

Flood Risk Assessment & Drainage Strategy

Land at Mount Avenue,
Chaldon, Caterham,
CR3 5BB



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1. Introduction

Andrew Waring Associates were engaged by Damian Sullivan of Sigma Homes Group to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) to support an Outline Planning Application.

This Flood Risk Assessment sets out the risk of flooding to the site and those that may arise as a result of the development. It also sets out the proposals to manage the surface water and foul water generated by the site.

This FRA has been prepared in line with the requirements of National Planning Policy Framework (NPPF) and Practice Planning Guidance (PPG). This report also takes into consideration the Non-statutory technical standards for sustainable drainage systems (March 2015), and the Lasoo practice guidance (July 2015).

2. Site Description

Location:

The proposed site is located on land at Mount Avenue Chaldon, Caterham, CR3 5BB. The current site area is approximately 1.45 hectares with a National Grid Reference (NGR) of 532120E, 154990N.

The site is a green field currently used as horse paddocks. There are some small sheds and store buildings on the site and an existing entrance leading from Birchwood Lane.

The site is bound on three sides by residential dwellings, with Birchwood Lane to the South.

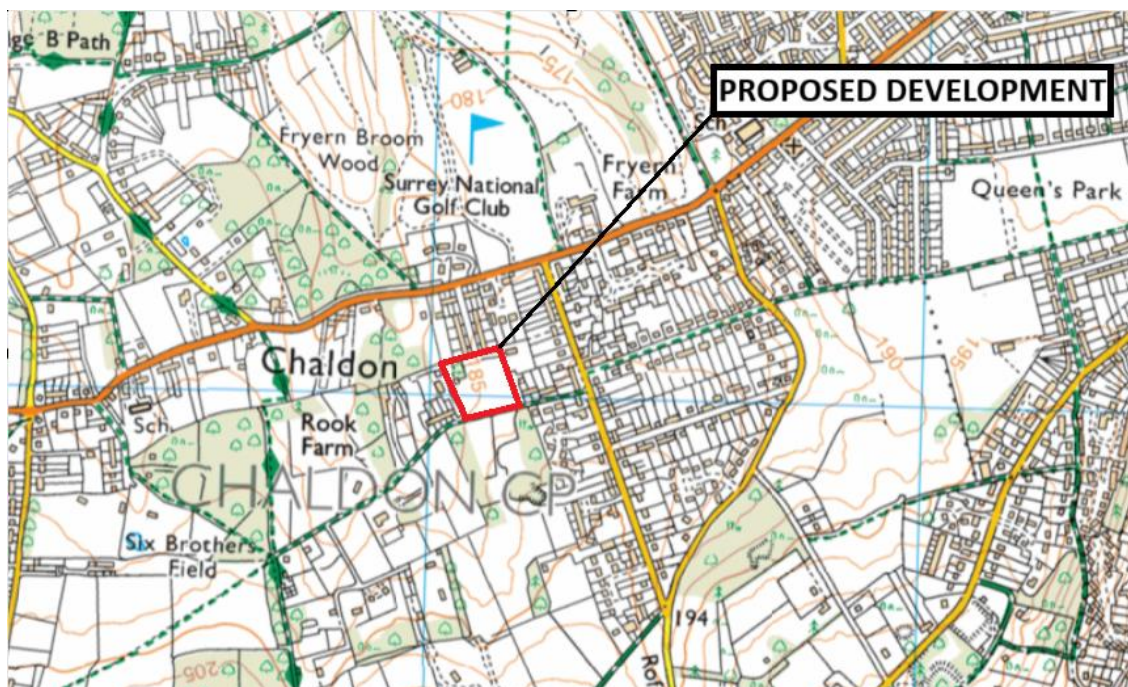


Figure 1: Site Location (Bing Maps, 2025)

Topography:

A topographical survey has been undertaken at the site. Refer to **Appendix A**.

Upon review of the topographical survey of the site, it is indicated that the site broadly falls in a North-westerly direction. The levels fall from a high point of 190.44m AOD to 182.28m AOD.

