WEPco | Rhondda Cynon Taf County Borough Council

RCT 3 Primaries Batch

Penygawsi Drainage Strategy Report

RH0401-ARP-01-00-RP-C-20001

Issue 1 | 14 October 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 280340

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Initial SAB Consultation

1 Introduction

The Client is promoting the re-development of an existing primary school site located in Penygawsi, Rhondda Cynon Taf. The site is currently an operational school and the proposal is to construct a new single school building with associated car parking and Multiple Use Games Area (MUGA) and demolish the existing school buildings. Ove Arup & Partners Ltd. (Arup) has been commissioned to support masterplan development, and compile the planning application and supporting technical assessments for the proposed development including a Drainage Strategy report.

This report discusses the proposed drainage strategy, taking into account the site conditions, the topography and connection points.

2 The Site

Penygawsi Primary School is currently an operational school located in Rhondda Cynon Taf, South Wales. Topographical survey of the site is contained in Appendix A.

The site is approximately 2.39 Ha in area and located within Llantrisant (centred around OS grid reference 304712,182766). The school location is shown on Figure 1.

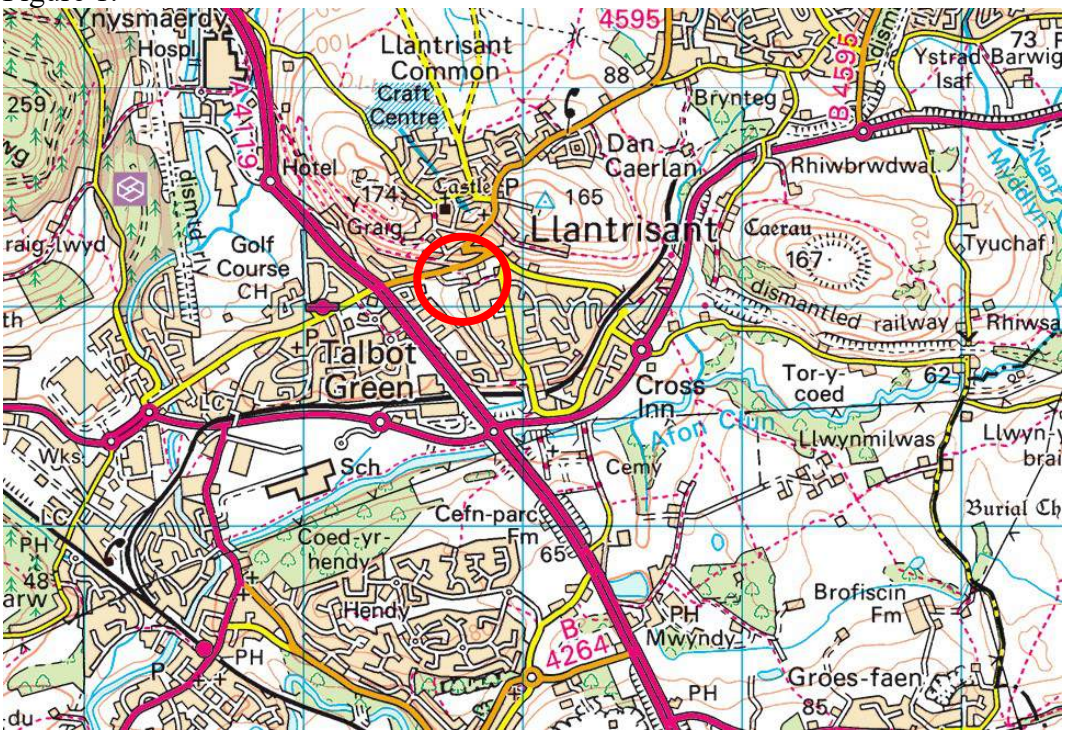


Figure 1: Site Location (circled in red) (streetmap.co.uk)

The proposed site for the new school building and associated car park and MUGA is located on the grounds of the existing school. The school site is accessed from the south via Chartist Road.

2.1.1 Site Terrain/Topography

In plan view, the site has a rectangular shape and is approximately 140m wide in the narrow plane and 170m wide in the larger plane (see Figure 2).

Figure 2: Site Location on OS Mapping

The site comprises of one main school building and a number of smaller associated smaller buildings. There are areas of asphalt surfaced playgrounds adjacent to the main school building and car parking that connects to Chartist Road through a single vehicular access point on the south western boundary.

There are a number of trees located around the site but are predominantly located around the site boundaries. There is a line of trees on the southern boundary and trees located along a portion of the eastern boundary. There is a larger wooded area on the western side of the site.

The site contours generally fall from the north east (63-64mAOD) towards the south west (54mAOD). A 1:5 slope down from the north eastern boundary extends approximately 40m to the school building and western playing field. The western playing field is approximately 80m long and 35m wide with a 1:40 slope east to west over the 35m side. A steep slope then falls down into the woodland however slopes within the wooded area are unknown as the survey company could not survey due to the dense vegetation.

The asphalt car park and playground areas are sloped gently around the school building. The slopes surrounding these areas in the landscaped areas are considerably steeper with a 1:6 slope down to the southern boundary, 1:2.5 slope to Chartist Road and a 1:5 slope down to the site entrance. The gradient of the access road is approximately 1:20 and the ground slopes at 1:12 gradient between the top half of the access road and the existing school building.

The existing school building is set at approximately 57.8mAOD and the western playing field is between 55-56mAOD.

The site is bounded on the north western, north eastern and south eastern sides by residential housing and along the southern western boundary is Chartist Road.

There are no watercourses within the site boundary and the nearest watercourse is Afon Clun, 400m south of the site.

3 Published Flood Risk Maps

The Flood Risk maps hosted on the Natural Resources Wales (NRW) web portal and the Welsh Government website have been reviewed for the site.

The maps available are:

- TAN 15 Development Advice Maps
- NRW River and Sea Flooding Maps
- NRW Surface Water Flooding Map

3.1.1 Development Advice Maps

The TAN 15 Development Advice Map (DAM) is for land use planning purposes based on NRW's extreme flood outlines and the British Geological Survey drift data which helps to determine whether a site is within a flood zone.

The new TAN15 DAM is due come into effect on 1st December. Both the current and proposed DAMs have been obtained.

The previous version TAN l5 DAM has been obtained and is shown in Figure 3.

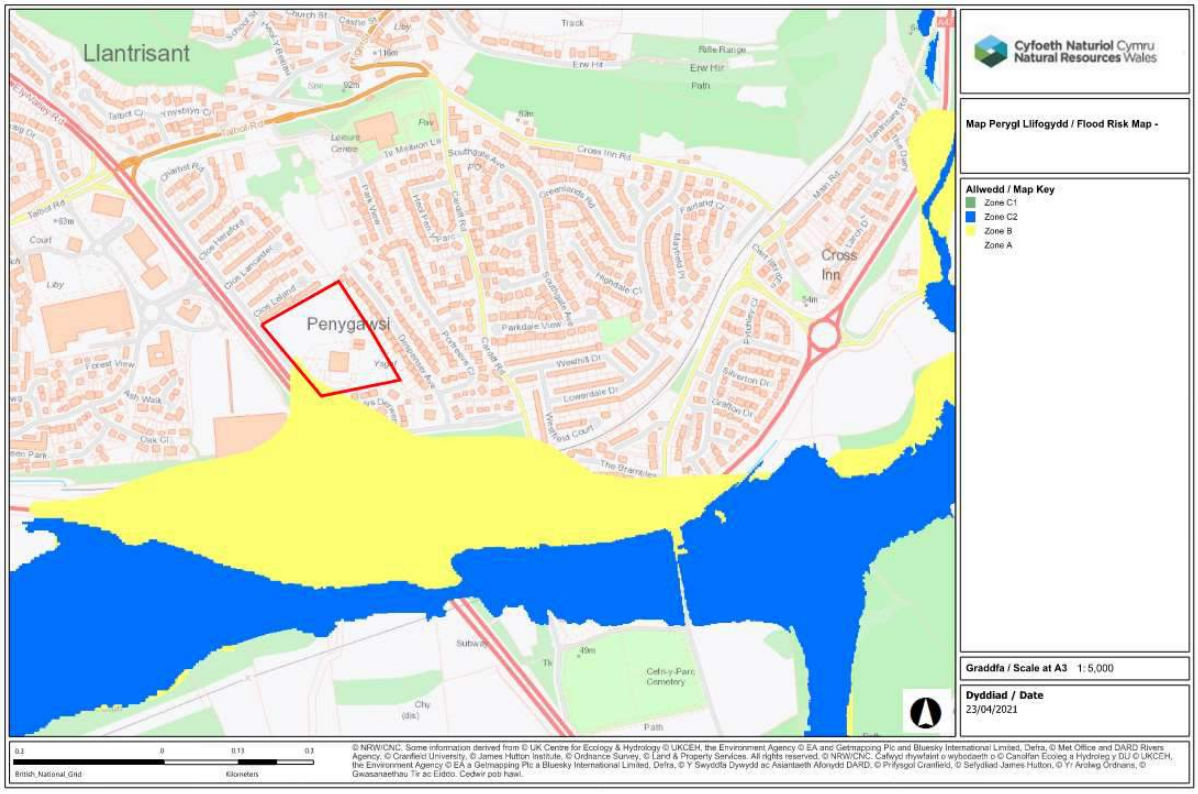


Figure 3 – Penygawsi TAN 15 Flood Map

The majority of the Penygawsi site is located in Zone A apart from the southern edge which is Zone B (areas known to have been flooded in the past evidenced by sedimentary deposits). The area of the site located in Zone B is not proposed to be developed and the current land form is a steep grassed embankment as per Figure 4. The Zone B area also covers the site entrance.

Figure 4: Embankment in Flood Zone B

The River and Sea flood zones depicted in the 1st December Flood Maps are shown in Figure 5.

Figure 5: 1st December TAN15 DAM

The 1st December TAN15 flood maps show the site is neither in River or Sea Zone 2 or 3. Based on the 1st December Flood Zone extents, and the fact that the areas in the existing Flood Zone B area is not being changed, the site does not require a Flood Consequence Assessment (FCA) for River or Sea flooding.

3.2 Fluvial, Reservoir, Coastal and Surface Water Flooding

NRW's flood maps show the sites risk from Fluvial, Reservoir or Coastal Flooding. NRW Long Term Flood Risk Maps show flood extent, depths, velocities and hazard.

Figures 6 shows that the site is located outside of the River and Sea flood risk zones.

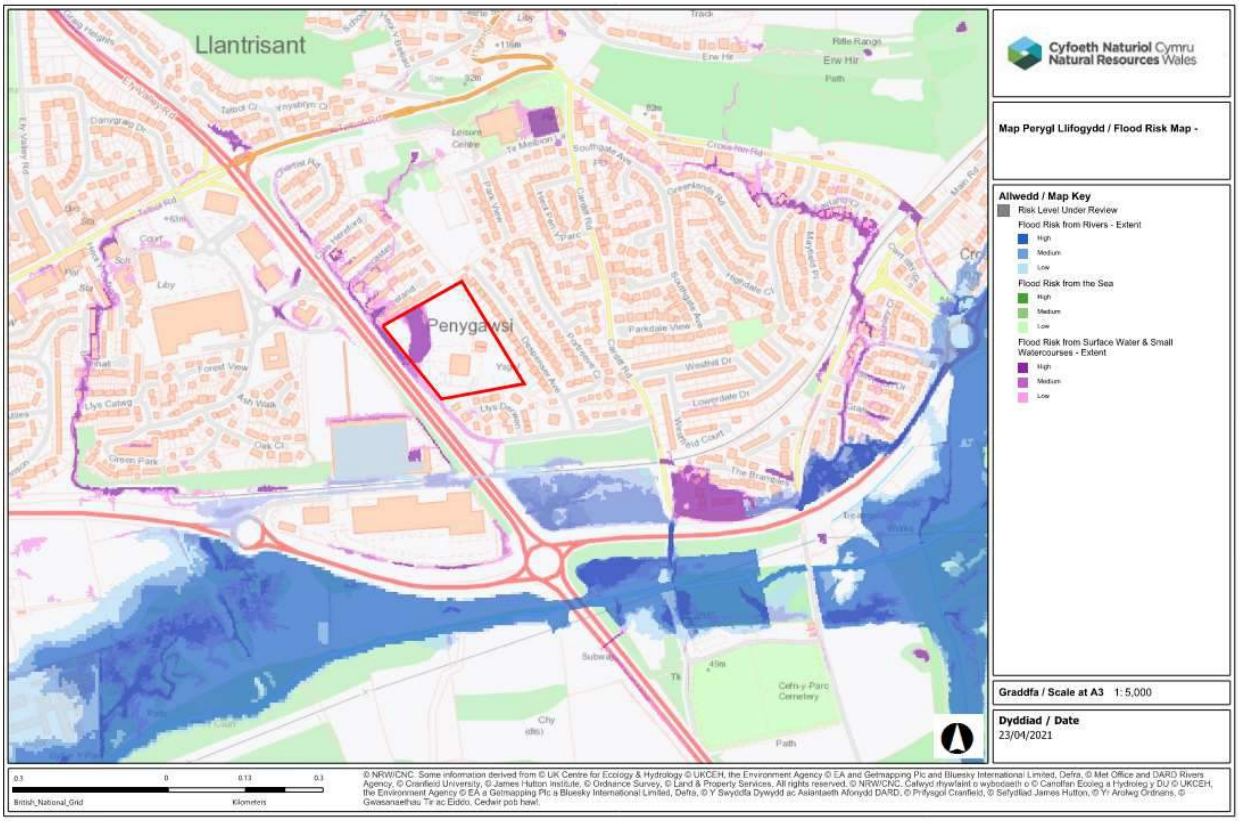


Figure 6 – Penygawsi NRW Flood Map

The surface water flooding identified on Penygawsi is shown in Figure 7.

Figure 7 – Penygawsi NRW Surface Water Flood Map

The Penygawsi surface water flood map shows surface water flooding on the western side of the site. This corresponds with the existing woodland area. The topographical surveyor was unable to survey this portion of the site due to the dense vegetation however the location of the surface water flooding implies a localised deeper depression in the landform. The areas of surface water flooding outside of the site implies that the flood water runs along Chartist Road to the south towards the Afon Clun after leaving the site.

The 1st December TAN15 surface water and small watercourse flood maps has also been obtained in Figure 8.

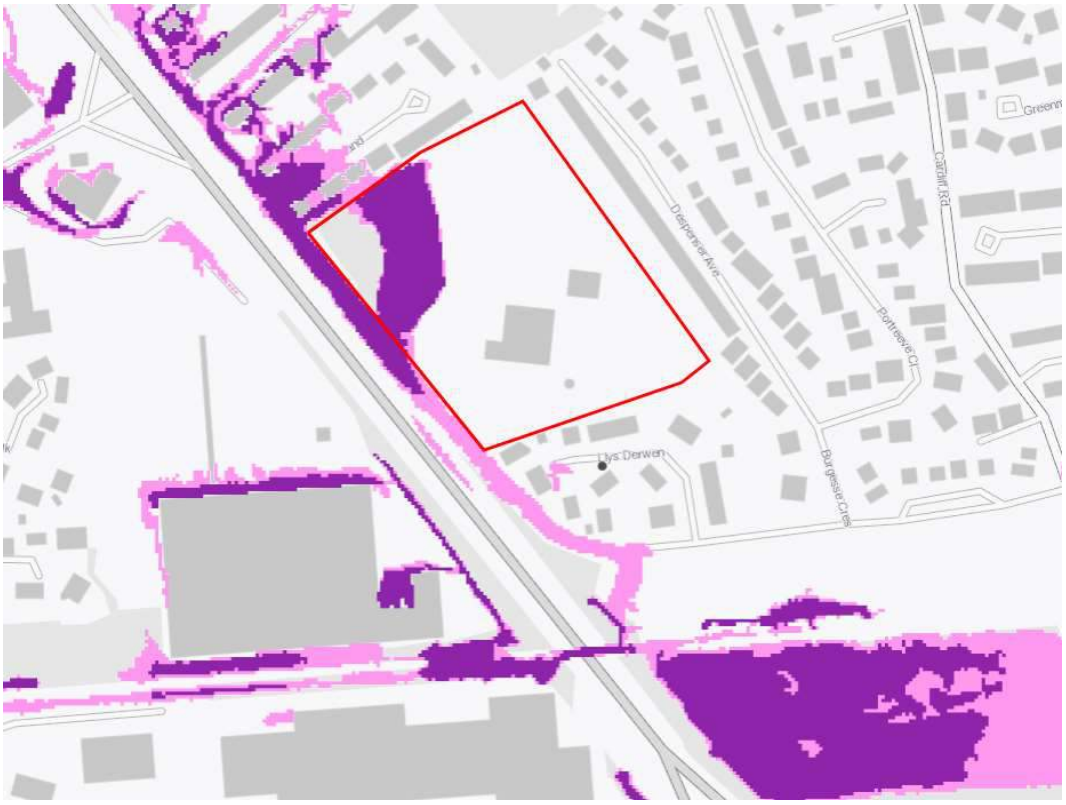


Figure 8: 1st December TAN15 DAM surface water and small watercourse flooding

The surface water Flood Zone 2 and 3 locations generally correlate to the NRW surface water flood maps. As there are surface water and local watercourse Flood Zone 2 and 3 areas within the red line boundary, a FCA is required.

4 Existing Drainage

The site is currently served by a positive foul and storm drainage network. The foul drainage is collected and outfalls to a DCWW foul network outside of the red line boundary located in Chartist Road.

The storm drainage captures the runoff from the buildings and portions of the hardstanding areas and conveys the flow to a low point at the site entrance. From here it is unclear where the existing storm water outfalls. The non intrusive survey shows the pipe heading towards the woodland however the pipe could not be fully surveyed due to dense vegetation in the woodland.

The green landscaping, where the run off is not captured in a network, either infiltrates into the ground or flows overland to a receptor e.g. the woodland or beyond the red line boundary on to the public footpath to the east.

Topographical, drainage and utility surveys were undertaken by Technics Group Ltd between August and September 2019. These surveys have been used to assess and understand the existing drainage within the site.

The surface water and foul drainage pipework identified in the non-intrusive survey is shown on drawing RH0401-ARP-ZZ-00-DR-C-00021.

4.1 Foul Drainage

The DCWW assets located adjacent to the site are shown in Figure 9.

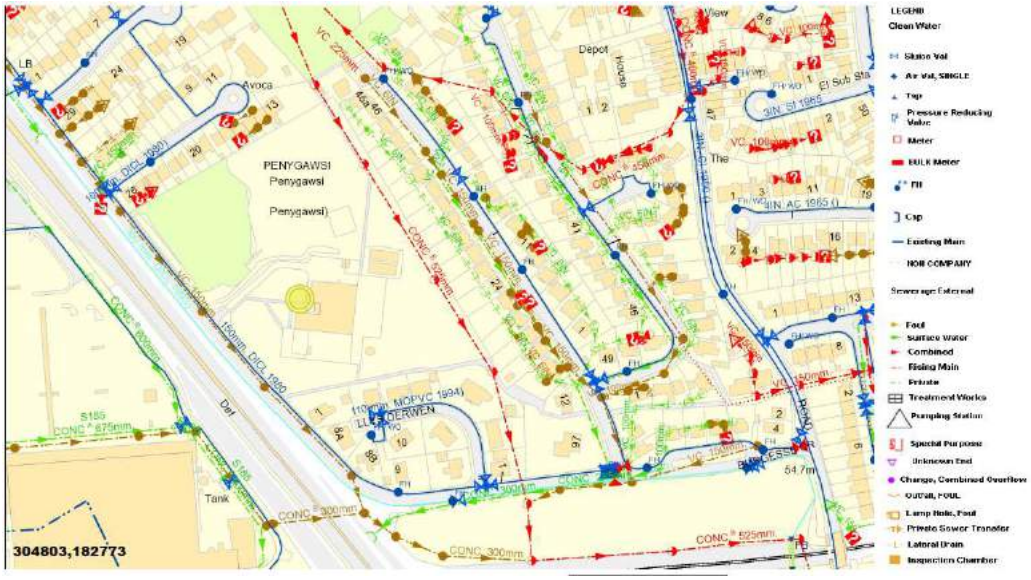


Figure 9: Public sewers plans (DCWW)

A 150mm clay foul drainage pipe is located in Chartist road just outside the site boundary. This falls in a south easterly direction before connecting to a 300mm diameter pipe after another 300mm diameter joins the network from the west. This then runs into a 525mm combined network and continues east.

The Penygawsi school buildings are served by a private foul drainage network shown on RH0401-ARP-ZZ-00-DR-C-00021. The foul drainage outlets from the main building are collected in a foul pipe network that runs around the perimeter of the building and outfalls to the public DCWW 150mm diameter foul network in Chartist Road (Figure 10).

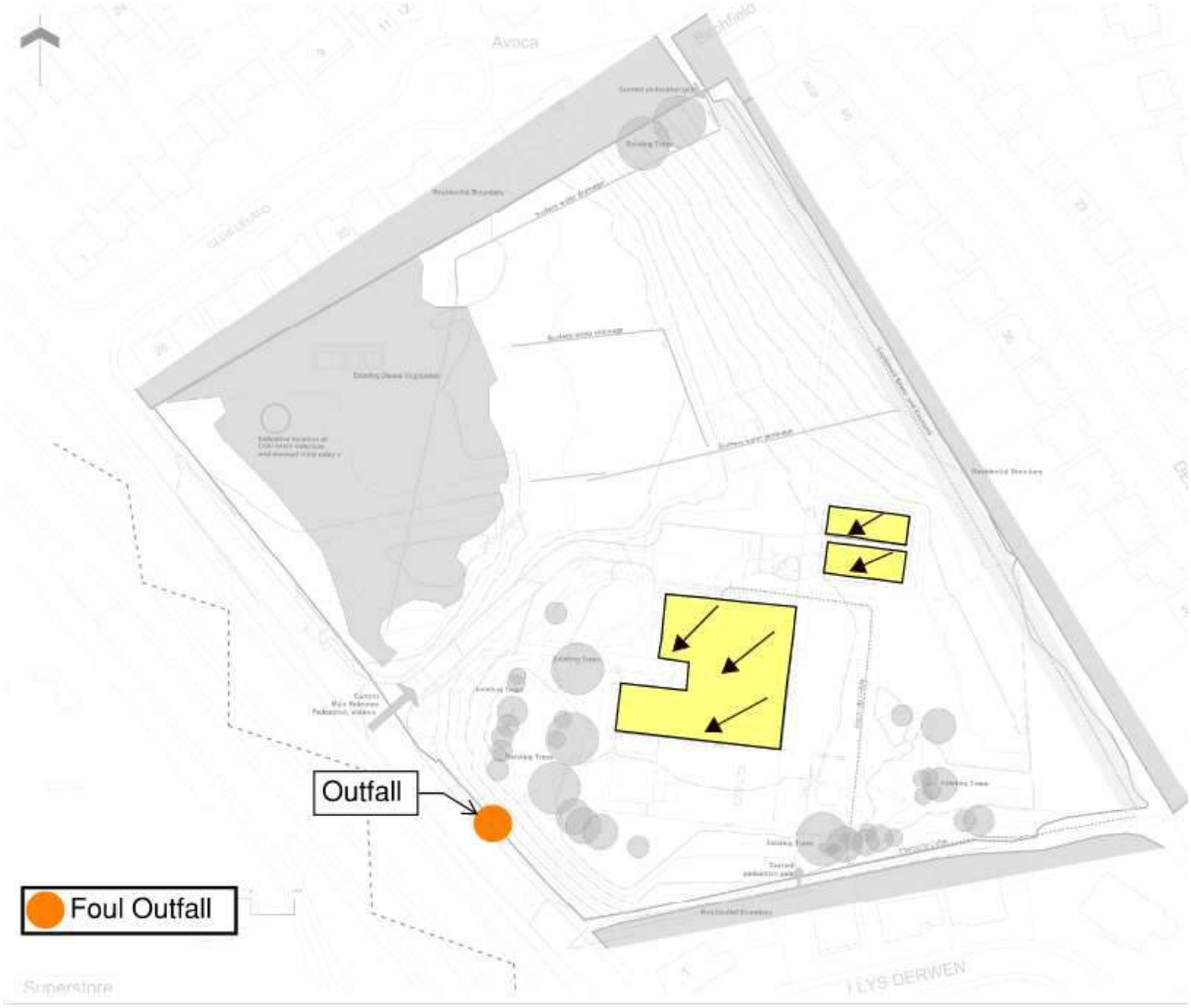


Figure 10. Penygawsi existing foul outfall and catchment

The two smaller buildings north of the main building also are served by a foul network and this connects into the main building drainage before heading to the outfall point.

