



DRAINAGE STRATEGY

Dowlais Primary School Flying Start

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INTRODUCTION

This drainage strategy has been commissioned by Blaenau Gwent County Borough Council to accompany a SAB application for a single storey classroom addition to Dowlais Primary School, Merthyr Tydfil.

POLICY CONTEXT

The drainage strategy will be based on the principles of sustainable drainage systems (SuDS) in order to meet the Welsh Government Statutory Standards for Sustainable Drainage Systems and the requirements of the SAB (Schedule 3 to the Flood and Water Management Act 2010).

The strategy has taken account of the Merthyr Tydfil County Borough Council Local Flood Risk Management Strategy (2013) and the Merthyr Tydfil Replacement Local Development Plan 2016 – 2031. The SuDS proposed will reduce run-off rates to reduce the risk of downstream flooding, improve amenity and biodiversity.

DEVELOPMENT PROPOSALS

The development will comprise of a single story classroom with external hardstanding and landscaping. The classroom building will be located to the north of the school site and the building will not be adjoined to the existing school building.

SITE LOCATION

The site is located within the playing fields of Dowlais Primary School, Merthyr Tydfil (fig. 1). The proposed extension will be positioned to the north of the existing school building. A playground will be constructed immediately to the west of the proposed extension (fig. 2).

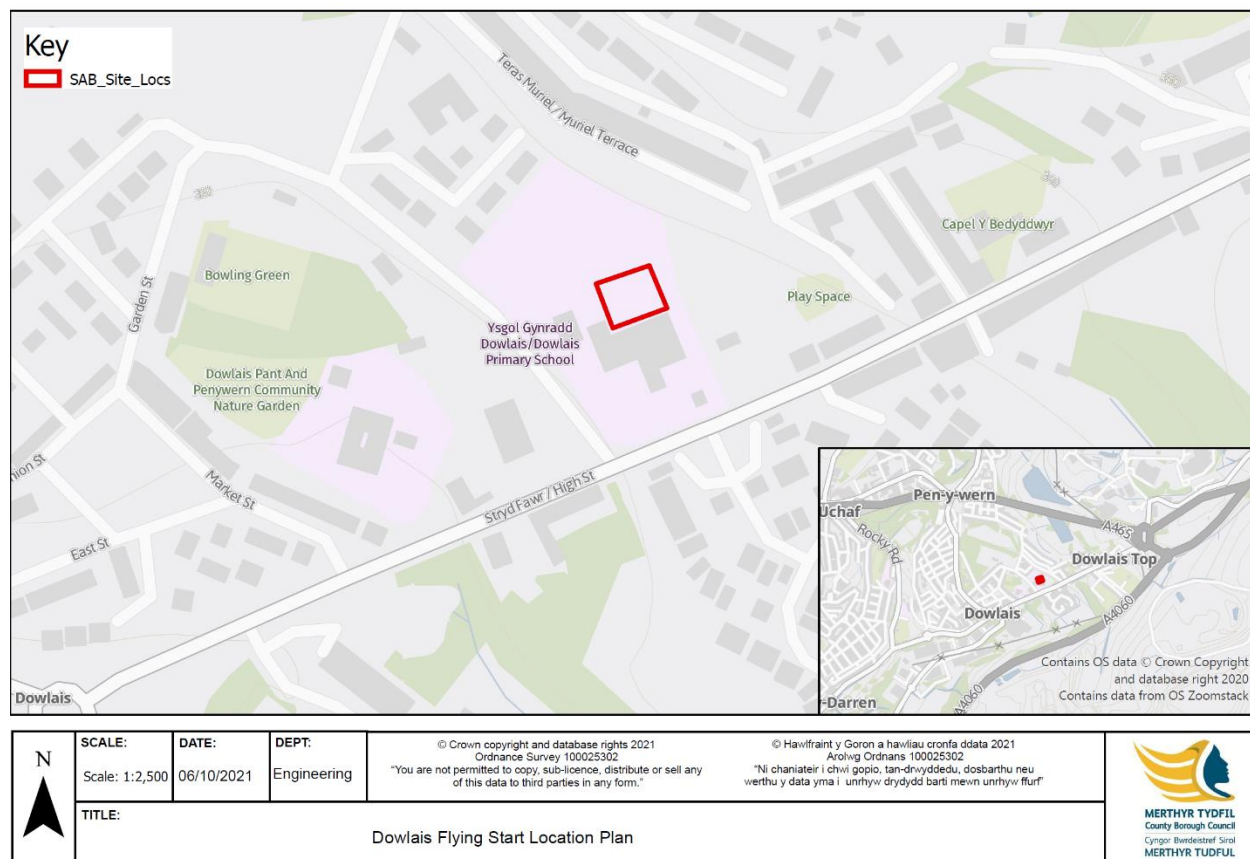


Figure 1: Site location map with inset.

