



BRIGHT PLAN CIVILS

**FISCAL HOUSE, 2 HAVANT ROAD,
EMSWORTH PO10 7JE**

**CONVERSION & EXTENSION OF
EXISTING OFFICES TO RESIDENTIAL,
AND DETACHED HOUSE WITH
GROUND FLOOR PARKING**

Flood Risk Assessment & Drainage Strategy
Report

Prepared on Behalf of

Paul & Elaine Munday Property Rentals

D2148/FRA1.0

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DOCUMENT CONTROL

Project: Fiscal House, 2 Havant Road, Emsworth PO10 7JE
Conversion & Extension of Existing Offices to Residential, and Detached House with Ground Floor Parking

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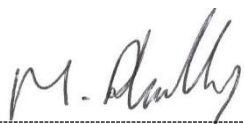


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1 INTRODUCTION

1.1 Background

- 1.1.1 Bright Plan Civils is instructed by Paul & Elaine Munday Property Rentals to prepare a Flood Risk Assessment & Preliminary Drainage Strategy Report to support a planning application for the Conversion & Extension of Existing Offices to Residential, and Detached House with Ground Floor Parking at Fiscal House, 2 Havant Road, Emsworth PO10 7JE, Emsworth – Phase 2 of the development at the site.
- 1.1.2 Site proposals are seen in **Appendix A** of the report.
- 1.1.3 This report has been undertaken in accordance with National Planning Policy Framework (NPPF) and The Planning Practice Guidance on the use of SuDS for achieving sustainable development.
- 1.1.4 In preparing this report, Bright Plan Civils has referred to the following documents and information:
- Environment Agency Product 4 Response
 - Environment Agency Flood Maps for Planning
 - Long Term Flood Risk Information; Flood Risk Maps
 - Southern Water and Local Authority Drainage Records
 - Local Planning Authority and Lead Local Flood Authority Strategic Flood Risk Assessments
 - British Geological Survey & Records
- 1.1.5 This document has been prepared to propose assess drainage constraints and propose a drainage strategy that is appropriate for the design life of the development, without causing offsite impacts from runoff in a design event.
- 1.1.6 This report has been prepared for the benefit of the named Client only.

1.2 Site Location and Description

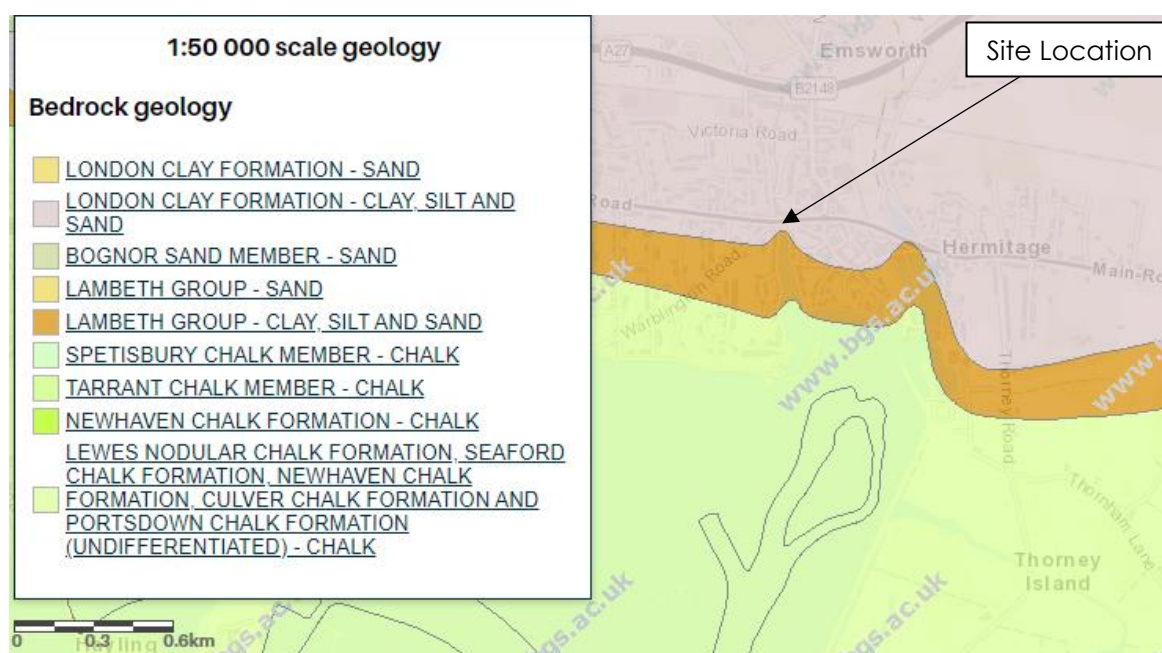
- 1.2.1 The property is in a residential area of Emsworth, within the Borough of Havant. It is bordered by residential Warblington Road to the west, Havant Road to the north, residential property to the south, and Waterside URC to the east, as seen in **Drawing 100**. The site area is 860m², with a Phase 2 development area of 678m².
- 1.2.2 A topographical survey of the site has been undertaken and provided by the client. It is included in **Appendix B** of this report. The topographical survey shows that the development area levels fall from 3.87mAOD in the south west corner of the site to the north, with a low point of 3.60mAOD within the north east corner of the courtyard.
- 1.2.3 The existing site buildings are drained by gully and pipe drainage, presumed to connect into the existing public surface water drainage system.
- 1.2.4 The nearest watercourse is the Main River (unknown name) that discharges into Slipper Mill Pond apposite Bath Road from the site (approx. 20 metres from the site boundary). In addition, the River Ems which runs south into coastal Chichester Harbour approximately 275m east of the site.
- 1.2.5 The nearest surface water feature is Slipper Mill Pond which runs adjacent to the site, approximately 20m

to the east.

- 1.2.6 The existing development area is 678m² (0.068 Ha), and consists of 656m² of hardstanding impermeable areas – as demonstrated in **Drawing 200**.

1.3 Ground Conditions

- 1.3.1 In the absence of a site-specific geotechnical investigation, reference has been made to the British Geological Survey (BGS) website.



- 1.3.2 The BGS geology viewer states that the bedrock geology is likely to consist of 'London Clay Formation – Clay, Silt and Sand', as seen in **Figure 1**.

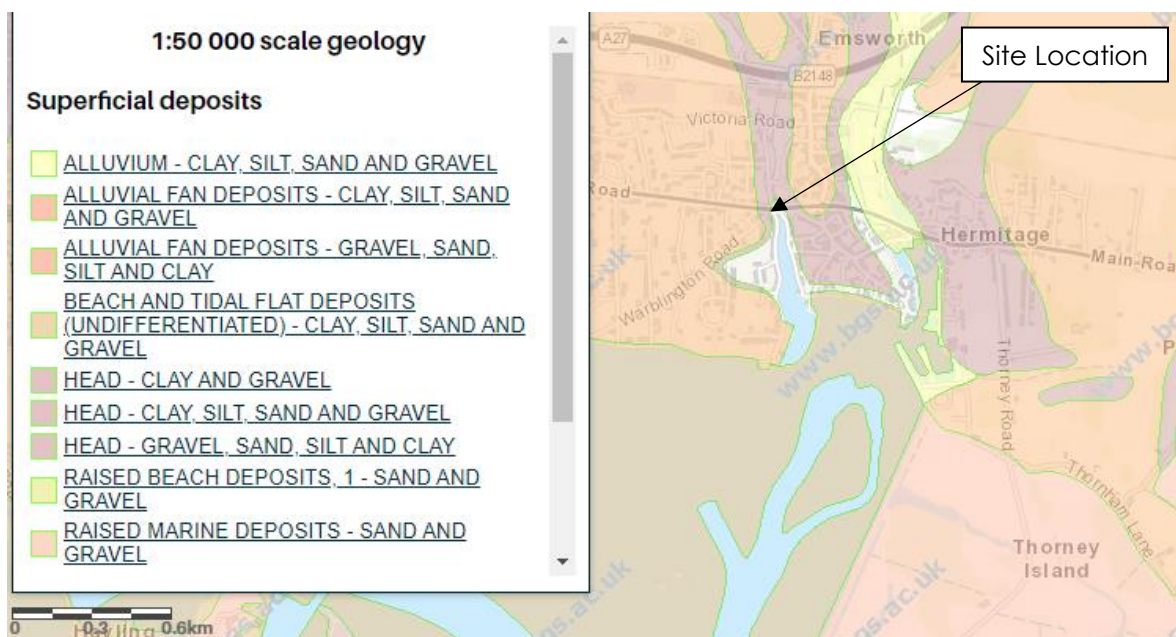


Figure 2. BGS website superficial deposits

1.3.3 Superficial Deposits are recorded as 'Head – Clay and Gravel', as seen in **Figure 2**.

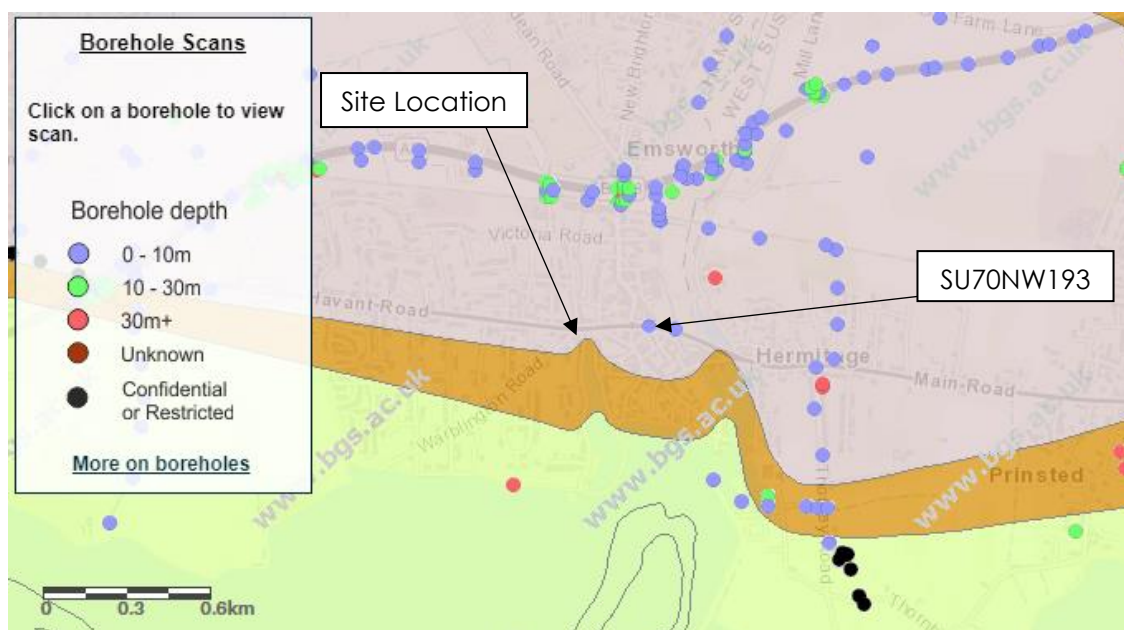


Figure 3. BGS website borehole locations

- 1.3.4 Historic borehole records from the Single Onshore Boreholes Index (SOBI) on the BGS website have also been reviewed in the absence of a site-specific geotechnical investigation, as depicted in **Figure 3**.
- 1.3.5 A borehole at the Emsworth New Bridge, 270m east of the site was assessed in comparison to the site, as seen in **Figure 3**. This borehole has similar geotechnical strata according to the BGS online mapping.
- 1.3.6 The borehole has a recorded depth of 5.9m and confirms the presence of 'stiff brown CLAY' to a depth of 4.0 metres, underlain by further layers of MUDSTONE and CLAY.
- 1.3.7 A copy of the BGS records reviewed can be found within **Appendix C** of this report.

1.4 Groundwater

- 1.4.1 The recorded BGS borehole at Emsworth New Bridge recorded groundwater at 1.2mbgl.
- 1.4.2 The Urban South Hampshire PUSH SFRA indicates that areas at risk of groundwater flooding are north of the borough where highly permeable geology meets lower permeability geology and is reflected by historical incident records. The PUSH SFRA Flood Mapping indicated no recorded groundwater flood incidents in the vicinity of the site. Extracts from the SFRA can be found within **Appendix D**.
- 1.4.3 Mapping managed by MAGIC (magic.defra.gov.uk) provides geographic information concerning the natural environment from across government. This mapping tool has been referred to in order to confirm whether the site is located within either any groundwater source protection zones or groundwater vulnerability zones.
- 1.4.4 The site is situated within an 'Unproductive' Aquifer for Bedrock stratum and a 'Secondary A' Aquifer for Superficial Drift stratum, as seen in **Figure 4**. This refers to bedrock that is impermeable and drift deposits only that exhibit variable permeability and may provide groundwater storage or supply at a local or strategic level.

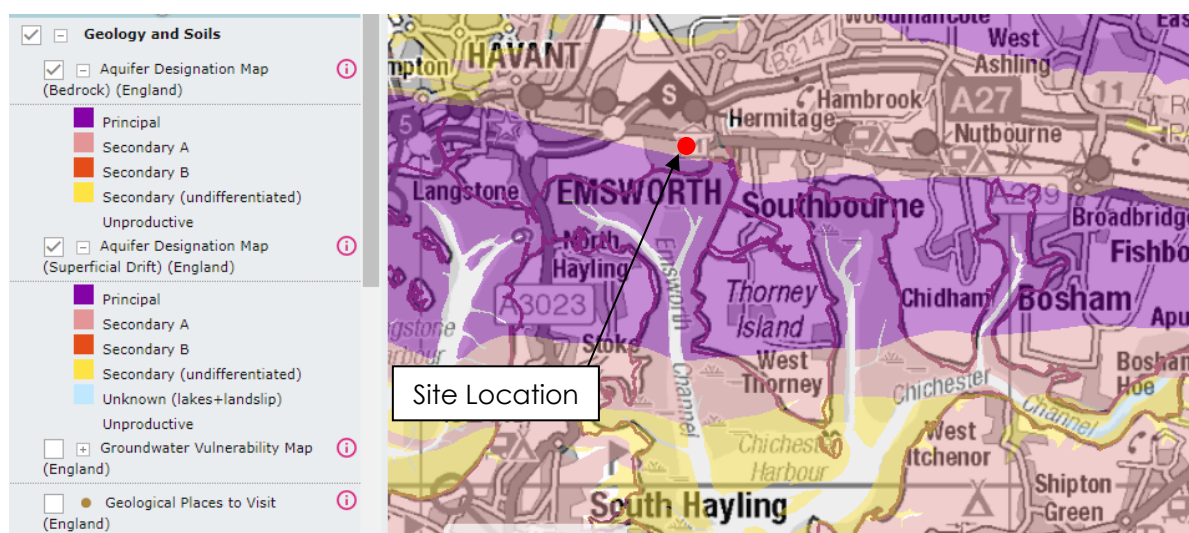


Figure 4. DEFRA Aquifer Designation Map

- 1.4.5 The Groundwater Vulnerability Map (**Figure 5**) confirms that the site falls within a 'Medium-Low' groundwater vulnerability zone with Soluble Rock Risk.

