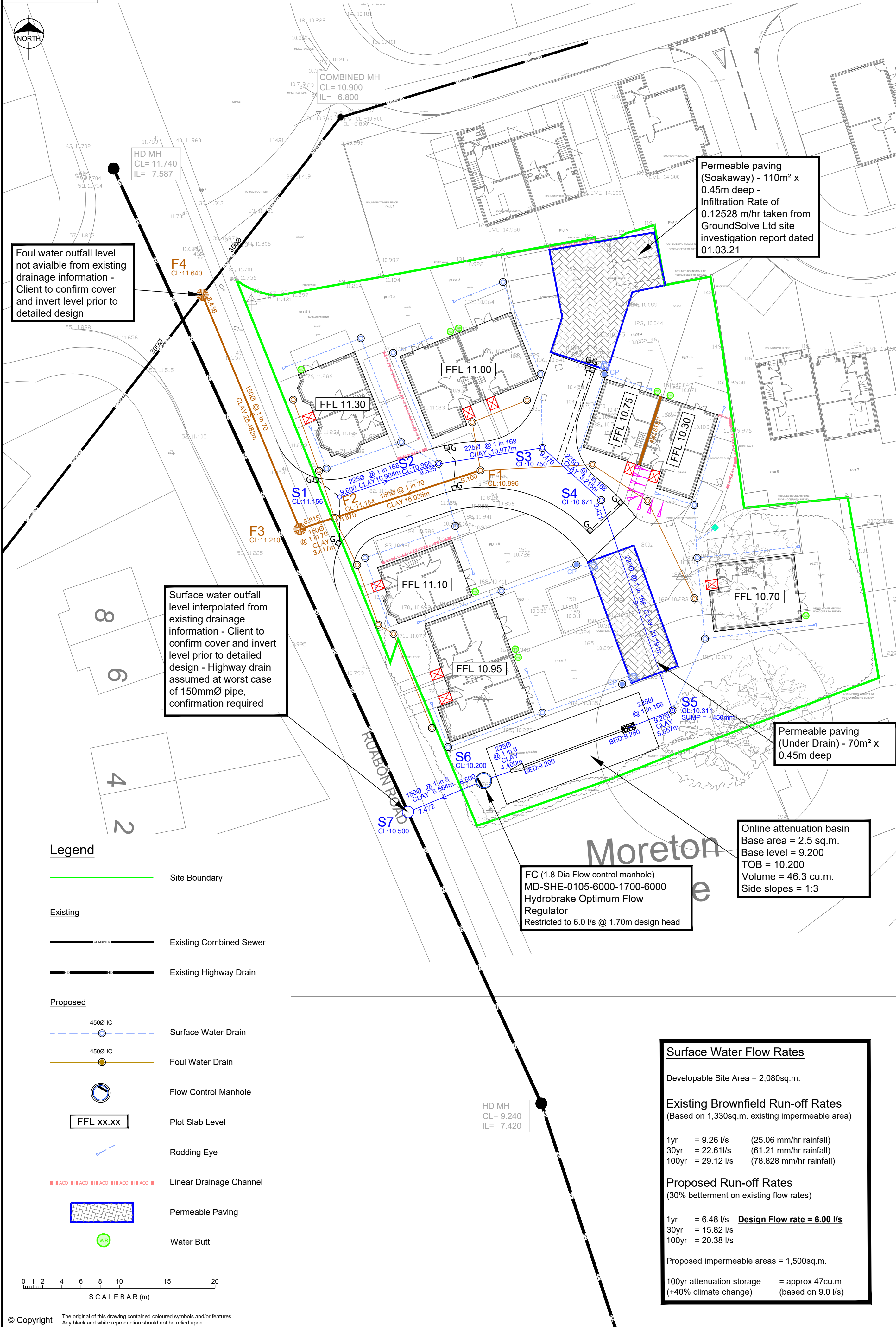


DO NOT SCALE



SUDS Strategy

The prime function of SuDS, as with conventional drainage, is to provide effective surface water drainage, ensuring the greatest degree of flood risk protection over the long term both within and downstream of the development and prevent pollution. However, SuDS approaches can bring wider benefits too. Appropriately designed, constructed and maintained, SuDS are more sustainable than conventional drainage systems and can help to:

- Reduce run-off surface water flow-rates and/or volumes and hence reduce the risk of flooding
- Encourage natural groundwater re-charge
- Reduce pollutant concentrations in storm water
- Provide habitat for wildlife.

There are many site-specific factors which will influence the choice of any single or combination of SuDS devices used within a development. The primary factors are:

- Whether the development is domestic, commercial or industrial
- Whether the underlying ground is contaminated. If so, infiltration systems will most probably not be permitted.
- Whether the underlying ground is permeable enough for infiltration systems to be considered.
- Whether the ground water levels are deep enough for infiltration systems to be considered
- Whether the site is steeply sloping and its general topography
- The availability of space inside the development for each potential SUDS facility.
- Health & Safety aspects should the development be likely to be inhabited or used by children.

