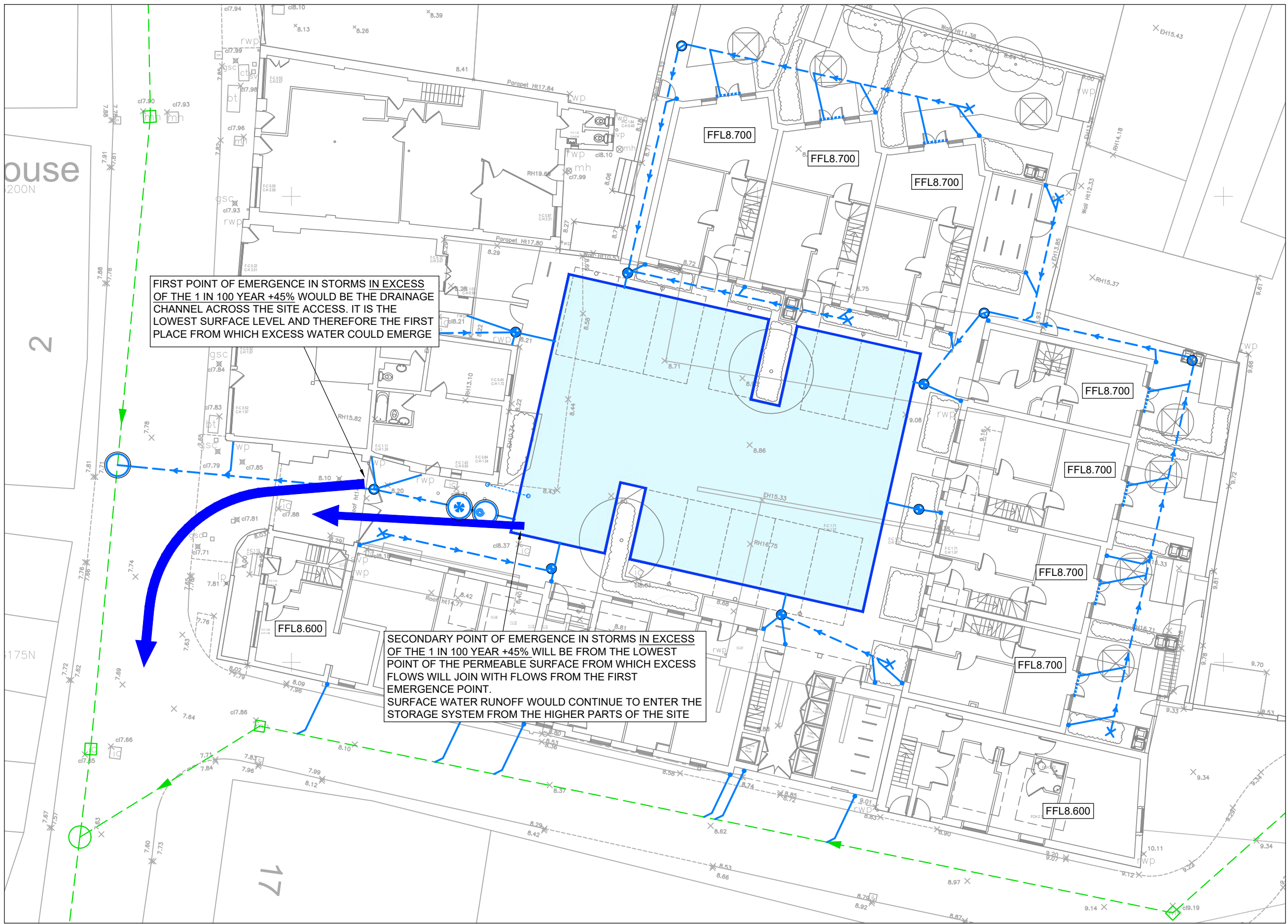
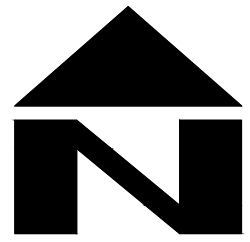
- 6.1.1 CGS Civils has been instructed by JNP Development sand Investments Ltd to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for a new residential development.
- 6.1.2 The Surface Water will discharge to the public surface water sewer network at a restricted rate of 2.0L/s and will provide an overall reduction in the amount of impermeable area draining to the local network as well as a reduction in flow rates for all relevant storms. This includes an allowance of 45% for the predicted effects of climate change and a 10% addition for Urban Creep.
- 6.1.3 The Foul water will discharge into the public foul sewer via an existing lateral connection (subject to S106). Existing surface water connections to the foul network will be diverted into the surface water network.
- 6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

7 Appendices

7.1 Appendix A – Site Plan



7.2 **Appendix B – Drainage Layout**



EXCEEDANCE ROUTE PLAN

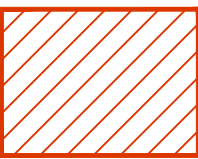
BLUE ARROWS SHOW ROUTE OF EXCEEDANCE FLOWS FROM PROJECTED POINTS OF EMERGENCE TOWARDS DIRECTION OF FALL.

ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%. EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER INTENSITY THAN THIS.

Impermeable drained areas



Total existing impermeable drained area
1937m²



Existing roofs to keep existing drainage
257m²



Proposed impermeable drained areas
1394m²

Total existing impermeable area to be replaced by new system = 1937 - 257 = 1680m²

Total reduction in impermeable area contributing to local drainage system = 1680 - 1394 = 286m²

Flood Plain Storage Calculation

Existing building footprint (demolished) = 453m²

Proposed new build footprint = 371m²

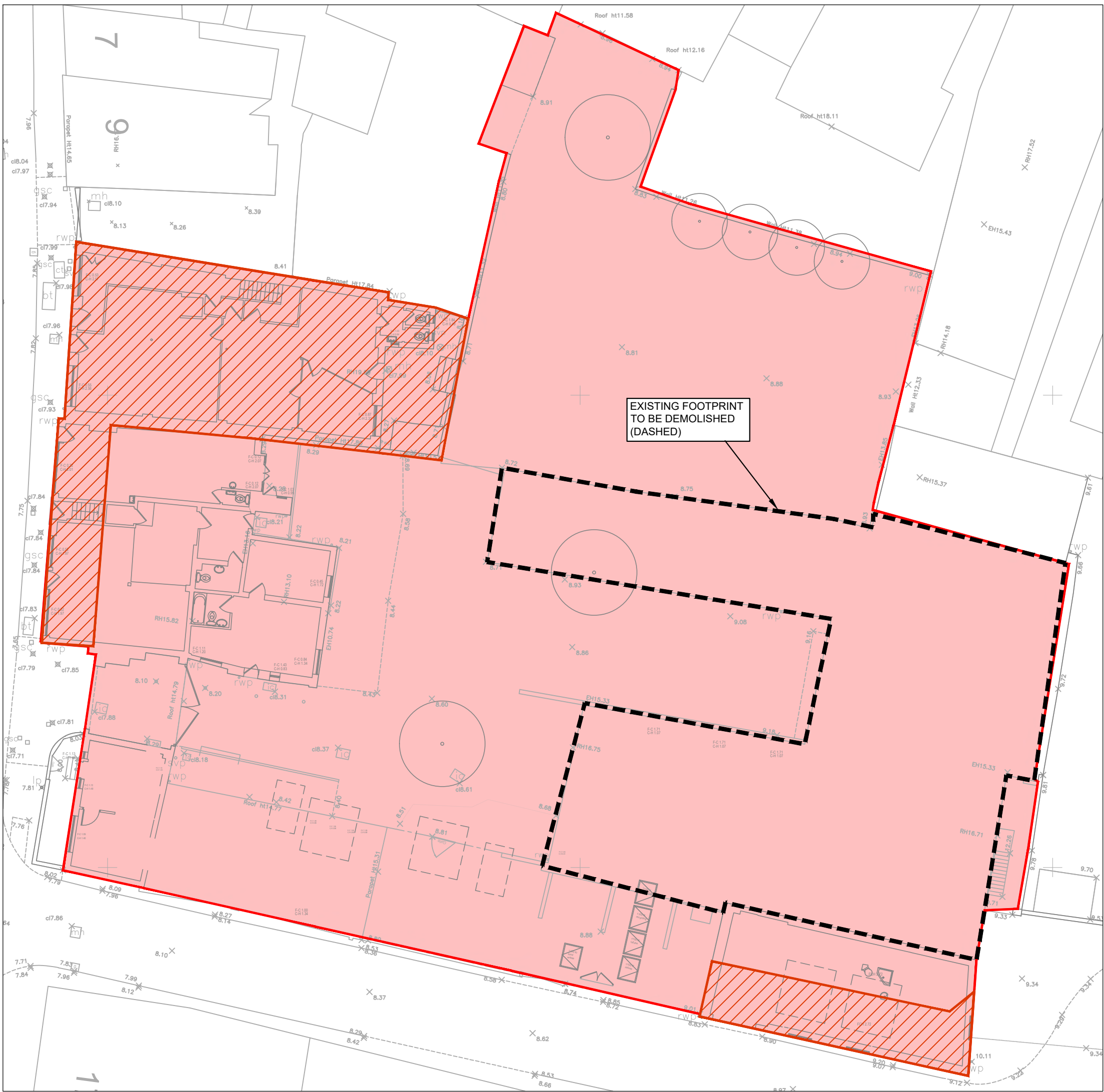
Therefore additional 82m² area available.