4.1.1 Existing DCWW combined pipe

As shown on DCWW's plans (Figure 9), a 525mm combined network (pipes and chambers) enter the site at the northern corner and then continues in a south easterly direction parallel to the site boundary. This then continues beyond the site and meets the foul sewer that runs along Chartist Road before continuing east.

The combined pipework varies in depth from between 2-4m.

Since the sewer is present within the site, an easement exists which allows DCWW, as Statutory Undertaker, to gain access to their apparatus. It is not anticipated that the pipe would be affected by the proposed development. However, if necessary, it may be possible for the drainage to be diverted under Section 185 of the Water Industry Act 1991, the cost of which will be charged to the developer.

4.2 Storm Water Drainage

A large proportion of the Penygawsi site is grassed playing fields, landscaping and woodland. There are impermeable surfaces including the school buildings and the associated asphalt areas and car parking. Rainwater falling on these impermeable surfaces is collected through roof gutter/downpipe or gullies and then conveyed to the site entrance through a piped network.

The natural contours and the piped networks imply the site is split in to two catchments (Figure 11)

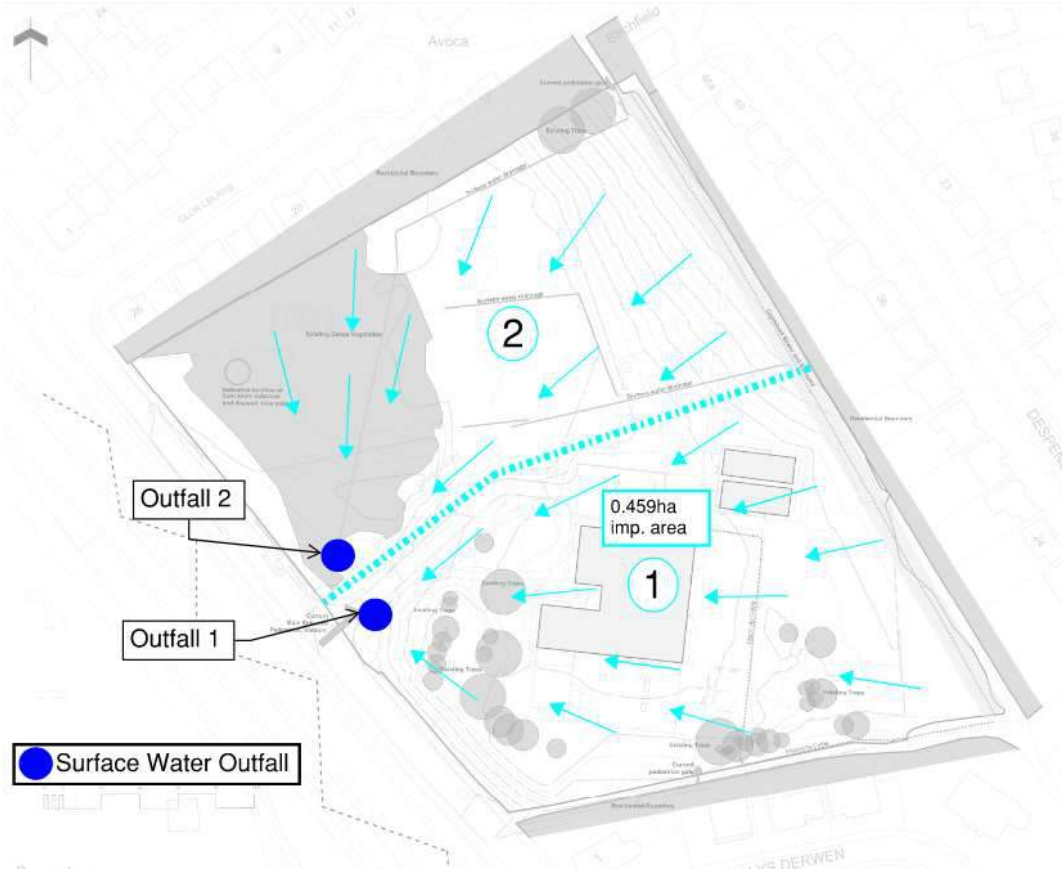


Figure 11: Penygawsi storm drainage outfall points and catchments

Catchment 1 is a combination of impermeable and permeable surfaces. The school buildings, playgrounds, access road and carpark are collected in a piped network which runs to the low point at the site entrance. The non-intrusive survey implies that the pipe exiting this chamber runs north west in the direction of the woodland. The survey did not detect the end of this pipe or the outfall point. The non intrusive survey indicates the route of a 300mm diameter private storm

drainage pipe that enters the northern corner of the site (depth 0.85m-1.5m), runs along the western boundary before running through the woodland. It is possible that the catchment 1 network connects to this before leaving the site. Alternatively, Catchment 1 could outfall directly into the wooded area. It should be noted that the DCWW sewer records do not show a storm or combined sewer network in Chartist Road and the non-intrusive survey does not show a pipe exiting the site towards the public road therefore it is possible that all storm flows are retained on site.

Further site investigations have been proposed to identify the outfall point for Catchment 1. The SAB officer has implied that there may be an existing highway drain located in Chartist Road. Gullies have been identified on both sides of the road and the further site investigations will explore this further.

Catchment 2 consists of green playing fields and the woodland. The non-intrusive survey has detected multiple private 100-150mm diameter shallow storm pipes (less than typically 500mm-600mm depth) however the purpose of these pipes and the contributing flows are unknown. Their location implies they could be field drains to serve the grassed areas and the northern steeper slope however their effectiveness is unknown as the utility survey recorded a number of blocked spurs. The non-intrusive survey did not detect the entire drainage network therefore the outfall location of these pipes is unknown however the direction and slope of the pipes imply these divert flow into the woodland. It is possible that these pipes connect to the 300mm surface water sewer that enters the site in the northern corner and travels through the woodland.

A 300mm diameter storm pipe (approximately 1-2m deep) enters the site mid way along the northeast boundary and travels in a south westerly direction to the storm network underneath the Catchment 2 playing field. The survey did not detect the entire route of the pipe although it is assumed to be a private network serving a development outside the site boundary.

Generally, rainfall landing on the grassed areas is assumed to either percolate into the ground or run overland. On the western portion of the site, assuming the drainage network is no longer functioning, the overland flow path is into the woodland on the western site boundary. Although a watercourse is not identified in the woodland area, the surface water flood maps imply surface water flooding therefore a depression in the natural landscape which could naturally attenuate the flow allowing evaporation/infiltration into the ground. It is likely that this attenuation is uncontrolled and is not managed or maintained.

On the other grassed areas of the site, the contours indicate that overland flow is directed on to the impermeable areas where it would be captured in the positive drainage.

Due to the steepness of some of the slopes, it is assumed that overland flow is likely in those steeper areas with the water potentially infiltrating in the shallower areas.

It is assumed that no significant flow enters the site overland from the surrounding areas. The general topography runs from north east to south west and adjacent to the northern boundary are residential property gardens.

It is assumed that the catchments are not attenuated.

4.2.1 Greenfield Runoff Rate

Hydrological analysis was undertaken for the site to determine the site's Greenfield Runoff Rate (GRR). The Institute of Hydrology 124 (IoH124) method was used to calculate the GRR for the 1:1, 1:30 and 1:100-year rainfall events. These values are used to inform the proposed drainage design, where Climate Change will also be considered.

The GRR values for the site are shown in Table 1. For further details of the assumptions, calculations and conclusions, refer to the Hydrology Calculations technical note in Appendix C.

Table 1 – Greenfield Runoff Rate for the site calculated using the IH124 method

Return period Event	Greenfield Runoff Rate (l/sec/ha)
1:1 Year	3.3
1:30 Year	6.6
1:100 Year	8.2
Qbar	3.8

4.2.2 Brownfield Runoff Rate

The site has been developed previously as it is currently a school. Although the ultimate outfall is unclear, the pipe network serving the impermeable areas of the school runs to the site entrance at an uncontrolled rate. Therefore, the pre-developed sections of site can be considered brownfield which will be used to inform the discharge rates from the site.

The existing storm drainage network, based on the topographical and utility survey, was modelled using Microdrainage software and the 1-year runoff rate for each catchment was calculated as shown in Table 2.

Table 2 – Brownfield Runoff Rate for the site calculated using the IH124 method

Catchment	Estimated Impermeable Area (ha)	Indicative Estimated 1-Year Flow (l/s)	Indicative Estimated 100-Year Flow (l/s)	1-Year Flooded Volume (m3)	100-Year Flooded Volume (m3)
Outfall 1	0.459	29.3	42.3	0	61
Outfall 2	0	0	0	0	0
TOTAL	**0.459**	**29.3**	**42.3**	**0**	**61**

Note is assumed that the green areas on each site do not enter these drainage networks. It is likely therefore that these are an underestimate.

Refer to Appendix C for further information.

5 Proposed Development

To provide the appropriate school facilities, the proposed site will contain a single school building, 2 number MUGA pitches, car parking and a mixture of impermeable and grassed landscaping.

The location of the various site features are influenced by numerous factors. The masterplan needs to function as a school but needs to consider the existing constraints including utilities, topography and site phasing.

The existing school needs to remain operational during construction. Once the new building is constructed and functional, school operations can be moved to the new building allowing the rest of the site to be developed. Due to the plan area of the proposed school building, the only suitable location not requiring significant earthworks is the western playing field. The existing access road is to remain in its current location and level to reduce disruption to the existing school operations.

These factors significantly limit the location of the proposed building and crucial infrastructure needed for the new building to become operational. This, the varying steep topography, and the woodland has an impact on the location of drainage features including raingardens and attenuation basin.

The proposed masterplans are shown in Appendix B.

The primary driver of the site finished levels is to provide a site that complies with the Equality Act with suitable slopes achieved across all land uses, whilst minimising the number of retaining structures. The levels and slopes have been designed to retain the existing site slope directions (and therefore catchments) where possible and to allow the foul and storm drainage to drain via gravity.

5.1 The masterplan and finished levels

The proposed building and hard landscaping works are generally located on the western portion of the development on the gently sloping portion of the existing playing field. This allows all existing school buildings to remain operational during construction.

The storm drainage pipe entering the site from the north will need to be diverted around the new building footprint.

The proposed car park and MUGA are located over the footprint of the existing building. The existing access road is to be retained as is the existing entrance on to Chartist Road. Pedestrian access will also be provided through the vehicular access and the existing pedestrian access to the south east will also be retained. This will provide a route across the landscaped areas, north of the MUGA to the school buildings.

The proposed building has been located at 56.5mAOD FFL. This level has been set to allow a 1:25 slope rise from the access road to the building entrance. Slopes have been designed to fall at 1:40 away from the building. The slope between the proposed pitch and the building across the landscaping however is 1:15.

The slope of the car park has been designed to fall at 1:30. This allows a suitable gradient between the western car park edge and the access road. The MUGA has been designed to fall at 1:100 and the landscape strip between the car park and MUGA used to achieve the level difference with a maximum 1:8 slope. The slope across the football pitch is 1:100 and has been sloped towards the MUGA so any overland flow will be captured by the MUGA permeable paving. The general slope of the proposed development is north east to south west as per the existing scenario.

The existing access road levels have been retained as existing which is at a 1:20 gradient. There is little scope to steepen this as pedestrian footway access is provided along this route.

The proposed finished levels are shown on drawing RH0401-ARP-ZZ-00-DR-C-00031.

6 Proposed Foul Drainage

The existing school has a foul network serving the main building and two smaller buildings north of the main building. The proposed development will also require a foul drainage network to serve the proposed building including canteens, classroom sinks, toilets and welfare facilities.

A pre-planning application has been submitted to DCWW to confirm the proposed foul connection point. The desire is to reuse the existing connection point and although the flows from the site are expected to increase due to the higher population, DCWW have offered the existing connection point.

Any foul drains constructed for DCWW adoption will be subject to a Section 104 Agreement and will require DCWW technical and legal consent. A Section 106 Agreement will be required for any new connections into DCWW's network and S185 will be required for the diversion.

6.1 Penygawsi Domestic Flows and Strategy

The proposed quantum has been considered in assessing the foul flows generated from the proposed development. The peak flow generated from the development has been estimated as 1l/s based on assuming 333 persons (split between pupils and staff) per day. An allowance for an expansion of 30 additional pupils has been accounted for in the 1l/s assumption.

The peak flow is based on a 20l/day/person and a peaking factor of 6.

As the proposed building is located on the western portion of the site the majority of the foul network could be constructed whilst the existing school is operational. It is proposed that all foul drainage outlets from the new building are connected to a drainage ring around the building and conveyed through a private foul drainage piped network to the low point where is then connects to the existing private manhole (subject to survey) just upstream of the DCWW manhole on the DCWW pipe in Chartist Road. Once the new school building is operational, the connection from the existing school building could be disconnected.

There is an existing foul drainage pipe coming from the east and connecting to the manhole just upstream of the DCWW manhole. It is proposed this is retained as the incoming flow source is unknown.

The population levels and estimated peak flows were communicated to DCWW in a pre-planning application to ascertain if sufficient capacity exists within the local network to facilitate the proposed development. DCWW stated that their network could accommodate the domestic flows from the site and offered a connection point at manhole ST04826702 to the 150mm foul sewer in Chartist Road. This is where the existing foul connection is located therefore the intent is to reuse the existing connection if possible (a condition survey of the existing network to be retained should be undertaken to ensure that the network is suitable for reuse).

The pre-planning response letter and details of further discussions can be found in Appendix D.

7 Proposed Stormwater Drainage

7.1 Introduction

The planned surface water drainage strategy for the proposed development will need to implement Sustainable Drainage Systems (SuDS) measures in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems 2018'. The proposed network will need to be approved by the local SuDS Approval Body (SAB). The SAB responsibility is administrated by Rhondda Cynon Taf County Council.

Early engagement with the SAB has been sought and a meeting with the RCT SAB officer was held on the 2nd of March 2021 where the initial drainage strategy was presented and discussed. A pre drainage strategy review has been undertaken by the SAB and received in August 2021. The level of detail provided was suitable for early design therefore a full drainage strategy review could not be completed. This review is contained in Appendix E.

The proposed storm water drainage strategy is currently under discussion with the SAB. Therefore, the proposals are subject to confirmation through the SAB Pre-Application process. The Pre-Application sets out the principles of the proposed storm drainage strategy and describes how it conforms to the Statutory Standards. The Pre-Application for the scheme is in the process of being submitted to the SAB.

The site has the opportunity to utilise rainwater harvesting to reuse grey water for flushing toilets etc. Rainwater would be collected from the building rooves and conveyed to an underground tank via gutters/downpipes. From here the water would be pumped into a small break tank located within building and then pumped around the building to the required locations.

The areas of the roof not contributing to the rainwater harvesting tank, and the other impermeable areas, the intention is to collect water through raingardens. These ensure that the drainage solution offers the required water quality, amenity and biodiversity qualities.

Where raingardens are not possible, surface water run-off generated from impermeable areas of the proposed development can be collected via rainwater pipes, gullies, in built fall linear drainage channels, or through permeable paving.

The intent is to reuse the outfall at the site entrance if condition allows and once the ultimate outfall has been confirmed through additional survey.

In general, the runoff will be collected by a drainage network and attenuated to an agreed rate before outfalling to the existing connection points. Raingardens, a dry basin, underground attenuation cells and pervious pavements are proposed in conjunction with hydraulic control measures to attenuate the flows to achieve the required runoff rate. The desire of the headteacher is to avoid standing water where possible.

As the site is a previously built development which is assumed to outfall to the receiving receptor unattenuated, it is proposed that the outfall rate from the proposed impermeable area for storms up to the 1:100 year event will be reduced to 70% of the existing 1:1 year flow rate.

7.2 Schedule 3 of the Flood and Water Management Act

Schedule 3 of the Flood and Water Management Act 2010 establishes SABs in local authorities. Since the 7th January 2019, developments greater than 100m^2 or developments containing more than one building require submitting a SAB application. This application requires developers to utilise SuDS in their surface water management for a development.

SuDS aim to manage rainfall on site using methods that mimic natural processes, by making use of the landscape and vegetation to control the flow, volume and quality of the surface water runoff. In addition, SuDS also provide amenity benefits by providing aesthetically pleasing and natural landscapes, and biodiversity benefits by creating habitats for wildlife and vegetated areas.

The Welsh Government's Statutory Standards for Sustainable Drainage Systems contains six standards, which details the requirements for the surface water drainage. The standards are as follows:

S1. Runoff destination

S2. Hydraulic control

S3. Water quality

S4. Amenity

S5. Biodiversity

S6. Construction, operation and maintenance

These form a set of principles which must be considered in the design of the SuDS features in order to obtain approval by the SAB.

The proposed storm water drainage provisions are shown on drawing RH0401-ARP- ZZ-00-DR-C-00041

7.2.1 S1 – Runoff Destination

The Welsh Government's SuDS Standard S1 provides a discharge hierarchy for surface water from developments, as well as exemption criteria for each level that must be met before the next level can be considered. The discharge hierarchy is shown below:

- Level 1: Surface water runoff is collected for use;
- Level 2: Surface water runoff is infiltrated to ground;

- Level 3: Surface water runoff is discharged to a surface water body;
- Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;
- Level 5: Surface water runoff is discharged to a combined sewer.

The aim of this is to encourage developments to use runoff as a resource and ensure that runoff is sustainably managed to avoid any negative impacts from the development, such as increased flood risk.

7.2.1.1 Level 1 – Collected for Use

Rainwater harvesting is proposed to be used on Penygawsi and an 54m^3 volume tank is proposed. Although rainwater harvesting is being utilised, the demand is not high enough to discharge all water through this method. There are also other catchments that will not contribute and will need another runoff destination.

7.2.1.2 Level 2 – Infiltrate to Ground

Level 2 of the hierarchy promotes infiltration of runoff to ground, mimicking natural infiltration and recharging below ground aquifers. The concept of infiltration is intended at trying to prevent runoff from sites when there are small rainfall events. The goal is to minimise the discharge of polluted runoff from entering streams and rivers, particularly in summer periods when there is low flows. The emphasis is on achieving no runoff for small rainfall events which are less than 5mm.

The Phase I Geo-Environmental Desk Study Report indicated that the majority of the site is underlain by superficial deposits of Diamicton Till, which generally comprises sands, gravels, silts and clays. The north western corner of the site is underlain by Devensian Glaciofluvial Deposits, which generally comprise sands and gravels. A Ground Investigation has been proposed to determine if infiltration measures will be possible hydraulically.

Historic mine works have been identified on the site including a shaft located in the woodland. The use of any soakway system on the site needs to consider the risk and impact of these mine workings.

It is proposed that raingardens are to be employed as a SuDS solution. Due to their proximity to the building the majority will need to be lined, which will limit their ability to contribute to interception. Evapotranspiration in summer is a key mechanism for reducing runoff. Raingardens located further from the building could be unlined depending on the planned soakaway.

A grass topped, gravel filter drain has been proposed to intercept flow from the embankment before reaching the school building. This will be lined due to proximity to the building and retaining structure.

The area of impermeable area on the site has also reduced by 0.11Ha with the difference replaced with permeable paving or grassed landscaping. The landscaping will encourage infiltration in the top soil layer as well as offer

evapotranspiration benefits. The permeable paving will hold and slow the water compared to the existing regime.

As a part of the storm water management network for the eastern catchment, a detention basin is proposed. The ground investigation will inform whether this could be unlined. The storm runoff from unlined features could contribute to the interception of the first 5mm of rainfall for the site. If the pond is lined, it will still contribute through evapotranspiration.

7.2.1.3 Level 3 – Discharge to a Surface Water Body

As there are no watercourse within or near to the site, discharging to a surface water body is not achievable.

7.2.1.4 Level 4 – Discharge to a Surface Water Drainage

It is proposed that the main form of discharge from the site will be through the existing outfall at the site entrance. The proposed catchments are shown in Figure 12.

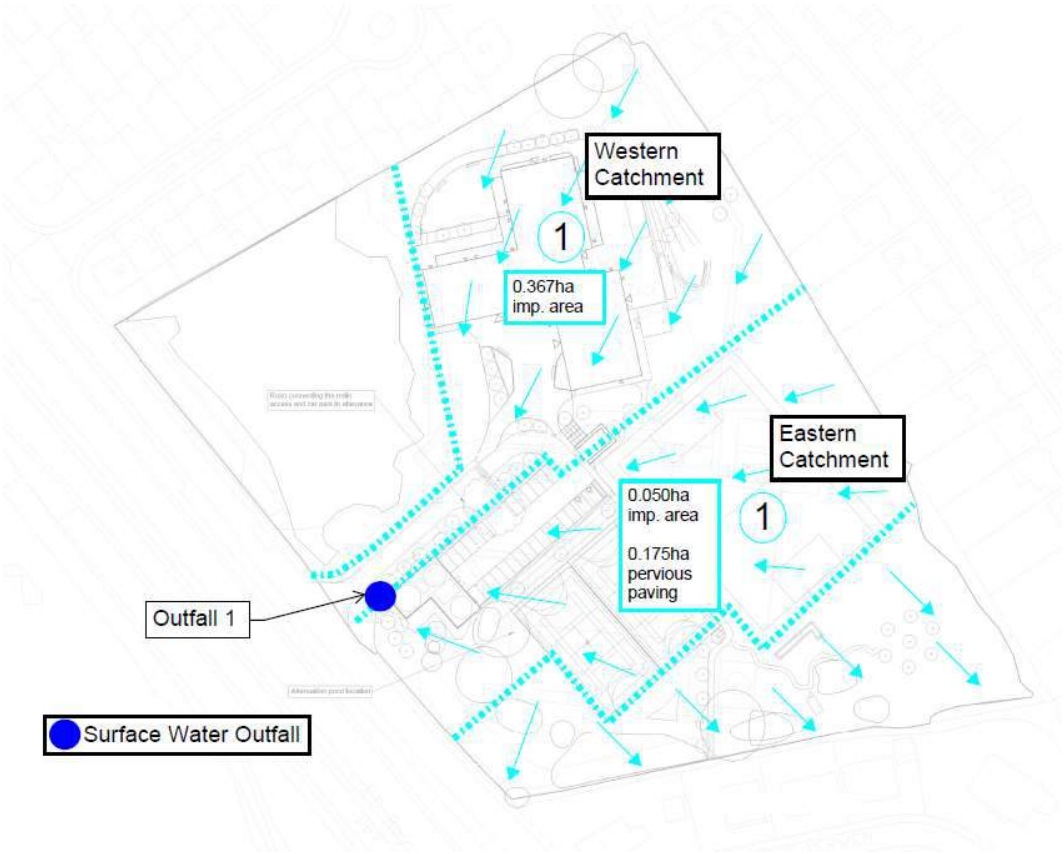


Figure 12: Proposed Penygawsi catchments

The western catchment would serve the proposed school building and adjacent hard standing. This catchment would be collected through a piped network and either attenuated through attenuation cells or pipe storage with the flow controlled with a vortex device.

The eastern catchment will serve the proposed car park and the MUGA. Flow will be attenuated through a dry basin before connecting to the outfall point.

The existing access road catchment has been included in the western catchment however it may be possible to retain the existing gullies and the existing storm pipe that connects to the outfall point. If not, the gullies will be connected to the new storm pipework.

The ultimate destination of the existing outfall is unknown and survey works have been proposed to investigate this.

The SAB has implied that there may be an unrecorded highway drain within Chartist Road and this could serve as the proposed storm outfall if present. Existing gullies have been identified on aerial photography. Site investigation has been proposed to identify if there is a highway drain.

7.2.2 S2 – Surface Water Runoff Hydraulic Control

Standard S2 details the requirements for hydraulic runoff from the site. It is broadly split into three main sections, runoff control, volumetric control and interception.

7.2.2.1 Runoff Control

The existing site is split between impermeable building with associated asphalt surfacing and grassed playing field. Figure 13 and Table 3 shows the comparison between the existing and proposed permeable and impermeable areas

Figure 13: Penygawsi existing impermeable/permeable areas

Table 3: Existing Impermeable Area versus Proposed Impermeable Area			
Site	**Existing Impermeable Area (ha)**	**Proposed Impermeable Area (ha)**	**Proposed Pervious Pavement (ha)**
Outfall 1	0.459	0.417	0.175
Outfall 2	0	0	0
TOTAL	**0.459**	**0.417**	**0.175**

The site investigation shows that the existing impermeable area of 0.459Ha is currently drained though an unattenuated pipe network to the low point at the site entrance. It is therefore assumed that this portion of the site is brown field. The proposed impermeable area which comprises of the proposed building and hard landscaping is slightly reduced to 0.417Ha. Although the location of the impermeable surfacing in the catchment is different to the existing situation, the outfall location is the same therefore the brownfield discharge rates of the existing situation can be used to inform the discharge rate of the proposed impermeable area. Note that the existing site access road has been included in the impermeable area.

