

Land North of Bronwylfa Road, Wrexham - Outline Surface Water Drainage Strategy

Version 4

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Contents

1	Introduction	1
1.1	Terms of Reference	1
1.2	Site Description	1
1.3	Development Proposal	2
1.4	Existing site topography	3
1.5	Summary of Surface Water Flood Risk	4
1.6	Existing site constraints	6
2	Surface Water Drainage Strategy	7
2.1	Site geology and hydrogeology	7
2.2	Existing Surface Water Regime	8
2.3	Greenfield Runoff Rates	8
2.4	Greenfield Runoff Volumes	9
3	Surface Water Management Approach	10
3.1	Surface Water Drainage Proposal	10
3.2	Design Standards	10
3.3	Sustainable Drainage Systems	10
3.4	Principles of SuDS	11
3.5	S1: Surface Water Runoff Destination	12
3.6	S2: Surface Water Runoff Hydraulic Control: Proposed Discharge Rate	13
3.7	S3: Water Quality	16
3.8	S4 & S5: Amenity and Biodiversity	18
3.9	S6: Design for Construction, Maintenance, and Structural Integrity	18
4	Conclusions and Recommendations	20
A	Development Proposal	A-1
B	Topographic Survey	B-1
C	Existing Utilities	C-2
D	Tree Survey	D-3

E	GI Report	E-4
F	Greenfield Runoff Rates	F-5
G	Outline Drainage Strategy	G-6
H	MicroDrainage Calculation Record	H-7
I	Designer's Risk Assessment	I-8

List of Figures

Figure 1-1 Site Location	2
Figure 1-2 LiDAR topographic data from NRW (1m resolution) for the main site of interest	4
Figure 1-3 FRAW - Flood Risk from Surface Water and Small Watercourses	5
Figure 1-4 FRAW - Flood Risk from Surface Water and Small Watercourses - Access Road	6
Figure 2-1 Trial Pit Locations for the main site of interest	8
Figure 3-1 Four Pillars of SuDS Designs (CIRIA 2015)	11

List of Tables

Table 1-1 Summary of site details	2
Table 2-1 Infiltration Results	7
Table 2-2 Greenfield Runoff Rates	9
Table 2-3 Greenfield Runoff Volumes	9
Table 3-1 User defined values	14
Table 3-2 Pollution Hazard Indices for a Low Pollution Hazard Site	17
Table 3-3 SuDS mitigation indices for discharge to groundwater	17

Abbreviations

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
BGS	British Geological Society
GI	Ground Investigation
Ha	Hectare
JBA	Jeremy Benn Associates
NRW	Natural Resources Wales
SAB	SuDS Approval Body
SuDS	Sustainable Drainage Systems

1 Introduction

1.1 Terms of Reference

JBA Consulting were commissioned by Innova Renewables Developments in April 2023 to prepare an outline surface water drainage strategy for a proposed energy storage site at Land north of Bronwylfa Road, Rhostyllen, Wrexham. The outline drainage strategy shall be used to support a planning application for the site and is to be submitted to the SuDS Approval Body (SAB) for pre-application consultation.

1.2 Site Description

The main development site is broadly triangular in shape, comprising a single agricultural field parcel and extends to approximately 5.5 ha in area. The site's boundaries feature a broad tree belt to the north and east, with hedgerows to the south and west. A former railway line runs along the northern boundary (set at a higher level and bounded by the mature vegetation) whilst the A483 lies to the east which is also elevated and bounded by mature established vegetation. The B5097 / Bronwylfa Road forms the southern boundary and Cadwgan Lane, a single-track road, forms the western boundary.

An existing vehicular access is located at the main development site's southern boundary from the B5097.

The land to the west of Cadwgan Lane comprises an L-shaped agricultural field and extends to approximately 3.4ha. It is bounded a tree belt to the north, Bersham Cricket Club to the southwest, and the B5097 / Bronwylfa Road to the south. An access track for abnormal loads extending to approximately 0.2ha is proposed on the southern part of this field.

Agricultural land and uses form the site's predominant surroundings to the north, south and west with pockets of residential properties dispersed throughout. To the east of the site (approx. 500m), on the opposite side of the A483, is the village of Rhostyllen. The Legacy National Grid Substation, which the proposals will connect to, is located approximately 750m west of the site.

Wrexham City Centre is located approximately 3km north-east.

No watercourses cross the proposed development site. The River Clywedog, an NRW Main River, flows in a general easterly direction approximately 500m to the north of the site. An unnamed ordinary watercourse flows approximately 250m to the north-west of the site and is a tributary to the River Clywedog. Approximately 550m to the south of the site is the Pentrebychan Brook, which flows into the Glanyrafon Brook to the eastern side of the A483. The Glanyrafon Brook then flows in a general easterly direction before converging with the River Clywedog around 2KM to the east of the site. A summary of the site details and the site location plan are shown in Table 1-1 and Figure 1-1 respectively.

Table 1-1 Summary of site details

Site name	Legacy Substation
Site area	5.5 ha
Existing land use	Greenfield
Proposal	Energy storage and substation
OS NGR	SJ 30546 48618
SuDS Approval Body	Wrexham County Borough Council
Sewerage Undertaker	Dŵr Cymru Welsh Water

