



Land to the West of Marwick Close
Bolney Road, Ansty, West Sussex

Flood Risk Assessment and Drainage
Strategy

For

Devine Homes PLC

Document Control Sheet

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This document has been issued and amended as follows:

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Contents

1.0	Introduction	1
2.0	Site Description	2
3.0	Flood Risk Legislative and Policy Framework	5
4.0	Current Flood Risk.....	10
5.0	Future Flood Risk & Climate Change	12
6.0	The Sequential and Exception Tests	13
7.0	Summary of Residual Flood Risk	14
8.0	Surface Water Drainage Strategy.....	15
9.0	Surface Water Runoff Quality	20
10.0	Residual Risk and Infrastructure Maintenance	22
11.0	Exceedance Events.....	23
12.0	Compliance with the National Standards for SuDS	24
13.0	Foul Water Drainage	26
14.0	Summary and Conclusion	27

Appendices

A	Site Location Plan
B	Proposed Development Layout
C	Proposed Housing Mix / Schedule of Accommodation
D	EA Flood Map for Planning
E	Topographic Survey
F	Southern Water Asset Location Plan
G	EA Risk of Flooding from Surface Water Maps + Climate Change
H	QMED Runoff Calculation / Outputs
I	Drainage Strategy Plan
J	MicroDrainage Network Hydraulic Model Outputs
K	Drainage Management and Maintenance Plan
L	Exceedance Plan

1.0 Introduction

- 1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been produced by Motion on behalf of their client, Devine Homes PLC. It supports the planning application for the erection of 34 residential dwellings, access, parking and landscaping on the land to the West of Marwick Close, Bolney Road, Ansty, West Sussex. A site location plan and red line boundary of the proposed development can be seen in [Appendix A](#).
- 1.2 The proposed development will provide 34 residential units consisting of 14 two-bed dwellings and 20 three-bed dwellings, with a mix of affordable and owner-occupied units. The proposed development layout can be seen in [Appendix B](#). The housing mix can be seen in [Appendix C](#).
- 1.3 The 1.62 hectares (ha) site is located within Flood Zone 1 according to the Environment Agency's (EA's) Flood Map for Planning ([Appendix D](#)) and is at Very Low Risk from surface water flooding. Because of the site is over one hectare in area, an FRA is still required to support the development.
- 1.4 The proposed development is 'major' in planning terms and has the potential to generate additional surface water runoff over the greenfield site, so a drainage strategy is also required to demonstrate how the development will manage and discharge surface water generated in all rainfall events up to and including the 1 in 100-year + 45% storm. Exceedance events will also need to be considered, along with how the development's hard surfaces may change over time and how drainage infrastructure should be managed and maintained going forward.
- 1.5 Therefore, this FRA and drainage strategy has been produced to discuss the flood risks to the proposed development, from all sources. This FRA and drainage strategy will also define how the development will manage its surface water and foul sewage so that the development does not increase flood risk in the area or to neighbouring properties/land over the existing situation.
- 1.6 This FRA and drainage strategy follows the guidance set out in:
 - West Sussex LLFA Policy for the Management of Surface Water (November 2018)
 - National Planning Policy Framework (NPPF)
 - Planning Practice Guidance (PPG) to the National Planning Policy Framework
 - CIRIA SuDS Manual 2015 (C753)
 - Environment Agency Rainfall Runoff Management for Developments
 - The New National Standards for SuDS (July 2025)
- 1.7 This FRA and drainage strategy report pertains only to the drainage strategy for the development. It does not provide details of how the site will be drained during the construction phase. This report is also not a drainage verification report, which can only be produced post-construction.
- 1.8 Similarly, this report does not provide information on how the drainage infrastructure will be protected during the construction phase of the project. The provision of this information is the responsibility of the appointed contractor.

2.0 Site Description

Table 2.1 – Site Summary

Site Name	Land to the West of Marwick Close
Location	Bolney Road, Ansty, West Sussex
Grid Reference	528962,123095
Site Area	1.62 ha
Development Type	34 residential dwellings, plus parking access and landscaping
Flood Zone	Flood Zone 1
Surface Water Flood Risk	Very Low Risk
Local Water Authority	Southern Water
Local Planning Authority	Mid Sussex District Council (MSDC)
Lead Local Flood Authority	West Sussex County Council (WSCC)

Site Location and Description

- 2.1 The red line boundary of the site is 1.62 ha, and the existing site is accessible from Bolney Road. The site location can be seen in the plan in [Appendix A](#).
- 2.2 The site is currently greenfield and used for pasture. An area of trees exists in the site's southwestern corner and the boundary between the site and the Bolney Road is bordered with more trees. Further fields lie to the southwest, south, southeast and the east of the site. Immediately to the north of the site is the residential area associated with Marwick Close, built in 2020.

Topography

- 2.3 With reference to the Topographical Survey of the site in [Appendix E](#), the site levels range from around 78 metres Above Ordnance Datum (mAOD) in the northeast of the site, to around 65.60 mAOD to the southwest of the site. The overall site gradient is estimated to be around 1 in 16.

Geology

- 2.4 The British Geological Survey (BGS) online 1:50,000 GeoIndex¹ mapping does not record any superficial deposits on the site² and the underlying solid geology is Upper Tunbridge Wells Sand, which is 'Thinly bedded silty mudstones, siltstones, silty sandstones and fine-grained sandstones'³.
- 2.5 Defra's Magic Map application⁴ lists the soil as being 'slightly acid loamy and clayey soils with impeded drainage'.

¹ https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.209746581.1437364440.1710252984-500540672.1710252984

² https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.209746581.1437364440.1710252984-500540672.1710252984

³ <https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=UTW>

⁴ <https://magic.defra.gov.uk/magicmap.aspx>

- 2.6 The nearest BGS borehole record is from around 500m south southwest of the site (TQ22SE149⁵). The borehole log shows Weald Clay to 12m, Tunbridge Wells Sand to 45m and Weald Clay to 46m. A groundwater strike is not recorded on the borehole log.
- 2.7 The Flood Risk Assessment & Drainage Strategy⁶ available to view on the MSDC planning portal for reserved matters application DM/19/1235 adjacent and to the northeast of the site (Land South Of Bolney Road Bolney Road Ansty West Sussex) states "*Previous site investigations undertaken on the site show that there is a layer of silty clay present overlying the sandstone bedrock. The trial holes undertaken show the sandstone present at a depth of between 1.40m and 1.90m*".
- 2.8 Trial pit logs TP1-TP8 in Appendix D of the Flood Risk Assessment & Drainage Strategy⁷ available to view on the MSDC planning portal for planning application DM/18/0596 (that incorporates the approximate northeast half of the site) were excavated to maximum depth of 70.8 mAOD and show CLAY over SAND and / or SANDSTONE. All the trial pits were recorded to be dry on completion.

Hydrogeology

- 2.9 Groundwater Source Protection Zones (SPZ's) are defined around groundwater abstraction sources such as wells, boreholes and springs that are used for public drinking water supply.
- 2.10 SPZ's show the risk of contamination to groundwater from any activities that might cause pollution in the area. The closer the activity to the source of abstraction, the greater the risk. The maps show three main zones; inner – Zone 1; outer – Zone 2; and total catchment – Zone 3.
- 2.11 Defra's Magic Map was reviewed to see where the site is located in relation to the Groundwater SPZ's, and the site is not located in a SPZ.
- 2.12 Defra's Magic Map application lists the bedrock geology as 'Secondary A' aquifer, and the Groundwater Vulnerability Map (England) classification is High.

Infiltration Potential

- 2.13 The Flood Risk Assessment & Drainage Strategy⁸ available to view on the MSDC planning portal for reserved matters application DM/19/1235 adjacent and to the northeast of the site states "*Soakage tests were undertaken in the trial holes which showed negligible soakage rates, implying that the site would be unsuitable for surface water infiltration techniques. It is possible that deeper soakage tests may present suitable rates of soakage for infiltration*".
- 2.14 BRE Digest 365 Soakage Test Trial pits TP1, TP2 and TP4 in Appendix D of the Flood Risk Assessment & Drainage Strategy⁹ available to view on the MSDC planning portal for planning application DM/18/0596 recorded soil infiltration rates of 9.84×10^{-7} m/s, 4.1×10^{-7} m/s and 1.1×10^{-6} m/s respectively. BRE Digest 365 Soakage Test Trial pits TP1 and TP2 were excavated in the proposed development site location, with TP2 excavated to the aforementioned maximum depth of 70.8m AOD.
- 2.15 CIRIA SuDS Manual 2015 states "*Infiltration viability should be given full consideration where rates of 10^{-6} m/s or greater exist on the site (subject to geotechnical and contamination considerations). Where rates are less than that, the soils can still usefully be used for Interception delivery, but disposal of significant volumes of runoff may not be cost-effective or appropriate, unless there is a large area of land available for this purpose*".

⁵ <https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/20236454>

⁶ Paul Basham Associates, Flood Risk Assessment & Drainage Strategy, referenced 020.5444/FRA&DS/4, Dated 13.06.19.

⁷ MLM Consulting Engineers Ltd, Flood Risk Assessment & Drainage Strategy, Referenced SJC/617474/TH Revision 2, Dated 11.03.16.

⁸ Paul Basham Associates, Flood Risk Assessment & Drainage Strategy, referenced 020.5444/FRA&DS/4, Dated 13.06.19.

⁹ MLM Consulting Engineers Ltd, Flood Risk Assessment & Drainage Strategy, Referenced SJC/617474/TH Revision 2, Dated 11.03.16.

- 2.16 With reference to Section 2.15, the results of infiltration testing in the proposed development site location (9.84×10^{-7} m/s and 4.1×10^{-7} m/s) indicate that infiltration rates are less than the lower limit of acceptability for soakaway feasibility - particularly once it is considered only one test was partially undertaken at the two test pit locations.
- 2.17 Therefore, the drainage strategy for the development will not look to use infiltration as part of the drainage strategy, and will utilise 'System C' pervious pavements, open SuDS features (a swale) and geocellular storage tanks for the attenuation of surface water runoff. Flow control chambers will be incorporated into the design to control discharge to the equivalent greenfield rate.

Existing Drainage Regime

- 2.18 The site is greenfield and currently undeveloped. Therefore, the site has no formal drainage, and the existing drainage regime is natural overland flow following the gradients/catchments discussed above. The overall fall of the land is to the south, and drains towards an ordinary watercourse that is on the southern boundary of the field to the south of the site. This field is also within the ownership of the landowner of the current development.
- 2.19 An asset location plan was obtained from Southern Water, and this can be seen in [Appendix F](#). This shows that there no public surface water sewers within the site or in the immediate vicinity of the site boundary. There is, however, a public foul sewer in that crosses the field to the south, with nodes 9801 and 8801 falling within the field boundary.
- 2.20 This foul sewer leads to a wastewater treatment works (WWTW) in the field to the southwest of the site and this is shown in the asset location plan in [Appendix F](#).
- 2.21 It is anticipated that that the foul sewer run 9801-8801 will have capacity of the site's foul flows, as is the case for drainage networks near WWTW's.

Hydrology

- 2.22 The EA Statutory Main River Map¹⁰ shows that the nearest Main River is approximately 1.9km south southwest of the site.
- 2.23 An ordinary watercourse that flows south southwest appears to originate at Butler's Farm approximately 150m west southwest of the site.

¹⁰ <https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386>

3.0 Flood Risk Legislative and Policy Framework

- 3.1 LLFA's including WSCC have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from local sources, such as surface water run-off, groundwater and ordinary watercourses (i.e. non main rivers). The EA plays a role in managing the watercourses designated as 'main rivers'.
- 3.2 West Sussex often delegates their LLFA responsibilities to Local Planning Authorities. It is often the case that MSDC consult on local flood risk and drainage matters, and this may be the case for the current application.

The National Planning Policy Framework

- 3.3 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Planning Practice Guidance (PPG) to the NPPF provides further information on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is considered at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are highest.
- 3.4 The process of directing development away from those areas where risks are highest is the Sequential Test. It covers all forms of flooding, and this is covered in Paragraphs 23 and 24 of the NPPF. Following the December 2024 update to the NPPF, Paragraph 175 was added that states that development can be appropriate on sites with flood risk "*in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would not be at risk of flooding from any source, now and in the future*". This essentially means that if a sequential approach is applied within the site boundary, and areas of flood risk now and in the future are avoided, that flood risk should not prevent the development coming forward and that the Sequential Test is not required.

The Environment Agency Flood Map for Planning

- 3.5 The updated Environment Agency's Flood Map for Planning was released on 25th March 2025. This updated and new National Flood Risk Assessment (NaFRA) uses both existing detailed local information and improved national data, includes the potential impact of climate change on flood risk, based on UK Climate Projections (UKCP18) and shows potential flood depths. This allows the Flood Map for Planning to provide much higher resolution maps that make it easier to see where there is risk
- 3.6 The New NaFRA Flood Map for Planning remains split into 'Flood Zones', which demarcate the extent of flooding from rivers or the sea for different return periods.
- 3.7 Table 3.1, on the next page, lists the flood zone categories and explains the flood risk probabilities they represent.

Table 3.1 – Flood Zone Categories

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 tidal 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 tidal flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water must flow or be stored in times of flood, which is typically the 1 in 30-year flood event or greater. Local planning authorities should identify in their SFRA's areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map, but may be distinguished in Product 4 information, for example)

- 3.8 A site-specific FRA is required for proposals of 1ha or greater in Flood Zone 1, all proposals for development in Flood Zones 2 and 3, or in an area within Flood Zone 1 that has critical drainage problems (as notified to the local planning authority by the EA). There are areas of surface water flood risk on the boundaries of the site and the site is over 1ha in area, thus flood risk from all sources will be reviewed for the completeness of the application.
- 3.9 An FRA should identify and assess the risks of all forms of flooding and demonstrate how these flood risks will be managed so that a development remains safe throughout its lifetime, taking climate change into account.
- 3.10 Within each Flood Zone, a key factor in determining planning applications for development is the flood risk vulnerability of a development. Table 2 of the PPG to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:
- Essential infrastructure;
 - Highly vulnerable development;
 - More vulnerable development;
 - Less vulnerable development, and;
 - Water-compatible development.
- 3.11 Within the different Flood Zones each of the above development categories are considered appropriate or not permissible. The Technical Guidance to the NPPF lists these as:
- Flood Zone 1:
- All the development categories listed above are appropriate.
- Flood Zone 2:
- Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this zone.
- Flood Zone 3a:
- Water-compatible and less vulnerable development is appropriate in this zone. Highly vulnerable development should not be permitted in this zone.

Flood Zone 3b:

- Only water-compatible development and essential infrastructure that must be there should be permitted in this zone.

3.12 The above information sets out the basis by which developments must be assessed in terms of flood risk.

3.13 The development will be reviewed against the Flood Zone in which it is located, and an assessment will be made of the appropriateness of the proposed development, as per the advice within the PPG to the NPPF, taking account of the proposed site layout for the development shown in [Appendix B](#).

The New National Standards for SuDS

3.14 On 19 June 2025 the UK government published its new National Standards for Sustainable Drainage Systems (SuDS). The new standards are a minor evolution of industry standards and current best practice, many of which practitioners and design engineers had already been actively incorporating in recent years. Therefore, while the New National Standards do not fundamentally change current standards, they are a welcome step in clarifying points that had previously been uncertain and has enshrined them in a single piece of guidance.

3.15 The standards emphasise and how sustainable drainage and flood risk should be considered in developments, and the importance of site appraisal and early, integrated design with the site's natural features and proposed infrastructure.

3.16 The New National Standards for SuDS outline that;

- SuDS a mandatory for major developments and drainage strategies must conform with the new national criteria and LLFA guidance.
- There is a stronger emphasis on the 'four pillars' of SuDS. Drainage strategies must demonstrate benefits for water quantity and quality as well as amenity, and biodiversity. This pushes designers to incorporate more surface level SuDS and rely less on below-ground attenuation.
- There is more clarity on long-term adoption & maintenance of SuDS system and LPA's will expect clearer maintenance and management strategies for drainage systems and require stronger evidence of deliverability.

3.17 As stated before, this is a minor evolution of the current approach to drainage design, but there are subtle differences in the design factors, which could lead to an increase in size of attenuation features. In addition to the above overarching principles of the New National Standards for SuDS, there are seven core standards that are to be achieved in drainage design. These are:

Standard 1 – Runoff destinations (Drainage hierarchy)

3.18 Surface water runoff must be discharged following a strict five-tier sustainability hierarchy, prioritising solutions that keep water close to where it falls:

1. Collected for non-potable reuse (e.g. rainwater harvesting)
2. Infiltrated to ground
3. Discharged to an above-ground surface water body
4. Discharged to a surface water sewer or piped system
5. Discharged to a combined sewer

3.19 Use of lower-priority options must be robustly justified.

Standard 2 – Management of everyday rainfall (interception)

3.20 SuDS must manage frequent, small rainfall events at source, with the key points being:

- The first 5mm of rainfall should be intercepted within the development.
- Interception should prevent runoff for most rainfall events, across both summer and winter seasons.
- Interception can typically delivered through features like green roofs, rain gardens, permeable paving, and bioretention.

Standard 3 – Management of extreme rainfall and flooding

3.21 SuDS must manage intense and extreme rainfall events to reduce flood risk:

- Control surface water runoff rates and volumes to greenfield runoff rates.
- Safely manage exceedance flows without negative impact on third party land.
- Ensure flooding (where unavoidable) is shallow, slow, and low-hazard.
- Prevent flooding of buildings and critical infrastructure.

Standard 4 – Water quality

3.22 SuDS must protect and improve water quality:

- Designs must be based on a site-specific water quality risk assessment.
- Drainage features should treat runoff according to the pollution risks of the proposed land use and this should be in accordance with Chapter 26 of the CIRIA SuDS Manual (C753).
- Multiple treatment stages are expected where risks are high (discharge to protected waters, for example)

Standard 5 – Amenity

3.23 SuDS must deliver positive placemaking outcomes, not just drainage quantity benefits:

- Contribute to attractive, usable, and safe spaces.
- Support recreation, wellbeing, and visual quality.
- Be integrated into landscaping and public realm design.

Standard 6 – Biodiversity

3.24 SuDS must enhance the natural environment:

- Deliver biodiversity benefits, aligned with Biodiversity Net Gain ambitions.
- Use vegetated, nature-based solutions wherever possible.
- Support habitats for plants, invertebrates, and wildlife.

Standard 7 – Design for construction, operation, maintenance, and structural integrity

3.25 SuDS must be designed for their whole lifecycle:

- They should be safe and effective to construct.
- They should include clear, deliverable maintenance and management plans.
- They must remain structurally sound over their design life.
- They should allow for decommissioning or adaptation (if required).