1.0 BASELINE CONDITIONS

EXISTING HYDROLOGY & DRAINAGE

The only surface water feature in the vicinity of the site is a drain that lies approximately 250m east of the site.

The existing site is an area of the school playing fields and therefore formed completely of amenity grassland. The playing field is up a steep bank from the school and currently runoff is likely to collect on the path between the base of the bank and the school building which drains to a channel drain.

FLOOD RISK

No areas of the site are shown to be at risk of flooding from Rivers or Surface Water & Small Watercourses. Areas of the path around the existing school building at the base of the bank and the yard to the front of the school are shown to have a 'high' risk of flooding from Surface Water & Small

Watercourses. Despite these areas of risk being located beyond the development boundary, they are downstream of the proposed development and therefore the proposed SuDS design will avoid increasing the runoff to these areas.

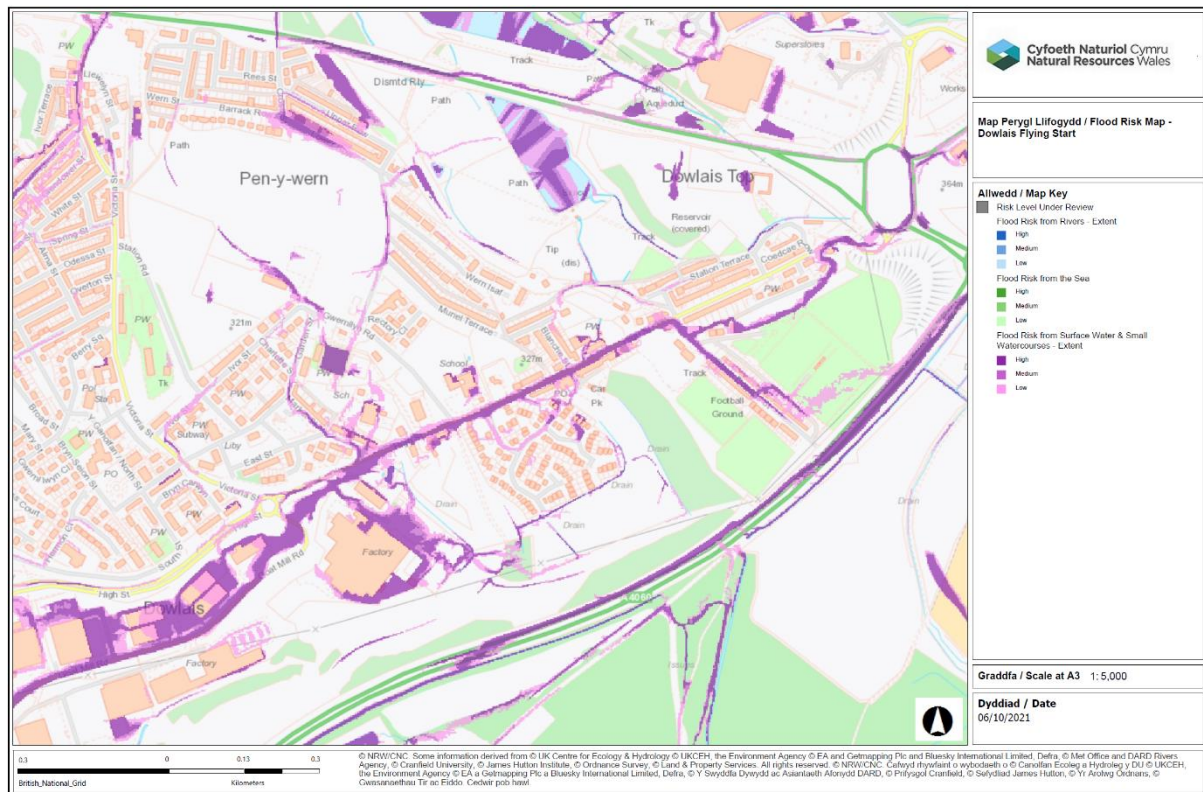


Figure 2: Flood risk from Rivers and Surface Water & Small Watercourses (NRW, 2021)

Both boreholes and trial holes were conducted as part of site investigations carried out by Earth Science Partnership. It is considered that a perched groundwater body is present at approximately 2m depth within the glacial soils and a deeper groundwater body is present in the Lower Coal Measures bedrock at approximately 10m bgl (ref.: ESP.7485d.3402).