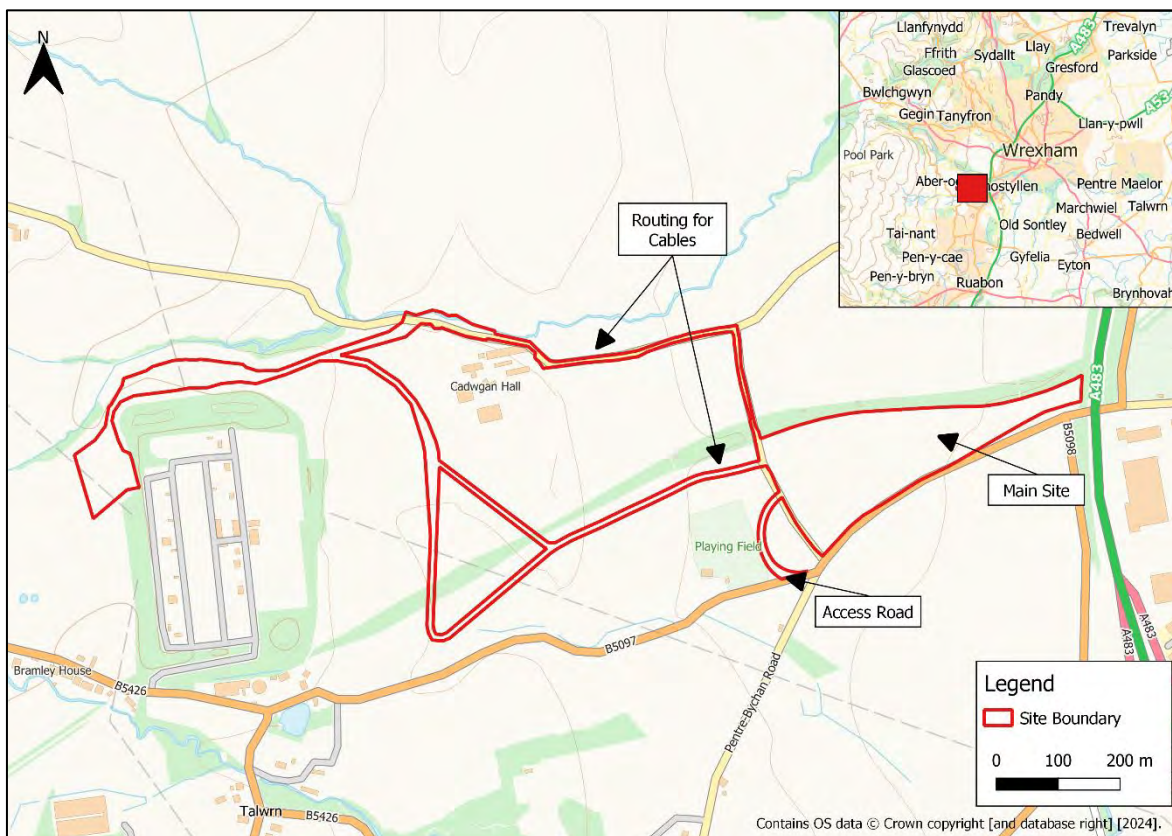


Figure 1-1 Site Location

1.3 Development Proposal

The proposal comprises installation and operation of an Energy Storage System (ESS) including energy storage units, substation, site access, cable connection, landscaping and ancillary infrastructure. A masterplan for the proposed development site is contained in Appendix A.

Access for construction and operation will be from the existing B5097 access and the new access established from the unnamed lane on the site's western boundary.

As part of the development proposals, a desk-based cut and fill exercise has been undertaken to alter ground levels across the site. A plan of the proposed ground levels across the site is included within Appendix A.

The proposed ESS development comprises:

- 400kV Substation with Gas Insulated Switchgear (GIS) building & Transformers;
- Energy storage containers;
- 33kV transformer bays;
- Medium Voltage (MV) Skid – Inverters & Transformers;
- Control buildings;
- Access from the adopted highway;
- Internal access road and crushed stone tracks;
- Drainage infrastructure, landscape, and ecological planting; and
- Security fencing and CCTV.

1.4 Existing site topography

A topographic survey of the site was undertaken by RPS Group in March 2023 and is contained in full in Appendix B. Natural Resources Wales (NRW) open source 1m Light Detection and Ranging (LiDAR) which provides an alternative illustration of the site topography, is shown in Figure 1-2.

The topographic survey indicates that a topographical ridge with levels ranging between approximately 116.36mAOD and 116.22mAOD is present in the most western part of the site. From there, ground levels generally fall in an easterly direction to approximately 105.61mAOD along the eastern boundary of the site.

The access road falls in a predominantly westerly direction with a fall from 113.05mAOD to 112.38mAOD. The camber of the road falls in a south-easterly direction, towards Bronwylfa Road.

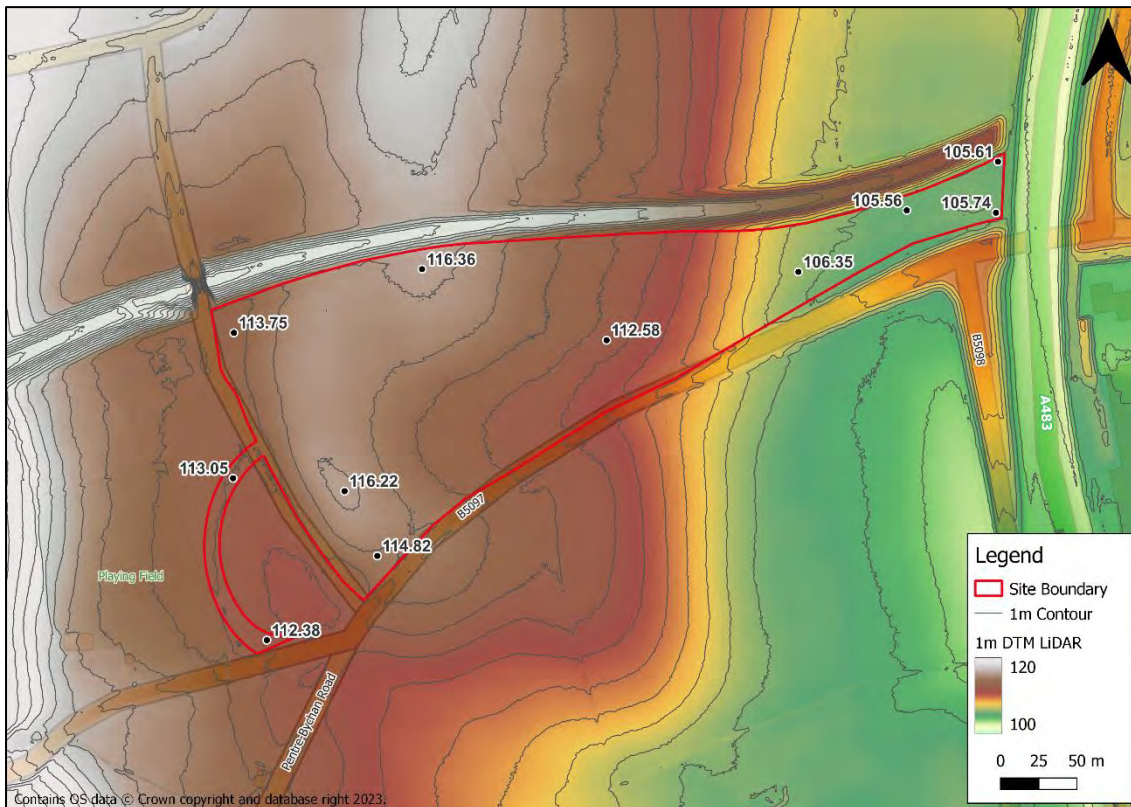


Figure 1-2 LiDAR topographic data from NRW (1m resolution) for the main site of interest

1.5 Summary of Surface Water Flood Risk

Surface water flooding occurs when rain falling on saturated ground flows overland, following the local topography. Surface water flooding and subsequent overland flow can therefore pose a risk to both the development site and the surrounding land. The overland flow may originate from the site itself or adjoining land at a higher elevation from which flow migrates onto the development.

The Natural Resources Wales (NRW) flood map for surface water and small watercourses, as shown in Figure 1-3, identifies the site as being predominantly at very low risk of surface water flooding (i.e. less than 1 in 1000 (<0.1% AEP) chance of flooding from rainfall in any given year).

A small area in the east of the site is shown to be at high risk of surface water flooding. (i.e. greater than 1 in 30 (>3.3% AEP) chance of flooding in any given year). This surface water flood risk is likely a result of a localised depression in the site topography. Development proposals do not result in a change in ground levels in this area of the site, and no built development is proposed for this area. Consequently, there shall be no change in risk as a result of the proposals.

