# Sustainable Drainage System
# 119 Charville Lane, Hayes

The proposed Sustainable Drainage Scheme (SuDS) strategy is comprised of an attenuation tank for surface water runoff. Surface water will discharge via connection to the public surface water sewer network, subject to confirmation from the sewer utility provider, and the incorporation of attenuation SuDS.

The Site is currently a Detached Bungalow which will be demolished and replaced with a Detached House.

The development site is located in Charville Lane, which is situated to the North of Hayes town centre in the London Borough of Hillingdon.

The Property is bounded by Green Belt open space to the south and properties and Childrens Home in Charville Lane to the west and properties to the east. To the north are properties in Ridings Lane and Palomino Close.

## Summary of discharge routes

There is a public surface water sewer, located in Charville Lane to the South of the Site, therefore discharge to sewer is likely to be achievable.

## Runoff rate and attenuation requirements

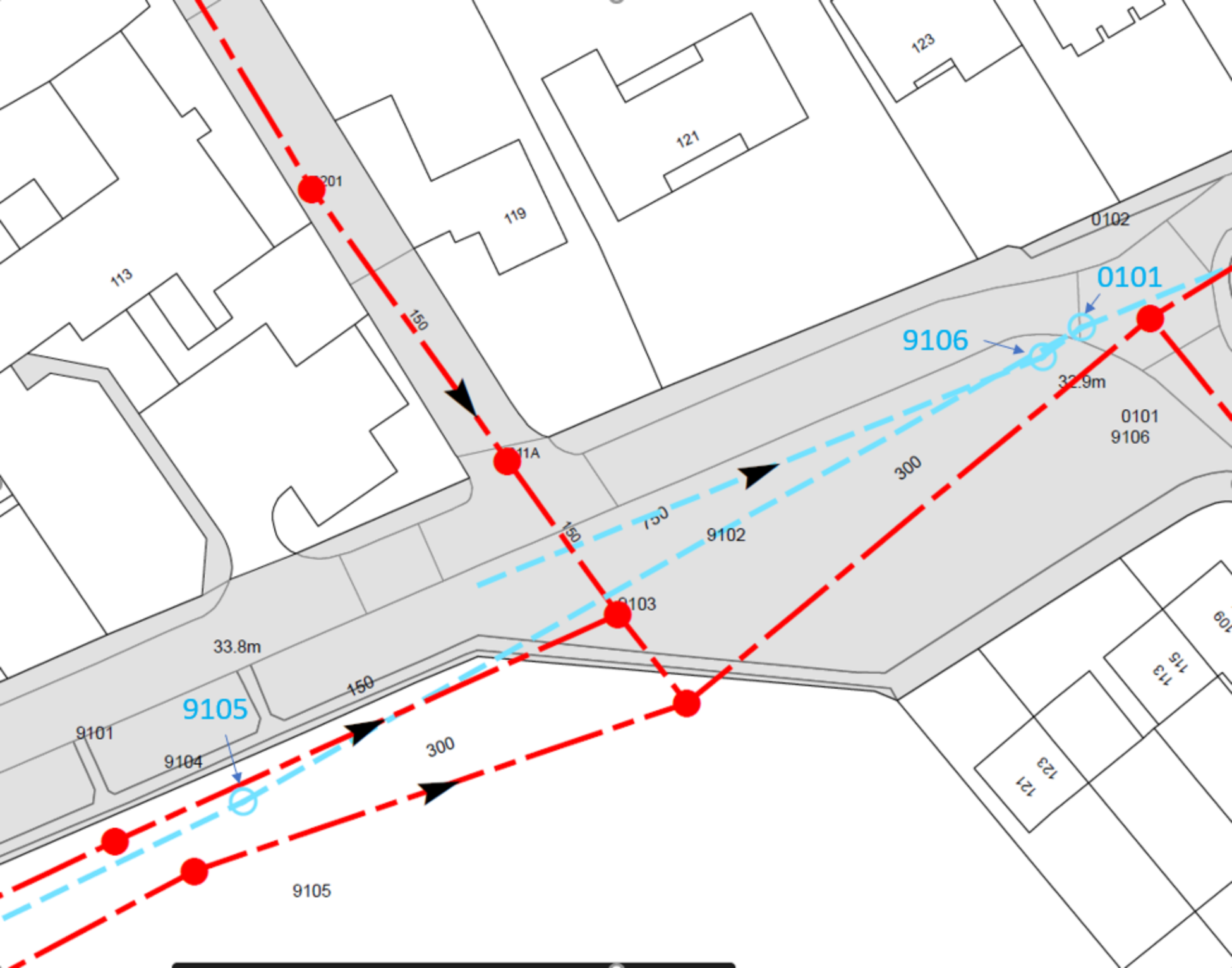
Discharging off-Site requires attenuation to be provided to ensure there is no flooding within the development in all storm events up to and including the 1 in 100 year including a 40% allowance for climate change. This volume is subject to the discharge rate being restricted to 1 l/s.

