FLOOD CONSEQUENCE ASSESSMENT AND SURFACE WATER DRAINAGE STRATEGY

National Road BESS

Land North and South of National Road, Cilfynydd

On behalf of REWE 2 Ltd
Date: 14/02/2025 | Pegasus Ref: P22-2733 – Author: Lucy Ginn

Document Management

Version	Date	Author	Checked/ Approved by:	Reason for revision
Version 1	12/10/2023	Lucy Ginn	Luke Johnson	First Issue
Version 2	06/02/2025	Lucy Ginn	Simon Jacques	Updated Site Layout & Additional Drainage Information
Version 3	14/02/2025	Hiu-yeung Chow	Simon Jacques	Updated following client comments

Contents

Figures

Tables

Appendices

1. Introduction

Background

1.1. Pegasus Planning Group Ltd has been appointed by REWE 2 Ltd (Windel Energy/Recurrent Energy) to undertake a Flood Consequence Assessment (FCA) and surface water drainage strategy for a proposed Battery Energy Storage System (BESS) with Associated Infrastructure, Earthworks, Access, Drainage, Landscaping, and an underground cable route connection at Land North and South of National Road.

1.2. The proposed underground cable route for the site will connect the proposed new sub-station south of National Road through to Cilfynydd 400kV Substation. The proposed cable route will be a buried service and as such, will not be at risk of flooding. The construction of the proposed cable route will also return surrounding ground to existing levels following installation and therefore not impact flood risk on site or elsewhere. As the proposed cable route is not considered to be at risk of flooding or expected to impact flood risk elsewhere, it has not been assessed in detail within this FRA.

Relevant Policy and Guidance

1.3. In accordance with Natural Resources Wales (NRW) guidance, this FCA considers flood risk to the proposed development from rivers and the sea, surface water and small watercourses, groundwater and reservoirs.

1.4. This FCA also demonstrates, where appropriate, that the proposed development has sufficient mitigation measures in place to reduce flood risk and consequences, is as safe as possible and causes no increased flood risk elsewhere. This is in accordance with NRW guidance.

1.5. The Sustainable Approval Body (SAB) was introduced in Wales in January 2019 and must approve proposed drainage strategies for all proposed developments with more than 1 dwelling or with an area greater than 100m^2. As such, any new applications which meet these criteria will require submission of drainage scheme and must demonstrate the use of Sustainable Drainage Systems (SuDS).

1.6. The site is primarily located within the Local Planning Authority of Rhondda Cynon Taf County Borough Council. The proposed underground cable route connection at Cilfynydd 400kV substation crosses into Caerphilly County Borough Council.

1.7. This assessment has reviewed the information and requirements included in the South East Wales – Strategic Flood Consequence Assessment (Stage 1) (2022). This assessment covers both Rhondda Cynon Taf County Borough Council and Caerphilly County Borough Council, alongside other Local Planning Authorities in South East Wales and is referred to as the "local SFCA (2022)" throughout this document.

1.8. Technical Advice Note 15 (TAN15) by Planning Policy Wales discusses policy in relation to 'development, flooding and coastal erosion' and has also been used to inform this FCA. TAN15 was first issued in July 2004 but in December 2021 was updated. The updated TAN15 is not yet adopted policy, having missed the expected adoption date

of 1 June 2023. At the time of writing it has not been confirmed when the new TAN15 will come into effect.

1.9. Key to the updated TAN15 (2021) is the introduction of NRW's Flood Map for Planning which "will replace the Development Advice Map for planning purposes when the Welsh Government implements the revised TAN15". Although the Flood Map for Planning "has no official status until the Welsh Government implements the revised TAN15", "it represents the best available information we have on flood risk" and as advised on the NRW website, will continue to be used to inform NRW planning advice. The Flood Map for Planning has therefore been used instead of the Development Advice Map to assess flood risk within this FCA.

2. Existing Site and Hydrology

Site Location & Existing Conditions

2.1. The site is located at Land North and South of National Road. The proposed development comprises a Battery Energy Storage System (BESS) with associated infrastructure, earthworks, access, drainage, landscaping and underground cable route connection.

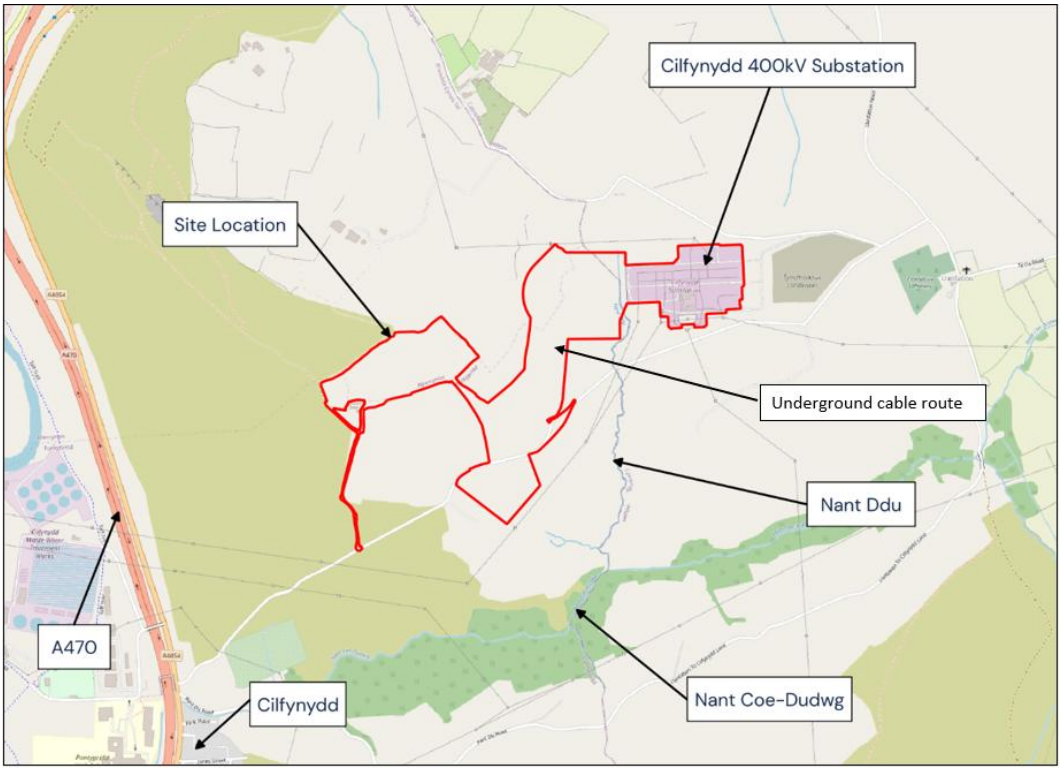
2.2. The site is located to the northeast of the village of Cilfynydd. The site is generally surrounded by open green space/agricultural land. The existing Cilfynydd 400kV substation is located at the eastern end of the site.

2.3. The Nant Ddu watercourse flows through the site towards the Nant Coe-Dudwg located to the south of the site.

2.4. Approximate co-ordinates at the centre of the site are E: 309597, N: 193525. The nearest postcode is CF37 4HW.

2.5. The site location is shown in Figure 2.1.

Figure 2.1 – Site Location



2.6. A topographic survey of the site was complete in September 2023 by Brunel Surveys Ltd and is included in **Appendix A**. The topographic survey of the site shows that the site exhibits localised areas of significant gradients. Due to the steep slopes on site, a Levels Strategy has been prepared and is included in **Appendix B.**

Existing Drainage and Hydrology

2.7. The topographic survey of the site shows several field boundary ditches on site. It is presumed that these are currently used to manage water levels of the existing agricultural land on site. The topographic survey is included in **Appendix A**.

2.8. The Nant Ddu watercourse flows through the site just west on the Cilfynydd 400kV Substation. The alignment of this watercourse is shown in Figure 2.1. The Nant Ddu flows southerly towards the Nant Cae-dudwg located approximately 300m south of the southern site boundary.