Surface water and small watercourse mapping also indicates the presence of surface water flow paths and ponding along the western boundary of the site. Ground levels at this location fall away from the proposed development site, and it is therefore considered that there is very low risk of these flows entering the development.

An area outside of the red line boundary, located between the proposed access road and main development site, is at high risk of surface water flooding, meaning there is a greater than 1 in 10 (>3.3% AEP) chance of flooding in any given year. This surface water risk is a result of a localised depression, retaining surface water at this location. Bronwylfa Road, the development site, and the access road are raised above this area of high surface water flood risk.

Along the proposed access road, a small area is shown to be at high risk of surface water flooding, as shown in Figure 1-4. Minor alterations in ground levels are proposed in this area, however it is not anticipated that the surface water flow path shall be interrupted as a result of the proposed access road. This is further discussed in Section 3.6.2 and within Section 4.5 of the Flood Risk Statement prepared for the site (refer to document KIR-JBAU-XX-XX-RP-D-0001-S3-P02-Legacy_Substation_FRS).

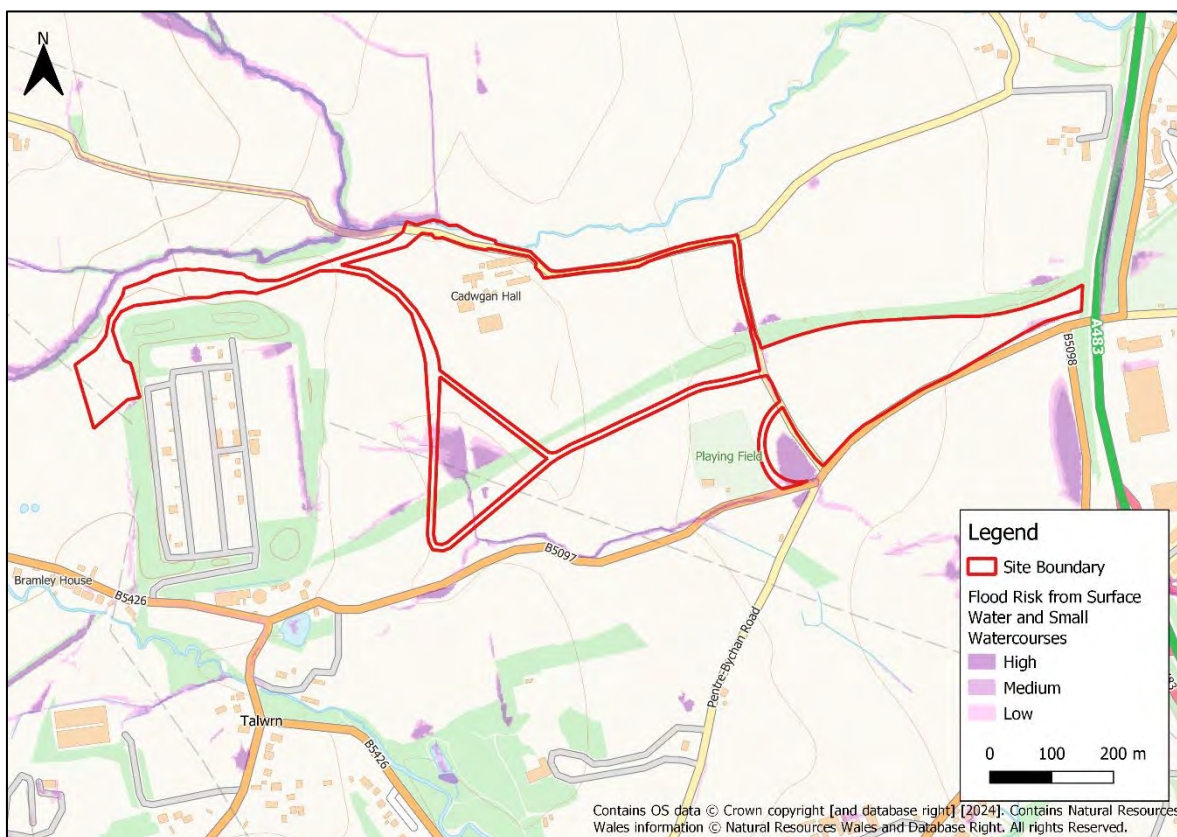


Figure 1-3 FRAW - Flood Risk from Surface Water and Small Watercourses



Figure 1-4 FRAW - Flood Risk from Surface Water and Small Watercourses - Access Road

1.6 Existing site constraints

Statutory undertaker's utility records have been provided by the Client to assist with this study and can be found in Appendix C. There are no gas, water, or electricity cables that are shown to cross the site underground at present, however an overhead 11kV line crosses the site.. A tree survey has been provided to inform site constraints, indicating that Root Protection Zones (RPZs) across the site are present, predominantly affecting the east of the site. The tree survey can be found in full in Appendix D. No further information has been provided at this time on any existing constraints related to ecology or land drainage. It is recommended that this information is obtained prior to detailed design.

2 Surface Water Drainage Strategy

2.1 Site geology and hydrogeology

The British Geological Society (BGS) GeoIndex¹ indicates that the western half of the proposed development is underlain by Pennine Lower Coal Measures formation - mudstone, siltstone, and sandstone. The east of the site is shown to be formed of Etruria Formation - mudstone. Superficial deposits are comprised of glaciofluvial deposits in the west and till in the east.

The soils on site have been assessed using the Cranfield University Soilscape viewer² and are shown to be freely draining slightly acid loamy soils.

BGS GeoIndex borehole records show a number of historical cores located near the site, to the south of the B5097. The boreholes, which were excavated in 1970 and 1978, were recorded to have been between 10 - 30m in depth, and no groundwater was recorded during these excavations.

A Ground Investigation (GI) was conducted on site by Gibbs Geotechnical in May 2023, the full report can be found in Appendix E.

Five trial pits were excavated at the site, as shown in Figure 2-1. All trial pits were successfully excavated to a depth of 1m. Grass loam was present from surface level to 0.2m, at which point a till/clay mix was encountered to the maximum depth of 1m.

Infiltration tests were carried out across the site as part of the GI and are summarised in Table 2-1, with test locations displayed in Figure 2-1.