Overall, outside levels remain similar to existing or are lowered by 100mm - 200mm in general, resulting in additional flood plain volume.

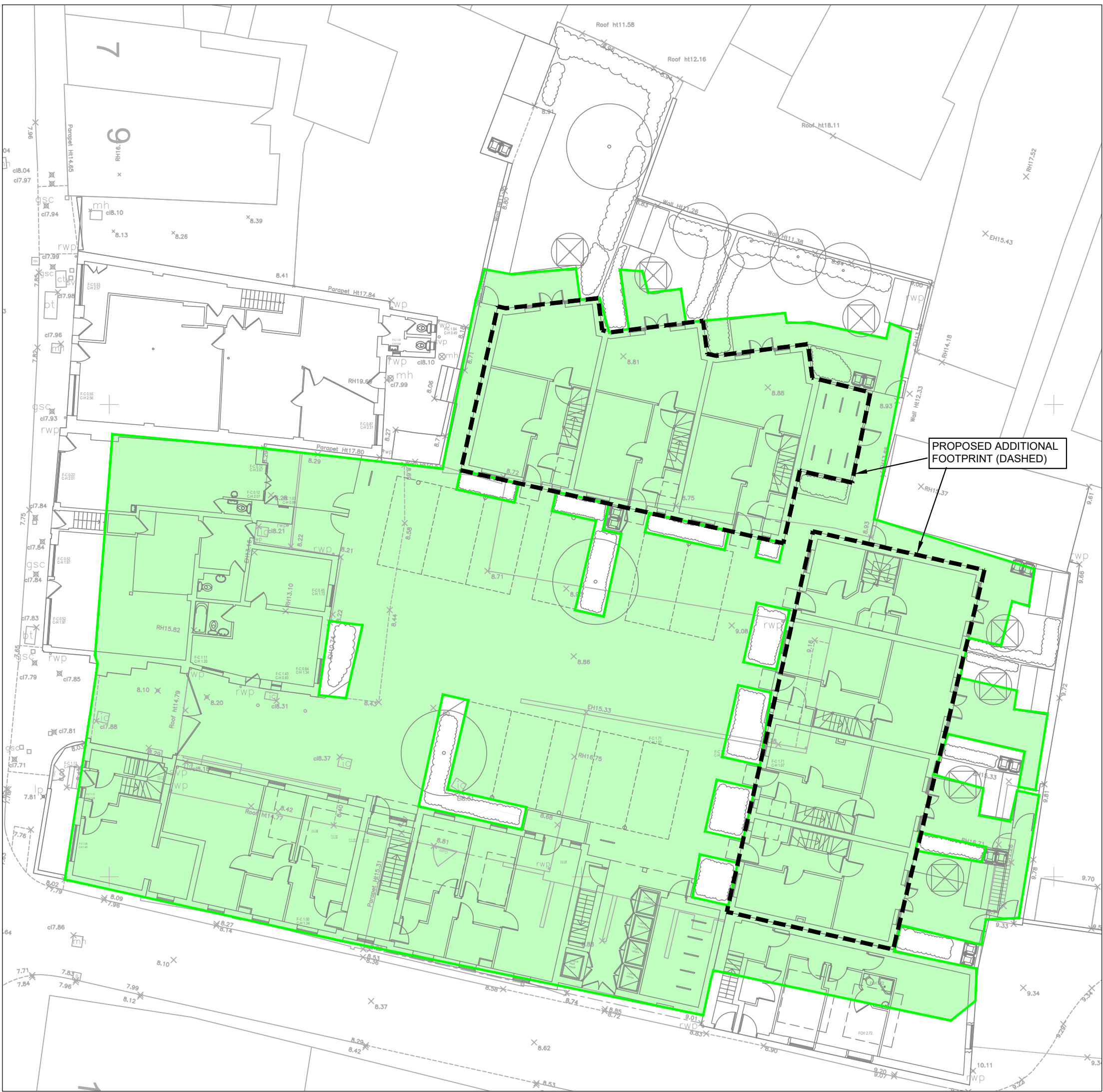
STANDARD DRAINAGE NOTES

- DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
- BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
- ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
- COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
- ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA.
- ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
- ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
- ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
- ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
- THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWINGS CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
- STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
- IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
- NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
- ALL EXISTING MANHOLE COVER'S, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
- UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
- MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD



EXISTING IMPERMEABLE AREAS

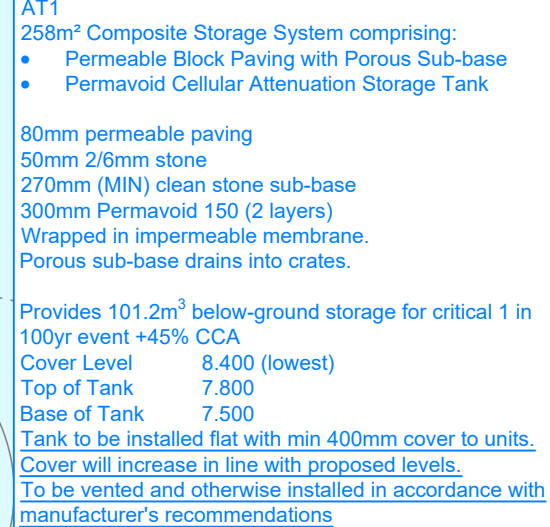


PROPOSED IMPERMEABLE AREAS

FOR PLANNING ONLY

PL3	17.11.23	Flood plain volume calculation added	SFC	CS	CS
PL2	27.09.23	Revised to LLFA comments	SFC	CS	CS
PL1	02.08.23	PRELIMINARY ISSUE	SFC	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP

 Consulting Civil Engineers					
CLIENT		JNP			
ARCHITECT		PDP ARCHITECTURE			
JOB TITLE		11-15 SOUTH STREET HAVANT			
DRAWING TITLE					
IMPERMEABLE AREAS AND EXCEEDANCE ROUTES					
DRAWN	ENGINEER		CHECKED	APPROVED	
SFC	SFC		CS	CS	
DATE	JUL '23		SCALE @ A1	1:200	
JOB No.	STATUS	DRAWING No.		REV.	
C2244	PL	102		3	



7.3 **Appendix C – Surface Water Calculations**

Calculated by:	simon clare
Site name:	South Street
Site location:	Havant

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.85070° N
Longitude:	0.9811° W
Reference:	1856223002
Date:	Jul 24 2023 14:37

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.163
-----------------------	-------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	731	731
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q ₅₀ (l/s):	0.49	0.49
1 in 1 year (l/s):	0.42	0.42
1 in 30 years (l/s):	1.13	1.13
1 in 100 year (l/s):	1.57	1.57
1 in 200 years (l/s):	1.84	1.84

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	500.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.350	Preferred Cover Depth (m)	0.600
CV	0.950	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
imp	0.140	5.00	8.350	1200	20.000	0.000	0.600
outfall	0.000		8.200	1200	0.000	0.000	0.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1	imp	outfall	20.000	0.600	7.750	7.500	0.250	80.0	150	5.30	148.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1	1.125	19.9	71.6	0.450	0.550	0.140	0.0	150	1.146

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	600
M5-60 (mm)	20.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.350	Check Discharge Rate(s)	x
Summer CV	0.950	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200
30	120	240	480	720	1440	2880	5760	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0

Node Tank Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	7.450	Product Number	CTL-SHE-0070-2000-0800-2000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	258.0	0.0	0.300	258.0	0.0	0.350	0.0	0.0

Node Tank Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	7.800	Slope (1:X)	999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.270
Safety Factor	2.0	Width (m)	16.060	Inf Depth (m)	
Porosity	0.30	Length (m)	16.060		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	imp	11	7.973	0.223	22.8	0.2517	0.0000	SURCHARGED
15 minute summer	outfall	11	7.634	0.134	22.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	imp	1	outfall	22.1	1.255	1.110	0.3419	9.8



Results for 30 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	imp	8	8.350	0.600	55.7	0.6786	5.5944	FLOOD
15 minute summer	outfall	8	7.642	0.142	31.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	imp	1	outfall	31.1	1.770	1.567	0.3485	18.8

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	imp	8	8.350	0.600	72.2	0.6786	10.2275	FLOOD
15 minute summer	outfall	8	7.642	0.142	31.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	imp	1	outfall	31.1	1.770	1.567	0.3485	21.0

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	500.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.350	Preferred Cover Depth (m)	0.600
CV	0.950	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
imp	0.140	5.00	8.350	1350	20.000	0.000	0.600
Tank	0.000		8.250	1350	10.000	0.000	0.800
outfall	0.000		8.200	1350	0.000	0.000	1.013

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1	imp	Tank	10.000	0.600	7.750	7.450	0.300	33.3	450	5.05	151.5
2	Tank	outfall	10.000	0.600	7.450	7.187	0.263	38.0	450	5.10	151.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1	3.530	561.5	72.8	0.150	0.350	0.140	0.0	109	2.469
2	3.306	525.7	72.6	0.350	0.563	0.140	0.0	112	2.352

