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YGG Rhosafan Drainage Strategy Report

For Morgan Sindall

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1. Introduction

Hydrock have been commissioned by Morgan Sindall on behalf of Neath Port Talbot Council to provide a drainage strategy report and preliminary design for the proposed development of YGG Rhosafan Primary School.

This report is required to support the planning and full SAB application submissions.

The objectives of the report are to;

- » Review the existing surface water drainage arrangements on site;
- » Assess the feasibility of Sustainable Drainage Systems (SuDS) features within the development to control and discharge surface water runoff in line with the requirements of the statutory National Standards for Sustainable Drainage Systems; and
- » Provide a developed design for surface water (SuDS) systems including indicative sizing of storage / attenuation features and detailed plan suitable for inclusion in planning and full application submissions to the local authority's planning department and SuDS Approval Body (SAB).

The following tasks have been undertaken to complete this report;

- » Undertake a desktop investigation of the site's existing surface water drainage arrangements.
- » Outline detailed solutions for surface water disposal. This includes calculations, in order that the conceptual designs may be agreed with the relevant authorities.
- » Determine the existing and proposed catchment areas and deduce areas currently draining to the combined sewer network and, post development, those areas to be discharged to ground via infiltration.
- » Expand on the feasibility of using infiltration as a disposal method, based on Ground Investigation report conducted previously at RIBA Stage 3.
- » Specify the size of storm water storage needed to manage run-off from the site post-development, using industry standard drainage design software (InfoDrainage);
- » Provide general information on the maintenance and adoption of SuDS via the SAB's approval process; and
- » Give consideration to drainage exceedance. In particular, use topographic information to identify overland flow paths and areas susceptible to surface water ponding.

A number of sources of information have been used to compile this drainage strategy. Whilst Hydrock believe them to be trustworthy we are unable to guarantee the accuracy of the information that has been provided by others.

This report is based on information available at the time of preparation. Consequently, there is potential for further information to become available. These changes may lead to future alteration to the conclusions drawn in this report for which Hydrock cannot be held responsible.

2. Existing Site

2.1 Site Location

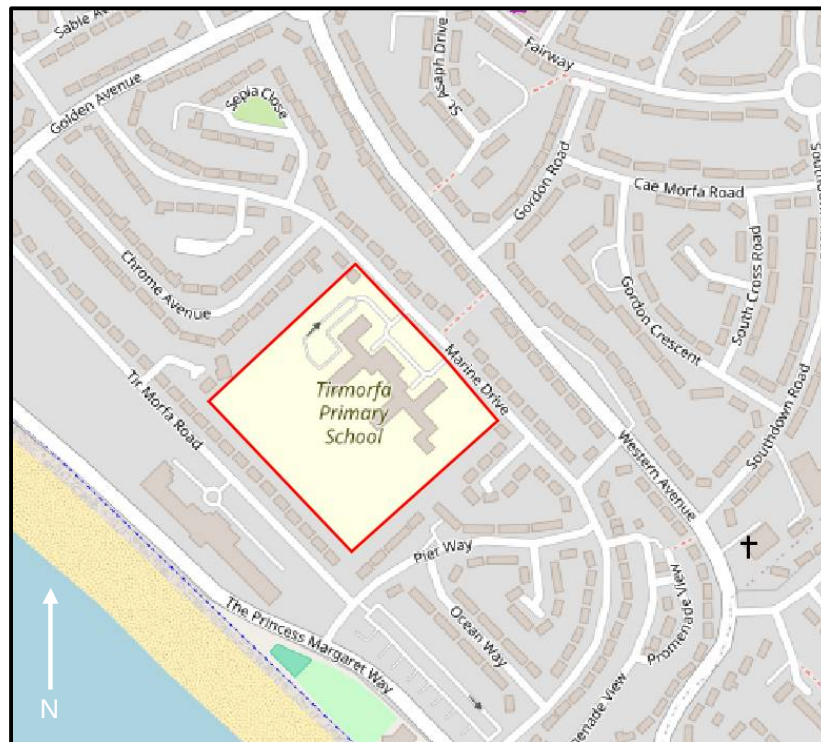


Figure 1: Site Location Plan

The site for the proposed school is located on the site of the existing primary school off Marine Drive, Sandfields West, Port Talbot, approximately 0.1km north of Swansea Bay and 1.5km west of Neath Port Talbot Hospital. The surrounding area is predominantly residential development and adopted highway. Neighbouring the site is:

- » Marine Drive to the northeast
- » Marine Close / Pier Way to the southeast
- » Tir Morfa Road to the southwest
- » Chrome Avenue to the northwest

Table 1: Site Information

Address	YGG Rhosafan, Marine Drive, Sandfields West, Port Talbot SA12 7NG
Grid Reference	273890mE, 190480mN

The site is square in shape and is currently occupied by the existing school building and associated facilities. The remainder of the site is comprised of open tarmac playground and fields.

2.1.1 Development History

A detailed history of the site's previous use can be found within the Phase 1 Desk study prepared by SOCOTEC report No. H9091-1 Dec 2019.

2.1.2 Site Description

The existing site comprises of the existing YGG Rhosafan primary school and associated facilities.

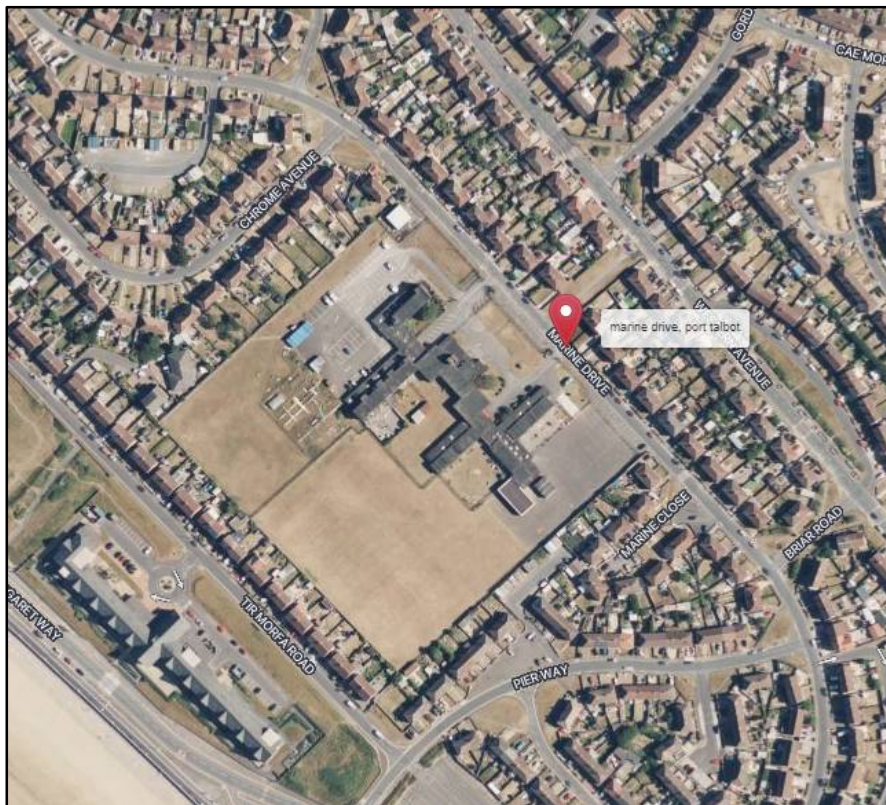


Figure 2 - Existing Site Layout (Grid Reference Finder)

2.1.3 Access

The site will be accessed by vehicles via two new bell-mouths from the adopted highway to the north of the site. NPT Highways have been consulted and have commented on the site access design proposals at various stages and comments have been incorporated in the Stage 4 site layout by Landscape Architects Fenton & Reece.