- 3.26 The below specific points should be borne in mind by designers and included in any drainage strategies:
- Standard 2 provides explicit guidance on the management of everyday rainfall. The first 5mm of rainfall (the 'first flush') must be managed by interception and should not leave the site. Instead, it should either collected for reuse, infiltrated into the ground, or else captured, conveyed, and stored within SuDS features (but there are specific criteria that make this last point acceptable).
 - The latest standards now formalise that the minimum permissible infiltration rate for discharging surface water via a 'System A' (Total Infiltration) solution. The minimum infiltration coefficient that can support an infiltration-based drainage solution is 1.0×10^{-6} m/sec. Additionally, the standards now add that the half drain in the 3.3% AEP event should be less than 24 hours.
 - A 'relaxation factor' should instead be applied to the target greenfield runoff rates on brownfield site. It defines that the maximum relaxation factor for runoff rates should be no greater than five times the greenfield rates. This allows for easier implementation on heavily developed urban sites, especially where LLFA's previously demanded greenfield runoff rates.
 - The New National Standards confirm a previous 'grey area' by stating that SuDS features should be included in the contributing catchment area. It also notes that there is no requirement to provide attenuation for external overland flows entering the site, but these flows should be considered for capacity of the pipe network.
 - Standard 3 of the New National Standards for SuDS clarifies the expectations with regards to urban creep. It says "*within developments an urban creep uplift factor shall be applied by adding a percentage increase to the calculated area of the impermeable area within the property curtilages. This shall be 10% for all developments unless there are no external private permeable spaces, for example, flats and apartments, when it shall be 0%.*"
- 3.27 The proposed development on the land west of Marwick Close acknowledges the requirements of the New National Standards for SuDS and will deliver them through the drainage strategy, where they are achievable alongside the competing technical and regulatory constraints.

4.0 Current Flood Risk

- 4.1 Flooding can arise from a variety or combination of sources. These may be natural or artificial and may be affected by climate change. These are discussed, below, in the following two sections and summarised in Table 7.1. The probability of any likely impacts is also assessed, where necessary.

Flooding from Rivers and the Sea

- 4.2 The 1.62 ha site is wholly located within Flood Zone 1 according to the EA's Flood Map for Planning (Appendix D). This means in any year the site has a less than 1 in 1,000-year (0.1%) chance of flooding from rivers or the sea.
- 4.3 There will be no increased risk of flooding from rivers or the sea on site post development, or as a result of climate change (this is discussed in Section 5, below).

Surface Water Flooding

- 4.4 With reference to the EA's Risk of Flooding From Surface Water (RoFSW) map, the site is in the 'Very Low' surface water flood risk category (less than 1 in 1,000 chance of flooding each year).
- 4.5 On the basis the development will manage and discharge surface water generated in line with appropriate guidance, there will be no increased risk of surface water flooding on site post development.

Groundwater Flooding

- 4.6 The risk of groundwater flooding is dependent on local geological and hydrogeological conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when rainfall is low and extractions are higher. In very wet winters, rising groundwater levels can reactivate flow in ephemeral streams that only flow for part of the year or even lead to the flooding of normally dry land.
- 4.7 The Geology and Infiltration Potential information in Section 2.0 indicate that groundwater is at least below 70.8m AOD based on Trial pit logs TP1-TP8 in Appendix D of the Flood Risk Assessment & Drainage Strategy¹¹ available to view on the MSDC planning portal for planning application DM/18/0596.
- 4.8 Because the lowest finished floor level (FFL) is conservatively estimated to be at least 1.7m higher than 70.8m AOD, the likelihood of groundwater flooding is low.

Flooding from Infrastructure Failure

- 4.9 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.
- 4.10 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.
- 4.11 Looking forward, the development's drainage must be designed in accordance with Sewers for Adoption, The Design and Construction Guidance (DCG), Building Regulations Approved Document Part H and BS EN 752. This will minimise the future risk of flooding due infrastructure failure.

¹¹ MLM Consulting Engineers Ltd, Flood Risk Assessment & Drainage Strategy, Referenced SJC/617474/TH Revision 2, Dated 11/03/16.

- 4.12 Therefore, it is concluded that the proposed development site is at low risk of flooding from infrastructure failure.

Flooding from Artificial sources

- 4.13 There are no canals in the site area to create flood risk.
- 4.14 The site is not in an area at risk of reservoir flooding.

Historic Flooding

- 4.15 Appendix C of the Level 1 SFRA¹² states that there are 'no specific flood risk issues in and around Ansty'.

¹² Mid Sussex District Council, Strategic Flood Risk Assessment Level 1, June 2015

5.0 Future Flood Risk & Climate Change

- 5.1 The NPPF and its supporting PPG sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

- 5.2 The site is within Flood Zone 1 and is not close to any watercourses that could create fluvial flooding, thus future fluvial flood risk does not need to be considered any further.

Peak Rainfall Intensity and Climate Change

- 5.3 Adur and Ouse Management Catchment¹³. The peak rainfall climate change allowances are as follows in Table 5.1, below:

Table 5.1 – Climate Change Predictions for Adur and Ouse Management Catchment

1 in 30-year Rainfall Event	Central Allowance	Upper End Allowance
2050's epoch	20%	35%
2070's epoch	20%	40%
1 in 100-year Rainfall Event	Central Allowance	Upper End Allowance
2050's epoch	20%	45%
2070's epoch	25%	45%

- 5.4 Appendix G has included the future surface water flood risk dataset, with climate change included. This does not indicate that the site, the development, or any of its infrastructure will be at risk of surface water flooding in the future.

¹³ <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall>

6.0 The Sequential and Exception Tests

- 6.1 The NPPF specifies that the suitability of all new development in relation to flood risk should be assessed by applying the Sequential Test to demonstrate that there are no reasonably alternative sites available in areas with a lower probability of flooding that would be appropriate to the type of proposed development.
- 6.2 On the basis the FRA indicates the site lies within Flood Zone 1 - i.e. land assessed as having less than a 0.1 per cent (1 in 1,000-year) chance of river flooding occurring each year as defined in Government Guidance on Flood risk and coastal change¹⁴ - and the flood risk assessment indicates a low risk of flooding from all 'local' sources both now and in the future, the Sequential and Exception tests will not be required for the proposed development.

¹⁴ <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

7.0 Summary of Residual Flood Risk

7.1 Table 7.1, below, summarises the residual level of flood risk, from all sources, once mitigating factors, site design and climate change has been considered (as laid out in Sections 4 and 5, above).

Table 7.1: Summary of Flood Risk

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial				X	There are no watercourses in the vicinity and the site is at very low risk of fluvial flooding
Tidal				X	The site is not at risk of tidal flooding
Groundwater				X	The site is in an area where susceptibility to groundwater is thought to be low and the FFL's of the dwellings will be well above risk areas.
Surface Water				X	There site is at Very Low risk of surface water flooding, today, and in the future.
Canals				X	There are no canals in the vicinity.
Reservoirs				X	There are no reservoirs in the vicinity.
Infrastructure Failure			X		The risk of infrastructure failure will be made negligible through drainage systems designed to accord with Building Regulations and adoptable standards.
Increase due to Climate Change				X	Climate change-related increases in rainfall are not expected to impact the development, especially because the drainage strategy will be designed to capture and attenuate the 1 in 100-year + 45% rainfall event.

8.0 Surface Water Drainage Strategy

Sustainable Drainage Overview

- 8.1 Current planning policy and EA guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible.
- 8.2 The key benefits of SuDS are as follows:
- Improving water quality over a conventional piped system by removing pollutants from diffuse pollutant sources (e.g., roads);
 - Improving amenity through the provision of open green space;
 - Improving biodiversity through increased areas for wildlife habitat; and
 - Enabling a natural drainage regime that recharges groundwater (where possible).
- 8.3 SuDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used where possible in a management train that mimics the natural pre-developed pattern of drainage.

Site Area and Greenfield Runoff Rate

- 8.4 The developed site's impermeable (contributing) areas will be 0.649 ha, which is inclusive of urban creep to acknowledge what the future impermeable areas of the site could be, and also includes for the surface area of the SuDS features (a swale), as directed by the New National Standards for SuDS.
- 8.5 The greenfield runoff rate has been determined for this impermeable, contributing area, and will guide the developed site's surface water discharge rates.
- 8.6 The greenfield runoff rates have been calculated using the QMED value, which is the index flood in the Flood Estimation Handbook (FEH). QMED has been calculated for rural and urban values in MicroDrainage using the catchment descriptors methodology, which includes the following input variables:
- Site Location
 - SAAR – Standard Average Annual Rainfall 1961 – 1990 (mm)
 - SPR Host - Standard percentage runoff derived from HOST soils data
 - URBEXT - The extent of urban and suburban cover
 - BFIHOST - Baseflow index derived from Hydrology of Soil Types (HOST) soils data
 - FARL - Index of flood attenuation due to reservoirs and lakes
- 8.7 The QMED urban/rural calculation can be seen in [Appendix H](#), but the outputs are summarised in Table 8.1, below.

Table 8.1: QMED Rural/Urban Values for Impermeable/Contributing Area

Impermeable Area	QMED Rural Runoff Rate	QMED Urban Runoff Rate
0.649 ha	6.7 l/s	7.0 l/s

- 8.8 Therefore, the target runoff rates for the developed site will be 6.7 l/s. This ensures that the development's runoff will never exceed the QMED greenfield runoff rate, even in higher order storms

when the undeveloped site's runoff rate would be far in excess of this. This provides protection to the site and the local area in terms of surface water flood risk because the high levels of runoff that would ordinarily occur during flood events will no longer do so.

Drainage Strategy Overview

- 8.9 The drainage strategy for the proposed development will use a mixture of surface level attenuation features and SuDS. These will provide the requisite surface water storage requirements, as well as pollution mitigation while tying into the landscaping and ecological strategy for the development. This summary should be read in conjunction with the Drainage Strategy plan in [Appendix I](#).
- 8.10 An area of the access, which is the least trafficked and will be exposed to least amount of commercial and refuse vehicles over 7.5 tonnes, will be constructed from System C (tanked) permeable pavements. This will provide source control for rainfall falling on the surrounding properties' roofs and driveways (which will discharge directly into the subbase of the permeable pavements) and on the road surface itself. The 30% porous subbase (nominally 450mm deep) and the 50mm grit laying course will provide attenuation and pollution mitigation. The gradients across the site and the slope of the permeable pavements will be addressed by using check-dams/baffles within the subbase of the permeable pavement so that the attenuation volume is maximised. The quantity and distribution of the check-dams will be confirmed at the detailed design stage.
- 8.11 As well as the permeable pavements, open SuDS features will be used, which will also offer visual amenity and biodiversity opportunities and ensures that the proposed drainage strategy provides all four SuDS pillars. A substantial swale is proposed to the south of the site.
- 8.12 Three geocellular tanks have also been used to provide the requisite attenuation for the development, inclusive of climate change allowance, urban creep, and other conservatively positioned design criteria (as specified by the LLFA). There are two tanks towards the south of the site, prior to the swale and another close to the site entrance in the area of public open space.
- 8.13 It should be noted that the volume of attenuation provided by the geocellular tanks cannot be found by increasing the size of the swale, due to land constraints in this location. The swale is currently occupying the maximum dimensions possible on this area of land.
- 8.14 There will be a single surface water discharge from the site. This will be from the swale and will run via a pipe down the eastern side of the field in which the swale is located, the boundary of which leads to the ordinary watercourse to the south. As noted earlier in this report, this land is all within the ownership of the landowner, and can be protected as an easement in perpetuity. The landowner also has riparian rights to the watercourse on the southern field's boundary.
- 8.15 The surface water discharge to the ordinary watercourses will be at no more than the QMED greenfield runoff rate, for all storms. This is 6.7 l/s.
- 8.16 Attenuation across the site is maximised using flow control devices (orifices/hydrobrakes), with the final outfall from the swale being controlled to 6.7 l/s using hydrobrake. This approach provides the drainage strategy with resilience so that surface water is attenuated in stages across the site and does not rely on a single 'end of pipe' solution for a successful drainage strategy.
- 8.17 It is also proposed to install at least 1no 'Type 2' (200-litre) water butt on each property. Water butts provide small amounts of storage for surface water and can often assist in achieving zero discharge for rainfall depths up to 5mm, which covers 50% of annual rainfall events (according to the EA's Rainfall Runoff Management for Developments report – SC030219) and means that the 'first flush', which can contain contaminants, does not reach the drainage system.
- 8.18 It is recognised that this, in isolation, does not achieve the 'Interception' standard of the New National Standards for SuDS (Standard 1). However, Standard 1 does specify that permeable pavements are suitable for interception, which the site's drainage strategy has employed. Similarly, while infiltration rates were

poor, they suggest that unlined features (which is possible due to the absence of groundwater) can achieve some infiltration when conditions allow due infiltration of coefficients of 9.84×10^{-7} m/s and 4.1×10^{-7} m/s being recorded. This means that interception can be achieved across all features within the drainage strategy. Should the LLFA require further groundwater monitoring to support this approach, we suggest that this be conditioned due to the limited availability in each year to record such data.

- 8.19 The drainage strategy as proposed can be seen in [Appendix I](#) of this report. It shows the location of the permeable pavements and SuDS features and the proposed discharge to the ordinary watercourse on the southern field boundary.
- 8.20 The proposed drainage strategy as laid out in [Appendix I](#) has been modelled in MicroDrainage’s Network hydraulic modelling module. While the full results of this hydraulic model can be seen in [Appendix J](#) of this report, a summary of the proposed runoff rates for different return periods is presented in Table 8.2, below. Due to the FEH data that has been used, a proposed runoff rate for the 1 in 1-year storm is not available and the maximum storm duration available is 5,760-minutes.

Table 8.2: Summary of existing and proposed site runoff rates

Return Period	Proposed Runoff Rate (l/s)
1 in 1	N/A
1 in 2	6.3
1 in 10 (+ 40%)	6.4
1 in 30 (+ 40%)	6.4
1 in 100 (+ 45%)	6.7

- 8.21 All storms other than the 1 in 100-year + 45% event are below the QBAR greenfield runoff rate of 6.7 l/s, which means there is actually a betterment over the greenfield situation for all storms (noting that the greenfield runoff rate in the 1 in 100-year + 45% would be much higher than 6.7 l/s).
- 8.22 In summary, the proposed drainage strategy provides the requisite attenuation and all four SuDS pillars, while maintaining the QBAR greenfield runoff rate for the site. How the proposed drainage strategy complies with the seven core standards of the National Standards for SuDS is presented later in this report (Section 12.0) after the discussions of Pollution Mitigation (Section 9.0), how the drainage infrastructure will be managed and maintained (Section 10.0), and exceedance events (Section 11.0).
- 8.23 In short, the drainage strategy uses a compliment of SuDS features, employs the highest available SuDS pillars and most sustainable discharge methods. Hydraulic modelling shows it does not flood up to and including the 1 in 100-year + 45% rainfall event, and this is inclusive of the impermeable area increases that will result from urban creep, plus other factors of safety. The drainage strategy is robust in its design and should not be an impediment to the progress of the planning application.

Design Criteria

- 8.24 The drainage strategy has been designed in accordance with the design criteria outlined in WSCC’s LLFA Policy for the Management of Surface Water¹⁵.
- 8.25 This ensures that the current drainage strategy accords with local policy requirements (as well as those of the NPPF). This includes:

¹⁵ https://www.horsham.gov.uk/__data/assets/pdf_file/0019/65017/West-Sussex-Surface-Water-Management-Policy.pdf

- Using FEH 2022 Annual Maximum Catchment data rather than FSR data. It should be noted that the MicroDrainage Results in Appendix K list 2013 data as being used, but we can assure that 2022 data has been used in full (this is a quirk of MicroDrainage).
- Using a runoff coefficient (CV) value of 1.0 in all hydraulic modelling
- Reducing the MADD Factor (which assumes 10m³ of pipe storage per hectare) to zero.
- The full suite of rainfall events has been used (up to the 5,760-minute storm, which is maximum allowable when using FEH data).
- The maximum rainfall intensity has been raised to 550mm/hr to ensure that the full hydrograph is included in the hydraulic calculations.

Urban Creep

- 8.26 An appropriate allowance should be made for urban creep throughout the lifetime of the development as per 'BS 8582: 2013 Code of Practice for Surface Water Management for Developed Sites'.
- 8.27 This also complies with Standard 3 of the New National Standards for SuDS, which clarifies the expectations with regards to urban creep. It says "*within developments an urban creep uplift factor shall be applied by adding a percentage increase to the calculated area of the impermeable area within the property curtilages. This shall be 10% for all developments unless there are no external private permeable spaces, for example, flats and apartments, when it shall be 0%.*"
- 8.28 Therefore, a full 10% urban creep has been added to the development's private impermeable areas (roofs and driveways), as per the Table 8.3, below, which shows the uplift to each pipe number in the hydraulic model. Please note that any pipes that have not had urban creep applied are not listed within Table 8.3.

Table 8.3: 10% Urban Creep Uplifts Applied to Hydraulic Model

Pipe Number	Total Impermeable Area	Private Impermeable Areas	10% Increase in Private Impermeable Areas	Post-Urban Creep Total Area Applied to Pipe
1.000	0.015	0.005	0.001	0.016
1.001	0.034	0.010	0.011	0.035
1.003	0.031	0.015	0.017	0.033
1.004	0.022	0.016	0.018	0.024
1.005	0.059	0.048	0.005	0.064
1.006	0.073	0.052	0.057	0.078
1.007	0.033	0.019	0.021	0.035
3.000	0.042	0.039	0.043	0.046
5.000	0.041	0.038	0.042	0.045
4.004	0.059	0.034	0.037	0.062
4.003	0.02	0.006	0.007	0.021
4.002	0.063	0.037	0.041	0.067
4.001	0.062	0.035	0.039	0.066

Freeboard

- 8.29 The SuDS Manual discusses freeboard for drainage strategies and states the following:

"Ensure that all surface water is retained within the SuDS components for events up to the critical 1:30-year event and contained within appropriate exceedance routes and storage areas up to the critical 1:100-year event, with 300 mm freeboard to points of potential entry to buildings (to meet water quantity standards 3a and 3b), and to include relevant climate change and urban creep allowances."

- 8.30 We understand that this is also the approach taken by WSCC as the LLFA, and that freeboard should be to the FFL's of the dwellings.
- 8.31 The approach of 300mm freeboard being measured between the top water level during the critical flood event and points of entry/FFL's of buildings is the approach that Motion have taken and there is 300mm freeboard between the highest water level in the swale, the largest and most significant SuDS feature in the development, and the lowest FFL's on site.

MicroDrainage Hydraulic Modelling

- 8.32 The drainage strategy outlined above has been designed in MicroDrainage's Network hydraulic modelling module.
- 8.33 The results of the MicroDrainage hydraulic modelling for the proposed development can be seen in [Appendix J](#).
- 8.34 The results of the hydraulic modelling show that the drainage strategy as outlined in this section can attenuate and discharge all surface water generated in the 1 in 100-year + 45% rainfall event, inclusive of urban creep, and without flooding. This has been achieved while complying with all national and local standards, as outlined in this report.
- 8.35 The maximum half drain time of the system is 832 minutes (in the 1 in 100-year + 45% rainfall event), which is less than the 1,440-minute (24-hour) requirement for this. The maximum half drain time for all storms is as follows:
- 1 in 2-year: 198 minutes
 - 1 in 10-year + 40%: 480 minutes
 - 1 in 30 year + 40%: 612 minutes
 - 1 in 100-year + 45%: 848 minutes

9.0 Surface Water Runoff Quality

- 9.1 The NPPF states that development should not have a detrimental impact on the environment, including the water environment. The technical guidance to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.
- 9.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from roof water runoff as 'very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would be achieved using catchpits and silt traps upstream of the permeable surfacing and throughout the drainage network.
- 9.3 With regards to the accesses and parking, Table 4.3 of the CIRIA SuDS Manual rates the pollution hazard from residential car parking and low traffic roads as 'low'. To mitigate a 'low' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.
- 9.4 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classification that requires consideration for low traffic roads and parking areas is in Table 9.1 below.