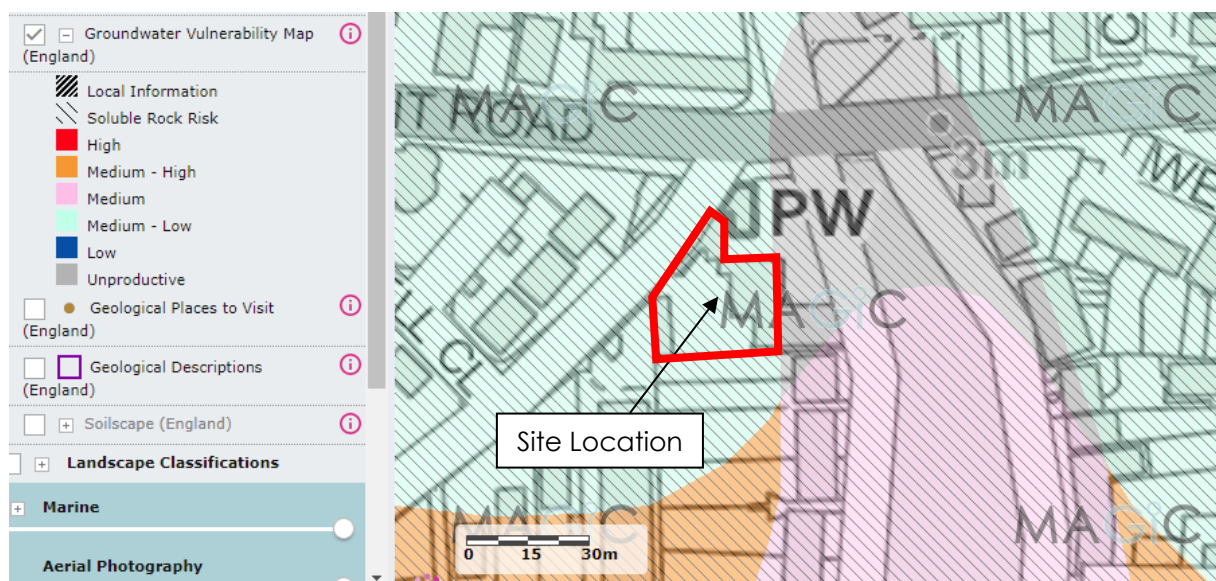


Figure 5. DEFRA Groundwater Vulnerability Map

- 1.4.6 The site is not indicated as within or in the vicinity of any Drinking Water Safeguard Zone or a Source Protection Zone.

1.5 Existing Drainage

- 1.5.1 The local Water Authority is Southern Water, who provide sewerage services within the area. Public sewer records have been obtained from Southern Water, as contained within this report in **Appendix E**.

1.5.2 Surface Water:

- (a) The Southern Water public sewer records (**Appendix E**) show public surface water sewers along Warblington Road and Havant Road adjacent to the site.
- (b) An existing public surface water manhole at the junction with Warblington Road is adjacent to the site frontage, and demonstrates cover level as 3.07mAOD and pipe invert level as 2.17mAOD.
- (c) The existing building is drained by rainwater pipes, and hardstanding areas by a drainage channel gully. The connection route of this drainage is not currently confirmed.
- (d) The nearest surface water feature is Slipper Mill Pond which runs adjacent to the site, approximately 20m to the east.
- (e) The nearest watercourse is a culverted Main River 20m east of the site, which discharges into the Slipper Mill Pond.
- (f) The existing hardstanding across the site is 656m². The estimated annual peak runoff rate for the development area of the site is therefore considered to be 9.1 l/s, based on a peak annual rainfall of 50mm/hr.

1.5.3 Foul Water:

- The Southern Water public sewer records (**Appendix E**) show public foul water sewers along Warblington Road, Havant Road and Bath Road adjacent to the site
- It is expected that there is an existing connection into the foul water sewer network from the site. Investigation is required to establish connection arrangements of the proposed development to the existing public foul sewer.

1.5.4 Highway Drainage:

(g) Havant Road (A259) and Warblington Road appear to be drained by highway gullies.

2 PROBABILITY

2.1 Sources of Information

- 2.1.1 The NPPF requires that all sources of flooding are considered being Tidal, Fluvial, Pluvial, Groundwater, Sewers and Man-made reservoirs/canals.
- 2.1.2 The likelihood of the site flooding has been established by reviewing the following information:
- Environment Agency Flood Maps for Planning
 - Long Term Flood Risk Assessment Surface Water Flood Risk Maps
 - Long Term Flood Risk Assessment Reservoir Flood Risk Maps
 - Local Authorities Strategic Flood Risk Assessment
 - Consultation with Local Authority/Lead Local Flood Authority

2.2 Flood Maps and Modelling

- 2.2.1 The Environment Agency's Product 4 Response provided flood maps for rivers, sea and surface water as seen in **Appendix F**.
- 2.2.2 The Product 4 shows the proposed development area of the site is in Flood Zones 1 and 2.
- 2.2.3 Flood levels for 3 No. nodes on the site have been taken from the Fluvial Levels Map, completed by The Environment Agency. All 3 no. nodes are located to the northeast of the proposed development area.
- 2.2.4 The table below demonstrates the modelled flood fluvial levels. When considered in comparison with the existing site levels, which have a minimum elevation of 3.60mAOD, the site is elevated above modelled fluvial flood risk.

Fluvial Flood Data		Water Surface Level (mAOD*)		Water Depth (metres)	
Point	Ground Level	1% Annual Probability/1 in 100 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)	1% Annual Probability/1 in 100 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)
1	3.08	No Data	3.25	No Data	0.17
2	3.18	No Data	3.25	No Data	0.07
3	3.13	No Data	3.15	No Data	0.02

- 2.2.5 In addition, Flood levels for 7 No. nodes on the site have been taken from the Tidal Levels Map, completed by The Environment Agency. Node 7 is considered to be in the Phase 1 area of the site to the northeast, so is not to be considered in this Flood Risk Assessment.
- 2.2.6 Three of the nodes within the development area have been provided in the table below for consideration.

Tidal Flood Data		Water Surface Level (mAOD*)		Water Depth (metres)	
Point	Ground Level	0.5% Annual Probability/1 in 200 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)	0.5% Annual Probability/1 in 200 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)
1	3.69	No Data	3.69	No Data	0.00
4	3.67	No Data	3.70	No Data	0.03
6	3.61	No Data	3.63	No Data	0.02

- 2.2.7 Of the information provided by the Environment Agency, as detailed above, Node 1 is located in the southeast corner, Node 4 is on the northwest boundary at the vehicular access, and Node 6 is in the central parking area.
- 2.2.8 When the modelled tidal flood levels are considered in comparison with the topographic survey, there is not considered to be any flood risk to the development area in an existing 1 in 200 year (0.5% AEP) storm event, and up to 100mm flooding in an existing 1 in 1000 year event (0.1% AEP) storm event.
- 2.2.9 The flood modelling results demonstrate that the proposed development area is elevated above fluvial flood levels and tidal flood levels for a 1 in 100 and 1 in 200 year storm respectfully, and is therefore elevated above the existing Flood Zone 3.
- 2.2.10 As the development area is partially below the 1 in 1000 year tidal flood level, it is partially within Flood Zone 2, however.
- 2.2.11 The Product 4 Response does not include an allowance for climate change, and therefore an allowance needs to be factored in to allow for an assessment of flood risk for the lifetime of the development (100 years).
- 2.2.12 Climate change allowances are set out for the following:
- peak river flow
 - peak rainfall intensity
 - sea level rise
 - offshore wind speed and extreme wave height
- 2.2.13 The site is located within the Arun and Western Streams Management Catchment, and the following peak river flow climate change allowances are provided by the Environment Agency for the catchment.

Epoch (period of time)	Central Allowance	Higher Allowance	Upper Allowance
2020s	11%	16%	27%
2050s	13%	19%	36%
2080s	25%	36%	64%

- 2.2.14 As per the Environment Agency guidance for more vulnerable development in flood zone 2, the central

allowance should be utilised. This represents a 25% increase in peak river flow for the lifetime of the development, and while it is not possible to quantify the potential increase in fluvial flood levels the building as a result of climate change without extensive 2D hydraulic modelling (unreasonable to scope of development), it is clear that there is an increased risk of fluvial flooding as a result of climate change.

- 2.2.15 As a result, it is recommended that a 300mm conservative allowance is considered above maximum fluvial flood levels – assuming a maximum fluvial flood level of 3.55mAOD in a 0.1% AEP flood event.
- 2.2.16 The Environment Agency provide sea level allowances by river basin district for each epoch (with a calculation made using the per year allowance for a 2022 baseline). The table below demonstrates the the total sea level rise in the South East river basin district, per epoch, in metres.

South East	2022 to 2035	2036 to 2065	2066 to 2095	2096 to 2122	Cumulative risk from 2022 to 2122
Higher Central	0.075m	0.261m	0.348m	0.354m	1.04m
Upper End	0.090m	0.339m	0.474m	0.491m	1.39m

- 2.2.17 This indicates an increase in maximum tidal flood levels of between 1.04m and 1.39m over the next 100 years. This would represent an increase in the tidal flood levels to between 4.55mAOD and 4.9mAOD for a 0.5% AEP tidal flood event.
- 2.2.18 The PUSH Strategic Flood Risk Assessment (SFRA), produced by Atkins in 2007, also indicated extreme water levels for Chichester Harbour as 4.5mAOD for a 0.5% AEP tidal flood event, for the year 2115. The Environment Agency response to Phase 1 of the development at this site was also to use 4.5mAOD as the design tidal flood level for the lifetime of the development.
- 2.2.19 Although there are also wind and wave allowances for climate change, the site is located significantly within an estuary that it is not considered these would have a significant effect on the site location.
- 2.2.20 The Environment Agency's on-line Flood Maps for Planning (rivers and sea) show that the site is located within Flood Zones 2 and 3a. The flood zones are also confirmed by information and mapping obtained from The Environment Agency following consultation, which is consistent within other flood risk mapping reviewed.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

2.2.21 **Figure 6** also shows that development area of the site is at 'low' to 'medium' risk of flooding from rivers or sea, bordering 'high' risk to the north.



Figure 6. Long Term Flood Risk Map; Flood risk from rivers or the sea

2.2.22 **Figure 7** shows that the development area of the site is at very low risk of surface water flooding. There is however medium to high risk of surface water flooding within the adjacent highways, although this would appear to be less than 300mm in a low risk flood scenario, which would not inhibit access or egress from the site.



Figure 7. Long Term Flood Risk Map; Flood risk from surface water

2.2.23 **Figure 8** shows that the site is not at risk of flooding from reservoirs.



Figure 8. Long Term Flood Risk Map; Flood risk from reservoirs

2.2.24 It is important to note, in summary, that the existing topographic survey shows the existing site is completely surrounded by a boundary wall elevated above all existing and future modelled flood levels. Assuming the flood mitigation measures for Phase 1 are in place on the building to the north, the only access for flood waters would be via the vehicular access to the west, which has a minimum level across the gate line of 3.79mAOD.

2.3 Strategic Flood Risk Assessment

2.3.1 The Urban South Hampshire PUSH SFRA identified the site location as at high susceptibility to groundwater, located within Flood Zone 2 and located within a Flood Warning Area.

2.3.2 The site is shown to have a 'low risk' rating for Flood Zone 2 Un defended Hazards, at very low risk of surface water flooding (small isolated area at low risk within the site, low to high risk within the adjacent highway), outside of the Climate Change (Year 2115) Fluvial Flood Zone 3 but within the Climate Change (Year 2115) Tidal Flood Zones 2 & 3. Extracts are included in **Appendix D**.

2.4 Historic Flooding

2.4.1 The Environment Agency were consulted regarding historic flooding at the site, and online information from Department for Environment, Food & Rural Affairs (DEFRA), Hampshire County Council and Havant Borough Council was investigated for details of historic flooding in the vicinity of the site.

2.4.2 The DEFRA recorded flood outlines on environment.data.gov.uk demonstrate a recorded flood outline along the watercourse corridor of the main river to the east of the site, including along the length of Bridge Road to the north and Bath Road to the east, and across the adjacent Havant Road where the watercourse passes under the road. This was shown to affect the site frontage, however the flood

extents do not indicate flooding within the site area.

- 2.4.3 The PUSH SFRA Flood Mapping indicated no records of Southern Water observed flooding in the vicinity of the site, and no recorded groundwater flood incidents in the vicinity of the site. Extracts are included in **Appendix D**.

2.5 Summary of Flood Risk

- 2.5.1 The potential sources of flooding are:

Source of Flooding	Level of Risk
Rivers and Coastal	Medium (Residual Risk: High) The site is within Flood Zones 1 and 2, however is shown to be at increased risk of tidal flooding for the lifetime of the development as a result of climate change and rising extreme tidal levels.
Surface Water	Very low The long-term flood risk for surface water is classified 'very low' risk across the development area. Surface water flooding within the adjacent highway is 'high' with depths indicated to be a maximum of 300mm.
Groundwater	Medium BGS records found the site to be situated above Clay soils. Nearby borehole logs found presence of groundwater 1.2mbgl. The Portsmouth City Council SFRA did not indicate the site area as susceptible to groundwater flooding.
Sewers	Medium There are surface water sewers within the area, and no reports of sewer flooding found. The high risk of surface water flooding within the adjacent highway could indicate areas of highway drainage at risk of being surcharged, however.
Artificial Sources	None The site is not shown to be at risk of flooding due to artificial sources.

3 PROPOSED DEVELOPMENT

3.1 Description of Development

- 3.1.1 The proposed development will involve the Conversion & Extension of Existing Offices to Residential, and Detached House with Ground Floor Parking, with associated landscaping as demonstrated within **Appendix A**.
- 3.1.2 The existing use of 'Building used for financial, professional, offices etc' is classified as 'less vulnerable' development whilst 'Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels' is classified as 'more vulnerable' development to the classification (Flood Risk and Coastal Change Table 2) and are considered appropriate within Flood Zones 1 and 2 (Flood Risk and Coastal Change Table 3).
- 3.1.3 This Flood Risk Assessment will provide flood mitigation measures to address the existing and future flood risk to the development.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	Exception Test Required	✓	✓	✓
Flood Zone 3a†	Exception Test Required †	✗	Exception Test Required	✓	✓
Flood Zone 3b*	Exceptions Test Required *	✗	✗	✗	✓*
✓ = Development is appropriate ✗ = Development should not be permitted					

- 3.1.4 The proposed development will decrease the hardstanding area of the site; reducing the rate of run-off generated by the site, with an area of existing building and hardstanding converted into soft landscaping garden areas. The surface water drainage of the site will follow existing principles as the proposals are only for a change of use to the existing buildings.

4 SEQUENTIAL AND EXCEPTION TESTS

4.1 Sequential Test

- 4.1.1 The Flood Map for Planning and assessment of flood risk against site levels demonstrate that the development area is within Flood Zones 1 and 2. Environment Agency guidance for sequential tests indicates that Sequential Tests must be undertaken for developments that are within Flood Zone 2.
- 4.1.2 The proposals are for two aspects: 1 no. conversion and extension of an existing office to a residential space, and 1 no. new residential development.
- 4.1.3 The proposed conversion and upper storey extension of the existing building is located within Flood Zone 2, although the finished floor level is to be raised 300mm above - and threshold accesses would be protected by flood route via the vehicular access - flooding above the Flood Zone 2 (1 in 1000 year flood) event. The Environment Agency guidance on the Sequential Test, Flood Risk and Coastal Change guidance, and Footnote 56 of the National Planning Policy Framework note that a Sequential Test is not required for minor development.
- 4.1.4 The proposed new residential building site area is located sequentially to the southwest of the site, within Flood Zone 1 and elevated above Flood Zone 2 (1 in 1000 year flood event levels). This aspect of development also does not require a Sequential Test, therefore.

4.2 Exception Test

- 4.2.1 The Flood Map for Planning and assessment of flood risk against site levels demonstrate that the development area is within Flood Zones 1 and 2. Residential development within Flood Zone 2 is considered acceptable, and an Exception Test would not be required.
- 4.2.2 Details below are considered however, in line with the wording of the Exception Test, to ensure the proposed development has considered management and mitigation of flood risk for the lifetime of the development, due to increased risk as a result of climate change.
- 4.2.3 The Exception Test demonstrates how flood risk is managed on a proposed site. The Exception Test should include a demonstration that the development will be safe for its lifetime taking into account the vulnerability of its users and that it won't increase flood risk elsewhere (assessment and mitigation within the flood risk assessment).
- 4.2.4 In order to demonstrate the requirements are met with reference to Paragraphs 102 & 103 of NPPG Flood Risk and Coastal Change we summarise as follows:
- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4.2.5 The Flood Risk Assessment demonstrates that the proposed development will reduce the site impermeable area and will reduce the rate of run off generated by the site from 9.1l/s peak annual average runoff to 2.0l/s in up to a design storm event (1 in 100 year, 45% climate change). This ensures that the development has a beneficial impact on surface water flood risk to and from the proposals.
- 4.2.6 The proposed conversion of the existing building will not increase the building footprint, with the extension only to upper floors to provide bedrooms. The proposed new residential building will have an open parking area at ground floor that is built sufficiently flood resilient for times of climate change

induced flooding, with residential development on upper floors. The proposals would therefore not impact on fluvial or tidal flood risk to or from the development.