Table 2-1 Infiltration Results

Trial Pit	Infiltration Rate (m/s)
TP6	8.5×10^{-5}
TP7	2.53×10^{-5}
TP8	Data error
TP9	6.23×10^{-6}
TP10	1.19×10^{-4}

¹ <https://mapapps2.bgs.ac.uk/geoindex/home.html>

² <https://www.landis.org.uk/soilscales/>

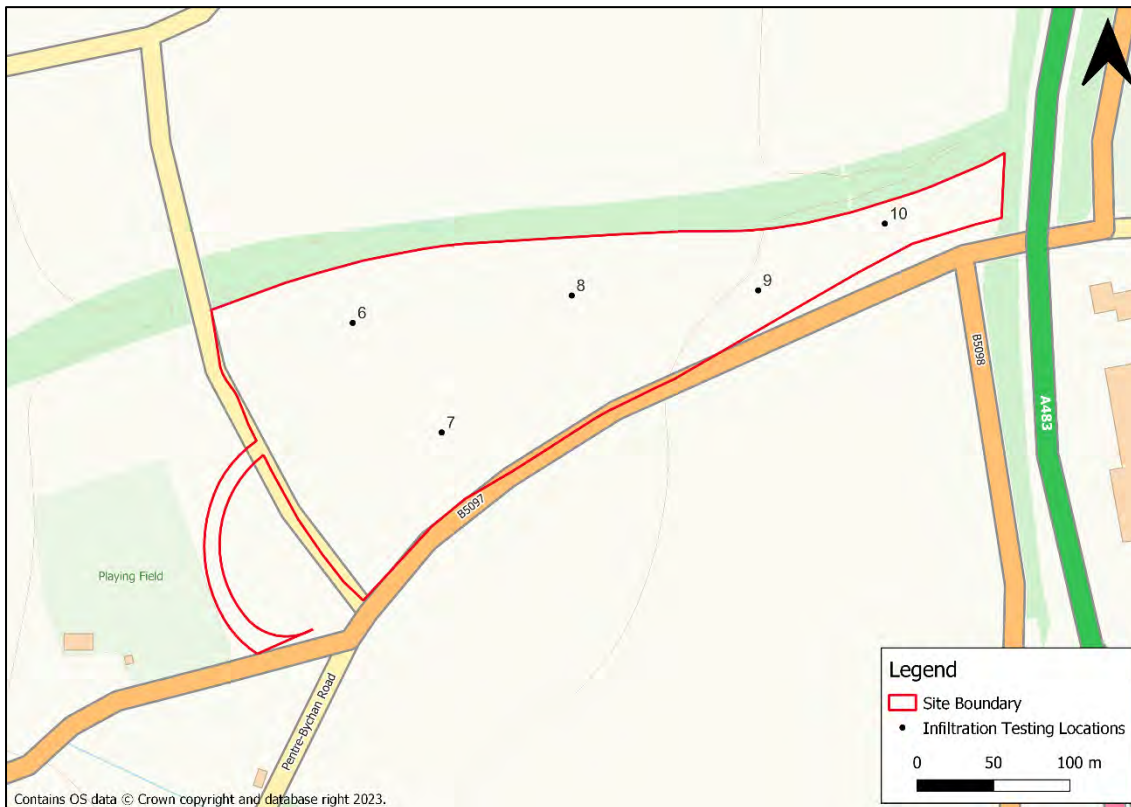


Figure 2-1 Trial Pit Locations for the main site of interest

2.2 Existing Surface Water Regime

There are no watercourses present within or in the immediate vicinity of the proposed development site. Additionally, utility records, contained in Appendix C, indicate that no public sewerage system crosses the proposed development site. Given the above positive infiltration rates, it is assumed that surface water currently drains via a combination of evapotranspiration, infiltration into underlying soils and overland flow following the local topography.

Greenfield runoff rates and volumes have been calculated and formed a key design criterion for the development of a surface water drainage system across the site.

2.3 Greenfield Runoff Rates

Table 24.1 of Ciria C753 The SuDS Manual indicates that FEH methods (FEH Statistical and ReFH20) should be the preferred method for calculating peak Greenfield runoff rates. This is supported by Natural Resources Wales GN008: Flood Estimation: Technical Guidance and Environment Agency Research by Faulkner et al which concluded that the FEH methods are applicable across a range of catchment sizes and that they should be used in place of outdated methods such as IH124 and ADAS 345, where possible.

The UK SuDS Tool was used to calculate the Greenfield runoff rates for the site. Catchment descriptors for the local catchment (SAAR and BFIHOST) were extracted from the FEH Web Service. The calculated Greenfield runoff rates for the main development site, with an

area of 5.5Ha are shown in Table 2-2 below and the UK SuDS calculation record is included in Appendix F.

Table 2-2 Greenfield Runoff Rates

Return Period	Specific Runoff (l/s/ha)	Peak Runoff Rate (l/s)
1	7.26	39.95
QBAR	8.25	45.40
30	14.69	80.82
100	17.99	98.98

2.4 Greenfield Runoff Volumes

Runoff volumes for the proposed development site were also calculated for the six-hour storm event using the FSSR16 method as shown in equation 1 below.

Equation 1:

Runoff Volume = Site Area x Rainfall Depth x Percentage Runoff

The rainfall depths for a six-hour 100-year storm event were extracted from the FEH Webservice and are summarised in Table 2-3 with the calculated Greenfield Runoff Volumes.

Table 2-3 Greenfield Runoff Volumes

Return Period	6-hour rainfall runoff depth (mm)	Site Runoff Volume (m³)
30	56.73	1450
100	73.99	1975

3 Surface Water Management Approach

3.1 Surface Water Drainage Proposal

An outline surface water drainage proposal for the site has been developed, which will manage surface water runoff without increasing flood risk to other developments or impacting on water quality downstream. The development of the drainage strategy is via a number of steps where the drainage objectives and options for SuDS features are determined. The drainage strategy is contained in Appendix G. Further detailed design of the drainage scheme will be required once an agreement in principle has been received from the SuDS Approval Body (SAB).

The outline drainage strategy discusses each SuDS standard in turn and details the way in which the proposed surface water drainage strategy will comply with each standard.

3.2 Design Standards

The drainage strategy outlining the means of surface water management at the proposed development site has been produced in line with the latest guidance and design standards including:

- C753 "The SuDS Manual" (CIRIA 2015)
- Statutory standards for sustainable drainage systems - designing, constructing, operating and maintaining surface water drainage systems (Welsh Government 2018)
- Rainfall Runoff Management for Developments - SC030219 (Environment Agency 2013)
- Planning Policy Wales (Edition 9, November 2016)
- The Building Regulations 2010: Part H: Drainage and Waste Disposal

In line with Sustainable Drainage Systems Standards for Wales (2018), surface water runoff events up to the 1% AEP (1 in 100 year) plus climate change return period event should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.

The Welsh SuDS Standards state that attenuation storage should be utilised to limit discharge of runoff from the site with surface storage features used in preference to underground systems as they are considered more adaptable.

Wrexham County Borough Council do not currently have specific guidance for SuDS. Should guidance be available at detailed design stage, it should also be consulted to inform the drainage strategy.

3.3 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of surface water drainage by allowing water to flow along natural flow routes ensuring that runoff rates and volumes during storm events are not increased above the Greenfield values. SuDS also

aim to provide water treatment, biodiversity, and amenity benefits within Blue and Green corridors.

Schedule 3 of the Flood and Water Management Act 2010 was enacted in Wales in January 2019, leading to the requirements for all new developments to incorporate the four pillars of SuDS design, shown in Figure 3-1.