Excluding the woodland, the remaining area of the proposed site is either grassed surfaced or permeable paved MUGA and car parking bays. The permeable paving associated with the MUGA and car parking bays is approximately 0.17Ha.

Rainfall will be captured in the western catchment through a number of ways. Water falling on the roof will be captured through guttering and downpipes before running into raingardens. The overland flow will be directed into raingardens or through an in built fall linear drainage at the building entrance. There will be a grassed topped filter drain located at the base of the retaining wall east of the building to intercept overland flow running from the earthworks.

The eastern catchment mainly comprises the MUGA and car park. Both the MUGA and parking bays are permeable paving (asphalt or blocks) and will capture and slow the water before connecting to the main piped network. The grassed pitch is sloped at a 1:100 gradient towards the MUGA so any runoff that does not infiltrate to the ground will be collected in the permeable asphalt. The impermeable sections of the car park are sloped towards a section of permeable block paved parking bays. The piped network will then connect to the outfall point via a dry attenuation basin and vortex control device to restrict the discharge.

The existing brownfield flow from the existing impermeable catchment has been considered and it is proposed that the outfall rate from both eastern and western catchments combined for storms up to the 1:100 year event will be reduced to 70% of the existing 1:1 year brownfield flow rate.

The existing catchment brownfield 1.1 year rate and proposed catchment discharge rate are as per Table 4:

Site	Proposed Impermeable/ permeable Area (ha)	Existing 1:1 Discharge Rate (l/s)	Proposed Discharge Rate (l/s)	Required Attenuation Volume – including porous paving (m^3)
Outfall 1	0.592	29.3	20.5	340
Outfall 2	0	0	0	0
TOTAL	**0.592**	**29.3**	**20.5**	**340**

Table 4 – Proposed catchment flow restrictions

It is proposed that the total discharge rate from the impermeable area is limited to 20.5l/sec. The total flows from the site through outfalls 1 and 2 will be reduced by 30% in the 1-year event and by up to 50% in the 100-year event (+ 40% climate change). These flow rates will be achieved by installing vortex flow controls upstream of the discharge location. The total flow leaving the site, including the access road, is significantly reduced compared to the existing scenario.

A climate change allowance of 40% has been proposed for the development.

7.3 Volumetric Control

The runoff volume discharged from site can be as harmful to downstream flood risk at peak flow rates. It is therefore essential to ensure that volume of runoff discharged from the site during rainfall events is controlled.

The volumetric control for the two catchments detailed below.

7.3.1 Western catchment

The network has been sized to accommodate the 1:100 year flow plus climate change. A vortex flow control near the outlet will restrict the flow in all return periods up to the 1:100 year storm to 18l/sec.

The majority of the catchment will be attenuated using 140m^3 of attenuation cells. The remainder of the catchment will rely on storage in the storm water pipework. There is an opportunity to explore the inclusion of a dry basin in the catchment however due to the location of the building, the access road, the catchment in general and the site topography, the size will not be sufficient to accommodate all of the required attenuated volume. The dry basin could supplement the attenuation cells. A flow control device located upstream of the outfall will restrict flow and promote the pipe storage.

It is proposed that the gullies from the existing access road connect to the pipework in this catchment.

Landscaping areas adjacent to the impermeable areas e.g. raingardens, earthwork slopes to connect the various land uses etc… will be captured by the positive drainage network serving the impermeable areas. These areas will therefore be attenuated in the network.

Storage will likely be provided in the rain gardens however this volume has not been included in the calculations.

7.3.2 Eastern catchment

The network has been sized to accommodate the 1:100 year flow plus climate change. A vortex flow control near the outlet will restrict the flow in all return periods up to the 1:100 year storm to 2.5l/sec.

The majority of the catchment will be attenuated using the dry basin which has been designed to store 70m^3 volume with a maximum storage depth of 1.5m with 0.3m freeboard to the top of the basin for a 100 year period including an allowance for climate change. Side slopes will be 1 in 3, with one side slope 1 in 5.

The MUGA and car parking bays will be constructed with permeable asphalt and blocks and although will connect to the piped storm system serving the proposed impermeable area and be restricted, the runoff will be slowed and stored at source before entering the network.

The sports pitch and the green field embankment north of the MUGA have been sloped towards the MUGA. Any rainfall that does not infiltrate can run overland on to the MUGA and be captured and stored in the permeable asphalt construction build up before running into the dry basin. The MUGA is assumed to contribute 130m^3 of storage in the pavement layers.

Storage volume will be provided in the rain gardens and the permeable parking bays however has not be included in the calculations.

7.3.3 Remaining green areas

It is common practise to meet greenfield runoff behaviour for green landscaped areas. The remaining green areas outside of the eastern and western catchments are typically retaining their existing form.

It is anticipated that rainfall that falls on these green areas e.g. the earthwork embankments will either percolate into the ground or flows overland to the nearest permeable or impermeable surface inside or outside of the site. In this situation, the existing scenario is retained.

The woodland is proposed to remain as existing and generally no works are proposed in the area apart from removal along the northern edge. Any rainfall that lands in the woodland or flows overland into the woodland will either percolate into the ground or be stored until it does percolate, evapotranspirates or evaporates.

7.4 Interception

The Welsh Governments "*Statutory Standards for Sustainable Drainage Systems*" require that, as far as practical, there should be no discharge from a site during the first 5mm of a rainfall event. This attribute is considered to be met by utilising systems as described in Table G2.1 of the standard or by demonstrating compliance through other means.

The concept of interception is to prevent any runoff taking place from sites when there are small rainfall events. The aim is to minimise the discharge of polluted runoff from entering streams and rivers, particularly in summer periods when they have low flows. Impermeable surfaces generate runoff from nearly all rainfall events, and this can have a negative impact on the morphology and ecology of receiving water bodies. Interception is aimed at trying to replicate greenfield runoff conditions.

Interception mechanisms are based on runoff retention. This can be achieved using rainwater harvesting, using soil storage and evaporation.

A green roof has been considered for the site however, following investigation, has been discounted from the scheme due to the ongoing maintenance and the increased imposed weight on the roof.

Reviewing Table G2.1 and giving consideration to the site the following SuDS features offer a suitable approach to meet the interception criteria:

- Rainwater harvesting
- Bioretention areas/ raingardens;
- Detention Basins; and
- Permeable surfaces.

The site is to employ rainwater harvesting. The harvesting system is designed to take runoff falling on certain sections of the roof and recycle this water for use within the building. This runoff therefore will not enter the drainage network. This is an effective use of water in smaller storm events however when the tank is full, the effects are lost as runoff will likely bypass the harvesting system and enter the piped network. The rainwater harvesting system is designed to accommodate 54m^3 of rainwater. Table G2.1 assumes that all surfaces drained to rainwater harvesting systems are treated as long as the system design is based on regular daily demand for non-potable water from surface water runoff.

There are approximately 360m^2 of bioretention features on Penygawsi. The total amount of bioretention features has been maximised to provide a greater contribution to interception requirements however the majority are likely to be lined due to proximity to the proposed school building. Those that may be unlined are subject to further ground investigations. Potential for infiltration is therefore anticipated to be low and may be insufficient to intercept all of the first 5mm of rainfall. In accordance with Table G2.1 in the Welsh Statutory Standards for Sustainable Drainage, it can be assumed that the first 5mm of rainfall from

contributing impermeable areas equal to five times the unlined vegetated bioretention areas can be intercepted.

There is approximately 4170m^2 impermeable area on Penygawsi. Assuming 190m^2 of the raingardens can be unlined as they are sufficient distance from the building, the mining risk is acceptable and the ground conditions allow, up to 950m^2 of impermeable area could be sufficiently intercepted through this method.

There is insufficient space available in appropriate locations on the proposed site for bioretention systems with a plan area equivalent to a fifth of the impermeable area as the land use is required for other purposes for the school to function.

A dry basin has been proposed as part of the storm drainage network to attenuate and treat flows. There is an opportunity for the basin to be unlined subject to survey. Table G2.1 states that areas up to five times the base area of the basins can be assumed to meet interception requirements. The base area of the Penygawsi basin is 20m^2 therefore it is assumed that approx. 100m^2 of impermeable area is sufficiently intercepted through this method, if the ground conditions allow.

It is proposed to use approximately 1930m^2 permeable pavement for the car parks and MUGAs. Table G2.1 states that all permeable surfaces can be assumed to comply provided that there is no additional area drained to the permeable surface. In all cases, additional flow will enter the permeable paving therefore only the surface area of the permeable paving itself has been considered and sufficiently intercepted through this method.

In total, based on the figures above, it is calculated that the amount of impermeable area on site that can be deemed to be compliant with interception requirements is between approx. 0.193Ha and 0.298Ha depending on ground conditions. Given that the total amount of impermeable area on site is 0.417ha, these measures are providing 46-71% of the required interception of flows on site, which equates to approximately 2.3-3.6mm of the first 5mm of rainfall. Although not the entire 5mm is captured, this is providing significant betterment to the existing regime and this excludes the rainwater harvesting contribution.

Disposal of significant events using solutions such as soakaway units or infiltration basins usually requires infiltration rates of the order of 1 x 10^{-6} m/s or higher. However, effective infiltration can be achieved with lower rates under units such as permeable pavements due to the large storage and infiltrating surface area available and the removal of sediment which would otherwise blind the infiltration surface. Therefore, the true interception provided through the permeable surfacing may be greater than suggested.

The lined bioretention components adjacent to the main building will also contribute to the interception requirements in terms of evapotranspiration.

It should also be noted that the impermeable area has been reduced therefore there is more grassed and permeable paved area compared to the existing case. This will naturally provide more interception compared to the existing case before considering additional interception added with raingardens, the dry basin and the permeable paving.

7.4.1 S3 – Water Quality

The Welsh Standard S3 covers the necessary water quality requirements for a scheme to prevent negative impacts on receiving waters.

During construction, it is likely that silts will be mobilised by rainfall which if uncontrolled will be conveyed to the downstream watercourses or pipework. The contractor will need to control silt runoff, particularly during the earthworks stage. This will be detailed in the Contractor's method statements.

The Simple Index Approach has been used to determine the pollution hazard index for the runoff and appropriate mitigation measures through SuDS. The strategy is to treat runoff at source and then connect to the main storm water network. Appropriate stages of treatment, often referred to as 'treatment trains' will be required to ensure adequate pollution mitigation is provided.

There are several zones within the development that require different treatment considerations. The various treatment zones are:

1. Main building roof
2. Car Park;
3. Site Access Road;
4. MUGAs
5. Footpaths, school yard, and hard paved areas

7.4.2 Main Building Roof

The construction makeup of the roof for the proposed building is an aluminium type. As such, it has conservatively been assumed that the "Commercial/Industrial Roofing: High potential for metal leaching" land use category could apply. With the source control bioretention system option required for interception, the SuDS treatment train would be as Figure 14:

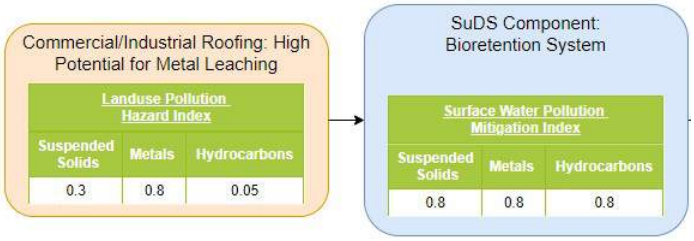


Figure 14: Roof Treatment Train (Simple Index)

As the downpipes are draining through raingardens, this bioretention system would be suitable to treat the water to a sufficient level prior to discharging from the site.

7.4.3 Car Park

The carpark has been assumed "Non-residential car parking with frequent change" category.

It is proposed to use a pervious block paving build-up for the car parking bays, resulting in the surface water in this area draining and being treated at source. The car park will then drain through the dry basin. The SuDS treatment train is as Figure 15.

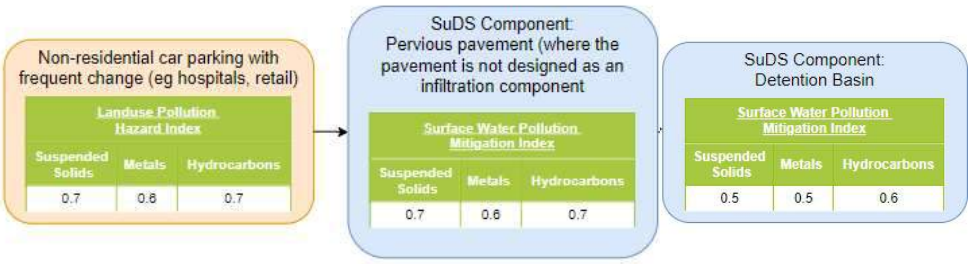


Figure 15: Car Park Treatment Train (Simple Index)

Pervious pavement provides suitable treatment for the runoff with the dry basin providing an additional level of treatment prior to discharging from the site.

7.4.4 Site Access Road

It is proposed to retain the site access road in its existing form. In the existing situation, the rainfall is collected through kerb and gullies and then drained to the low point at the site entrance unattenuated. It is proposed to connect these existing gullies to the proposed drainage network which will attenuate the flow within the storm drainage pipes using a vortex control device.

The level of the access road is beneath the invert level of the dry basin. The gully system cannot connect to the basin as the basin cannot be lowered due to the steep topography and the earthworks impact. Raingardens would not be a viable option as the gully tail would connect to the lower levels of the raingarden rather than promote filtration through the raingarden layers. The slope of the road is 1:20 meaning swales are not viable due to gradient.

Although the volume of water leaving the site will be reduced, no additional treatment of the water from this small catchment is proposed as per the existing case due to the limited site area and the topographical levels.

7.4.5 MUGAs

Traffic is not expected on the MUGAs however the lowest category in the simple index tool is 'low traffic roads' therefore this has been used as a benchmark in Figure 16.

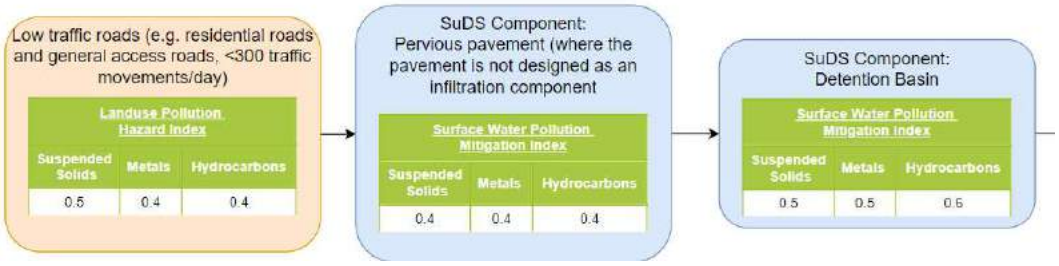


Figure 16: MUGA Treatment Train (Simple Index)

As the MUGA runoff transfers storm water through the pervious paving and then the detention basin, sufficient treatment for a low traffic road is provided.

7.4.6 Footpaths, School yard and other hard surfaces

Emergency access is expected in these areas of the site only. The 'low traffic roads' category was selected however the volume of traffic and the frequency of vehicles is extremely low as vehicular use will be in emergencies only. Figure 17 shows the range of treatments around the site.

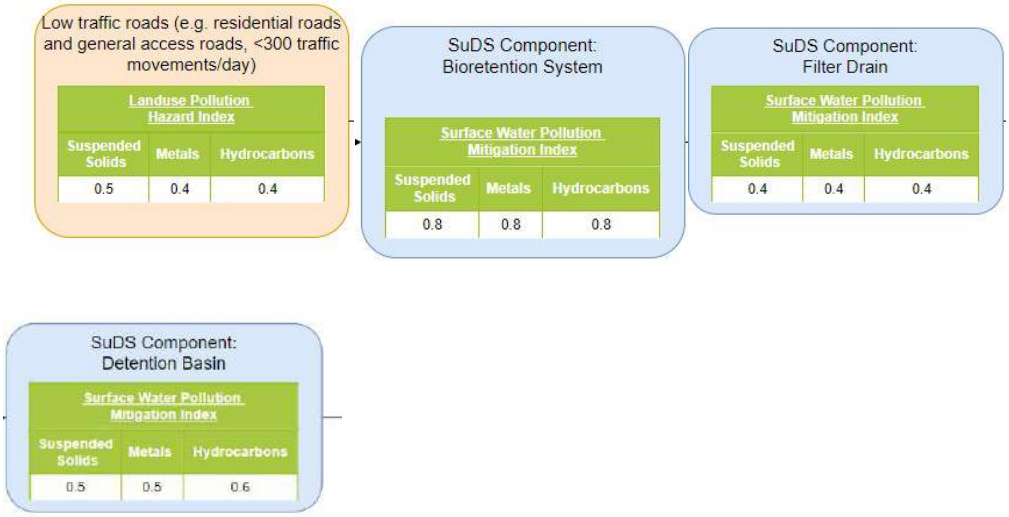


Figure 17: Footpaths, School Yard and other hard surfaces (Simple Index)

The majority of the hard surfaces are captured through raingardens. This bioretention system provides sufficient treatment for a low trafficked road. Some of the hard surfaces are drained through the dry basin, therefore those areas are sufficiently treated also.

The footways north east of the building will be captured in the grass topped, gravel filter drain at the base of the retaining wall. Assuming this has similar treatment properties as a filter drain, the metals and hydrocarbons will be sufficiently treated although the suspended solids only treat 0.4 of the required 0.5. It is extremely unlikely a vehicle will access this area therefore this is deemed suitable as the low traffic road is an 'over classification'.

At the building entrance, an inbuilt fall drainage channel is used to capture flow running toward the building. This will be attenuated as part of the wider drainage network through attenuation cells and flow control devices although does not travel through any treatment. The only traffic using this area will be emergency vehicles therefore low traffic road is an 'over classification'. This is therefore deemed acceptable.

7.5 S4 – Amenity and S5 Biodiversity

The Welsh Standard S4 states that the surface water management systems should maximise amenity benefits.

Raingardens are proposed to capture the storm water for the majority of the site. The raingardens will likely be planted with trees and lower level shrubs which provide the opportunity to house birds, small mammals and insects as well as offering a visual benefit from the school and development outside of the school boundary.

Well positioned raingardens with trees can provide natural shaded areas for the children in the summer months and those near to the buildings windows can aid with keeping the classrooms cool in hotter periods.

Raingardens and other green infrastructure may also offer an educational opportunity with green landscaping generally improving physical health, e.g. clean air from trees improving air pollution and children's wellbeing, e.g. the 'restorative' experience where landscape increases relaxation levels, reducing stress and improving concentration. This can lead to positive effects on emotional, behaviour and cognitive development.

Locating raingardens adjacent to the pedestrian walkways will allow them to be enjoyed as people enter, leave and move around the site.

By retaining the existing woodland on the site and locating the school building closer the woodland, the raingardens will further bring the trees and vegetation closer to the school building.

A portion of the attenuation is proposed to be through a dry basin. The basin could be planted with appropriate plant species for the wet/dry conditions adding additional habitat variety.

7.6 S6 – Construction, Operation and Maintenance

Standard S6 requires that the proposed surface water drainage systems are designed such that they can be constructed, operated and maintained easily, safely and cost effectively for the whole design life of the systems. They should also aim to minimise the use of natural resources and embedded carbon.

These aspects will be considered through the design of the drainage system. A SuDS Management Plan will be developed to determine how the proposed SuDS features can be effectively and efficiently managed with associated ongoing costs for maintenance included where possible. Where possible, natural resources will be utilised.

The SuDS management plan will be submitted as part of the full SAB application.

A flat width has been provided around the dry basin to provide a safe platform for inspection and maintenance. Access to the basin has been incorporated into the design with the feature located near to the car park.

8 Summary

This drainage strategy has considered the existing site conditions and constraints, the proposed development at Penygawsi together with potential discharge points. DCWW have been consulted to determine an appropriate foul connection to their network and the SAB consulted regarding the storm drainage. The storm drainage follows the principles of the Welsh Government's Statutory Standards for Sustainable Drainage.

Flood maps have been acquired for the site and the site is outside of Zones 2 and 3 for river and sea flooding however there are areas of Zones 2 and 3 surface water and small watercourse flooding identified. A Flood Consequence Assessment will be required for the site.

The site is currently an active primary school with an associated private utility network including storm drainage and foul drainage networks. The piped storm drainage is taken to the site entrance however the ultimate outfall is unknown. There is an existing wooded area in the south east corner of the site and the outfalling pipe from the chamber at the site entrance is shown to slope in that direction in the non intrusive survey. Further investigation has been proposed. The foul drainage connects to the existing DCWW 150mm foul network in Chartist Road.

The topography slopes generally from north east to south west. A portion falls towards the existing woodland with the remainder sloping to the site boundary to Chartist Road. A section of the existing playing field slopes south east toward the existing footpath outside of the site boundary. There is one vehicular access point and dedicated pedestrian access point on the eastern boundary and these are being retained in their existing location.

The proposed school site is to contain a new building, car parking, MUGA, hard landscaping for play areas and circulation, and green space for play and landscaping. When determining the locations of the features, a number of constraints needed to be considered. These included site phasing as the existing schools need to remain operational during construction, existing utilities, topography and a working proposed masterplan with a suitable relationship between proposed uses. These constraints limit the location of the proposed building and crucial infrastructure for the new building to be made operational, including drainage.

Earthworks reprofiling is required to form the level plateau for the building and suitable slope directions and gradients for the other land uses. The proposed earthworks have shaped and informed the drainage strategy. Retaining walls will be required.

Foul flows have been estimated based on the anticipated school population and use and a pre planning application has been submitted to DCWW to determine a suitable foul drainage connection point. The desire is to reuse the existing outfall point to the network in Chartist Road. DCWW supported this by confirming the connection could be made to their asset in that location.

The surface water drainage strategy has been considered in accordance with the Welsh Government's Statutory Standards for Sustainable Drainage Systems. Consideration has been given to the proposed runoff destination, hydraulic control, water quality, amenity and biodiversity.

Rainwater harvesting will be employed however is not sufficient to manage all of the rainwater. Soakaways tests have been proposed to inform whether infiltration to the ground will be possible hydraulically. The possibility of infiltration also needs to consider proximity to buildings and the mining risk.

It is proposed the existing outfall is reused, subject to survey and invert levels. The ultimate outfall is to be determined. The existing storm drainage serving the existing building and impermeable areas will no longer be required following construction.

Rainwater landing on the roof will be captured using guttering and downpipes which will then be fed to a raingarden. Raingardens will be used to capture surface water runoff where possible but will be supplemented with an in built fall channel at the building entrance. Permeable block paving has been employed in the car parking bays and the MUGAs will be constructed using permeable asphalt paving.

The existing catchments have been analysed with the piped networks modelled to determine the existing catchment areas and the brownfield flow, assuming all catchments are unattenuated. The GRR has also been calculated for the existing playing field.

The proposed impermeable area is similar to the existing impermeable area with the remainder of the site either permeable paving or grassed landscaping. As the existing impermeable area is brownfield, the existing brownfield rate can be used to inform the proposed discharge rates from the proposed impermeable area. It is proposed to limit the flow from the western catchment and eastern catchment so that the total flow from both catchments is equal to the existing 1:1 year brownfield rate with a 30% betterment.

There are no works proposed to the remaining green areas, including the woodland, outside of the eastern and western catchments. The rainfall will either naturally infiltrate or run overland to the existing receptor. This replicates the existing regime therefore runoff in these areas is proposed to be unattenuated.

To attenuate the flow in the western catchment, a combination of attenuation cells and pipe storage has been used with discharge controlled using a vortex control device. For the eastern catchment, attenuation will be provided by the MUGA and the dry basin. Although raingardens and permeable paving in the parking bays will offer attenuation, these have not been included in the calculations.

