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1. INTRODUCTION

- 1.1 This drainage technical note has been prepared by Paul Basham Associates on behalf of Pickup Town Planning to support a full planning application for a residential site. The land is located at 78 Havant Road, Emsworth. The nearest postcode is PO10 7LH (473924N/105927W). The site location is demonstrated within **Figure 1**.



Figure 1: Site Location Plan

- 1.2 The proposed development aspirations are to demolish the existing residential home and replace this with 9 apartments within a care home complex over 3 storeys. The site has an area of 1675 m² (0.1675 Ha).

2. SITE DETAILS

- 2.1 A review of the British Geological Survey (BGS) mapping (**Figure 2**) indicates that the bedrock geology beneath the site is “London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period” overlying this is superficial deposits of “River Terrace Deposits - Sand, silt and clay. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period”
- 2.2 GCC report confirmed the underlying geology (**Refer to Appendix A, GCC report J22-037-R01, and Infiltration testing -J23-037-R01**)

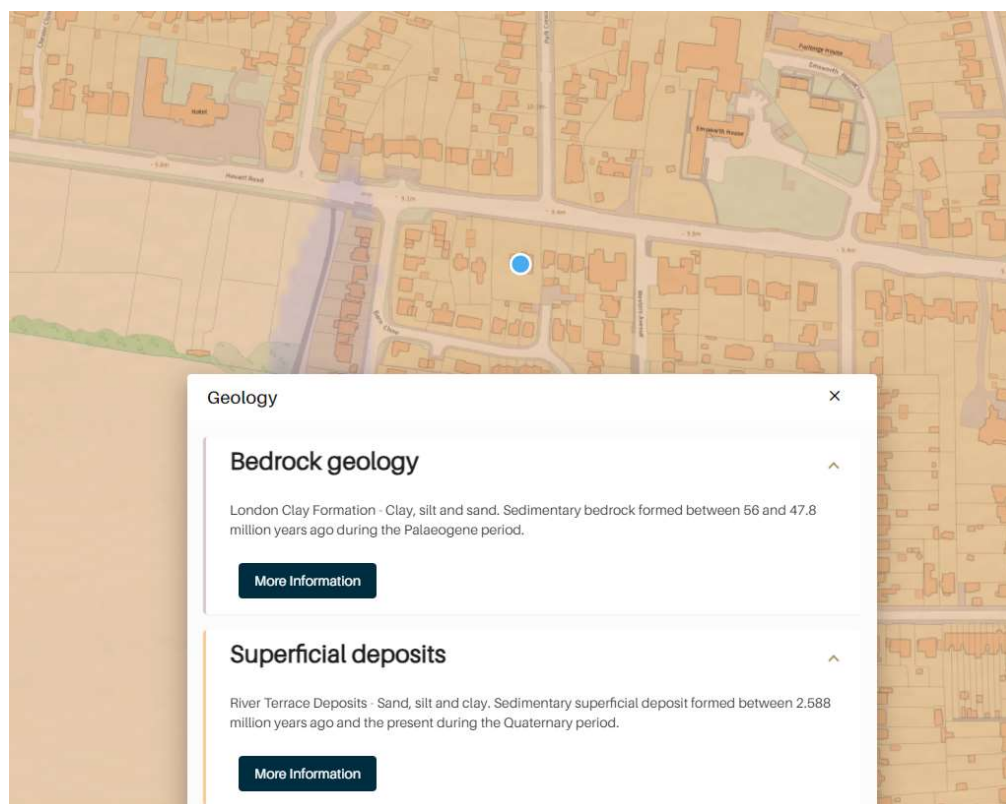


Figure 2:BGS Bedrock Mapping

3. FLOOD RISK

- 3.1 Flood mapping obtained from the government's 'flood map for planning' website (see Appendix B) has identified that the site falls within flood zone 1. See **Figure 3**