Table 9.1 - Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, homezones and general access roads) with less than 300 traffic movements per day.	Low	0.5	0.4	0.4

- 9.5 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).
- 9.6 Table 26.3 of the CIRIA SuDS Manual provides indicative SuDS mitigation indices for each SuDS type when discharging to surface waters. Table 9.2, below, which is an excerpt from Table 26.3, shows the mitigation index for permeable pavements, which are specified for part of the site.

Table 9.2: Pollution Mitigation Indices for Permeable Pavements

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Permeable Pavements	0.7	0.6	0.7

- 9.7 The mitigation indices for permeable pavements exceed those of the highest pollution hazard index figures from Table 9.1.
- 9.8 The site will also include a swale, thus some surface water will pass through two mitigation components. Where two mitigation components are used in series, the SuDS manual states that:

Total SuDS mitigation index = mitigation index (component one) + 0.5 mitigation index (component two)

9.9 The a swale will provide the below mitigation indices as in Table 9.3:

Table 9.3: Pollution Mitigation Indices for Secondary SuDS Feature

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Swale	0.25 (0.5 ÷ 2)	0.25 (0.5 ÷ 2)	0.30 (0.6 ÷ 2)

9.10 And the total mitigation indices for the site will be as per Table 9.4, below, which shows the mitigation indices for secondary SuDS features added to the mitigation indices for the primary SuDS feature:

Table 9.4: Total Pollution Mitigation Offered by Permeable Paviours and Swale:

Contaminant Type	Pollution Hazard Index	Pollution Mitigation Index	Difference
Total Suspended Solids	0.5	0.95 (0.7 + 0.25)	+ 0.45
Metals	0.4	0.85 (0.6 + 0.25)	+ 0.45
Hydrocarbons	0.4	1.00 (0.7 + 0.30)	+ 0.60

9.11 The above evidence shows how the permeable surfaces provide sufficient pollution mitigation on their own, but with the swale in addition to the permeable paviours, they combine to ensure all pollution hazards are completely mitigated. Where surface water only passes through the swale prior to discharge the mitigation indices will be as follows in Table 9.5:

Table 9.5: Pollution Mitigation Indices for Swale

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Swale	0.5	0.5	0.6

9.12 Once again, the mitigation indices for the swale exceed the pollution hazard indices laid out in Table 9.1. This guarantees that every part of the site will receive adequate pollution mitigation prior to surface water being discharged off site.

10.0 Residual Risk and Infrastructure Maintenance

- 10.1 Whilst the drainage strategy for the development has been designed to attenuate surface water from the 1 in 100-year plus 45% rainfall event, plus an inclusion for urban creep, there could be a small residual risk of flooding due to blockage or failure or poor performance of on-site infrastructure. Therefore, appropriate and regular maintenance of the drainage infrastructure should be undertaken by the site management company or their agents.
- 10.2 To assist with this process, a Drainage Management and Maintenance Plan has been prepared, which sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the development. The Drainage Management and Maintenance Plan can be seen in [Appendix K](#).
- 10.3 The purpose of this document is to ensure that those responsible for site maintenance have a robust inspection and maintenance plan going forwards. This will help ensure the optimum operation of the surface water drainage system and that it will be regularly maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

11.0 Exceedance Events

- 11.1 Exceedance events are those greater than the design rainfall event (i.e., greater than the 1 in 100-year rainfall event plus 45% for climate change).
- 11.2 Any rainfall events greater than the design rainfall event may cause flooding due to them 'exceeding' the capacity of the drainage system. In this situation it is imperative to check whether flooding would occur and, if so, whether it needs to be contained on site. Exceedance flows should not ingress into any properties on site and should not cause nuisance to any neighbouring sites or buildings.
- 11.3 Because the drainage system is not shown to flood in the MicroDrainage hydraulic model, it has some 'freeboard' within it that would provide attenuation during exceedance events. This allows for the attenuation of some surface water in storms beyond the 1 in 100-year + 45% event.
- 11.4 Should an exceedance event cause the drainage system to surcharge, the topography of the site and the road network would direct surface water flows and, using these factors as a guide, a high-level plan of exceedance flows has been produced to show the pathway that exceedance flows would take across the site. This can be seen in [Appendix L](#).
- 11.5 It is clear that the receptor for exceedance would be the field to the south, which is also within the same land ownership of the site. Therefore, exceedance would not impact any infrastructure or third-party land.

12.0 Compliance with the National Standards for SuDS

- 12.1 The seven core standards for SuDS, as laid out in the National Standards for SuDS, was presented in Section 3 of this report (Paragraphs 3.14 to 3.27).
- 12.2 This section will review how the drainage strategy has attained the seven core standards for SuDS, which is presented below.

Standard 1 – Runoff destinations (Drainage hierarchy)

- 12.3 With regards to the proposed development and its drainage strategy, the tiers of the drainage hierarchy that have been achieved are outlined in Table 12.1, below. These are the highest available tiers, as demonstrated by the discussion of the geoenvironmental characteristics and constraints discussed in Section 2 of this report.

Table 12.1: Compliance with Standard 1 and the Drainage Hierarchy

Tier	Discharge Method	Used?	Notes
1	Collected for non-potable use	ü	Water Butts are to be used on the downpipes of the dwellings.
2	Use infiltration techniques	ü	Total infiltration is not viable on this site due to the local geology, but the features will be unlined to provide some infiltration when ground conditions allow, because slow infiltration coefficients were recorded on site (10^{-7} m/s)
3	Discharged to an above ground surface water body	ü	The drainage strategy will discharge surface water at the greenfield runoff rate to an ordinary watercourse, which has ongoing connectivity.
4	Discharged to a surface water sewer, or another piped surface water drainage system	û	This tier of the drainage hierarchy will not be required.
5	Discharged to a combined sewer	û	This tier of the drainage hierarchy will not be required.

Standard 2 – Management of everyday rainfall (interception) - ü

- 12.4 Water butts will be fitted to all properties.
- 12.5 Permeable paving is being used.
- 12.6 All SuDS and attenuation features will be unlined, and the slow to marginal infiltration rates available will allow some soakage, particularly in the everyday rainfall events.
- 12.7 Therefore, between the water butts, the permeable pavements and the open SuDS features, there is confidence that adequate interception, as required by Standard 2 of the National Standards for SuDS, has been provided. It is recognised that some of the technical criteria of Standard 2 means that infiltration has not been fully provided by each individual SuDS feature on their own, but together and in a SuDS train there is sufficient evidence of interception and the attainment of Standard 2 by the overall drainage system.

Standard 3 – Management of extreme rainfall and flooding - Ü

- 12.8 The hydraulic modelling carried out in MicroDrainage, as presented in Appendix K, shows that the proposed development can manage all surface water arising from current and future impermeable areas (with inclusions for urban creep and climate change) can be attenuated and discharged at the QMED greenfield runoff rate. This can be achieved without any flooding, and is inclusive of all factors of safety.
- 12.9 Exceedance has also been considered and planned for.

Standard 4 – Water quality- Ü

- 12.10 Section 9 of this drainage strategy has demonstrated that the proposed development can mitigate all expected pollution hazards that will arise on site using the specified SuDS features, complying with the requirements of Chapter 26 of the CIRIA SuDS Manual (C753).

Standard 5 – Amenity- Ü

- 12.11 The proposed drainage strategy uses surface level SuDS, that tie into the landscape and provide visual interest and a sense of space. The permeable pavements will also provide an interesting textured surface to the prescribed area of hardstanding and will break up the use of tarmac.

Standard 6 – Biodiversity - Ü

- 12.12 The SuDS strategy uses a swale, both of which can be planted and maintained to provide biodiversity benefits and will support BNG targets, as required.

Standard 7 – Design for construction, operation, maintenance, and structural integrity- Ü

- 12.13 By using surface-level SuDS in the drainage strategy, a system that is safe to construct and is sustainable to use and maintain, and safely integrates into the development, has been specified.
- 12.14 A clear and detailed management and maintenance plan has been produced, which specifies how the drainage system should be maintained in perpetuity.

13.0 Foul Water Drainage

- 13.1 The peak foul flow rate from the proposed development has been calculated based on Southern Water's foul sewerage modelling criteria. In summary, the calculation is based on the foul flow element, plus an allowance for misconnected surface water. While this is unlikely, it provides a precautionary approach.
- 13.2 Based on Southern Water's foul sewerage modelling criteria, the calculated design foul flow from the proposed development is 0.25 l/s.
- 13.3 The proposed connection point for the site's foul drainage is to run a foul sewer from the southern site boundary down the eastern border of the field to south (that is within the same land ownership) and connect to the public foul sewer that crosses the southern section of this field. This is shown in the asset location plan in [Appendix F](#). It is anticipated that that the foul sewer run 9801-8801 will have capacity of the site's foul flows, as is the case for drainage networks near WWTW's.
- 13.4 The ability to make this connection, along with the capacity of the existing 150m diameter foul sewer, and any required network reinforcement will be explored with Southern Water at the appropriate project juncture, along with the surface water drainage connections. However, because of the small peak flow rate proposed, and its proximity to the WWTW, it is not expected that network reinforcement will be required, or that there will be a lack of available capacity.
- 13.5 All Water and Sewerage Companies (WaSC's) have a legal obligation under Section 94 of the Water Industry Act 1991 (the Act) to provide developers with the right to connect to a public sewer regardless of capacity issues. This, in conjunction with Section 91(1) of the Act effectively means that Southern Water cannot object and the LPA cannot refuse to grant planning permission on the grounds of insufficient capacity or that no improvement works are planned for an area. The case precedent for this is a Supreme Court decision in *Barratt Homes vs Welsh Water*, in which the court held that the developer has an absolute right to connect to the existing sewer, whether or not it overloads the system. It ruled that the specific wording of the legislation allows for this right to be exercised, at no cost to the developer, apart from the normal connection charges.
- 13.6 Where local sewerage infrastructure constraints are identified, network reinforcements are delivered by the WaSC through New Infrastructure Charges on developers. For non-strategic sites, the WaSC company have a maximum of 24 months to deliver sewerage improvements from the date of the outline or full planning consent.
- 13.7 New Infrastructure Charge on developers mean that the delivery of improvements to drainage is generally linked to funding made available from approved planning permissions.
- 13.8 Therefore, if there are any existing capacity issues in the local public foul sewerage, this would be addressed by the network reinforcement process, and the proposed development would bring about an increase in the capacity and condition of the local foul sewerage so that it will have capacity for the new development's foul drainage.

14.0 Summary and Conclusion

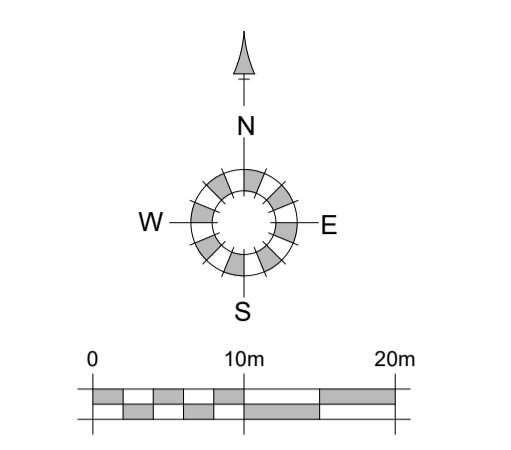
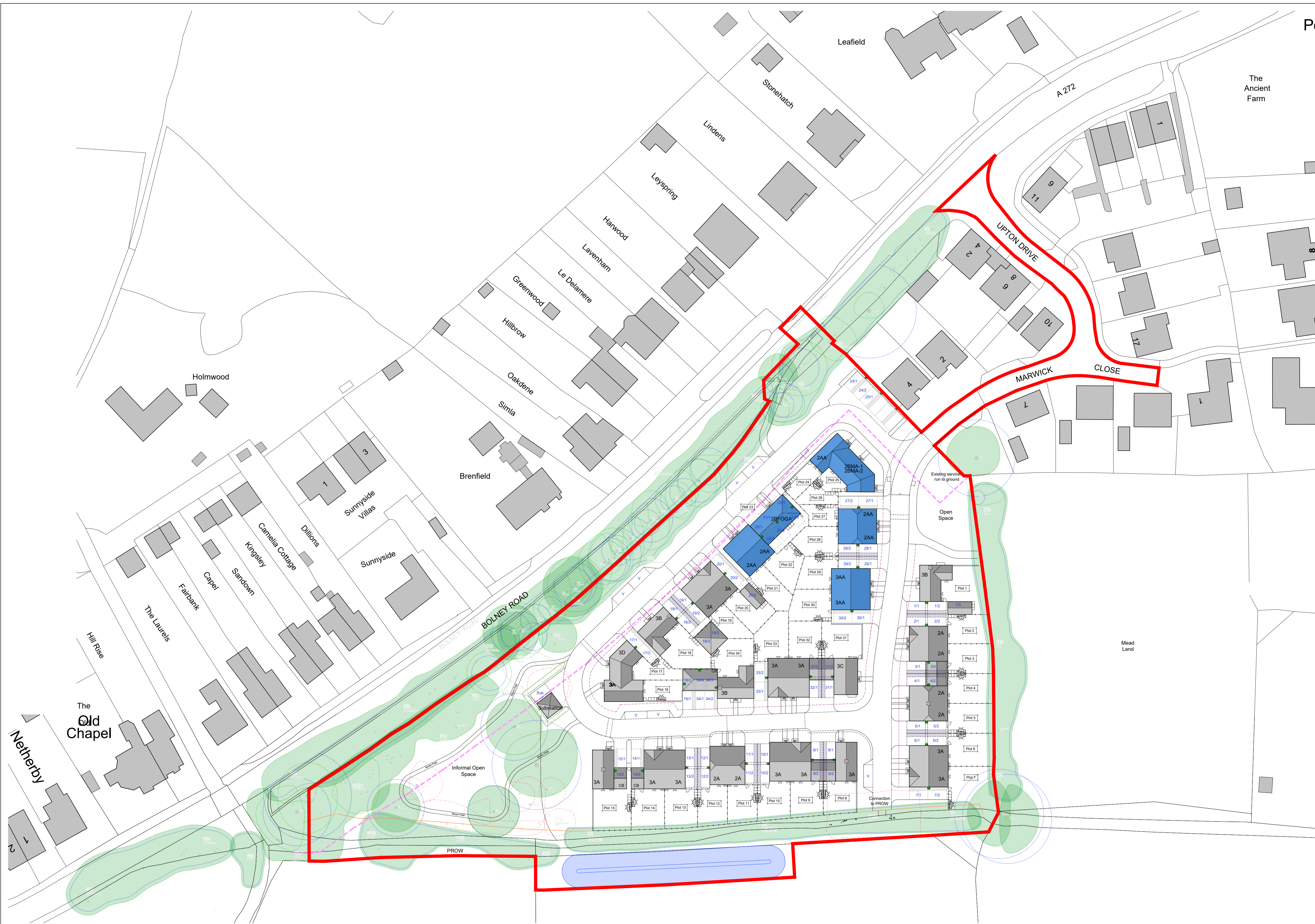
- 14.1 This FRA and Drainage Strategy has been produced by Motion on behalf of their client, Devine Homes PLC. It supports the planning application for a 34-unit residential development on the land west of Marwick Close, Bolney Road, Ansty, West Sussex.
- 14.2 The EA's Flood Map for Planning shows that the proposed development site is entirely within Flood Zone 1. Therefore, the site is at very low risk of flooding from rivers.
- 14.3 The site is in an area of Very Low surface water flood risk.
- 14.4 All other forms of flooding are low/very low risk to the site and the development.
- 14.5 Flood risk does not increase as a result of climate change.
- 14.6 With the above in mind, flood risk should not form an impediment to the progress of this development as it does not place residents at risk.
- 14.7 The drainage strategy for the proposed development has been produced in line with the NPPF, the National Standards for SuDS, and WSCC's local standards. It complies with the seven core standards, utilises the highest available tiers of the drainage hierarchy, and will use a train of SuDS features to provide attenuation, source control, pollution mitigation, visual amenity and biodiversity benefits. The site's surface water will discharge at no more than the QMED rural runoff rate, for all storms, to an ordinary watercourse (by gravity), which has ongoing connectivity. This means that the drainage also maintains the existing hydraulic regime and health of the watercourses.
- 14.8 In terms of attenuation, permeable pavements are being used where appropriate in the site. Additional attenuation will be provided through a swale and geocellular storage.
- 14.9 This drainage strategy has been hydraulically modelled in MicroDrainage's Network module and has shown that it can attenuate the 1 in 100-year + 45% rainfall event without flooding, with an inclusion for urban creep, as well as using the technical design criteria and factors of safety specified by WSCC as the LLFA.
- 14.10 The proposed drainage strategy can successfully mitigate the expected pollution hazards that will be generated on site.
- 14.11 A drainage management and maintenance plan has been produced that shows how the proposed drainage system (surface water and foul) will be maintained in perpetuity.
- 14.12 Exceedance flows have been considered and an exceedance plan produced.
- 14.13 In conclusion, this drainage strategy has shown that the proposed development is at a very low residual risk of flooding, and this makes it appropriate in this location. Similarly, the drainage strategy has shown that the development can manage its foul and surface water sustainably. Therefore, flood risk and surface water management should not form an impediment to the progress of this application.