Geology:

The British Geological Survey mapping indicates that the bedrock geology is Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven chalk Formation. The mapping shows that the superficial deposits are Clay with Flints Formation. For full details on all ground conditions, refer to the full Site Investigation Report in **Appendix B**.

The combined published site geology is illustrated below on **Figure 2**.

Map Legend

Bedrock geology 1:50,000 scale

 CLAY WITH FLINTS FORMATION – CLAY, SILT, SAND AND GRAVEL

Superficial deposits 1:50,000 scale

 LEWIS NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) - CHALK

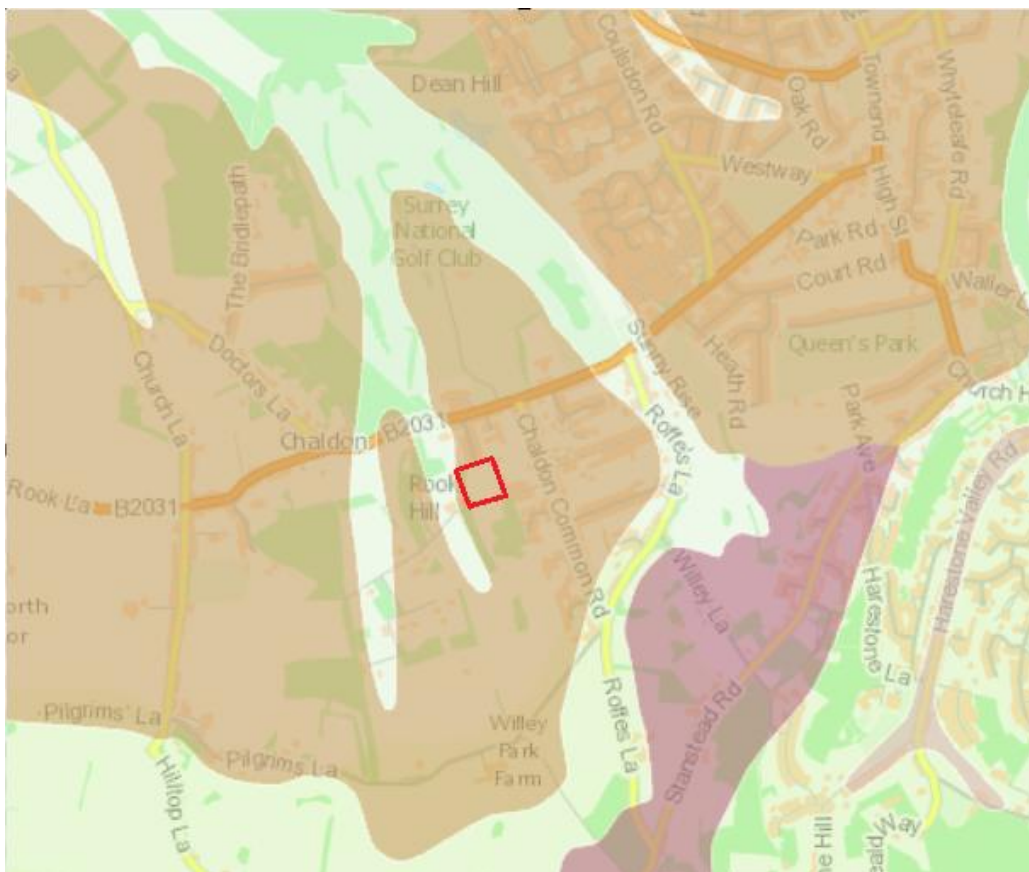


Figure 2

Hydrogeology:

The British hydrogeological Survey mapping shows that the site is underlain with White Chalk Group which is a highly productive aquifer and is classified as a principal aquifer.

A principal aquifer in UK up to 450 m thick and yielding 50 to 100 L/s from large diameter boreholes and up to 300 L/s from audited systems. Hard to very hard, good quality water.

The published site hydrogeology map is illustrated below on **Figure 3**.