2.9. Geological data from the British Geological Survey (BGS) shows that the site generally comprises "Hughes Member – Sandstone" bedrock geology. Areas of "Hughes Member – Mudstone, Siltstone and Sandstone" are also recorded on site.

2.10. BGS also record "Till, Devensian – Diamicton" superficial deposits extending across the majority of the site, with a small area of "Peat" also recorded at the northern end of the Cilfynydd 400kV substation.

2.11. Various soils are recorded on site by Soilscapes including: "slowly permeable wet very acid upland soils with a peaty surface" and "freely draining acid loamy soils over rock".

2.12. The hydrogeology 625K digital hydrogeological map of the UK highlights that the entire site is underlain by a "moderately productive aquifer".

2.13. Infiltration testing was carried out on site in September 2023 by Roberts Environmental Ltd. The report issued following this testing is included in **Appendix C** and summaries the ground conditions on site to comprise "clayey gravelly sands" topsoil, superficial deposits of varied compositions of clay, gravel and sand and weather bedrock generally as "sandy clayey gravel and clayey sandy gravel". Compared to the datasets discussed above, the on-site ground investigations revealed a more clayey nature of the site.

3. Proposed Development

3.1. The proposed development comprises a “Proposed Battery Energy Storage System (BESS) with Associated Infrastructure, Earthworks, Access, Drainage, Landscaping and Underground cable route connection”.

3.2. The proposed site layout in included in **Appendix D.**

4. Flood Risk and Land Use Vulnerability

Planning Policy Wales Edition 12 (2024)

4.1. Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government.

4.2. It outlines that all new development should:

1. Consider all flood risk at an early stage in the development.
2. Reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself.
3. Not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS.

TAN 15 – Development, flooding and coastal erosion (2021)

4.3. TAN 15 (2021) reflects the core principles of the National Strategy for Flood and Coastal Erosion Risk Management in Wales, to adopt a risk-based approach in respect of new development in areas at risk of flooding and coastal erosion.

4.4. TAN 15 (2021) discusses how flood risk encompasses 2 things:

1. The likelihood of an event happening
2. The impact that will result if flooding or coastal erosion occurs.

4.5. Based on the above consideration of flood risk, TAN 15 (2021) sets out the different requirements that apply to different types of new development in different areas.

4.6. As detailed in TAN 15 (2021), the National Strategy aims to prevent exposure to risk to new developments by making locational choices in the following order of preference:

a) Direct new development to areas at minimal risk of flooding – areas in Zone 1

b) Enable resilient development in areas served by formal flood risk management defences that reduce the risk and consequences of flooding over the lifetime of development – areas in the TAN 15 Defended Zones;

c) Allow resilient development in undefended areas of relatively low risk – areas in Zone 2

d) Only permit water compatible development, essential infrastructure, and less vulnerable developments by exception in areas of higher risk – areas in Zone 3

4.7. The above approach is based on:

a) A Flood Map for Planning showing flood zones which trigger justification and acceptability tests;

b) Defining development types by their vulnerability in flood events;

c) Advice on permissible uses in relation to the location of development and the consequences of flooding;

d) Planning authorities incorporating local flood risk considerations into their planning policies and decisions

Suitability of the Proposed Development

4.8. All proposed development is located in the Flood Map for Planning Zone 1. This type of development is the most preferential in terms of flood risk, as referenced above in relation to the National Strategy. Though part of the site boundary is within Flood Zone 2 and 3 in relation to surface water and small watercourse flooding, these areas are not proposed for development except for the underground cable route previously identified to not be at risk of flooding due to the buried nature.

4.9. TAN 15 details that the Flood Map for Planning Zone 1 is suitable for "all" development types and that there are "no constraints relating to flooding from rivers or the sea, other than to avoid increasing risk elsewhere". A justification test is also not required for development in Zone 1. The proposed surface water drainage strategy (see Section 6) will ensure the proposed development will not increase flooding elsewhere. The proposed development is therefore considered appropriate.

5. Site Specific Flood Risk

5.1. In accordance with NRW guidance, this FCA considers the risk of flooding from:

a) Rivers

b) The Sea

c) Surface Water and Small Watercourses

d) Groundwater

e) Reservoirs

5.2. In addition to requirements set out above, the following sources of flooding have also been considered as part of this FCA:

a) Historic

b) Sewers

Flood Map for Planning Flood Risk Classification

5.3. As discussed in Section 2, NRW's Flood Map for Planning is the "best available information we have on flood risk". The Flood Map for Planning includes several layers reflecting flood risk from Rivers, Rivers & Sea, Sea and Surface Water and Small Watercourses. The risk from each source is defined as Flood Zone 2 and Flood Zone 3. The flood risk classification defined by NRW's Flood Map for Planning is summarised in Table 5.1 below.

Table 5.1 – NRW Flood Map for Planning – Risk Classification

Layer	Risk of Flooding (including the effects of climate change)
Rivers – Flood Zone 2	1 in 1,000 to 1 in 100 year
Rivers – Flood Zone 3	> 1 in 100 year
Rivers & Sea – Flood Zone 2	Combined 1 in 1,000 year
Rivers & Sea – Flood Zone 3	Combined 1 in 100 year
Sea – Flood Zone 2	1 in 1,000 to 1 in 200 year
Sea – Flood Zone 3	> 1 in 200 year

Surface Water and Small Watercourses – Flood Zone 2	1 in 1,000 to 1 in 100 year
Surface Water and Small Watercourses – Flood Zone 3	> 1 in 100 year

Rivers

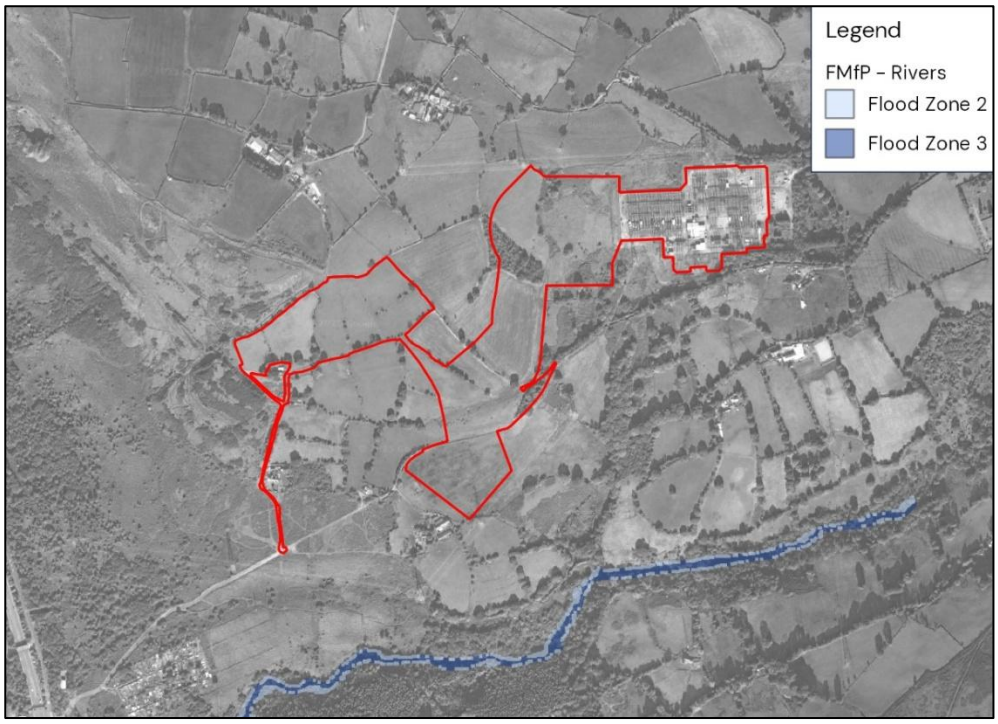
5.4. NRW's Flood Map for Planning for Rivers (shown in Figure 5.1) does not predict the site to be at risk of fluvial flooding, with the site not predicted to be impacted by a 1 in 1,000 year fluvial flood event, including the impacts of climate change. As shown in Figure 5.1, the closest area to the site identified to be at risk of fluvial (river) flooding is located approximately 300m south of the southern site boundary. This risk is associated with the Nant Coe-Dudwg watercourse located here.