## Site information

The purpose of this report is to assess the potential for disposing of surface water through a Sustainable Drainage System (SuDS) for the site at 119 Charville Lane, Hayes.

## Development

The Site is currently a Detached Bungalow which will be demolished and replaced with a Detached House.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**Groundwater levels.**

Infiltration features are not proposed at the Site, given the impermeability of the underlying geology.

**Ground conditions**

Infiltration SuDS features are not proposed at the Site, therefore a detailed investigation into the ground conditions is not required.

**Water quality**

The Site does not lie within an SPZ. The infiltrated water quality should be of sufficient quality that it does not give rise to pollution of the underlying groundwater. Further consultation with the water company is unlikely to be required.

A development should utilise sustainable drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. attenuate rainwater by storing in tanks or sealed water features for gradual release,
2. discharge rainwater to a surface water drain

**Peak Flow control**

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

**Volume control**

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. The runoff volume must be discharged at a rate that does not adversely affect flood risk.

The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 40 year rainfall event.

**Primary SuDS Strategy:**
Infiltration to ground is not achievable at the Site, and water features were not identified or available, therefore surface water runoff will be managed within SuDS features and discharged to the public sewer network

**Proposed SuDS type, features, discharge location and rate restriction**

| | |
|---|---|
| SuDS type | Source control (interception) and attenuation SuDS. |
| SuDS features | Rainwater harvesting and an attenuation tank. |
| Discharge location | Public surface water sewer network. |
| Discharge rate | 1 l/s. |

**Proposed SuDS sizing (dimensions) and attenuation volumes**

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|---|---|
| Rainwater Harvesting | To comply with London Plan policy, rainwater harvesting butts should be established for the proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by Rainwater Harvesting has not been considered within the Preliminary SuDS schematic. |
| Attenuation tank | An attenuation tank comprised of 48 Graf Eco blocks to form 4.6 m x 3.6 m x 0.84 |
| anhole and pipework | The connecting pipework and manholes would be able to provide the remaining storage and attenuation required to prevent flooding during a storm event. |

| | |
|---|---|
| Project: | 119 Charville Lane. Hayes for Designed Images |
| Ref: | DB03/01-02 first designed 03/01/2023 |
| Designer: | DB |
| Company: | Graf UK Limited<br>Willington, Shipston on Stour, Warwickshire, CV36 5AS |
| Tel: | 01608 661500 |
| e-mail: | mail@grafuk.co.uk web site: www.grafuk.co.uk |

## Catchment Details:

| | | |
|---|---|---|
| Buildings | 171 | m² x 95 % |
| Dense surfacing | 112 | m² x 90 % |
| Effective Area | 263.25 | m² |

## Storage Details:

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|---|---|---|
| Product | RainBloc | |
| Length | 4 units = | 4.8 m |
| Width | 6 units = | 3.6 m |
| Depth | 2 units = | 0.84 m |
| Volume Ratio | 95 % | |

## Rainfall Details - FSR Method:

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|---|---|
| Return Period | 100 years |
| Climate Change Factor | 40 % |
| r value | 0.44 |
| M5-60 | 20.7 mm |
| Summer Storm Profile | |

| Duration | Intensity mm | mm/h | Required storage(m³) |
|---|---|---|---|
| 30 min | 34.2 | 95.7 | 11.534 |
| 45 min | 38.7 | 72.3 | 12.590 |
| 60 min | 42.0 | 58.7 | 13.152 |
| 2 hours | 49.8 | 34.8 | 13.645 |
| 6 hours | 62.0 | 14.5 | 12.488 |
| 24 hours | 80.1 | 4.7 | 7.346 |

## Outflow Details:

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|---|---|
| Infiltration rate | Attenuation only |
| Attenuation Control | Orifice Plate |
| Orifice Diameter | 23 mm |
| Discharge rate | 1 l/s |