Map Legend

Hydrogeology 1:50,000 scale. Aquifers with significant intergranular flow

 Highly productive aquifer



Figure 3

The Environment Agency Source protection zone map indicates that the site is located within Zone 2 (SPZ2) Outer and zone 3 (SPZ3) protection zone.

A groundwater SPZ2 is the area around an abstraction point for domestic supply or for food production purposes that meets one of the following definitions.

A groundwater SPZ3 is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

The Environment Agency (EA) online mapping indicates that the site is within the medium to medium-high groundwater vulnerability zones.

Hydrology:

The Environment Agency (EA) online mapping indicates that the nearest 'Main River' is the Redhill Brook, which is located 2.7km to the South-west.

During site investigations boreholes were excavated to 20m depth and no groundwater was recorded.

The Environment Agency (EA) online mapping indicates that the site is not in a drinking water safeguard zone.

Soakage testing was undertaken on the site by Southern Testing in April 2025 at two locations on the site. Testing was specifically aimed at the chalk layers at depths of 7:00m AOD and deeper, via boreholes. This was due to the Clay strata found at shallower depths preventing the use of traditional soakaway device use. The preliminary result recorded was $1 \times 10^{-5} \text{m/s}$ which was noted as conservative. Refer to **Appendix B** for the soakage testing results within the Site Investigation Report.

Existing Drainage:

The existing local public sewer network serving the Caterham area is owned and maintained by Thames Water.

The Thames Water asset plans confirm the presence of a foul water sewer located within Mount Avenue, which flows in a Northerly direction, passing out on to Rook Lane (B2031) where it flows in an Easterly direction. There are a number of properties in the area that are shown to connect their surface water to this public foul water sewer.

Refer to **Appendix C** for a copy of the Thames Water asset plans.

3. Proposed Development

Development Description:

The proposed development comprises 30 dwellings with associated gardens, driveways, open space and roads.

Refer to **Appendix D** for a copy of the Architect's Site Plan detailing the development proposals.

Development Suitability:

The NPPF aims to direct developments to suitable areas with low probability of flooding. The table below in **Figure 4** illustrates the acceptable classification of development within each flood zone.

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1 (<1 in 1000)	✓	✓	✓	✓	✓
Flood Zone 2 (up to 1 in 1000)	✓	✓	Exception Test	✓	✓
Flood Zone 3a (1 in 100 fluvial) (1 in 200 tidal)	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b (functional floodplain)	Exception Test	✓	X	X	X

Figure 4

The proposed development type is considered to be classified as a 'more vulnerable' development under Table 2 of the NPPF.

As the site is in Flood Zone 1, all vulnerability classes are suitable and thus the proposed scheme is deemed sequentially appropriate within flood risk terms, with the Exception Test therefore not required.

4. Flood Risk

This section of the report explores flood risk to the site. Refer to **Appendix E** for a copy of the Envirocheck Flood Screening Report (EFSR) for further details.

Tidal & Fluvial:

The Environment Agency (EA) Flood Map for Planning shows the site is located within Flood Zone 1 – Low probability in Table 1 of NPPF Planning Practice Guidance.

This zone has less than 1 in 1000 year annual probability of flooding.

The NPPF Planning Practice Guidance states that all types of development are suitable for this flood zone. See below **Figure 5** for the EA map.