- 4.2.7 Flood Mitigation measures will be proposed to ensure that the proposed development is safe for its lifetime for the proposed residential occupants. This includes flood resilient construction techniques, flood protection measures, vulnerable uses (bedrooms) proposed solely on upper floors, and a flood evacuation plan.
- 4.2.8 Paragraph 103 states 'When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:'
- *within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location.*
- 4.2.9 The proposals are sequentially located to the lowest area of flood risk at the site, with access and egress at the highest point of the site with access to higher ground. In addition, the proposals have been sequentially designed to ensure all bedrooms are included at higher levels at the existing building, and that the proposed new building has only open parking at the ground floor, and more vulnerable site use is elevated solely at higher levels.
- *development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.'*
- 4.2.10 As discussed in Section 6, Flood Mitigation measures will be proposed that ensure the development is appropriately flood resilient. In addition, safe access and egress routes will be provided where necessary so that any residual risk to future residents can be safely managed. A Flood Evacuation Plan (FEP) template is provided in **Appendix G**.
- 4.2.11 As the development is partially within Zone 2, it is therefore recommended that the occupants of the development are subscribed to the Environment Agency's flood warning scheme and there is provision of a Flood Evacuation Plan to determine what actions occupants should take leading up to and during a nearby flood event. The Flood Plan would consider further the specific requirements with regard to access and egress.
- 4.2.12 The development has considered use of sustainable drainage systems, to further reduce runoff from the existing Brownfield site. The proposals will also reduce site runoff by proposing new areas of soft landscaping.

5 PROPOSED DRAINAGE STRATEGY

5.1 Surface Water

5.1.1 The SUDS manual and Building Regulations set out a hierarchy of drainage methods to ensure that developments maximise the use of sustainable drainage techniques. The hierarchy favours infiltration methods of disposal over other methods such as watercourse and sewers, as detailed below;

- i. Utilise infiltration techniques
- ii. Attenuate rainwater in ponds or open water features for gradual release
- iii. Attenuate rainwater by storing in tanks or sealed water features for gradual release
- iv. Discharge rainwater direct to a watercourse
- v. Discharge rainwater to a surface water sewer/drain
- vi. Discharge rainwater to a combined sewer

SUDS Technique	Suitable	Comments
Living Roof	No	Pitched roof proposed means green or sedum roof is not be consistent with architects proposals. Architect has confirmed not viable to include measures.
Basins and Ponds (such as Wetlands, Balancing Ponds, Detention Basins, Retention Ponds)	No	There is no sufficient space for these measures.
Filter strips and swales	No	There is no sufficient space for these measures.
Infiltration Devices - Soakaways - Infiltration trenches and basins	No	Underlying ground conditions are indicated as predominantly Clay so soakage is not considered feasible, and there is not sufficient space to ensure any soakaway features have clearance from structures.
Permeable surfaces and filter drains (such as gravelled areas and porous block paving)	Yes	As above, however permeable surfaces would provide a source of treatment and shallow attenuation.
Tanked systems (such as oversized pipes or cellular tanks)	No	Shallow sewer connections limit viability of a gravity connection from a tanked storage system.

- 5.1.2 It is not considered that infiltration measures are viable, given BGS borehole records in the vicinity which indicate underlying Clay from below the surface to bedrock level. Permeable surfacing will capture rainfall however and attenuate surface water in order that it can be discharged at a reduced controlled rate.
- 5.1.3 It is recommended that the existing drainage on and in the vicinity of the site is investigated. It may be that existing surface water drainage infrastructure from the previous development can be utilized thus avoiding the need to connect into the public surface water system directly.
- 5.1.4 The proposed drainage system will utilize 195m² of permeable block paving with a minimum sub-base thickness of 400mm, with a controlled outflow via a Hydrobrake of 2.0l/s to the public surface water sewer system, as detailed in **Drawing 400**. Confirmation of existing drainage infrastructure is required to establish a connection point for the proposed drainage system.
- 5.1.5 The site area is elevated above existing and future fluvial modelled flood levels, and existing tidal flood levels. Should the site become flooded by future tidal flood levels, the permeable pavement would be inundated. As the wider private and public surface water drainage networks would also be inundated in this instance, it is not considered a barrier to proposing permeable block pavement.
- 5.1.6 It is proposed that all captured runoff from the proposed hardstanding areas is captured up to the 100-year event including allowance for climate change and urban creep, without exceedance.
- 5.1.7 The strategy above will ensure that there is no increase in the rate of run-off leaving the site, therefore no increase in the risk of flooding from this source.
- 5.1.8 Hydraulic Modelling calculations demonstrate the surface water drainage system operation up to the design event are included in **Appendix H**.

5.2 Treatment

- 5.2.1 In accordance with the CIRIA SuDS Manual C753 regarding methods for managing pollution risks, the risk posed by surface water runoff to the receiving environment depends on the pollution hazard at the site (the source), SuDS treatment techniques (the pathway), and the sensitivity of the environment (the receptor).
- 5.2.2 The simple index approach considers whether SuDS techniques are appropriate for the site. The states that for SuDS components to deliver adequate treatment, the total pollution mitigation index for each contaminant type should equal or exceed the pollution hazard index.
- 5.2.3 The SuDS Manual outlines three categories of pollution hazard identification, which vary depending on proposed land use, which are as follows:
- Total Suspended Solids (TSS).
 - Metals (M).
 - Hydrocarbons (H).
- 5.2.4 In accordance with C753 Table 26.2, the proposed land uses at the site are categorised as follows:
- Residential Roofs and non-trafficked areas – very low/TSS=0.2/M=0.2/H=0.05

- Residential car parks – low/TSS=0.5/M=0.4/H=0.4

5.2.5 In accordance with C753 Table 26.3, the values of SuDS Mitigation indices are provided for permeable paving:

- Permeable Pavement – TSS=0.7/M=0.6/H=0.7

5.2.6 As the pollution hazard index does not exceed any pollution mitigation index for any contaminant type, the proposed SuDS methods will provide sufficient treatment for the proposed development.

5.3 Foul Water Drainage

5.3.1 An existing foul water sewer runs adjacent the site along Warblington Road. Investigation is required into the existing site connection in order to ascertain the proposed connection arrangement for the proposed development.

5.3.2 Post development, there will be an estimated increase in peak foul water flows to 0.10 l/s (based on Water UK Sewer sector Guidance, Design and Construction Guidance).

5.3.3 The infrastructure and connection charges (OFWAT Charging Rules) place the onus on the sewerage undertaker to reinforce their network should there no longer be sufficient capacity to serve the new development. Funding for this is provided by revised charging arrangements for infrastructure and connection charges for each dwelling constructed comprising a Network Reinforcement Charge and Site-Specific Charges. The revised charging arrangement (funded by the developer) covers alterations to the Existing Sewer Network and the sewerage undertaker remains responsible for the cost of reinforcing their Strategic Assets. The developer is responsible for connecting the development to the public sewer network.

5.4 Climate Change

5.4.1 In May 2022 the Environment Agency updates the latest climate change allowances (available online at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>), which supports the NPPF in making an allowance for climate change within flood risk assessment. The allowances provide predictions of anticipated change for peak river flow by river basin district and peak rainfall intensity.

5.4.2 The table below shows the anticipated changes in extreme rainfall intensity. For flood risk assessments, both the central and upper end allowances should be assessed to understand the range of impact.

5.4.3 For the Arun and Western Streams Management Catchment peak rainfall allowances, climate change allowances are provided for the 2050s epoch and 2070s epoch for a 1 in 30 year storm and a 1 in 100 year storm. The '2050s' epoch is for development with a lifetime up to 2060 and the 2070s epoch for development with a lifetime between 2061 and 2125.

Arun and Western Streams Management Catchment	Total potential change anticipated for the '2050s'	Total potential change anticipated for the '2070s'
Central	20%	25%
Upper End	35%	40%

3.3% annual exceedance rainfall event

Arun and Western Streams Management Catchment	Total potential change anticipated for the '2050s'	Total potential change anticipated for the '2070s'
Central	20%	25%
Upper End	45%	45%

1% annual exceedance rainfall event

- 5.4.4 Based on the latest allowances, an increase of 25% should be applied to peak rainfall to this development, with a review undertaken to determine the impact of a 45% increase.

5.5 Urban Creep

- 5.5.1 In accordance with the HCC surface water guidance on urban creep requirements for residential developments, a 10% allowance for urban creep has been assessed against the proposed surface water drainage system. The hydraulic calculations demonstrate that the proposed system has sufficient capacity to allow for the urban creep allowance without exceedance.

6 RESIDUAL RISK AND MITIGATION

6.1 Residual Risk

6.1.1 The following residual risks have been identified in relation to the proposed development:

- i. Flooding of buildings within flood zone.
- ii. Increased flood risk as a result of climate change.

6.2 Mitigation

6.2.1 Consideration has been taken to the residual risks stated in Section 6.1, and the following mitigation measures are proposed:

- i. The Environment Agency Product 4 response indicates the site is subject to 1 in 200 year flood levels 3.50mAOD (Flood Zone 3) and 1 in 1000 year flood levels of 3.70mAOD (Flood Zone 2). The minimum existing site levels are approximately 3.60mAOD, with the proposed finished floor levels of 4.00mAOD and minimum hardstanding levels of 3.85mAOD. As such, the proposed site will be elevated above existing flood levels.
- ii. The impact of climate change is predicted to result in an increase to design flood levels over the lifetime of the development, to 4.5mAOD. This would result in flooding to the existing property of up to 500mm, and external flooding along the site evacuation route of up to 600mm. Mitigation measures are required to ensure that the site is safe for use for the lifetime of the development. In accordance with "Improving the Flood Performance of New Buildings – Flood Resilient Construction", produced for Communities and Local Government and the Environment Agency, May 2007, as well as in accordance with standing advice and Flood Resilient Construction guidance (<https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings>) & (<https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#extra-flood-resistance-and-resilience-measures>), the following mitigation measures are proposed accordingly:
 - a. Flood resistance measures; which look to keep water out of the building when flood depths are up to 300mm. This includes tanking and waterproof construction, to be considered as retrofit measures to the conversion development, as well as the use of impermeable building materials to at least 300mm. This will look to keep water out of the building in up to 4.3mAOD in a future extreme tidal flood event, and would result in minimal damage or deformation. Residents would also be able to leave their house and follow the evacuation plan in this scenario.
 - b. Flood resistance measures; in addition, use of floodgates across doors could prevent flood ingress to entrances.
 - c. Flood resilience measures; where flood depths exceed 300mm, impacts could be minimised by use of flood resilient materials such as lime plaster, raising air bricks, positioning NRVs and services at over 0.5m height from FFL, raising potential hazards and/or damage above modelled flood levels, and design of the proposed building layout to allow access to all

spaces to permit drying and cleaning. This would minimise damage to building in all future predicted extreme tidal flood events.

- d. Installation of a sump and pump, to allow draining away of internal flooding in coordination with flood gates.
- e. All proposed bedrooms to be located on the higher floors of the property, above all existing and future modelled flood levels.
- f. Installation of non-return valves of all soil pipes to prevent back-flow.
- g. Development of an emergency escape plan, inclusive of recommendations on seeking refuge at higher levels and of when and how to utilise a safe route of access and escape to ground above the estimated flood level, which connects the site to an area away from flood risk. This is to include provision of a Flood Warning and Flood Alert System. A Flood Evacuation Plan (FEP) template is provided in **Appendix G**.

7 FLOOD RISK MANAGEMENT

7.1 Safe Access and Egress

- 7.1.1 The proposed site partially development falls within Flood Zones 2, however the access to the site is primarily from Warblington Road, which is within Flood Zone 1. The proposed site levels are designed such that the access and egress route is above all existing modelled flood levels up 1 in 1000 year events (3.70mAOD). The minimum level at the gate line is 3.79mAOD and therefore the site is not expected to flood up to this level, due to the existing boundary wall surrounding the site.
- 7.1.2 Finished floor levels are proposed at 4.00mAOD. Should climate change induced flooding cause predicted flood levels to exceed this, access and egress is available by leaving the site via the Warblington Road access and headed due southwest, where levels are elevated above the predicted future flood level of 4.5mAOD.
- 7.1.3 Flood levels along the evacuation route could raise to up to 600mm in a future flood event. Should residents need to seek refuge within the property, the upper storeys of the building will remain elevated above all predicted flood levels for the lifetime of the development, and will remain safe provided the development is appropriately flood resilient, as per the measures set out in **Section 6**.

7.2 Flood Warning

- 7.2.1 The site is at risk of future tidal flooding, therefore there is a recommendation for a Flood Evacuation Plan (FEP). This should consider the provision of a Flood Warning and Flood Alert System. A Flood Evacuation Plan (FEP) template is provided in **Appendix G**.

8 OFFSITE IMPACTS

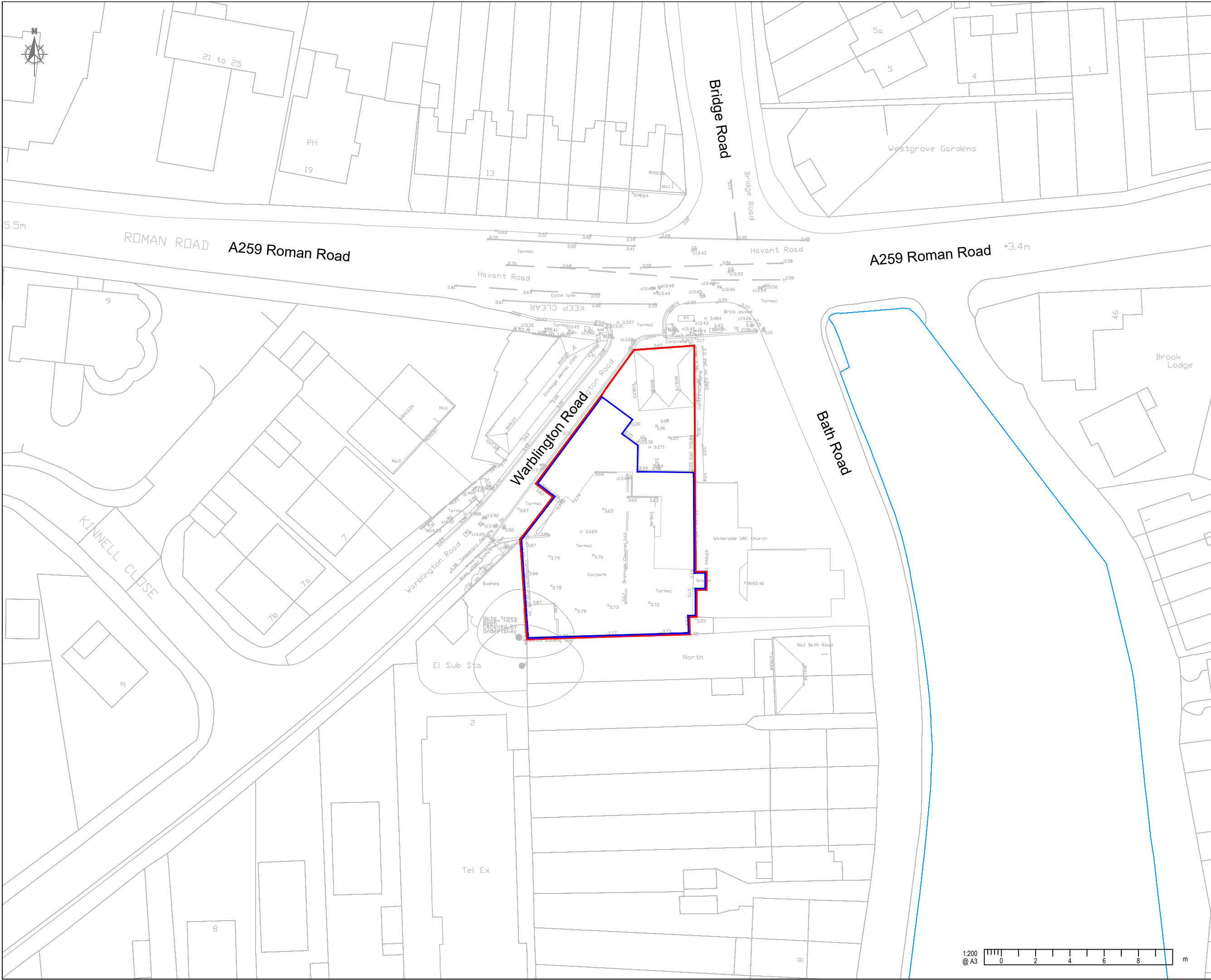
- 8.1.1 The proposed development will result in an estimated 80% decrease in runoff from the site in up to a design event, and therefore will not cause an increase in flood risk offsite.
- 8.1.2 Post development foul water flows will contribute a negligible increase to the sewer network compared to the previous use – it is expected that the foul sewer flow from the proposed residential properties will be 0.10l/s.