Appendix A

Site Location Plan

Appendix B

Proposed Development Layout



Site Plan Legend
Site Area 1.62 Ha (4.00 Acres)

- Application Site Boundary Line
- Existing Trees/Hedgerow
- Proposed Trees
Indicative locations (see Landscape Architects Drawing xxx)
- Proposed Hedging
Indicative locations (see Landscape Architects Drawing xxx)
- Trees / Hedges Removed
(see Landscape Architects Information)
- 2B** Dwelling Reference
Example shown
- Plot 00 Plot Number
- 1 Allocated Parking
2.5m x 5m
- V Visitor Parking
2.5m x 5m
- 1.8m Brick Wall
- 1.8m Timber Fence
- Affordable Housing
- Drainage Easement
- Air Source Heat Pump
(indicative location)
- Electric Vehicle Charging Point
- [Garage] Covered bins and bike shed
- Rumble Strip

REV	DATE	REVISIONS:	BY	REV	DATE	REVISIONS:	BY	REV	DATE	REVISIONS:	BY	STATUS:
A	18/06/25	Minor amendments	BH	P	11/12/25	Minor amendments	BH					
B	31/07/25	Re drawn following clients sketch.	BH	R	16/12/25	Extra plot added W of plot 14, rest of plots re-numbered accordingly. Route of mown path adjusted.	BH					
C	13/08/25	Amended following clients comments.	BH				BH					
D	14/08/25	Amended following clients comments.	BH	S	18/12/25	Chimney moved from plot 13 to plot 15.	BH					
E	18/08/25	Topo survey overlaid.	BH	T	14/01/26	Red line amended, chimneys added to plots 8 & 34, car barn between plots 8 & 9 added and garage to plot 8 omitted.	BH					
F	02/09/25	Amended following clients comments.	BH	U	15/01/26	Drainage pond reduced and red line amended.	BH					
G	02/09/25	Amended following clients comments.	BH	V	19/01/26	Red line amended.	BH					
H	11/09/25	Amended following clients comments.	BH	W	20/01/26	New footpath into site amended.	BH					
J	15/09/25	Plot 23 updated.	BH				BH					
K	18/09/25	Boundary line & Plot 22 updated.	BH				BH					
L	30/09/25	Updated following clients comments.	BH				BH					
M	07/11/25	Layout amended to suit new client house types	BH				BH					
N	26/11/25	Minor S.O. amendments from HT design development	BH				BH					

Preliminary

CLIENT: Devine Homes	PROJECT: Land South of Bolney Road Ansty
SCALE: 1:500 (A1 ORIGINAL)	DRAWING: Proposed Site Layout
DRAWN: NCL	22129 SK15 W
DATE: 17/06/25	



Appendix C

Proposed Housing Mix / Schedule of Accommodation



Schedule of accommodation (SK15V)

Project Title: Land South of Bolney, Ansty

Project Ref: 22129

Client: Devine Homes

Date: 19.01.26

Rental Summary						
Reference	House Type	Area m ²	Area ft ²	No. units	Tot. Area m ²	Tot. Area ft ²
2BFOGA	2 Bedroom Flat	75.0	807	1	75.0	807
2BMA-1	2 Bed GF Maisonette	71.0	764	1	71.0	764
2BMA-2	2 Bed FF Maisonette	75.6	813	1	75.6	813
2AA	2 Bedroom House	80.3	864	5	401.3	4,320
3AA	3 Bedroom House	97.6	1,050	2	195.2	2,101
				10	818.0	8,805

Affordable = 29.4%

Private Summary						
Reference	House Type	Area m ²	Area ft ²	No. units	Total Area m ²	Total Area m ²
2A	2 Bedroom House	80.3	864	6	481.6	5,183
3A	3 Bedroom House	97.6	1,050	13	1,268.5	13,655
3B	3 Bedroom House	111.1	1,196	2	222.2	2,392
3B(B)	3 Bed House (+Bay)	112.2	1,208	1	112.2	1,208
3C	3 Bed House (WF)	101.1	1,088	1	101.1	1,088
3D	3 Bedroom House	104.9	1,129	1	104.9	1,129
				24	2,290.5	24,655

				34	3,108.5	33,459
--	--	--	--	-----------	----------------	---------------



Schedule of accommodation (SK15V)

Project Title: Land South of Bolney, Ansty

Project Ref: 22129

Client: Devine Homes

Date: 19.01.26

Plot No.	Ref.	House Type	Tenure	Area m ²	Area ft ²
1	3B(B)	3 Bed House (+Bay)	Private	112.2	1208
2	2A	2 Bedroom House	Private	80.3	864
3	2A	2 Bedroom House	Private	80.3	864
4	2A	2 Bedroom House	Private	80.3	864
5	2A	2 Bedroom House	Private	80.3	864
6	3A	3 Bedroom House	Private	97.6	1050
7	3A	3 Bedroom House	Private	97.6	1050
8	3A	3 Bedroom House	Private	97.6	1050
9	3A	3 Bedroom House	Private	97.6	1050
10	3A	3 Bedroom House	Private	97.6	1050
11	2A	2 Bedroom House	Private	80.3	864
12	2A	2 Bedroom House	Private	80.3	864
13	3A	3 Bedroom House	Private	97.6	1050
14	3A	3 Bedroom House	Private	97.6	1050
15	3A	3 Bedroom House	Private	97.6	1050
16	3A	3 Bedroom House	Private	97.6	1050
17	3D	3 Bedroom House	Private	104.9	1129
18	3B	3 Bedroom House	Private	111.1	1196
19	3A	3 Bedroom House	Private	97.6	1050
20	3A	3 Bedroom House	Private	97.6	1050
21	2AA	2 Bedroom House	Affordable	80.3	864
22	2AA	2 Bedroom House	Affordable	80.3	864
23	2BFOGA	2 Bedroom Flat	Affordable	75.0	807
24	2AA	2 Bedroom House	Affordable	80.3	864
25	2BMA-1	2 Bed GF Maisonette	Affordable	71.0	764
26	2BMA-2	2 Bed FF Maisonette	Affordable	75.6	813
27	2AA	2 Bedroom House	Affordable	80.3	864
28	2AA	2 Bedroom House	Affordable	80.3	864
29	3AA	3 Bedroom House	Affordable	97.6	1050
30	3AA	3 Bedroom House	Affordable	97.6	1050
31	3C	3 Bed House (WF)	Private	101.1	1088
32	3A	3 Bedroom House	Private	97.6	1050
33	3A	3 Bedroom House	Private	97.6	1050
34	3B	3 Bedroom House	Private	111.1	1196
Total				3,108.5	33,459

Appendix D

EA Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	528919/123096	22 January 2026 15:33

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

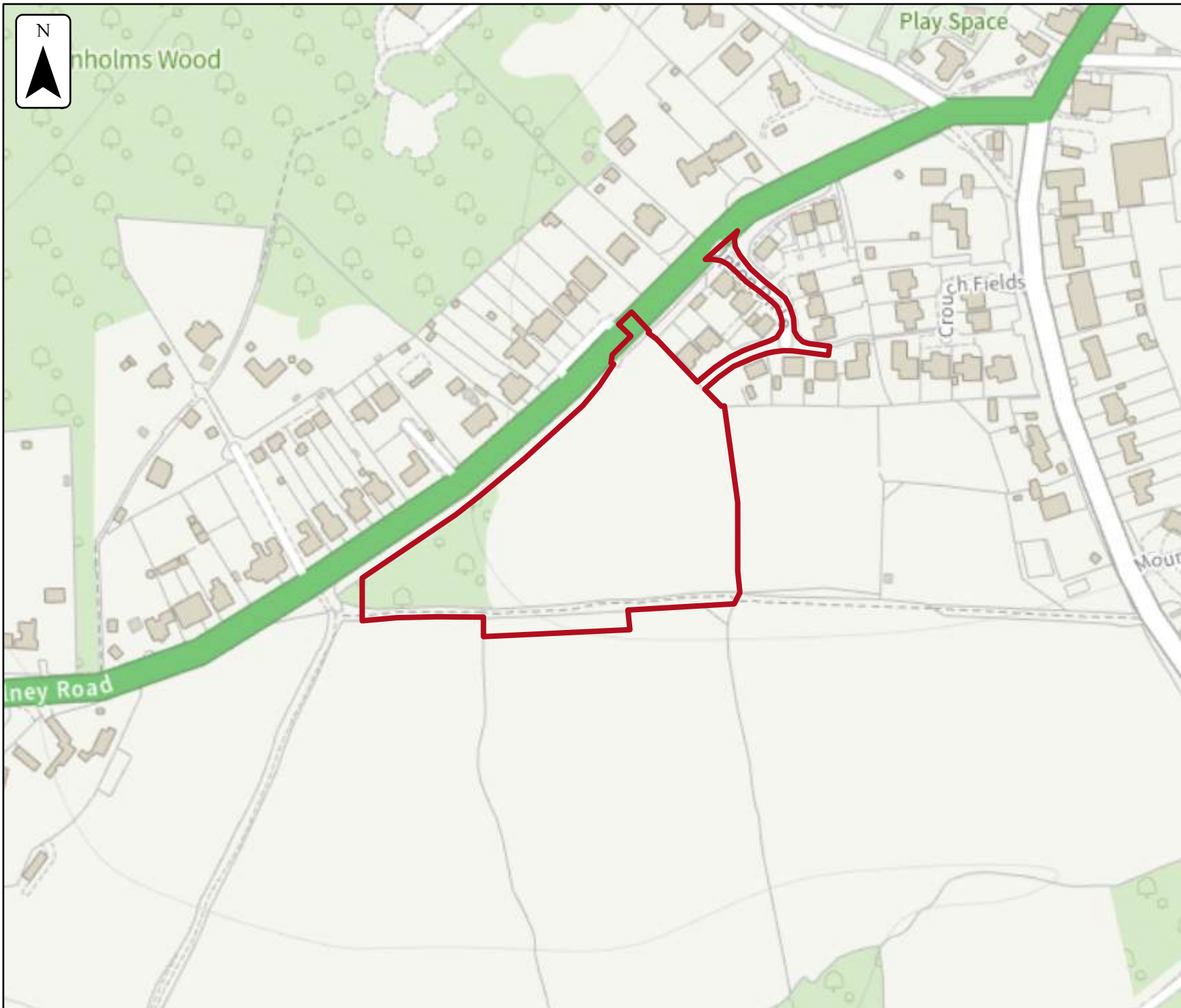
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2026 AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

Unspecified

Location (easting/northing)

528919/123096

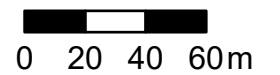
Scale

1:2,500

Created

22 Jan 2026 15:33

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area



Appendix E

Topographic Survey

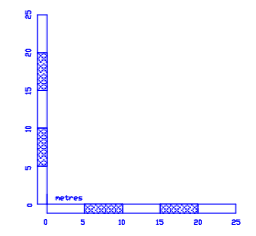
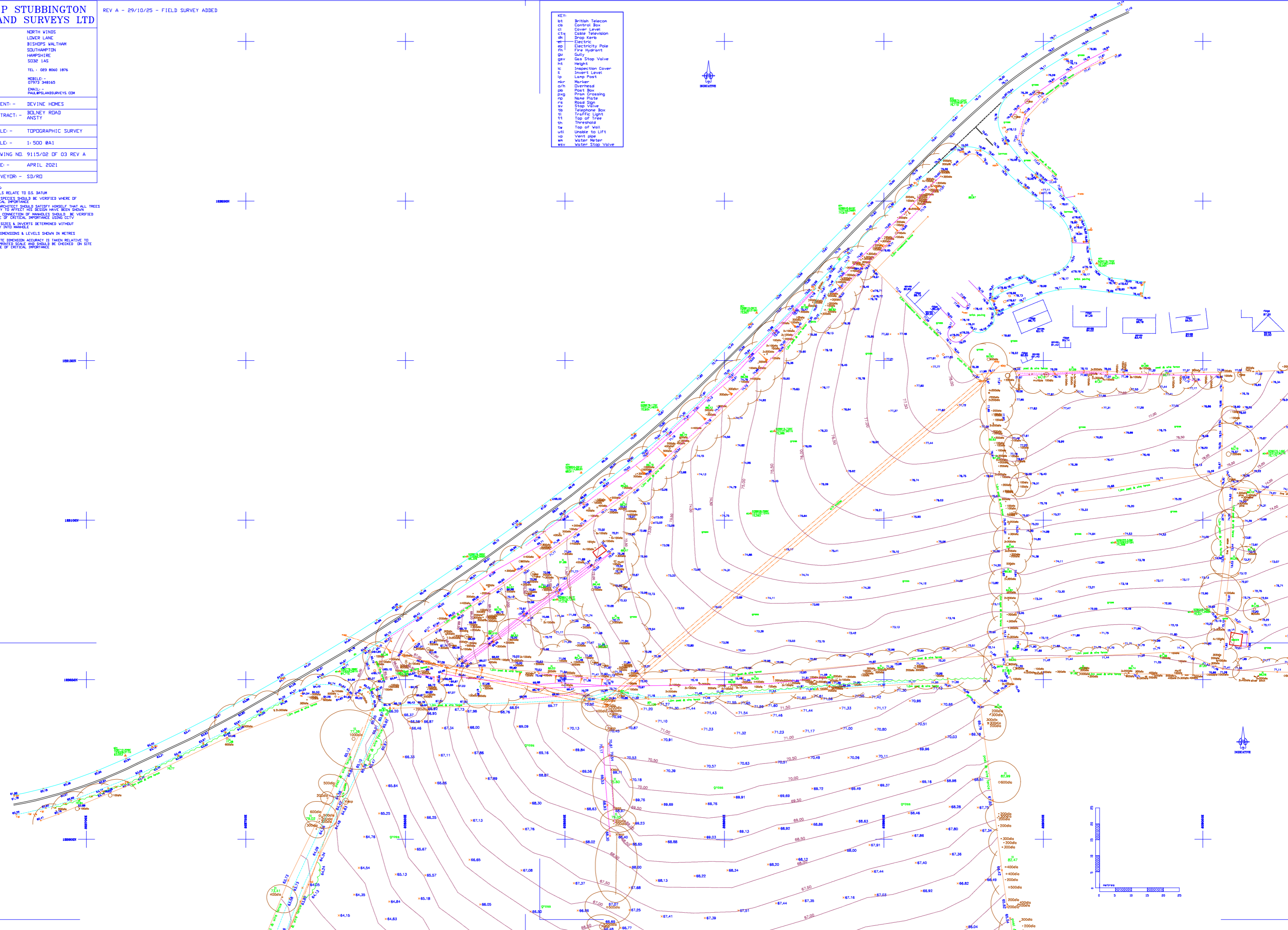
NORTH WINDS
LDNER LANE
BISHOPS WALTHAM
SOUTHAMPTON
HAMPSHIRE
SO32 1AS
TEL : 023 8060 1976
MOBILE -
07973 348165
EMAIL -
PAUL@LANDSURVEYS.COM

CLIENT - DEVINE HOMES
CONTRACT - BOLNEY ROAD
ANSTY

TITLE - TOPOGRAPHIC SURVEY
SCALE - 1:500 @A1
DRAWING NO. 9115/02 OF 03 REV A
DATE - APRIL 2021
SURVEYOR - SD/RD

NOTES
LEVELS RELATE TO O.S. DATUM
TREE SPECIES SHOULD BE VERIFIED WHERE OF
CRITICAL IMPORTANCE
THE ARCHITECT SHOULD SATISFY HIMSELF THAT ALL TREES
LIKELY TO AFFECT HIS DESIGN HAVE BEEN SHOWN
INTER CONNECTION OF MANHOLES SHOULD BE VERIFIED
WHERE OF CRITICAL IMPORTANCE USING CCTV
PIPE SIZES & INVERTS DETERMINED WITHOUT
ENTRY INTO MANHOLE
ALL DIMENSIONS & LEVELS SHOWN IN METRES
ON SITE DIMENSION ACCURACY IS TAKEN RELATIVE TO
THE PRINTED SCALE AND SHOULD BE CHECKED ON SITE
WHERE OF CRITICAL IMPORTANCE

bt	British Telecom
cb	Control Box
cl	Cover Level
ctv	Cable Television
dk	Drop Kerb
el	Electric
ep	Electricity Pole
fh	Fire Hydrant
gv	Gully
gsv	Gas Stop Valve
ht	Height
ic	Inspection Cover
il	Invert Level
lp	Lamp Post
mr	Marker
o/n	Overhead
pb	Post Box
phg	Pan Crossing
pl	Plot
rs	Road Sign
sv	Stop Valve
tb	Telephone Box
tl	Traffic Light
tt	Top of Tree
th	Threshold
tw	Top of Wall
url	Unable to Lift
vp	Vent pipe
wn	Water Meter
wsv	Water Stop Valve