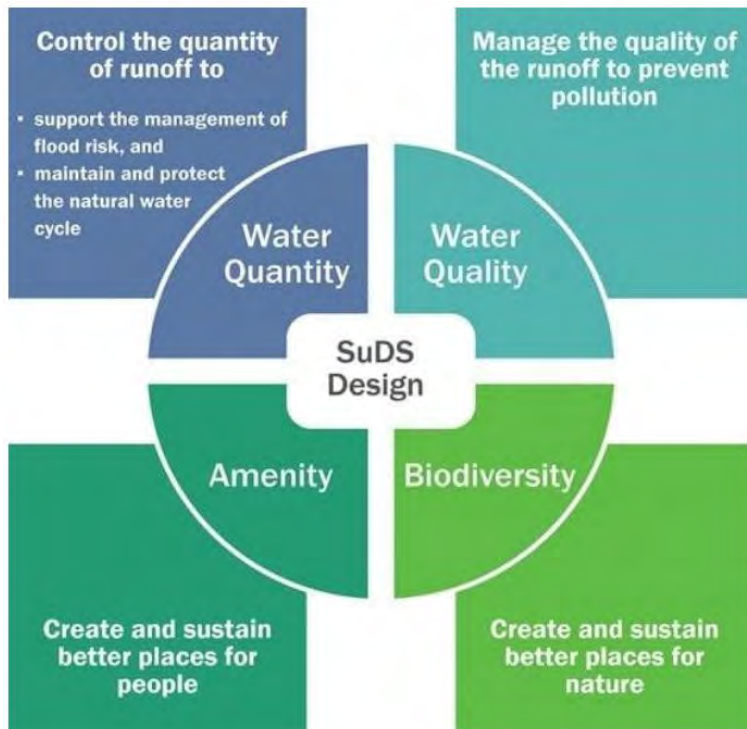


Figure 3-1 Four Pillars of SuDS Designs (CIRIA 2015)

3.4 Principles of SuDS

The proposed surface water drainage strategy complies with the standard principles of SuDS in the following way:

- Wherever possible across the site, water is managed as close to the surface as possible. Water is conveyed across the site via filter drains.
- Rainwater is treated as a valuable resource across the site by keeping water as close to the surface as possible through the use of filter drains, macro permeable paving, and an infiltration basin. SuDS assets will provide amenity and biodiversity benefits where possible across the site.
- Across the site, rainfall shall be managed to help protect critical infrastructure from increased flood risk through the implementation of techniques such as an infiltration basin and filter drains.
- Rainfall will be managed across the site to ensure the site does not flood during the 1 in 100-year plus 40% climate change event.
- A 40% climate change allowance will be applied to design flows.
- Two SuDS management trains are proposed for the site. Water falling on roofs, roads, and other hardstanding areas within the main site area will flow into filter

drains constructed adjacent to the roads. Water will then either infiltrate via the filter drain into the ground or will be conveyed into the infiltration basin in the east of the site. In the west of the site, the proposed access road shall utilise macro-permeable paving, allowing water storage and infiltration in the sub-base below impermeable surfaces in areas which are subject to high traffic loads and/or high shear forces from turning vehicles. This is based on an assumption that infiltration to ground is viable - subject to results of a more targeted ground investigation, including soakaway testing, groundwater levels monitoring, hydrogeological profiling and contamination risk assessment.

- The Simple Index Approach, in line with C753, will be used to demonstrate how surface water shall be managed to ensure that the proposed development site will not have a detrimental effect on water quality in the catchment.
- Biodiversity and amenity benefits are maximised across the site wherever possible. The use of vegetation around the infiltration basin increases opportunities for habitat creation and aids to promote a sense of wellbeing for employees. A detailed Amenity and Biodiversity Plan will need to be produced at the detailed design stage.
- To make the best use of available land by working with the existing topography of the site and placing SuDS features in green areas of the proposed design, enhancing the environment and providing multifunctional areas of open space.
- To ensure that the scheme performs reliably and effectively for the lifetime of the development, a maintenance plan shall be produced during detailed design stage which shall detail the management and maintenance requirements of the system to ensure it functions to its optimal capacity in perpetuity.
- During detailed design stage, further information shall be provided on the affordability in terms of long-term maintenance costs through provision of a SuDS maintenance plan. The environmental and social benefits of the scheme are detailed in Section 3.8.

3.5 S1: Surface Water Runoff Destination

The Statutory Standards for SuDS in Wales address the use of surface water by the development and where it should be discharged. Standard S1 describes a destination hierarchy which sets out the preferred routes for discharge of runoff from the site:

- Priority Level 1: surface water runoff is collected for reuse.
- Priority Level 2: surface water runoff is infiltrated to ground.
- Priority Level 3: surface water runoff is discharged to a surface water body.
- Priority Level 4: surface water runoff is discharged to a surface water sewer; highway drain or other drainage system.
- Priority Level 5: surface water runoff is discharged to the combined sewer.

Priority Level 1 is the preferred (highest) priority and 4 and 5 should only be used in exceptional circumstances. The following outlines how the proposed development adheres to the drainage hierarchy.

3.5.1 Priority Level 1 - Water for reuse

Given the nature of the proposal for energy storage purposes, the potential for surface water re-use across the development is limited and would not provide a viable means for the disposal of surface water for the site.

3.5.2 Priority Level 2 - Infiltration

Based on the current information about underlying geology, borehole records and infiltration test results, disposal of the runoff via infiltration to ground may be viable on this site and this is being promoted as part of the drainage strategy. This will however need to be confirmed following a detailed targeted ground investigation that should include soakaway testing at specific locations and depths, soil testing for contamination and installation of permanent groundwater monitoring wells on the site and ideally monitoring groundwater conditions for 12 months (or as a minimum across late winter/early spring) to develop an understanding of groundwater level fluctuations and flow patterns in the area where the SuDS measures shall be constructed.

Depending on the ground and groundwater conditions on site either traditional shallow or deep bore soakaways may be installed.

Should these detailed investigations find that infiltration to the ground is not suitable for the site then discharge to the closest surface water body should be considered.

3.5.3 Priority Level 3 - discharge to surface water body.

An unnamed ordinary watercourse is located approximately 250m to the north of the site. This watercourse flows into the River Clywedog about 550m to the north of the site. If required surface water could be discharged into the Pentrebychan Brook to the south. Connections to any of those watercourses would require crossing third party land and obtaining appropriate consents and easements. These connections should be investigated at detailed design, should infiltration prove not to be viable.

As a suitable means of discharge is deemed to have been found, Priority Levels 4 and 5 have not been considered further.

3.6 S2: Surface Water Runoff Hydraulic Control: Proposed Discharge Rate

There are typically three design storm events which should be considered when designing the SuDS system for managing flows and volumes:

- 1 in 1 year event, on sloping sites where surcharging above soffits of any surface water drainage pipework is not permitted.
- 1 in 30-year storm event, where surface water flooding of the site does not occur at this frequency.
- 1 in 100-year storm event with allowance for future climate change, where runoff from the site should be controlled to Greenfield rate using SuDS attenuation features to manage flows and volumes within the extents of the development site.