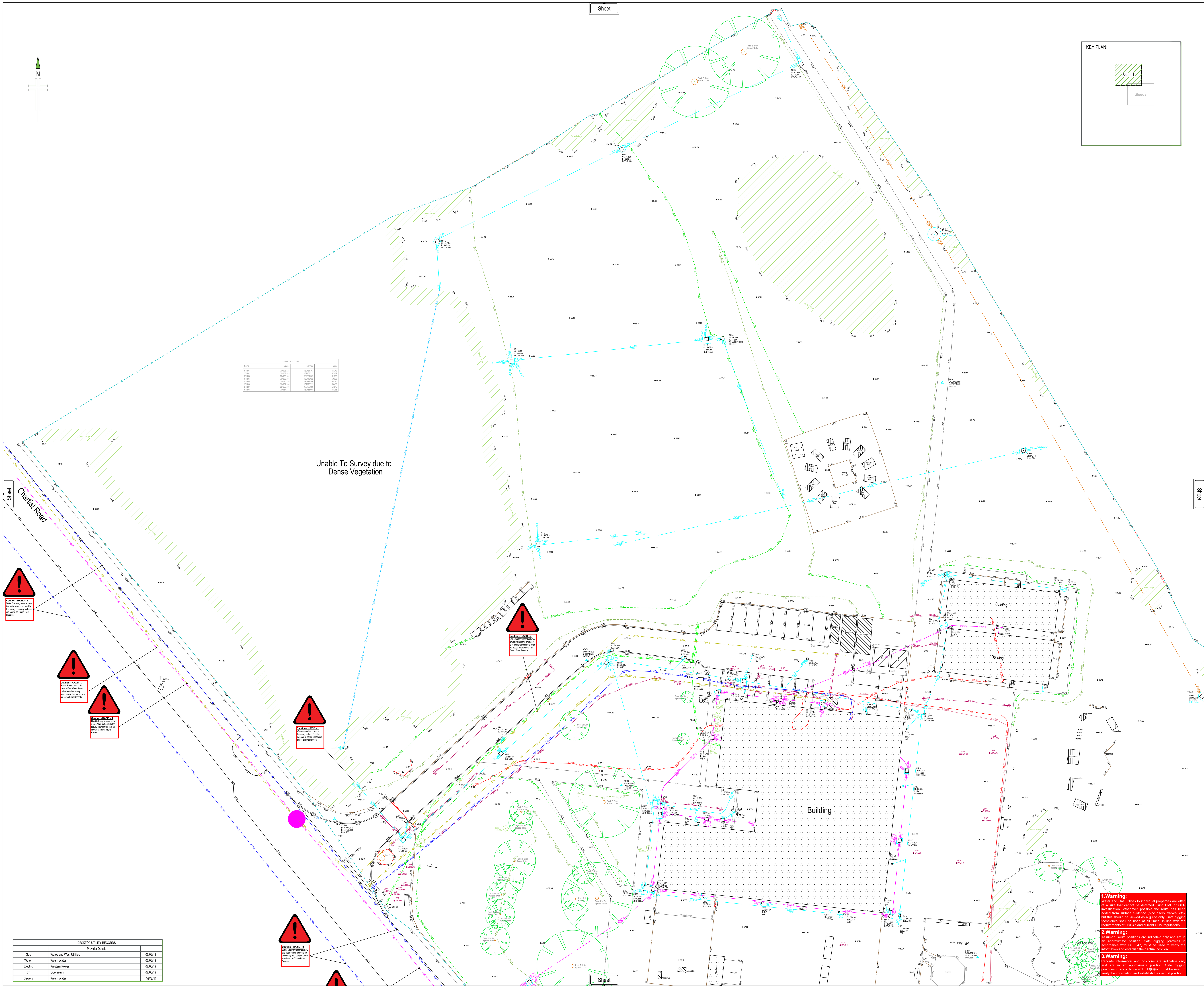
Through these systems, the first 2.3-3.6mm of rainfall will be intercepted. Although this is not the entire first 5mm, this is a significant betterment compared to the existing situation. The treatment train for each land use has been calculated and generally all uses are adequately treated. The existing site access road, which is proposed to remain in its current form is not proposed to be treated as it is desirable to retain the existing storm drainage capture method and the hard paving adjacent to the building entrance has insufficient treatment. The hard paving has been classed as a low traffic road as this is the lowest classification available in the Simple Index tool and therefore is deemed an 'over classification' as only emergency vehicles will use the area.

The storm drainage proposals for the development will need to be approved by the local SAB and an initial pre drainage strategy review has been submitted. The SAB has agreed in principle to the proposed discharge rates on confirmation of the assumptions made through additional survey.

Amenity, biodiversity and construction, operation and maintenance have all been considered and will be further detailed in the SAB application.

Appendix A

Existing Topography Drawing



DESKTOP UTILITY RECORDS		
	Provider Details	
Gas	Wales and West Utilities	07/08/19
Water	Welsh Water	06/08/19
Electric	Western Power	07/08/19
BT	Openreach	07/08/19
Sewers	Welsh Water	06/08/19

1.Warning:
Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR investigation. Whenever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only. Safe digging techniques shall be used at all times, in line with the requirements of HSG47 and current CDM regulations.

2.Warning:
Assumed Route positions are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to verify the information and establish their actual position.

3.Warning:
Records information and positions are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to verify the information and establish their actual position.

UTILITY NOTES:

Services shown outside the survey boundary are for information only and may not be complete. If information is required outside our survey boundary, please contact a Technics Project Manager.

WEATHER CONDITIONS:

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Rev.	Date	Revision	Signed
A	05/09/19	First Issue	LW

DO NOT SCALE!

Client:	HSP		
Project:	Penygawsi Primary School Pontyclun CF72 8PZ		
Survey Quality:	Topographical and Utility Survey		
Start Date of Survey:	07-15/09/2019		
Drawing Status: Final	Surveyed: SW/JV	Drawn: LW	Approved: LJM
Digital File: 4436-0819-02.dwg	Original Size: A0	Scale: 1:200	Sheet: 1 of 2
Drawing No.: 4436-0819-02			Revision: A

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GENERAL NOTES:

Electrical Comments:
Please note that ratings for electrical services i.e. LV, HV and EHV are taken from statutory records provided by the client. Technics hold no liability for misidentification of the rating for cables as there is no detection technology that will confirm the rating of a cable. Where no statutory records are provided we will show all cables as LV unless there is evidence to the contrary.

Methods Used:
Radio-frequency, Flexitracing and sonde and Ground Penetrating Radar techniques may be used in the location of underground utilities. The results are not infallible and vacuum excavation (QL-A) should be carried out to confirm positions of the identified utilities. Although great efforts have been made in conducting the survey the completeness of the underground utilities information cannot be guaranteed.

Accuracy Statement:
For Radio frequency depths shown have been obtained by electromagnetic means and can be subject to high levels of interference and distortion at the source or from surrounding services so can not be relied upon. In areas where depth is of high importance Technics would advise you to use PAS128 QL-A to obtain accurate depth readings.

Drainage:
Drainage connectivity will be proven by either a bang test or by drain dye. Unless otherwise specified in project spec the line shown between connecting manholes will be assumed as running straight. Where a connecting manhole can not be found or is thought not to run straight, the line of the pipe will be sonded as far as possible at the time of survey.

For Ground Penetrating Radar (GPR) methods the depth surveyed varies according to the subsurface ground conditions and level, and is normally characterised by the depth of penetration of the radar signal. In areas where depth is of high importance Technics would advise you to use PAS128 QL-A to obtain accurate depth readings. The average penetration will be greater in sandier regions than in clay regions, but will typically be in the range 2.0m to 2.5m. In exceptionally good or exceptionally bad conditions the depth may exceed 3m or be restricted to 1.2m to 1.5m. Clay conditions and water logged areas offer a greater restriction to the surveyor and can in some cases render the GPR ineffective in locating services within some areas. Where the client issues statutory records we will highlight the services that could not be found for this reason. This is not possible when the client does not issue statutory records and may require further investigation prior to commencing with the project.

Unless otherwise stated, all services shown on this plan have been surveyed using approved detectors and the connections between manholes, if unable to be traced, have been assumed to be direct. The detection confidence for each utility segment is depicted in line with the scheme and outlined within the PAS128:2014 Quality Level Guide only if survey has been requested to PAS128 prior to survey starting.

Information depicted as QL-C, QL-D,QL-B4, TFR and AR cannot be guaranteed as it is based on historic utility records or assumed routes which can be inaccurate and incomplete.

Depicted service routes may reflect the routes of multiple cables or pipes. It is not always possible to differentiate between buried construction features, utilities and other subsurface linear features therefore it is possible that some features shown are not utility related, and due to the limitations of electromagnetic techniques all utility identifications should be treated with caution and verified prior to any design/building works.

If the location or depth of services/features is of importance to a project then it is recommended that discussions are held with Technics Group regarding any possible limitations or anomalies. It is also advised that trial excavations should be undertaken to verify survey results within key areas of importance prior to any design/building works.

No utility mapping survey can be considered a 100% accurate depiction of the sub-surface environment, and the use of these drawings does not remove the requirement for the use of safe digging techniques at all times, in line with the requirements of HSG47 and current CDM regulations.

PAS128: does not apply to standard utility surveys

Greatest confidence
- QL"A" Horizontal (±50mm) and vertical (±25mm) position verified visually.
- QL"B1P" Horizontal (±150mm or ±15% of detected depth) and vertical (±15% of detected depth) position detected by multiple methods with post processing of data.
- QL"B1" Horizontal (±150mm or ±15% of detected depth) and vertical (±15% of detected depth) position detected by multiple methods.
- QL"B2P" Horizontal (±250mm or ±40% of detected depth) and vertical (±40% of detected depth) position detected by a single method with post processing of data.
- QL"B2" Horizontal (±250mm or ±40% of detected depth) and vertical (±40% of detected depth) position detected by a single method.
- QL"B3P" Horizontally positioned (±500mm) data with post processing
- QL"B3" Horizontally positioned (±500mm) data only
- QL"B4" Assumed route but no signal detectable using eml or gpr
- QL"C" Route from utility records correlated to visual indicators
- QL"D" Route from utility records

Least confidence

LEGEND:

Utility features:
- Combined Water Sewer
- ELEC — Electric
- Foul Water Sewer
- FW(AR) — Foul Water Sewer Assumed Route
- FW(TFR) — Foul Water Sewer Taken from Records
- GPR Detection
- GAS — Gas
- Surface Water Sewer
- SW(AR) — Surface Water Sewer Assumed Route
- TELCM — Telecoms
- URF — Unknown Radio Frequency
- WATER — Water
- W(TFR) — Water Taken from Records

Topographical features:
- Approximate chamber extents
- Bank - Bottom
- Bank - Top
- Building
- Building canopy
- Concrete
- Drainage Channel
- Fence
- Kerb - Bottom
- Kerb - Drop
- Kerb - Top
- Road marking - yellow
- Road marking - white
- Road - centre line
- Ridge= 74.10 Eaves= 72.19 — Roof / Eaves levels
- Surface change
- Visible Trench Line
- Wall

HAZID warning tag - this symbol means there is important information that needs to be read regarding an asset

- QLD Utility line taken from records provided by client and or site features.
- GPR Utility \ feature found using ground probing radar which maybe non-metallic.
- RF Utility \ feature found using radio frequency locating equipment.

NB: Topographical legend not applicable if Technics utility survey is overlaid onto client's topographical survey.

STN1 E=458043.509 N=340010.635 H=30.825 — Survey control station

- Unable to survey area with GPR due to poor ground conditions.
- Area not surveyed.
- Unidentified subsurface distortion designated with GPR
- X4 Number of ducts entering or exiting the inspection pit
- Buildings
- OS Buildings
- Overhead electrical tower
- GPR Baseline

SERVICE DEPTHS:

* Depths of services can be measured from different points:

A 1.20 B 1.20 C 1.20

- A Indicates where GPR depth is measured from.
- B Indicates where depth is measured from when using radio frequency.
- C Indicates where depth is taken from on drainage pipes using a tape measure.

ABBREVIATIONS:

Designation:

BLKD	Blockage	MAR	Man Entry Required	UTL	Unable to Lift
D	Depth to Utility	MKR	Marker Post	UTT	Unable to Trace
DIA	Diameter	NFI	No Further Information	WO	Wash Out
DOC	Depth to Cover	NVP	No Visible Pipe		
DTB	Depth to Base	NVV	No Visible Valve		
EOT	End of Designation	OSA	Out of Survey Area		
GPR	Ground Penetrating Radar	P/S	Poor Signal		
ID	Invert Depth	PEV	Polyethylene Valve		
IL	Invert Level	SOR	Start of Run		

Topographic / Fence and Wall features:

BOL	Bollard	RE	Rodding Eye	B/W	Barbed Wire
BT	British Telecom Cover	RS	Road Sign	C/B	Close Boarded
DK	Drop Kerb	RSC	Rolled Steel Column	C/M	Corrugated Metal
EL	Electricity Cover	RSJ	Rolled Steel Joist	C/L	Chain Link
EP	Electricity Pole	RWP	Rain Water Pipe	C/P	Chesnut Paling
FH	Fire Hydrant	SC	Stop Cock	HR	Hand Rail
FFP	Flagged Footpath	SP	Sign Post	I/R	Iron Railing
FL	Floor Level	SS	Street Name Sign	Lat	Lattice
G	Gully	STP	Stand Pipe	P/C	Post and Chain
GM	Gas Meter	SV	Stop Valve	P/R	Post and Rail
GV	Gas Valve	SVP	Soil Vent Pipe	P/W	Post and Wire
HT	Height	TFP	Tarmac Footpath	Ret	Retaining Wall
IC	Inspection Cover	THL	Threshold Level		
LP	Lamp Post	TL	Traffic Light		
LH	Lamp Hole	TP	Telegraph Pole		
MH	Manhole	VP	Vent Pipe		
NB	Notice Board	WM	Water Meter		
OSBM	Ordnance Survey Bench Mark	WP	Waste Pipe		
P	Post	WT	Wall Top		
PB	Post Box	WV	Water Valve		

SURVEY AND DATUM INFORMATION:

Pseudo Ordnance Survey plane grid tied to National Grid via GPS observations at survey control point STN01.
Bearing STN01 to STN03: 52°00'43"
Survey control as indicated.

The results of the subsurface survey have been measured utilizing the existing survey control as indicated in the drawing mentioned above.

SURVEY STATIONS

Name	Easting	Northing	Height
STN01	304696.823	182784.703	56.243
STN02	304702.675	182763.712	57.429
STN03	304756.580	182831.369	61.038
STN04	304803.105	182746.622	59.096
STN05	304762.510	182734.806	58.150
STN06	304707.024	182723.799	58.456
STN07	304677.619	182726.690	54.547
STN08	304654.514	182758.068	54.265

UTILITY NOTES:

Services shown outside the survey boundary are for information only and may not be complete. If information is required outside our survey boundary, please contact a Technics Project Manager.

WEATHER CONDITIONS:

.

Rev.	Date	Revision	Signed
A	05/09/19	First Issue	LW

DO NOT SCALE!

Client:	HSP		
Project:	Penygawsi Primary School Pontyclun CF72 8PZ		
Survey Quality:	Topographical and Utility Survey		
Start Date of Survey:	07-15/09/2019		
Drawing Status: Final	Surveyed: RS/JV	Drawn: LW	Approved: LJM
Digital File: 4436-0819-02.dwg	Original Size: A0	Scale: 1:200	Sheet: 2 of 2

Drawing No.:	Revision:
4436-0819-02	A

Technics
Geospatial Consultant Surveyors

Approach House
109 Great North Road
Woodlands
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Tel: 01302 330105
Fax: 01302 338920
e-mail: Lee.Mcnichol@technicsgroup.com

Regulated by RICS

DESKTOP UTILITY RECORDS

Utility Type	Provider Details	Date Acquired
Gas	Wales and West Utilities	07/08/19
Water	Welsh Water	06/08/19
Electric	Western Power	07/08/19
BT	Openreach	07/08/19
Sewers	Welsh Water	06/08/19

1.Warning:
Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR investigation. Whenever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only. Safe digging techniques shall be used at all times, in line with the requirements of HSG47 and current CDM regulations.

2.Warning:
Assumed Route positions are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to verify the information and establish their actual position.

3.Warning:
Records information and positions are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to verify the information and establish their actual position.

Appendix B

Proposed Drawing Pack

	PROPOSED HIGHWAY - ASPHALT	
LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	AC10 CLOSE SURF, PSV 65 MIN, AAV 12 MAX TO BE EN 13108-4 AND BS 594987:2015	40
BINDER COURSE	AC20 DENSE BIN 40/60 REC. TO BS594987:2015 AND CLAUSE 906 OF THE SHW	60
BASE COURSE	AC32 DENSE BASE 40/60 REC. TO BS594987:2015 AND CLAUSE 906 OF THE SHW	150
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	230
CAPPING LAYER	CAPPING TO CLAUSE 613 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	380

	PROPOSED PEDESTRIAN AREA - ASPHALT	
LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	AC6 DENSE 100/150 (EXCLUDING LIMESTONE) TO BS EN 13108-1 AND BS 594987:2015 (BUFF COLOURED TO ARCHITECTS SPECIFICATION)	20
BINDER COURSE	AC 20 DENSE BIN 100/150 REC. TO BS594987:2015 AND CLAUSE 906 OF THE SHW	50
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	225

	PERMEABLE ASPHALT	
LAYER	SPECIFICATION	THICKNESS (mm)
SURFACE COURSE	10mm 'SUPER DRAIN ASPHALT' THIN SURFACE COURSE SYSTEM, BIN 20mm OR SIMILAR APPROVED MATERIAL	30
BINDER COURSE	14mm 'SUPER DRAIN ASPHALT' BINDER COURSE SYSTEM WITH >18% VOID CONTENT OR SIMILAR APPROVED MATERIAL	50
BASE COURSE	32mm 'SUPER DRAIN ASPHALT' BASE COURSE SYSTEM WITH >18% VOID CONTENT OR SIMILAR APPROVED MATERIAL	70
SUB BASE	TYPE 3 GRANULAR MATERIAL TO CLAUSE 805 (SPECIFICATION FOR HIGHWAY WORKS) WITH PERFORATED CARRIER DRAINS AT REGULAR INTERVALS. SEE NOTE 1.	230
CAPPING LAYER	CAPPING TO CLAUSE 613 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	380
SUBGRADE SEPARATION	GEOMEMBRANE WRAPPED IN NON-WOVEN GEOTEXTILE. SEE NOTE 2.	-

	PERMEABLE BLOCK PAVING	
LAYER	SPECIFICATION	THICKNESS (mm)
CONCRETE BLOCKS	TBC BY ARCHITECT	TBC
LAYING COURSE	TBC BY MANUFACTURER. ASSUME 6-2mm OPEN GRADED CRUSHED ROCK WUTH 6mm JOINTS FILLED WITH CRUSHED ROCK	50
SUB BASE	TBC BY MANUFACTURER. ASSUME 20-4mm OPEN GRADED CRUSHED ROCK WITH MARSHALLS MT120 (OR SIMILAR) FILTRATION TEXTILE SEPERATING SUBBASE AND SUBGRADE	200

	FEATURE PAVING/CONCRETE BLOCKS	
LAYER	SPECIFICATION	THICKNESS (mm)
CONCRETE BLOCKS	TBC BY ARCHITECT	TBC (50mm min)
SAND-LAYING COURSE	SAND LAYING COURSE WITH SAND FILLED NARROW JOINTS IN ACCORDANCE WITH BS7533-4	50
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	360

	FEATURE PAVING/CONCRETE BLOCKS WITH LIGHT TRAFFICKING	
LAYER	SPECIFICATION	THICKNESS (mm)
CONCRETE BLOCKS	TBC BY ARCHITECT	TBC
SAND-LAYING COURSE	SAND LAYING COURSE WITH SAND FILLED NARROW JOINTS IN ACCORDANCE WITH BS7533-4	30
ROADBASE	AC20 DENSE BASE WITH 100 PEN. LAID IN 2 LAYERS	125
SUB BASE	TYPE 1 GRANULAR MATERIAL TO CLAUSE 803 (SPECIFICATION FOR HIGHWAY WORKS). SEE NOTE 1.	360

	PROPOSED SOFT LANDSCAPING - TO BE CONFIRMED BY LANDSACPE ARCHITECT	
LAYER	SPECIFICATION	THICKNESS (mm)
TOP SOIL	CLEAN TOPSOIL	TBC
SUB SOIL	CLEAN SUB-SOIL	TBC

	WET POUR RUBBER SURFACING	
LAYER	SPECIFICATION	THICKNESS (mm)
WET POUR	RUBBER PLAYGROUND SURFACING. REFER TO MANUFACTURER AND ARCITECT SPECIFICATION	TBC
PEDESTRAIN AREA ASPHALT	MATERIALS AS PER PEDESTRAIN AREA ASPHALT. ALL LAYERS REQUIRED	AS PED AREA ASPHALT

Legend

- Proposed Highway - Asphalt
- Proposed Pedestrian Area - Asphalt
- Permeable Asphalt
- Permeable block paving
- Feature paving/concrete block
- Feature paving/concrete block overridden by vehicular traffic (note 4)
- Proposed Landscaping (grassed areas)
- 'Wet Pour' (see note 3)

Notes

1. A design CBR value of 3% has been taken across the site. CBR to be confirmed by contractor.

2. Wrapped geomembrane used for car park areas to stop infiltration due to the potential for water seepage through the construction layer.

3. Wetpour is a rubber surfacing that is to be applied on top of the pedestrian asphalt construction build up. Refer to manufactuer and architecture specification

4. Traffic loading is to be less than 5 vehicles a day with no more than 0.5msa over the pavement lifetime

Issue	Date	By	Chkd	Appd
P01	24/09/21	IA	JN	IA

Issued for RIBA Stage 3

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Construction Build-Ups

Scale at A1 1:250 | Role Civils

Suitability S3- Suitable for Review and Comment

Job No 281143 | Rev P01

Drawing No
RH0101-ARP-ZZ-00-DR-C-00091

J:\281\00\281143-004 Internal Project Data\4-00 Drawings\4-31 Issue drawings\RH0201-ARP-04-DR-C-00091.dgn

Do not scale

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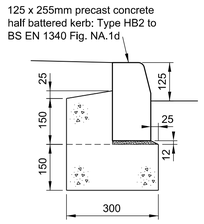
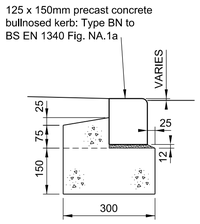
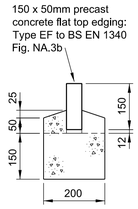


KERB TYPE HB2



KERB TYPE BN (FLUSH KERB)



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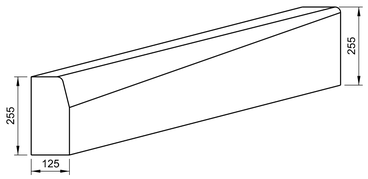
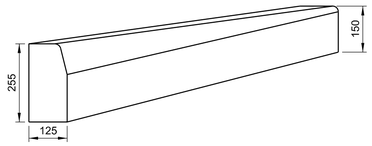
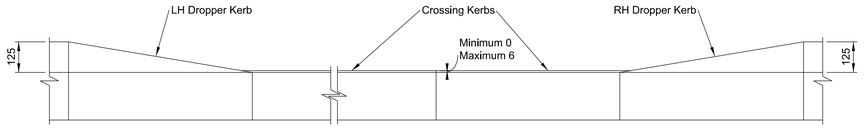


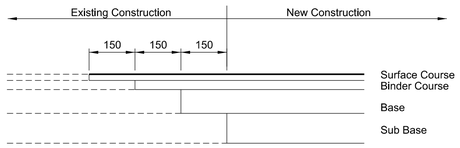
TRANSITION KERB (125x255 HB - BN)



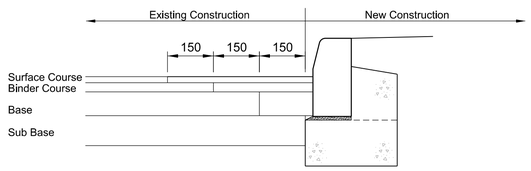
DROP KERB (125x255/150 HB - BN)



DROPPED KERB CROSSING POINT DETAIL - HALF BATTERED TO BULLNOSED



LONGITUDINAL TIE IN DETAIL

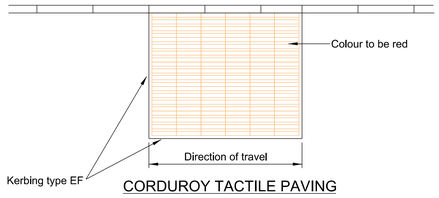


REINSTATEMENT DETAIL

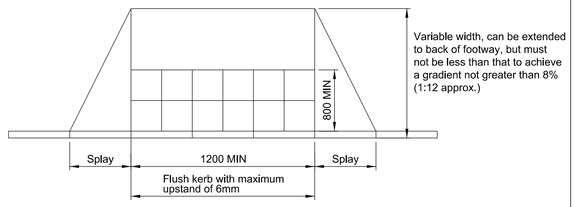
MODULE TYPE	SIZE	PITCH DIMENSION(mm)	
		A	B
A	400 x 400	66.8	33
B	450 x 450	64	33
C	200 x 133	67	33

Notes:-

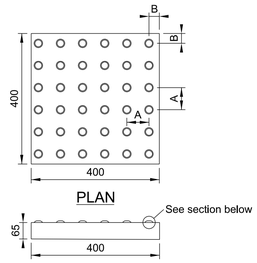
1. Textured slabs to be laid parallel to the crossing studs which may not necessarily be square to the crossing.
2. Flush kerb is type 4 dropped kerb laid flush with the carriageway surface or with a maximum upstand of 6mm.
3. Textured slabs to be coloured red at controlled crossings and buff coloured at uncontrolled crossings as detr mobility unit 'guidance on the use of tactile paving surfaces'.
4. Textured slabs to be bedded on 25mm sand bed on 100mm thick type 1 sub-base to CL 803.