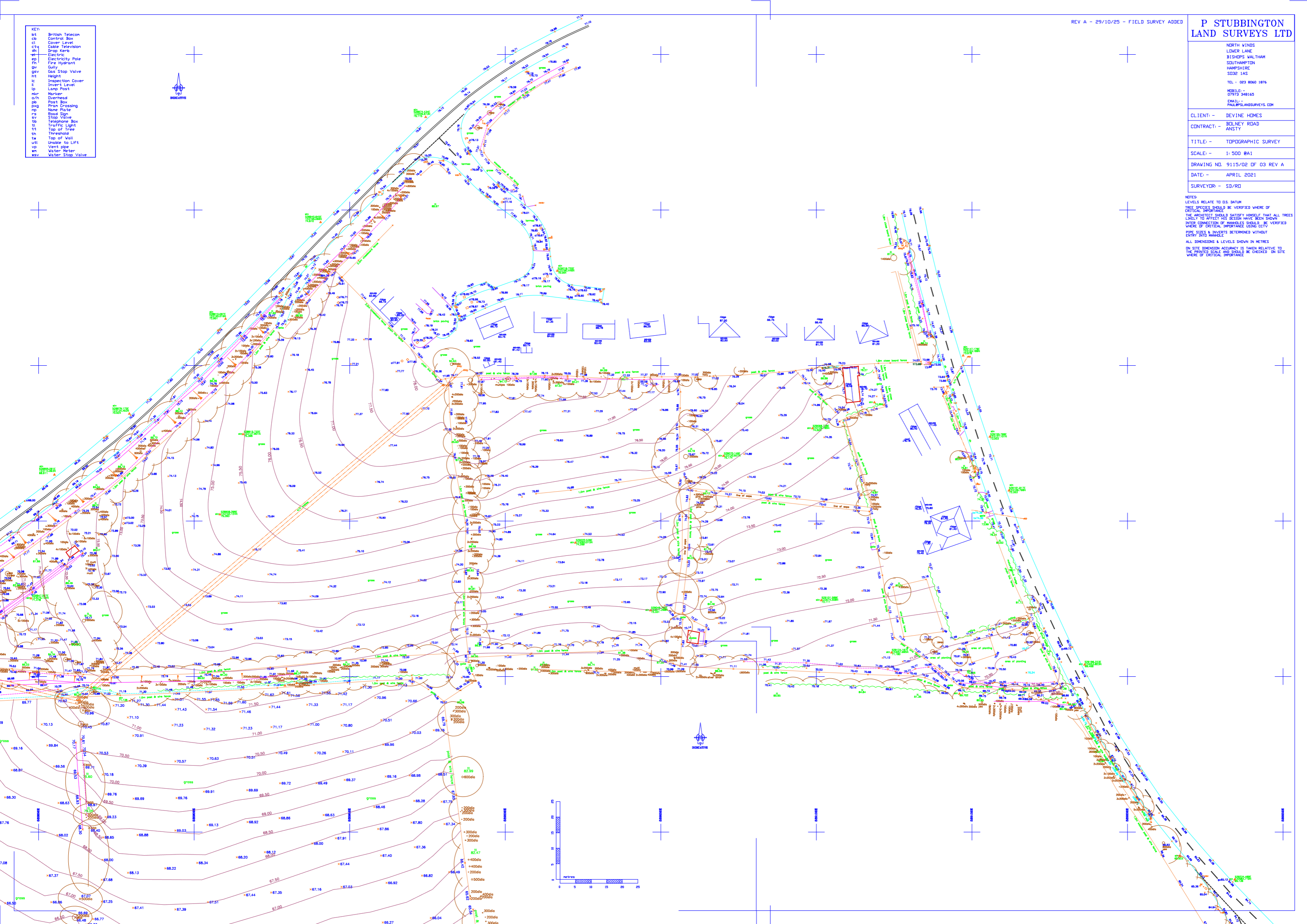


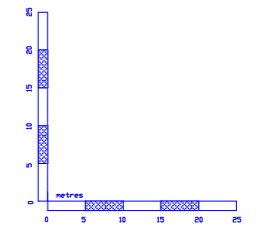
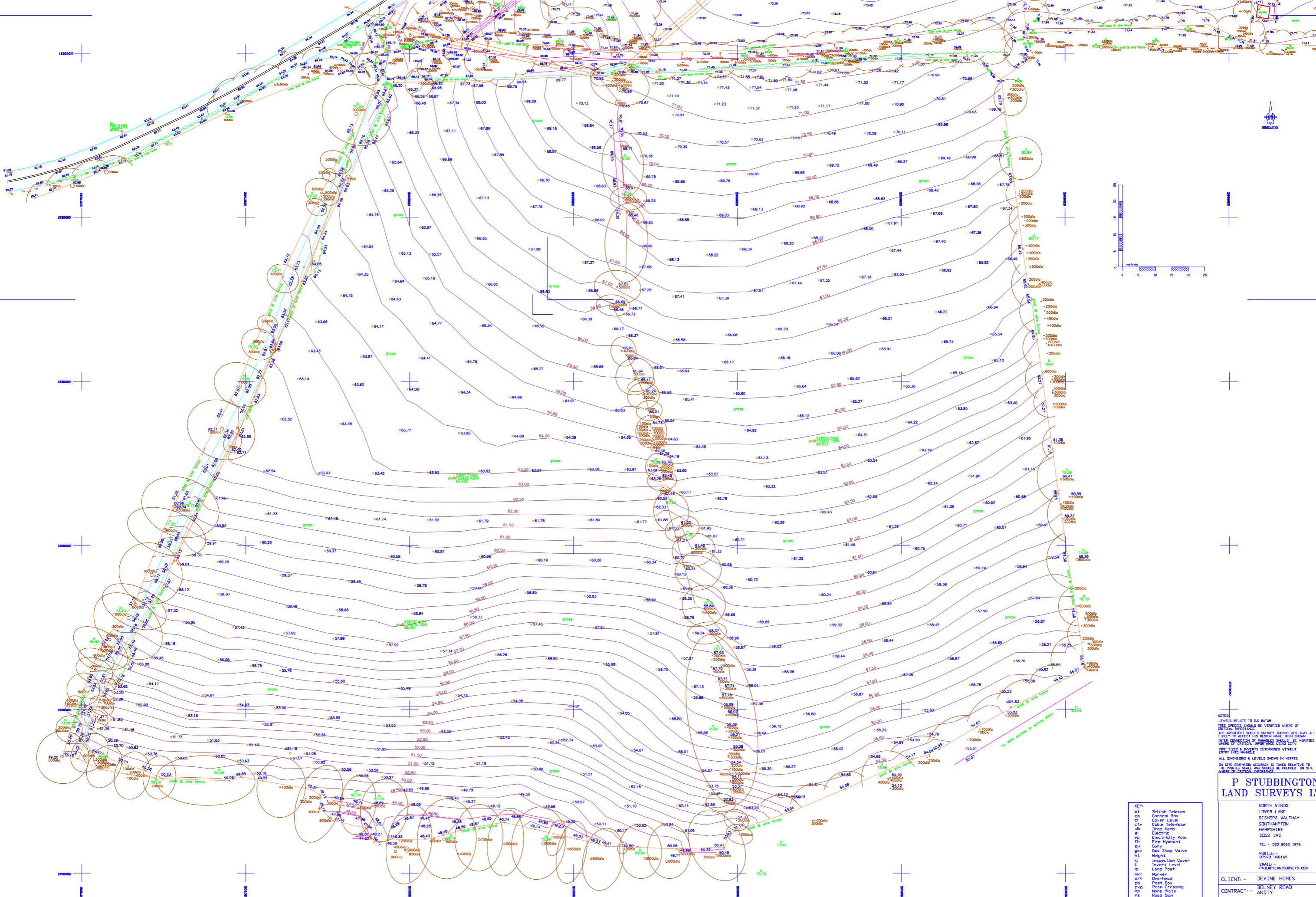
NORTH WINDS
LOWER LANE,
BISHOPS WALTHAM
SOUTHAMPTON
HAMPSHIRE
SO32 1AS
TEL : 083 8060 1876
MOBILE -
07973 348165
EMAIL -
PAUL@PLANDSURVEYS.CO.UK

CLIENT - DEVINE HOMES
CONTRACT - BOLNEY ROAD
ANSTY
TITLE - TOPOGRAPHIC SURVEY
SCALE - 1:500 @A1
DRAWING NO. 9115/02 OF 03 REV A
DATE - APRIL 2021
SURVEYOR - SD/RD

NOTES
LEVELS RELATE TO O.S. DATUM
TREE SPECIES SHOULD BE VERIFIED WHERE OF
CRITICAL IMPORTANCE
THE ARCHITECT SHOULD SATISFY HIMSELF THAT ALL TREES
LIKELY TO AFFECT HIS DESIGN HAVE BEEN SHOWN
INTER CONNECTION OF MANHOLES SHOULD BE VERIFIED
WHERE OF CRITICAL IMPORTANCE USING CCTV
PIPE SIZES & INVERTS DETERMINED WITHOUT
ENTRY INTO MANHOLE
ALL DIMENSIONS & LEVELS SHOWN IN METRES
ON SITE DIMENSION ACCURACY IS TAKEN RELATIVE TO
THE PRINTED SCALE AND SHOULD BE CHECKED ON SITE
WHERE OF CRITICAL IMPORTANCE

- KEY:
- bt British Telecom
- cb Control Box
- cl Cover Level
- ct Cable Television
- dk Drop Kerb
- el Electric
- ep Electricity Pole
- fh Fire Hydrant
- gu Gully
- gv Gas Stop Valve
- ht Height
- ic Inspection Cover
- il Invert Level
- lp Lamp Post
- l Marker
- lur Marker
- o/h Overhead
- pb Post Box
- png Pylon Crossing
- rd Road
- rs Road Sign
- sv Stop Valve
- tb Telephone Box
- tl Traffic Light
- tt Top of Tree
- th Threshold
- tv Top of Wall
- ut Unable to Lift
- vp Vent Pipe
- wn Water Meter
- wsv Water Stop Valve





NOTES:
 LEVELS RELATE TO OS DATUM
 TREE SPECIES SHOULD BE VERIFIED WHERE OF CRITICAL IMPORTANCE
 THE ARCHITECT SHOULD SATISFY THEMSELVES THAT ALL TREES LIKELY TO AFFECT HIS DESIGN HAVE BEEN SHOWN
 INTER CONNECTION OF MANHOLES SHOULD BE VERIFIED WHERE OF CRITICAL IMPORTANCE USING CCTV
 PIPE SIZES & INVERTS DETERMINED WITHOUT ENTRY INTO MANHOLE
 ALL DIMENSIONS & LEVELS SHOWN IN METRES
 ON SITE DIMENSION ACCURACY IS TAKEN RELATIVE TO THE PRINTED SCALE AND SHOULD BE CHECKED ON SITE WHERE OF CRITICAL IMPORTANCE

**P STUBBINGTON
 LAND SURVEYS LTD**

NORTH WINDS
 LIVER LANE
 BISHOPS WALTHAM
 SOUTHAMPTON
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 SO32 1AS
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 MOBILE : 07973 348165
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bt	British Telecom
cb	Control Box
cl	Cover Level
ctv	Cable Television
dk	Drop Kerb
el	Electric
ep	Electricity Pole
fh	Fire Hydrant
gv	Gully
gsv	Gas Stop Valve
ht	Height
ic	Inspection Cover
il	Invert Level
lp	Lamp Post
mr	Marker
o/h	Overhead
pb	Post Box
png	Piran Crossing
rs	Road Sign
sv	Stop Valve
tb	Telephone Box
tl	Traffic Lights
th	Threshold
tw	Top of Wall
ult	Unable to Lift
vp	Vent pipe
wm	Water Meter
wsv	Water Stop Valve

CLIENT - DEVINE HOMES
 CONTRACT - BULNEY ROAD ANSTY

TITLE - TOPOGRAPHIC SURVEY

SCALE - 1:500 @A1
 DRAWING NO. 9115/03 OF 03 REV A
 DATE - OCTOBER 2025

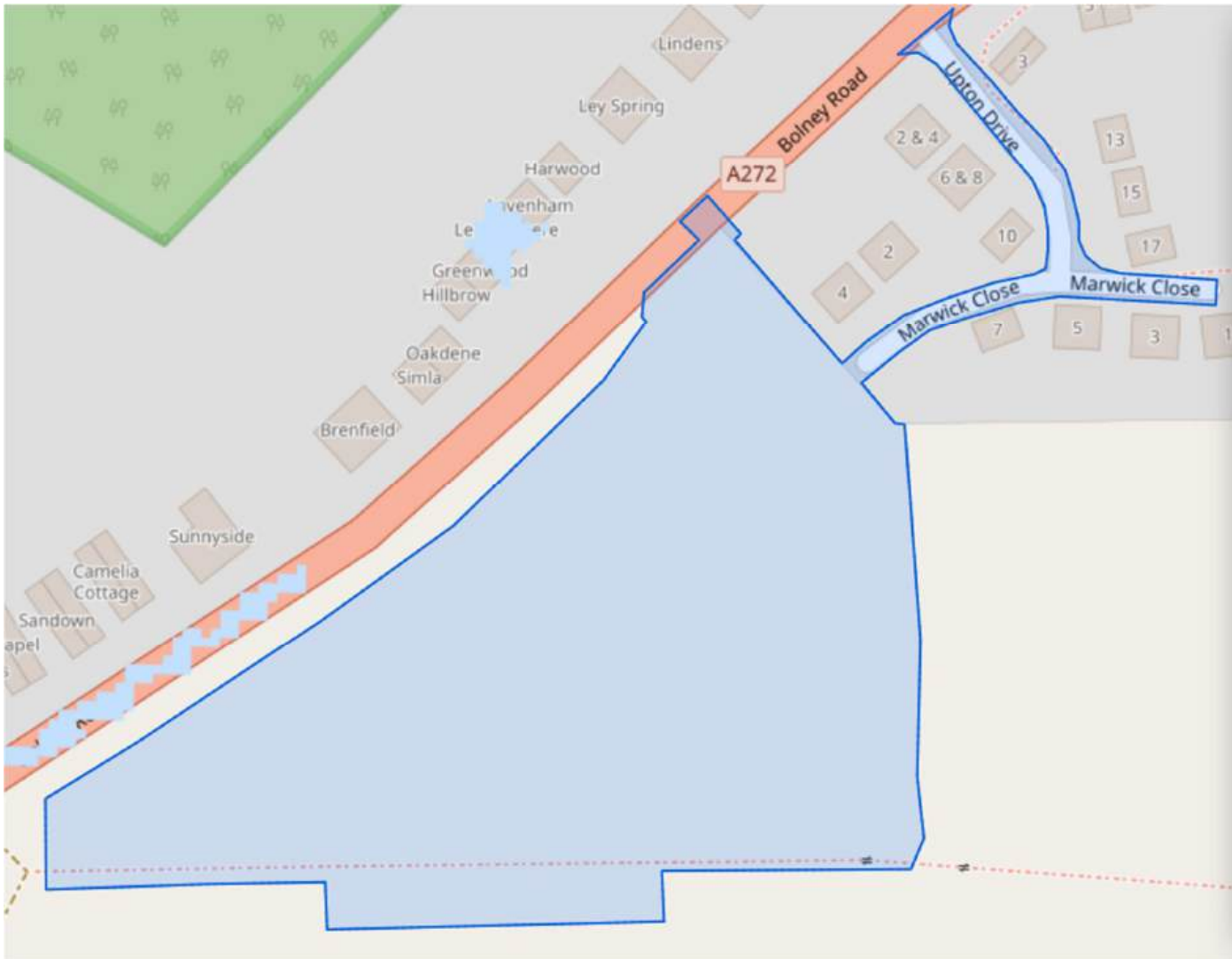
SURVEYOR - SD

Appendix F

Southern Water Asset Location Plan

Appendix G

EA Risk of Flooding from Surface Water Maps + Climate Change



Risk of Flooding from Surface Water - Climate Change 1

Environment Agency

All Layers

rofsw_cc01

- High
- Medium
- Low
- Unavailable

rofsw_cc01_0_2m_depth

rofsw_cc01_0_3m_depth

rofsw_cc01_0_6m_depth

rofsw_cc01_0_9m_depth

rofsw_cc01_1_2m_depth

Appendix H

QMED Runoff Calculation / Outputs

84 North Street
Guildford
Surrey GU1 4AU



Date 15/01/2026 09:32
File

Designed by commonuser
Checked by

Innovyze Source Control 2020.1.3

FEH Mean Annual Flood

Input

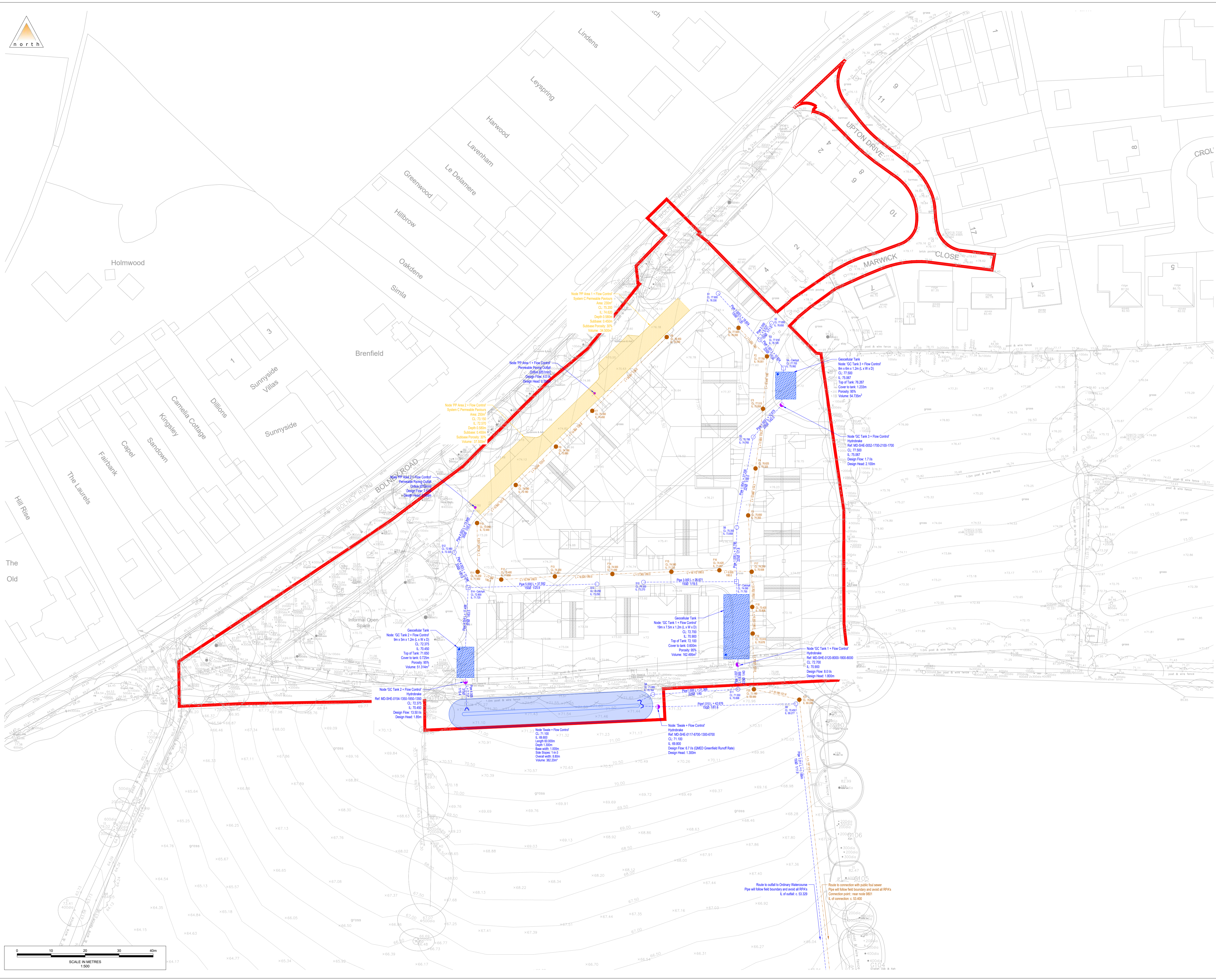
QMED Method	2008	SAAR (mm)	814	BFIHOST	0.414
Site Location	GB 528400 123250 TQ 28400 23250	URBEXT (1990)	0.0343	FARL	1.000
Area (ha)	0.649	SPRHOST	44.300		

Results

QMED Rural (l/s) 6.7 QMED Urban (l/s) 7.0

Appendix I

Drainage Strategy Plan



- Notes**
- This Drainage Strategy Plan is for planning purposes and does not constitute detailed designs and should not be used for construction purposes.
 - All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
 - This drawing has been based upon survey supplied information and Motion cannot guarantee the accuracy of the data provided.
 - The drainage levels are based on existing levels, but also proposed levels where existing site features present unusual changes in gradient.
 - Any discrepancies should be reported to the engineer immediately, so that clarification can be sought prior to the commencement of works.
 - This drawing should be read in conjunction with all other relevant engineering details, drawings and specification.
 - 350mm minimum cover is to be provided for private pipes laid in soft/paved areas, with 900mm minimum cover to be provided for private pipes laid beneath roads / driveways unless not practicable. Where unachievable, shallow pipe drains may require protection using concrete surround or paving slabs bridging the trench, subject to the NINIC Inspector's requirements.
 - Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames.
 - All foul sewage to have levels confirmed once detailed design commences and slab/FLLs are finalised.

- Legend**
- Site Boundary
 - Permeable Paviments
 - Geocellular Attenuation Tank
 - Surface Water Gravity Pipe
 - Surface Water Manhole
 - Foul Gravity Pipe
 - Foul Water Manhole
 - Orifice Flow Control
 - Hydrobrake Flow Control
 - Catchpit Manhole (1200mm)
 - Proposed Headwall
 - Geocellular Tank Vent
 - Existing FFW Sewer
 - Existing Public FFW Sewer

Rev.	Description	Drn	Chk	App	Date
P05	Fourth Issue	PA	PA	PA	05.02.2026
P04	Third Issue	PA	PA	PA	22.01.2026
P03	Second Issue	PA	PA	PA	15.01.2026
P02	First Issue	PA	PA	PA	13.01.2026
P01	Draft Issue - For Discussion	PA	PA	PA	12.01.2026

Drawing Status: **FOR PLANNING NOT FOR CONSTRUCTION**



Client: **Devine Homes PLC**

Project: **Land West of Marwick Close, Ansty**

Title: **Drainage Strategy Layout**

Scale: 1:500 (@ A1)
 Drawing: **2509009-0500**
 Revision: **P05**



- Notes**
1. This Drainage Strategy Plan is for planning purposes and does not constitute detailed designs and should not be used for construction purposes.
 2. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
 3. This drawing has been based upon survey supplied information and Motion cannot guarantee the accuracy of the data provided.
 4. The drainage levels are based on existing levels, but also proposed levels where existing site features present unusual changes in gradient.
 5. Any discrepancies should be reported to the engineer immediately, so that clarification can be sought prior to the commencement of works.
 6. This drawing should be read in conjunction with all other relevant engineering details, drawings and specifications.
 7. 350mm minimum cover is to be provided for private pipes laid in soft/paved areas, with 900mm minimum cover to be provided for private pipes laid beneath roads / driveways unless not practicable. Where unachievable, shallow pipe drains may require protection using concrete surround or paving slabs bridging the trench, subject to the NIRC Inspector's requirements.
 8. Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames.
 9. All foul sewage to have levels confirmed once detailed design commences and slab/FFLs are finalised.