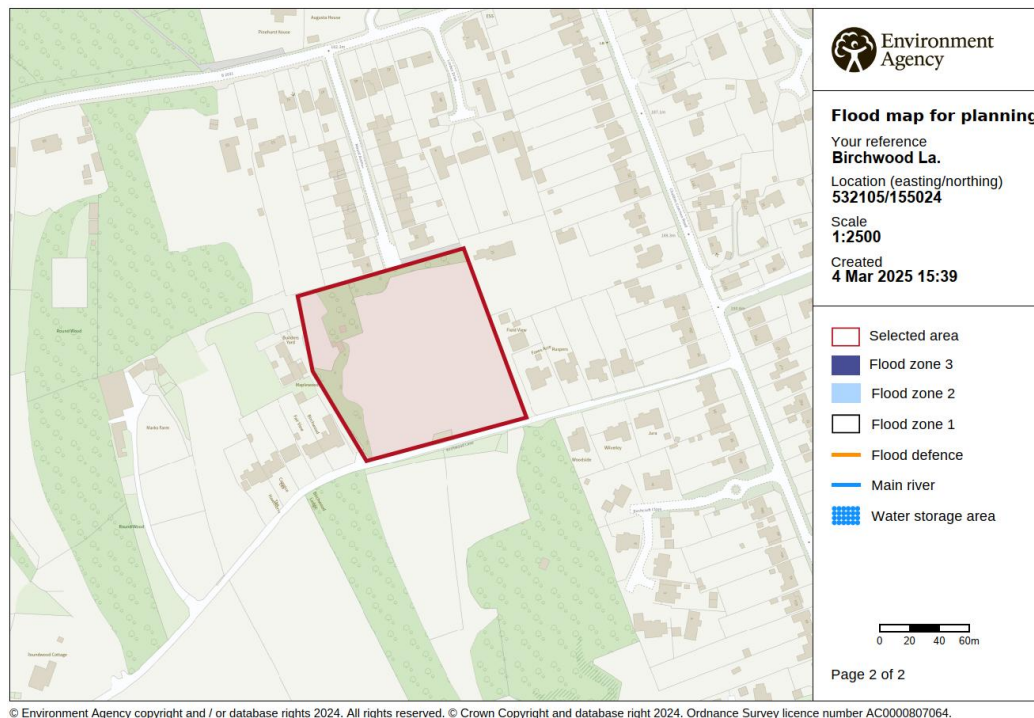


Figure 5

The proposed site is identified as lying outside of the tidal and fluvial flood risk zone according to the Envirocheck Flood Screening Report (EFSR) maps in Appendix E.

There has been no recorded historical flood occurrences within 1000m of the site according to the EA/NRW Historic Flood Event Data within the EFSR.

The risk of tidal and fluvial flooding should be considered as low.

Surface Water Flooding:

The EA Flood Map below in **Figure 6** shows the site is not at risk of flooding from surface water up to and including the 1 in 1000 year event.