2.2 Existing Constraints

There are a number of existing civil engineering constraints that have been identified across the site that require consideration in any future design development. Key include (but are not limited to) the following:

- » Existing highway - Levels and construction of new access road serving development to tie into that of the existing highway.
- » Existing drainage - Levels of proposed sewers serving the development to tie into levels of existing sewer network at applicable locations.
- » Existing boundaries - Levels at site boundaries to be maintained and proposed buffer zones to be adhered to.
- » Existing structures - Demolition of existing school and other relevant structure to be phased.
- » Existing utilities - Existing utilities identified in GPR survey to be taken into careful consideration during the design and construction of the scheme. Existing utilities may be in excess of those identified during GPR survey exercise. HSE publication HSG47 to be adhered in order to avoid contact with underground services.

2.3 Flood Risk

In accordance with the Welsh Government's Technical Advice Note (TAN)¹⁵, a development of this nature (i.e. school / childcare establishment) is categorised as a "Highly Vulnerable Development". National Resources Wales (NRW) Development Advice Map shows the site lies wholly outside of any flood zone therefore has no recorded flooding events associated with it, which is considered as little to no risk from flooding. A small extent of Zone 2 surface water flooding has been recorded within the existing staff car park however it is understood that this is due to the area being a low point and the existing drainage system likely silted and blocked therefore not in effective operation. The new drainage scheme implemented under the redevelopment works will seek to eradicate this extent of surface water flooding by ensuring all impermeable areas drain to nearby SuDS features and infiltrate to ground.

The risk of flooding from uncontrolled surface water runoff, caused by the maximum soil infiltration rate or storage capacity being reached, local drainage failure, or inadequate existing drainage off-site, must also be considered. The main site area is shown generally to be at little to no risk based on the NRW flood risk from surface water and small watercourse mapping with no surface water flow paths shown to pass through the site. The potential effects of climate change could increase the general frequency, depth, and extent of surface water flooding in the Port Talbot area however considering that, currently, the area surrounding the site also has little or no risk from flooding, the risk of surface water flooding is considered to be low post development. The surface water drainage design will, in due course, be designed to accommodate the 100yr + 40%CC event in order to ensure the development's drainage capabilities are sufficient for the coming decades of use.

A robust sustainable surface water drainage strategy has been provided to support the design of the development, presenting the on-site surface water drainage infrastructure to protect the site from flooding. Additionally, this considers the impact on flood risk to land and property outside of the development boundary. New surface water drainage infrastructure has been designed so that the development does not increase the risk of flooding elsewhere but rather seeks to reduce demand on the surrounding sewer networks by removing surface water and discharging to ground via infiltration instead.