- Legend**
- Site Boundary
 - Permeable Paviments
 - Geocellular Attenuation Tank
 - Surface Water Gravity Pipe
 - Surface Water Manhole
 - Foul Gravity Pipe
 - Foul Water Manhole
 - Orifice Flow Control
 - Hydrobrake Flow Control
 - Catchpit Manhole (1200mm)
 - Proposed Headwall
 - Geocellular Tank Vent
 - Existing FW Manhole
 - Existing Public FW Sewer

FOR PLANNING
NOT FOR CONSTRUCTION



Client: Devine Homes PLC

Project: Land West of Marwick Close, Ansty

Title: Drainage Strategy Layout

Scale: 1:500 (@ A1)


Drawing: 2509009-0501

Revision: P01

0 10 20 30 40m
SCALE IN METRES
1:500

Appendix J

MicroDrainage Network Hydraulic Model Outputs

Motion		Page 1
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32	Designed by commonuser	
File 1dhan2-MD-NW-22.01.2026.MDX	Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 528400 123250 TQ 28400 23250
Data Type	Catchment
Maximum Rainfall (mm/hr)	550
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	0.900
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm



Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.243	4-8	0.334	8-12	0.030	12-16	0.030	16-20	0.012

Total Area Contributing (ha) = 0.649

Total Pipe Volume (m³) = 20.134

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	18.604	0.155	120.0	0.016	15.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	5.527	0.475	11.6	0.004	15.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	94.92	15.34	76.330	0.016	0.0	0.0	0.0	0.92	16.2	5.5
2.000	95.90	15.03	76.650	0.004	0.0	0.0	0.0	2.97	52.5	1.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.001	10.824	0.108	100.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	🟢
1.002	1.144#	0.011	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🟢
1.003	12.675#	0.302	42.0	0.033	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
1.004	27.200	0.907	30.0	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
1.005	15.795	2.034	7.8	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
3.000	26.671	1.370	19.5	0.046	15.00	0.0	0.600	o	150	Pipe/Conduit	🔴
1.006	3.757#	0.038	100.0	0.078	0.00	0.0	0.600	o	300	Pipe/Conduit	🔴
1.007	8.099	0.202	40.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
1.008	21.366	0.534	40.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
1.009	5.252	0.214	24.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
4.000	1.957	0.019	104.9	0.003	15.00	0.0	0.600	o	150	Pipe/Conduit	🟡
4.001	2.000#	2.050	1.0	0.066	0.00	0.0	0.600	o	225	Pipe/Conduit	🔴
4.002	13.895	0.250	55.6	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	🔴
4.003	12.286	0.150	81.9	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	🟢
5.000	37.592	1.450	25.9	0.045	15.00	0.0	0.600	o	150	Pipe/Conduit	🟡
4.004	17.456#	0.275	63.5	0.062	0.00	0.0	0.600	o	375	Pipe/Conduit	🟡
4.005	56.583	0.500	113.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🟡
1.010	42.676#	0.523	81.6	0.051	0.00	0.0	0.600	o	150	Pipe/Conduit	🔴
1.011	189.000#	15.948	11.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔴

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	94.48	15.48	76.100	0.055	0.0	0.0	0.0	1.31	52.0	18.6
1.002	94.43	15.49	75.992	0.055	0.0	0.0	0.0	1.31	52.0	18.6
1.003	94.11	15.60	75.067	0.088	0.0	0.0	0.0	2.03	80.5	29.8
1.004	93.52	15.78	74.765	0.112	0.0	0.0	0.0	2.40	95.3	37.7
1.005	93.35	15.84	73.858	0.176	0.0	0.0	0.0	4.73	187.9	59.2
3.000	95.38	15.19	73.270	0.046	0.0	0.0	0.0	2.29	40.5	15.8
1.006	93.23	15.88	71.750	0.300	0.0	0.0	0.0	1.57	111.1	100.9
1.007	93.03	15.95	70.900	0.335	0.0	0.0	0.0	2.07	82.5	112.4
1.008	92.51	16.12	70.698	0.335	0.0	0.0	0.0	2.07	82.5	112.4
1.009	92.41	16.15	70.164	0.335	0.0	0.0	0.0	2.65	105.4	112.4
4.000	95.89	15.03	74.639	0.003	0.0	0.0	0.0	0.98	17.3	1.0
4.001	95.89	15.04	74.620	0.069	0.0	0.0	0.0	13.35	531.0	23.8
4.002	95.53	15.15	72.570	0.136	0.0	0.0	0.0	2.11	149.4	46.8
4.003	95.16	15.26	72.320	0.157	0.0	0.0	0.0	1.74	122.9	53.9
5.000	94.99	15.32	73.250	0.045	0.0	0.0	0.0	1.99	35.1	15.4
4.004	94.58	15.44	71.725	0.264	0.0	0.0	0.0	2.28	251.5	90.1
4.005	92.87	16.00	70.450	0.264	0.0	0.0	0.0	1.70	188.0	90.1
1.010	90.54	16.79	69.800	0.649	0.0	0.0	0.0	1.11	19.7	212.2
1.011	87.59	17.86	69.277	0.649	0.0	0.0	0.0	2.94	52.0	212.2

















Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
	1	77.600	1.270	Open Manhole	1200	1.000	76.330	150			
	2	77.850	1.200	Open Manhole	1200	2.000	76.650	150			
	3	77.910	1.810	Open Manhole	1200	1.001	76.100	225	1.000	76.175	150
									2.000	76.175	150
	4 - Catchpit	77.705	1.713	Open Manhole	1200	1.002	75.992	225	1.001	75.992	225
	GC Tank 3 + Flow Control	77.500	2.433	Open Manhole	1200	1.003	75.067	225	1.002	75.980	225
		75.788	1.023	Open Manhole	1200	1.004	74.765	225	1.003	74.765	225
		75.350	1.492	Open Manhole	1200	1.005	73.858	225	1.004	73.858	225
		74.320	1.050	Open Manhole	1200	3.000	73.270	150			
	7 - Catchpit	74.090	2.340	Open Manhole	1200	1.006	71.750	300	1.005	71.824	225
									3.000	71.900	150
	GC Tank 1 + Flow Control	72.700	1.800	Open Manhole	1200	1.007	70.900	225	1.006	71.712	300
		71.550	0.852	Open Manhole	1200	1.008	70.698	225	1.007	70.698	225
		71.900	1.736	Open Manhole	1200	1.009	70.164	225	1.008	70.164	225
		75.300	0.661	Junction		4.000	74.639	150			
	PP Area 1 + Flow Control	75.200	0.580	Open Manhole	1200	4.001	74.620	225	4.000	74.620	150
	PP Area 2 + Flow Control	73.150	0.580	Open Manhole	1200	4.002	72.570	300	4.001	72.570	225
		72.900	0.580	Open Manhole	1200	4.003	72.320	300	4.002	72.320	300
		74.250	1.000	Open Manhole	1200	5.000	73.250	150			
	14 - Catchpit	72.800	1.075	Open Manhole	1350	4.004	71.725	375	4.003	72.170	300
									5.000	71.800	150
	GC Tank 2 + Flow Control	72.375	1.925	Open Manhole	1350	4.005	70.450	375	4.004	71.450	375
	Swale + Flow Control	71.100	1.300	Open Manhole	1350	1.010	69.800	150	1.009	69.950	225
									4.005	69.950	375
		70.450	1.173	Open Manhole	1200	1.011	69.277	150	1.010	69.277	150
	Ordinary Watercourse Outfall	54.329	1.000	Open Manhole	0		OUTFALL		1.011	53.329	150

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
	1	528949.862	123161.506	528949.862	123161.506	Required
	2	528967.005	123152.476	528967.005	123152.476	Required
	3	528963.165	123148.500	528963.165	123148.500	Required
	4 - Catchpit	528968.939	123139.167	528968.939	123139.167	Required
	GC Tank 3 + Flow Control	528969.209	123132.209	528969.209	123132.209	Required
	5	528961.657	123120.558	528961.657	123120.558	Required



Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
6	528956.216	123093.907	528956.216	123093.907	Required	
10	528928.773	123078.434	528928.773	123078.434	Required	
7 - Catchpit	528955.442	123078.131	528955.442	123078.131	Required	
GC Tank 1 + Flow Control	528957.629	123054.208	528957.629	123054.208	Required	
11	528957.831	123046.112	528957.831	123046.112	Required	
8	528936.506	123044.796	528936.506	123044.796	Required	
11	528913.186	123133.922			No Entry	
PP Area 1 + Flow Control	528912.358	123132.148	528912.358	123132.148	Required	
PP Area 2 + Flow Control	528878.157	123101.294	528878.157	123101.294	Required	
12	528873.102	123088.352	528873.102	123088.352	Required	
13	528914.611	123077.944	528914.611	123077.944	Required	
14 - Catchpit	528877.040	123076.714	528877.040	123076.714	Required	
GC Tank 2 + Flow Control	528877.110	123049.939	528877.110	123049.939	Required	
Swale + Flow Control	528932.968	123040.913	528932.968	123040.913	Required	
9	528934.193	123034.547	528934.193	123034.547	Required	
Ordinary Watercourse Outfall	528979.910	123024.856			No Entry	

PIPELINE SCHEDULES for Storm


Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150		1 77.600	76.330	1.120	Open Manhole	1200
2.000	o	150		2 77.850	76.650	1.050	Open Manhole	1200
1.001	o	225		3 77.910	76.100	1.585	Open Manhole	1200
1.002	o	225	4 - Catchpit	77.705	75.992	1.488	Open Manhole	1200
1.003	o	225	GC Tank 3 + Flow Control	77.500	75.067	2.208	Open Manhole	1200
1.004	o	225		5 75.788	74.765	0.798	Open Manhole	1200
1.005	o	225		6 75.350	73.858	1.267	Open Manhole	1200
3.000	o	150		10 74.320	73.270	0.900	Open Manhole	1200
1.006	o	300	7 - Catchpit	74.090	71.750	2.040	Open Manhole	1200
1.007	o	225	GC Tank 1 + Flow Control	72.700	70.900	1.575	Open Manhole	1200
1.008	o	225		11 71.550	70.698	0.627	Open Manhole	1200
1.009	o	225		8 71.900	70.164	1.511	Open Manhole	1200
4.000	o	150		11 75.300	74.639	0.511	Junction	
4.001	o	225	PP Area 1 + Flow Control	75.200	74.620	0.355	Open Manhole	1200
4.002	o	300	PP Area 2 + Flow Control	73.150	72.570	0.280	Open Manhole	1200
4.003	o	300		12 72.900	72.320	0.280	Open Manhole	1200
5.000	o	150		13 74.250	73.250	0.850	Open Manhole	1200
4.004	o	375	14 - Catchpit	72.800	71.725	0.700	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	18.604	120.0		3 77.910	76.175	1.585	Open Manhole	1200
2.000	5.527	11.6		3 77.910	76.175	1.585	Open Manhole	1200
1.001	10.824	100.0	4 - Catchpit	77.705	75.992	1.488	Open Manhole	1200
1.002	1.144#	100.0	GC Tank 3 + Flow Control	77.500	75.980	1.295	Open Manhole	1200
1.003	12.675#	42.0		5 75.788	74.765	0.798	Open Manhole	1200
1.004	27.200	30.0		6 75.350	73.858	1.267	Open Manhole	1200
1.005	15.795	7.8	7 - Catchpit	74.090	71.824	2.041	Open Manhole	1200
3.000	26.671	19.5	7 - Catchpit	74.090	71.900	2.040	Open Manhole	1200
1.006	3.757#	100.0	GC Tank 1 + Flow Control	72.700	71.712	0.688	Open Manhole	1200
1.007	8.099	40.0		11 71.550	70.698	0.627	Open Manhole	1200
1.008	21.366	40.0		8 71.900	70.164	1.511	Open Manhole	1200
1.009	5.252	24.5	Swale + Flow Control	71.100	69.950	0.925	Open Manhole	1350
4.000	1.957	104.9	PP Area 1 + Flow Control	75.200	74.620	0.430	Open Manhole	1200
4.001	2.000#	1.0	PP Area 2 + Flow Control	73.150	72.570	0.355	Open Manhole	1200
4.002	13.895	55.6		12 72.900	72.320	0.280	Open Manhole	1200
4.003	12.286	81.9	14 - Catchpit	72.800	72.170	0.330	Open Manhole	1350
5.000	37.592	25.9	14 - Catchpit	72.800	71.800	0.850	Open Manhole	1350
4.004	17.456#	63.5	GC Tank 2 + Flow Control	72.375	71.450	0.550	Open Manhole	1350

Motion		Page 6
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.005	o	375	GC Tank 2 + Flow Control	72.375	70.450	1.550	Open Manhole	1350
1.010	o	150	Swale + Flow Control	71.100	69.800	1.150	Open Manhole	1350
1.011	o	150	9	70.450	69.277	1.023	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.005	56.583	113.2	Swale + Flow Control	71.100	69.950	0.775	Open Manhole	1350
1.010	42.676#	81.6	9	70.450	69.277	1.023	Open Manhole	1200
1.011	189.000#	11.9	Ordinary Watercourse Outfall	54.329	53.329	0.850	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.016	0.016	0.016
2.000	User	-	100	0.004	0.004	0.004
1.001	-	-	100	0.035	0.035	0.035
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.033	0.033	0.033
1.004	-	-	100	0.024	0.024	0.024
1.005	-	-	100	0.064	0.064	0.064
3.000	-	-	100	0.046	0.046	0.046
1.006	-	-	100	0.078	0.078	0.078
1.007	-	-	100	0.035	0.035	0.035
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.003	0.003	0.003
4.001	-	-	100	0.066	0.066	0.066
4.002	-	-	100	0.067	0.067	0.067
4.003	-	-	100	0.021	0.021	0.021
5.000	-	-	100	0.045	0.045	0.045
4.004	-	-	100	0.062	0.062	0.062
4.005	-	-	100	0.000	0.000	0.000
1.010	User	-	100	0.051	0.051	0.051
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.649	0.649	0.649

Free Flowing Outfall Details for Storm


Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.011	Ordinary Watercourse Outfall	54.329	53.329	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Manhole Headloss Coeff (Global)	0.500	Inlet Coefficient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m ³ /ha Storage	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	6	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	No
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 528400 123250 TQ 28400 23250	Cv (Winter)	1.000
Data Type	Catchment	Storm Duration (mins)	30

Motion		Page 8
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32	Designed by commonuser	
File 1dhan2-MD-NW-22.01.2026.MDX	Checked by	
Innovyze	Network 2020.1.3	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: GC Tank 3 + Flow Control, DS/PN: 1.003, Volume (m³): 2.7

Unit Reference	MD-SHE-0052-1700-2100-1700	Sump Available	Yes
Design Head (m)	2.100	Diameter (mm)	52
Design Flow (l/s)	1.7	Invert Level (m)	75.067
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	1.7	Kick-Flo®	0.463	0.9
Flush-Flo™	0.228	1.1	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	0.800	1.1	2.000	1.7	4.000	2.3	7.000	3.0
0.200	1.0	1.000	1.2	2.200	1.7	4.500	2.4	7.500	3.1
0.300	1.0	1.200	1.3	2.400	1.8	5.000	2.5	8.000	3.2
0.400	1.0	1.400	1.4	2.600	1.9	5.500	2.6	8.500	3.2
0.500	0.9	1.600	1.5	3.000	2.0	6.000	2.8	9.000	3.3
0.600	1.0	1.800	1.6	3.500	2.1	6.500	2.9	9.500	3.4

Hydro-Brake® Optimum Manhole: GC Tank 1 + Flow Control, DS/PN: 1.007, Volume (m³): 2.2

Unit Reference	MD-SHE-0120-8000-1800-8000	Sump Available	Yes
Design Head (m)	1.800	Diameter (mm)	120
Design Flow (l/s)	8.0	Invert Level (m)	70.900
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	8.0	Kick-Flo®	1.071	6.3
Flush-Flo™	0.523	7.9	Mean Flow over Head Range	-	7.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.2	0.800	7.6	2.000	8.4	4.000	11.7	7.000	15.2
0.200	6.8	1.000	6.8	2.200	8.8	4.500	12.3	7.500	15.7
0.300	7.5	1.200	6.6	2.400	9.2	5.000	13.0	8.000	16.2
0.400	7.8	1.400	7.1	2.600	9.5	5.500	13.6	8.500	16.7
0.500	7.9	1.600	7.6	3.000	10.2	6.000	14.1	9.000	17.2
0.600	7.9	1.800	8.0	3.500	10.9	6.500	14.7	9.500	17.6

Orifice Manhole: PP Area 1 + Flow Control, DS/PN: 4.001, Volume (m³): 0.7

Diameter (m) 0.051 Discharge Coefficient 0.600 Invert Level (m) 74.620

Orifice Manhole: PP Area 2 + Flow Control, DS/PN: 4.002, Volume (m³): 0.7

Diameter (m) 0.070 Discharge Coefficient 0.600 Invert Level (m) 72.570

Hydro-Brake® Optimum Manhole: GC Tank 2 + Flow Control, DS/PN: 4.005, Volume (m³): 4.5

Unit Reference	MD-SHE-0154-1350-1850-1350	Sump Available	Yes
Design Head (m)	1.850	Diameter (mm)	154
Design Flow (l/s)	13.5	Invert Level (m)	70.450
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.850	13.5	Kick-Flo®	1.137	10.7
Flush-Flo™	0.543	13.5	Mean Flow over Head Range	-	11.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.5	0.800	13.1	2.000	14.0	4.000	19.5	7.000	25.5
0.200	11.5	1.000	12.1	2.200	14.6	4.500	20.6	7.500	26.3
0.300	12.7	1.200	11.0	2.400	15.3	5.000	21.7	8.000	27.2
0.400	13.3	1.400	11.8	2.600	15.9	5.500	22.7	8.500	28.0
0.500	13.5	1.600	12.6	3.000	17.0	6.000	23.7	9.000	28.7
0.600	13.5	1.800	13.3	3.500	18.3	6.500	24.6	9.500	29.5


Hydro-Brake® Optimum Manhole: Swale + Flow Control, DS/PN: 1.010, Volume (m³): 8.1

Unit Reference	MD-SHE-0117-6700-1300-6700	Sump Available	Yes
Design Head (m)	1.300	Diameter (mm)	117
Design Flow (l/s)	6.7	Invert Level (m)	69.800
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	6.7	Kick-Flo®	0.809	5.4
Flush-Flo™	0.384	6.7	Mean Flow over Head Range	-	5.8


The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.1	0.600	6.4	1.600	7.4	2.600	9.3	5.000	12.6
0.200	6.2	0.800	5.5	1.800	7.8	3.000	9.9	5.500	13.2
0.300	6.6	1.000	5.9	2.000	8.2	3.500	10.7	6.000	13.8
0.400	6.7	1.200	6.4	2.200	8.6	4.000	11.3	6.500	14.3
0.500	6.6	1.400	6.9	2.400	8.9	4.500	12.0	7.000	14.8

Motion		Page 10
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

Hydro-Brake® Optimum Manhole: Swale + Flow Control, DS/PN: 1.010, Volume (m³):
8.1

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
7.500	15.3	8.000	15.8	8.500	16.3	9.000	16.7	9.500	17.2

Motion		Page 11
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32	Designed by commonuser	
File 1dhan2-MD-NW-22.01.2026.MDX	Checked by	
Innovyze	Network 2020.1.3	

Storage Structures for Storm

Cellular Storage Manhole: GC Tank 3 + Flow Control, DS/PN: 1.003

Invert Level (m) 75.067 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

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	48.0	48.0	1.200	48.0	81.6	1.201	0.0	81.6