2.0 SUDS STRATEGY

EXISTING SURFACE WATER DISCHARGE

The proposed development has a site area of 0.057ha, with the entire area being permeable as it is formed of amenity grassland. The existing run-off characteristics of the site are assumed to be greenfield. The proposed classroom building, hardstanding playground and paths will add 445m² of impermeable area to the site.

The greenfield run-off rates for the existing site were determined through rural runoff calculations using ICP SuDS methodology and using uksuds greenfield runoff estimation tool (IH124 method). The greenfield runoff rates for the site are listed in table 1 below.

Method	QBAR	Q (1 year)	Q (30 year)	Q (100 year)
ICP SuDS (0.057ha)	0.5	0.4	0.9	1.1
IH124 (0.1ha)	1.53	1.34	2.72	3.33

Table 1: Greenfield runoff rates

Runoff from the site currently infiltrates within the amenity grassland. Due to the ground conditions the infiltration is limited and the site is often waterlogged. Surface water that is unable to infiltrate will run off the grass towards the school building and drain to gullies within the existing concrete path. These gullies are connected to the school's private surface water drainage system which outfalls to a combined DCWW sewer in Dowlais High Street.

PROPOSED DRAINAGE STRATEGY

Standard S1 of the Sustainable Drainage Standards for Wales is a hierarchy standard and discharge from a site must make use of the highest possible priority level before moving down the list. Exception criteria need to be demonstrated if higher priority levels cannot be met. The levels are detailed in figure 4.

S1 Surface water runoff destination

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Figure 4: Standard 1 Priority Levels, Sustainable Drainage Standards for Wales

As the development is a school extension with the proposed use as classrooms there is very limited foreseeable demand for non-potable water on the site. This results in rainwater harvesting not being a cost-effective part of the solution for managing surface water runoff on the site. The raingarden proposed will provide direct rainwater collection for use by the plants in the raingarden and reduce the demand on potable water supply for watering the plants. Priority Level 1 unsuitable, move to Level 2.

Infiltration drainage is not practicable on the site due the stability of the soils and the lack of permeability of the soil for disposing of runoff. Infiltration testing was conducted on site (report ref.: ESP.7485d.3402) but the majority of the trial pits collapsed and remaining pits experienced rapidly decreasing infiltration with depth. SuDS features utilised on the site will be unlined but positively drained, this encourages losses but mitigates any flood risk from minimal infiltration. Priority Level 2 unsuitable, move to Level 3.

The closest surface water body to the site is approximately 175m to the north east and therefore not practical to discharge to for a development of this size. Priority Level 3 impracticable, move to Level 4.

The most appropriate discharge point from the site is a private surface water sewer located within 15m of the proposed classroom building. It is possible to discharge to this sewer via gravity from the proposed SuDS system.

Given the site characteristics and project constraints the most appropriate SuDS for the development are two raingarden areas to manage runoff from the building roof and the hardstanding play area. The runoff will be discharged to a private surface water sewer via a flow control. A proposed layout for the SuDS features is provided in drawing no. MTD_2102_01.

Raingardens

The raingarden situated to the north of the site provides source control for the proposed classroom building. Runoff from the building will be directed to the rain garden via rainwater pipes and surface channels where necessary. Some runoff from the asphalt path around the building will also reach the raingarden. The raingarden is approximately 77m² and will contain 350mm of open graded aggregate and 400mm of engineered soil with min. 50% sand content. The surface of the raingarden will be constructed with an accentuated dish up to 250mm deep at the centre. This will create a large ponding area to provide additional storage for extreme events. Planting in the raingarden will provide interception and generate losses through evapotranspiration in addition to water quality improvement. The raingarden will provide biodiversity benefit with a focus on native and architectural species. The subbase of the raingarden will be linked via a pipe to the downstream raingarden at the south of the site.

The raingarden located to the south of the site will provide source control for the asphalt play area and will manage outfalls from the raingarden to the north and receive some runoff from the asphalt path around the building. A cross-fall will be created on the surface of the play area allowing runoff to flow laterally onto the surface of the raingarden. Outfalls from the permeable paving and first raingarden will be connected to the subbase. The raingarden is approximately 50m² and will contain 350mm of open graded aggregate and 400mm of engineered soil with min. 50% sand content. The surface of the raingarden will be constructed with an accentuated dish up to 200mm deep at the centre. This will create a large ponding area to provide additional storage for extreme events.

Run-off Rates

The proposed runoff rate from the site for the 1 in 100 year + 30% climate change event will total 0.7l/s. Table 2 provides a comparison of existing and proposed runoff rates for the site. Detailed calculations are provided in supporting documents.