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	600
M5-60 (mm)	20.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.350	Check Discharge Rate(s)	x
Summer CV	0.950	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200
30	120	240	480	720	1440	2880	5760	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	35	0	0
100	45	10	0

Node Tank Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	7.450	Product Number	CTL-SHE-0070-2000-0800-2000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	696

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	258.0	0.0	0.300	258.0	0.0	0.350	0.0	0.0

Node Tank Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	7.800	Slope (1:X)	999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	200	Depth (m)	0.270
Safety Factor	2.0	Width (m)	16.060	Inf Depth (m)	
Porosity	0.30	Length (m)	16.060		

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	imp	10	7.876	0.126	75.2	0.1797	0.0000	OK
240 minute summer	Tank	232	7.733	0.283	21.6	57.7312	0.0000	OK
15 minute summer	outfall	1	7.187	0.000	2.0	0.0000	0.0000	OK

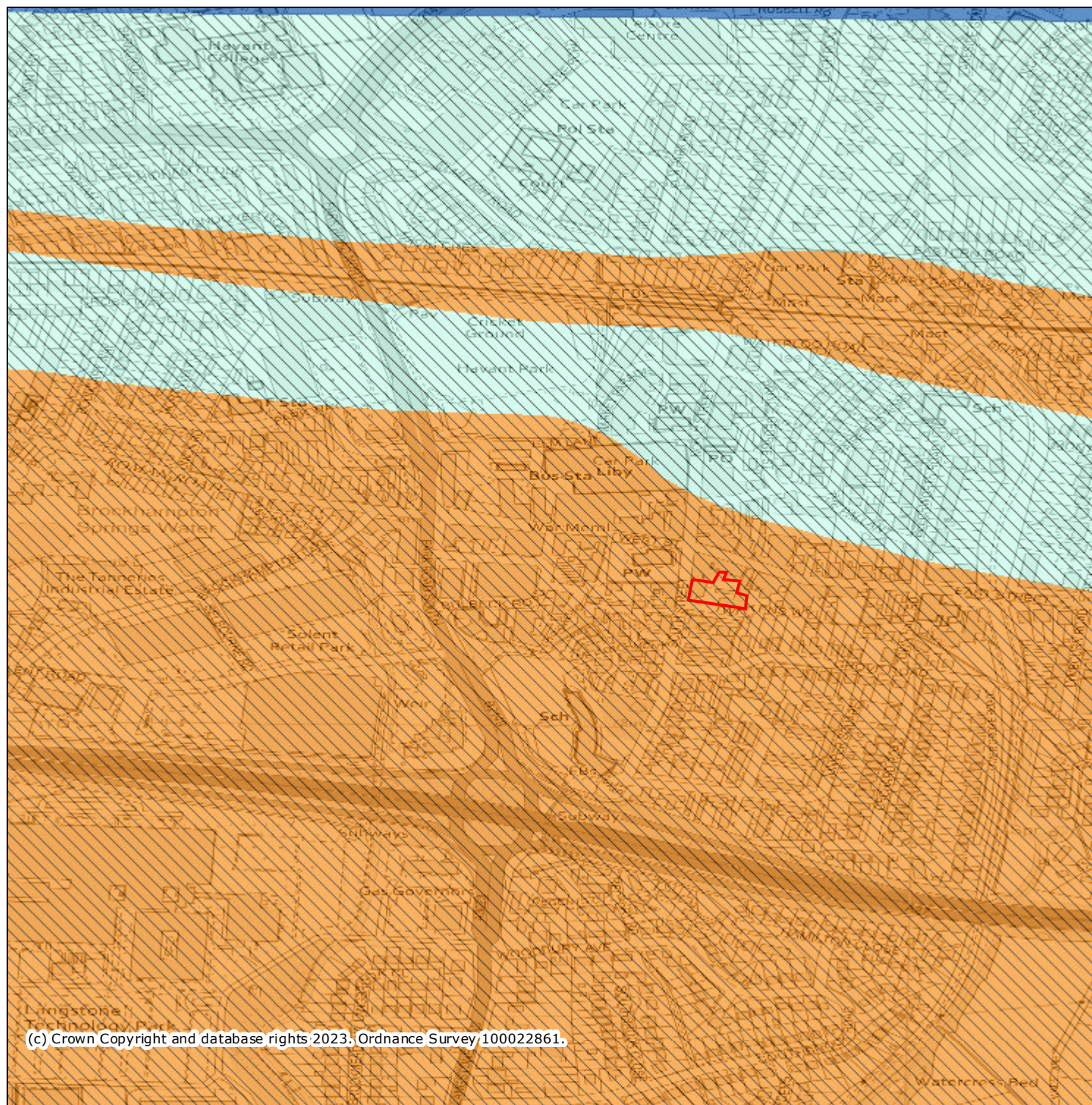
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	imp	1	Tank	75.2	2.413	0.134	0.3582	
240 minute summer	Tank	Hydro-Brake®	outfall	2.0				82.2