3.6.1 Interception of Rainfall

When rainfall occurs on greenfield sites there is, for the majority of rainfall events no runoff due to evapotranspiration or groundwater recharge. Therefore, interception mechanisms are based on runoff volume reduction using evapotranspiration and infiltration processes. Table G2.1 of the Statutory Standards for SuDS in Wales lists the interception drainage components which have assumed compliance.

Given that the surface water drainage strategy proposes to discharge surface water via infiltration, it is evident that the site complies with the requirements for interception across the site.

3.6.2 Discharge limits and attenuation volume

Main Development Site

For the main development site, the infiltration rate recorded during the preliminary GI at the proposed location of the infiltration basin has been used ($TP10 = 1.19 \times 10^{-4}$ m/s) to estimate the total required attenuation volume for the site. This is based on a total proposed impermeable area of 1.71 ha.

MicroDrainage Source Control model has been utilised to estimate the required surface water storage for the 1 in 100-year plus 40% climate change event. Catchment descriptors were obtained from the Flood Estimation Handbook webservice and are summarised in Table 3-1 along with other user defined variables. The required attenuation volume for the main site area is estimated as **1007m³**. The Source Control calculation record can be found in Appendix H.

Table 3-1 User defined values

Variable	Value
Site area	5.5 ha
Area of public space	3.79 ha
Developable area	1.71 ha
Impermeable area	1.71 ha
Climate change allowance	40%
Urban creep allowance	N/A
BFI Host	0.413
SPR Host	43.22%
Cv (summer and winter)	0.95

As discussed in section 3.5.2 infiltration as a means of surface water discharge is dependent on detailed ground investigation findings. Should infiltration not be possible the

drainage strategy should be revised accordingly. This could include lining the basin on site, and introducing filter drains where possible and surface water pipes to convey water to the attenuation basin. Surface water could then be discharged at the existing QBAR rate of 47.31 l/s, as shown in Section 2.3, to the local watercourse.

Filter drains across the site will intercept runoff generated by the access roads, roofs, and other hardstanding areas and either infiltrate it to the ground or convey it to an infiltration basin, which will slowly drain it into underlying soils. It is proposed that the basin has a maximum water depth of 0.7m, including a 0.3m freeboard, and side slopes no steeper than 1 in 3. The approximate available storage in the basin is 974m³.

The approximate volume of storage provided in filter drains is 86m³, based on a depth of 0.6m, width of 0.3m and porosity of 30%.

Access Road

For the proposed access road to the west of the main development site, the infiltration rate recorded during the preliminary GI at the western boundary of the site has been used (TP7 = 2.53×10^{-5} m/s) to estimate the total required attenuation volume for the site. This is based on a total proposed impermeable area of 0.17 ha.

MicroDrainage Source Control model has been utilised to estimate the required surface water storage for the 1 in 100-year plus 40% climate change event. Catchment descriptors were obtained from the Flood Estimation Handbook webservice and are summarised in Table 3-1 along with other user defined variables. The required attenuation volume for the main site area is estimated as **84m³**. The Source Control calculation record can be found in Appendix H.

Variable	Value
Site area	0.17 ha
Area of public space	0.0 ha
Developable area	0.17 ha
Impermeable area	0.17 ha
Climate change allowance	40%
Urban creep allowance	N/A
BFI Host	0.413
SPR Host	43.22%
Cv (summer and winter)	0.95

Macro-permeable paving is proposed along the access road in the west of the site. It is proposed that macro-permeable paving shall be used to attenuate, as necessary, and

infiltrate surface water that lands on the proposed access road. It is proposed that the macro-permeable paving has a depth of 0.2m, a porosity of 0.3, and provides approximately 107m³ of storage volume.

Macro-permeable paving allows water storage and infiltration in the sub-base below impermeable surfaces in areas which are subject to high traffic loads and/or high shear forces from turning vehicles.

Due to site constraints, it is proposed to locate a small area of macro-permeable paving within the high-risk extent for surface water flooding, in order to provide sufficient storage for the proposed impermeable area. The requirement for abnormal loads to access the site means that the proposed access road cannot be modified to be sized or positioned outside of the surface water flood extent. It should be noted that only up to 6 abnormal load vehicle deliveries are forecast for the construction phase, and it is very unlikely any further deliveries will be required thereafter.

Existing flow paths shall not be interrupted, as surface water will be able to flow over the proposed macro-permeable paving. It is understood that a proportion of road shall experience surface water flooding of up to 90mm during high-risk flood events, however this only affects a fraction of the width of the road at the entrance, leaving 13m of road width flood free to ensure safe access and egress. Consequently, it is recommended that abnormal load deliveries shall only be scheduled to access the site around local weather warnings, to avoid surface water flood risk constraints or impacts to the development.

Due to the proposed ground levels of the site, it may be appropriate to include check dams within SuDS assets to slow the flow of water, increase storage potential of the asset and enhance infiltration.

3.6.3 Exceedance Events

Extreme events exceeding the design event or internal drainage blockages / failures could occur and result in overland flows across the site. The duration of flooding, maximum depths, velocity and route of flood flows should be established by detailed hydraulic modelling and managed. The impact of exceedance flows onto adjacent land should also be considered - the return period of this assessment will be related to the potential consequences associated with the impact, and further guidance is requested from the SAB. For the proposed development site, it is envisaged that flows generated by exceedance events shall be conveyed easterly along the proposed access tracks towards the infiltration basin in the lowest area of the site. It is recommended that critical infrastructure such as the storage units are raised to avoid being affected by exceedance flows. Exceedance flows shall be directed towards and managed by the basin before infiltrating after the storm subsides. Potential exceedance routes based on existing site ground levels can be seen on the drawing in Appendix G.

3.7 S3: Water Quality

The surface water drainage system should provide a sufficient level of water quality treatment to prevent pollution of receiving waterbodies. During the water treatment design event (5mm rainfall across the site) no runoff should leave the site. This is usually achieved through source control techniques such as permeable pavements and rain gardens.

Table 4.3 of the SuDS Manual advocates the use of the "simple index approach" to determine an appropriate level of pollution mitigation for such sites. This splits pollution into three contaminant types (Total Suspended Solids, Metals, and Hydrocarbons) and assigns a "pollution hazard index" to each type. Different SuDS features are then assigned a "SuDS Mitigation Index" and sufficient treatment is deemed to have been provided if the "SuDS Mitigation Index" is equal to or greater than the "pollution hazard index" for each pollutant type. When more than one SuDS component is required a multiplication factor of 0.5 is applied to mitigation indices for secondary and tertiary components to account for reduced performance.

As the proposed development is for energy storage with low traffic roads, it is defined as having a Low Pollution Hazard Level in line with Table G3.1 of the Statutory Standards for SuDS in Wales.