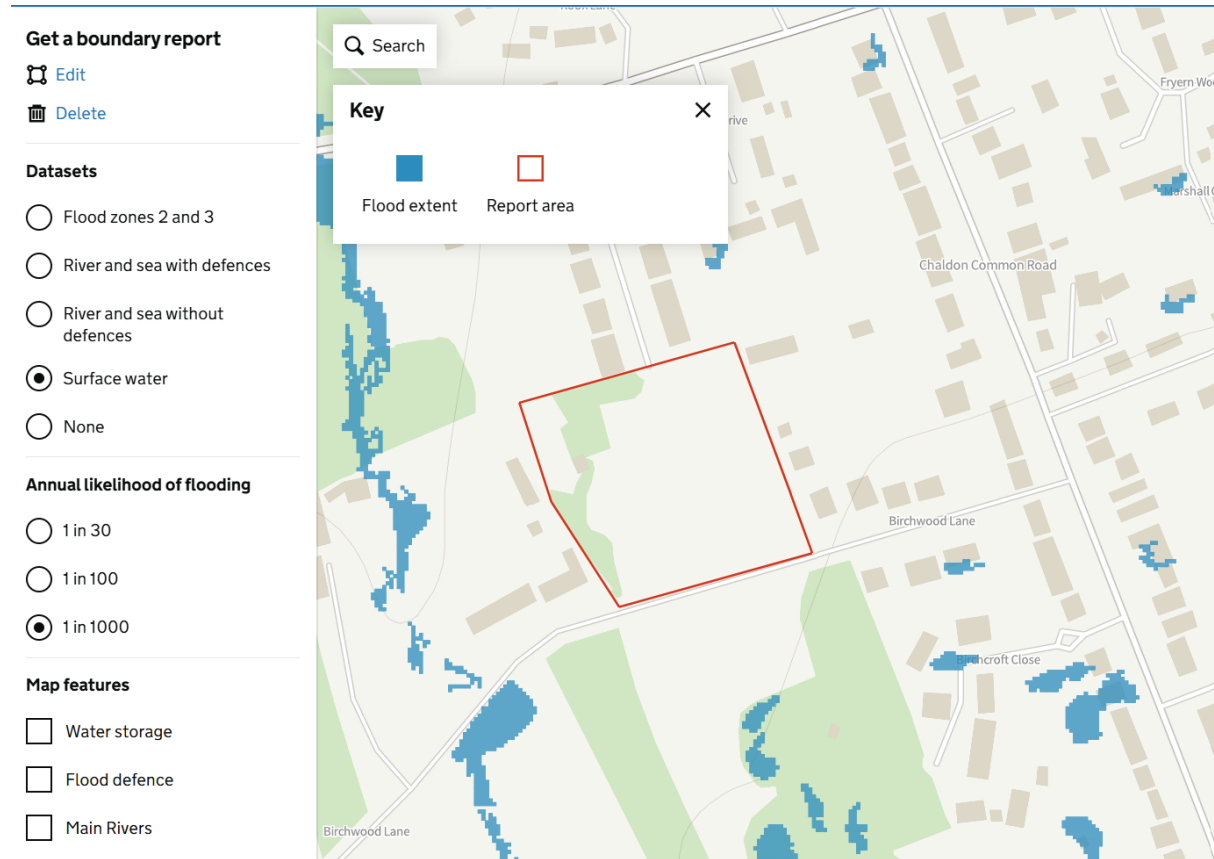


Figure 6

The surface water mapping within the EFSR confirms the EA mapping data for storm events of 1 in 30 year and 1 in 100 year. However, for the 1 in 1000 year the EFSR shows minor flooding to the Northern end of the site with a depth 150mm, velocity of up to 0.25 m/s and of low hazard classification. The minor flooding is shown to flow in a northerly direction.

It is worth noting that the minor flooding is shown to occur in an area that a new road is proposed as part of the development works. Any minor flooding of this road that cannot flow to the north as it would have in the existing scenario, will be directed along the road to the lower area of open space, where the proposed pond is to be located. Therefore, no flooding will occur to properties and flows offsite will be reduced.

The JBA Consulting Strategic Flood Risk Assessment (SFRA) notes historical surface water flooding and damage to 100 properties and 13 business within the Caterham area in February 2014. No flooding occurred at the development site. However, there was recorded road flooding to Heath Road nearby and some wet spots in to Rook Lane and Roffes Lane.

The JBA Consulting Strategic Flood Risk Assessment (SFRA) notes that in 2016 surface water flooding occurred in Chaldon and Caterham where one and half times the mean June rainfall fell in a 2 hour period. 86 internal property floods and 63 external property floods were reported. A number of roads were closed. Groundwater levels were above the normal June but it is not known if this was a contributing factor.

The minor surface flooding shown on EFSR is not considered to impact the development site due to these events occurring in minor form on roads where they are contained within kerbs and will therefore not flow to the development site nor be increased by flow from the development site, as there are no flows coming from the development site other than greenfield runoff, which is reduced by the development proposals. The development site maintains a generous soft landscaping buffer to its boundaries and does not create any runoff beyond the site other than a greatly reduced greenfield runoff, due to the majority of the site being served by infiltration devices. Therefore the site proposals are not seen to exacerbate flooding on or off site and are seen to provide betterment.

The risk of flooding from surface water should be considered low.

Groundwater Flooding:

The BGS groundwater flood data within the EFSR shows 'Limited Potential for Groundwater Flooding to Occur' with 'Negligible Risk' of groundwater flooding for the entire site and surrounding area.

The JBA Consulting Strategic Flood Risk Assessment (SFRA) notes groundwater flooding occurred in February and March 2014 within the Chaldon area due to high groundwater levels. The high groundwater levels caused by the record rainfalls in December 2013 and January 2014 led to the Caterham Bourne rising, the emergence of springs causing flooding in gardens and basements, and ingress of groundwater to the sewer network. This was exacerbated by surface water runoff which could not infiltrate and blockages to drainage infrastructure.