Return Period	Existing rate (l/s)	Proposed rate (l/s)
1 in 1	0.4	0.6
1 in 30	0.9	0.7
1 in 100	1.1	0.7
1 in 100 + 30%	-	0.7

Table 2: Comparison of greenfield and proposed runoff rates for return periods.

A model was constructed in Infodrainage to provide a final discharge rate for the site for various return periods and estimate storage requirements. Detailed calculations are provided in supporting documents.

Outfall and Exceedance

The site will outfall to the existing private surface water drainage system via a new chamber with an orifice flow control. Outfalls from the raingarden to the north will be routed to the southern raingarden before outfalling to the flow control chamber. The existing drainage system is in a state of disrepair and will require works to fix the lines prior to connections being made from the new development. Discharge rates from the proposed development have been designed to very low in order to not overload the private surface water system.

The SuDS strategy has been designed for there to be no flooding on the site up to the 1 in 100 year event (including a climate change allowance). Due to the existing falls on the site, exceedance will flow to the perimeter path of the existing school building which contains a number of gullies to manage runoff reaching this area. As the level differences are fairly extreme it is not possible to improve the existing runoff regime, but due to increased interception and storage offered by the rain gardens the development will not exasperate existing conditions.

MATERIAL SPECIFICATIONS

Table 3 provides details for the materials proposed throughout the SuDS strategy. For full specifications relating to proprietary products please see supporting documents.

Item	Description	Drawing ref.
Raingardens		
Aggregate	4-20mm crushed aggregate to BS EN 13242	MTD_2102_03
Soil	Free draining sandy loam topsoil (see section 6.0)	MTD_2102_03
Underdrain	110mm perforated pipe	MTD_2102_03
Linking pipe	110mm non perforated drainage pipe	MTD_2102_02
Geotextile	300gsm hessian	MTD_2102_02
Liner	1mm impermeable membrane	MTD_2102_02
Inlets	Althon Swale Inlet Headwall with grille	MTD_2102_03
Inspection chamber	450mm inspection chamber 110mm inlet/outlet with cover (A15 class)	MTD_2102_05
Orifice chamber	450mm chamber with orifice plate with 30mm opening. B125 class cover	MTD_2102_03
Filter drain		
Aggregate	4-20mm crushed aggregate to BS EN 13242	MTD_2102_03
Underdrain	150mm perforated pipe	MTD_2102_03
Liner	1mm impermeable membrane	MTD_2102_03

Table 3: Material specifications

3.0 WATER QUALITY

SIMPLE INDEX APPROACH

In line with the The SuDS Manual C753 (CIRIA, 2015) Table 4.3, the simple index approach for discharge to surface waters will be used to assess the treatment suitability of the SuDS features proposed. Table 26.2 of The SuDS Manual indicates that a land use of 'Other Roofs' has a pollution hazard level of 'low'. The upper limit of the hazard indices for 'low' pollution hazard level have been used to account for the footpaths and play area. The mitigation indices correlating to this pollution hazard level and SuDS features proposed for the site are outlined below.

It should be noted that the mitigation of indices of SuDS in series should be combined as followed:

Total SuDS mitigation = mitigation index + 0.5 (mitigation index)

This accounts for the reduction in performance of secondary or tertiary SuDS components.

	Mitigation Indices		
Source PHL	TSS	Metals	Hydrocarbons
Low	0.5	0.4	0.4
Proposed SuDS			
Raingardens	0.8	0.8	0.8
Sufficient Mitigation	✓	✓	✓
Additional Mitigation	N/A		

Table 4: Outputs from simple index approach

4.0 MANAGEMENT & MAINTENANCE

MANAGEMENT

The SuDS will not be adopted by Merthyr Council County Borough Council as the site is exempt as a 'single property'. The SuDS will be managed by Dowlais Primary School and maintenance will be organised accordingly.

MAINTENANCE

The SuDS features will be maintained in accordance with guidance in the CIRIA SuDS Manual and current best practice. Table 5 provides details of the maintenance requirements for each SuDS feature, the frequency of the maintenance activity and the resources required.