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	imp	360	8.249	0.499	25.1	0.7142	0.0000	FLOOD RISK
360 minute summer	Tank	360	8.250	0.800	25.1	101.2278	0.0000	FLOOD RISK
15 minute summer	outfall	1	7.187	0.000	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	imp	1	Tank	25.1	0.518	0.045	1.5844	
360 minute summer	Tank	Hydro-Brake®	outfall	2.0				103.7

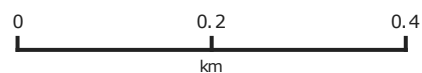
7.4 **Appendix D - Mapping Data**



Legend

Groundwater Vulnerability Map (England)

-  Local Information
-  Soluble Rock Risk
-  High
-  Medium - High
-  Medium
-  Medium - Low
-  Low
-  Unproductive



Projection = ETRS89_GEOGRAPHIC

xmin = -0.9973

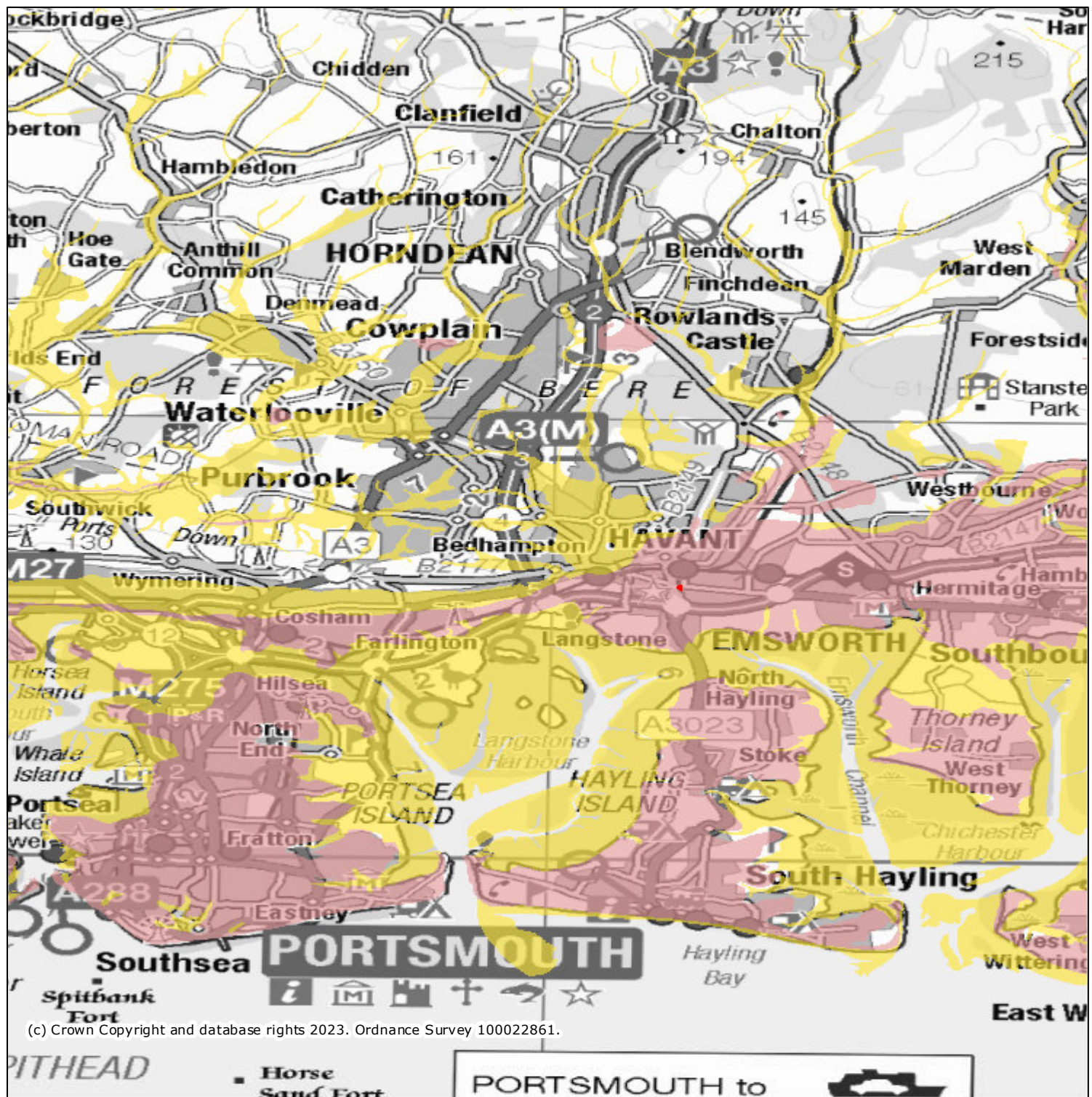
ymin = 50.8445

xmax = -0.9691

ymax = 50.8579

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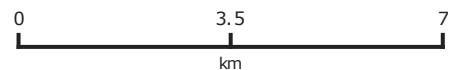