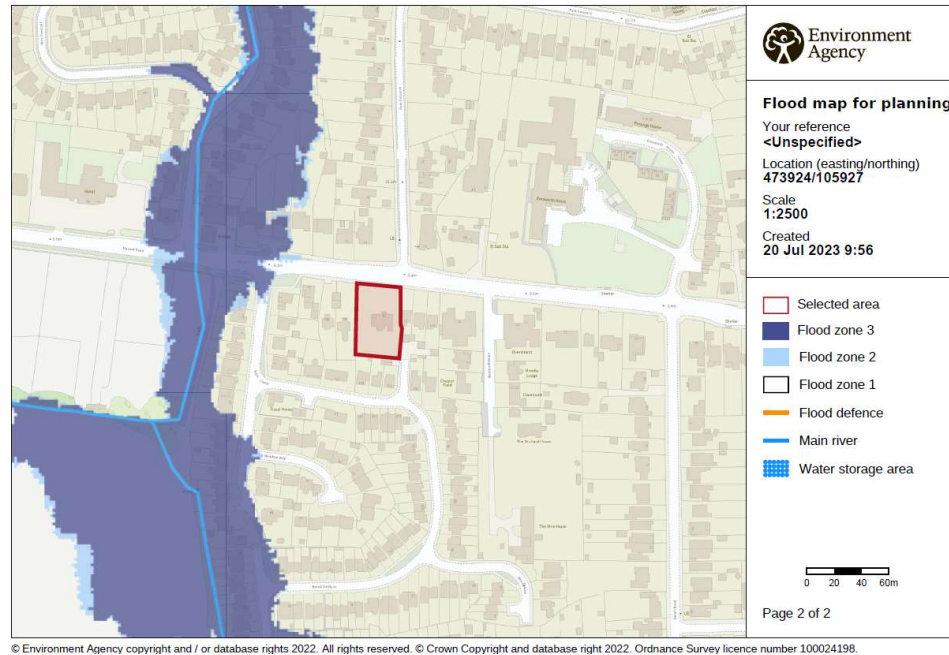


Figure 3: Flood Map for Rivers and Seas

- 3.2 The long-term flood risk and from rivers and seas mapping shows the site is not considered to be at risk of flooding from surface water. See **Figure 4**