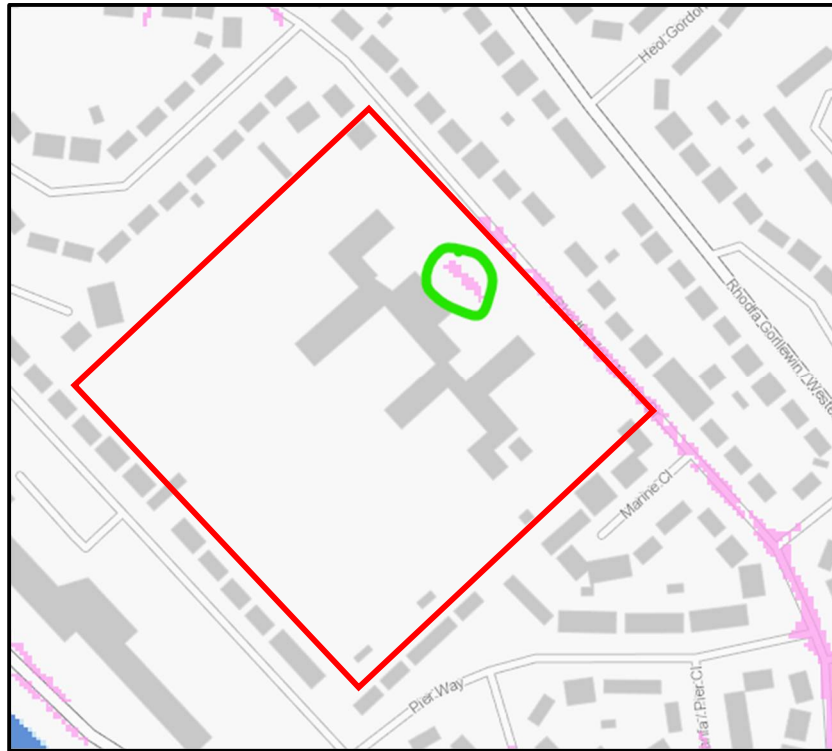


Figure 3 - Extract of NRW Flood Risk Assessment Wales Map (Accessed 25/06/2024)



Figure 4 - Extract of NRW Flood Map for Planning (Accessed 25/06/2024)

2.3.1 Drainage Arrangements

Following the below ground services GPR survey by Gwalia Surveyors (3351-U-09 dated 30/04/24) a specification for further CCTV survey works has been produced in order to further understand levels and the condition of sewer assets likely to be reused for the new development. Refer to CCTV Specification Plan (drawing No. 26CC04-HYD-XX-XX-DR-C-0300_PO1). Reference should be made to the original drawings and reports for full details.

Sewers serving the existing school are to remain operational during the construction of the new school and their abandonment / removal (where applicable) is to be phased in line with the demolition of the existing school.

2.4 Existing Drainage

2.4.1 Public Sewers

Existing 225mm dia. (9 inch) DCWW adopted combined sewers have been located in the area surrounding the site which generally drain to the northeast. See below for extract of adopted sewer map.

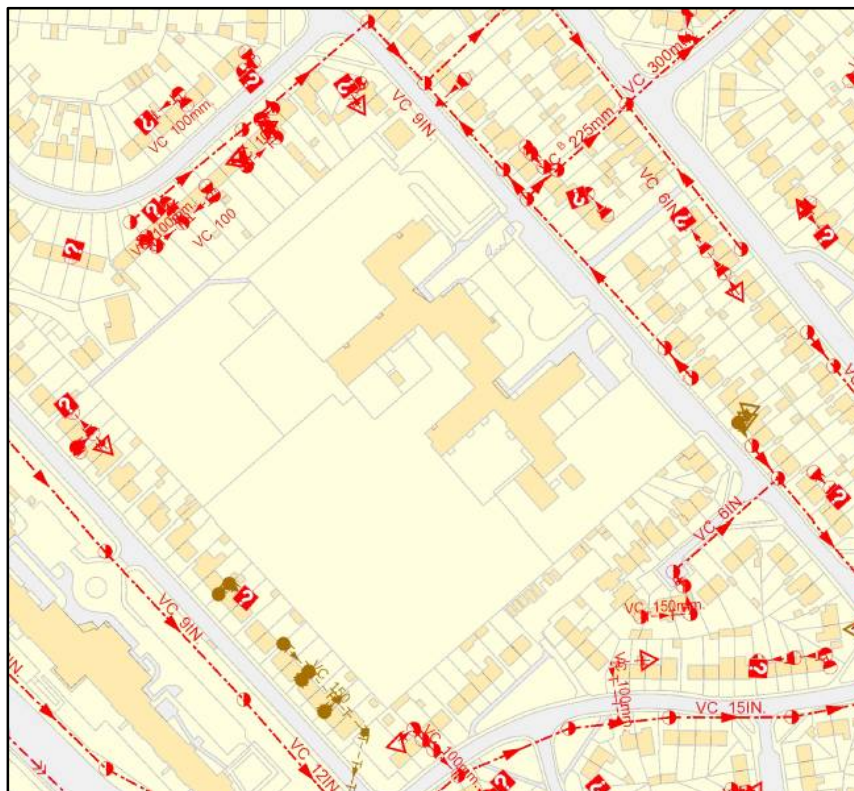


Figure 5 - Extract of DCWW Asset Record Mapping (09/10/2018)

It is assumed that all public sewers have associated no build easements imposed by DCWW, however this does not affect the redevelopment proposals as existing onsite private sewers are to be utilised to convey foul flow from the new school building to the public combined sewer network as per the existing arrangement.