## Results:

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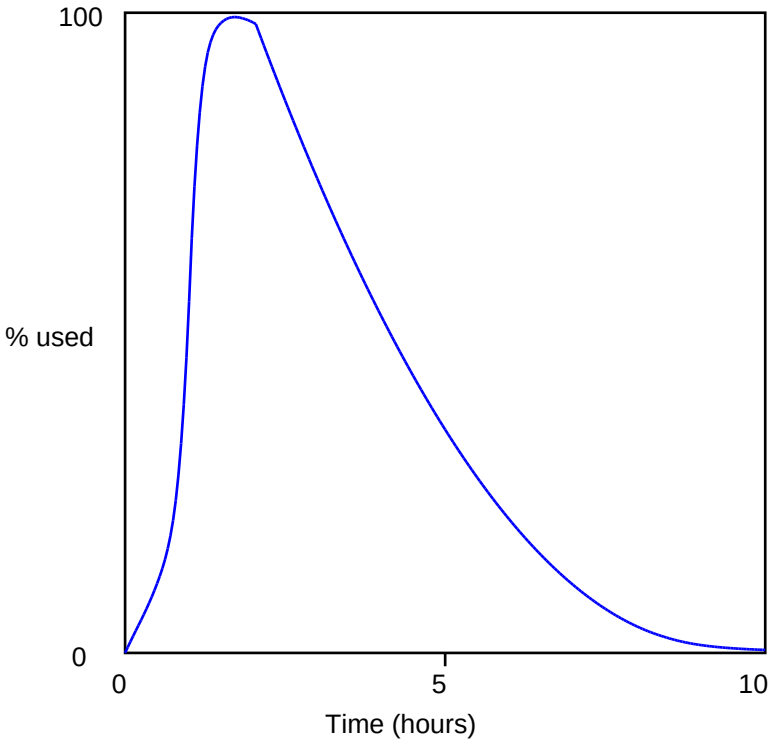
|---|---|
| Outcome | Pass |
| Critical Storm Duration | 2.07 hrs |
| Critical Rainfall Rate | 34 mm/h |
| Hmax | 0.831 m |
| Time to half empty | 1.9 hrs |
| Volume Required | 13.642 m³ |

## Tank Operation:



| | |
|---|---|
| Permeable paving | The proposed driveway and paths will consist of permeable paving. As the features are self- draining they have been excluded from this report and do not form part of the calculations. |
| | |
| | |

**Rainwater harvesting**

To comply with London Plan policy, rainwater harvesting butts are proposed. The run-off from the proposed development roof should be led into rainwater harvesting butts via rainwater downpipes and guttering to catch run-off from the extension roof. Overflow from the butts should be discharged into the storage system provided by the attenuation tank.

Due to the relatively insignificant amounts of attenuation provided by rainwater harvesting tanks in this instance and the requirement to retain water for non-potable uses such garden maintenance, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the report.

As there is an issue with the storage capability of Rainwater Harvesting tanks, this method should have a fixed attenuation volume and a controlled outlet to discharge into the proposed SuDS feature. An overflow system will be required for implementation on the Site due to exceedance events (where the pumps fail or there is a blockage within the system / or the number of residents and subsequent water usage is reduced).

Roof run-off is generally less polluted than run-off from road surfaces but can still generate pollutants such as sediments. Pollutants would be captured by the collection and filtration system and, by reducing the volume of run-off generated from the Site. Primary screening devices are used to prevent leaves and other debris from entering the butt and first flush devises can be designed to divert the first part of the rainfall away from the main storage tank and can pick up most of the dirt, debris and contaminates that collect on a residential roof.

**Permeable paving**

Permeable Paving is proposed for driveway areas to intercept runoff. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2015) will improve water quality due to their filtration capacity and usually work to a 30% porosity. A geotextile layer will be required for paving underlain by aggregate material to intercept silt/particles. Permeable pavements are multi-layered surfacing systems. The surface layer is constructed out of permeable material allowing infiltration of water through gaps along its surface. A geomembrane isolates stored water from the surrounding soil, especially in contaminated areas and a geotextile layer prevents clogging and damage to the geo-cellular modules.

The geotextile layer works to intercept silt/particles flowing through the system via direct rainfall, or through vehicle use deposited onto the car park area and into the permeable paving. The majority of silt would be trapped within the top 30mm of the joining material between the paving blocks. Rainfall flowing into the permeable paving directly from the development roof/rainwater butts would not contain enough volumes of silt and or particles to cause blockage so will be fed directly into

underlying porous substrate via rainwater pipes. Downpipes from the development roofs/rainwater butts should extend through the paving for c.5 meters to divert roof run-off away from building foundations. Paving could also implement an impermeable liner close to the building or creating a separate compartment within the permeable sub-base close to the building to further divert attenuated water away from building foundations.

**Flow control devices and systems**

Hydrobrake Flow control systems can be used to reduce the runoff rate from the Site. These are usually a device used for controlling water flow into a connecting feature, such as a sewer, to a specific attenuation performance. The design consists of an intake, a volute and an outlet and the configuration is critical to ensure discharge control. For drainage areas which are less than 3 ha, outlet throttle diameters would have to be small (<150mm diameter) to achieve outflow rates which could result in blockage. For most SuDS features, a flow control device will comprise a fixed orifice or a throttle such as a short pipe.

A Vortex Control is usually a self-activating vortex flow device which directs water into a volute to form a vortex. For the Site, rainwater down pipes from the development roof should drain directly into the attenuation feature to reduce infill from potential flood water.

**Drainage protection devices**

A non-return flap value is recommended for outflow pipes to reduce the risk of backflow from the channel/sewer during a large scale rainfall event.