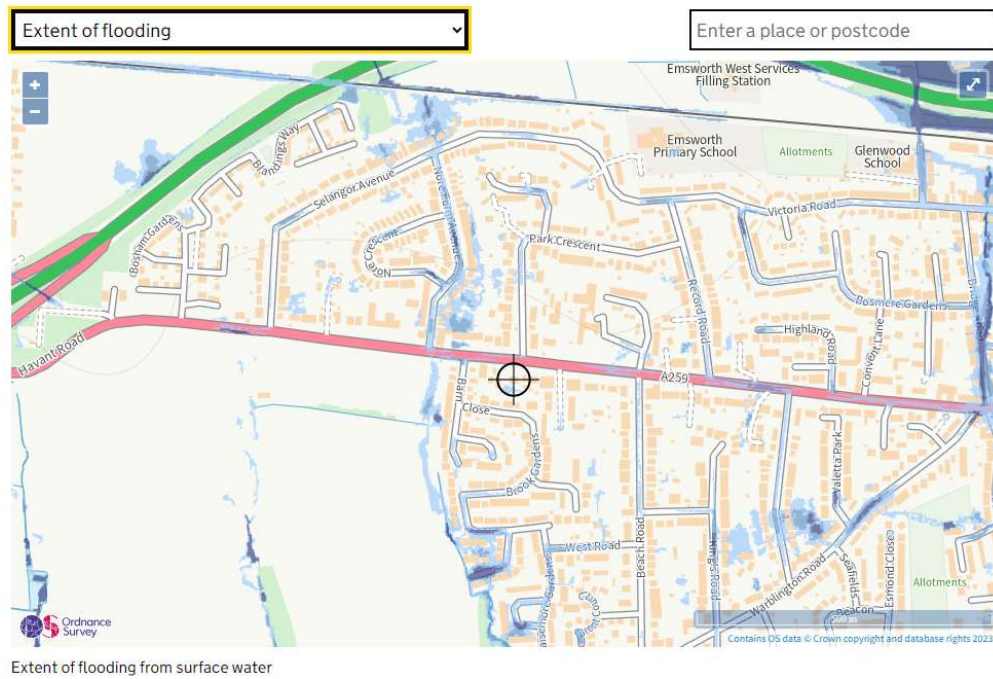
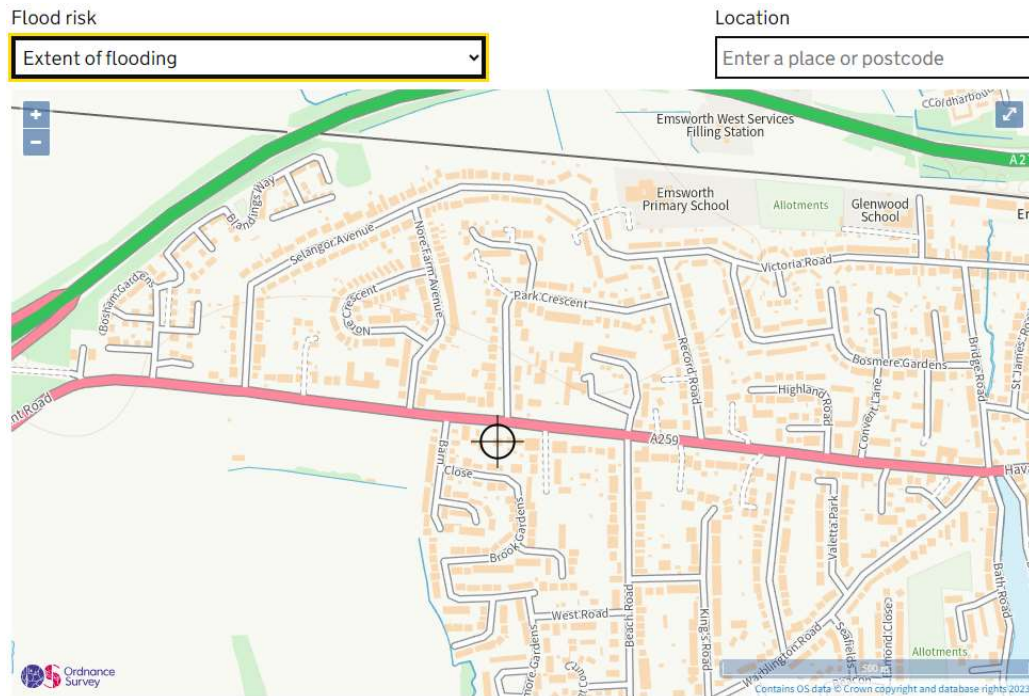


Figure 4: Long - Term Flood Risk from surface water

- 3.3 The long-term flood risk from reservoirs mapping shows that the site is not considered to be at risk of flooding from reservoirs. See **Figure 5**



Maximum extent of flooding from reservoirs:

Figure 5: Long Term Flood Risk from Reservoirs Map

4. EXISTING DRAINAGE

Surface Water

- 4.1 The existing development consists of a 3-storey dwelling. Total existing impermeable area (from roofs) contributing to positive drainage outfall is 240 m². The permeable areas consist of planted beds and lawns.
- 4.2 The existing impermeable area contributing to discharge from the development:
- Roof area- 240 m²
- 4.3 The existing permeable area contributing to discharge from the development.
- Permeable areas- 1435 m²
- 4.4 Based on a review of the available information, it is evident that a local foul sewer network exists in Havant Road. A surface water sewer network may also exist in the public highway.
- 4.5 No evidence of surface water treatment of runoff has been uncovered during survey or exploratory work.
- 4.6 BRE365 soakage tests were carried out in order to confirm the infiltration rates for the underlying ground. Testing indicated an average soakage rate in soakaway pit SA101 of 1.68×10^{-6} m/s (0.0060

m/h), and for soakaway pit SA102 9.3×10^{-7} m/s (0.0033 m/h). Neither of these tests were able to be run for the recommended duration or repeated due to the slow infiltration rates.