5.5. Smaller watercourses are discussed below with reference to the Flood Map for Planning for Surface Water and Small Watercourses.

5.6. The local SFCA (2022) details that in Rhondda Cynon Taff County Borough, that due to steep topography in the area, "the floodplains are narrow and Flood Zones 2 and 3 are largely confined to the areas within the immediate vicinity of the watercourses". This is the case for the site area which exhibits steep topography and a subsequent narrow extent of Flood Zone 2/3 to the south of the site.

Overall, given the above, the site is considered to be at **Very Low** risk of flooding from rivers.

Figure 5.1 – Flood Map for Planning - Rivers



Sea

5.7. NRW's Flood Map for Planning for Sea does not predict the site to be at risk of tidal flooding, with the site not predicted to be impacted by a 1 in 1,000 year tidal flood event, including the impacts of climate change.

5.8. The site's inland location will ensure it is not at risk of flooding from the sea.

5.9. The local SFCA (2022) states that "the Rhondda Cynon Taf Country Borough is not at risk of tidal flooding".

5.10. Overall, the flood risk to the site from the sea is considered to be **Very Low**.

Surface Water and Small Watercourses

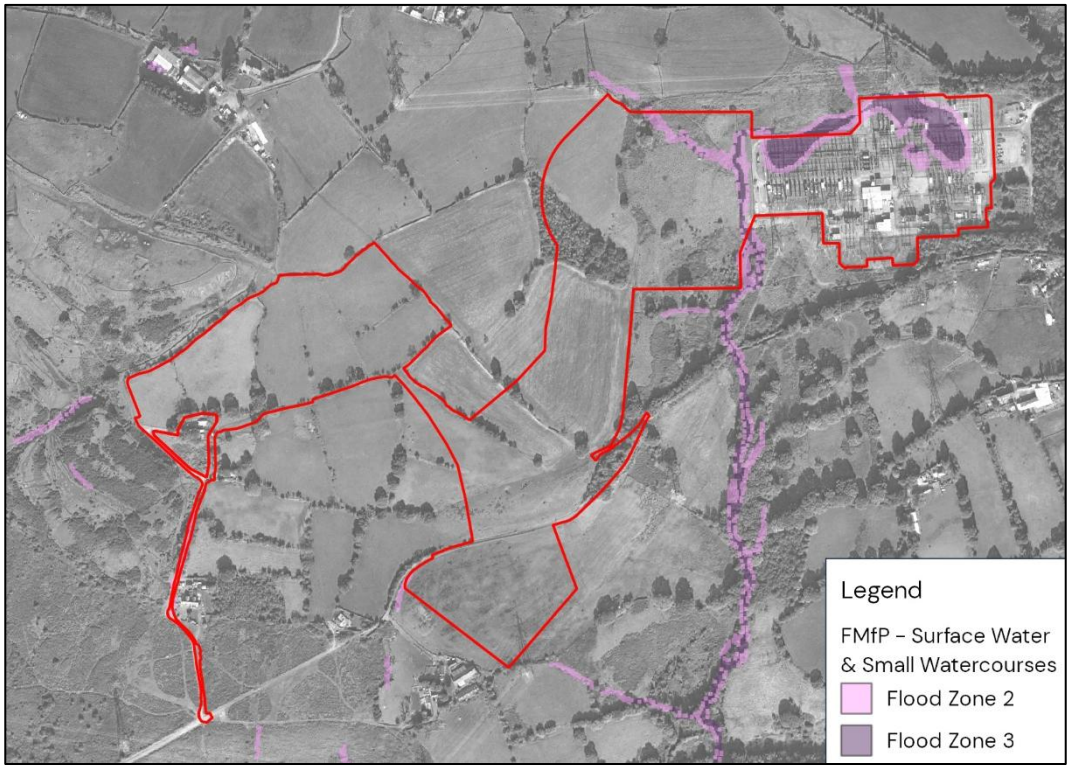
5.11. NRW's Flood Map for Planning for Surface Water and Small Watercourses generally defines the site to be at Low risk, not predicted to be impacted by the 1 in 1,000 year flood event (see Figure 5.2).

5.12. There are also areas on site the Flood Map for Planning for Surface Water and Small Watercourses highlights to be at risk. These risk areas are generally associated with the existing Cilfynydd 400kV substation and the proposed underground cable. There is no new development proposed in areas predicted to be at risk of flooding from surface water and small watercourses.

5.13. In reference to Rhondda Cynon Taf, the local SFCA (2022) states that "due to the steep topography of the borough, surface water is channelled to the bottom of the valleys where most of the urban areas are located". The site is however not located at the bottom of a valley, with surface water therefore not predicted to accumulate on site.

5.14. Overall, given the above, the flood risk to the site from surface water and small watercourses is considered to be **Very Low.**

Figure 5.2 –Flood Map for Planning–Surface Water & Small Watercourses



5.15. Groundwater

5.16. Infiltration testing was carried out on site in September 2023 by Roberts Environmental Ltd. The report issued following this testing is included in **Appendix C.** During testing, a total of 7 trial pits were dug. Groundwater was encountered at just 1 of these locations, sited at the lowest part of the site.

5.17. The infiltration testing at the site also recorded that the ground conditions on site yield very poor infiltration rates. As such, ground conditions on site are not expected to be associated with groundwater emergence, with permeabilities expected to be insufficient for emergence to occur.

5.18. Site topography is not considered to be conducive to groundwater flooding. Any ground water to emerge would follow site topography and flow in a general southerly direction, without accumulating on site.

5.19. The local SFCA (2022) includes indicative groundwater flood depths maps and highlight that "groundwater levels are at least 5m below the ground surface" on site.

5.20. Overall, given the above, the risk of groundwater flooding on site is considered to be **Very Low.**

Reservoirs

5.21. NRW's Flood Risk from Reservoirs mapping does not highlight the site to be at risk of flooding. The nearest recorded risk area is located approximately 1km west of the site, alongside the River Taff.

5.22. The local SFCA (2022) states that artificial flooding on Rhondda Cynon Taf "does not cause extensive flooding" and that "reservoirs in the UK have an excellent safety record" and note the requirement for reservoirs to be inspected regularly. The likelihood of a reservoir breach is therefore considered to be very low.

5.23. Overall, the site is considered to be at **Very Low** risk of reservoir flooding.

Historic Flooding

5.24. NRW's Historic Flood Map does not show any historic flood events impacting the site. The closest recorded event is approximately 1km west of the site associated with the River Taff.

5.25. The local SFCA (2022) details that "Rhondda Cynon Taf Country Borough has a history of recorded flood events caused by multiply sources of flooding". There are however no identified records of historic flooding impacting the site.

5.26. Overall, the site is considered to be at **Very Low** risk is historic flooding.

Sewers

5.27. The local SFCA (2022) details that there are 3 recorded sewer flooding incidents in the electoral ward of Cilfynydd. There are no further location details to pin point where these flood events impacted.

5.28. Site topography is not considered to be conducive to sewer flooding. Any sewer flood waters to reach the site would follow site topography and flow in a general southerly direction, without accumulating on site.

5.29. Overall, the site is considered to be at **Very Low** risk of sewer flooding.

Access & Egress

5.30. The site is proposed to be accessed via an existing access off National Road at the southern site boundary.

5.31. The access and egress points of both parcels are not shown to be at significant risk of flooding from any source (see flood risk assessment above and Table 5.2 below).