9 SUMMARY

- 9.1.1 This site-specific report is based on the EA Product 4 Response, Flood Maps, Public Sewer Records, BGS records, and the local SFRA mapping and guidance.
- 9.1.2 The existing site consists of residential offices and car parking space.
- 9.1.3 The topographical survey shows that the existing site levels fall from 3.87mAOD in the south west corner of the site to the north with a low point of 3.60mAOD within the courtyard.
- 9.1.4 The existing site buildings are drained by gully and pipe drainage, presumed to connect into the existing public surface water drainage system.
- 9.1.5 The nearest watercourse is the Main River (unknown name) that discharges into Slipper Mill Pond apposite Bath Road from the site (approx. 20 metres from the site boundary). In addition, the River Ems which runs south into coastal Chichester Harbour approximately 275m east of the site.
- 9.1.6 The proposed development comprises the Conversion & Extension of Existing Offices to Residential, and Detached House with Ground Floor Parking.
- 9.1.7 Surface water will be captured and attenuated within permeable block pavement, with discharge limited to 2.0l/s to the public surface water sewer, with connection arrangement to be confirmed subject to site investigation.
- 9.1.8 The wastewater from the proposed development will discharge to the public foul sewer network, with connection arrangement to be confirmed subject to site investigation.
- 9.1.9 The development lies within Flood Zones 1 and 2, and is subject to increased future flood risk as a result of extreme sea level increases. Flood mitigation measures and the consideration of safe access and egress has been considered in order to address the safe use of the development for its lifetime. A Flood Evacuation Plan (FEP) template is provided within the appendices.
- 9.1.10 The completion of the development will not increase flood risk on or off the site, and appropriate flood mitigation has been proposed to ensure the site is safe for use, access and egress for the lifetime of the development.

DRAWINGS

D2148-100	Site Location Plan
D2148-200	Impermeable Areas Comparison
D2148-300	Existing Levels
D2148-400	Preliminary Levels & Drainage



NOTES

A3

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- Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

-Site Location Key-

Site Area - 860m² (0.086Ha)

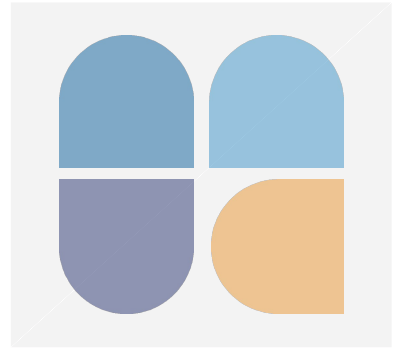
Development Area - 678m² (0.068Ha)

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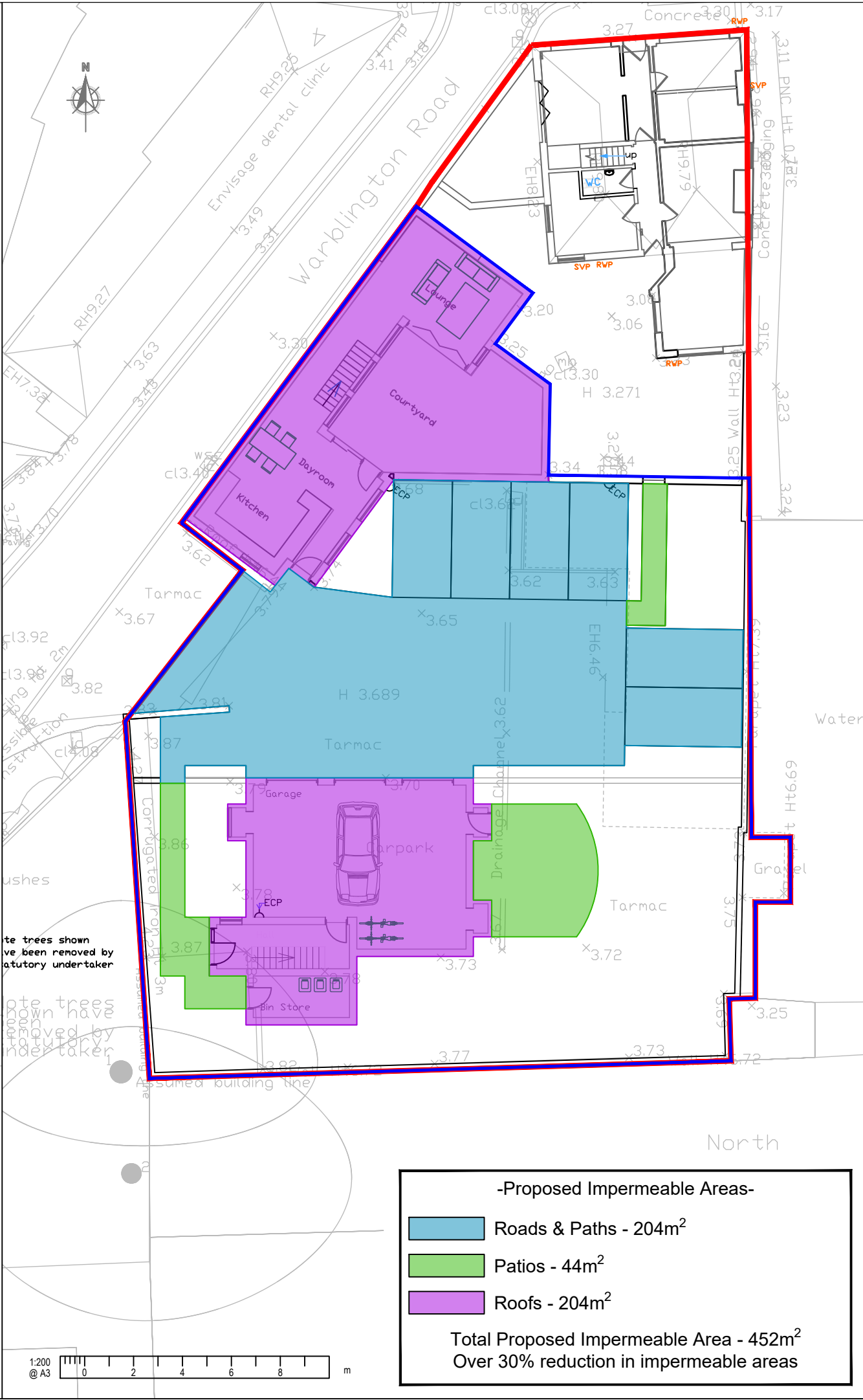
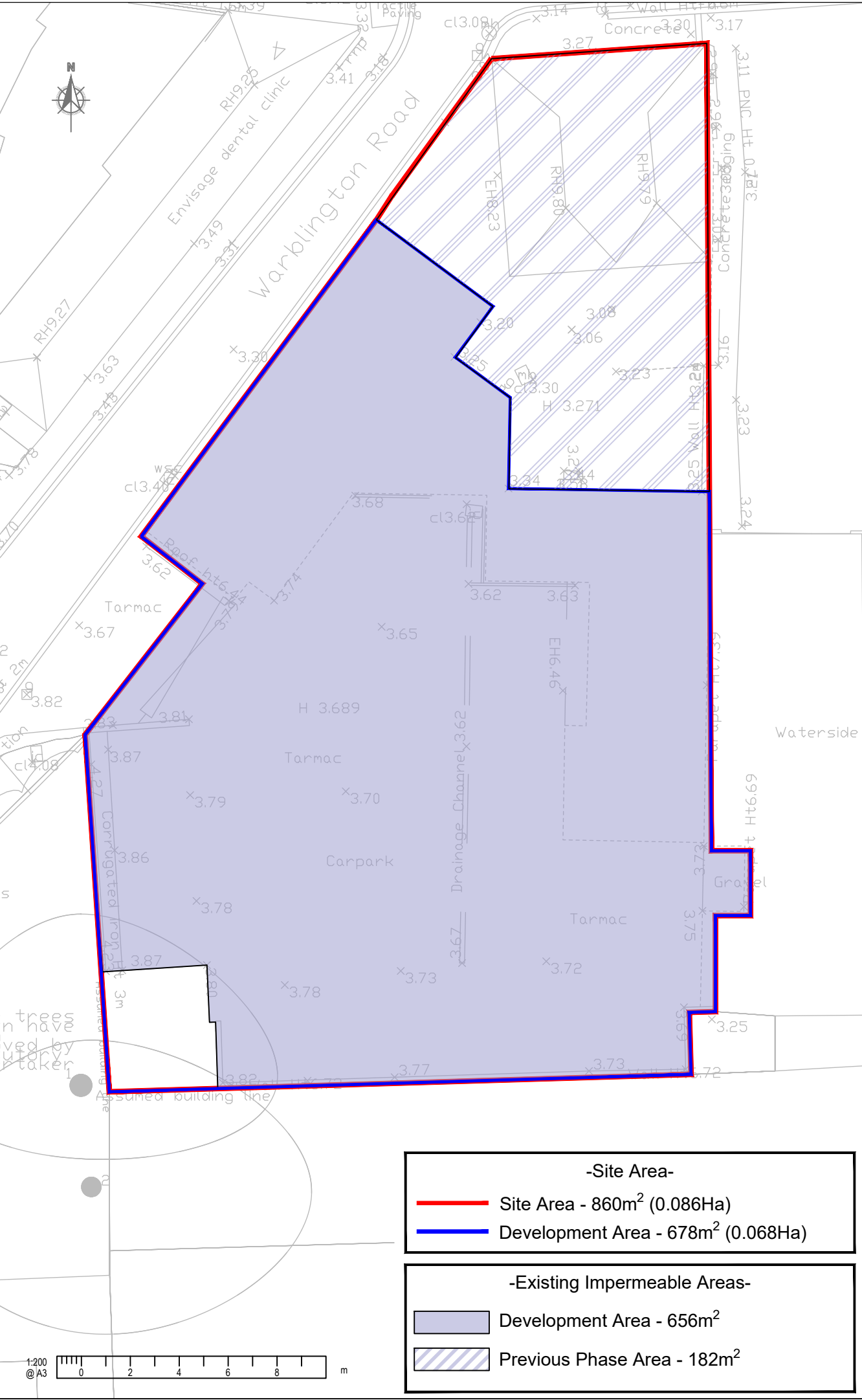
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Drawing Status	PLANNING		
Client	Paul and Elaine Munday Property Rentals		
Project	Phase 2 Fiscal House, 2 Havant Road, Emsworth		
Drawing Title	Site Location Plan		
Scale	1:500	Date	Jan 2023
Drawn By	DJL	Checked By	MJA
Drawing No.	D2148-100		Rev.
		-	



NOTES

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Drawing Status

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Client

Paul and Elaine Munday
Property Rentals

Project

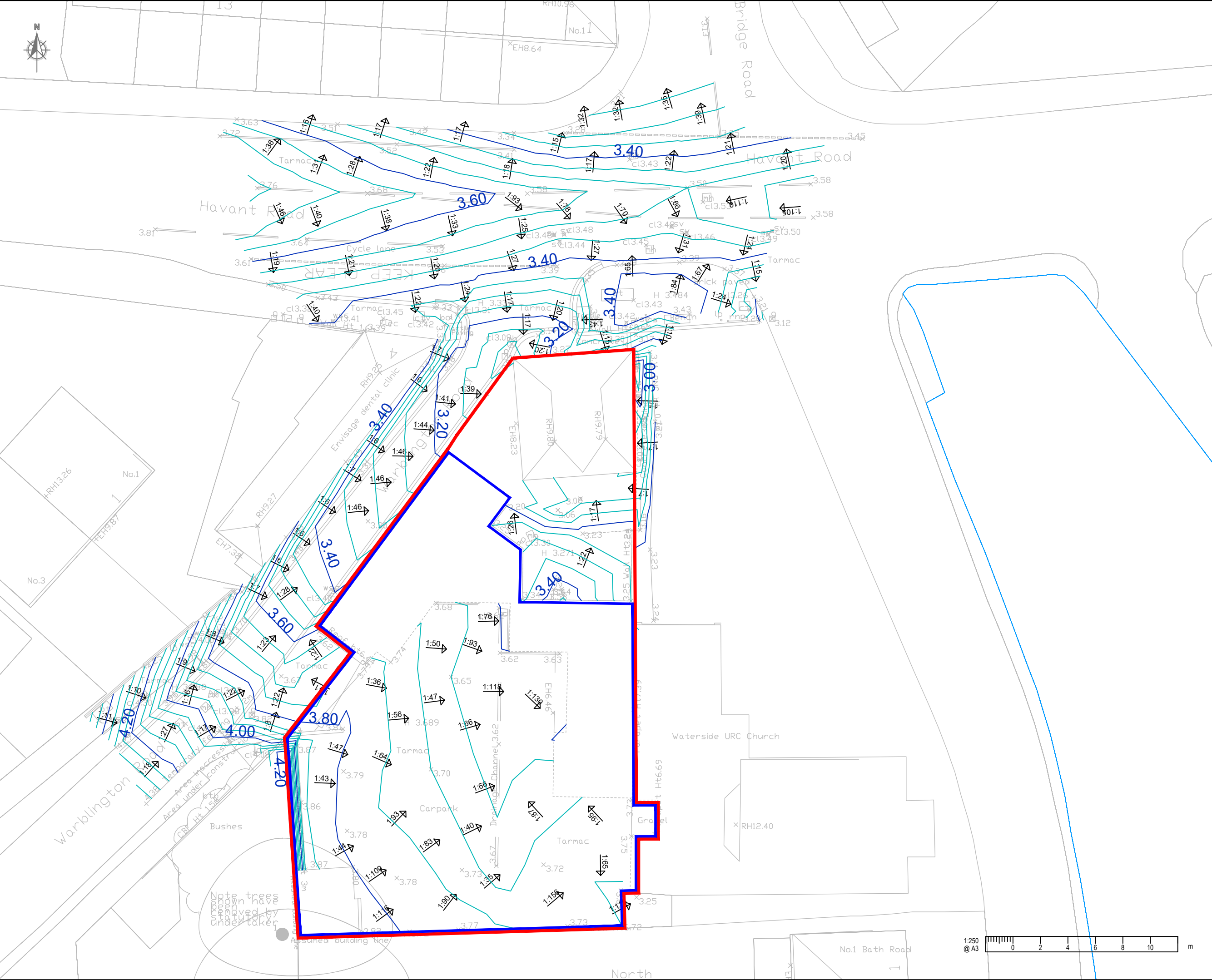
Phase 2
Fiscal House, 2 Havant Road, Emsworth

Drawing Title

Impermeable Area Comparison

Scale	Date	Drawn By	Checked By
1:200	Jan 2023	DJL	MJA

Drawing No.	Rev.
D2148-200	-



NOTES

A3

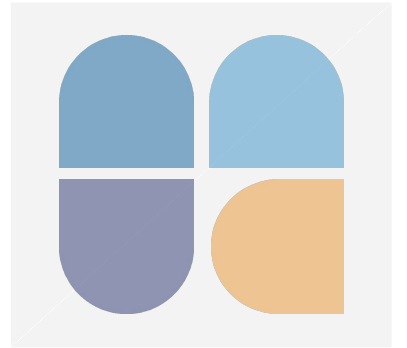
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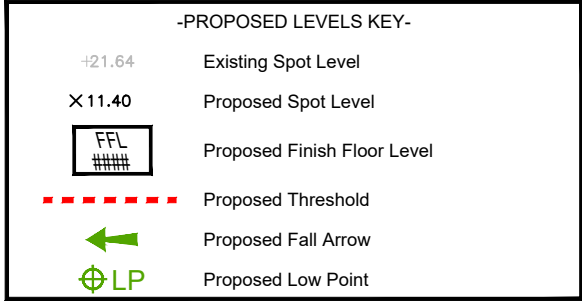
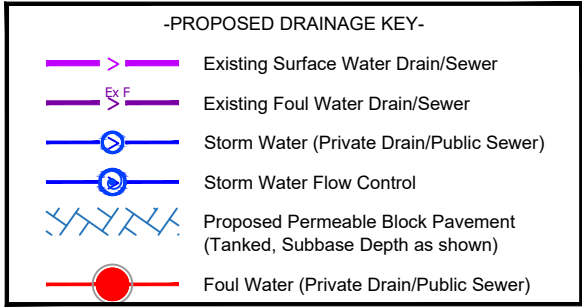
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Drawing Status	PLANNING		
Client	Paul and Elaine Munday Property Rentals		
Project	Phase 2 Fiscal House, 2 Havant Road, Emsworth		
Drawing Title	Existing Levels		
Scale	1:200	Date	Jan 2023
Drawn By	DJL	Checked By	MJA
Drawing No.	D2148-300		Rev.
		-	