2.4.2 Highway Drainage

2.4.2.1 Marine Drive

- » Several gulleys are located within the adopted highway fronting the existing school along Marine Drive. It is assumed that these gulleys discharge into the existing DCWW combined sewer however further investigation would be required in order to prove this.



Figure 6 - Marine Drive (July 2022)

2.4.3 Surface Water

The existing surface water network serving the existing school is a traditional gravity network comprising of 100mm & 150mm diameter sewers of unknown material. As indicated in Gwalia Surveyors drawing No. 3351-U-09 for full Utilities Survey plan, ultimate discharge of the existing surface water network is assumed to be via the combined sewer network and soakaways across the site.

2.4.4 Foul Water

The existing foul water network serving the existing school is a traditional gravity network comprising of 100mm & 150mm diameter sewers of unknown material. The general direction of flow is to the northeast (see Gwalia Surveyors drawing No. 3351-U-09 for full Utilities Survey plan). The future CCTV survey will seek to confirm the condition, material and extent of existing sewers on site within the range specified in 26CC04-HYD-XX-XX-DR-C-0300_PO1 - CCTV Survey Specification Plan.

2.4.5 Combined

The existing combined network serving the existing school is a traditional gravity network comprising of 225mm diameter sewers of unknown material. The general direction of flow is to the northeast (see Gwalia Surveyors drawing No. 3351-U-09 for full Utilities Survey plan). The future CCTV survey will seek to confirm the condition, material and extent of existing sewers on site within the range specified in drawing 26CC04-HYD-XX-XX-DR-C-0300_PO1 - CCTV Survey Specification Plan.

3. Proposed Development

3.1 Development Proposals

The site is currently brownfield in nature, on the site of the existing Rhosafan Primary School.

3.1.1 Proposed Level Strategy

The site is relatively flat and somewhat level at all 4 boundaries; therefore, the proposed strategy involves placing the building FFL at 11.300m AOD (some 150mm higher than the existing building) and introducing suitable gradients in order for surface water runoff to drain to adjacent SuDS features for attenuation, treatment and infiltration to ground.

3.1.2 Earthworks

The site will require an initial vegetation and topsoil strip, predicted to be 200mm and, while this material may be reused in general areas of soft landscaping, SuDS features will require imported soil to a precise engineering specification to comply with national standards. The existing soil bunds will also need to be excavated and worked into the main site levelling exercise.

A cut & fill analysis, separated out into 3 required construction phases, has been carried out in RIBA Stage 3 based on indicative construction depths and has determined a need for additional material to be imported to the site during construction, albeit minimal as a net balance has been sought throughout the setting of external levels. During RIBA Stage 4, specialist geotechnical assessment and design must be sought on the suitability of the site-won material for reuse and for a Materials Management Plan and Earthworks Specification for the reuse of site arisings.

Imported aggregates for use in pavements, roads, hardstanding and temporary platforms should target a minimum recycled content of 30% where possible and permitted.

3.2 Surface Water Drainage

As the site is over 100m² and is a new development, the proposed surface water drainage will be subject to SAB (Sustainable Drainage Systems Approval Body) approval by the corresponding local authority (NPT) and will therefore be designed in accordance with the statutory national standards for sustainable drainage systems outlined in Schedule 3 of the Flood & Water Management Act 2010.

The statutory standards set out basic principles that SuDS should meet, these include:

- » Managing water on or as close to the surface and as close to the source of the runoff as possible;
- » Treat rainfall as a valuable resource;
- » Ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;
- » Manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;
- » Take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;
- » Use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development);
- » Maximise the delivery of benefits for amenity and biodiversity;
- » Seek to make the best use of available land through multifunctional usage of public spaces and the public realm;
- » Perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;
- » Avoid the need for pumping where possible;
- » Be affordable, taking into account both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system.