Cellular Storage Manhole: GC Tank 1 + Flow Control, DS/PN: 1.007

Invert Level (m) 70.900 Safety Factor 1.5
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

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	142.5	142.5	1.200	142.5	206.1	1.201	0.0	206.1

Porous Car Park Manhole: PP Area 1 + Flow Control, DS/PN: 4.001

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 5.0
 Membrane Percolation (mm/hr) 1000 Length (m) 46.0
 Max Percolation (l/s) 63.9 Slope (1:X) 0.0
 Safety Factor 2.0 Depression Storage (mm) 5
 Porosity 0.30 Evaporation (mm/day) 3
 Invert Level (m) 74.620 Cap Volume Depth (m) 0.500

Porous Car Park Manhole: PP Area 2 + Flow Control, DS/PN: 4.002

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 5.0
 Membrane Percolation (mm/hr) 1000 Length (m) 50.0
 Max Percolation (l/s) 69.4 Slope (1:X) 0.0
 Safety Factor 2.0 Depression Storage (mm) 5
 Porosity 0.30 Evaporation (mm/day) 3
 Invert Level (m) 72.570 Cap Volume Depth (m) 0.500

Cellular Storage Manhole: GC Tank 2 + Flow Control, DS/PN: 4.005


Invert Level (m) 70.450 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

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	45.0	45.0	1.200	45.0	78.6	1.201	0.0	78.6

Swale Manhole: Swale + Flow Control, DS/PN: 1.010

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
 Infiltration Coefficient Side (m/hr) 0.00000 Invert Level (m) 69.800
 Safety Factor 2.0 Base Width (m) 1.0

Motion		Page 12
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32	Designed by commonuser	
File 1dhan2-MD-NW-22.01.2026.MDX	Checked by	
Innovyze	Network 2020.1.3	


Swale Manhole: Swale + Flow Control, DS/PN: 1.010

Length (m) 60.0 Cap Volume Depth (m) 0.000
 Side Slope (1:X) 3.0 Cap Infiltration Depth (m) 0.000
 Slope (1:X) 0.0 Include Swale Volume Yes

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000		1	1.436	0.329	1.765
2.000		2	1.357	0.098	1.455
1.001		3	2.047	0.430	2.477
1.002	4 - Catchpit		1.938	0.045	1.983
1.003	GC Tank 3 + Flow Control		2.752	0.504	57.991
1.004		5	1.157	1.081	2.238
1.005		6	1.687	0.628	2.315
3.000		10	1.188	0.471	1.659
1.006	7 - Catchpit		2.647	0.266	2.912
1.007	GC Tank 1 + Flow Control		2.036	0.322	162.495
1.008		11	0.964	0.850	1.813
1.009		8	1.963	0.209	2.172
4.000		11	0.000	0.035	0.035
4.001	PP Area 1 + Flow Control		0.656	0.080	34.500
4.002	PP Area 2 + Flow Control		0.656	0.982	37.500
4.003		12	0.656	0.868	1.524
5.000		13	1.131	0.664	1.795
4.004	14 - Catchpit		1.539	1.928	3.467
4.005	GC Tank 2 + Flow Control		2.755	6.249	51.314
1.010	Swale + Flow Control		1.861	0.754	382.200
1.011		9	1.327	3.340	4.667
Total			31.752	20.134	722.745
					774.630

Motion		Page 13
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	6	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details


Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 528400 123250 TQ 28400 23250	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF	Inertia Status	ON
Analysis Timestep	Fine	DVD Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760
Return Period(s) (years)	2, 10, 30, 100
Climate Change (%)	0, 40, 40, 45


PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)
1.000		1 30 minute 2 year Summer I+0%	30	77.600	76.363	-0.117	0.000	0.11	
2.000		2 30 minute 2 year Summer I+0%	30	77.850	76.656	-0.144	0.000	0.01	
1.001		3 15 minute 2 year Summer I+0%	15	77.910	76.163	-0.162	0.000	0.17	
1.002	4 - Catchpit	15 minute 2 year Summer I+0%	15	77.705	76.068	-0.149	0.000	0.25	
1.003	GC Tank 3 + Flow Control	240 minute 2 year Summer I+0%	240	77.500	75.369	0.077	0.000	0.01	
1.004		5 15 minute 2 year Summer I+0%	15	75.788	74.798	-0.192	0.000	0.05	
1.005		6 15 minute 2 year Summer I+0%	15	75.350	73.904	-0.179	0.000	0.09	
3.000		10 30 minute 2 year Summer I+0%	30	74.320	73.305	-0.115	0.000	0.12	
1.006	7 - Catchpit	15 minute 2 year Summer I+0%	15	74.090	71.906	-0.144	0.000	0.52	
1.007	GC Tank 1 + Flow Control	180 minute 2 year Summer I+0%	180	72.700	71.138	0.013	0.000	0.11	
1.008		11 180 minute 2 year Summer I+0%	180	71.550	70.744	-0.179	0.000	0.10	
1.009		8 360 minute 2 year Summer I+0%	360	71.900	70.293	-0.096	0.000	0.11	
4.000		11 240 minute 2 year Summer I+0%	240	75.300	74.746	-0.043	0.000	0.01	
4.001	PP Area 1 + Flow Control	240 minute 2 year Summer I+0%	240	75.200	74.746	-0.099	0.000	0.01	
4.002	PP Area 2 + Flow Control	240 minute 2 year Summer I+0%	240	73.150	72.701	-0.169	0.000	0.03	
4.003		12 120 minute 2 year Summer I+0%	120	72.900	72.360	-0.260	0.000	0.04	
5.000		13 30 minute 2 year Summer I+0%	30	74.250	73.286	-0.114	0.000	0.14	
4.004	14 - Catchpit	15 minute 2 year Summer I+0%	15	72.800	71.800	-0.300	0.000	0.09	
4.005	GC Tank 2 + Flow Control	120 minute 2 year Summer I+0%	120	72.375	70.620	-0.205	0.000	0.06	
1.010	Swale + Flow Control	360 minute 2 year Summer I+0%	360	71.100	70.291	0.341	0.000	0.33	
1.011		9 30 minute 2 year Summer I+0%	30	70.450	69.312	-0.115	0.000	0.12	

PN	US/MH Name	Infil. Vol (m ³)	Maximum Vol (m ³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000		1	0.031		1.6	OK
2.000		2	0.001		0.4	OK
1.001		3	0.067		7.4	OK
1.002	4 - Catchpit		0.127		7.4	OK
1.003	GC Tank 3 + Flow Control	0.000	14.129	172	1.0	SURCHARGED
1.004		5	0.040		4.6	OK
1.005		6	0.055		15.4	OK
3.000		10	0.033		4.7	OK
1.006	7 - Catchpit		0.176		32.1	OK
1.007	GC Tank 1 + Flow Control	0.000	32.473	87	7.1	SURCHARGED

Motion		Page 14
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.008		11	0.058		7.1	OK
1.009		8	0.194		7.0	OK
4.000		11	0.102		0.1	OK*
4.001	PP Area 1 + Flow Control	0.000	8.825	104	1.7	OK
4.002	PP Area 2 + Flow Control	0.000	10.003	124	3.2	OK
4.003		12	0.055		4.0	OK
5.000		13	0.036		4.6	OK
4.004	14 - Catchpit		0.100		17.6	OK
4.005	GC Tank 2 + Flow Control	0.000	7.503	52	10.7	OK
1.010	Swale + Flow Control	0.000	75.440	192	6.3	SURCHARGED
1.011		9	0.047		6.3	OK

Motion		Page 15
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32	Designed by commonuser	
File 1dhan2-MD-NW-22.01.2026.MDX	Checked by	
Innovyze	Network 2020.1.3	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 0.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 528400 123250 TQ 28400 23250 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160,
2880, 4320, 5760
Return Period(s) (years) 2, 10, 30, 100
Climate Change (%) 0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)
1.000		1 30 minute 10 year Summer I+40%	30	77.600	76.381	-0.099	0.000	0.26	
2.000		2 30 minute 10 year Summer I+40%	30	77.850	76.664	-0.136	0.000	0.02	
1.001		3 15 minute 10 year Summer I+40%	15	77.910	76.213	-0.112	0.000	0.50	
1.002	4 - Catchpit	15 minute 10 year Summer I+40%	15	77.705	76.135	-0.081	0.000	0.72	
1.003	GC Tank 3 + Flow Control	240 minute 10 year Winter I+40%	240	77.500	75.844	0.552	0.000	0.02	
1.004		5 15 minute 10 year Summer I+40%	15	75.788	74.823	-0.167	0.000	0.15	
1.005		6 15 minute 10 year Summer I+40%	15	75.350	73.939	-0.144	0.000	0.28	
3.000		10 30 minute 10 year Summer I+40%	30	74.320	73.325	-0.095	0.000	0.29	
1.006	7 - Catchpit	15 minute 10 year Summer I+40%	15	74.090	72.146	0.096	0.000	1.57	
1.007	GC Tank 1 + Flow Control	180 minute 10 year Summer I+40%	180	72.700	71.485	0.360	0.000	0.12	
1.008		11 180 minute 10 year Summer I+40%	180	71.550	70.746	-0.177	0.000	0.11	
1.009		8 600 minute 10 year Winter I+40%	600	71.900	70.717	0.328	0.000	0.12	
4.000		11 720 minute 10 year Winter I+40%	720	75.300	74.789	0.000	0.000	0.01	
4.001	PP Area 1 + Flow Control	180 minute 10 year Summer I+40%	180	75.200	74.907	0.062	0.000	0.01	
4.002	PP Area 2 + Flow Control	240 minute 10 year Summer I+40%	240	73.150	72.857	-0.013	0.000	0.04	
4.003		12 15 minute 10 year Summer I+40%	15	72.900	72.393	-0.227	0.000	0.13	
5.000		13 30 minute 10 year Summer I+40%	30	74.250	73.308	-0.092	0.000	0.32	
4.004	14 - Catchpit	15 minute 10 year Summer I+40%	15	72.800	71.855	-0.245	0.000	0.26	
4.005	GC Tank 2 + Flow Control	60 minute 10 year Summer I+40%	60	72.375	70.995	0.170	0.000	0.08	
1.010	Swale + Flow Control	600 minute 10 year Winter I+40%	600	71.100	70.714	0.764	0.000	0.33	
1.011		9 2880 minute 10 year Summer I+40%	2880	70.450	69.312	-0.115	0.000	0.12	

PN	US/MH Name	Infil. Vol (m ³)	Maximum Vol (m ³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000		1	0.052		3.9	OK
2.000		2	0.011		0.9	OK
1.001		3	0.133		21.8	OK
1.002	4 - Catchpit		0.296		21.6	OK
1.003	GC Tank 3 + Flow Control	0.000	36.295		1.1	SURCHARGED
1.004		5	0.075		13.6	OK
1.005		6	0.102		47.0	OK
3.000		10	0.056		11.2	OK
1.006	7 - Catchpit		0.556		96.4	SURCHARGED
1.007	GC Tank 1 + Flow Control	0.000	79.833	138	7.9	SURCHARGED

Motion		Page 16
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.008		11	0.060		7.9	OK
1.009		8	1.270		7.7	SURCHARGED
4.000		11	0.155		0.1	SURCHARGED*
4.001	PP Area 1 + Flow Control	0.000	20.156	114	2.8	FLOOD RISK
4.002	PP Area 2 + Flow Control	0.000	21.882	140	5.1	FLOOD RISK
4.003		12	0.107		12.6	OK
5.000		13	0.060		10.9	OK
4.004	14 - Catchpit		0.185		53.0	OK
4.005	GC Tank 2 + Flow Control	0.000	24.094	36	13.5	SURCHARGED
1.010	Swale + Flow Control	0.000	212.707	480	6.4	SURCHARGED
1.011		9	0.047		6.4	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 0.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 528400 123250 TQ 28400 23250 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760
Return Period(s) (years) 2, 10, 30, 100
Climate Change (%) 0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)
1.000		1 30 minute 30 year Summer I+40%	30	77.600	76.390	-0.090	0.000	0.34	
2.000		2 30 minute 30 year Summer I+40%	30	77.850	76.666	-0.134	0.000	0.03	
1.001		3 15 minute 30 year Summer I+40%	15	77.910	76.233	-0.092	0.000	0.65	
1.002	4 - Catchpit	15 minute 30 year Summer I+40%	15	77.705	76.166	-0.050	0.000	0.95	
1.003	GC Tank 3 + Flow Control	360 minute 30 year Winter I+40%	360	77.500	76.080	0.788	0.000	0.02	
1.004		5 15 minute 30 year Summer I+40%	15	75.788	74.833	-0.157	0.000	0.20	
1.005		6 15 minute 30 year Summer I+40%	15	75.350	73.952	-0.131	0.000	0.37	
3.000		10 30 minute 30 year Summer I+40%	30	74.320	73.334	-0.086	0.000	0.38	
1.006	7 - Catchpit	15 minute 30 year Summer I+40%	15	74.090	72.252	0.202	0.000	2.05	
1.007	GC Tank 1 + Flow Control	180 minute 30 year Summer I+40%	180	72.700	71.694	0.569	0.000	0.12	
1.008		11 720 minute 30 year Winter I+40%	720	71.550	70.889	-0.034	0.000	0.11	
1.009		8 720 minute 30 year Winter I+40%	720	71.900	70.878	0.489	0.000	0.12	
4.000		11 15 minute 30 year Summer I+40%	15	75.300	74.789	0.000	0.000	0.07	
4.001	PP Area 1 + Flow Control	180 minute 30 year Summer I+40%	180	75.200	74.994	0.149	0.000	0.02	
4.002	PP Area 2 + Flow Control	240 minute 30 year Summer I+40%	240	73.150	72.939	0.069	0.000	0.05	
4.003		12 15 minute 30 year Summer I+40%	15	72.900	72.405	-0.215	0.000	0.17	
5.000		13 30 minute 30 year Summer I+40%	30	74.250	73.318	-0.082	0.000	0.42	
4.004	14 - Catchpit	15 minute 30 year Summer I+40%	15	72.800	71.877	-0.223	0.000	0.34	
4.005	GC Tank 2 + Flow Control	60 minute 30 year Summer I+40%	60	72.375	71.308	0.483	0.000	0.08	
1.010	Swale + Flow Control	720 minute 30 year Winter I+40%	720	71.100	70.874	0.924	0.000	0.33	
1.011		9 960 minute 30 year Summer I+40%	960	70.450	69.312	-0.115	0.000	0.12	

PN	US/MH Name	Infil. Vol (m ³)	Maximum Vol (m ³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000		1	0.062		5.1	OK
2.000		2	0.013		1.2	OK
1.001		3	0.178		28.5	OK
1.002	4 - Catchpit		0.392		28.3	OK
1.003	GC Tank 3 + Flow Control	0.000	47.330		1.2	SURCHARGED
1.004		5	0.088		17.4	OK
1.005		6	0.119		61.2	OK
3.000		10	0.067		14.7	OK
1.006	7 - Catchpit		0.741		125.9	SURCHARGED
1.007	GC Tank 1 + Flow Control	0.000	108.379	165	7.9	SURCHARGED

Motion		Page 18
84 North Street Guildford Surrey GU1 4AU		
Date 22/01/2026 13:32 File 1dhan2-MD-NW-22.01.2026.MDX	Designed by commonuser Checked by	
Innovyze	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.008		11	0.317		7.9	OK
1.009		8	1.598		7.8	SURCHARGED
4.000		11	0.195		0.8	SURCHARGED*
4.001	PP Area 1 + Flow Control	0.000	26.244	123	3.2	FLOOD RISK
4.002	PP Area 2 + Flow Control	0.000	28.076	148	5.9	FLOOD RISK
4.003		12	0.126		16.9	OK
5.000		13	0.071		14.4	OK
4.004	14 - Catchpit		0.221		69.8	OK
4.005	GC Tank 2 + Flow Control	0.000	37.887	50	13.5	SURCHARGED
1.010	Swale + Flow Control	0.000	280.062	624	6.4	FLOOD RISK
1.011		9	0.047		6.4	OK

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 0.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 528400 123250 TQ 28400 23250 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
 Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160,
 2880, 4320, 5760
 Return Period(s) (years) 2, 10, 30, 100
 Climate Change (%) 0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)
1.000		1 360 minute 100 year Winter I+45%	360	77.600	77.260	0.780	0.000	0.12	
2.000		2 360 minute 100 year Winter I+45%	360	77.850	77.259	0.459	0.000	0.01	
1.001		3 360 minute 100 year Winter I+45%	360	77.910	77.259	0.934	0.000	0.14	
1.002	4 - Catchpit	360 minute 100 year Winter I+45%	360	77.705	77.257	1.041	0.000	0.21	
1.003	GC Tank 3 + Flow Control	360 minute 100 year Winter I+45%	360	77.500	77.257	1.965	0.000	0.02	
1.004		5 15 minute 100 year Summer I+45%	15	75.788	74.842	-0.148	0.000	0.25	
1.005		6 15 minute 100 year Summer I+45%	15	75.350	73.968	-0.115	0.000	0.48	
3.000		10 30 minute 100 year Summer I+45%	30	74.320	73.345	-0.075	0.000	0.50	
1.006	7 - Catchpit	15 minute 100 year Summer I+45%	15	74.090	72.432	0.382	0.000	2.67	
1.007	GC Tank 1 + Flow Control	240 minute 100 year Summer I+45%	240	72.700	72.040	0.915	0.000	0.12	
1.008		11 960 minute 100 year Winter I+45%	960	71.550	71.092	0.169	0.000	0.11	
1.009		8 960 minute 100 year Winter I+45%	960	71.900	71.082	0.693	0.000	0.12	
4.000		11 15 minute 100 year Summer I+45%	15	75.300	74.789	0.000	0.000	0.09	
4.001	PP Area 1 + Flow Control	180 minute 100 year Summer I+45%	180	75.200	75.118	0.273	0.000	0.02	
4.002	PP Area 2 + Flow Control	240 minute 100 year Summer I+45%	240	73.150	73.057	0.187	0.000	0.06	
4.003		12 15 minute 100 year Summer I+45%	15	72.900	72.417	-0.203	0.000	0.23	
5.000		13 30 minute 100 year Summer I+45%	30	74.250	73.330	-0.070	0.000	0.56	
4.004	14 - Catchpit	60 minute 100 year Summer I+45%	60	72.800	72.309	0.209	0.000	0.33	
4.005	GC Tank 2 + Flow Control	60 minute 100 year Summer I+45%	60	72.375	72.301	1.476	0.000	0.08	
1.010	Swale + Flow Control	960 minute 100 year Winter I+45%	960	71.100	71.078	1.128	0.000	0.35	
1.011		9 960 minute 100 year Winter I+45%	960	70.450	69.313	-0.114	0.000	0.13	

PN	US/MH Name	Infil. Vol (m ³)	Maximum Vol (m ³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000		1	1.047		1.8	SURCHARGED
2.000		2	0.683		0.4	SURCHARGED
1.001		3	1.689		6.3	SURCHARGED
1.002	4 - Catchpit		1.808		6.3	SURCHARGED
1.003	GC Tank 3 + Flow Control	0.000	57.210		1.7	FLOOD RISK
1.004		5	0.100		22.4	OK
1.005		6	0.142		79.6	OK
3.000		10	0.079		19.3	OK
1.006	7 - Catchpit		1.055		164.1	SURCHARGED
1.007	GC Tank 1 + Flow Control	0.000	155.713	228	7.9	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.008		11	0.710		7.9	SURCHARGED
1.009		8	1.835		7.8	SURCHARGED
4.000		11	0.268		1.0	SURCHARGED*
4.001	PP Area 1 + Flow Control	0.000	34.942	135	3.7	FLOOD RISK
4.002	PP Area 2 + Flow Control	0.000	37.055	160	6.9	FLOOD RISK
4.003		12	0.145		22.0	OK
5.000		13	0.085		18.9	OK
4.004	14 - Catchpit		1.162		67.8	SURCHARGED
4.005	GC Tank 2 + Flow Control	0.000	55.735		13.5	FLOOD RISK
1.010	Swale + Flow Control	0.000	378.916	848	6.6	FLOOD RISK
1.011		9	0.048		6.6	OK

Appendix K

Drainage Management and Maintenance Plan



Land West of Marwick Close
Bolney Road, Ansty, West Sussex

Drainage Management and Maintenance
Plan

For

Devine Homes PLC

Document Control Sheet

Land West of Marwick Close

Bolney Road, Ansty, West Sussex

Devine Homes PLC

This document has been issued and amended as follows:

Date	Issue	Prepared by	Approved by
9 th January 2026	Final	Phil Allen BSc (Hons) MCIWEM C.WEM	Neil Jaques



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Contents

1.0	Introduction	1
2.0	Maintenance Categories	2
3.0	The Drainage System Components.....	3
4.0	General Maintenance Principles	4
5.0	Inspection and Maintenance Frequency of Components.....	6
6.0	Foul Pump Station.....	Error! Bookmark not defined.