CORDUROY TACTILE PAVING

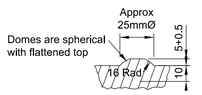


HAZARD TACTILE PAVING



PLAN

ELEVATION



BLISTER PAVING

Notes:

1. Do not scale from this drawing.

2. All dimensions are in millimetres unless noted otherwise.

Issue	Date	By	Chkd	Appd
P01	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Construction Details

Scale at A1: NTS
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: 281143
Rev: P01
Drawing No: RH0101-ARP-ZZ-00-DR-C-00100

\\globaleurope\Cardiff\Jobs\281000\281143-004 Internal Project Data\4-30 Drawings\4-31 Issue drawings\RH0101-ARP-00-DR-C-00100.dgn

Do not scale

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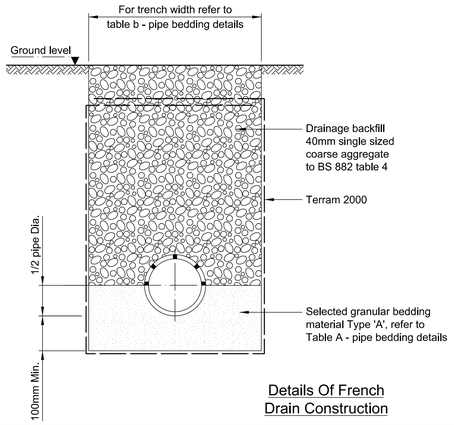
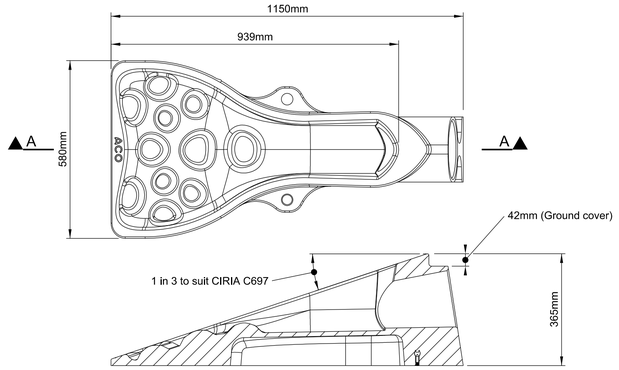


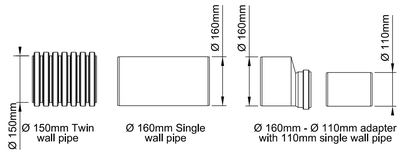
Details Of French Drain Construction

Notes

1. Top soil may be extended over the drainage stone with the engineer's approval.
2. For details of pipes refer to the layout drawings.
3. Terram 2000 to be used to surround backfill as specified by the engineer.
4. All dimensions are in mm.
5. Filter drain detail as existing. To be confirmed on site.



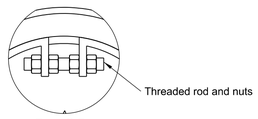
SECTION A-A



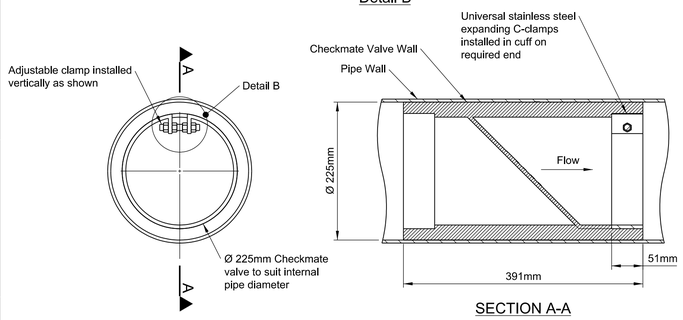
Notes

*Grating kit contains 1 x Grade 304 Stainless Steel mesh grating (mesh size is 42mm), 3 x anchors, 3 x washers and 3 x fixing screws
+ Ground Anchor kit contains 2 x ground anchors, 2 x washers and 2 x bolts

ACO Swale Inlet



Detail B



SECTION A-A

In-Line Non-Return Valve
Althon Checkmate or Similar Approved

Notes

1. Clamp installed in upstream or downstream cuff depending on installation orientation.
2. Shorter lengths available.

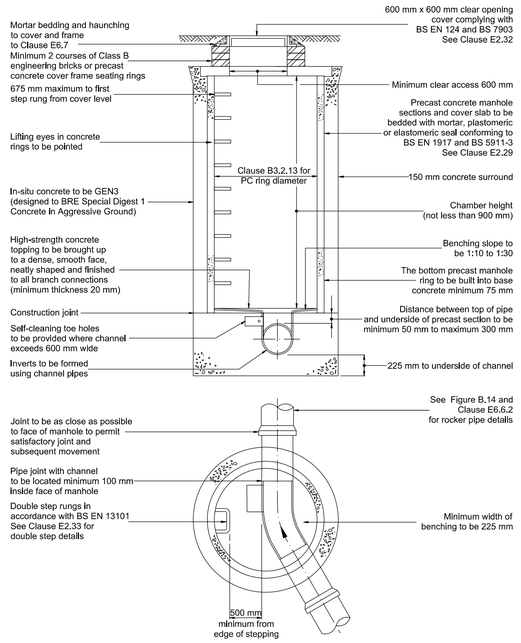


Figure B.12
Typical Manhole Detail - Type 2
Maximum depth from cover level to soffit of pipe 3.0 m

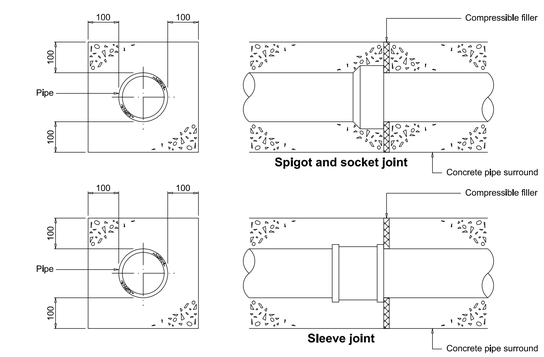
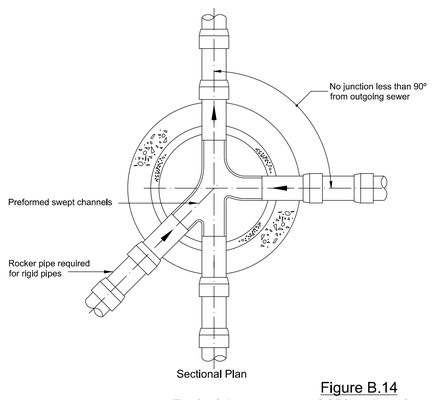


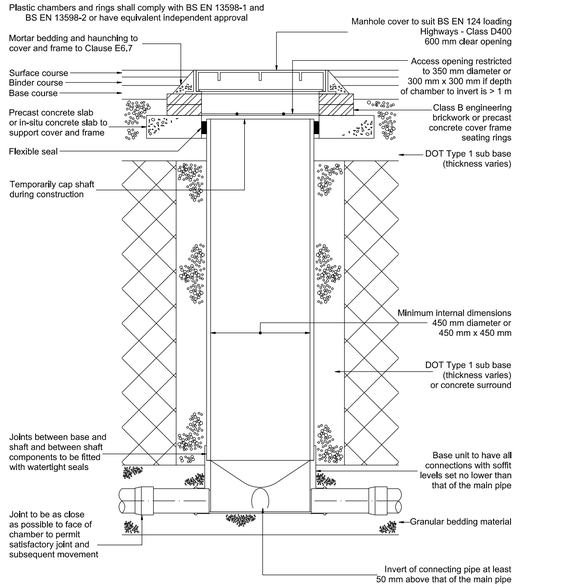
Figure B.26
Joints For Concrete Encased Pipes



Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

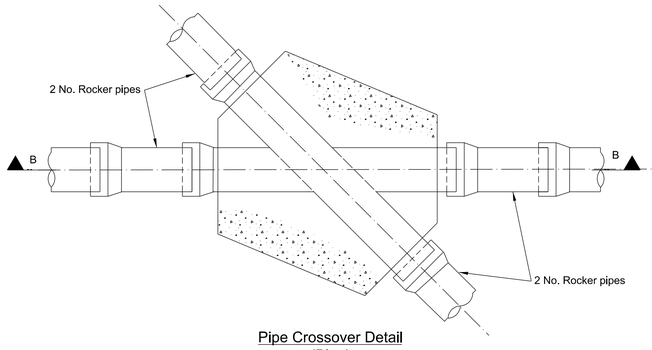
Table 1-Rocker Pipe Lengths

Figure B.14
Typical Arrangement Of Pipe Junctions Within Manholes

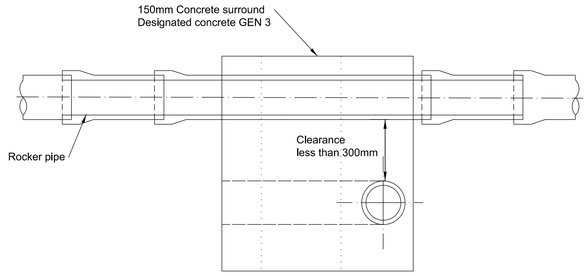


Note: Where the access chamber is in the highway the Highway Authority can have specific requirements

Figure B.16
Typical Inspection Chamber Detail - Type 3 (Flexible Material Detail)
Maximum depth from cover level to soffit of pipe
in areas subject to vehicle loading 3 m, non-entry



Pipe Crossover Detail
(Plan)



Section B-B
Pipe Crossover Detail

Notes

1. Do not scale.
2. All levels are in metres above ordnance datum unless stated otherwise.
3. All propriety products to be installed to manufacturers requirements and specifications.
4. Drainage design and construction is in accordance with Sewers for Adoption 7th Edition.
5. The details shown on this drawing are for RIBA Stage 3. The details will need to be reviewed and revised following Full SAB process.

Issue	Date	By	Chkd	Appd
P01	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Proposed Drainage Details
Sheet 1 of 2

Scale at A1 N.T.S | Role Civils
Suitability S3- Suitable for Review and Comment
Job No 281143 | Rev P01
Drawing No RH0101-ARP-ZZ-00-DR-C-00110

\\globaleurope\Cardiff\Jobs\281800\281143\004 Internal Project Data\4-00 Drawings\4-31 Issue drawings\RH0101-ARP-00-DR-C-00110.dgn

Do not scale
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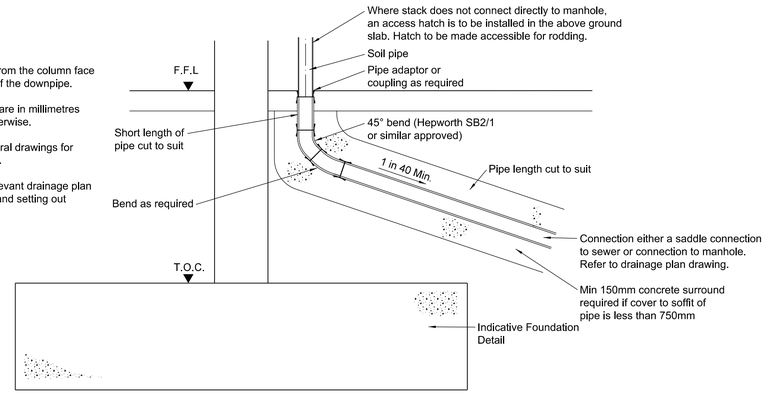
Notes:

1. All offsets are from the column face to the centreline of the downpipe.

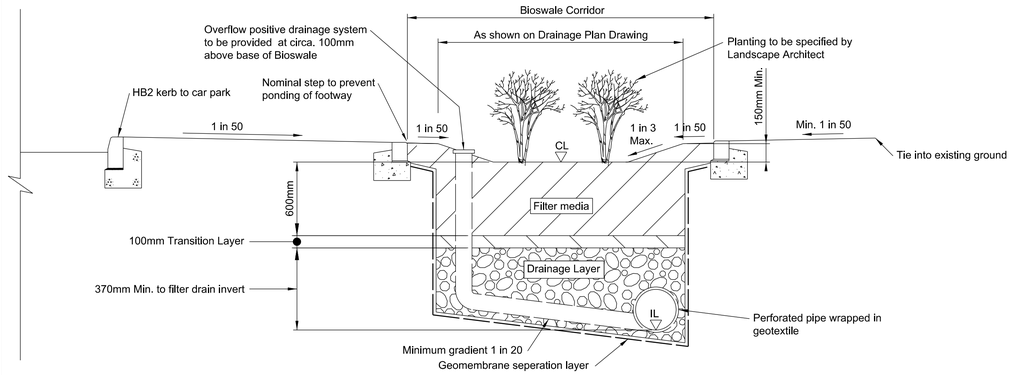
2. All dimensions are in millimetres unless shown otherwise.

3. Refer to structural drawings for foundation details.

4. Refer to the relevant drainage plan drawing for level and setting out information.



Connection Detail For Downpipes



Bioretention Feature with low planting

Scale 1:25

Notes

1. Do not scale.

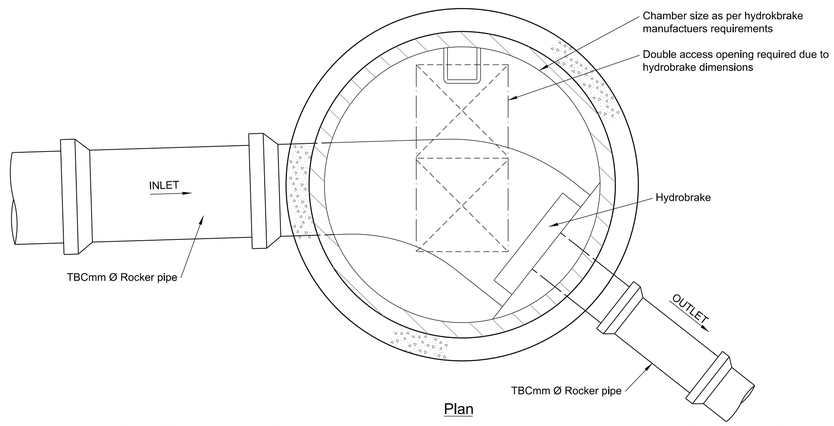
2. All levels are in metres above ordnance datum unless stated otherwise.

3. All propriety products to be installed to manufacturers requirements and specifications.

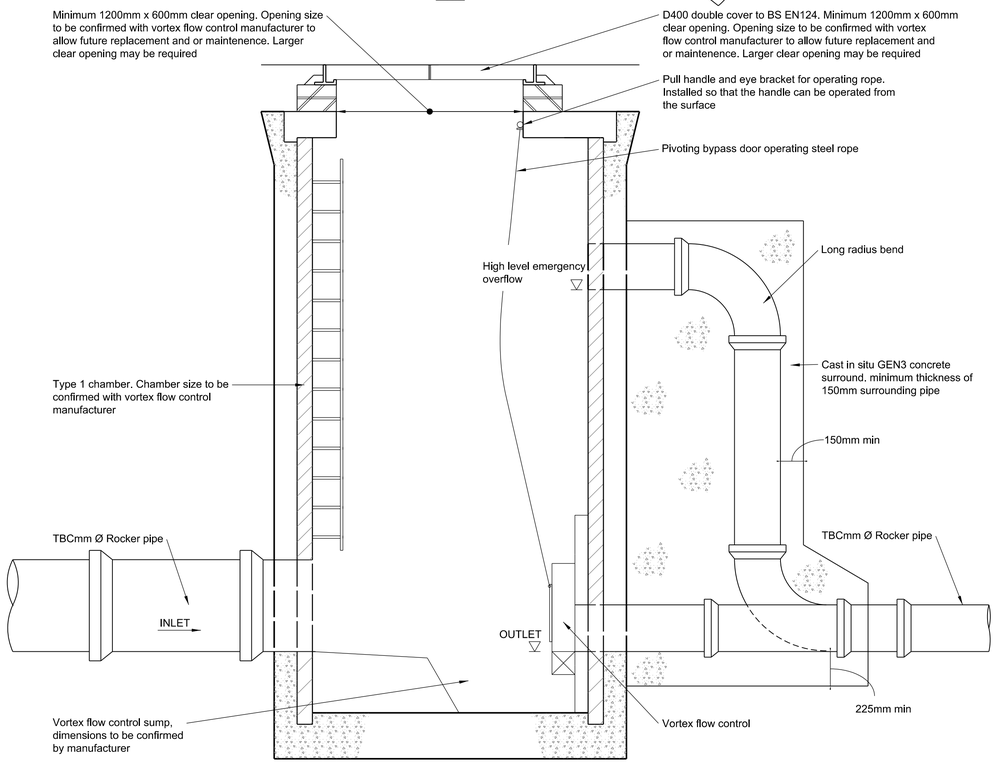
4. Drainage design and construction is in accordance with Sewers for Adoption 7th Edition.

5. The details shown on this drawing are for RIBA Stage 3. The details will need to be reviewed and revised following Full SABS.

6. Refer to drawing RH0201-ARP-0-0-DR-C-00041, RH0301-ARP-0-0-DR-C-00041 and RH04 01-ARP-0-0-DR-C-00041 for plan extents of raingarden features.

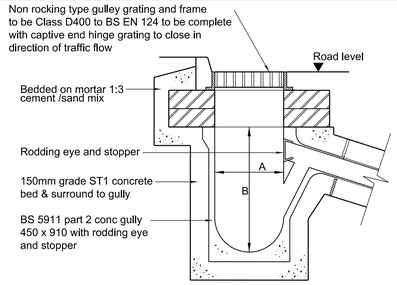


Plan

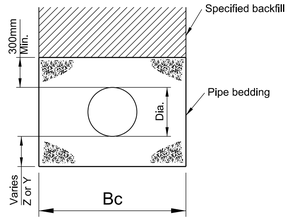


Section

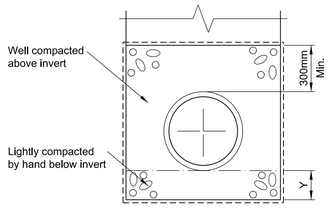
Flow Control Chamber



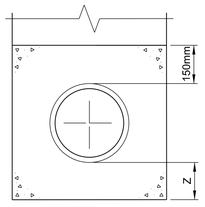
Gully Detail



	Yard Gully	Road Gully
A	300	450
B	600	750



Class S
Granular Bed and Surround
(Bedding factor 2.2)



Class Z
Concrete Bed and Surround
(Bedding factor 4.5)

Legend

- Concrete mix ST4
- Granular pipe bedding material Type 'A' (See Table A)
- Selected excavated material (Refer to specification)
- Clay (See CESWI 7, clause 2.18)

Pipe Dia. (mm)	Aggregate Size: Graded (mm)	Aggregate Size: or single sized (mm)
100	-	10
150	14 - 5	10 Or 14
225-300	14 - 5 Or 20 - 5	10, 14 Or 20
375-525	14 - 5 Or 20 - 5	10, 14 Or 20
EXCEEDING 525	14 - 5 Or 20 - 5 Or 40 - 5	10, 14, 20 Or 40

Table A - Granular pipe bedding material Type 'A'

Table of Dimensions

Letter		Pipe Sizes	Dimension (mm)
L		100 - 450	25
		525 - 900	30
Y*	Y1	100 - 150	100
		225 - 900	150
	Y2	100 - 750	200
		825 - 900	225
Z		100 - 375	100
		450 - 600	150
		675 - 900	225

* Y1 - Unifrom Soil
* Y2 - Rock

Notes:

1. All excavation in excess of Bc shall be backfilled with concrete Mix ST2.

2. Dimension Y2 shall be increased at a rate of 40mm per additional 1000mm cover to pipe in excess of 5000mm.

Pipe Dia.	Width Bc: Max.	Width Bc: Min.	Y: Y1 (Uniform soil)	Y: Y2 (Rock) *	L	Z
						Min.
100	550	450	100	200	25	100
150	600	490	100	200	25	100
225	700	580	150	200	25	100
300	750	680	150	200	25	100
375	1050	950	150	200	25	100
450	1150	1030	150	200	25	150
525	1200	1120	150	200	30	150
600	1350	1240	150	200	30	150
675	1450	1330	150	200	30	225
750	1500	1400	150	200	30	225
825	1600	1490	150	225	30	225
900	2100	1900	150	225	30	225
975	2150	1950	175	250	30	300
1050	2250	2050	175	275	30	300
1200	2500	2250	200	300	30	300
OVER 1200	Outside Dia. + 1000	Outside Dia. + 800	DIA/6	DIA/4	54	400

Table B - Trench widths and other dimesions
* See Note 2

Pipe Bedding Details

Issue	Date	By	Chkd	Appd
P01	24/09/21	RL	JN	IA

Issued for RIBA Stage 3

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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Proposed Drainage Details
Sheet 2 of 2

Scale at A1: N.T.S
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: 281143
Rev: P01
Drawing No: RH0101-ARP-ZZ-00-DR-C-00120

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Do not scale

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A1

N

Unable To Survey due to Dense Vegetation

Charles Road

Building

55.50m

55.50m

59.50m

60.50m

60.00m

58.00m

57.8m

54.50m

58.00m

57.50m

CLOS LELAND

Avoca

Birchfield

DESPENSER AVENUE

LLYS DERWEN

Penygawsi Primary School

Ysgol Gynradd Penygawsi

Legend

Site Boundary

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in September 2019. No responsibility can be taken for the accuracy of the survey.

4. All levels are shown above ordnance datum (m AOD).

5. The details shown on this drawing are subject to change in subsequent design stages and following any potential comments received from statutory authorities.

Issue	Date	By	Chkd	Appd
P02	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				
P01	24/05/21	DS	JN	IA
Issued for Information				

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Existing Site Layout

Scale at A1: 1:500
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: **281143**
Rev: **P02**
Drawing No: **RH0401-ARP-ZZ-00-DR-C-00001**

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Do not scale

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A1

Legend

Site Boundary

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in September 2019. No responsibility can be taken for the accuracy of the survey.

4. All levels are shown above ordnance datum (m AOD).

5. The details shown on this drawing are subject to change in subsequent design stages and following any potential comments received from statutory authorities.

6. Layouts are based on conceptual layouts received from Ares on 01-09-2021 and are subject to ongoing coordination and further design development during subsequent stages.

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Issue	Date	By	Chkd	Appd
P02	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				
P01	24/05/21	DS	JN	IA
Issued for Information				

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Proposed General Arrangement

Scale at A1: 1:500
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: **281143**
Rev: **P02**
Drawing No: **RH0401-ARP-ZZ-00-DR-C-00011**

Do not scale

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A1

Legend

- Site Boundary
- Storm Sewer
- Storm Sewer (Assumed Route)
- Foul Sewer
- Foul Sewer (Assumed Route)
- Combined Sewer
- Gas
- Water
- Telecoms
- Electric
- Unknown

Notes

1. The positions of services and plant shown on this drawing are indicative only and reflect the level of information obtained from a survey carried out by 'Technics Group' in August 2019. No guarantee is given for the accuracy of this information and it is intended for general guidance only.

2. Services may exist at various depths and their routes may deviate within the vicinity of the routes shown,. The information must not be relied upon for excavation or other works. The onus of locating the services before using mechanical excavator or other plant, rests entirely upon the contractor.

3. Where utilities are indicated there may be multiple cables present.

4. Other utilities may be present underground that are not shown on this drawing. Before any works are undertaken, the contractor is to ensure they are satisfied that the works area is utility free or that any identified utility can be managed safely.

5. Contractor should review all factual information related to utilities, liaise with statutory authorities and undertake further checks and surveys to ascertain location and depth of utilities prior to undertaking intrusive, construction or diversion works.

6. Utility location and depth should be read at the appropriate accuracy in accordance with PAS128.

7. Refer to MEP drawings for the utility strategy and how the services are to be removed and at what stage of the project.

8. The existing drainage of the school site will need to be accommodated during construction. Details to be confirmed at future design stages.

Issue	Date	By	Chkd	Appd
P02	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				

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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Existing Utilities

Scale at A1 1:500 | Role Civils

Suitability S3- Suitable for Review and Comment

Job No **281143** | Rev **P02**

Drawing No **RH0401-ARP-ZZ-00-DR-C-00021**

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Do not scale

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A1

N

Retaining structure or ground improved (if possible) required

Existing playing field levels retained

Topographical survey is not available. 2-3m tall retaining structure may be required if earthwork solution is not possible.