(Refer to Appendix A, GCC report J22-037-R01, and Infiltration testing -J23-037-R01)

- 4.7 The site's **existing** surface water drainage system is currently draining an impermeable area of 240 m² which includes the roofs. External areas are predominantly gravel surfaced and are believed to drain to the underlying soil or runoff to neighbouring properties and road in extreme events.
- 4.8 The greenfield run-off rates for the existing site have been estimated using the HR Wallingford online calculator on the UK SuDS website.
- 4.9 A range of SOIL values has been model from a soil value of 2 (default) to a value of 3 (edited) which we feel more accurately represents the impermeable nature of the development and the underlying London clay overlain by alluvial deposits.
- SOIL indices (1 to 5) are defined in the Flood Studies Report (NERC, 1975). The index broadly describes the maximum runoff potential and was derived by a consideration of soil permeability and topographic slope. SOIL type 1 is sandy highly permeable material with permeability reducing as the SOIL value increases. SOIL type 4 is heavy clay and 5 (which is rarely applied) is exposed rock.
- 4.10 The Qbar run-off rate is 0.5l/s. See **Figure 6**. The full UK SuDS toolkit output can be found in **Appendix C**.

Greenfield runoff rates		Default	Edited
Q _{BAR} (l/s):		0.32	0.5
1 in 1 year (l/s):		0.27	0.42
1 in 30 years (l/s):		0.73	1.15
1 in 100 year (l/s):		1.01	1.59
1 in 200 years (l/s):		1.18	1.86

Figure 6: Greenfield run off rates

Foul Water

- 4.11 Foul flows produced on site are presumed to be taken off site via a gravity flow system onto the local public sewer network, connecting to an existing sewer network in Havant Road. An assessment of the existing flow volumes with an occupancy of approximately 4 persons yields a flow in the the order of 480 l/day.

5. PROPOSED DRAINAGE STRATEGY

Surface Water

- 5.1 The proposed layout has increased the impermeable roof area to 315 m². Permeable paving parking areas of 100m² will collect rainwater runoff from roofs via a pipe network. Permeable paving systems will incorporate a deep, fine reduced granular base to act as a storage reservoir for water running off the roofs and the permeable paving surface.
- 5.2 Paved paths and hardstanding of 160 m² around the properties will not be positively drained and will instead drain to adjacent soft landscaping. See drainage strategy layout and catchment plans in **Appendix F- 020.5859.100**
- 5.3 The impermeable area contributing to discharge from the development total = 456 m² (including 10% urban creep):
- Roof area- 315 m²
 - Permeable paving car parks- 100 m²
- 5.4 Permeable areas **not** contributing to the drainage discharge:
- Impermeable hardstanding and paths not positively drained- 160 m²
 - Permeable areas including gravel topped driveway- 1100 m²
- 5.5 The proposed drainage system will therefore make use of new drainage runs. New soakaway systems shall consist of permeable paving systems with fines reduced granular material under which will attenuate and soakaway surface water runoff. If required by low infiltration rates, overflow to the drainage network in the highway will be proposed to discharge at a greenfield runoff rate of 2.0 l/s and utilise existing connections to the offsite network. Existing drains that cannot be used, shall be abandoned, or removed and capped off.
- 5.6 MicroDrainage source control calculations have been carried out and show that the site will not flood in events up to 1 in 100-year + 45% climate change storm event. See **Appendix E** for the full MicroDrainage output.

Foul water

- 5.7 The site's foul water flows shall be taken off site via the existing outfall (to be surveyed) and presumed to outfall to a foul water sewer in Havant road. Existing drains that cannot be used shall be abandoned or removed. Please refer to **Appendix F- 020.5859.100** for the drainage strategy drawing.
- 5.8 Foul water volume assessments are based on 5 number 2-bedroom apartments and 4 number 1-bedroom apartments. This level of occupancy will yield an average of 1.81 residence per apartment and based on 150l/person/day yields a foul flow of 2443 l/day. (9x1.81x150)

6. WATER QUALITY

6.1 Figure 7 to Figure 8 are extracted from the SuDS Manual and demonstrate the pollution risks associated with various discharge situations.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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 ¹	High	0.8 ²	0.8 ²	0.9 ²

Figure 7: Table 26.2 of the SuDS Manual

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater				
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons	
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6	
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3	
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4	
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7	
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8	
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.			