To ensure no increased flood risk to offsite land and development, disposal of surface water to the ground is encouraged and runoff volumes will be reduced through the SuDS management train where ground conditions permit. Where ground conditions are unsuitable, a discharge to an open water body / sewer will be necessary with rates restricted to the existing site conditions.

SUDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	Not suitable: Architectural proposals for the development involve a pitched roof arrangement which are not suitable for green roofs.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site, and reduces treated water consumption.	Not suitable: Additional costs of installation would have severe effect on viability of the development. Running and maintenance costs would not be acceptable to our client. The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration	Reduces total run off volume from the development	Not suitable due to cohesive ground conditions in most areas
Permeable Surfacing (Infiltration)	Reduces total run off volume from the development. Can be used to enhance quality of run-off water.	Suitable: Northeast car park area - Subject to detailed design from manufacturers. Infiltration suitable in this area
Permeable Surfacing (Tanked)	Can be used to enhance quality of run-off water. Sub-base provides 'source' storage and reduces the volume of storage downstream. The storage can be created with selection of the stone fill or use of plastic box systems. Impermeable membrane at base of construction to prevent impact on pavement stability	Suitable: South car park area - Subject to detailed design from manufacturers. Infiltration is not suitable in this area - Drained via under drain
Swailes, basins and ponds	Provide areas for above ground surface run off storage. Swales also allow filtering of particulate matter, improving water quality.	Suitable: A shallow SUDS feature may be possible in the courtyard on the Southwest side of the development subject to landscaping proposals.
Bio-Retention Areas	Collect and retain run-off to help improve water quality, prior to discharge in piped system or infiltration	Not Suitable: Limited space within the development to incorporate further bio-retention.
Geocellular storage	Suitable for sites with insufficient space for basins etc. Suitable for sites where topography prevents the use of open basins etc. Can be very effective infiltration devices subject to ground conditions.	Suitable: Subject to detailed design and drainage layout, currently not required
Large Pipes, conduits and tanks	Suitable for sites with insufficient space for basins etc. Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. Generally, be suitable for adoption by the statutory water company.	Not Suitable: Limited space within the development to incorporate a network or large oversized pipes.

Drainage Strategy

Existing Drainage

Drainage surveys have identified a highway drain adjacent to the development in Ruabon Road. This runs the length of the Western boundary - Pipe size, level and gradient to be confirmed by client

The survey has also identified an existing combined sewer which across Ruabon Road and the above highway drain to the north - Pipe size, level and gradient to be confirmed by client.

Proposed Foul

We propose to utilize the existing combined sewer to the north the site. All foul flows from the proposed development will discharge into this asset subject to Welsh Water approval - Pipe size, level and gradient to be confirmed by client.

Proposed Surface Water

1. Collection for re-use
Nuundale Ltd are not proposing the use of rainwater harvesting for re-use within the dwellings. Rainwater harvesting alone would not be adequate to deal with the surface water flows from the site and provision will be required for an overflow to a Level 2 or lower priority runoff destination. Therefore RWH systems are not considered a cost effective solution for managing surface water and a lower priority runoff destination is required.

The use of water butts to be installed on some RWP's will be considered if there is potential for demand.

2. Infiltration
The site investigation report has determined the site is suitable for infiltration techniques to the north of the development only.

3. Watercourse
There are no watercourses within the vicinity of the site.

4. Surface water sewer (Highway Drain)
Sewer records indicate a 150mm Dia Highway drain in Bay Raubon Road to the front of the site. However consent from Welsh Water/highways authority will be required.

5. Combined sewer
The Welsh Water sewer records indicate a combined sewer to the Northern boundary. Pipe size, level and gradient to be confirmed by client.

Water Quality

Roof

Run-off from roof can be considered clean run-off and will generally not require any treatment

Car parking

Consideration of components to assist with removal of suspended solids and hydrocarbons so that the water draining into the public sewer network is of a high quality.

Maintenance / Responsibilities

Adoption and maintenance of all surface water components serving 2 or more properties subject to SAB approval.

A 'Private Management Company' should be set-up to maintain the SAB approved surface water network in the future.

SABS authority will require details of the Management Company. Maintenance requirements will be considered further at detailed design stage and a SUDS Management Plan will be produced to address the frequency and type of maintenance activities. Details /costs to be determined for Full SABS Application.

Pipes and manholes:

All piped networks to have CCTV survey at end of construction activities. Any debris to be removed. Future maintenance to involve inspections to ensure no silt build ups within network. SUDS Management Plan to be produced to address frequency and type of maintenance activities

Flow Control:

To be maintained by private 'Management Company' SUDS Management Plan to be produced to address frequency and type of maintenance activities.

Gullies and drainage channels:

To be maintained by private 'Management Company' SUDS Management Plan to be produced to address frequency and type of maintenance activities.

Shallow SUDS Basin:

To be maintained by private 'Management Company' SUDS Management Plan to be produced to address frequency and type of maintenance activities.

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Rev.	Date	Revision	By	Appd.
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