5.32. The Flood Map for Planning for Surface Water and Small Watercourses defines a small area of Flood Zone 2 along the access to the proposed BESS. The proposed BESS will however be managed remotely and only visited occasionally for maintenance. Access to the site during an extreme flood event should therefore not be required.

Flood Risk Summary

5.33. The risk of flooding from all sources is summarised in Table 5.2:

Table 5.2 – Flood Risk to the Site from All Sources

Flood Source	Flood Risk	Mitigation/Comments
Rivers	Very Low	• The Flood Map for Planning for Rivers does not predict the site to be impacted by a 1 in 1,000 year fluvial flood event. • The steep topography on site ensures Flood Zones associated with local watercourses are largely confined to areas in the immediate vicinity of the watercourses.
Sea	Very Low	• The Flood Map for Planning for the Sea does not predict the site to be impacted by a 1 in 1,000 year tidal flood event. • The site is located inland and is not at risk of tidal flooding.
Surface Water & Small Watercourses	Very Low	• The vast majority of the site is not predicted to be impacted by a 1 in 1,000 year flood event • Areas identified to be at risk of flooding from surface water and small watercourses are not proposed for development.
Groundwater	Very Low	• Infiltration testing on site recorded very limited emergence of groundwater on site, with emergence noted at just 1 out of 7 trial pits. • Infiltration testing on site recorded very poor infiltration rates on site. In the same sense, groundwater is therefore not expected to emerge on site. • Site topography is not considered conducive to groundwater flooding. • The local SFCA details that groundwater is expected to be at least 5m below the ground surface on site.

Reservoirs	Very Low	• The site is not predicted to be at risk by NRW's Flood Risk from Reservoirs mapping. • The likelihood of a reservoir breach is considered to be very low.
Historic	Very Low	• NRW's Historic Flood Map does not record any historic flood events impacting the site. • There are no know historic flood events to have impacted the site.
Sewers	Very Low	• There are no know records of sewer flooding impacting the site. • The site's topography is not considered conducive to groundwater flooding.

6. Surface Water Drainage Strategy

6.1. The proposed development will increase the area of impermeable hardstanding on site and as such, a surface water drainage strategy will be required. The surface water drainage strategy will ensure surface water runoff rates from the site and associated surface water flood risk on site and elsewhere do not increase.

Surface Water Management

6.2. The SuDS hierarchy demands that surface water run off should be disposed of as high up the following list as practically possible:

• Into the ground (infiltration) and re-use, or then;

• To a surface water body, or then;

• To a surface water sewer, highway drain or another drainage system, or then;

• To a combined sewer.

6.3. In order to determine the most suitable method of surface water disposal from the site the options listed above have been considered as follows:

Infiltration

6.4. Infiltration testing has been conducted on site, the results of which are included in **Appendix B.**

6.5. The onsite testing has shown that infiltration-based SuDS are not suitable for the management of surface water runoff from the site. The water levels did not drop below 25% of the starting volume as required to determine the coefficient of permeability in accordance with BRE 365 guidance.

6.6. Based on the above, infiltration-based SuDS have been ruled out as a means of surface water management on site.

Surface Water Body

6.7. The next option in the SuDS hierarchy is to discharge surface water runoff into an existing surface water body.

6.8. As detailed in Section 2, there are several field boundary ditches on site, one of which is defined by the topographic survey **(Appendix A)** to flow to the south of the proposed substation area. It is therefore proposed to discharge surface water runoff from the proposed substation area into this watercourse at a controlled rate.

6.9. Following a review of the topographic survey and LiDAR coverage of the site, the only watercourse evident in close proximity to the proposed BESS flows along the northern site boundary. The northern site boundary represents the high point of the BESS area and is therefore not where the current site would naturally drain. In order to maintain

existing flow patterns and associated flood risk on site and elsewhere, the watercourse along the northern BESS boundary has been ruled out as a point of surface water discharge. Instead, it is proposed to design a drainage strategy that maintains existing flow patterns on site and in the surrounding area.

6.10. Existing ground levels where the BESS is proposed fall steeply to the south. It is therefore proposed to outfall surface water runoff into a series gravel trenches along the southern side of the proposed BESS. Surface water will be discharged into the gravel trenches at a controlled rate. Once the capacity of the gravel trenches has been exceeded, surface water will overtop and flow southerly in accordance with existing topography and flow patterns. This approach ensures surface water does not need to be discharged into the watercourse along the northern site boundary. Ground levels beyond the proposed gravel trenches continue to fall in a southerly direction.

SuDS selection process

6.11. Various methods of SuDS (Sustainable Drainage Systems) should be considered for use as different methods have constraints attached to them and may not be suitable for this development.

6.12. An assessment of the suitability of different SuDS techniques is summarised in Table 6.1 below. Guidance from 'The SuDS manual' C753 has been used to form the basis of this assessment.

Table 6.1 – Assessment of SuDS Suitability

SuDS Technique	Potentially suitable for this development	Justification
Rainwater Harvesting	No	Not considered suitable for BESS developments.
Green Roofs	No	Not considered suitable for BESS developments.
Infiltration Systems (Soakaways, etc.)	No	Infiltration testing has ruled out infiltration-based SuDS on site.
Filter Drains	Yes	Could be used to help convey surface water runoff on site.
Swales	Yes	Could be used to convey surface water runoff on site.

Bioretention Systems	No	Not considered suitable due to land take.
Trees	Yes	Could be considered but would not significantly reduce the storage requirements.
Underground storage	Yes	Proposed to help provide storage within the surface water drainage system.
Detention basins & ponds	Yes	Could be used.
Wetlands	No	Not considered suitable due to land take.
Permeable Paving	Yes	Could be used for the proposed access tracks.

Surface Water Drainage Strategy – Substation Area

6.13. The proposed surface water drainage strategy drawings are included in **Appendix E**, with the associated greenfield runoff rate and Microdrainage calculations included in **Appendix F**.

6.14. As detailed in the surface water drainage strategy drawings, surface water runoff from the proposed substation area will be conveyed towards geocellular attenuation crates. The attenuation crates have been designed to manage surface water runoff from 0.77ha of impermeable area for all storm events up to and including the 1 in 100 year rainfall event plus a 45% allowance for climate change.

6.15. The impermeable area used is a conservative value as in reality, much of the proposed substation area is expected to comprise a permeable gravel base. Given the failed infiltration testing on site however, we have conservatively included the full substation area as impermeable within the drainage calculations.

6.16. The proposed attenuation crates will outfall into the watercourse to the south of the proposed substation area via a pipe at a controlled rate of 7.2l/s. This represents the calculated QBAR greenfield runoff rate for the 0.77ha impermeable substation area, calculations of which are included in **Appendix F**.

6.17. The proposed surface water drainage strategy drawings are included in **Appendix E**, with the associated greenfield runoff rate and Microdrainage calculations included in **Appendix F**.

6.18. As detailed in the surface water drainage strategy drawings, surface water runoff from the proposed BESS will be conveyed towards a series of geocellular attenuation crates. The attenuation crates have been designed to manage surface water runoff from 2ha of impermeable area for all storm events up to and including the 1 in 100 year rainfall event plus a 45% allowance for climate change.

6.19. The impermeable area used is a conservative value as in reality, much of the proposed BESS area is expected to comprise a permeable gravel base. Given the failed infiltration testing on site however, we have conservatively included the full substation area as impermeable within the drainage calculations.

6.20. The proposed attenuation crates will outfall into a series of gravel trenches at the southern end of the proposed BESS (see further details about the chosen outfall above). Surface water will be discharged into the gravel trenches at a controlled rate, with the total combined discharge into the gravel trenches designed not to exceed the calculated QBAR greenfield runoff rate of 18.9l/s for the 2ha of impermeable BESS area (see **Appendix F**). The proposed gravel trenches, once at capacity, will then overtop and surface water will continue to flow southern in accordance with existing drainage patterns.