Figure 8 : Table 26.4 of the SUDS Manual

6.2 Using the UK SuDS water quality toolkit, the proposed SuDS components have been assessed and would be deemed as sufficient. Please see **Table 1** below for a summary of the toolkit results. See **Appendix G** for the full UK SuDS water quality toolkit output.

6.3

Land Use	Pollution Hazard Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Low Traffic Roads/Residential Parking	0.5	0.4	0.4
SuDS Component	Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7
Sufficiency of water treatment	Sufficient	Sufficient	Sufficient

Table 1: UK SuDS Water Quality Toolkit Summary

7. MICRODRAINAGE CALCULATIONS

7.1 Source control calculations have been carried out to determine the stability and resilience of the drainage system to drain the development in its future use.

7.2 Factors used:

- Proposed drainage area is 0.0415Ha + 10% urban creep = 0.0456 Ha
- 45% climate change applied to all modelling scenarios.
- Runoff coefficient 1.0 for summer, 1.0 for winter.
- infiltration rates are based on the **average** rate of 0.0046 m/hour.
- A safety factor of 2 has been applied to the soakaway structures to account for a scenario in which half of the soakaway structures are blocked.

7.3 Results of the modelling indicate that there is no flooding experienced in the worst case 100 year + 45% Climate change event.

7.4 Half drain times have been calculated. The durations are longer than 24 hours with the worst case 100 year +45% storm and as such additional storage capacity has been included to include for a 10 year +45% storm occurring within 24 hours.

7.5 **Refer to appendix E for MicroDrainage calculations.**

8. SUMMARY AND CONCLUSION

- 8.1 This site falls wholly within flood zone one (FZ1), and the development is appropriate for the site according to NPPF guidance.
- 8.2 Surface water runoff from the development shall be drained by a combination of new and existing drains and shall discharge to a soakaway system under a permeable paving car park. Micro drainage calculations have been undertaken to determine if the development soakaway capacity, from the existing systems, is sufficient to drain the development with the inclusion of 45% increase in climate change. Overflow from the surface water system, if soakaway rates preclude disposal of all the surface water to the ground, will be made to the front of the property via the existing surface water connection at 2l/s.
- 8.3 Results of modelling the flows through the soakaway structures indicate that the soakaway system does not flood in the 100-year event +45%. The Half drain time of the worst-case 100-year event exceeds 24 hours and as such additional volume storage is provided in the structure to fully accommodate a 10 year +45% storm occurring within a 24-hour period. **No flooding occurs** in any event up to the 100 year +45% climate change scenario. Soakaway structure volume is 73 m³ (surface area 124m², 1.7m deep). The worst case 100-year event generates 44 m³ and the 10-year worst case generates 25 m³ cube. Total combined 100 year and 10 year event is 69 m³. Therefore, the drainage system fully accommodates all storms up to an including 100 year storm +45% and a 10 year storm +45% occurring within 24 hours with no associated flooding
- 8.4 Foul flows produced on site shall be taken off site via a gravity flow system and passed onto the existing Southern Water sewer located in Havant Road. Utilization of the existing connection is preferable and will depend on the condition of this connection.
- 8.5 The site has been assessed for all sources of flood risk including rivers, canals, reservoirs, surface water and sewers. This report concludes that the site is considered to be at very low risk of flooding from all sources of flooding.
- 8.6 The proposed surface water system provides adequate water quality uplift in accordance with the UK SuDS Water Quality Toolkit. (Refer to Appendix F)

- 8.7 As a result of the proposed development there is no increase in flood risk either on site or downstream, and therefore it is considered that the development is suitable in the context of flood risk.