Surrey County Council and Tandridge District Council constructed a series of major attenuation features in adjacent fields aimed at alleviating the above issues. There has been no recorded historical groundwater flooding issues reported on the site. The proposed development utilises infiltration but also provides considerable attenuation, which will delay runoff getting to ground, thereby minimising any impact on groundwater levels.

The risk of groundwater flooding should be considered low to medium.

Sewer Flooding:

The JBA Consulting Strategic Flood Risk Assessment (SFRA) notes that there were 2 recorded sewer flood instances.

There are no known capacity issues within the local sewerage network and following a recent Pre-planning enquiry with Thames Water, the response confirmed that there is capacity within the local foul water sewerage network to serve the foul water from the proposed 30 unit development. Surface water will not be drained to the sewer network. Refer to **Appendix F** for a copy of the Thames Water Pre-Planning Enquiry response.

The risk of sewer flooding should be considered low.

Flooding from Artificial Sources:

The JBA Consulting Strategic Flood Risk Assessment (SFRA) notes that there is no risk of flooding from canal failure.

The EA's Flood Risk from Reservoirs map in **Figure 7** below, shows that the site is not at risk of flooding from a reservoir.



Figure 7

The risk of flooding from artificial sources should be considered low.

5. Proposed Drainage Strategy

The Preliminary Drainage Strategy described below can be found in **Appendix G**.

Foul Water:

A new foul water drainage network will be required to serve the proposed development.

The Building Regulations Part H1 states that an adequate system of drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority:

- A public sewer; or, where that is not reasonably practicable,
- A private sewer communication with a public sewer; or, where that is not reasonably practicable,
- Either a septic tank which has an appropriate form of secondary treatment or another wastewater treatment system; or, where that is not reasonably practicable,
- A cesspool.

It is proposed that the new network will be a traditional gravity pipe and manhole system that will collect all flows from the entire site and conveying them to the Thames Water public foul water sewer network.

The point of connection to the public sewer network will be via manhole reference 0000, which is located a few metres beyond the northern site boundary within the road of Mount Avenue.

A Pre-planning enquiry was submitted to Thames Water to understand whether there was capacity within the network to serve this 30 unit site and the response from Thames Water confirmed that there was capacity. A copy of the Pre-planning enquiry response from Thames Water can be found in **Appendix F**.

The new foul water drainage network is designed to accommodate the anticipated flows from the development without flooding. A copy of the foul water drainage flow calculations can be found in **Appendix G**.

Surface Water:

Current legislation and guidance requires developers to manage surface water run-off from new developments to mitigate flood risk to the site and the surrounding area, and also provide a sustainable means of disposing of run-off from impermeable areas.

Based on the Non-statutory Technical Standards for Sustainable Drainage: Practice Guidance, surface water runoff should be disposed of according to the following hierarchy:

- Into the ground (infiltration);
- To a surface water body;
- To a surface water sewer, highway drain, or another drainage system;
- To a combined sewer.

In line with the hierarchy set out above, It is proposed to utilise infiltration on the site to manage surface water run-off. However, the superficial deposits on the site are clay which is not conducive of infiltration and therefore rules out traditional shallow forms of infiltration. There is chalk below the clay at depths of 7 metres and deeper. Intrusive site investigation works were undertaken on the site recently, which included soakage testing within boreholes. The infiltration rate was $1 \times 10^{-5} \text{m/s}$ and noted by the engineer as being a conservative rate, with further testing expected to achieve better rates. Refer to **Appendix B** for a copy of the site investigation report.

It is proposed to utilise borehole soakaways for the infiltration of all run-off to ground. Two surface water systems are proposed to serve the development site. One system will serve the run-off from roofs with flows collected via a traditional gravity fed pipe and manhole system and conveying them to a pond in the north-west corner of the site at the natural low spot. The second system will serve run-off from roads, drives, paths and all hardstanding areas collecting all flows within a porous paved road system that will convey all flows to the pond as well.