The "pollution hazard indices" for a low pollution site are given in Table 3-2 below.

Table 3-2 Pollution Hazard Indices for a Low Pollution Hazard Site

Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Low	0.5	0.4	0.4

Table 26.4 of the SuDS Manual provides indicative SuDS mitigation indices for discharges to groundwater. The key conveyance routes for surface water to be discharged into groundwater is through filter drains, and infiltration basins.

Table 3-3 details the SuDS mitigation indices for the main components across the site. It indicates that the proposed surface water drainage scheme provides sufficient treatment across the site.

Table 3-3 SuDS mitigation indices for discharge to groundwater

SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons	Sufficient Mitigation Supplied?
Infiltration trench underlain by a soil with good contaminant attenuation potential of at least 300mm in depth (Filter Drain sub-base)	0.4	0.4	0.4	N/A

SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons	Sufficient Mitigation Supplied?
Bioretention underlain by a soil with good contaminant attenuation of at least 300mm in depth (Infiltration Basin)	0.8	0.8	0.8	N/A
Total	0.8	0.8	0.8	Yes
Constructed permeable pavement underlain by a soil with good contaminant potential of at least 300mm in depth (Macro-permeable paving)	0.7	0.6	0.7	Yes

3.8 S4 & S5: Amenity and Biodiversity

The aim of Standard 4 (S4) is to ensure that wherever possible and having regard to the need to prioritise infiltration drainage, the SuDS scheme makes the best contribution towards maximising benefits for amenity.

The surface water drainage system should seek to enhance existing habitats within the site and complement neighbouring habitats. Vegetated SuDS are proposed in the form of an infiltration basin. It is proposed that native plants and grasses will be used in and around the infiltration basin to improve biodiversity and ecological potential across the site.

The landscape masterplan details planting in the attenuation basin, which is currently proposed to be wet grassland EM8 meadow mix for wetland or similar. The detailed design phase of the proposed surface water drainage strategy will provide further information on the proposed ecological enhancements to be provided across the site.

3.9 S6: Design for Construction, Maintenance, and Structural Integrity

The national SuDS standards state that components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development, taking into account the requirement for reasonable levels of maintenance. The detailed design will include a maintenance plan and associated costs for the development site.

3.9.1 Health and Safety

Under the Construction (Design and Management) Regulations 2015 (CDM 2015) it is the designer's duty to:

- Eliminate foreseeable health and safety risks to anyone affected by the project.
- Take steps to reduce or control any risks that cannot be eliminated.

- Communicate, cooperate and coordinate with the client, other designers and contractors involved in the project so that designs are compatible, and health and safety risks are accounted for during the project and beyond.

The potential significant hazards and risks associated with the construction, operation, and maintenance of the proposed surface water drainage system, have been identified during the design process. The information on the identified hazards and potential mitigation measures of the risks presented by the hazards is summarised in the 'Designer's Risk Assessment', included in Appendix I.

It should be noted that the document identifies only significant hazards and risks associated within and in the immediate vicinity of the site based on a desk-based assessment of available information. The list therefore should not be considered as exhaustive, and a detailed site survey should be undertaken prior to commencing any construction activities on site. A further detailed CDM risk assessment should be undertaken during the detailed design stage, when the development proposals are finalised.

3.9.2 Adoption and maintenance

Schedule 3 of the Flood and Water Management Act was implemented in Wales on the 7th of January 2019. Under this legislation, SuDS that serve multiple properties must be approved and adopted by the SuDS Approval Body (SAB) - a function performed by the Lead Local Flood Authority at Wrexham County Borough Council. Any SuDS that serve a single curtilage will not typically be adopted by the SAB. Therefore, it is unlikely that any SuDS on the proposed development site will be offered for adoption.

3.9.3 Construction Stage

The surface water runoff will need to be managed during the construction stage of the development to minimise the risk of flooding and pollution to the surrounding environment. This will be addressed within an Environmental Management Plan prepared for the development by an appointed contractor for the works prior to construction commencing and shall be submitted with the full application for approval.

4 Conclusions and Recommendations

JBA Consulting were commissioned by Innova Renewables Developments in April 2023 to prepare an outline surface water drainage strategy for a proposed energy storage site at land north of Bronwylfa Road, Rhostyllen, Wrexham.

The proposed development site is approximately 5.5 ha in size and currently greenfield. The development proposal comprises energy storage and construction of an associated substation along with an access road and access tracks, and other necessary hardstanding areas.

Infiltration tests undertaken by Gibbs Geotechnical in May 2023 indicate that infiltration rates are good across the main development area of the site (lowest rate of 6.23×10^{-6} m/s). In the south-west of the site, near to the proposed access road, an infiltration rate of 2.53×10^{-5} m/s has been utilised.

It is proposed that surface water from hardstanding areas will infiltrate into the ground. This is provided that a targeted detailed ground investigation including soakaway testing at specific locations, soil testing for contamination and installation of permanent groundwater monitoring wells on the site is undertaken and shows that infiltration is a viable means of discharge across the site.

The required 1 in 100-year plus 40% climate change attenuation storage, based on the lowest available infiltration rate, has been calculated as 1007m³ for the main development site, using Micro Drainage software. This will be incorporated through filter drains along the access roads and an infiltration basin in the east of the site. The proposed access road is calculated to require approximately 84m³ of attenuation storage for the 1 in 100-year plus 40% climate change event. It is proposed to incorporate macro-permeable paving along the access road.