6.21. There is a penstock located upstream of each of the proposed gravel trench outfalls. In the event of a fire, these penstocks will be closed. This will ensure any potentially contaminated fire suppression water is contained within the drainage system and is not able to pollute the local environment. Within each drainage network that includes a penstock, the storage capacity of the system exceeds 228m^3. The volume of 228m^3 is in accordance with the National Fire Chiefs Council "Grid Scale Battery Storage System planning – Guidance for FRS" which states that BESS site's "should be capable of delivering no less than 1,900 litres per minute for at least 2 hours".

6.22. The provision of fire suppression water on site is also detailed in the proposed surface water drainage strategy **(Appendix E)**.

6.23. Water Quality

6.24. The SuDS Manual (CIRIA C753) states that the design of surface water drainage should consider minimising contaminants in surface water runoff discharged from the site. The level of treatment required depends on the proposed land use, according to the pollution hazard indices.

6.25. Table 6.2 shows the pollution indices for the proposed BESS and substation.

6.26. Table 6.3 shows the pollution mitigation indices for the proposed BESS gravel trenches and expected substation gravel base. It is shown that the pollution mitigation index

exceeds the proposed development pollution index. Therefore, the mitigation measures are deemed adequate for the site.

Table 6.2 – Pollution Hazard Indices – BESS and Substation

Pollutant	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05

Table 6.3 – Indicative SuDS Mitigation Indices

Type of SuDS component	Total suspended solids (TSS)	Metals	Hydrocarbons
Filter Drain	0.4	0.4	0.4

7. Summary

7.1. The proposed development comprises a "Proposed Battery Energy Storage System (BESS) with Associated Infrastructure, Earthworks, Access, Drainage, Landscaping and Underground cable route connection" at Land North and South of National Road.

7.2. The proposed development is in accordance with Planning Policy Wales (PPW), TAN 15 and the National Strategy guidance with regards to flood risk.

7.3. The site is considered to be at Very Low risk of flooding from all sources.

7.4. A surface water drainage strategy has been proposed to manage surface water runoff from the development to ensure runoff rates and associated flood risk on site and elsewhere do not increase.

7.5. A Levels Strategy has also been prepared to manage the steep gradients on site.

7.6. Overall, the development is not considered to be at significant risk of flooding and a surface water drainage strategy will be implemented on site to ensure flood risk elsewhere is not impacted. It is therefore concluded as acceptable development from a flood risk and surface water drainage perspective.

Appendix A – Topographic Survey

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
PGM1	309464.186	193547.379	226.155	PGM
PGM2	309361.950	193553.241	226.617	PGM
PGM3	309288.224	193560.236	226.730	PGM
PGM4	309191.115	193535.575	221.687	PGM
PGM5	309139.050	193488.765	211.179	PGM
PGM6	309661.020	193417.810	206.011	PGM
PGM7	309829.829	193505.183	183.154	PGM
PGM8	309851.478	193372.025	166.614	PGM
PGM9	309723.917	193259.785	171.318	PGM
N1	309226.416	193411.109	201.462	Nail
N2	309180.331	193245.007	178.913	Nail
N3	309223.117	193096.547	162.229	Nail
N4	309530.866	193314.968	183.375	Nail
N5	309685.262	193355.289	187.131	Nail
N6	309712.757	193372.361	188.359	Nail
N7	309911.708	193576.008	178.650	Nail
N8	309462.608	193230.650	180.039	Nail

SURVEY STATION NOTES

Scale Factor: Local Scale Factor=0.999702

Grid Orientation: OS National Grid OSTN15

Level Datum: OS National Grid OSGM15

The contractor is to check and verify all critical dimensions and levels before work starts.

Every effort is made to identify all visible above ground features. However, it may be possible that certain features are obscured at the time of survey.

LEGEND

AV	Air Valve	GV	Gas Valve	SVP	Soil Vent Pipe
BL	Bollard	GY	Gulley	THL	Threshold Level
BH	Bore Hole	Ht	Height	TL	Traffic Light
BS	Bus Stop	IC	Inspection Cover	TP	Telegraph Pole
BT	Telecom Cover	IL	Invert Level	TS	Traffic Sign
CL	Cover Level	KI	Kerb Inlet	ITS	Illuminated TS
DP	Down Pipe	LC	Lamp Column	TT	Tree Top
EY	Electricity Cover	MH	Manhole	TV	Cable TV Cover
EOS	End of Survey	MK-(Type)	Marker Post	TWL	Top of Wall level
EOT	End of Trace	OH	Overhead Cable	UTL	Unable to Lift
EP	Electricity Pole	PB	Post Box	UTS	Unable to Survey
ER	Earth Rod	RE	Rodding Eye	UTT	Unable to Trace
FFL	Finished Floor Level	RNP	Road Name Plate	VP	Vent Pipe
FH	Fire Hydrant	SC	Stop Cock (Water)	VT	Vegetation Top
FP	Fence Post	SL	Silt Level	WL	Water Level
GP	Gate Post	SP	Sign Post	WM	Water Meter
GPR	Ground Penetrating Radar	SV	Stop Valve	WO	Wash Out

KEY

STN1 SURVEY STATION — GATE — BANK — FOLIAGE — CLIFF

50m — MAJOR CONTOUR

MINOR CONTOUR (0.25m interval)

Brunel Surveys Ltd
Land, Building and Utility Surveyors

Unit 59, Shrivenham Hundred Business Park
Watchfield, Swindon, Wiltshire, SN6 8TY
EMAIL : admin@brunelsurveys.com
WEB : www.brunelsurveys.com
TEL : 01793 784700

CLIENT

Pegasus Group

3rd Floor,
Gainsborough House,
34-40 Grey Street,
Newcastle upon Tyne,
NE1 6AE.

JOB TITLE

Topographical Survey

Cilfynydd BESS
(Windel Capital Limited)
Trefechan Farm,
Cilfynydd,
Pontypridd,
CF37 4HN.

Sheet 1 of 4

REVISIONS

SCALE	A0 Sheet @ 1 to 500		
DATE	Sept 2023	SURVEYED BY	JGE&NB
DRAWN BY	JGE&NB	CHECKED BY	PJA

DRAWING No. 26002-500-01-S1

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
PGM1	309464.186	193547.379	226.155	PGM
PGM2	309361.950	193553.241	226.617	PGM
PGM3	309288.224	193560.236	226.730	PGM
PGM4	309191.115	193535.575	221.687	PGM
PGM5	309139.050	193488.765	211.179	PGM
PGM6	309661.020	193417.810	206.011	PGM
PGM7	309829.829	193505.183	183.154	PGM
PGM8	309851.478	193372.025	166.614	PGM
PGM9	309723.917	193259.785	171.318	PGM
N1	309226.416	193411.109	201.462	Nail
N2	309180.331	193245.007	178.913	Nail
N3	309223.117	193096.547	162.229	Nail
N4	309530.866	193314.968	183.375	Nail
N5	309685.262	193355.289	187.131	Nail
N6	309712.757	193372.361	188.359	Nail
N7	309911.708	193576.008	178.650	Nail
N8	309462.608	193230.650	180.039	Nail

SURVEY STATION NOTES

Scale Factor: Local Scale Factor=0.999702

Grid Orientation: OS National Grid OSTN15

Level Datum: OS National Grid OSGM15

The contractor is to check and verify all critical dimensions and levels before work starts.

Every effort is made to identify all visible above ground features. However, it may be possible that certain features are obscured at the time of survey.