Footpath slope to be reviewed in next Stage

Existing access road levels retained

Indicative attenuation pond location and earthworks. Invert level to be reviewed and earthworks refined in the next Stage

FFL = 56.500m

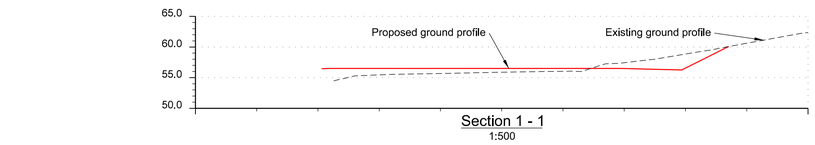
low point

Unable To Survey due to Dense Vegetation

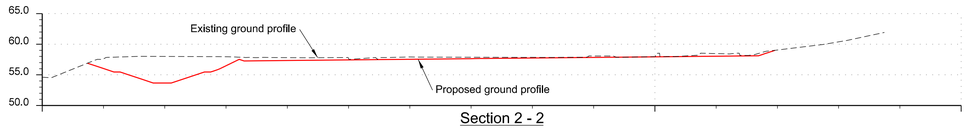
CLOS LELAND

Chapel Road

DESPENSER AVENUE



Section 1 - 1
1:500



Section 2 - 2
1:500

Legend

- Site Boundary
- 47.00m — Proposed Contour
- C 0.29m — Depth of Cut
- F 0.29m — Depth of Fill
- Retaining structure
- Possible retaining structure

Notes

1. Cut and fill depths shown are based on the difference between the proposed finished levels and the existing ground level.

2. All levels at the site boundary are retained at existing level.

Issue	Date	By	Chkd	Appd
P02	24/09/21	CB	JN	IA
Issued for RIBA Stage 3				
P01	24/05/21	DS	JN	IA
Issued for Information				

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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
External Finished Levels

Scale at A1: 1:500
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: 281143
Rev: P02
Drawing No: RH0401-ARP-ZZ-00-DR-C-00031

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Do not scale

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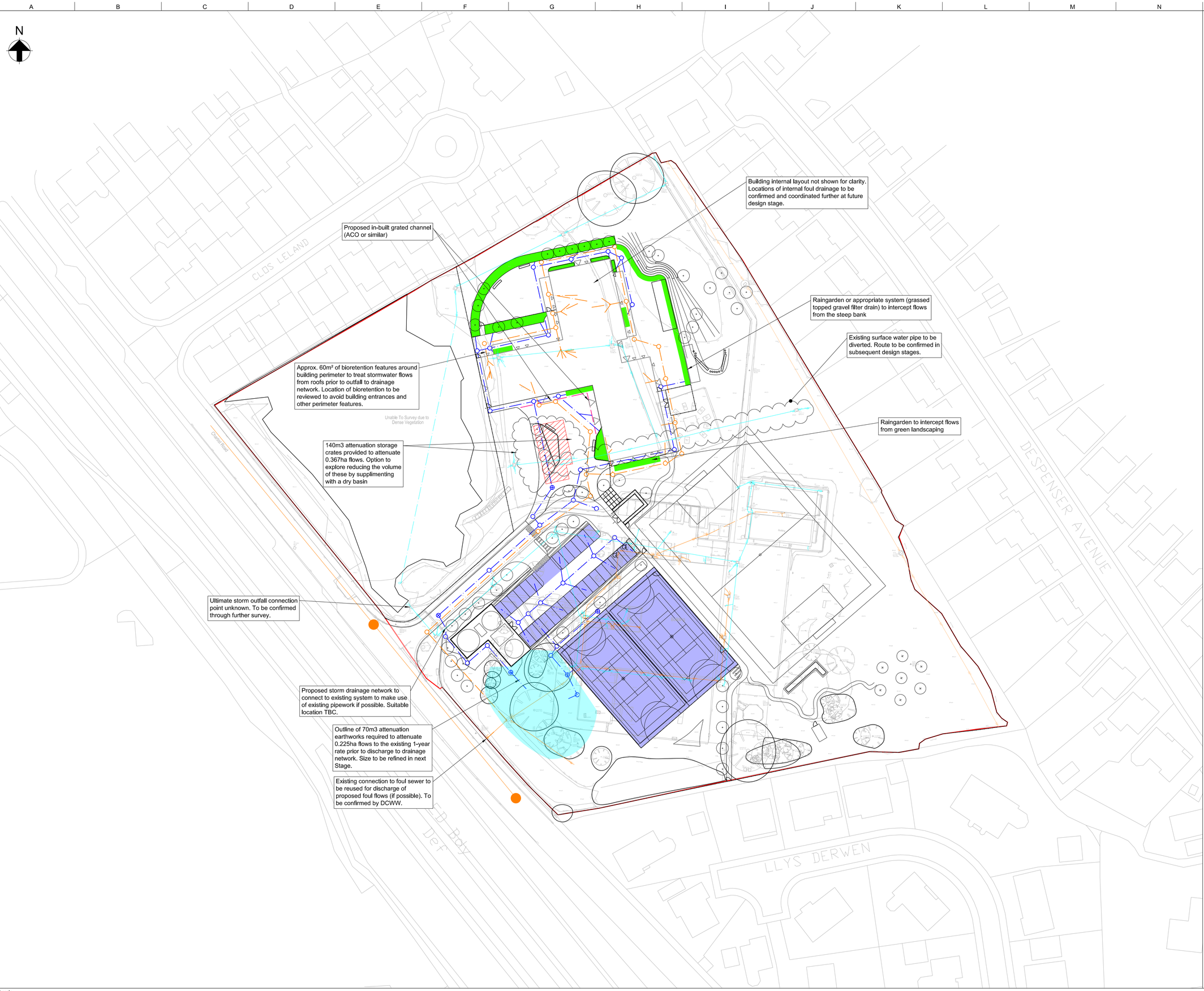

Legend

- Site Boundary
- Existing Storm Sewer
- Existing Storm Sewer (Assumed Route)
- Existing Foul Sewer
- Existing Foul Sewer (Assumed Route)
- Existing Combined Sewer
- Proposed Bioretention
- Proposed Storm Drainage
- Proposed Flow Control
- Proposed In-Built Fall Grated Channel
- Proposed Detention Basin
- Proposed Porous Paving
- Proposed Foul Drainage

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on a RIBA Stage 3 design produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in September 2019. No responsibility can be taken for the accuracy of this survey.

4. All levels are shown above ordnance datum (mAOD)

5. Storm drainage proposals to be agreed with RCT SAB officer including form and location of treatment/attenuation and the outfalling discharge rate.

6. Attenuation sizes are based on attenuating all return periods up to 1:100 to the 1:1 year discharge rate. The area and volume of attenuation required is subject to agreement with the SAB and DCWW.

7. Manhole and pipe sizes/locations to be confirmed in subsequent design stages.

8 Awaiting soakaway test results to determine if a soakaway solution is acceptable. Further Ground Investigation works may be required.

9. Foul and storm drainage provision to be retained for the operational school buildings during construction.

10. Continued coordination with the landscape architect required through the subsequent design stages.

11. Location of rainwater downpipes to be confirmed at future design stages and drainage design to be updated. Locations of bioretention features are indicative and liable to change as as a result. Location of attenuation, rain gardens and pipe routes to be coordinated through future design stages.

Issue	Date	By	Chkd	Appd
P02	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				
P01	24/05/21	DS	JN	IA
Issued for Information				

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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Proposed Drainage

Scale at A1	Role
1:500	Civils

Suitability: S3- Suitable for Review and Comment

Job No	Rev
281143	P02

Drawing No
RH0401-ARP-ZZ-00-DR-C-00041

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Do not scale

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A1

Legend

- Site Boundary
- Proposed Highway - Asphalt
- Proposed Pedestrian Area - Asphalt
- Permeable Asphalt
- Permeable block paving
- Feature paving/concrete block
- Feature paving/concrete block (trafficking)
- Proposed Landscaping (grass and rain garden)
- 'Wet Pour'
- HB2 kerb
- Flush kerb

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on a RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in August 2019. No responsibility can be taken for the accuracy of this survey.

4. The details shown on this drawing are subject to change in subsequent design stages and following any potential comments received from statutory authorities.

5. Drawing does not show proposed soft landscaping details to be incorporated for the SuDS design.

6. Soft landscaping soil details to be advised by landscape architect.

7. The construction thickness of the permeable block paving, feature block paving and 'Wet Pour' are to be designed by the chosen supplier for the desired use and trafficking

8. An edging kerb to architect specification will be required between all footway and landscaping areas and any change of surface.

9. The construction finishes are designed by the Landscape Architect. Refer to drawing RH0201-ARP-0-0-DR-C-00091 for the construction build-ups.

10. Layouts are based on conceptual layouts received from Ares on 01-09-2021 and are subject to ongoing coordination and further design development during subsequent stages.

11. Transition kerbs will be requierd between flush and HB2 kerbing.

12. All levels are shown above ordnance datum (m AOD)

13. Hard landscaping finishes based on Ares drawings received 20/09/2021

Issue	Date	By	Chkd	Appd
P02	24/09/21	IA	JN	IA
	Issued for RIBA Stage 3			
P01	24/05/21	DS	JN	IA
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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Construction Finishes

Scale at A1	Role
1:500	Civils

Suitability: S3- Suitable for Review and Comment

Job No	Rev
281143	P02

Drawing No
RH0401-ARP-ZZ-00-DR-C-00051

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Do not scale

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A1

Legend

- Site Boundary
- Large Refuse Vehicle In
- Large Refuse Vehicle Out
- Fire Tender In
- Fire Tender Out

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on a RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographical survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in August 2019. No responsibility can be taken for the accuracy of this survey

4. All levels are shown above ordnance datum (m AOD).

5. The details shown on this drawing are subject to change in subsequent design stages and following any potential comments received from statutory authorities.

6. Layouts are based on conceptual layouts received from Ares on 11-06-2021 and are subject to ongoing coordination and further design development during subsequent stages.

Issue	Date	By	Chkd	Appd
P01	24/09/21	RL	JN	IA
Issued for RIBA Stage 3				

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Client
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Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygsawi
Vehicle Tracking

Scale at A1	Role
1:500	Civils

Suitability: S3- Suitable for Review and Comment

Job No	Rev
281143	P01

Drawing No
RH0401-ARP-ZZ-00-DR-C-00061

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Do not scale

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A1

N

Existing dense vegetation and woodland to be removed. Extent of removal TBC

Unable To Survey due to Dense Vegetation

Garden area (decking, flower bed, shed etc..) to be removed

Containers to be removed

Shed to be removed

Apparatus to be removed

Lamp post to be removed

Shed to be removed

Play house to be removed

Benches to be removed

Gate to be removed

Gazebo to be removed

Decking to be removed

Charlist Road

Building

Building

Building

Avoca

Birchfield

CLOS LELAND

LLYS DERWEN

DESPENSER AVENUE

Penygawsi Primary School

Ysgol Gynradd Penygawsi

Legend

- Site Boundary
- Structure demolition shown by others
- Asphalt and associated pavement removed to bottom of porposed subbase
- Landscaping to be removed to bottom of porposed subbase
- Internal wall to be removed
- Existing tree to be removed

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on a RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in August 2019. No responsibility can be taken for the accuracy of this survey.

4. All levels are shown above ordnance datum (m AOD).

5. The contractor should review the bottom of subbase levels and remove and exisitng pavement/landscaping above this level.

6. All existing furniture/equipment/structures to be removed

7. All kerbing to be removed within side boundary

8. All existing sheds/canopies/greenhouses or any other buildings/structures associated with the existing school main buldings are to be removed.

9. All stairsets and walling within the red line boundary is to be removed (excluding the perimater walling around the red line boundary

10. All existing redundant utilities (including chambers to be removed)

11. If possible, contractor to retain existing features e.g. fencing/kerbing and reuse

Issue	Date	By	Chkd	Appd
P02	24/09/21	IA	JN	IA
	Issued for RIBA Stage 3			
P01	24/05/21	DS	JN	IA
	Issued for Information			

ARUP

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www.arup.com

Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Site Cearance

Scale at A1 1:500

Role Civils

Suitability S3- Suitable for Review and Comment

Job No **281143**

Rev **P02**

Drawing No **RH0401-ARP-ZZ-00-DR-C-00071**

J:\281\00\281143-004 Internal Project Data\4-00 Drawings\4-31 Issue drawings\RH0401-ARP-XX-DR-C-00071.dgn

Do not scale

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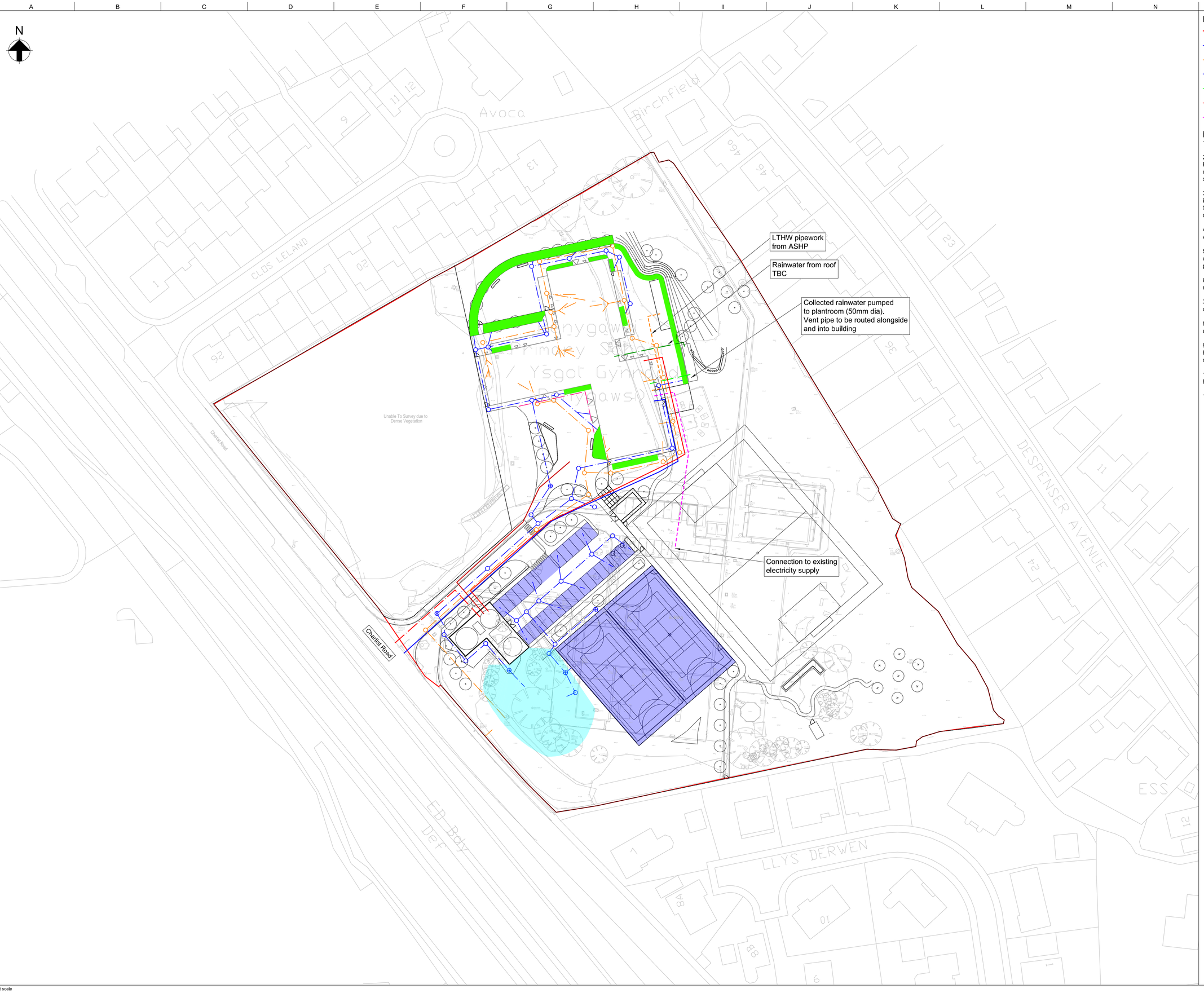
A1



Legend

- Site Boundary
- Proposed Surface Water Drainage
- Proposed Foul Water Drainage
- Proposed Potable Water
- Proposed Fire Water
- Proposed Hydrant Main
- Proposed LV Electric

Notes

1. Do not scale from this drawing.

2. The details shown on this drawing are based on a RIBA Stage 3 produced for MIMWEP Stage 2. The details will need to be reviewed and revised during subsequent design stages.

3. The topographic survey detail shown on this drawing is based on a survey carried out by 'Technics Group' in September 2019. No responsibility can be taken for the accuracy of this survey.

4. All levels are shown above ordnance datum (m AOD).

5. The details shown on this drawing are subject to change in subsequent design stages and following any potential comments received from statutory authorities.

6. Existing servies to the existing school building to be removed not shown on this drawing for clarity.

7. Contractor to identify any unknown services prior to commencement of works.

8. Contractor to investigate and identify all known and unknown services prior to commencement of works.

9. Refer to MEP drawings for the utility strategy and how the services are to be removed and at what stage of the project.

10. The existing drainage of the school site will need to be accommodated during construction.

11. No gas is required

Issue	Date	By	Chkd	Appd
P01	24/09/21	IA	JN	IA
Issued for RIBA Stage 3				

ARUP

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Client
MIMWEP
Rhondda Cynon Taf County Council

Project Title
RCT Batch Primary

Drawing Title
Penygawsi
Proposed Utilities

Scale at A1: 1:500
Role: Civils
Suitability: S3- Suitable for Review and Comment
Job No: 281143
Rev: P01
Drawing No: RH0401-ARP-ZZ-00-DR-C-00081

J:\281000\281143-00\4 Internal Project Data\4-00 Drawings\4-31 Issue drawings\RH0401-ARP-XX-DR-C-00081.dgn

Do not scale

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Appendix C

Hydrology Calculations

File Note

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Project title	RCT 3 Primary Batch	Job number	281143
cc		File reference	4-20
Prepared by	Jim Newbold (Cardiff)	Date	6th October 2021
Subject	Hydrology Calculations – Penygawsi Primary		

1 Introduction

This technical note outlines the hydrological calculations to determine the existing and proposed discharge rate for Penygawsi Primary School and estimate the storm water attenuation volume required.

Hydrological analysis has been undertaken on the existing catchments to inform the storm flows generated from the existing development. The proposed allowable discharge rate leaving the site has been investigated with two calculation methods explored:

1. Restricting the impermeable area outflow (up to the 1:100-year event plus 40% climate change) to the 1:1 year Greenfield Runoff Rate (GRR);
2. Restricting the proposed impermeable area flow (up to the 1:100-year event plus 40% climate change) to 70% of the existing 1:1 year brownfield rate (providing 30% betterment on the 1:1 year storm event and more for higher events).

Both methods offer a reduction in the flow leaving the site compared to the existing situation and therefore will reduce the risk of flooding in the receiving receptor. Note the ultimate outfall is unknown and additional survey has been proposed.

The restricted water will need to be stored on site and the method used to calculate the allowable discharge will directly impact the attenuation volume.

2 Existing Storm Drainage

Topographical, drainage and utility surveys were undertaken for the site by Technics Group Ltd between August and September 2019. These surveys have been used to assess and understand the existing drainage within the site.

Figure 1 below shows the assumed existing storm drainage scenario for the site:

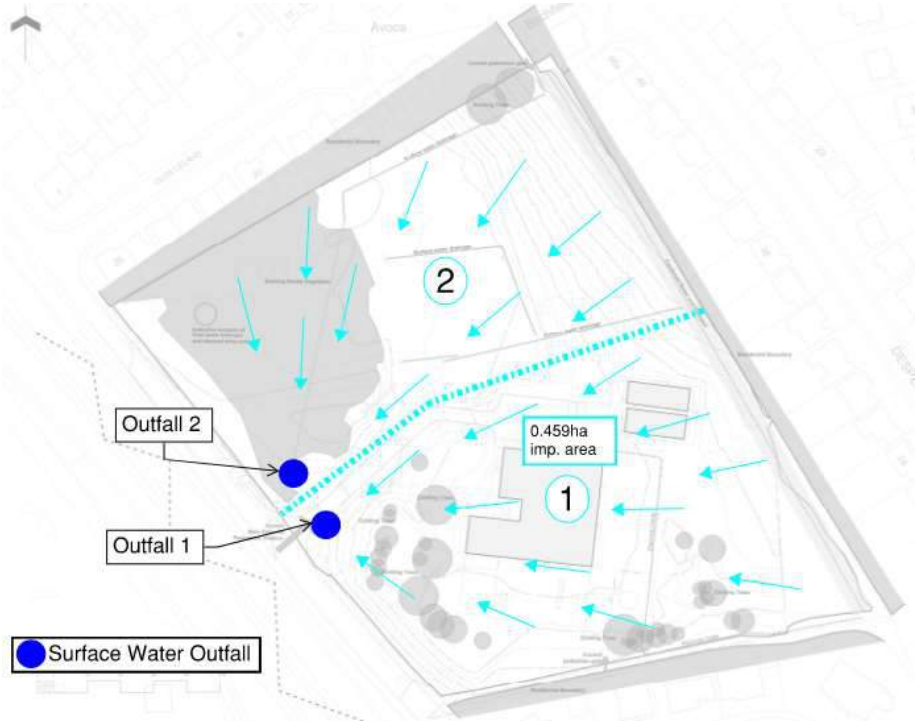


Figure 1: Penygawsi Primary School existing catchment plan – informed by topographical survey carried out by Technics Group Ltd between August and September 2019.

It is shown on the survey that the site is split into two catchments, which drain towards two locations in the area of dense vegetation adjacent to the western site boundary. Both Outfalls 1 and 2 in Figure 1 represent the points at which the non-intrusive survey was unable to continue. It is possible that the two networks combine and outfall to a surface water sewer west of the development, however this has not been confirmed. It should be noted that the DCWW sewer records do not show a storm or combined sewer network in Chartist Road and the non-intrusive survey does not show a pipe existing the site towards the public road therefore it is possible that all storm flows are retained on site within the woodland.

A large proportion of the Penygawsi site is grassed playing fields, landscaping and woodland with impermeable areas associated with the school building, car park and access road.

The catchment to Outfall 1 comprises of the school buildings and associated asphalt areas and car parking impermeable surfaces with overland flow from the grassed areas within the catchment boundary. These are collected through roof gutter/downpipe or gullies and then conveyed to the site entrance through a piped network. The non-intrusive survey implies that the pipe exiting the chamber at the site entrance runs west in the direction of the woodland.

The catchment for Outfall 2 covers the western portion of the site. The non-intrusive survey has detected multiple private storm pipes under the playing field however the purpose of these pipes and the contributing flows are unknown. Their location implies they could be field drains to serve the grassed areas and the northern steeper slope. The effectiveness of these pipes is also unknown as the utility survey recorded a number of blocked spurs. The non-intrusive survey did not detect the entire drainage network therefore the outfall locations of these pipes are unknown. The plans suggest that a sewer enters the site from the north and runs through the woodland to the approximate Outfall 2 location although this sewer is not indicated on the DCWW plans. The majority of the route could not be surveyed due to dense vegetation in the woodland. The upstream catchment outside of the site boundary is unknown. There is no impermeable area included in the catchment of the Penygawsi site that drains to Outfall 2 and due to the steepness of some of the slopes, it is assumed that overland flow is likely in those steeper areas with the water potentially infiltrating in the shallower areas.

Generally, rainfall landing on the grassed areas is assumed to either percolate into the ground or run overland. On the western portion of the site, assuming the drainage network is no longer functioning, the overland flow path is into the woodland on the western site boundary. Although a watercourse is not identified in the woodland area, the surface water flood maps imply surface water flooding therefore a depression in the natural landscape which could naturally attenuate the flow allowing evaporation/infiltration into the ground. It is likely that this attenuation is uncontrolled and is not managed or maintained.

3 Calculated discharge rates from the existing site

The greenfield runoff rate and the brownfield runoff rate have been determined for the site. The existing drainage networks have been modelled on each site to inform the brownfield runoff.

3.1 Greenfield Runoff Rate Calculation

The Greenfield Runoff Rate (GRR) is the flow rate that stormwater from the site would discharge if it was undeveloped. The GRR for the Qbar, 1:1 year, 1:30 year and 1:100-year event have been calculated for the site using the ICP SuDS method. This is an industry standard method to estimate the GRR based on the Institute of Hydrology 124 (IoH124) method. The results are given in Table 1 below.