SuDS Feature	Required Action	Frequency	Resources
Raingardens	Inspect infiltration surfaces for silting and ponding	Quarterly	Visual inspection by 1 competent person
	Check operation of outfall by inspection of flows after rain	In first month, then annually	Visual inspection by 1 competent person
	Assess plants for disease infection, poor growth, invasive species etc. and replace as necessary	Quarterly	Visual inspection by 1 competent person; hand tools if replanting is necessary
	Inspect inlets, outlets and overflows for blockages	Quarterly	Visual inspection by 1 competent person
	Remove litter, surface debris and weeds	Quarterly	Litter picking apparatus; hand tools for weeding; 1 person
	Replace any plants to maintain planting density	As required	Hand tools if replanting is necessary

	Infill any holes or scour in the filter medium, improve erosion protection if required	As required	Bioretention soil; 1 person
Filter Drain	Remove litter and debris from filter drain surface and access chambers	Monthly	Litter picking apparatus; 1 person
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly	Visual inspection by 1 competent person
	Inspect perforated pipework for silt accumulation and establish appropriate silt removal frequencies	Six monthly	Visual inspection by 1 competent person
	Clear pipework of blockages	As required	1 drainage professional

Table 5: Maintenance activities, frequencies and resources for all SuDS elements

5.0 LANDSCAPE PLAN

PRECEDENT IMAGES



PLANTING

Majority native species have been selected for the rain gardens in order to create a sympathetic scheme. The sides and some of the base areas of the rain garden will be planted with a relatively low density so that storage capacity at the surface is maintained. A number of compact and clump forming species have been selected to help with this and to keep the area looking neat and intentional. The species will be appropriate for a school setting and will be low maintenance. Plants at the base of the rain garden have been selected to be those that prefer wetter conditions to the ones further up the side slopes.

Planting must be carried out at an appropriate time of year under suitable weather conditions. Any proposed substitutions including species, cultivar, pot size or other specification, must be approved by landscape architect prior to planting. Delivered plants to be approved by landscape architect/designer on site prior to planting. Please see MTD_2102_04 for planting locations.

Planting Palette Raingardens			
Common/Latin Name	Photo	Attributes	Maintenance
Dusky cranesbill/ <i>Geranium phaeum</i>		• Attractive to pollinators and birds • Clump forming	Cut back after flowering
Water avens/ <i>Geum rivale</i>		• Attractive flowers • Late flowering • Native	Deadhead after flowering
Snowy woodrush/ <i>Luzula nivea</i>		• Low maintenance • Architectural • Attracts pollinators	Minimal
Soft shield fern/ <i>Polystichum setiferum</i>		• Evergreen • Interesting form • Native	Minimal
Quaking grass/ <i>Briza media</i>		• Unusual form • Semi-evergreen • Native	Cut back in Spring if messy
Purple moor grass/ <i>Molinia caerulea</i>		• Native ornamental grass • Autumn interest • Architectural	Minimal

Table 6: Planting palette for raingardens

MAINTENANCE

A 12 months establishment period maintenance will be sought from the landscaping contractor.

General maintenance requirements for all planting in raingardens:

- Weed between plants regularly
- Replace any dead plants for first 12 months
- Water regularly during first 12 months to help plants establish; water during extended dry periods for lifetime of planting
- Apply light feed in early spring

SOIL

The raingardens will be filled with open graded aggregate followed by 400mm of bioretention soil. This soil must be free draining and contain a minimum of 50% sand. The saturated hydraulic conductivity (permeability) should be between 100 mm/h and 300 mm/h.

The bioretention soil shall have the following composition:

- | | |
|--|------------|
| • Sandy Loam Topsoil (BS3882:2015) | 30% |
| • Medium sand | 60% |
| • Greenwaste compost (BSI PAS-100 certified 10-20mm) | 10% |

Existing topsoil may be used to make sandy loam topsoil with clay not exceeding 15%.

6.0 INFORMATION & COMMUNICATIONS PLAN

THE SCHOOL

As the SuDS will form part of a school site, providing information and education will be a key part of the scheme.

Having SuDS within the school grounds allows the management of rainwater and the water cycle to more easily form part of learning. Making SuDS a part of education in school improves local community education around SuDS by children communicating learning to their parents. Informal maintenance could be carried out by children and teachers helping the school to be more engaged with their SuDS.

WIDER COMMUNICATION

Once the SuDS have established the raingardens and basin planting in particular will form a visually attractive part of the scheme. Using photographs of these features will help to promote the use of green SuDS in schools and feed in to wider SuDS communication and promotion in Merthyr Tydfil and surrounding boroughs.

7.0 CONSTRUCTION MANAGEMENT PLAN

KEY CONSIDERATIONS FOR SuDS

The following considerations relate specifically to the construction of SuDS features proposed for the site:

- The raingardens should be protected from any damage whilst the site is active and installed in the final stages of the scheme. Construction site runoff should not be drained through the raingardens.
- Planting, seeding and turfing should take place once construction works are completed.