The porous paved road system will provide attenuation and slow the water flow to the pond by utilising a flow control manhole to the end of this system. Additional attenuation is provided within the pond itself. The pond will have three borehole soakaways placed within it that will discharge all run-off from both surface water systems to ground. The borehole soakaways are each 20 metres in depth.

Both surface water systems, the pond and boreholes soakaways are designed to accommodate a 1 in 100 year storm plus 40% allowance for climate change, which is in line with the upper end allowance set out in the EA climate change allowances for peak rainfall in England website. In order to allow for urban creep, 10% has been added to the catchment areas of dwellings.

The pond has been designed to have a minimum of 300mm freeboard.

Refer to **Appendix G** for surface water calculations.

Exceedance flows have been considered and it is expected that flows will follow the falls of the site and be routed to the low point where the pond and borehole soakaways are proposed. Property levels are set at least 150mm above external ground level ensuring exceedance flows would be diverted around the new properties. Refer to **Appendix G** for exceedance routing shown on the Preliminary Drainage Strategy Layout.

6. Sustainable Drainage Systems & Water Quality

The “pollution hazard indices for different land use classifications” table has been extracted from CIRIA C753 The SuDS Manual, and applied to the development proposals.

See tables below referring to the two surface water drainage systems and how they achieve the required water quality treatment:

SW System serving roofs only - Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05

The detention basin would provide treatment for the surface water runoff from all roofs. The SuDS mitigation indices for detention basins have been calculated in the table below, in accordance with the guidance contained in The SuDS Manual.

SW System serving roofs only - SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Detention Basin	0.5	0.5	0.6

SW System serving roads, drives & hard standings - Pollution Hazard Indices

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, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. less than 300 traffic movements per day	Low	0.5	0.4	0.4

The porous paving would provide treatment for the surface water runoff from the roads, drives and hardstandings. The SuDS mitigation indices for porous paving has been calculated in the table below, in accordance with the guidance contained in The SuDS Manual.

SW System serving roads, drives & hard standings - SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Detention Basin	0.7	0.6	0.7

7. SuDS Management & Maintenance

Maintenance of the drainage system and SuDS features would be carried out in accordance with CIRIA C753 The SuDS manual to minimise the residual flood risk of drainage system blockage.

Maintenance would be the responsibility of the developer to assign, however the maintenance requirements have been extracted from The SuDS Manual and are presented in **Appendix H**.

8. Conclusion & Recommendations

Andrew Waring Associates were engaged by Damian Sullivan of Sigma Homes Group to provide a Flood Risk Assessment and Drainage strategy to support an Outline Planning Application for the development which comprises the construction of greenfield land of circa 30 no. residential dwellings.

Flood mapping shows that the site is located within Flood Zone 1. Under the NPPF the proposed development is classified as 'more vulnerable', is located within a sequentially appropriate fluvial and tidal Flood Zone and does not require the application of the exception test.

The potential risk of flooding from other sources at the site including surface water, sewers and artificial sources are considered low. The potential risk of flooding from groundwater is considered low to medium.

The surface water drainage strategy will manage flood risk by reducing the greenfield runoff leaving the site via the use of infiltration. Two surface water systems are proposed. One collecting roof runoff and conveying them to the pond via a traditional gravity fed pipe and manhole system and the other system collecting all runoff from road, drives and hardstandings and conveying them to the pond via porous paving to all roads. Within the pond are 3 no. borehole soakaways, which will drain all runoff from both systems to ground. Both surface water systems, the pond and boreholes soakaways are designed to cater for the 1 in 100 year storm event including an additional 40% allowance for climate change. Catchments for dwellings have been increased by 10% to allow for urban creep.

The foul water drainage for the entire site will be served by a traditional gravity fed pipe and manhole foul water drainage system, which will convey all flows to the Thames Water public foul water sewer network, making the connection point at public manhole reference 0000.

Maintenance of the SuDS will be in line with CIRIA C753 the SuDS Manual and by the developer appointed company.