The statutory standards contain six technical standards that the SuDS system needs to conform with to be deemed acceptable by the SAB, these standards are:

- » Standard S1 - Surface water runoff destination;
- » Standard S2 - Surface water runoff hydraulic control;
- » Standard S3 - Water quality;
- » Standard S4 - Amenity;
- » Standard S5 - Biodiversity;
- » Standard S6 – Design of drainage for Construction, Operation and Maintenance and Structural Integrity

3.2.1 Target Strategy

The site is proposed to contain a wide coverage of soft SuDS features to receive, intercept, treat, convey and store surface water runoff. These have been integrated into the site layout design and the landscape scheme, without adversely affecting the building layout and the access requirements.

The SuDS features that are proposed across the site exist in various forms. These include:

- » Partial green roof to the school building
- » Raingardens and bio-retention areas within the winter garden and externally across the site
- » Permeable block paving parking bays
- » Underground cellular crate soakaways
- » Porous asphalt MUGA areas

While not all SuDS features perform a surface water attenuation storage role, they are present in the location shown for interception and water quality purposes. Without them the SuDS scheme would not be deemed compliant and would likely not achieve SAB approval.

3.2.2 S1 - Surface Water Run-off Destination

In determining a suitable methodology for disposal of surface water flows from this development, it is necessary to explore the technical options outlined under Standard S1 of the SDSSW 2018 document published by Welsh Government. This states that disposal should be made through the hierarchical approach which are, in order of preference; surface water runoff collected for use, infiltration methods, discharge to surface water body, discharge to a surface water sewer, highway sewer or another drainage system and finally discharge to a combined sewer. Each of these options are considered below.

3.2.2.1 Collected for use

Rainwater harvesting not currently considered due to unviable yield ratio.

3.2.2.2 Infiltration Methods

The current design shows viable infiltration due to ground comprising mainly of blown sands. Due to the size of the site, infiltration testing has been taken at 12 locations in order to provide better accuracy when producing hydraulic calculations for features that are to infiltrate to ground. A factor of safety of 2 has been applied to all infiltrating features in order to ensure a robust design has been provided. Refer to Desktop Study & Ground Investigation report by Tetra Tech (784-B068544).

3.2.2.3 Discharge to Surface Water Body

Based on the above information there is no need to consider discharging into a public surface water body.

3.2.2.4 Discharge to Surface Water Sewer

Based on the above information there is no need to consider discharging into a public surface water sewer system. The proposals seek to remove all existing areas of surface water currently draining to the combined sewer and discharge to ground thus reducing the demand on the wider drainage network.

3.2.2.5 Discharge to Combined Sewer

Based on the above information there is no need to consider discharging into a public combined sewer system. The proposals seek to remove all existing areas of surface water currently draining to the combined sewer and discharge to ground thus reducing the demand on the wider drainage network.

3.2.3 S2 - Surface Water Run-off Hydraulic Control

3.2.3.1 Runoff rate control

As previously mentioned, the current proposals include infiltration as a means of discharging surface water and therefore a reduction to runoff rates is not considered relevant. The rates at which surface water will discharge to ground will be dictated by corresponding infiltration rates provided following onsite testing. Refer to Desktop Study & Ground Investigation report by Tetra Tech (784-B068544).

3.2.3.2 Runoff volume control

The volume of runoff from the site can be as damaging to downstream flood risk as peak flow rates. It is therefore necessary to ensure that volume of runoff discharged from the site during extreme events is also controlled. Where possible, the volume of runoff from the development area should not exceed the volume of runoff from the equivalent area in its greenfield condition for the same rainfall event.

For previously developed sites, the surface water management system should be designed so the volume of surface water runoff discharged from the site for the 1:100-year, 6 hour event is kept as close to greenfield conditions as possible.