LEGEND

AV	Air Valve	GV	Gas Valve	SVP	Soil Vent Pipe
BL	Bollard	GY	Gulley	THL	Threshold Level
BH	Bore Hole	Ht	Height	TL	Traffic Light
BS	Bus Stop	IC	Inspection Cover	TP	Telegraph Pole
BT	Telecom Cover	IL	Invert Level	TS	Traffic Sign
CL	Cover Level	KI	Kerb Inlet	ITS	Illuminated TS
DP	Down Pipe	LC	Lamp Column	TT	Tree Top
EY	Electricity Cover	MH	Manhole	TV	Cable TV Cover
EOS	End of Survey	MK-(Type)	Marker Post	TWL	Top of Wall level
EOT	End of Trace	OH	Overhead Cable	UTL	Unable to Lift
EP	Electricity Pole	PB	Post Box	UTS	Unable to Survey
ER	Earth Rod	RE	Rodding Eye	UTT	Unable to Trace
FFL	Finished Floor Level	RNP	Road Name Plate	VP	Vent Pipe
FH	Fire Hydrant	SC	Stop Cock (Water)	VT	Vegetation Top
FP	Fence Post	SL	Silt Level	WL	Water Level
GP	Gate Post	SP	Sign Post	WM	Water Meter
GPR	Ground Penetrating Radar	SV	Stop Valve	WO	Wash Out

KEY

STN1 SURVEY STATION — GATE — BANK — FOLIAGE — CLIFF

50m MAJOR CONTOUR

MINOR CONTOUR (0.25m interval)

Brunel Surveys Ltd
Land, Building and Utility Surveyors

Unit 59, Shrivenham Hundred Business Park
Watchfield, Swindon, Wiltshire, SN6 8TY
EMAIL : admin@brunelsurveys.com
WEB : www.brunelsurveys.com
TEL : 01793 784700

CLIENT

Pegasus Group

3rd Floor,
Gainsborough House,
34-40 Grey Street,
Newcastle upon Tyne,
NE1 6AE.

JOB TITLE

Topographical Survey

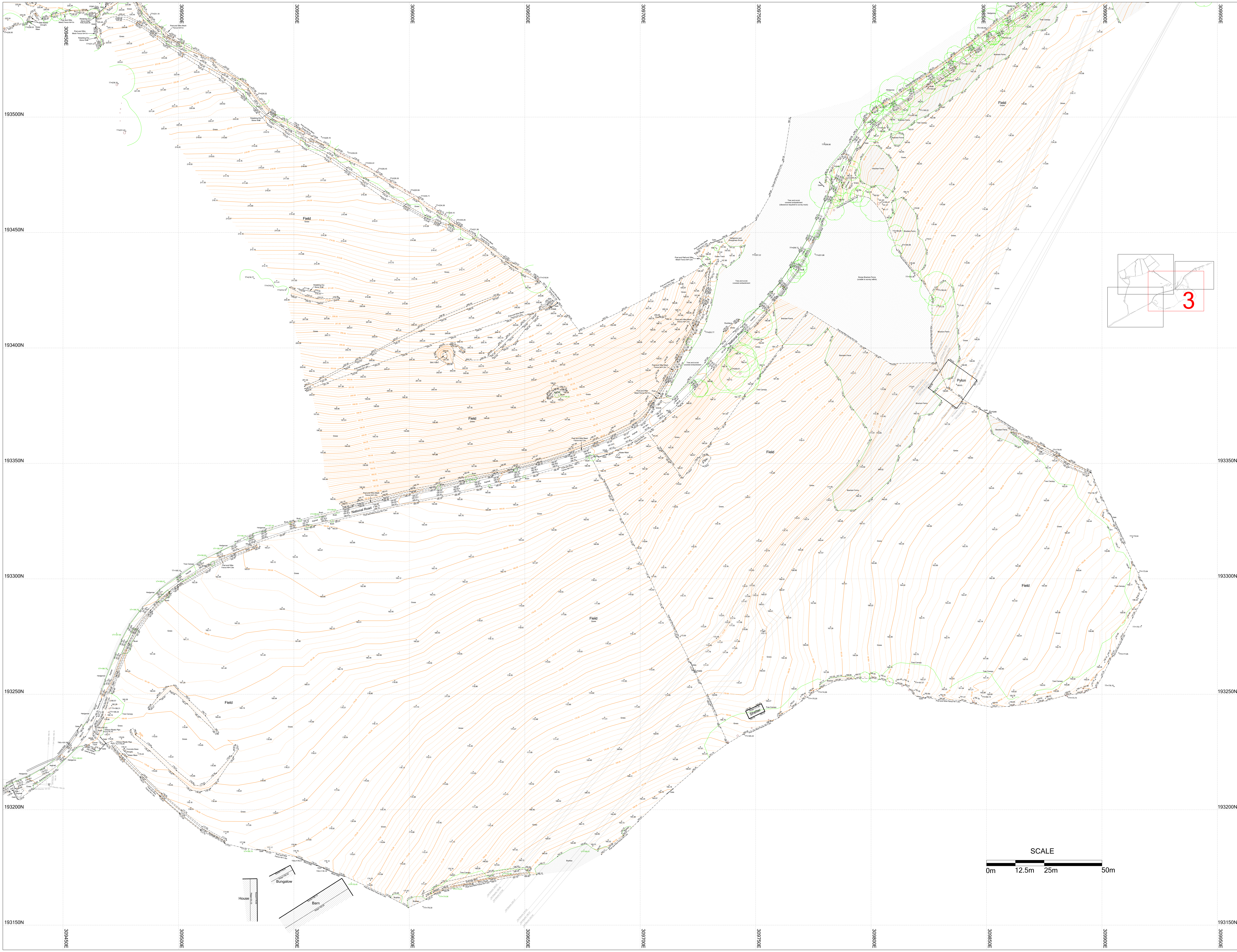
Cilfynydd BESS
(Windel Capital Limited)
Trefechan Farm,
Cilfynydd,
Pontypridd,
CF37 4HN.

Sheet 2 of 4

REVISIONS

SCALE	A0 Sheet @ 1 to 500
DATE: Sept 2023	SURVEYED BY: JGE&NB
DRAWN BY: JGE&NB	CHECKED BY: PJA

DRAWING No.
26002-500-01-S2



SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
PGM1	309464.186	193547.379	226.155	PGM
PGM2	309361.950	193553.241	226.617	PGM
PGM3	309288.224	193560.236	226.730	PGM
PGM4	309191.115	193535.575	221.687	PGM
PGM5	309139.050	193488.765	211.179	PGM
PGM6	309661.020	193417.810	206.011	PGM
PGM7	309829.829	193505.183	183.154	PGM
PGM8	309851.478	193372.025	166.614	PGM
PGM9	309723.917	193259.785	171.318	PGM
N1	309226.416	193411.109	201.462	Nail
N2	309180.331	193245.007	178.913	Nail
N3	309223.117	193096.547	162.229	Nail
N4	309530.866	193314.968	183.375	Nail
N5	309685.262	193355.289	187.131	Nail
N6	309712.757	193372.361	188.359	Nail
N7	309911.708	193576.008	178.650	Nail
N8	309462.608	193230.650	180.039	Nail

SURVEY STATION NOTES

Scale Factor: Local Scale Factor=0.999702

Grid Orientation: OS National Grid OSTN15

Level Datum: OS National Grid OSGM15

The contractor is to check and verify all critical dimensions and levels before work starts.

Every effort is made to identify all visible above ground features. However, it may be possible that certain features are obscured at the time of survey.