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Legend

Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive



Projection = ETRS89_GEOGRAPHIC

xmin = -1.2339

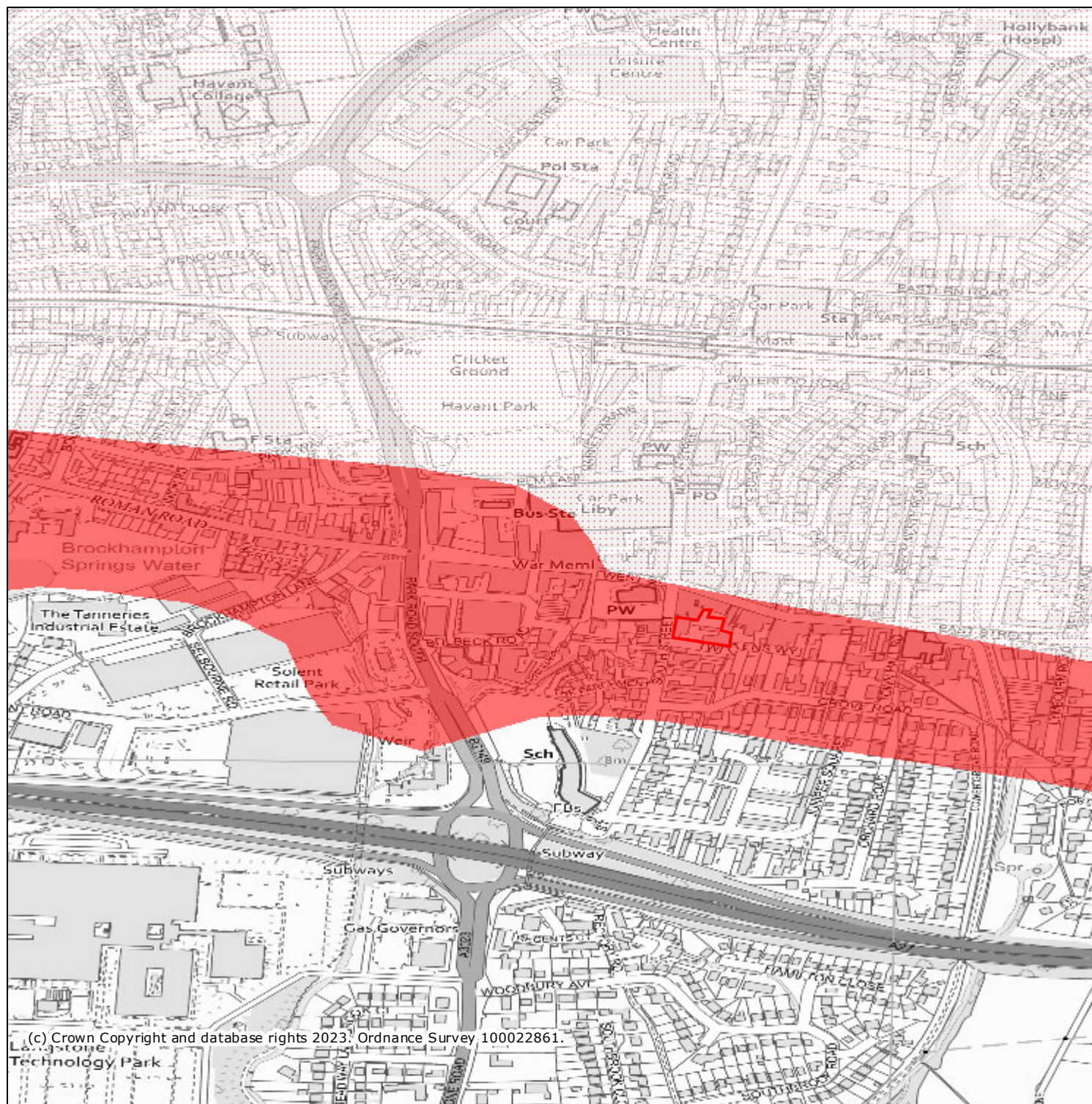
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xmax = -0.7821

ymax = 50.9651

Map produced by MAGiC on 26 July, 2023.