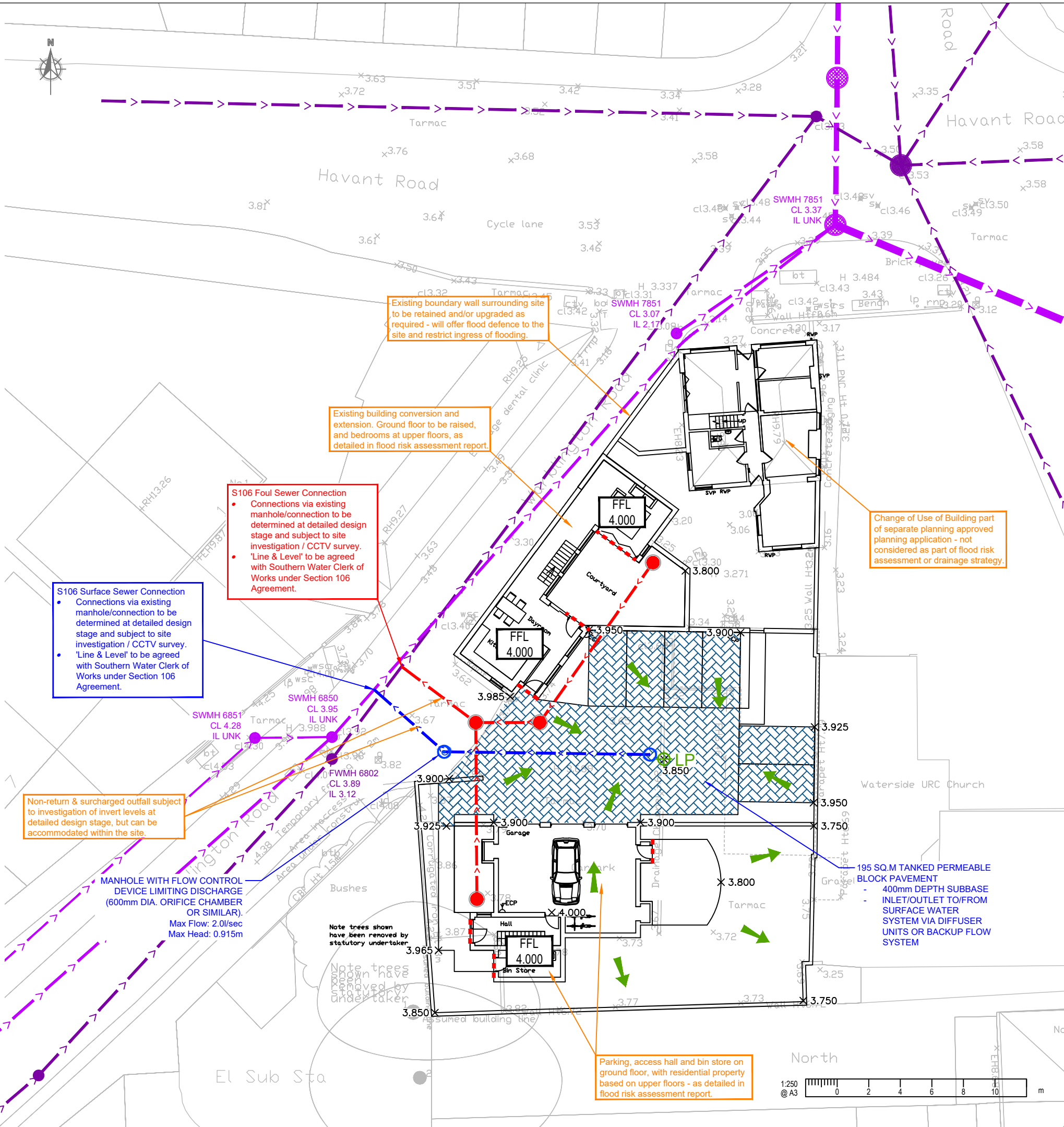
Refer to structural drawings for further information on structural slab levels.

Topographical information shown is based on site survey undertaken by others as part of site-wide development.

Contours are only as accurate as the initial land survey information. Contours are approximate only and spot levels may vary slightly on site.

- SURFACE WATER DRAINAGE STRATEGY-**
- Surface water disposal should be managed in view of the SuDS hierarchy;
 - Infiltration
 - Watercourse
 - Public Surface Water Sewer(s)
 - A site-specific geotechnical investigation has not been undertaken, however BGS data concludes infiltration methods are not viable, as the underlying soils are predominantly Clay.
 - In view of the above, it is proposed that the existing surface water connection to the public surface water sewer is utilised.
 - Attenuation will be provided by site in the form of 195 sq.m of permeable block pavement (tanked) with 400mm sub-base thickness. The reduction in impermeable areas by introducing new landscaping areas is also beneficial.
 - A flow control device would be required in order to restrict flows to the sewer, at a rate of 2.0l/s.
 - Hydraulic calculations adhere to the following criteria;
 - a 1-in-30 year storm event, with an allowance of 40% for climate change, no flooding
 - a 1-in-100 year storm event, with an allowance of 45% for climate change & 10% urban creep allowance, no flooding.

- FOUL WATER DRAINAGE STRATEGY-**
- Foul water disposal should adhere to the following hierarchy;
 - Public Sewer
 - Private Treatment Plant
 - Septic Tank and Drainage Field
 - Cesspool
 - It is proposed that, post-development, foul flows generated by the site will outfall to the public foul water sewer.
 - Post-development peak foul flows have been determined to be in the region of 0.10l/s (based on Design & Construction Guidance) for 2 No. Residential units.



NOTES

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Drawing Status: **PLANNING**

Client: **Paul and Elaine Munday Property Rentals**

Project: **Phase 2 Fiscal House, 2 Havant Road, Emsworth**

Drawing Title: **Preliminary Levels & Drainage Design**

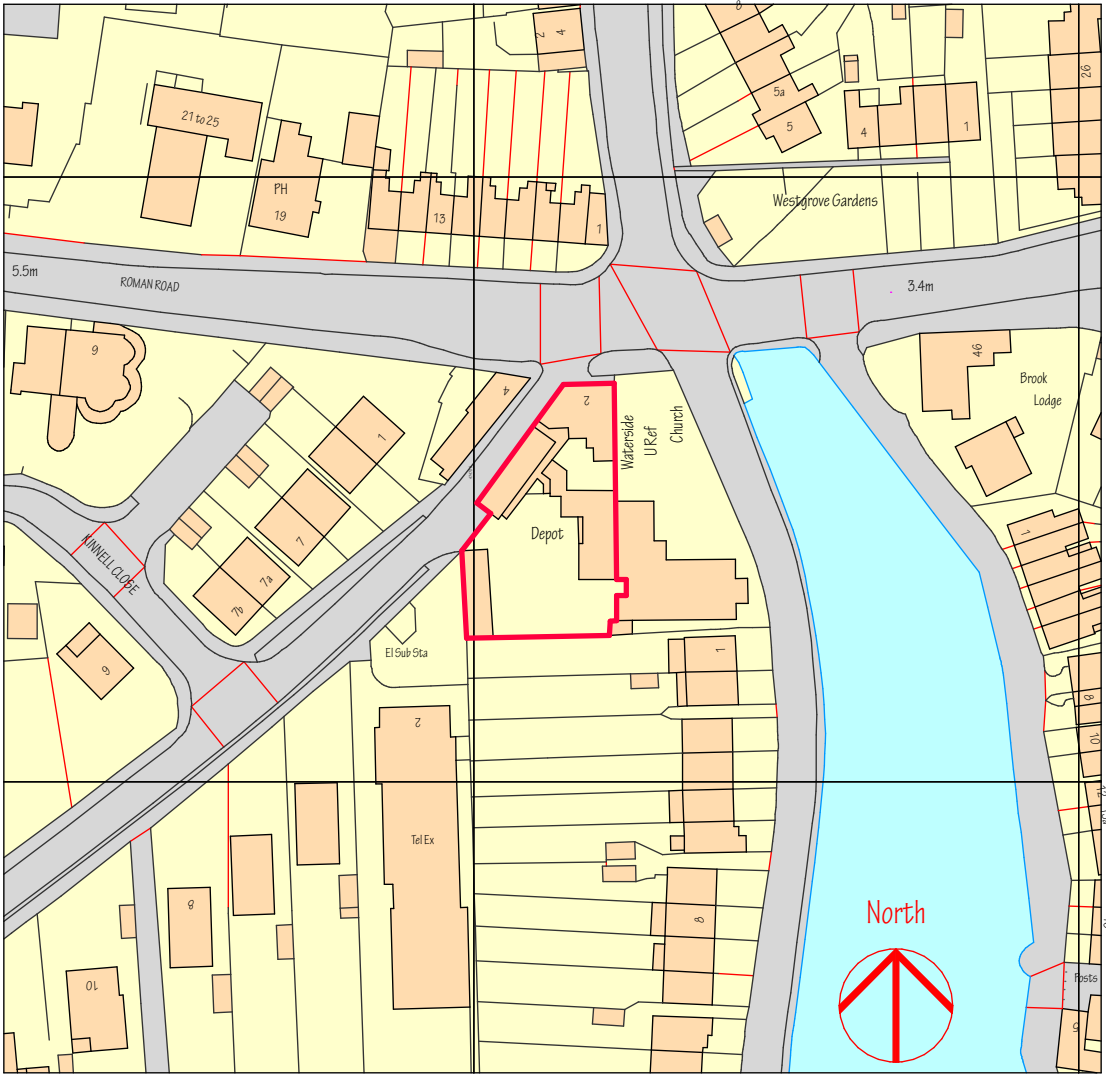
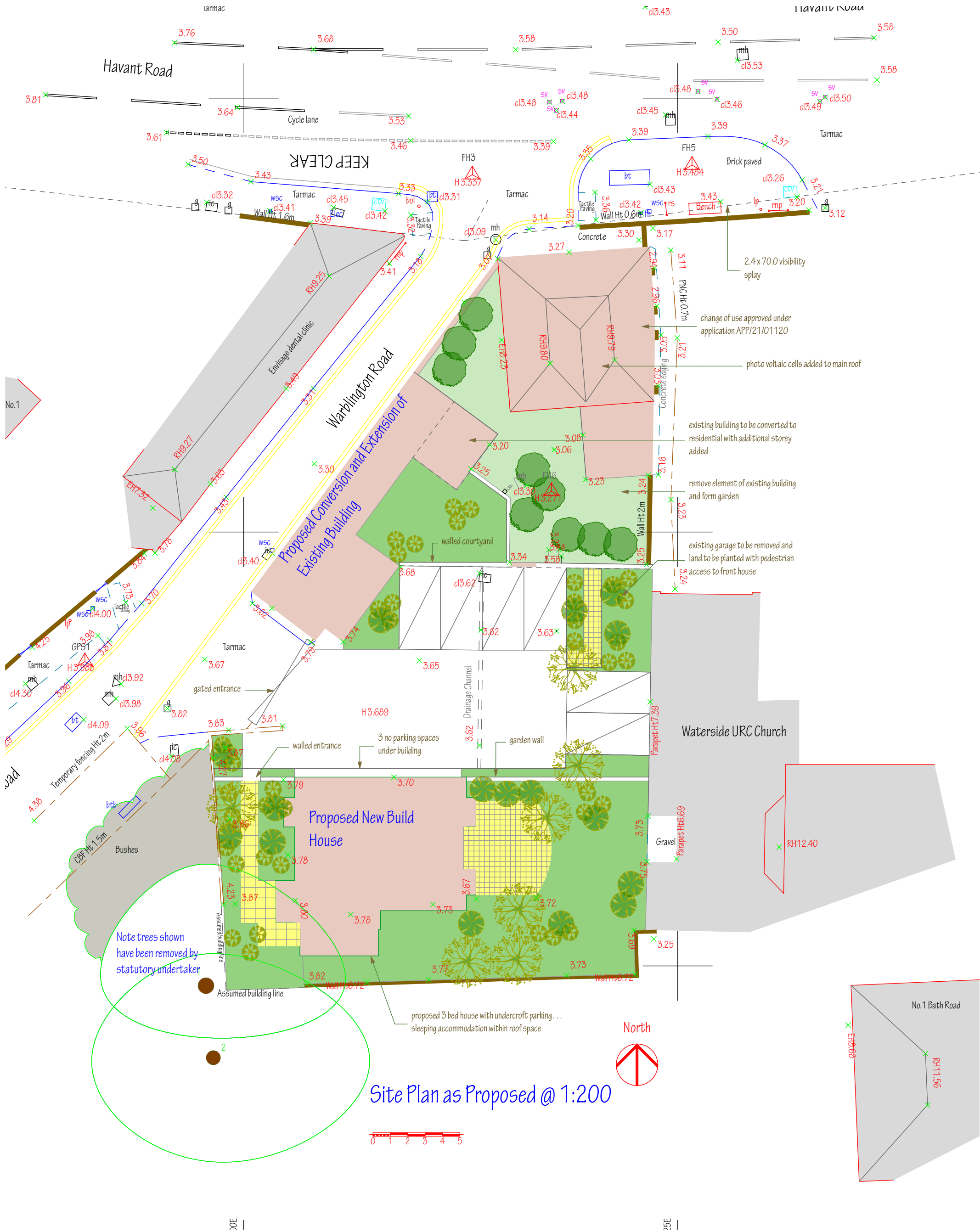
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1:250	Jan 2023	DJL	MJA

Drawing No. **D2148-400**

Rev. **-**

APPENDICES

Appendix A Preliminary Site Layout



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Fiscal House, 2 Havant Road, Emsworth PO10 7JE
Location Plan @ 1:1250

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Transmittal Set	Revision ID	Change Name	Date
00	01		18/09/2022
04	A	Planning November 22	03/11/2022

PURPOSE OF ISSUE
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TENDER
CONSTRUCTION

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CLIENT
Mr & Mrs P A Munday

JOB TITLE
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2 Havant Road
Emsworth
Hampshire
PO10 7JE

DRAWING TITLE
Site Plan as Proposed

SCALE	DATE	
1:1250 & 200 @ A2	16/08/2022	
DRAWN BY	CHECKED BY	
EC		
DRAWING NUMBER	LAYOUT ISSUE	DRWG REVISION
12:1089:L(2)-321	12	A

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004	01			03/11/2022



Ground Floor Plan as Proposed @ 1:100



PURPOSE OF ISSUE

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Fiscal House
2 Havant Road
Emsworth
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DRAWING TITLE
Ground Floor Plan as Proposed
Conversion of Existing
Building