3.2.3.3 Interception of runoff

Further to the above, increased vegetated surface areas to SuDS features has been sought to be provided in order to deliver interception as far as reasonably practicable considering the spatial constraints of the site and the requirements for the development to make use of available external space for sports, learning, and play. This aims to satisfy the criteria of the prevention of the first 5mm of rainfall from leaving site. An interception plan in reference to the school building only has been developed (see drawing No. 26CC04-HYD-52-XX-D-CS-4100).

Typically, one fifth of all proposed impermeable areas require an open SuDS feature as surface to provide the required level of interception. As such design development is to be undertaken with the Landscape Architect and Architect to see how the necessary features and drainage regimes can be worked into the site design where any areas of hardstanding that are identified as requiring further provision can be addressed. Where possible, areas of hardstanding, footpaths and play areas etc. are to be permeable so they infiltrate into the ground and in other impermeable surfaces (such as the access road) will drain overland to bioretention areas/ permeable paving for treatment and attenuation prior to discharging to ground. A extensive array of sedum green roof will contribute to interception of rainfall landing on the new roof and, in addition to treatment, will present attenuation and flow restriction benefits.

3.2.4 S3 - Water Quality

This standard requires treatment of surface water runoff to prevent negative impacts on the receiving water quality and / or to protect downstream drainage systems including sewers. The only exception to this standard is where drainage connects directly to a combined sewer, where the quality requirements are limited to preventing the discharge of oil and sediments to the sewer system.

The management trains to be used on the project have been assessed using the Simple Index Assessment (SIA) tool available publicly (<http://www.ukSuDS.com/drainage-calculation-tools/water-quality-assessment-for-SuDS-developments>) which is built around the principles for simple assessment outlined in CIRIA C753 to assess the levels of treatment provided by the proposals. The simple index approach indicates that all surface water will receive a sufficient amount of pollution mitigation. Refer to 26CC04-HYD-50-XX-D-CS-4700 - Water Quality Plan.

Planting within the SuDS features should form part of the water quality strategy. SuDS components like bioretention features & permeable paving provide water quality improvements by reducing sediment and contaminants from runoff either through settlement or biological breakdown of pollutants as part of their interceptor function, so only robust and tolerant species of planting should be specified. Once these species establish this will decrease the flow rate of water travelling through and filter pollutants and contaminants before entering the downstream network.

3.2.5 S4 - Amenity

Standard S4 addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits.

The features in the form of Bioretention systems and green roofs have been provided, based on its natural form that mimics natural landscapes. These SuDS features will be planted with a planting regime, with wildflower grasses and native shrub planting to the surrounding areas, to create an attractive environment for the building users and visitors. Seating has been provided outside the front of the building, to provide seating areas for users or visitors to improve the health and well-being of the users. Wider amenity benefits include improvements in air quality and carbon sequestration around the development through the planting of trees and shrubs in and around the SuDS features.

A copy of the landscaping plans and details for the site can be found in the supporting documents within the planning and full SAB application packs.

3.2.6 S5 - Biodiversity

Standard S5 addresses the design of SuDS to ensure, where possible, they create ecologically rich green corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together.

The SuDS scheme biodiversity strategy should revolve around the creation of significant and varied habitat to increase the overall biodiversity of the site and ecological value. The inclusion of plant species that will enhance the general eco system and simultaneously act as a water filtration system to clean pollutants and contaminants should be used where possible.

For planting schedule refer to landscape architect's information provided in full SAB application pack.