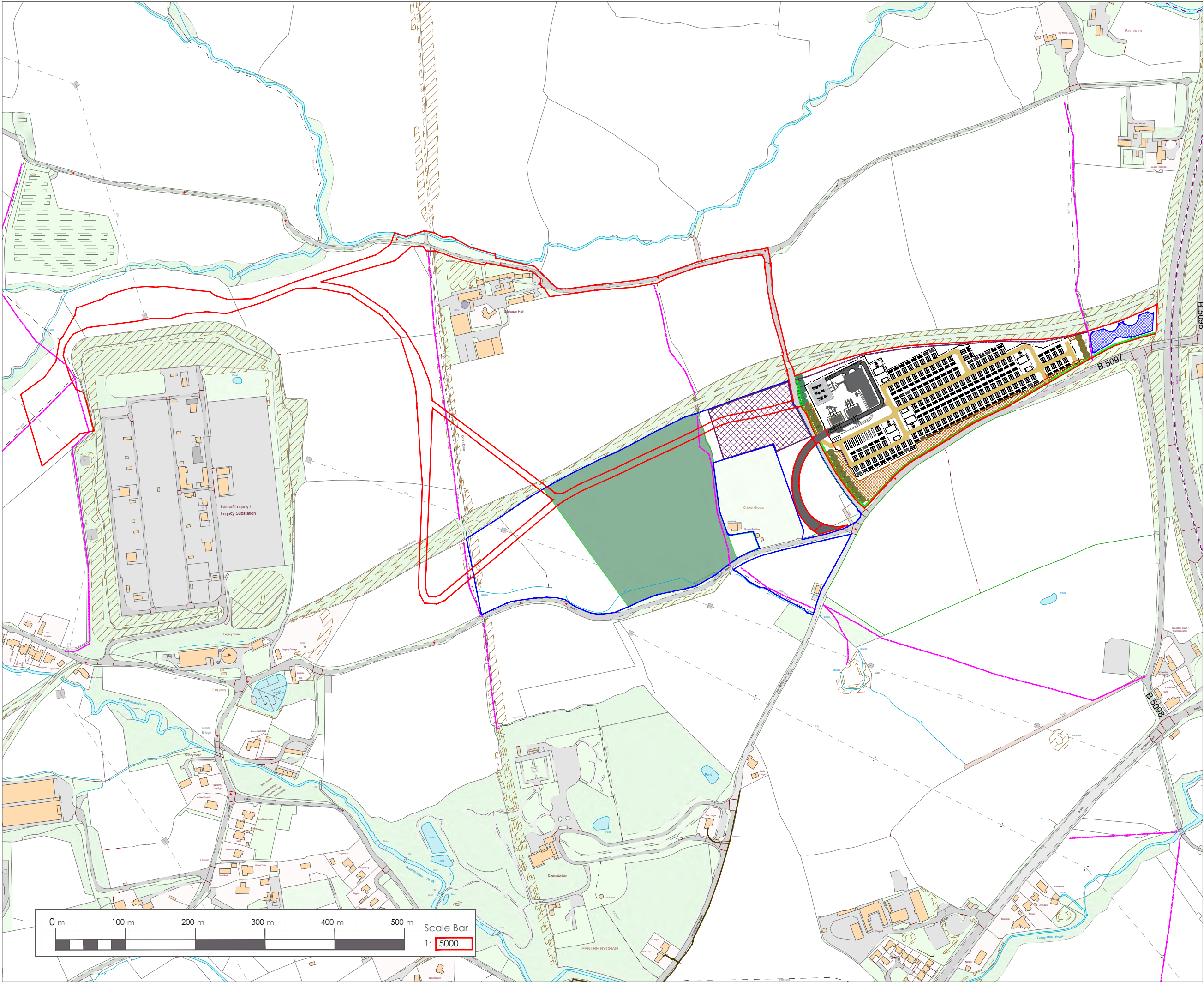
There will be two flow paths across the site. Water falling on roofs, roads, and other hardstanding areas across the site will flow into filter drains and either infiltrate into ground or be conveyed easterly to the infiltration basin and then infiltrate to ground. The access road shall retain its own drainage system, whereby water falling onto the road flows into macro-permeable paving and then infiltrates into the ground. It is possible that check dams shall be required within the macro-permeable paving, and filter drains, to slow the flow of water, and promote infiltration across the site.

Should further investigations show that infiltration is not suitable for the site this drainage strategy should be revisited to adapt it for attenuation rather than infiltration. Runoff should then be discharged at the QBAR rate of 45.4 l/s into the local watercourse.

The proposed SuDS assets shall provide sufficient water quality and amenity benefits to the site via the use of a wide shallow infiltration basin.

Multiple biodiversity benefits will be provided by the use of native planting in and around the SuDS feature.

A Development Proposal



KEY:

- Development Boundary
- Additional Land Within Applicants Control
- ESS Unit
- 400kV Substation
- 33kV Bay
- Access Track
- Access Road
- Permissive Footpath
- Bund
- Attenuation Basin
- Construction Compound
- Ecological Enhancement Area
- Woodland Planting
- Hedgerow Enhancement
- Fenceline
- Access Gate
- Water Container
- Storage Container
- Office Container
- Parking Spaces
- PRoW



DATE: 21/02/2024

PROJECT TITLE:

Legacy

DRAWING TITLE:

Layout Plan

DRAWING VERSION NUMBER:

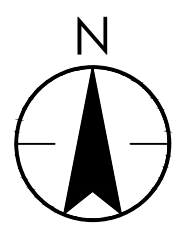
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SCALE: 1:5000

PAGE SIZE: A3

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- KEY:
- PROPOSED MAJOR CONTOURS (0.5m)
 - PROPOSED MINOR CONTOURS (0.1m)
 - ROOT PROTECTION AREA

P03 AMENDED TO SUIT INNOVA COMMENTS	HR	DG	2023.09.15	
P02 REVISED LOGO	HR	DG	2023.09.01	
P01 FIRST ISSUE	DF	DG	2023.08.23	
Issued/Revision	By	Appd	YYYY.MM.DD	
	DF	SMW	HR	2023.09.14
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

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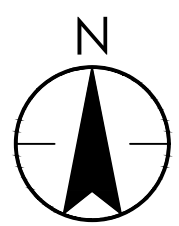
BATTERY STORAGE AT LEGACY
SUBSTATION, WREXHAM

Title
PROPOSED CONTOURS

SHEET 1 OF 2

Project No. 332610070	Scale 1:500
Revision P03	Drawing No. STN-HGT-XX-DR-CE-0601

Plotted: 15/09/2023 09:59:15 1:10:30 AM By: Ross, Henry
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D

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B

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 - ROOT PROTECTION AREA

PD1 - FIRST ISSUE	HR	DG	2023.09.15
Issued/Revision	By	Appd	YYYY.MM.DD
	DF	SMW	HR
	Dwn.	Dsgn.	Chkd.

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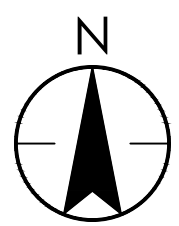
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BATTERY STORAGE AT LEGACY
SUBSTATION, WREXHAM

Title
PROPOSED CONTOURS

SHEET 2 OF 2

Project No. 3326107070	Scale 1:500
Revision P01	Drawing No. STN-HGT-XX-DR-CE-0602



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A

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CUT/FILL ANALYSIS

CUT: 26,955 m³
FILL: 26,945 m³
NET: 10 m³ CUT

SURFACE LEVEL DATA			
No.	MIN. LEVEL	MAX. LEVEL	COLOUR
1	-2.50	-2.00	■
2	-2.00	-1.50	
3	-1.50	-1.00	■
4	-1.00	-0.50	
5	-0.50	0.00	■
6	0.00	0.50	
7	0.50	1.00	■
8	1.00	1.50	
9	1.50	2.00	■
10	2.00	2.50	
11	2.50	3.00	■
12	3.00	3.50	
13	3.50	4.00	■
14	4.00	4.50	
15	4.50	5.00	■

P03 AMENDED TO SUIT NOVUS COMMENTS	HR	DG	2023.09.15
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BATTERY STORAGE AT LEGACY
SUBSTATION, WREXHAM

Title
PROPOSED CUT AND FILL

SHEET 1 OF 2

Project No. 332610070	Scale 1:500
Revision P03	Drawing No. STN-HGT-XX-DR-CE-0611