1.0 Introduction

- 1.1 This document sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the development proposed on the land west of Marwick Close, Bolney Road, Ansty.
- 1.2 The purpose of this document is to ensure that the site management company or their agents have a robust inspection and maintenance plan going forwards. This ensures the optimum operation of the surface water drainage system and that it will be continually maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.
- 1.3 All those responsible for maintenance should follow relevant health and safety legislation for all activities listed within this report (including lone working, if relevant). Method statements and risk assessments should always be undertaken and made available, if requested.
- 1.4 This document has been produced by Motion on behalf of their client, Devine Homes PLC. This document describes the typical management and maintenance tasks that are known at the design stage (maintenance frequencies and typical tasks, for example). These have been drawn from industry guidance such as CIRIA C753 - The SuDS Manual – and manufacturer’s own guidance.
- 1.5 Maintenance is considered as a construction activity under the CDM Regulations 2015. Under the CDM Regulations, it is a requirement that a competent person be appointed to carry out a required role. CDM defines a competent person as an individual with sufficient knowledge of the specific tasks to be undertaken, as well as sufficient experience and ability to carry out their duties in relation to the task in a way that secures health and safety on site.
- 1.6 In recognition of the requirements of the CDM Regulations 2015, this surface water management and maintenance plan expects that the maintenance work will be carried out by a competent person who must have prior knowledge of the drainage components and SuDS systems on site.
- 1.7 There are limitations on what this document can prescribe at this time. At this stage this document cannot name the specific individuals who will carry out the maintenance and what equipment is to be used. Related to this, this document is unable to provide method statements for exactly how maintenance practices will be carried out. These can only be determined at the time of the maintenance being carried out, the exact maintenance need and the methods of working prescribed by those carrying out the maintenance (in their RAMS, for example). Therefore, this is to be the responsibility of the site management company and/or the individuals carrying out the work. We urge those who are carrying out the maintenance to record this information and make it available to the Local Planning Authority (LPA), if required to do so. This drainage management and maintenance plan needs to be a living document that is owned and maintained by the adopting site management company.

2.0 Maintenance Categories

2.1 There are three categories of maintenance activities referred to in this report. These are:

Regular maintenance (including inspections and monitoring)

- Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including inspections, vegetation management, and litter, silt and debris removal.

Occasional maintenance

- Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).

Remedial maintenance

- Remedial maintenance comprises of intermittent tasks that may be required to rectify faults associated with the system. The likelihood of faults can be minimised by correct installation, regular inspection and timely maintenance. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events and, as such, timings are difficult to predict.
- This document should be read in conjunction with the design drawings of the drainage system, so that the location and type of each feature can be recognised and understood.

3.0 The Drainage System Components

Surface water

- 3.1 The proposed surface water drainage system is made up of a number of components. These include:
- Water Butts
 - Pipes
 - Manholes
 - Catchpit manholes/silt traps
 - Permeable Pavements
 - SuDS Basin
 - A Swale
 - Hydrobrakes
 - Orifice Plates
- 3.2 All components should be installed in accordance with the manufacturer's instructions and to the levels/arrangement as defined on the designer's drawings. Not doing so will invalidate any warranty provided by the manufacturer.
- 3.3 All maintenance and cleaning must be carried out in accordance with manufacturer's recommendations and by competent and suitably qualified staff, as defined in the CDM regulations 2015.

4.0 General Maintenance Principles

- 4.1 All surface water drainage systems, whether piped gravity systems, Sustainable Drainage Systems (SuDS), or flow control devices, require regular maintenance to keep them working at optimum efficiency and capacity. The maintenance of the surface water drainage system on the development on the land to the west of Marwick Close should be carried out alongside other regular maintenance tasks on site.
- 4.2 Timely and adequate maintenance will increase the lifespan of all the drainage components. Inadequate maintenance will do the reverse. Therefore, the projected lifespan and anticipated replacement date of each drainage component cannot be forecast at the time of this document being produced.
- 4.3 The site management company and/or their agents are responsible for the maintenance of the surface water drainage system.
- 4.4 Construction activities can create and discharge significant quantities of sediment that will quickly clog the surface water drainage system. Therefore, construction-stage sediment removal is required immediately post-construction. This may require several cleans of the system during the first year after installation. The construction site manager should assess this and carry out cleaning as necessary.
- 4.5 Catchpit manholes/silt traps will be specified upstream of the permeable paving. They will remove gross solids and the majority of silts. It is important that any debris build-up in the catchpit manholes/silt traps is removed at regular intervals. This will reduce the risk of the permeable paving becoming silted up. It will maintain its design capacity and function.
- 4.6 Cleaning should also take place after large storms when there have been increased surface water flows and visible entrainment and deposition of debris.
- 4.7 An increased frequency of inspection and maintenance should be programmed into the autumn and winter months in acknowledgement that:
 - Leaf fall from deciduous trees in autumn will result in an increased amount of leaf litter and an elevated blockage risk of drainage infrastructure.
 - Increased rainfall during winter months will result in greater quantities of water moving through the drainage system and a greater input of silt and other debris.
- 4.8 Table 4.1, on the next page, gives an overview of typical maintenance tasks and the frequency with which they need to be undertaken. Section 5 – Inspection and Maintenance Frequency of Components – will assign typical maintenance frequencies and tasks to the specific components used within the surface water drainage system on the proposed development.

Table 4.1: Typical maintenance tasks and frequencies

Activity	Indicative Frequency	Typical Tasks
Routine/regular maintenance	Monthly to annually	<ul style="list-style-type: none"> • Litter picking • Silt removal • Inspection of all inlets, outlets and control structures • Weed removal and invasive plant control
Occasional maintenance	Annually up to 25 years	<ul style="list-style-type: none"> • Silt control around components • Vegetation management around components • Sweeping of pavement areas to remove surface silt • Silt removal from catchpits, cellular storage structures
Remedial maintenance	As required	<ul style="list-style-type: none"> • Inlet/outlet repairs • Erosion repairs • Reinstatement of edgings • Reinstatement following pollution • Removal of silt build-up and leaf litter after storms • Repair of vandalism • Replacement of any blocked filter membranes/materials

5.0 Inspection and Maintenance Frequency of Components

- 5.1 Table 5.1 below lists each of the components used within the development's surface water drainage system. It suggests an indicative maintenance frequency for each component and ascribes typical maintenance tasks to them.
- 5.2 This list is not exhaustive, nor is it prescriptive. As mentioned in Section 3, additional, unscheduled maintenance may be required following adverse weather conditions or after autumn leaf falls. Additional maintenance tasks may be required to adequately clean and maintain individual components.
- 5.3 The list of components should be cross-referenced with the designer's drawings so that the location of each component can be identified.
- 5.4 It is the responsibility of the site management company and/or their agents to ensure that all necessary maintenance activities are carried out in a timely manner and that the design performance of each drainage component is preserved.
- 5.5 If there is any uncertainty regarding the correct and safe methods of cleaning, or what equipment should be used, the manufacturer should be consulted.

Table 5.1: Maintenance Frequency and Task for Drainage Components

Activity	Indicative Frequency	Anticipated Tasks
Pipes	As required	<ul style="list-style-type: none"> • Identify any pipes that may not be operating properly and employ a competent, qualified contractor to inspect using CCTV. • If the pipe is blocked with silt or debris, the pipe should be jetted clean from an upstream access point. All silt and debris should be captured and removed at a downstream access point. • Inspect once clean. • If any other defects are encountered (cracks, displaced joints, root ingress), appropriate solutions should be discussed with a competent and qualified contractor. These services are usually provided by the same companies that offer CCTV surveys and pipe jetting services.
Manholes	Annually	<ul style="list-style-type: none"> • Inspect/identify any damage or areas that are not operating correctly • Remove silt, litter, leaves and other detritus. • Inspect once clean.
Catchpit Manholes/Silt Traps	Twice a year, before and after autumn/winter	<ul style="list-style-type: none"> • Inspect/identify any damage or areas that are not operating correctly • Remove silt, litter, leaves and other detritus. • Inspect once clean.
Hydrobrake chambers	Every three months for the first year, then annually thereafter	<ul style="list-style-type: none"> • Contact manufacturer for instruction on approved and safe inspection and maintenance practices. • Inspect Hydrobrake and check functionality. • Remove any detritus as required. • Inspect once clean.

<p>Orifice Plates</p>	<p>Inspections at regular intervals (every 3 – 6 months).</p>	<ul style="list-style-type: none"> • Orifice plates have no moving parts to fail and quality units are made of stainless steel to resist scour, degradation and chemical attack. • The orifice plates in this scheme are to be downstream of the permeable pavements, so all contributing flows should be heavily filtered and free of any debris. • Debris and silt should be removed if present • Check wear on orifice to ensure no enlargement is taking place. • Any visible fixing bolts should be checked. • If there is a suspected blockage, the housing chamber can be inspected internally, the blockage cleared and the orifice returned to its working position.
<p>Water Butts</p>	<p>Annually in Autumn to Winter</p>	<ul style="list-style-type: none"> • Remove falling leaves and seeds from guttering or those that have found their way into the water butt. • Water may stagnate slightly. If so, use a water butt cleaning disc into the tank. • In autumn and winter, drain water off every 10 days (or less) to make sure that water butts don't overflow and that water is kept moving. This will stop larvae and flies from using the water butt. • Use safe products such as vinegar to clean the outside of the tank and the inside of the lid and be careful not to contaminate water with chemicals. • At least once a year, completely empty the water butt and scrub it out with warm soapy water and then rinse thoroughly. This is best done at a time when the water butt is already nearly empty (end of summer) or when it can readily refill (winter).
<p>Permeable paving</p>	<p>Once a year after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations.</p>	<ul style="list-style-type: none"> • Agitate surface by means of mechanical sweeping or vacuuming to ensure no vegetation or moss is allowed to establish and grow in the joints. • Mechanical sweeping of pavements and refilling of joints with the correct aggregate need only be carried out at intervals of 5 years or so • Remove weeds from the surface through the application of glyphosate-based weed killers • Stabilise and mow contributing and adjacent areas. • Inspect once clean. • See Table 20.15 of CIRIA C753 for more information. • Permeable paving has a nominal 25-year lifespan, if correctly and regularly maintained.

		<ul style="list-style-type: none"> • When subjected to low level oil drips permeable pavements can continue to biodegrade hydrocarbons indefinitely. • Major oil spills have the potential to contaminate the surface and the underlying crushed stone. In the event of a major oil spill, the area of block pavements and crushed stone that is affected should be removed, cleaned and reinstalled.
SuDS Basin	Monthly in Summer, as required in Winter	<ul style="list-style-type: none"> • Responsibility should be with landscape contractors. • Maintenance tasks are not that different from standard public open space. • Adequate access needs to be provided to the area. • Regular mowing should take place across maintenance access routes, amenity areas, across embankments and the main storage area. Remaining areas can remain as 'meadow'. Mowed grass lengths of 75 – 100mm are appropriate. • Grass clippings should be disposed of off-site. • Any dead growth should be cleared before the start of the growing season. • Any permanently wet areas with emergent aquatic vegetation should be managed as ponds or wetlands. • Remove any sediment build-up as required. • Check any inlets and outlets for blockages and clear as required. • Check any flow control devices, if present.
Swale	Monthly in Summer, as required in Winter	<ul style="list-style-type: none"> • Maintenance tasks for swales match those of SuDS basins, so please refer to the maintenance tasks, above.

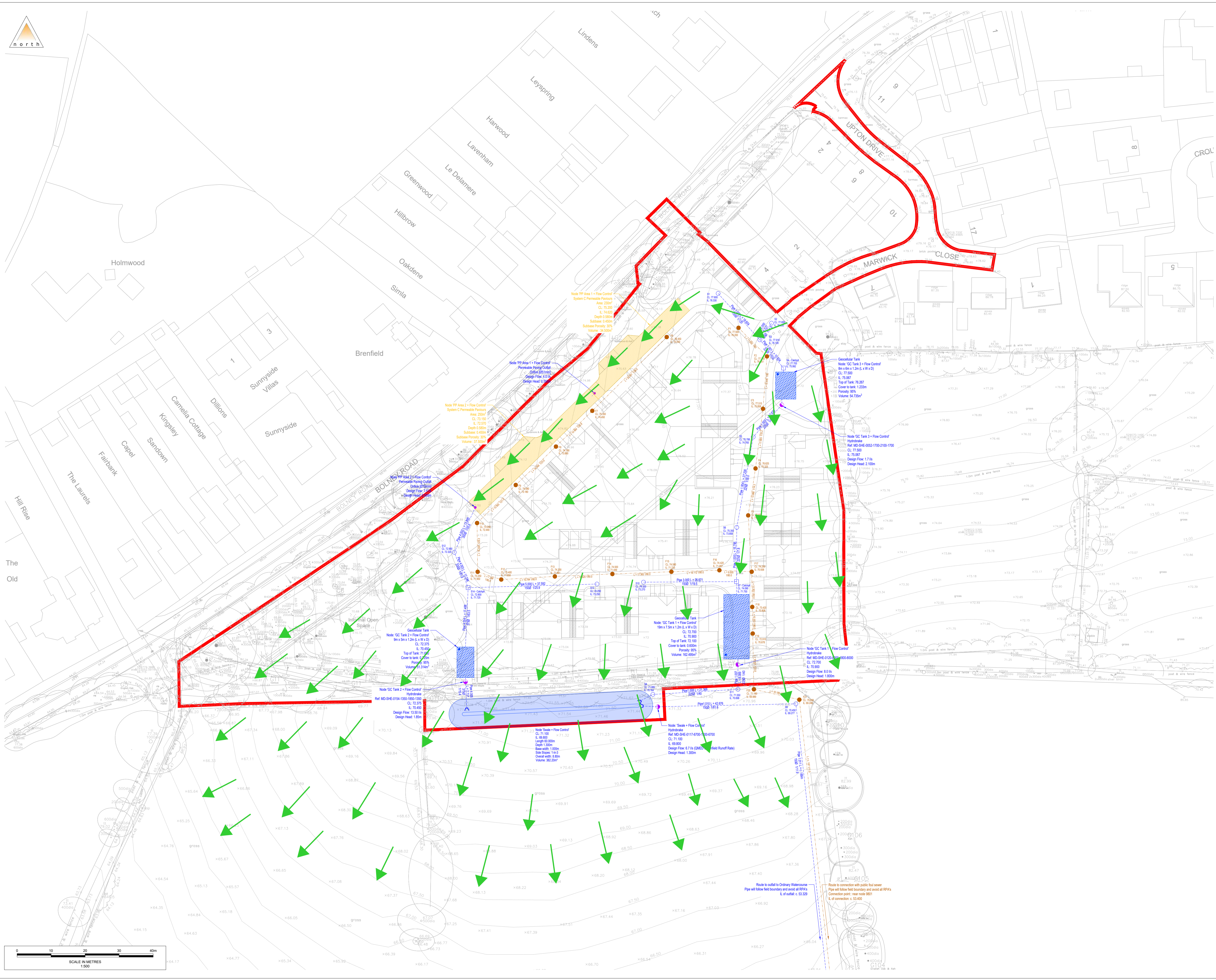
5.6 Upon completion of maintenance activities, a record should be kept of the work carried out. This should be retained, and an annual maintenance report should be compiled, which should include the following:

- Observations resulting from inspections
- Maintenance and operation activities undertaken during the year
- Recommendations for inspections and maintenance programmes for the following year

5.7 On the last page of this document is a table with suggested information that should be recorded and included with the maintenance plan. As mentioned in the introduction to this document, this should be a living document and regularly updated, as required.

Date	Component requiring maintenance	Issues prompting maintenance	Scheduled maintenance (Y/N)	Maintenance carried out	Additional works required (Y/N). If yes, please detail	Next scheduled date of inspection and maintenance

Appendix L
Exceedance Plan



- Notes**
- This Drainage Strategy Plan is for planning purposes and does not constitute detailed designs and should not be used for construction purposes.
 - All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
 - This drawing has been based upon survey supplied information and Motion cannot guarantee the accuracy of the data provided.
 - The drainage levels are based on existing levels, but also proposed levels where existing site features present unusual changes in gradient.
 - Any discrepancies should be reported to the engineer immediately, so that clarification can be sought prior to the commencement of works.
 - This drawing should be read in conjunction with all other relevant engineering details, drawings and specification.
 - 350mm minimum cover is to be provided for private pipes laid in soft/paved areas, with 900mm minimum cover to be provided for private pipes laid beneath roads / driveways unless not practicable. Where unachievable, shallow pipe drains may require protection using concrete surround or paving slabs bridging the trench, subject to the NIRC Inspector's requirements.
 - Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames.
 - All foul sewage to have levels confirmed once detailed design commences and slab/FLLs are finalised.

- Legend**
- Site Boundary
 - Permeable Paviments
 - Geocellular Attenuation Tank
 - Surface Water Gravity Pipe
 - Surface Water Manhole
 - Foul Gravity Pipe
 - Foul Water Manhole
 - Orifice Flow Control
 - Hydrobrake Flow Control
 - Catchpit Manhole (1200mm)
 - Proposed Headwall
 - Geocellular Tank Vent
 - Existing FW Manhole
 - Existing Public FW Sewer

Rev.	Description	Drn	Chk	App	Date
P05	Fourth Issue	PA	PA	PA	05.02.2026
P04	Third Issue	PA	PA	PA	22.01.2026
P03	Second Issue	PA	PA	PA	15.01.2026
P02	First Issue	PA	PA	PA	13.01.2026
P01	Draft Issue - For Discussion	PA	PA	PA	12.01.2026

Drawing Status: **FOR PLANNING NOT FOR CONSTRUCTION**



Client: **Devine Homes PLC**

Project: **Land West of Marwick Close, Ansty**

Title: **Drainage Strategy Layout**

Scale: 1:500 (@ A1)
 Drawing: **2509009-0500**
 Revision: **P05**