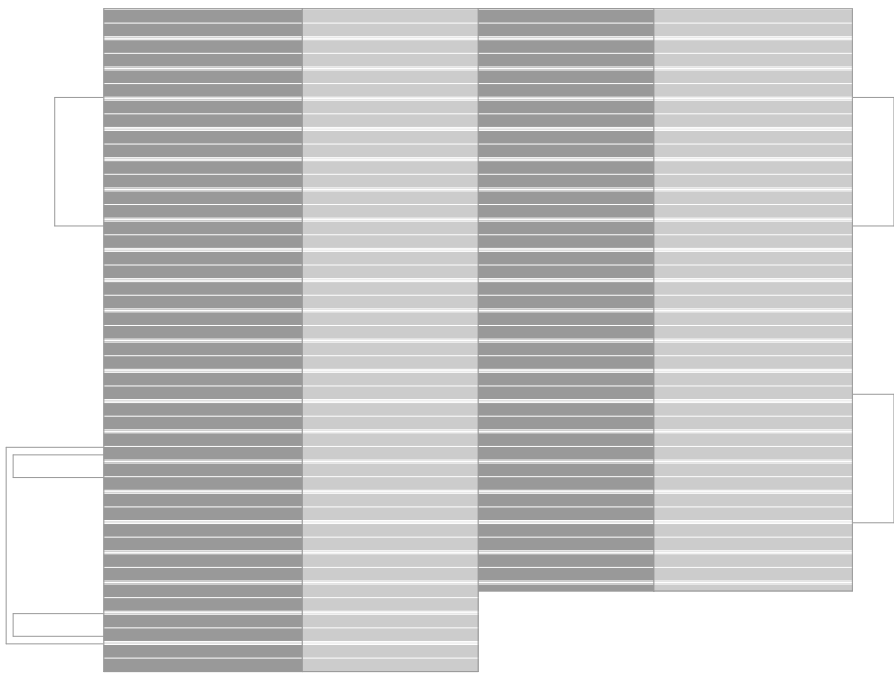
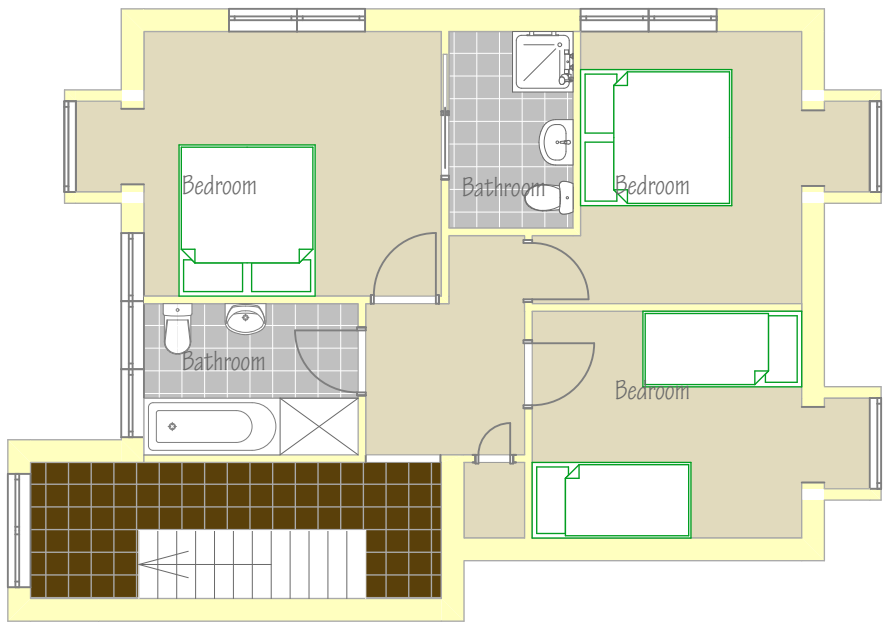
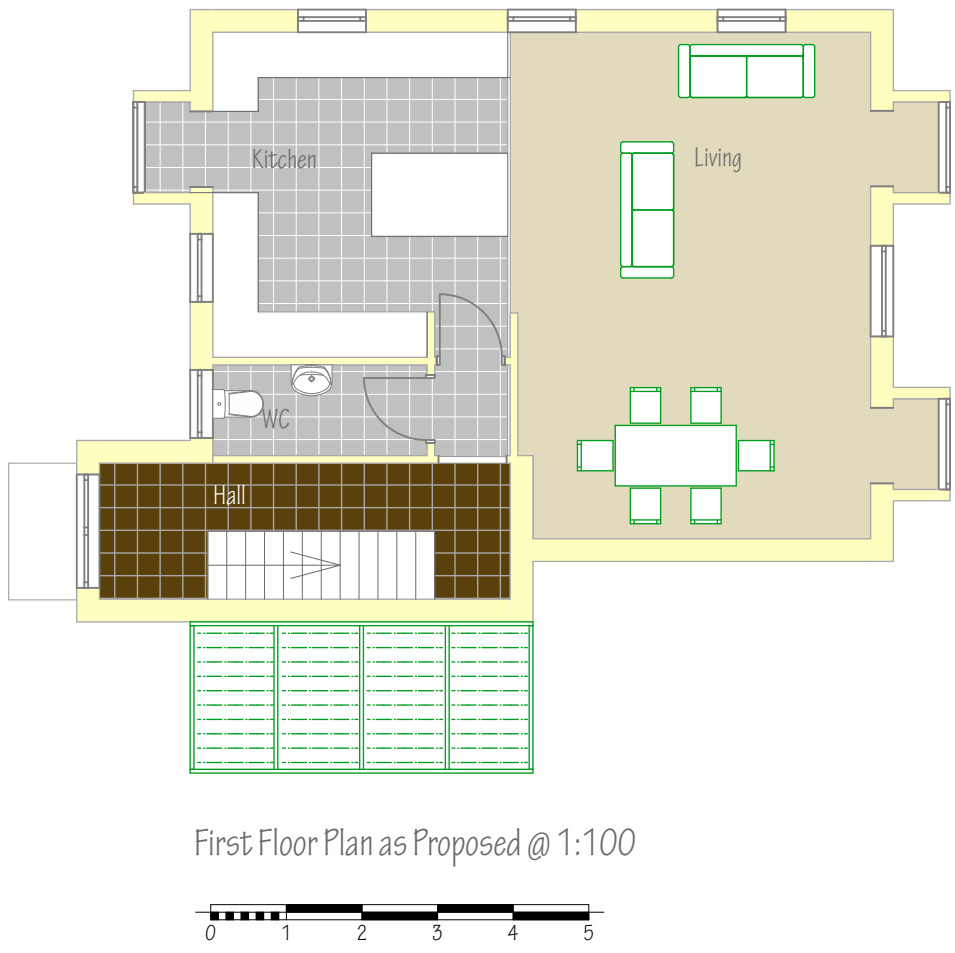
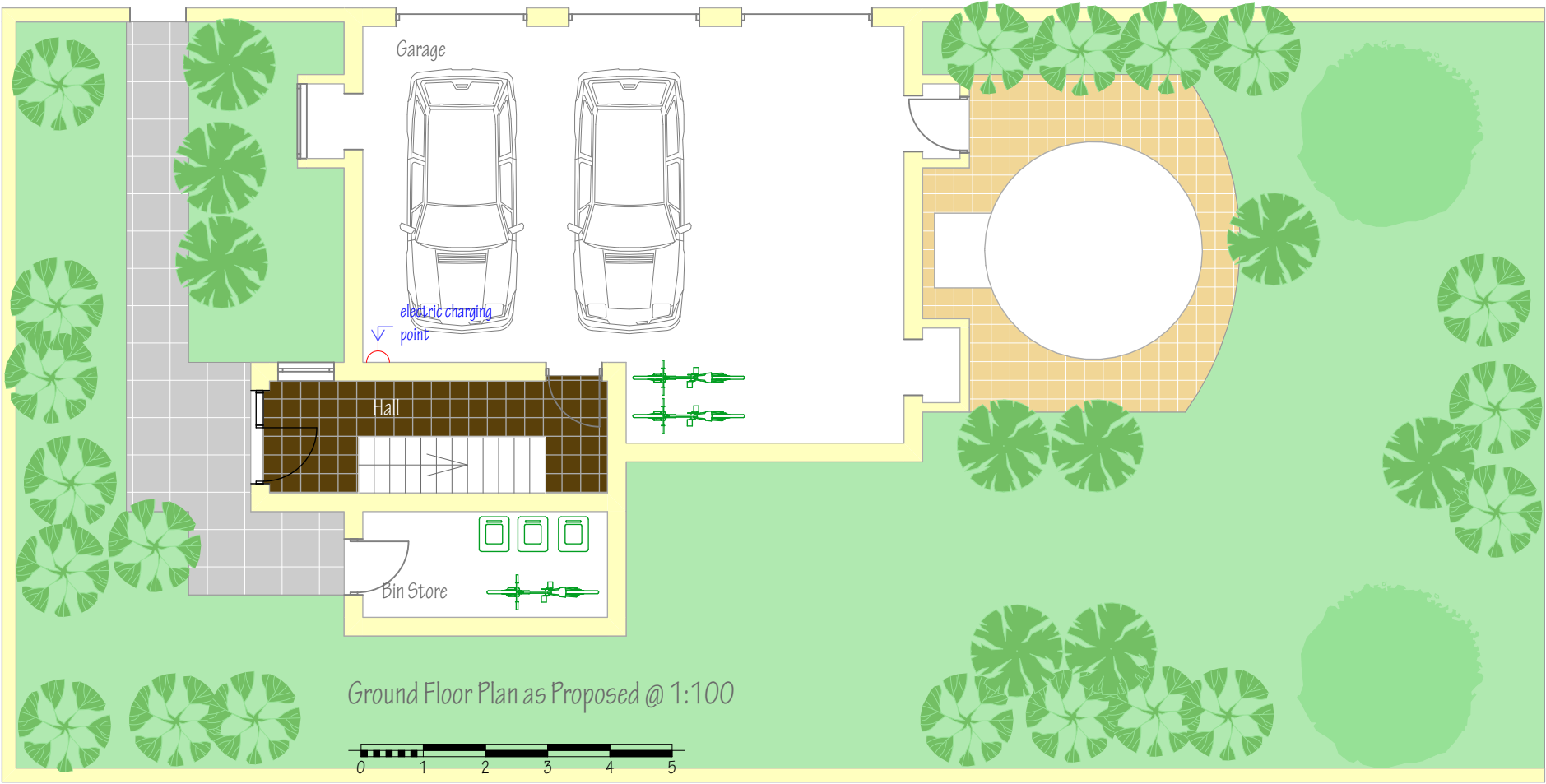
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DATE
03/11/2022

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004	01			03/11/2022

PURPOSE OF ISSUE

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CLIENT
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JOB TITLE
Fiscal House
2 Havant Road
Emsworth
Hampshire
PO10 7JE

DRAWING TITLE

Floor Plans and Elevation as Proposed

New Build House

SCALE
1:100 @ A2

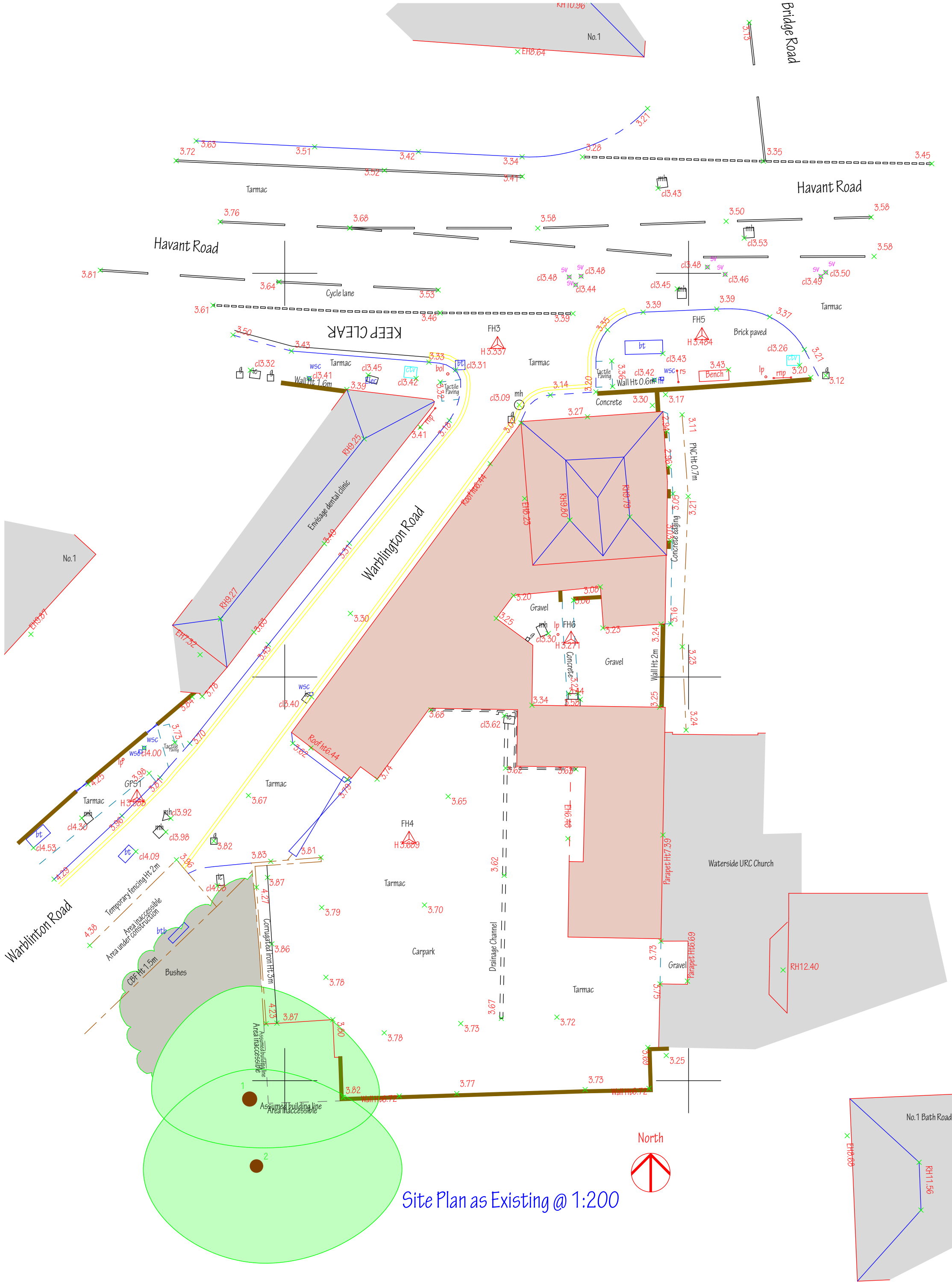
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EC

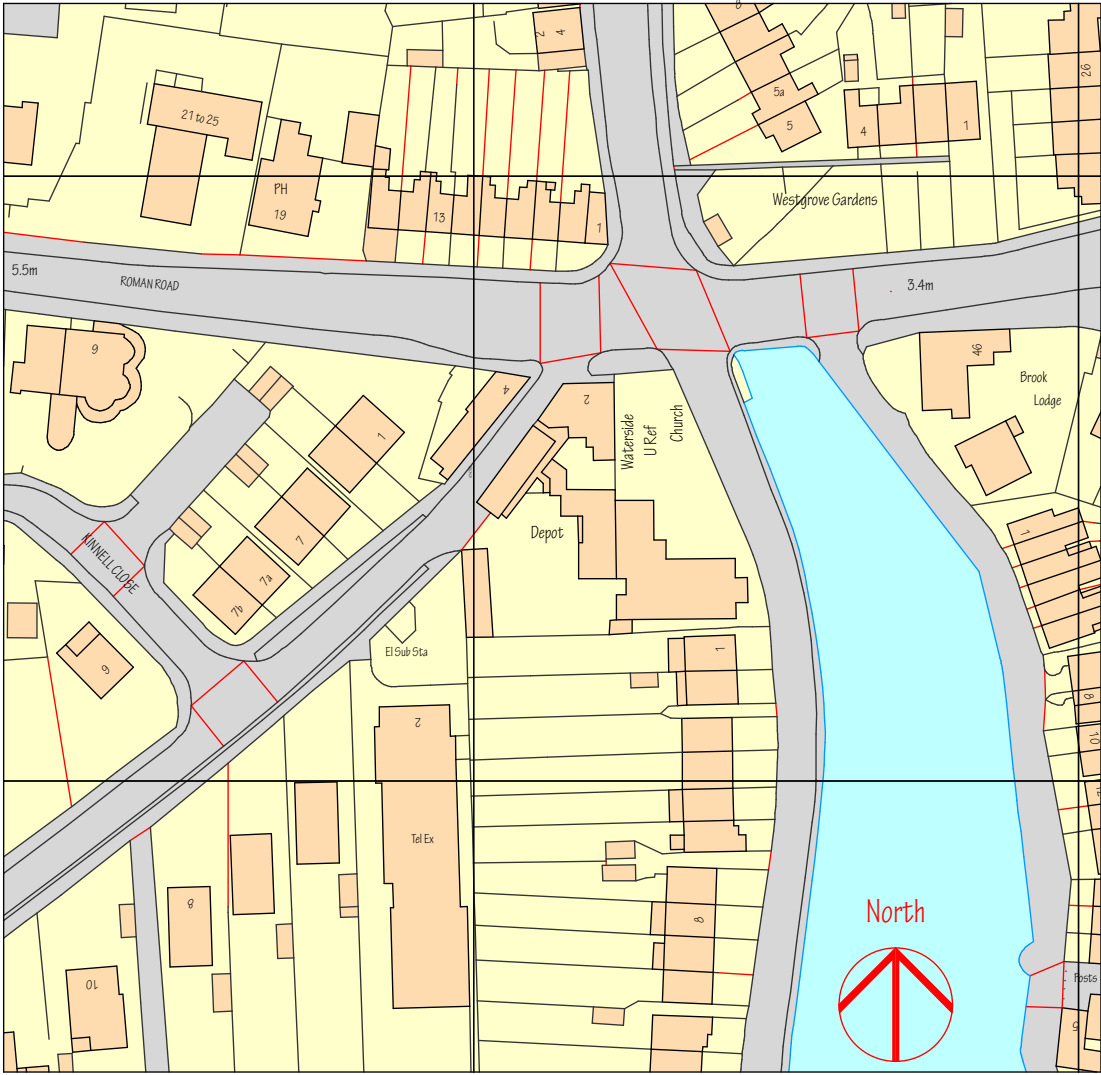
CHECKED BY

DRAWING NUMBER	LAYOUT ISSUE	DRWG REVISION
12:1089:L(2-)341	10	01

Appendix B Topographic Survey



Site Plan as Existing @ 1:200



Fiscal House, 2 Havant Road, Emsworth P010 7JE
Location Plan @ 1:1250

NOTES:
This drawing is the copyright of
EDWARD CAUSH + ASSOCIATES
All dimensions must be checked on site prior to the commencement of construction
and the Architect notified of any discrepancy. Figured dimensions are to be used in
preference to scaled dimensions. The Local Planning Authority may scale from this
drawing as the only exception. No deviation from the drawing will be permitted without
the written consent of the Architect.