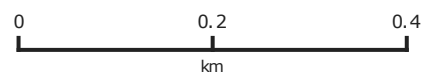
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Legend

Source Protection Zones merged (England)

- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest



Projection = ETRS89_GEOGRAPHIC

xmin = -0.9971

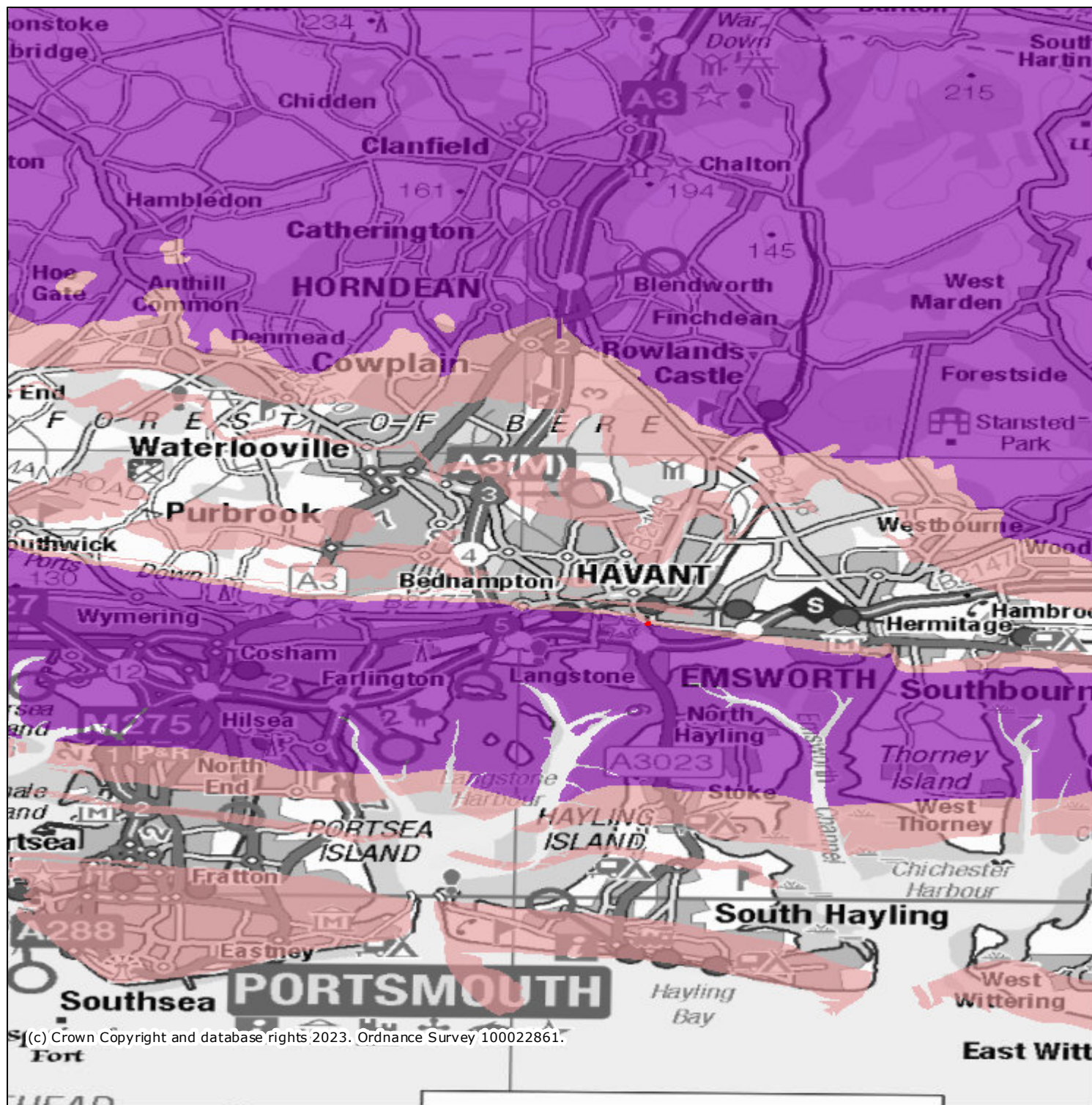
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xmax = -0.9689

ymax = 50.8584

Map produced by MAGiC on 26 July, 2023.

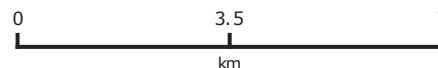
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Legend

Aquifer Designation Map (Bedrock) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive



Projection = ETRS89_GEOGRAPHIC

xmin = -1.2265

ymin = 50.7568

xmax = -0.7747

ymax = 50.9716

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