The plant species selected should be both locally contextual and appropriate for the varied habitat zones including primary characteristics that shall ensure:

- » Good soil binding and filtration species
- » Minimised erosion
- » Improved filtration via dense root and stem species
- » Tolerance to seasonal variations including droughts and inundations
- » Good suspended solids retention
- » Pollutant tolerant
- » Emergent and pioneering species for natural ecological colonisation
- » The creation of diverse, self-sustaining and resilient ecosystems for high species biodiversity
- » Support for local and regional habitat strategies

3.2.7 S6 - Design of Drainage for Construction and Maintenance and Structural Integrity

All surface water drainage is to be designed and constructed in accordance with Sewer for Adoption 7th Edition, the CIRIA SuDS Manual C753 and CDM 2015 Regulations. Any risks associated with the surface water drainage system will be identified and sought to be designed out during the detailed design in line with best practice. Any residual risks associated with the design will then be assessed by the contractor who should seek to implement suitable control methods.

For surface water drainage systems to be managed by a suitable adopting authority, a maintenance plan must be set out and approved prior to the adoption of the system. The entire surface water drainage network including all SuDS features, pipework, chambers etc will be offered for adoption by Neath Port Talbot SAB. Similarly, they will adopt the maintenance regime for the components / features they are responsible for post development.

4. Statutory Approvals

4.1 Water Authority - Dwr Cymru Welsh Water (DCWW)

Due to utilising infiltration as a means of surface water discharge, only the foul flows arising from the new school building will need to be connected into the existing private sewer network which discharges to the existing adopted DCWW combined sewer along Marine Drive to the northeast of the site. A comparison between the existing and proposed flows was submitted to DCWW during the PAC process who have subsequently responded confirming no issue with the additional foul flows connecting to the public combined sewer indirectly via the existing foul drainage on site. A copy of this correspondence can be found within the full SAB application pack.

4.1.1 Sewer Position & Easements

Position of existing private sewers on site previously confirmed by Gwalia Surveyors' GPR survey and future CCTV survey is to be undertaken to further understand condition and extent of those existing private sewers. No currently known DCWW adopted sewers are present on the site therefore easements are not applicable.

4.1.2 Pre-Planning Advice (PPA)

Previous meetings have been held with Neath Port Talbot SAB during RIBA Stage 2 to discuss the access from the existing highway and the general SuDs strategy. Regarding the surface water SuDs strategy, no major concern from NPT was brought up. General acceptance of the SuDs strategy i.e. draining to permeable paving for the car parking bays, bioretention areas are around the site, a general comment to reduce the amount of underground pipework and crates was made and to provide as much above ground drainage as possible. These comments have been noted and the current design has been produced with these in mind.

4.1.3 Section Agreements

Works associated with new connections or amendments to the existing public sewer network require water authority consent. As such:

- » Any connection to a public sewer is subject to confirmation of available downstream capacity and a Section 106 agreement with DCWW - the detail of which should also include any proposed changes to the existing chamber to accept new connections although not anticipated as required for this scheme.
- » A Section 104 agreement may also be required to any drainage that serves more than one curtilage although not anticipated as required for this scheme.
- » A Section 185 agreement will be required in order to divert or remove any existing public sewers although not anticipated as required for this scheme.

4.2 SuDS Approval Body

The proposed development is subject to the Schedule 3 requirements and therefore a surface water drainage strategy incorporating SuDS is required which will also be subject to full SAB approval. The role of the SAB is also to adopt SuDS features and maintain them for the lifetime of the development. Although serving a single development, the entire surface water network is to be adopted by NPT as the school is the responsibility of the local authority.

5. Conclusions

The aim of the proposed SuDS strategy is to mimic the natural catchment processes as closely as possible whilst ensuring the design is in accordance with the Welsh Government's statutory national standards for sustainable drainage systems, the local authority's SAB requirements and CIRIA's C753 SuDS Manual as well as meeting the requirements of Building Regulations, Document H.

The proposed drainage strategy will aim to maximise the amenity and biodiversity benefits of the site. The proposed SuDS components across the site align with the SAB standards. All SuDS components being proposed have been considered due to their performance, design life and future maintenance requirements. As part of the proposals a scheme of SuDS is proposed which will provide interception, water quality, flow reduction, amenity and biodiversity benefits.

An extensive set of design drawings are included with this report to support the full SAB application.