Issue ID	Revision ID	Change Name	Date
01	01		17/11/2020

PURPOSE OF ISSUE
INFORMATION
DESIGN
TENDER
CONSTRUCTION

EDWARD CAUSH + ASSOCIATES
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CLIENT
Mr & Mrs P A Munday

JOB TITLE
Fiscal House
2 Havant Road
Emsworth
Hampshire
P010 7JE

DRAWING TITLE
Site Plan as Existing

SCALE	DATE	
1:1250 & 200 @ A2	25.09:2019	
DRAWN BY	CHECKED BY	
EC		
DRAWING NUMBER	LAYOUT ISSUE	DRWG REVISION
12:1089:L(2-) 002	04	01

Appendix C Geotechnical Information

CONTRACT No. 4277

BOPEHOLE RECORD

CONTRACT EMSWORTH.

DATE STARTED 2/1/68 FINISHED 5/1/68

BOREHOLE No.

OPERATOR

ORDNANCE DATUM LEVEL 22.74

TYPE OF PENETRATION TEST

TYPE OF BORING Shell & Auger

WEIGHT _____ DROP _____

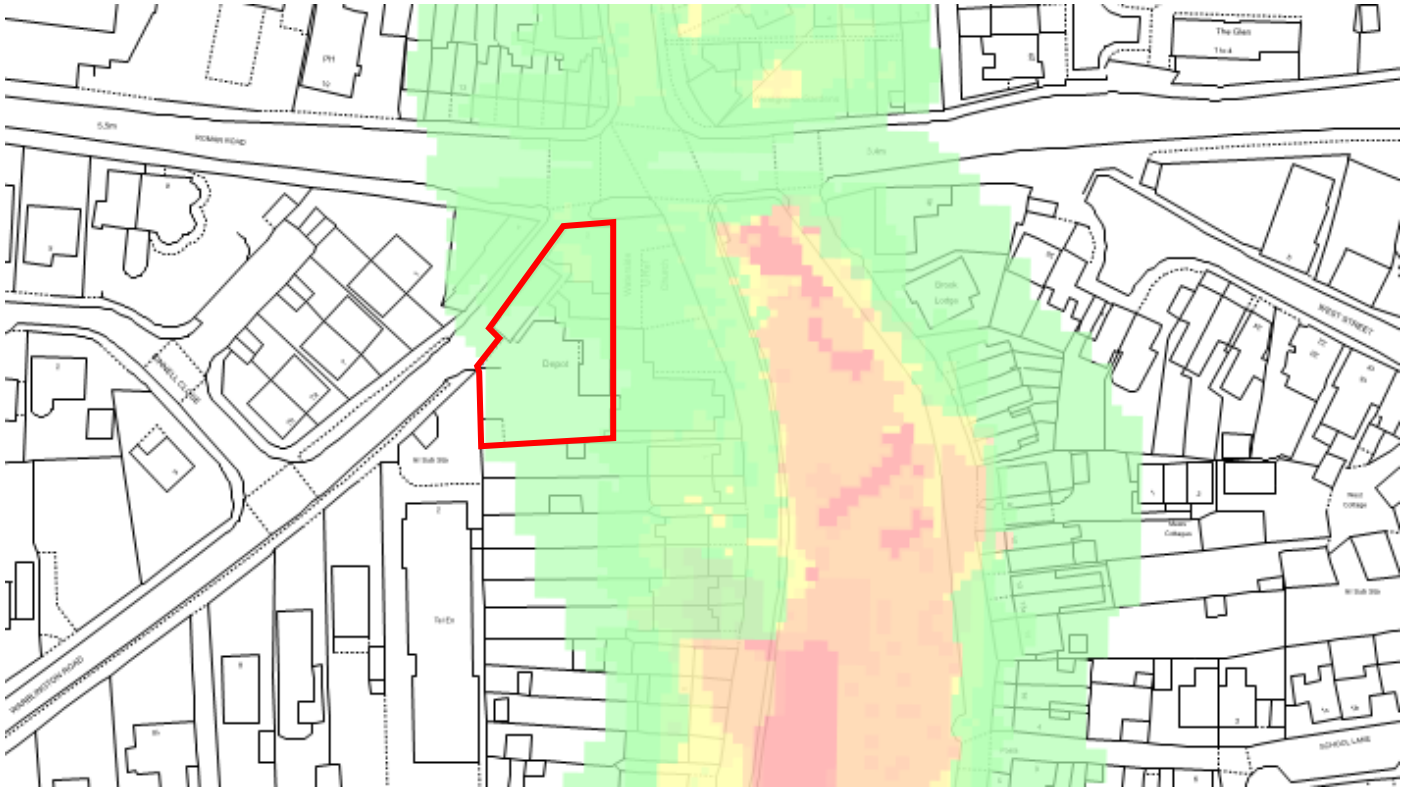
DIAMETER OF BORING 6'

STANDING WATER LEVEL 450"

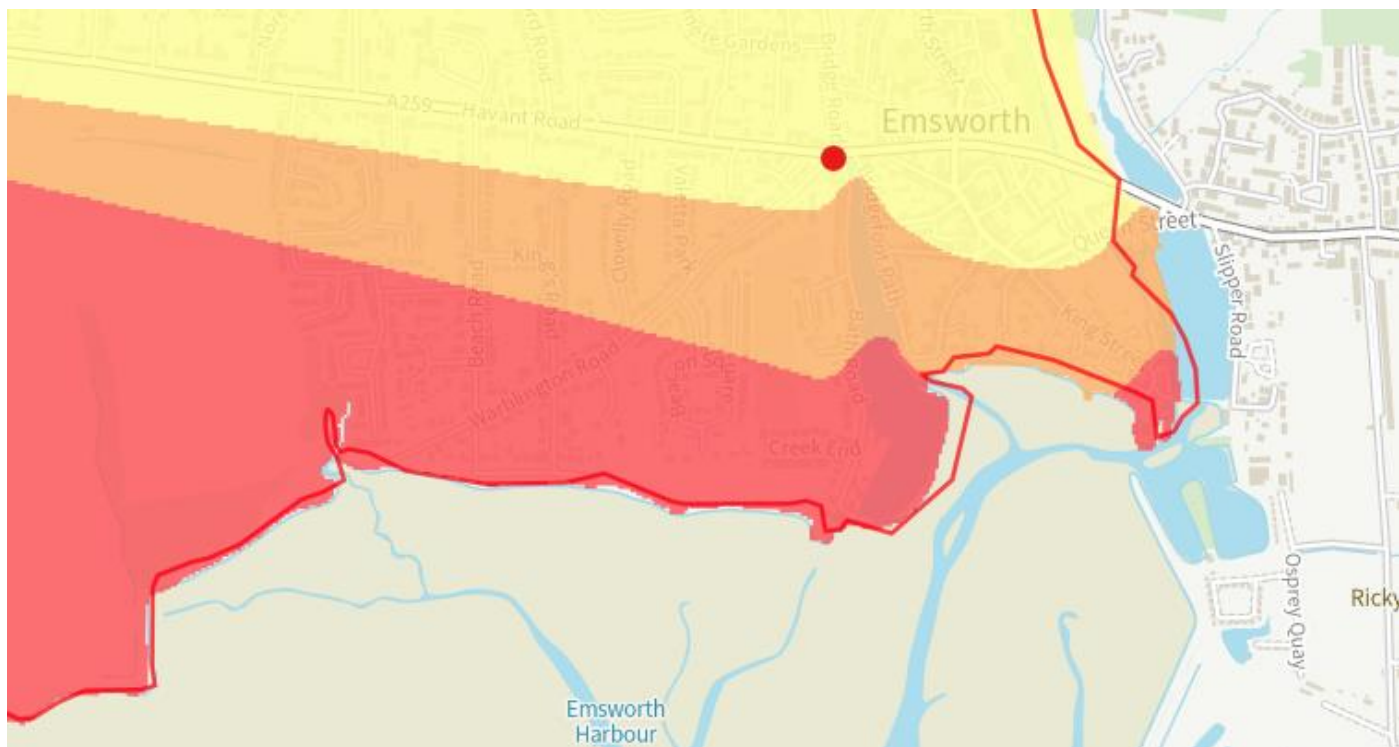
REMARKS

Depth Feet	O.D. Level	Type & No. of Sample	Boring Details			Legend	Description of Material and Observations
			Penetration	Lining	Water		
							Full material with tarmac surface
5.					S.W.L.		Stiff brown clay.
10		U4/5 L0'					Stiff brown sandy clay.
15		U4/10 L0'					Hard grey mudstone
20		U4/18 L0'					Hard grey clay.
		Borehole terminated.					
							mapping suggests some Drift over

Appendix D LLFA & LPA Consultation and Extracts

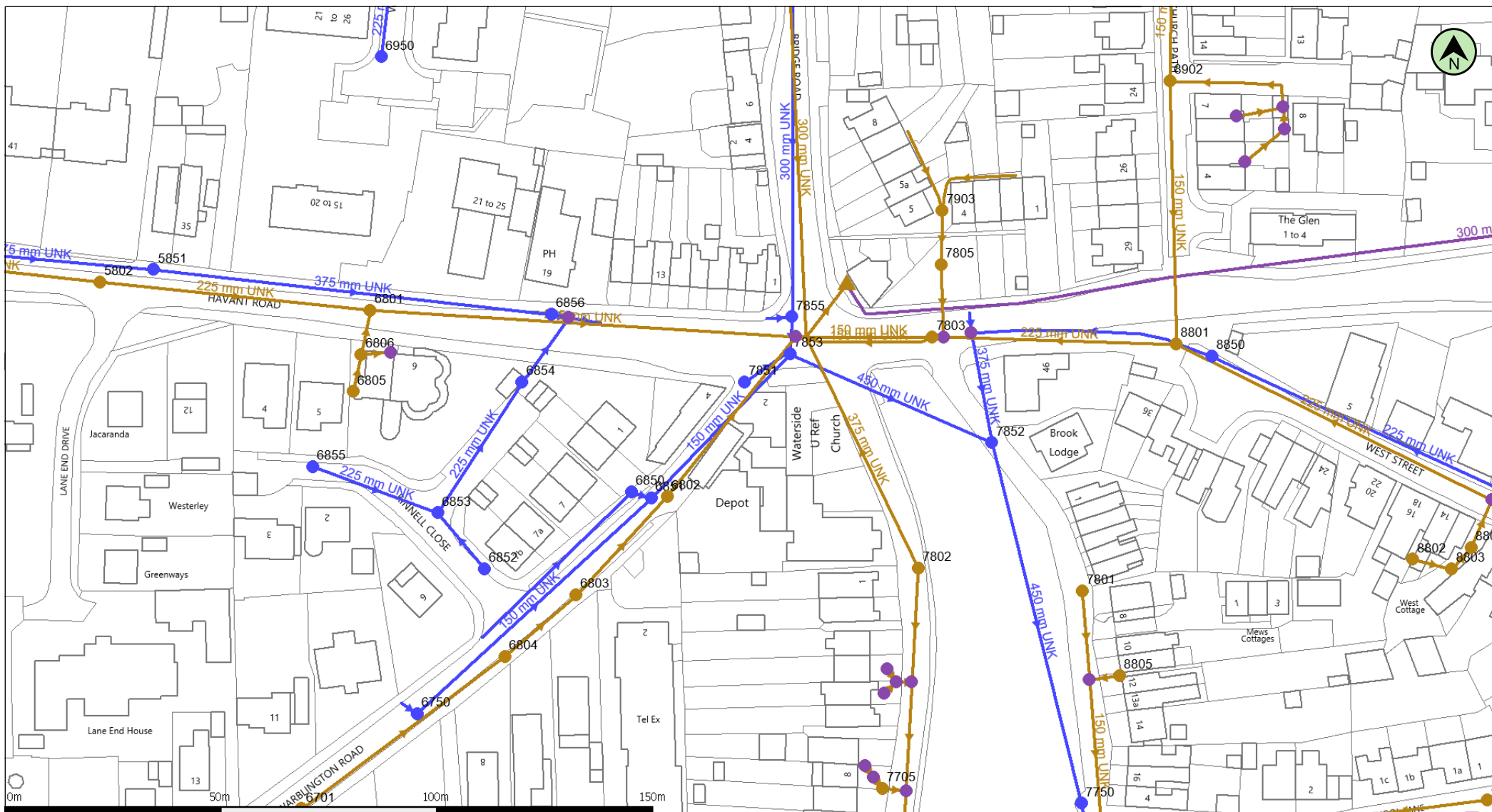


Surface Water Flood Risk (very Low to Low)



Bedrock Permeability (Low)

Appendix E Public Sewer Records



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673

Date: 21/02/22

Scale: 1:1250

Map Centre: 474716,105861

Data updated: 17/01/22

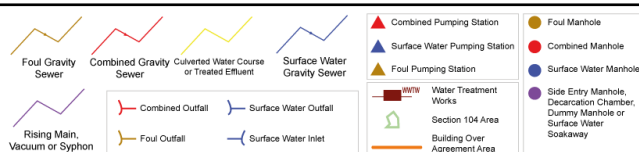
Our Ref: 787401 - 1

Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



searches@bpcivils.co.uk

D2043



Appendix F Product 4 Flood Modelling Response

JFLOW 2016 Levels (Fluvial) Map Centred on Fiscal House - Created 4 February 2022



Legend

+ Location_Point

Water Depth

Value

High : 6.2658

Low : 0

Ground Level

Value

High : 200.075

Low : -13.7875

1:898

*when printed at A4.