**Attenuation Tanks**

Attenuation tanks are proposed to provide the storage required. Attenuation tanks provide a below-ground void space for use of temporary storage via controlled release. They can also be modified to suit specific characteristics of a site. DEFRA, 2015 states that the run-off volume from the development to drain to any sewer of surface water body in the 1 in 100 year rainfall event must be constrained to a value as close as is reasonably practical to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development prior to redevelopment from the Site. Issues with Attenuation tanks are the level of accessibility, lack of treatment performance and cost in comparison to surface systems.

Regular maintenance is essential to ensure effective operation of the SuDS features over the intended lifespan of the proposed development. The SuDS Manual (C753) (CIRIA, 2015) provides a maintenance schedule for SuDS with details of the necessary required actions as shown in the Table below.

**SuDS operation and recommended maintenance requirements**

| Asset type | Maintenance schedule (and frequency) |
|---|---|
| Permeable pavements | Regular maintenance:<br>Brushing and vacuuming (three times per year).<br>Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required).<br>Monitoring:<br>Initial inspection (monthly).<br>Inspect for poor performance and inspection chambers (annually). |
| Hydro-Brake Flow Control | Low amounts of maintenance required as there are no moving parts within the Hydro-Brake® Flow Control.<br>Initial monthly inspection at the manhole once the construction phase is over.<br>If blockages occur they normally do so at the intake. Hydro-Brake® Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.<br>Inspection should be undertaken annually or when a storm event occurs. |
| Underground drainage pipe network | Regular maintenance:<br>Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber (annually).<br>Cleaning of gutters and any filters on downpipes (annually).<br>• Trimming any roots that may be causing blockages (annually or as required). Monitoring:<br>Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually). |
| Rainwater Harvesting | Regular maintenance:<br>Inspection of tank for debris and sediment build up (annually and following poor performance). |

| Asset type | Maintenance schedule (and frequency) |
|---|---|
| | Inspection of inlets, outlets, overflow areas, pumps and filters (annually and following poor performance).<br>Cleaning of tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required).<br>Remedial actions:<br>Repair or overflow erosion damage or damage to tank and associated components (as required) |

| | |
|---|---|
| Attenuation tanks | Regular maintenance:<br>Remove litter and debris from inlets and outlets (monthly).<br>• Trimming any roots and surrounding grass<br>blockages (as required). Monitoring:<br>Inspect inlets, outlets and overflows for blockages (monthly or after a heavy storm).<br>Inspect inlets and outlets for silt accumulation (half yearly).<br>Inspect infiltration surfaces for compaction and ponding (monthly). |

## Location Plan

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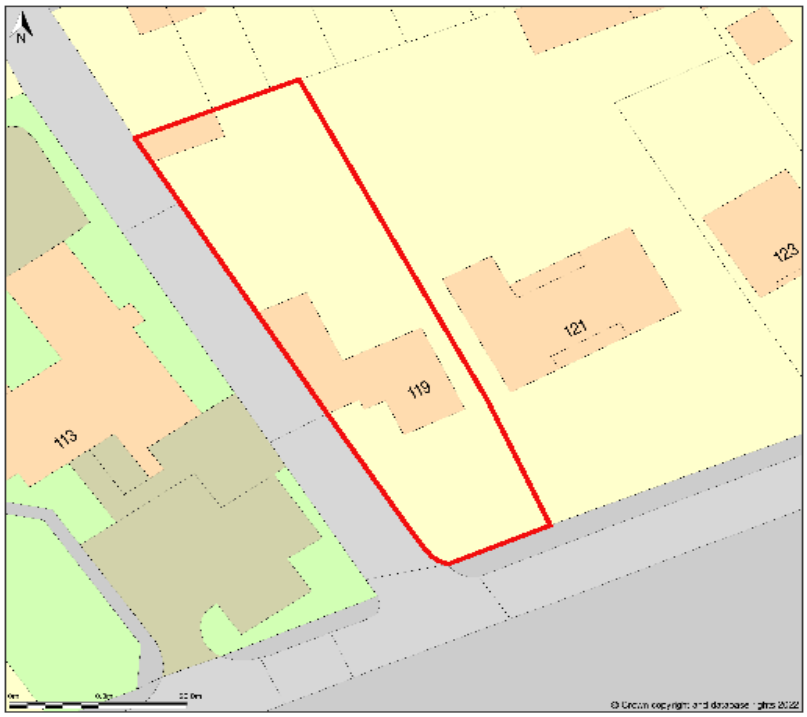
119, Charville Lane, Hayes, Hillingdon, UB4 8PD






Block Plan shows area bounded by: 508899.02, 183161.07 508989.02, 183251.07 (at a scale of 1:500), OSGridRef: TQ 8948320. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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Designed Images

January 2023