In conclusion, this Flood Risk Assessment and Drainage Strategy demonstrates that the proposals are consistent with the aims of the NPPF, planning guidance and the SFRA.

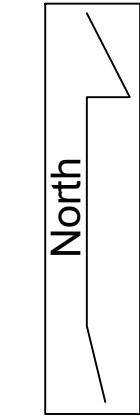
Appendix A: Topographical Survey

Do Not Scale



NOTES

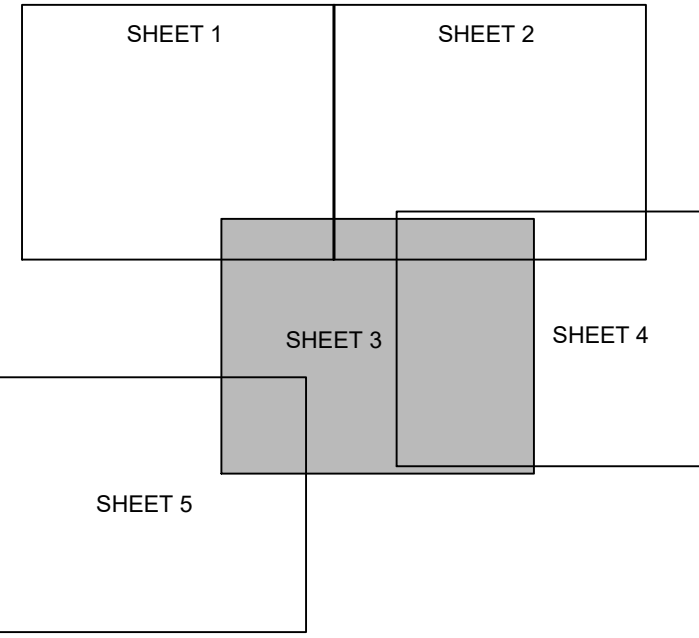
1. The Grid and Levels are oriented to OS Active Grid using OSTN 15.
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3. Surveyed boundary features are not necessarily legal boundaries.
4. Dimensions should not be scaled. All dimensions should be checked on site before any fabrication / construction.
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9. All utilities have been identified to the best of the surveyors knowledge. The correct identification of the utility types can not be 100% guaranteed, therefore these should be independently verified prior to use in any design and building works.
10. All pipe diameters and levels are assumed to be correct, however due to non entry to inspection chambers, these should be verified before any works commence.
11. External caves levels are surveyed to lowest tile position.



LEGEND

- B - Bollard
- CL - Cover Level
- EAV - Eaves Level
- FH - Fire Hydrant
- FPO - Fence Post
- GV - Gas Valve
- IC - Inspection Cover
- IL - Invert Level
- LP - Lamp Post
- MT - Multi Trunk
- RID - Ridge Level
- RS - Road Sign
- SC - Stop Cock
- SV - Sluice Valve
- TK - Top of Kerb
- TW - Top of Wall
- WM - Water Meter
- WO - Wash Out

KEYPLAN

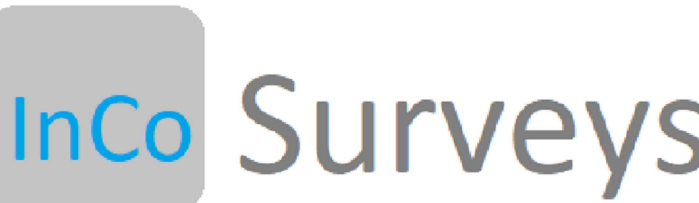


Rev	Revised By	Date	Revision
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Project
**LAND AT MOUNT AVENUE
CHALDON, CATERHAM
SURREY, CR3 5BB**

Drawing Title
TOPOGRAPHIC SURVEY

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Surveyed: M.Jones January 2024
Drawn: M.Jones February 2024

Project No.	Drawing Status	Scale (@ A1)
S24813	INFORMATION	1:500

**TOPOGRAPHIC
SURVEY
Sheet 3 of 5**