0 10 20
Metres



Water Depths & Levels for Fiscal House

Point	Water Surface Level (mAOD*)		Ground Level	Water Depth (metres)	
	1% Annual Probability/1 in 100 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)		1% Annual Probability/1 in 100 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)
1	No Data	3.25	3.08	No Data	0.17
2	No Data	3.25	3.18	No Data	0.07
3	No Data	3.15	3.13	No Data	0.02

* Levels in metres above Ordnance Datum Newlyn

Levels (Tidal) Map Centred on Fiscal House - Created 10 February 2022



Legend

+ Location_Point

Water Depth

Value

High : 26.817

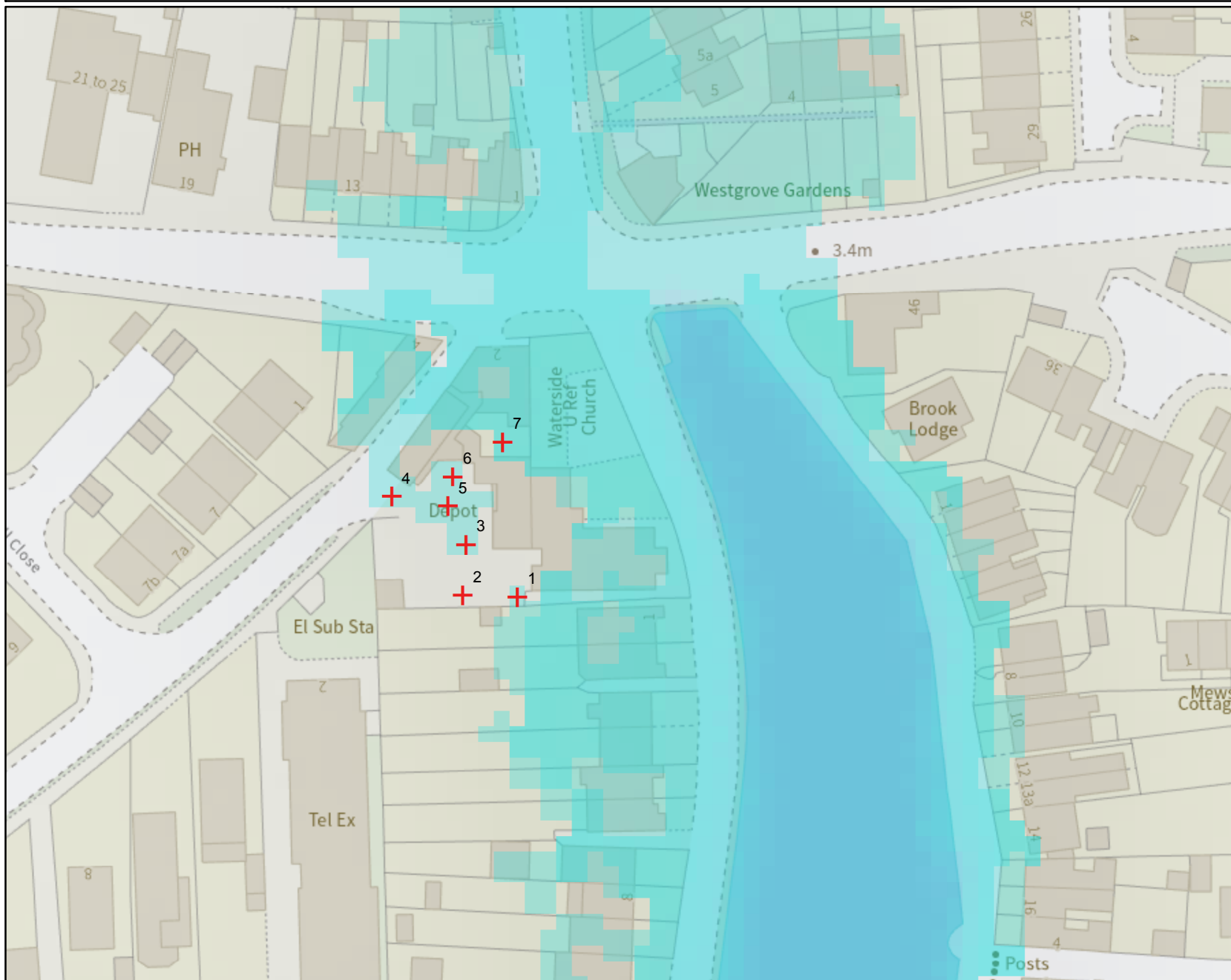
Low : 1.93721e-006

Ground Level

Value

High : 18.1244

Low : -23.2942



1:898 *

*when printed at A4.

0 10 20
Metres



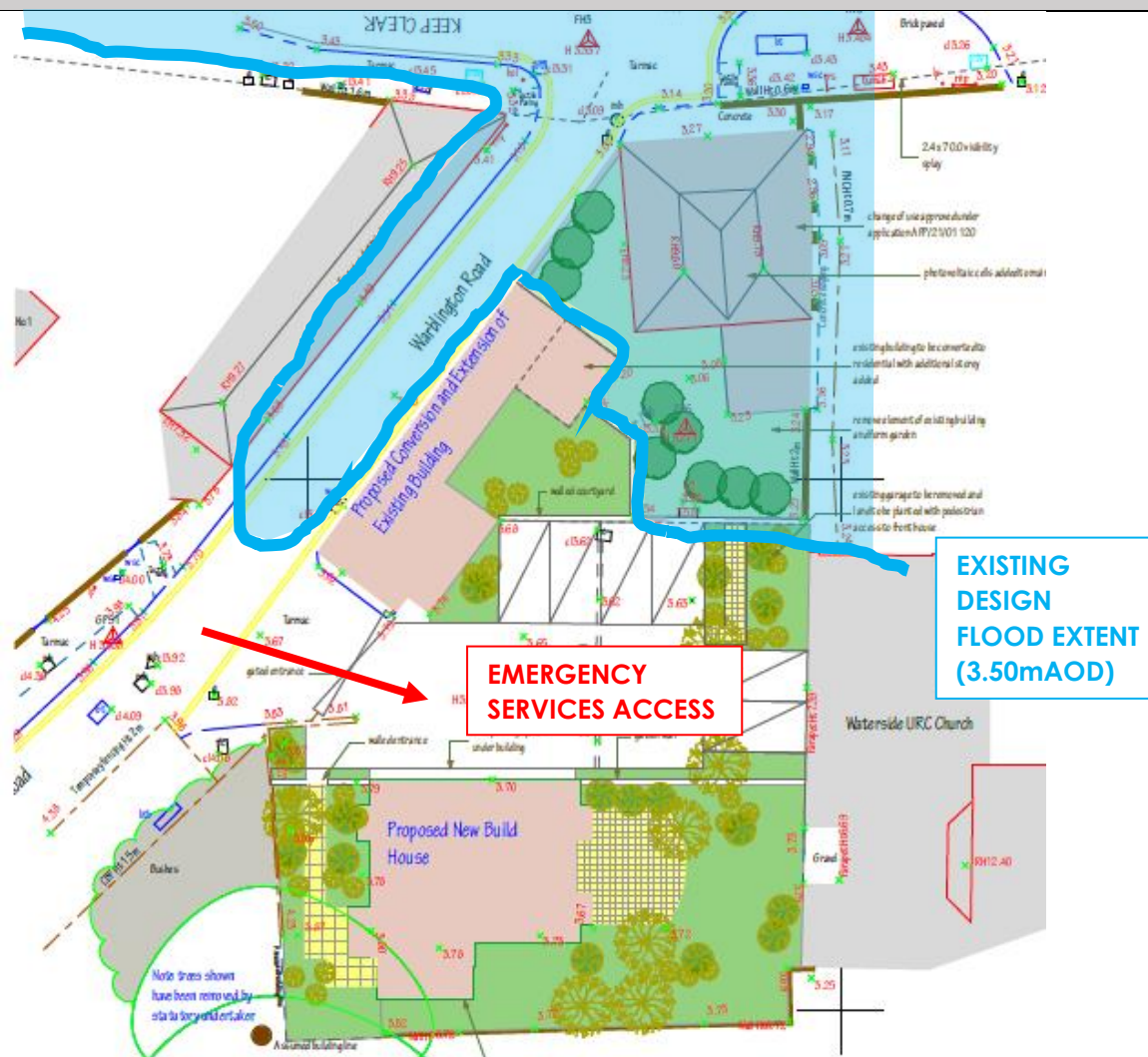
Water Depths & Levels for Fiscal House

Point	Water Surface Level (mAOD*)		Ground Level	Water Depth (metres)	
	0.5% Annual Probability/1 in 200 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)		0.5% Annual Probability/1 in 200 Year (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)
1	No Data	3.69	3.69	No Data	0.001
2	No Data	No Data	3.66	No Data	No Data
3	No Data	3.62	3.62	No Data	0.001
4	No Data	3.70	3.67	No Data	0.029
5	No Data	3.63	3.63	No Data	0.003
6	No Data	3.63	3.61	No Data	0.022
7	3.50	3.68	3.21	0.29	0.466

* Levels in metres above Ordnance Datum Newlyn

Appendix G Flood Evacuation Plan Template

Predicted Flood Extents & Emergency Services Access



Flood Risk Assessment & Flood Preparation

The site lies within Flood Zones 1 and 2. It is also at potential increased flood risk as a result of climate change.

During an extreme flood event or a climate induced flood event, access and egress will be through shallow water. In some extreme events, access and egress would be restricted and it is recommended that evacuation were to be followed prior to flood levels reach a dangerous level.

It is recommended that evacuation of the building takes place prior to a predicted flood event but should you find yourself in the building, on the upper floors, during a flood event you should decide if it is safe for you to enter the flood water. It may be more appropriate for you to remain in the building.

It is also recommended that the ground floor benefits from a flood warning alarm attached to a drain within a ground floor well – this would inform evacuation or other necessary actions such as contact of emergency services.

Protection: Flood barriers are to be installed on the buildings at risk from flooding to allow some protection, intended to prevent internal flooding in some events, and allow extra time for evacuation in an extreme flood scenario. Although flood barriers should be installed at all times of flood warning or expected flooding, the site should also be evacuated as a precaution whenever it is apparent that flooding is imminent (i.e. seen on the lower Havant Road adjacent the proposed residential property.)

Preparation: Subscription to the EA Flood Warning & Flood Alert Service will allow occupants to be aware of possible expected flood events, in order to have flood barriers ready for deployment and be prepared in advance for any necessary evacuation.

Flood Warnings

The Environment agency flood risk early warning system contacts the primary designated number. Should they be unavailable, the secondary number is contacted.

Contact Name (1st): _____ Number: _____

Contact Name (2nd): _____ Number: _____

The property can be signed up the Environment Agency Flood Warning Scheme (<https://fwd.environment-agency.gov.uk/app/olr/home>) 0845 988 1188.

Warning	Message	Timing	Action on Alert
 FLOOD ALERT	Flooding is possible. Be prepared.	2 hours to 2 days in advance of flooding.	- Be prepared for flooding. - Prepare a flood kit. - Check flood barriers are ready for deployment.
 FLOOD WARNING	Flooding is expected. Immediate action required.	Half an hour to 1 day in advance of flooding.	- Act now to protect your property. - Block doors with flood barriers, and cover airbricks and other ventilation holes. - Move pets and valuables to a safe place. - Keep a flood kit ready. - Move any critical equipment and information to a safe location.
 SEVERE FLOOD WARNING	Severe flooding. Danger to life.	When flooding poses a significant threat to life and different actions are required.	- Be ready should you need to evacuate from the property. - Co-operate with the emergency services and call 999 if you are in immediate danger.
Warning Removed	No further flooding is currently expected for your area.	Issued when a flood warning is no longer in force.	- Flood water may still be around and could be contaminated. - If you've been flooded, ring your buildings and contents insurance

			company as soon as possible.
Action On Alert			
Flood Alert	• Person(s) responsible for receiving flood warnings to keep up to date with the situation by watching local television news or tuning in to your local radio station on a portable radio • Decide how flood alerts and the decision to evacuate will be communicated and obtain help and equipment to do this if required • Keep a list of important contacts to hand or store them on your mobile phone • Consider who will need extra support during a flood event • Think about if there is anything that you want to keep particularly safe (high value) that you can move now to a safer location (as high as possible in your property) • Know how to turn off the gas, water and electricity • Prepare a Flood Kit, which could contain warm and waterproof clothing, a torch, a portable radio (battery or wind up), rubber gloves, a first aid kit (containing all important medication), food, bottled water and blankets together with a copy of important documents		
Flood Warning	• Keep up to date with the situation by tuning in to your local radio station on a portable radio • Keep your Flood Kit close to hand • Move important items to a safe place (high shelf if possible) • Move people and vehicles to higher ground and Fit flood protection items (door barriers) • Do not assume that the emergency services will be able to assist, they may be helping more vulnerable people • Switch off gas, water and electricity supplies (do not touch electrical item if they are wet or if you are standing in water) • Listen to and act upon the advice given by Emergency Services and evacuate if instructed • Avoid walking or driving through floodwater. 150mm (6 inches) depth of fast flowing water is enough to knock over an adult and 600mm (2 foot) of water can move a car		
Warning Removed	• Make sure it is safe to re-enter your property. Wait for the Environment Agency to state that no flood warning is in force and for the Emergency Services to confirm that it is safe to re-enter. • Floodwater can contain bacteria and harmful substances including sewage so protect yourself by wearing rubber gloves, eye protection, waterproof boots and waterproof over-clothes before entering any areas affected by floodwater.		

		- If your property was damaged by floodwater, contact your insurance company. You may be covered if you incur accommodation costs due to not being able to stay in your property - Take photographs to record any damage to pass on to your insurance company - Get a qualified electrician to check your electrics and a qualified engineer to check your heating system before switching them back on		
Utilities Contacts				
Company/Type	Contact No.	Account No.	Switched Off (Y/N)	Notes (e.g. location of cut-off)
Electricity				
Gas				
Water				
Southern Water				
Telephone				
Insurance				
Landlord				
Documentation Control				
This document is to be completed and kept up-to-date by the building owner and provided to all occupants for consideration, further completion and guidance.				
This document is to be reviewed on January 1 st every three years				
Version Control				
Version No.		Issued on (Date)		Valid Until (Date)
Version No.		Issued on (Date)		Valid Until (Date)
Version No.		Issued on (Date)		Valid Until (Date)
Version No.		Issued on (Date)		Valid Until (Date)
Version No.		Issued on (Date)		Valid Until (Date)

Conditions and Limitations

1. This report does not constitute a design document. It is the duty of the project designers, to confirm the content of this report and to design the scheme in accordance with their own research and other extraneous parameters.
2. This report is produced for the named Client and must not be relied upon by any third parties, without the express prior written permission of Bright Plan Civils.
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4. Unless specifically stated otherwise in the report, any recommendations for works given in the report are to be confirmed or modified as appropriate at design stage.
5. Under the Construction (Design & Management) Regulations, latest edition, the Client has obligations for ensuring the Health & Safety arising from any construction work. If it is proposed to proceed with construction works, based upon information or recommendations contained in this report, these regulations probably apply. Further details of any issues arising from our report or the client's obligations generally are available on request

Appendix H Hydraulic Modelling Calculations



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	250.0
Additional Flow (%)	10	Minimum Velocity (m/s)	0.75
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.700
CV	0.750	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)	Depth (m)
1	0.045	5.00	3.850		0.850
2			3.850	600	1.025
3			3.800		1.009

Links (Input)

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)
1.01	1	2	13.050	0.600	3.000	2.825	0.175	74.6	150	5.19	69.2
1.02	2	3	5.900	0.600	2.825	2.791	0.034	173.5	150	5.32	68.4

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	1440
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	10	0

Node 2 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.915	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	2.825	Diameter (m)	0.031		

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.340	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	184	Depth (m)	0.400
Safety Factor	2.0	Width (m)	19.500	Inf Depth (m)	
Porosity	0.32	Length (m)	10.000		



Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	28	3.429	0.429	7.5	2.9126	0.0000	SURCHARGED
30 minute winter	2	28	3.428	0.603	3.3	0.1705	0.0000	SURCHARGED
15 minute winter	3	1	2.791	0.000	1.5	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.01	2	4.5	0.646	0.216	0.2297	
30 minute winter	2	Orifice	3	1.5				5.8



Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	57	3.512	0.512	9.4	8.1754	0.0000	SURCHARGED
60 minute winter	2	57	3.511	0.686	2.3	0.1941	0.0000	SURCHARGED
15 minute winter	3	1	2.791	0.000	1.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.01	2	4.4	0.744	0.214	0.2297	
60 minute winter	2	Orifice	3	1.6				13.8



Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	1	114	3.803	0.803	12.2	22.8123	0.0000	FLOOD RISK
120 minute winter	2	114	3.802	0.977	2.1	0.2764	0.0000	FLOOD RISK
15 minute winter	3	1	2.791	0.000	1.8	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.01	2	4.9	0.803	0.240	0.2297	
120 minute winter	2	Orifice	3	2.0				35.1