Table 1: ICP SuDS Method Results

	Greenfield Runoff Rate (l/s/ha)
1:1-Year	3.3
1:30-Year	6.6
1:100-Year	8.2
Qbar	3.8

3.2 Brownfield Runoff Rate

Microdrainage was used to model the existing site storm drainage network for the development, based on the topographical and utilities information. The flow rates have been assessed for both the 1-year and 100-year storm events.

Table 2 shows the measured impermeable areas for each of the existing site catchments (as denoted in Figure 1 previously), as well as the 1-year and 100-year flows from the model outputs. The results showed that no flooding occurred for the 1-year event on the sites, with the 100-year flooded volume for each catchment shown in the table.

Table 2: Existing Storm Water Runoff Flows

Catchment	Estimated Impermeable Area (ha)	Indicative Estimated 1-Year Flow (l/s)	Indicative Estimated 100-Year Flow (l/s)	1-Year Flooded Volume (m3)	100-Year Flooded Volume (m3)
Outfall 1	0.459	29.3	42.3	0	61
Outfall 2	0	0	0	0	0
TOTAL	0.459	29.3	42.3	0	61

It is assumed that the green areas on the site do not enter the drainage network, however it is likely that this is an underestimate and there would be some residual runoff from the green areas in the catchment that drains to Outfall 2.

Therefore, the Outfall 2 catchment has been included for completeness and may be modified to include greenfield flows during future design stages.

4 Proposed storm drainage strategy

A positive drainage network is proposed to serve the school building and the associated impermeable areas. Areas of landscaping and green spaces will not be positively drained as it is assumed that the majority of runoff will locally percolate into the ground. Alternatively, where this doesn't occur, it is assumed the flows will run over land to an area which it can percolate or into a positively drained impermeable area.

Although the site comprises of new built development, the existing school buildings and portions of the associated hardstanding will be demolished and broken out. Some of these areas will be replaced with permeable surfaces.

Figure 2 below shows the proposed drainage strategy for the site. It is proposed to discharge to and reuse the existing Outfall 1. The ultimate outfall however is unknown and further site investigation has been requested.

Figure 2: Penygawsi Primary School proposed drainage catchment plan

Figure 3 and table 3 below show the comparison of impermeable and permeable area in the existing case and the proposed case for each proposed catchment.

Figure 3: Penygawsi Primary School impermeable area plan

Table 3: Existing Impermeable Area versus Proposed Impermeable Area			
Site	**Existing Impermeable Area (ha)**	**Proposed Impermeable Area (ha)**	**Proposed Pervious Pavement (ha)**
Outfall 1	0.459	0.417	0.175
Outfall 2	0	0	0
TOTAL	0.459	0.417	0.175

The total area of proposed pervious paving and impermeable surfacing combined is higher than the existing total impermeable surfaced area. However, it is anticipated that the rate of flow through these 'hard-paved' areas will be significantly slower than existing due to the mechanisms of capture i.e. raingardens and porous asphalt, compared to the existing gully/downpipe collection methods.

Due to the close proximity of the two 'outfall points' of the existing catchments (the points at which the surveys are unable to continue) and the fact they are assumed to outfall to the same receptor, the two proposed catchments have been consolidated and assumed to outfall to a single point at Outfall 1.

The nature of the ultimate discharge point for the catchments is not clear from the current available information and so further survey has been proposed to determine this.

5 Proposed Hydraulic Control

The two scenarios below have been considered to estimate the flow restrictions for the proposed sites. The two methods were discussed with the SAB.

1. Restricting the proposed impermeable area outflow (up to the 1:100 year event plus 40% climate change) to the 1:1 year Greenfield Runoff Rate (GRR);
2. Restricting the proposed impermeable area outflow (up to the 1:100 year event plus 40% climate change) to 70% of the existing 1:1 year brownfield rate (providing 30% betterment on the 1:1 year storm event and more for higher events).

It was agreed in principle that restricting the proposed outflows to 70% of the existing 1:1 year brownfield rate would be a suitable approach to ensure a reduction in the flow leaving the site compared to the existing situation and therefore a reduction in the risk of flooding in the receiving soakaway. Moreover, the following estimates for required attenuation volumes have been calculated on the basis of restricting the proposed flows to 70% of the existing 1:1 year brownfield rate.

5.1 Attenuation Estimates

Restricting the flow rate to 70% of the 1-year existing discharge rate would be achieved by throttling the flows within the drainage network and providing attenuation storage.

It is proposed to place this restriction on all flows up to and including the 1:100-year event, with suitable allowance for climate change. The National Planning Policy Framework (NPPF) sets out how the planning system should minimise vulnerability and provide resilience to the impacts of climate change. Table 2 within the guidance shows the potential peak rainfall intensity change

anticipated for different time intervals. It is recommended to use the upper end allowance, which for a 100-year event is a 40% increase in the peak rainfall intensity.

The discharge restrictions for the proposed site have been calculated and an indicative estimate of required attenuation volumes has been made by modelling the proposed network in Microdrainage.

Table 4 below shows the allowable discharge rates and attenuation volume estimates, along with the impermeable area for each catchment. The areas of porous paving have been included in the impermeable area figures for the estimates to allow a conservative approach to be taken.

Due to the close proximity of existing outfalls 1 and 2, and because they are both assumed to discharge to the same receptor, the information below has been combined into a single catchment at Outfall 1.

Table 4: Attenuation modelling estimates for restriction to 70% of 1:1-Year Flows

Site	Proposed Impermeable/permeable Area (ha)	Proposed Discharge Rate (l/s)	Required Attenuation Volume (m^3)
Outfall 1	0.592	20.5	340
Outfall 2	0	0	0
TOTAL	0.592	20.5	340

As shown in Tables 2 and 4, the total flows leaving the site through outfalls 1 and 2 from the impermeable areas will be reduced by 30% in the 1-year event and by up to 50% in the 100-year event (+ 40% climate change), representing a significant reduction in total discharge rate for the site to the watercourse.

The figures above represent the total amount of storage volume required to be included through dedicated attenuation features such as basins and cellular storage as well as the MUGA. In total, 130m^3 of storage volume is provided by the MUGA with 210m^3 provided through attenuation cells and the dry basin.

Additional storage volumes provided by the smaller areas of porous car park have not been modelled at all currently and so may further reduce the estimates for required volumes of dedicated storage in future design stages.

6 Conclusion

A positive storm drainage system is required to serve the new school building and associated impermeable hardstanding.

For the existing school site, greenfield runoff rates and brownfield rates have been calculated. The greenfield run off rate has been calculated for each site using the ICP SuDs methods for the 1-year, 30-year, 100-year and Qbar return periods. The existing school site has an existing drainage network and this has been modelled in Microdrainage to determine estimated brownfield rates.

For the proposed development, it is assumed that rainfall on the green landscaped areas will either percolate into the ground or runoff overland to a location where it can percolate to ground, to the receptor it currently reaches or into the positively drained network for the impermeable area. The

desire is to retain the existing regime of the green areas where possible and for the new green areas, slope these to direct the runoff to an appropriate receptor.

When determining the appropriate discharge rate for the impermeable areas leaving the site, two runoff scenarios have been explored.

1. Restricting the impermeable area outflow (up to the 1:100 year event plus 40% climate change) to the 1:1 year Greenfield Runoff Rate (GRR);
2. Restricting the proposed impermeable area flow (up to the 1:100 year event plus 40% climate change) to 70% of the existing 1:1 year brownfield rate (providing 30% betterment on the 1:1 year storm event and more for higher events).

The site has been previously developed and the proposed impermeable area is similar to the existing impermeable area, therefore it is proposed that impermeable area flow (up to the 1:100 year event plus 40% climate change) is restricted to 70% of the existing 1:1 year brownfield rate, as per Scenario 2 above.

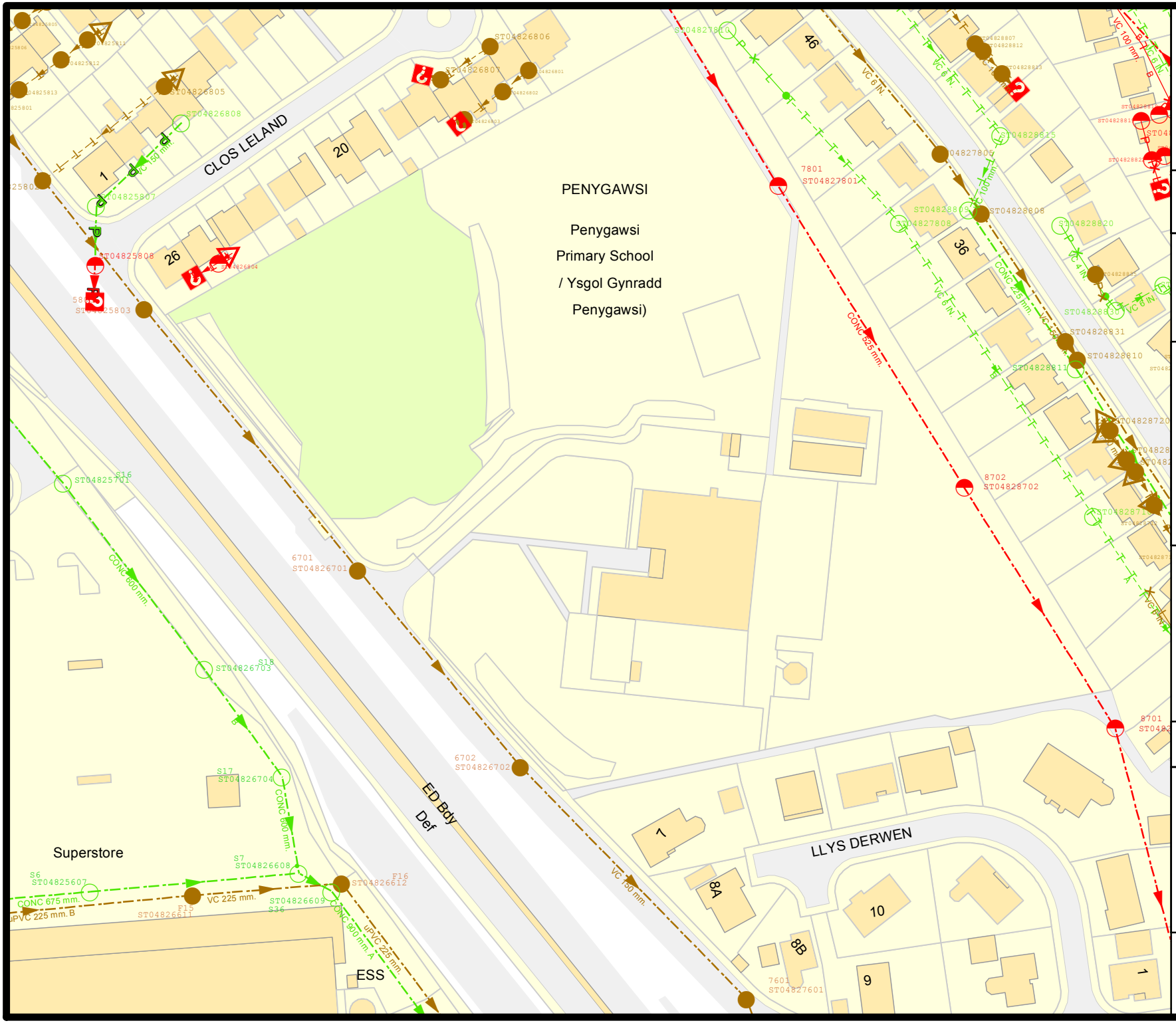
On this basis, a Microdrainage model of the proposed drainage network for the site was built and attenuation volumes were estimated for each catchment.

It was found that a total of 210m^3 of dedicated attenuation features, such as swales and basis, will be required in addition to the 130m^3 storage volume provided by porous surfacing features.

Further surveys are to be performed in several parts of the site to ascertain the ultimate discharge point for the site.

Appendix D

DCWW Pre-planning response and correspondence



Dŵr Cymru
Welsh Water

ST04825803 to ST04826702

N
W E
S

LEGEND(Representative of most common features)

Waste network:

Foul chamber	Outfall
Surface water chamber	Lamphole
Combined chamber	Storm Overflow
Combined sewer overflow	Rising main
Special purpose chamber	Gravity sewer
Treatment works	Private sewer
Pumping station	Private sewer subject to Sect. 104 adoption agreement
	Private Sewer Transfer
	Lateral Drain
	Inspection Chamber

N.B. Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S22 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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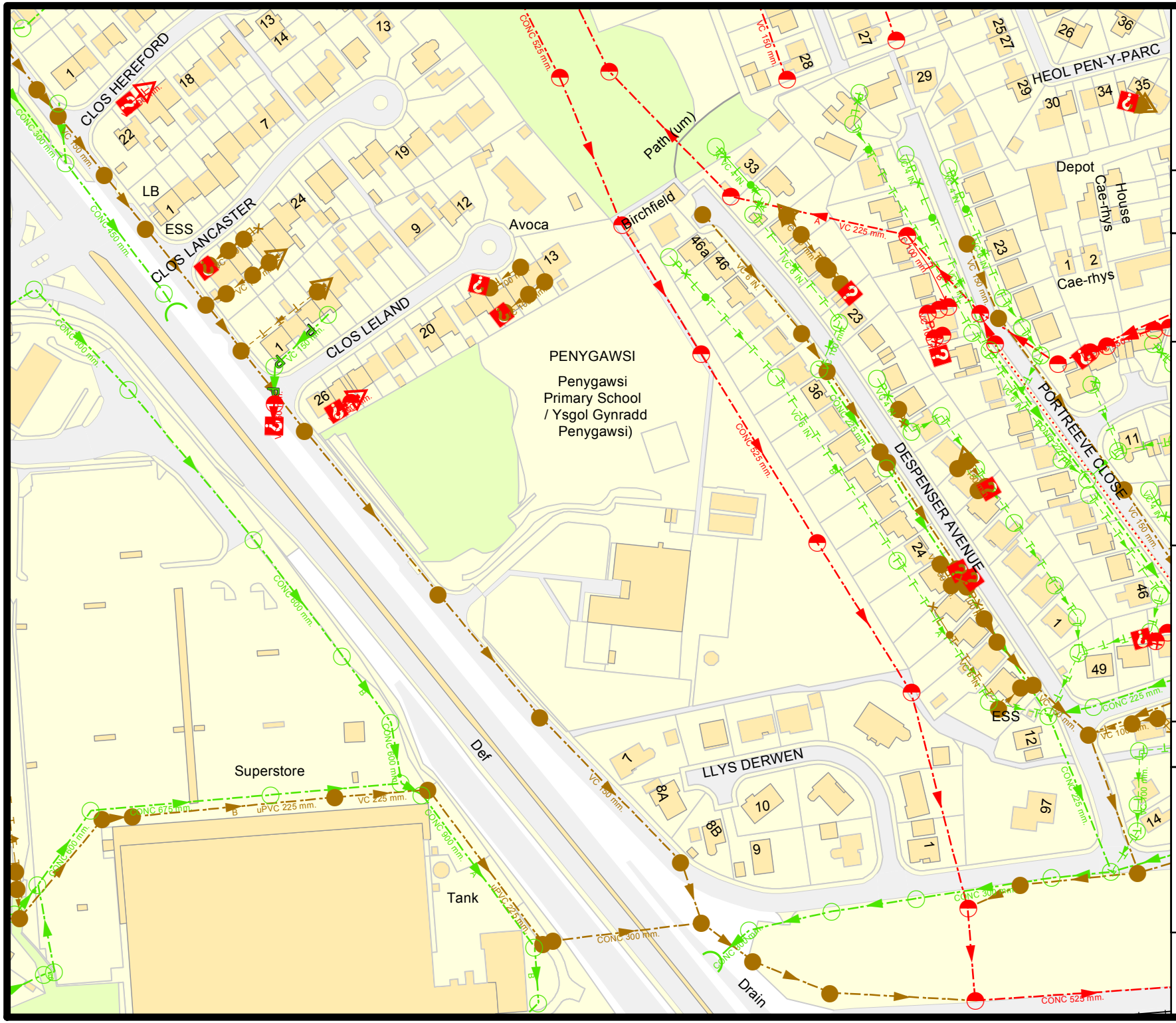
Map Ref:	304706,182773
Map scale:	1:1250
Printed by:	Maria Evans
Printed on:	18 Aug 2021



Dŵr Cymru
Welsh Water

SEWER PLAN PPA0005708

N
W E
S

LEGEND(Representative of most common features)

Waste network:

	Foul chamber		Outfall
	Surface water chamber		Lamphole
	Combined chamber		Storm Overflow
	Combined sewer overflow		Rising main
SPS	Special purpose chamber		Gravity sewer
	Treatment works		Private sewer
	Pumping station	S 104	Private sewer subject to Sect. 104 adoption agreement
			Private Sewer Transfer
			Lateral Drain
			Inspection Chamber

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Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map scale:	1:2000
Printed by:	Natalie Walmsley
Printed on:	25 May 2021

Appendix E

Initial SAB Consultation

RHONDDA CYNON TAF COUNTY BOROUGH COUNCIL

Sustainable Drainage Approval Body

Penygawsi Primary School

Pre-Application Strategy Review Report

August 2021

ANDREW STONE
Strategic Projects Manager
Strategic Projects, Sardis House, Sardis Road, Pontypridd, CF37 IDU

NIGEL WHEELER
Group Director
Prosperity, Development and Frontline Services, The Pavilions, Clydach Vale, CF40 2XX

RHONDDA CYNON TAF

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RHONDDA CYNON TAF

DOCUMENT VERIFICATION

Applicant	Ian Amos on behalf of Arup
Site Name	Penygawsi Primary School
Document Title	Pre-Application Strategy Review Report
Document Ref	SR – 21 – RCTSAB127-001-PA

Revision Status	FINAL
Date of Issue	August 2021
Prepared by	Liam Swanwick BSc (Hons), MSc
Checked by	Owen Griffiths BSc (Hons), MSc
Approved by	Owen Griffiths BSc (Hons), MSc

This report should only be used in its entirety.

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RHONDDA CYNON TAF

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CONTENTS

1 INTRODUCTION

1.1 PURPOSE OF THE REPORT

The purpose of the report is to undertake an appraisal of the site and assess the overall strategy of an application compliance with the National Standards. The report will also inform the applicant, where required, what additional information is required for the full application in order for the application to constitute as a validly made application.

1.2 SITE PROPOSAL

The applicant proposes to construct a new school building with associated play areas, car parking and Multi-Use Games area (MUGA).

1.3 SUSTAINABLE DRAINAGE PROPOSAL

An unknown extent of runoff from the school building roof is to drain to a rainwater harvesting tank 54m^3 in volume, and therefore utilise rainwater as grey water for flushing toilets.

All areas of the roof that do not drain to the harvesting tank are intended to drain to a rain garden. The strategy notes where rain gardens are not possible, surface water runoff will be collected via rainwater pipes, combined kerb drainage, gullies, linear kerb drainage or permeable paving. Of note, the drainage layout is not exactly clear where runoff will exactly drain to from the roof, access road or pedestrian footpaths/areas.

Car parking spaces are to be of permeable construction, and therefore will percolate through the pavers and either infiltrate to ground or be collected and convey to the proposed drainage system. The aisle will be of standard impermeable asphalt construction but will shed to the permeable pavers parking spaces.

The MUGA is to be of permeable construction, and therefore will percolate through the asphalt and either infiltrate to ground or be collected and convey to the proposed drainage system.

The overall drainage proposal intends to collect rainwater as detailed above and convey to a number of dry attenuation basins which will provide the required attenuation whilst flows are restricted off site. The nature of the destination is currently unknown.

A steep bank is located on the north western boundary/ extent of the site and a rain garden is proposed to collect any flows that shed from this embankment.

1.4 Site Location

The land to be developed lies at the existing Penygawsi primary school off Chartist Road, Llantrisant, CF72 8PZ.

1.5 Submitted Documentation

As part of the application, the following documents were submitted:

- Pre-App Application Form
- SAB pre preapp
- Penygawsi Primary School GI
- Penygawsi Drawings
- Hydrology Calculations Technical Note
- ALA679SK016 Penygawsi- Sketch plan CEM6
- Penygawsi DAP
- Penygawsi surface water map

2 SITE APPRAISAL

2.1 SUSTAINABLE DRAINAGE APPLICATION HISTORY

No sustainable drainage application has previously been submitted within the boundary of the development.

2.2 EXISTING SITE USE

The land is currently occupied by the existing primary school, associated hardstanding such as play areas and car parking, playing field and existing woodland.

2.3 EXISTING SITE DRAINAGE

The applicant commissioned Technics Group to asses and establish the existing drainage on site.

As stated above, the existing site comprises of the existing school buildings, hardstanding for car parking and playgrounds. Hardstanding areas are drained via roof gutters, gullies or channel drainage. Following a non-intrusive survey, it was identified that the site is split into two catchments, but both drain towards the woodland area on the western extent of the site.

Catchment 1 is 0.459ha in impermeable area, comprising the existing school buildings and hardstanding. This catchment conveys through a surface water pipe within the site towards a chamber at the site entrance before conveying towards the woodland area. However, the destination of this pipe and thus catchment is unknown with the non-intrusive survey unable to continue beyond the woodland area.

Catchment 2 comprises the western extent of the site and does not include for any impermeable area from the Penygawsi site. A number of pipes were detected by the intrusive survey on the western extent. However, the exact nature of the contributing flows is unknown, but could serve the grassed pitch. The condition of these pipes on the field was poor and numerous blockages were identified. Therefore, it is assumed runoff percolates to ground or sheds with the contours of the land.

It is noted that an existing 300mm surface water sewer has been identified to cross the existing grassed pitch and convey towards the woodland area. This possibly serves the residential development to the north of the site. However, the destination of this pipe and thus catchment is unknown with the non-intrusive survey unable to continue beyond the woodland area.

Both pipes convey to the west but stopped short of the boundary within the woodland area as the non-intrusive survey finalised at this point. The drainage strategy states there is a possibility that the runoff outfalls in this area and percolates to ground with the woodland and associated depression acting as a soakaway. Further survey work is required to establish where these pipes convey to.

2.4 Flood Risk Review

Following a review of the Development Advice Map, it was found that the site does not lie within a Tan15 C1 or C2 zone. A small area of the south western extent does lie with a TAN15 Zone B. However, this area will not be developed.

The risk of surface water flooding has been investigated utilising Natural Resources Wales' Flood Risk Assessment Wales maps. The results of which have identified a high risk of surface water flooding on the western area within the existing woodland. Based on the map, it would suggest a localised depression with no source from an ordinary watercourse. Please see figure 1 below.

Figure 1. Areas of Low/Medium/High Surface Water Flood Risk at the proposed site, as per NRW Flood Risk Assessment maps.

2.5 Environmental Impact Assessment

The applicant has stated that the proposed development does not require an environmental impact assessment, and therefore the determination period for the full application will be 7 weeks once the application is determined as validly made.

2.6 Ordinary Watercourse Consents

Since the Lead Local Flood Authority became responsible for authorising ordinary watercourse consents (OWC) in 2012, no OWC have been authorised within the boundary of the site.

2.7 Dwr Cymru Welsh Water Apparatus

Following a review of the Dwr Cymru Welsh Water (DCWW) GeoWeb, DCWW apparatus comprising of a 525mm diameter concrete combined sewer was identified within the site boundary. This conveys along the eastern boundary in a south eastern direction. The non-intrusive survey commissioned by the applicant found the depth of this pipe varied between 2-4m.

2.8 Ordinary Watercourses

No known ordinary watercourses lie within the boundary of the site.

2.9 Main River

No main river lies within or in close proximity to the boundary of the site. The Afon Clun is approximately 375m south of the site boundary. This conveys from west to east.

2.10 Assets

There are no known land drainage assets situated within the boundary of the site.

3 VALIDITY OF APPLICATION

3.1 REQUIREMENTS FOR A FULL APPLICATION

Paragraph 9 (2) of schedule 3 states that an application must be in any form required by the Approving Body. Within Regulations 'The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018', regulation 3 states that an approving body may refuse to determine an application for approval which is not made in accordance with Paragraph 9(2) of Schedule 3.

The table below summarises the general documentation determined to be the minimum required to constitute a valid application, based on the development proposed. Table A and Table B found within the "Guidance on completing the full application form" has been utilised to determine the required documentation for a validly made application.

It is recommended that the applicant considers Table A and Table B prior to submitting a full application to the SuDS Approval Body (SAB). Supporting documentation required for each of the standards is stated and discussed in chapter 5 "compliance with National Standards" of this report.

Please note that where insufficient detail has been found on a drawing, that documentation has been determined to not be provided.

The SAB application form must be completed in full.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
A Site Plan	Construction area extent (1:2500 scale)	Y	Y
	Extent of Drainage system	Y	Y
	Location Plan	N	Y
General documentation	EIA Statement	N	N
	Drawing Issue Sheet	N	Y

Table 1. General documentation required for the Full Application

3.2 CONSTRUCTION AREA AND ASSOCIATED FEE

An applicant must pay the correct fee in order for the application to constitute as a valid application. Each full application will be charged by the SAB in accordance with the regulations i.e. the application fee is related to the construction area of the proposed development. A review has been undertaken regarding the construction area and an estimate can be found in the table below.

Criteria	Estimated construction area (m^2)	Required Fee (£)	Comments
Application fee	25,000	1250	Applicant needs to define construction area.

Table 2. Required Fee based on an estimation of the Construction Area

It is of note that the Application fee does not need to be provided to the SAB until the SAB has confirmed the validity of the application. Please visit the below webpage address which states the process of submission and validation for a full application.

Web Link - www.rctcbc.gov.uk/sustainabledrainage

4 ADOPTION

4.1 REQUIREMENT FOR ADOPTION

The SuDS proposed is designed to provide drainage for a single property as defined by Regulation 9 of The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018 and therefore **the SAB does not have a mandatory duty to adopt** as per the exemption detailed in paragraph 18 (1) and (2) of Schedule 3 of the Flood and Water Management Act 2010.

5 COMPLIANCE WITH NATIONAL STANDARDS

5.1 STANDARD S1 - SURFACE WATER RUNOFF DESTINATION

Priority level 1 – The drainage proposal includes water re-use on the site via a rainwater harvesting tank. Although the extent of roof to drain to the rainwater harvesting tank has not been provided, preliminary size of the tank is to be 54m^3 which would serve the school building and provide grey water for the toilet. It is considered that the implementation of this tank would maximise priority level 1, but discharge at a lower priority level will be required.

Priority level 2 – The current drainage proposal has not yet established the exact destination of the surface water runoff from the site. The existing drainage regime is assumed to either outfall to the woodland area and percolate to ground or convey to a downstream surface water drainage system. The drainage proposal has suggested the proposed drainage system may mirror this method should infiltration testing be found to be suitable on site.

A ground investigation was undertaken by HSP. Ground conditions were varying across the site. The majority of the site generally found made ground underlain by diamicton till superficial deposits overlying Upper Coal Measures Formation. Groundwater strikes were encountered at 1.4m and 3.5m within the diamicton till layer. Groundwater monitoring identified a level of between 1.30mbgl and 1.70mbgl.

The following is stated in the strategy report “if the existing site drainage outfalls into the woodland area, the desire is to replicate the outflow conditions and retain the existing conditions to allow existing ecology to thrive”. Should infiltration be proposed at the woodland area, it must be demonstrated that all runoff can successfully infiltrate to ground via hydraulic modelling with an appropriate factor of safety. Should infiltration be found to not be suitable all runoff, the applicant should still consider potential for losses via partial infiltration i.e. dry basin, bioretention areas or permeable surfaces and would recommend infiltration testing in accordance with BRE365 to be undertaken to establish the potential of this. HSP also state in their GI that infiltration drainage may be possible on site.

However, mining work and associated instability was noted within the GI including mine shafts. Whilst infiltration is a high priority level for runoff, it must be assessed and demonstrated that infiltration will not pose an instability risk to ground.

Priority level 3 – There are no surface water bodies on or in close proximity to the site, and therefore priority level 3 cannot be achieved.

Priority level 4 – The drainage layout shows the proposed drainage system to connect to the existing system prior to outfall. However, as stated above, the current drainage proposal has not yet established the exact destination of the existing surface water runoff from the site. Whilst it may possibly infiltrate to ground, a further possibility is draining to a surface water sewer on Chartist Road. Whilst, there are no records on the DCWW maps, there is potential for an unmapped asset, a highway drain or a culverted watercourse. Should the existing site drain to this asset, then the SAB would offer no objection to discharge to a piped surface water system, providing the rate is acceptable.

Priority level 5 – it is noted within the strategy that if soakaway solutions are found to not be a suitable destination, then pumping flow to the DCWW system could be explored. Prior to selecting this route, the applicant would have to ensure that all other routes have been explored including any surface water system on the highway. Both discharge to a DCWW combined system and surface water pumping are last resort.

Priority Level	Primary destination	Secondary destination	Comments
Priority Level 1	N	N	
Priority Level 2	N	N	
Priority Level 3	N	N	
Priority Level 4	N	N	Unknown destination
Priority Level 5	N	N	Unknown destination

Table 3. Primary and secondary destination of surface water runoff

In summary, the proposed design **does not include sufficient information to ascertain compliance** with Standard S1.

A likely compliance with Standard S1 can be achieved through the inclusion of the 'further information required' outlined below. However, **compliance is dependent on the quality of the information that is provided** and cannot be guaranteed without appropriate evaluation of the additional documentation.

Further information required

Please see Table 4 which summarises the documentation required to satisfy standard S1. As a result of the sites previous use, evidence will have to be provided to demonstrate that infiltration is not feasible via BRE365 testing and must demonstrate that if infiltration is proposed, that it will not a pollution risk to groundwater.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S1	Detailed whole Site SuDS Drainage Design Proposals	Y	Y
	Detailed Geotechnical factual and interpretive report	N	Y
	Unstable and Contaminated Land Reports	N	Y

Table 4. Documentation required to satisfy Standard S1 for the Full Application

5.2 STANDARD S2 – SURFACE WATER RUNOFF HYDRAULIC CONTROL

Interception of runoff

The drainage proposal includes for numerous SuDS that provide interception such as permeable surfacing, bioretention areas and a dry basin which provide interception regardless of whether the features will allow for infiltration or not. Currently, the proposal does not currently state as to whether the rain gardens, permeable surfacing or dry basin are to be lined. Should they not be lined with an impermeable geomembrane, they will provide additional interception losses via infiltration to ground as well as evaporation, evapotranspiration and uptake by plants in the bioretention areas.

The proposal will reduce the extent of hardstanding area from 0.459ha to 0.342ha. This will be replaced by landscaping or pervious paving (0.17ha), and therefore will increase significantly the extent of interception of runoff in comparison to the existing regime. The existing drainage regime via traditional methods such as gullies, channel drainage and pipe network would offer no interception. As such, the proposal would provide significant interception benefits in comparison to the existing.

Although the extent of roof to drain to the rainwater harvesting tank has not been provided, this tank will provide interception for the area it drains if designed to BS 8515.

As stated, the SuDS proposed such as rain gardens, permeable paving and dry basin will provide interception, but to confirm as to whether the interception criteria is met, the contributing areas to each and size and construction of systems will determine acceptability. Overall, it is considered that it is likely that the proposal will satisfy the interception criteria should all impermeable areas drain to the proposed SuDS.

Morphological protection of receiving surface water bodies

The drainage proposal proposes to discharge to either the woodland area or a surface water sewer. As such, runoff is not proposed to discharge directly to a watercourse, and therefore morphological damage is not envisaged.

Flood Risk mitigation for receiving surface water bodies

Based on the impermeable area currently on site of 0.459ha, the existing Q1 rate has been calculated as 29.3l/s. Whilst the SAB does not technically object to the method

used to obtain the rate via microdrainage, the microdrainage simulation that evidences this flow must be provided at the full application stage.

Total outfall from the site is proposed to be 20.5l/s which offers a 30% betterment in comparison to the existing Q1 flow rates of 29.3l/s, and a larger significant betterment in comparison to the Q100 of 42.3l/s. Of note, the Q100 rate is conservative given the system floods.

Overall, the SAB would not raise an objection to the proposed solution of 30% betterment to existing Q1 rate in line with paragraph G2.24 of the Statutory Standards.

Flood Protection for the site

At the drainage strategy review stage, hydraulic models are not reviewed. Although, it is noted the applicant has calculated likely storage requirement to discharge at the above detailed rate. Storage is to be provided via the dry basin and potentially the void space within the sub-base of the permeable paving and MUGA pitches. The preliminary drainage layout outlines the dry basins will provide the 330m^3 of storage highlighted within the technical note that is required to accommodate the Q100 plus CC storm event.

Within the technical note, an appropriate allowance of 40% is stated to be incorporated into the proposed hydraulic model.

At the full application stage, the applicant must demonstrate that the drainage system can successfully restrict the runoff to an appropriate discharge rate as detailed previously, whilst also accommodating the Q100 plus CC event in line with the principle criteria detailed in paragraph G2.34 of the Statutory Standards.

A further important consideration is that the drainage proposal should take into account the potential for runoff which might flow onto the site during an extreme event up the Q100 event as per paragraph G2.33 of the Statutory Standards. As identified during the site appraisal and review of the FRAW, the woodland area is at high risk of flooding from surface water and ordinary watercourses. Any storage located within this flood risk extent would need to incorporate such flows, as this would impact storage during a storm event.

If infiltration within the woodland area is explored, then flows from the 300mm pipe that may outfall to the woodland must also be considered.

Extreme event exceedance management of surface water runoff

The drainage strategy does not consider this element at this early stage. At the full application stage, the applicant must demonstrate via a flow exceedance plan the flow routes of runoff during an exceedance event.

Evaluation of impact of potential failure of a drainage system

The drainage strategy does not consider this element at this early stage. At the full application stage, the applicant must assess the potential failure of the drainage system such as blockage of a flow control and incorporate mechanisms to alleviate the impact of such event.

In summary, the proposed design **does not include sufficient information to ascertain compliance** with Standard S2.

A likely compliance with Standard S2 can be achieved through the inclusion of the 'further information required' outlined below. However, **compliance is dependent on the quality of the information that is provided** and cannot be guaranteed without appropriate evaluation of the additional documentation.

Further information required

Please see table 5 which summarises the documentation required to satisfy standard S2. At the full application stage, an engineering layout which includes levels, gradients, locality and storage is required. Furthermore, detailed hydraulic calculations will be required to demonstrate the hydraulic suitability of the proposed drainage system. The hydraulic calculations will have to demonstrate that the proposed drainage system can accommodate the Q100 plus climate change event, whilst successfully restricting runoff to the proposed rates. This will need to be accompanied by a contributing area plan that will depict the contributing areas inputted into the hydraulic calculations at each manhole. Detailed cross sections and construction drawings will be required to demonstrate suitable design.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S2	Detailed whole Site SuDS Drainage Design Proposals	N	Y
	Flood Consequence Assessment	N	N
	Detailed hydraulic calculations	N	Y
	Cross section drawings and standard detail drawings	N	Y
	Longitudinal section coloured drawings	N	Y
	Natural and artificial drainage catchment and sub-catchment plan	N	Y
	Concept drawings	Y	Y
	Contributing area plan	N	Y
	General engineering layout coloured drawings	N	Y

Table 5. Documentation required to satisfy Standard S2 for the Full Application

5.3 STANDARD S3 – WATER QUALITY

The proposed development of a new school building with associated access road, parking and MUGA pitches results in pollutant loadings to the surface water runoff (table 6). This assessment will consider the proposed land use and associated treatment from the proposed SuDS. Whilst this review of S3 has predominantly focussed on water quality of discharge to a surface waterbody, the indices utilised can apply to groundwater also due to the SuDS proposed.

Area	Proposed Land Use	Pollution Hazard Level	Total suspended Solids (TSS)	Metals	Hydrocarbons
1	School Roof	Low	0.3	0.2	0.05
2	Access Road	Low	0.5	0.4	0.4
3	Car Park spaces and aisles	Low	0.5	0.4	0.4
4	Pedestrian areas	Low	0.5	0.4	0.4
5	MUGA pitch	Low	0.5	0.4	0.4

Table 6. Pollution hazard level and pollution indices for each of the proposed land uses Proposed based on Ciria SuDS Manual C753, table 26.2

Area	Contaminant	Risk Indices	Permeable Paving	Bioretention system	Total Mitigation indices	Compliant
1	TSS	0.3	-	0.8	0.8	Yes
	Metals	0.2	-	0.8	0.8	Yes
	Hydrocarbons	0.05	-	0.8	0.8	Yes
2	TSS	0.5	NC	NC	NC	NC
	Metals	0.4	NC	NC	NC	NC
	Hydrocarbons	0.4	NC	NC	NC	NC
3	TSS	0.5	0.7	-	0.7	Yes
	Metals	0.4	0.6	-	0.6	Yes
	Hydrocarbons	0.4	0.7	-	0.7	Yes
4	TSS	0.5	NC	NC	NC	NC
	Metals	0.4	NC	NC	NC	NC
	Hydrocarbons	0.4	NC	NC	NC	NC
5	TSS	0.5	0.7	-	0.7	Yes
	Metals	0.4	0.6	-	0.6	Yes
	Hydrocarbons	0.4	0.7	-	0.7	Yes

Table 7. Mitigation indices for proposed SuDS on site

*NC denotes not clear.

A risk indices approach as per the Ciria SuDs Manual has been undertaken with the proposal at concept stage. Due to the uncertainty of conveyance and collection of runoff, the dry detention basin has been discounted from the assessment, but it is noted that this can provide treatment of runoff if designed appropriately.

As stated in chapter 1, the strategy notes where rain gardens are not possible, surface water runoff will be collected via rainwater pipes, combined kerb drainage, gullies, linear kerb drainage or permeable paving. However, it is not clear from the current layout as to where exactly all the runoff will drain. Therefore, areas 2 and 4 could not be reviewed and suitability of water quality established.

Regarding area 1, where runoff from the roof does not drain to the rainwater harvesting tank, it is assumed it will drain to bioretention areas. Whilst specific drawings have not been provided, should the runoff drain directly to the surface of the bioretention areas then this will provide sufficient treatment.

Regarding Areas 3 and 5, the car parking spaces and MUGA pitches are to comprise of permeable construction, and therefore treatment provided at source. The car parking spaces are proposed to comprise of permeable paving and aisles is to contour towards the permeable construction which provide sufficient treatment. MUGA areas are proposed to be of permeable asphalt construction, and therefore these areas will undergo sufficient treatment.

Regarding area 2 and 4, it is currently unclear from the drawings or sketch as to the exact nature of how runoff from the tarmac access road and asphalt footpath will drain.

Should the access road drain to the surface of the permeable paving, rain garden or detention basin then it is likely to be sufficiently treated. However, this will be dependent on sufficient size rain gardens when in comparison to the contributing area. It is stated within the strategy that SuDS will be sized for the Q1 runoff event. For events that are greater than the Q1, the dilution effect will take place, and therefore the SAB accepts this proposed sizing arrangement.

Whilst the asphalt footpath has been regarded as a low pollution, this is a conservative assessment due to its absence from the Ciria SuDS Manual. Should runoff from this area convey to the surface of any of the SuDS proposed, then runoff would undergo sufficient treatment.

Please note that gullies and linear kerb drainage do not offer treatment benefits, and therefore if collection is via this method, conveyance to a downstream SuDS will be required.

The following was detailed in S1 “Groundwater strikes were encountered at 1.4m and 3.5m within the diamicton till layer”. Whilst infiltration from the proposed systems has not been suggested or confirmed, it is worth noting that in line with paragraph G3.32 of the Statutory Standards, there should be 1m of unsaturated ground between the base of an infiltration system and groundwater level.

The ground investigation undertaken by HSP did not identify any contaminants of concern. This would suggest that infiltration would not pose a pollution risk to the underlying groundwater.

In summary, the proposed design **does not include sufficient information to ascertain compliance** with Standard S3.

A likely compliance with Standard S3 can be achieved through the inclusion of the ‘further information required’ outlined below. However, **compliance is dependent on the quality of the information that is provided** and cannot be guaranteed without appropriate evaluation of the additional documentation.

Further information required

Please see Table 8 which summarises the documentation required to satisfy standard S3.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S3	Water quality treatment and pollution prevention strategy and Plan	N	Y
	Contaminated Land Report	N	N

Table 8. Documentation required to satisfy Standard S3 for the Full Application

5.4 STANDARD S4 – AMENITY

The drainage proposal includes for bioretention areas across the site to drain hardstanding areas including building roofs. The bioretention areas are proposed in close proximity to the building, and therefore provide valuable amenity benefits to staff and site users. The close proximity of the vegetation and trees will provide shading and thus cooling of the classrooms and play areas which will be beneficial during hot spring and summer days.

Whilst the exact planting arrangement has not been provided given the early stage of the design, it is noted in the application form that the intention is to plant trees within the bioretention areas which will provide significant amenity benefits. It is noted that by instruction from education that there should be no standing water SuDS on site. As such, three dry basins are proposed which will only have water at times of storm events. It is preferable that the drainage proposal includes water at the surface as this provides amenity, biodiversity and maintenance benefits. However, the SAB will not object to the use of the dry basin, as per the request from the head teacher.

It is considered that the inclusion of rain gardens across the site and dry basins will likely satisfy the amenity standard. Importantly, in comparison to the existing site layout, the proposal provides a significant betterment whilst also integrating the drainage with the landscaped areas.

In summary, the proposed design **demonstrates a likely compliance** with Standard S4.

Further information required

At the full application stage, a landscape plan and layout will be provided to demonstrate the locality and composition of the landscaped areas. Please see Table 9 which summarises the documentation required to satisfy standard S4.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S4	Amenity Plan	N	Y
	Landscape Plan	N	Y
	Landscape Layout drawings	N	Y

Table 9. Documentation required to satisfy Standard S4 for the Full Application

5.5 STANDARD S5 – BIODIVERSITY

The drainage proposal includes for bioretention areas across the site to drain hardstanding areas including building roofs.

Whilst the exact planting arrangement has not been provided given the early stage of the design, it is noted in the application form that the intention is to plant trees within the bioretention areas which will provide significant amenity benefits including cooling classroom and play areas.

The proposal of bioretention areas and dry basins would suggest that biodiversity is maximised and therefore satisfy the biodiversity standard. However, the submission will need to demonstrate appropriate planting of the bioretention areas and dry basins. In particular, whilst trees provide significant hydraulic and biodiversity benefits, they must be incorporated suitably such as sufficient soil volume, appropriate tree species etc. All other vegetation such as shrubs must be suitable for its purpose as a SuDS system. Furthermore, it must be designed appropriately to ensure that the tree roots will not have any adverse impact on the building i.e. root protection barrier.

In summary, the proposed design **does not include sufficient information to ascertain compliance** with Standard S5.

A likely compliance with Standard S5 can be achieved through the inclusion of the 'further information required' outlined below. However, **compliance is dependent on the quality of the information that is provided** and cannot be guaranteed without appropriate evaluation of the additional documentation.

Further information required

At the full application stage, a landscape plan and layout will be provided to demonstrate the locality and composition of the landscaped areas. Please see table 10 which summarises the documentation required to satisfy standard S5.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S5	Biodiversity Plan	N	Y
	Landscape Plan	N	Y
	Landscape Layout drawings	N	Y

Table 10. Documentation required to satisfy Standard S5 for the Full Application

5.6 Standard S6 – Design of Drainage for Construction, Maintenance and Structural Integrity

At this stage, the applicant has provided very little information relative to standard S6 given design is only at early stages. Therefore, this standard cannot be properly reviewed by the SAB.

A small note is included within the pre-app report regarding the phasing of the construction. The new school building is proposed on the existing playing field on the north western extent and therefore the existing school can remain in place and operational whilst the new school is built. There is only one access to the site, and therefore this would have to serve both the construction site and the operational existing school. This will require a management plan to ensure that the drainage systems aren't impacted during the construction phase. An important consideration is the drainage of the existing school site and the newly formed building. In particular, to ensure that runoff from the site is not exacerbated at any times during the works with sufficient measures in place to reduce the rate and ensure the quality of the runoff does not pose a pollution risk.

At the full application stage, the applicant must provide a suitable maintenance plan that details appropriate schedules and demonstrates ease of access to all elements of the drainage system. Furthermore, the design life of all elements of the drainage system must be considered, and should it be less than the design life of the development, a replacement must be incorporated into the maintenance schedule as per paragraph G6.17 of the Statutory Standards.

The applicant has highlighted that all drainage features will have hard paved routes in order for the appropriate person and associated plant to have access to undertake maintenance. Furthermore, the proposed dry basins are proposed to be situated on the central extent of the site, and this can be accessed via the access road. Access will need to be particularly evidenced to the flow control chamber.

It is noted that there is no requirement for pumping as the entirety of the drainage system drains via gravity.

At the full application stage, full construction details will be required of all drainage elements including the flow control chambers. SuDS should be designed in accordance with best practice such as Ciria SuDS Manual and suitable specification of material.

Of particular note is the proposal for permeable surfacing. Given the traffic loads on the car parking area, a suitable depth of sub-base and capping layer should be proposed depending on the Californian Bearing Ratio (CBR). An important further consideration to the SAB is the amount of runoff that will drain to the permeable parking spaces from the hardstanding area if any. It is recommended that the ratio of impermeable to permeable should not be greater than 2:1 due to the increased risk of clogging. The SAB is currently unable to provide advice regarding this as the specific area of permeable surfacing and hardstanding that may drain to it has not been provided.

Whilst Dwr Cymru Welsh Water have not been consulted as part of the pre-application, on previous sites, they have stated the following regarding the interaction of permeable systems and their adoptable assets “Service strips within permeable paved areas apply for all adoptable drainage, so any pipe that is conveying flows of more than one property, or a single property carrier pipe that leave the curtilage of a property (lateral)”. It is also noted DCWW will not accept any SuDS structure crossing or overlying their existing or any proposed adoptable infrastructure. This would apply to the 525mm concrete pipe identified in chapter 2 which will certainly be subject to an easement.

It is noted that an existing 300mm surface water sewer has been identified to cross the existing grassed pitch. This will be required to be diverted to cater for the proposed layout and building footprint. Whilst the SAB cannot objection to this diversion, it is recommended establishing the owner and responsible person for this drainage pipe, and ensure they are satisfied with the diversion.

In summary, the proposed design **does not include sufficient information to ascertain compliance** with Standard S6.

A likely compliance with Standard S6 can be achieved through the inclusion of the ‘further information required’ outlined below. However, **compliance is dependent on the quality of the information that is provided** and cannot be guaranteed without appropriate evaluation of the additional documentation.

Further information required

Please see table 11 which summarises the documentation required to satisfy standard S6. Further construction details will be required such as specification of all materials in the design. Further details are required regarding the construction in terms of management and phasing to ensure a structured approach is utilised.

A Maintenance plan must be provided to ensure the SuDS will be properly maintained and can function across its entire design life. A maintenance plan must include the schedules including activity and frequency, access arrangements for each drainage feature including the flow control chamber and the responsible person to undertake the tasks for each drainage feature.

Criteria	Information/ documentation	Provided (Y/N)	Required? (Y/N)
Standard S6	Construction details (to calculate non-performance bond)	N	N
	Construction Management Plan	N	Y*
	Construction Phasing Plan	N	Y*
	Information and communications plan	N	Y
	Detailed SuDS Assets Maintenance Plan	N	Y
	Specialist drawings	N	Y
	General engineering layout coloured drawings	N	Y

Table 11. Documentation required to satisfy Standard S6 for the Full Application

Please note the asterisk illustrates documentation that is required but can be conditioned as part of any approval.

6 FURTHER INFORMATION

6.1 USEFUL WEBPAGES

For further information, it is recommended you visit the below webpages:

RCT SAB Pre-Application Webpage –
https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/SustainableDrainage/PreapplicationAdvice.aspx

RCT SAB Full Application Webpage –
https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/SustainableDrainage/MakeaSustainableDrainageApplication.aspx

RCT Ordinary Watercourse Consent Webpage -
https://www.rctcbc.gov.uk/EN/Business/LicencesandPermits/Otherlicences/OrdinaryWatercourseConsenting.aspx

Natural Resources Wales Environmental Permitting Website -
https://naturalresources.wales/permits-and-permissions/environmental-permits/?lang=en

Welsh Government – Sustainable Drainage Systems on new Developments -
https://gweddill.gov.wales/topics/environmentcountryside/epg/flooding/drainage/?lang=en

Susdrain Website - https://www.susdrain.org/

Wallingford Hydrosolutions – http://www.uksuds.com/drainage-calculation-tools/greenfield-runoff-rate- estimation

Ciria Website - https://www.ciria.org/

Dwr Cymru Welsh Water Website - https://www.dwrcymru.com/en/Developer-Services/Pre-Planning.aspx

Please note:

The advice given in this response represents an informal opinion, provided in accordance with the Council's Planning Pre-Application Service. In particular, it is emphasised that while this pre-application advice will be carefully considered in reaching a decision or recommendation on an application, the final decision on any application that you may make can only be taken after we have consulted statutory consultees. It does not therefore prejudice any decision which the SuDS Approval Body may make should an application be submitted.