LEGEND

AV	Air Valve	GV	Gas Valve	SVP	Soil Vent Pipe
BL	Bollard	GY	Gulley	THL	Threshold Level
BH	Bore Hole	Ht	Height	TL	Traffic Light
BS	Bus Stop	IC	Inspection Cover	TP	Telegraph Pole
BT	Telecom Cover	IL	Invert Level	TS	Traffic Sign
CL	Cover Level	KI	Kerb Inlet	ITS	Illuminated TS
DP	Down Pipe	LC	Lamp Column	TT	Tree Top
EY	Electricity Cover	MH	Manhole	TV	Cable TV Cover
EOS	End of Survey	MK-(Type)	Marker Post	TWL	Top of Wall level
EOT	End of Trace	OH	Overhead Cable	UTL	Unable to Lift
EP	Electricity Pole	PB	Post Box	UTS	Unable to Survey
ER	Earth Rod	RE	Rodding Eye	UTT	Unable to Trace
FFL	Finished Floor Level	RNP	Road Name Plate	VP	Vent Pipe
FH	Fire Hydrant	SC	Stop Cock (Water)	VT	Vegetation Top
FP	Fence Post	SL	Silt Level	WL	Water Level
GP	Gate Post	SP	Sign Post	WM	Water Meter
GPR	Ground Penetrating Radar	SV	Stop Valve	WO	Wash Out

KEY

STN1 SURVEY STATION — GATE — BANK — FOLIAGE — CLIFF

50m — MAJOR CONTOUR

MINOR CONTOUR (0.25m interval)

Brunel Surveys Ltd

Land, Building and Utility Surveyors

Unit 59, Shrivenham Hundred Business Park
Watchfield, Swindon, Wiltshire, SN6 8TY

EMAIL : admin@brunelsurveys.com

WEB : www.brunelsurveys.com

TEL : 01793 784700

CLIENT

Pegasus Group

3rd Floor,
Gainsborough House,
34-40 Grey Street,
Newcastle upon Tyne,
NE1 6AE.

JOB TITLE

Topographical Survey

Cilfynydd BESS
(Windel Capital Limited)
Trefechan Farm,
Cilfynydd,
Pontypridd,
CF37 4HN.

Sheet 3 of 4

REVISIONS

SCALE	A0 Sheet @ 1 to 500		
DATE	Sept 2023	SURVEYED BY	JGE&NB
DRAWN BY	JGE&NB	CHECKED BY	PJA

DRAWING No. 26002-500-01-S3

309750E 309800E 309850E 309900E 309950E 310000E 310050E

193600N 193550N 193500N 193450N 193400N

NORTH

W E

S

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
PGM1	309464.186	193547.379	226.155	PGM
PGM2	309361.950	193553.241	226.617	PGM
PGM3	309288.224	193560.236	226.730	PGM
PGM4	309191.115	193535.575	221.687	PGM
PGM5	309139.050	193488.765	211.179	PGM
PGM6	309661.020	193417.810	206.011	PGM
PGM7	309829.829	193505.183	183.154	PGM
PGM8	309851.478	193372.025	166.614	PGM
PGM9	309723.917	193259.785	171.318	PGM
N1	309226.416	193411.109	201.462	Nail
N2	309180.331	193245.007	178.913	Nail
N3	309223.117	193096.547	162.229	Nail
N4	309530.866	193314.968	183.375	Nail
N5	309685.262	193355.289	187.131	Nail
N6	309712.757	193372.361	188.359	Nail
N7	309911.708	193576.008	178.650	Nail
N8	309462.608	193230.650	180.039	Nail

SURVEY STATION NOTES

Scale Factor: Local Scale Factor=0.999702

Grid Orientation: OS National Grid OSTN15

Level Datum: OS National Grid OSGM15

The contractor is to check and verify all critical dimensions and levels before work starts.

Every effort is made to identify all visible above ground features. However, it may be possible that certain features are obscured at the time of survey.

LEGEND

AV	Air Valve	GV	Gas Valve	SVP	Soil Vent Pipe
BL	Bollard	GY	Gulley	THL	Threshold Level
BH	Bore Hole	HI	Height	TL	Traffic Light
BS	Bus Stop	IC	Inspection Cover	TP	Telegraph Pole
BT	Telecom Cover	IL	Invert Level	TS	Traffic Sign
CL	Cover Level	KI	Kerb Inlet	ITS	Illuminated TS
DP	Down Pipe	LC	Lamp Column	TT	Tree Top
EY	Electricity Cover	MH	Manhole	TV	Cable TV Cover
EOS	End of Survey	MkC type)	Marker Post	TWL	Top of Wall level
EOT	End of Trace	OH	Overhead Cable	UTL	Unable to Lift
EP	Electricity Pole	PB	Post Box	UTS	Unable to Survey
ER	Earth Rod	RE	Rodding Eye	UTT	Unable to Trace
FFL	Finished Floor Level	RNP	Road Name Plate	VP	Vent Pipe
FH	Fire Hydrant	SC	Stop Cock (Water)	VT	Vegetation Top
FP	Fence Post	SL	Silt Level	WL	Water Level
GP	Gate Post	SP	Sign Post	WM	Water Meter
GPR	Ground Penetrating Radar	SV	Stop Valve	WO	Wash Out

KEY

STN1 SURVEY STATION | GATE | BANK | FOLIAGE | CLIFF

50m MAJOR CONTOUR

MINOR CONTOUR (0.25m Interval)

Brunel Surveys Ltd
Land, Building and Utility Surveyors

Unit 59, Shrivenham Hundred Business Park
Watchfield, Swindon, Wiltshire, SN6 8TY
EMAIL : admin@brunelsurveys.com
WEB : www.brunelsurveys.com
TEL : 01793 784700

CLIENT

Pegasus Group

3rd Floor,
Gainsborough House,
34-40 Grey Street,
Newcastle upon Tyne,
NE1 6AE.

JOB TITLE

Topographical Survey

Cilfynydd BESS
(Windel Capital Limited)
Trefechan Farm,
Cilfynydd,
Pontypridd,
CF37 4HN.

Sheet 4 of 4

REVISIONS

SCALE	A1 Sheet @ 1 to 500
DATE	Sept 2023
SURVEYED BY	JGE&NB
DRAWN BY	JGE&NB
CHECKED BY	PJA

DRAWING No.

26002-500-01-S4

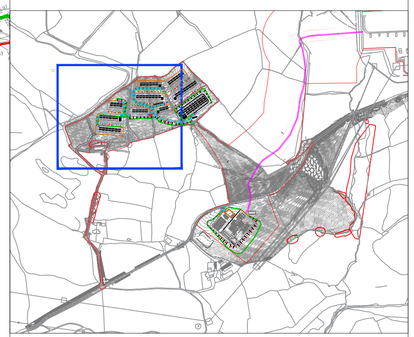
Appendix B – Proposed Levels Strategy

N

1:500
0 12.5m 25m

Key:

- Retaining Structure (Type and exact height TBC)
- Vehicle Access Location
- Embankments
- 182.000> Proposed platform levels and earthwork gradients



REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P4	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P3	07/02/2025	Updated to suit new layout.	HYC	SAJ	SAJ
P2	29/11/2023	Updated to suit new layout.	LAJ	LAJ	-
P1	10/10/2023	First issue.	LAJ	LAJ	-

Levels Strategy
Sheet 1

Land North and South of National Road
Cilfynydd

CLIENT:
REWE 2 Ltd

DATE: 10/10/2023	SCALE: 1:500@A1	DRAWN BY: LAJ CHECKED BY: LAJ APPROVED BY: -

DRAWING NUMBER:
P22-2733-PEG-XX-XX-DR-C-2000-P4

PG OFFICE / TEAM:
BRS-IN

PEGASUS REF No:
P22-2733

DRAWING STATUS
S2

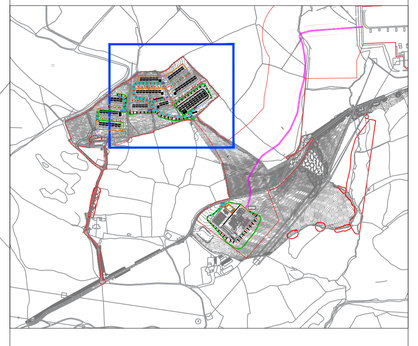
PEGASUS GROUP

N

1:500
0 12.5m 25m

Key:

- Retaining Structure (Type and exact height TBC)
- Vehicle Access Location
- Embankments
- 182.000> Proposed platform levels and earthwork gradients



REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P4	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P3	07/02/2025	Updated to suit new layout.	HYC	SAJ	SAJ
P2	29/11/2023	Updated to suit new layout.	LAJ	LAJ	-
P1	10/10/2023	First issue.	LAJ	LAJ	-

Levels Strategy
Sheet 2

Land North and South of National Road
Cilfynydd

CLIENT:
REWE 2 Ltd

DATE: 10/10/2023
SCALE: 1:500@A1
DRAWN BY: LAJ
CHECKED BY: LAJ
APPROVED BY: -

DRAWING NUMBER: P22-2733-PEG-XX-XX-DR-C-2001-P4
PG OFFICE / TEAM: BRS-IN

PEGASUS REF No: P22-2733
DRAWING STATUS: S2

PEGASUS GROUP

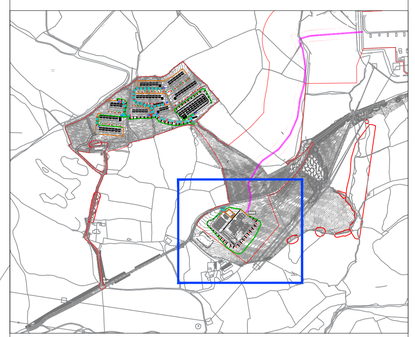
N

1:500
0 12.5m 25m

Key:

- Retaining Structure (Type and exact height TBC)
- Vehicle Access Location
- Embankments
- 182.000> Proposed platform levels and earthwork gradients

Earthworks and assessment for retaining features to be considered further once underground cable route connection strategy is developed.



REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P4	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P3	07/02/2025	Updated to suit new layout.	HYC	SAJ	SAJ
P2	29/11/2023	Updated to suit new layout.	LAJ	LAJ	-
P1	10/10/2023	First issue.	LAJ	LAJ	-

Levels Strategy
Sheet 3

Land North and South of National Road Cilfynydd

CLIENT:
REWE 2 Ltd

DATE: 10/10/2023
SCALE: 1:500@A1
DRAWN BY: LAJ
CHECKED BY: LAJ
APPROVED BY: -

DRAWING NUMBER: P22-2733-PEG-XX-XX-DR-C-2002-P4
PG OFFICE / TEAM: BRS-IN

PEGASUS REF No: P22-2733
DRAWING STATUS: S2

PEGASUS GROUP

Appendix C – Infiltration Testing Report

55 Whitfield Street
London
W1T 4AH

Our Ref: 230820.R.001
5 September 2023

Ms L Ginn,
Pegasus Group,
3rd Floor,
Gainsborough House,
34 40 Grey Street,
Newcastle upon Tyne
NE1 6AE

Re: Soakaway Assessment – Trefechan Farm, Clifynydd, Pontypridd, CF37 4HN.

Dear Lucy,

Further to your instruction on 24 August 2023, we have recently undertaken an investigation into soil percolation rates at the site known as Trefechan Farm, Clifynydd, Pontypridd.

Roberts Environmental Limited ("**REL**") understands that Pegasus Group ("**the Client**") requires the soil infiltration rates to be determined at the subject site.

The purpose of the site investigation was to determine the suitability of the deposits at the site for the use of soakaways to support a drainage strategy, by establishing the drainage characteristics of the soils from soakaway tests undertaken in general accordance with BRE Digest 365 Soakaway Design.

This letter report specifically excludes comments and/or advice relating to contamination and/or contaminated land, in addition to geotechnical and structural parameters of the deposits on the subject site.

Site Investigation

Seven mechanically excavated Trial Pits (TP01 - TP07) were excavated to depths of between 1.10m and 1.50 metres below current ground level (m bcgl) respectively on 30 September 2023, to gain an understanding of the underlying ground conditions at the subject site. All Trial Pits were terminated due to the competency of the underlying weathered bedrock deposits restricting the mechanical excavator from progressing further.

A plan showing the indicative layout of the trial pit locations is included in **Enclosure I** and trial pit logs are included in **Enclosure II**.

Trial Pits were situated in general accordance with Pegasus Group's proposed plan, understood to suit likely positions for soakaways in the final design as denoted in **Enclosure III**. However, due to the shallow ingress of groundwater at 0.75m bcgl, TP01 was aborted and a further position (TP07) was progressed.

Physical Ground Conditions

The geology beneath the site summarised below has been established from the British Geological Survey (BGS) 1: 50,000 scale Provisional Series, Geological Map, England, and Wales, Sheet 249 (Newport), together with information from the BGS website.

A geological review of the area using BGS data has positioned the site situated within an area not recorded to be underlain by Made Ground deposits. The superficial deposits below the subject site are understood to comprise Devensian Till deposits of clays, silts, sands and gravels with the bedrock geology comprising the Hughes Member of sandstone.

Made Ground

No Made Ground was encountered within any of the exploratory hole locations.

Topsoil

Topsoil was encountered within all exploratory hole locations from ground level to between 0.20-0.25m bcgl, comprising brown clayey gravelly sand. Gravels were of sandstone and mudstone.

Natural Deposits

No superficial deposits were encountered at TP04 – TP07.

At TP01 – TP03 superficial deposits comprised orangish/greyish brown sandy gravelly clay, clayey gravelly sand and clayey very sandy gravel with variable cobble content.

Weathered Bedrock

Weathered bedrock deposits were generally recovered as sandy clayey gravel and clayey gravelly sand with medium to high cobble content with gravel and cobbles comprising sandstone.

Groundwater

A groundwater strike was encountered within TP01 at 0.75m bcgl, ingress was noted from the northern wall of the pit. The groundwater ingress was recorded for sixty minutes and groundwater rose from the base of the pit (1.50m bcgl) to 1.22m bcgl. No groundwater was encountered during the progression of any of the other exploratory hole locations.

TP03 and TP06 were progressed to monitor groundwater ingress adjacent to the soakaway locations. No groundwater ingress was noted within either of the pits during the soakaway testing.

Infiltration Rate – Trial Pit Soakaways

Soakaway percolation tests were undertaken following the excavation of TP02, TP04, TP05 and TP07. Testing was carried out in general accordance with BRE Digest 365 Soakaway Design, which required excavating the trial pit to a sufficient size and filling with clean water followed by regular monitoring of the falling water level, permitting an infiltration rate to be calculated.

The water level did not drop below 25% of the starting volume by the end of the monitoring period of 3 hours. To allow for the coefficient of permeability to be determined, the water level within the test pit needs to fall below 75% of the starting volume.

Nevertheless, the results have been extrapolated to provide the Infiltration (f) rates summarized in the below table. However, it should be noted that the extrapolation does not take into account increasing pore water pressure, reducing infiltration potential. As such, the indicative infiltration value presented below is based upon primary data only, and if tested for the complete 24 hour duration, would likely result in a very poor infiltration rate due to a gradual increase in pore water pressure. Given the above, the indicative infiltration values should not be relied upon and interpreted with caution.

Table 1: Summary of Infiltration Rates

Test Location ID	Infiltration Rate Result (ms^{-1})	Drainage Characteristics / Permeability Classification*
TP02	9.00×10^{-7}	Poor / Very Low to Low
TP04	5.13×10^{-6}	Good to Poor / Low
TP05	3.14×10^{-6}	
TP07	1.17×10^{-6}	

*In accordance with Figure 12.1, Section 12 of Head. K, Soil Technicians Handbook, Dated 1989. Based on extrapolated results.

The full percolation test result calculation sheet is presented in **Enclosure III**.

Conclusions

It is the opinion of REL that it is unlikely that the materials tested are suitable to support a natural attenuation drainage scheme. However, the results should be passed on to the drainage engineers so a definitive assessment can be made.

For further advice, consultation with a drainage engineer would be required and it is recommended in the event of redevelopment that a flood risk assessment is undertaken which addresses the proposed drainage and any surface water flooding issues that may be present.

If during construction ground conditions vary from those reported, further work may needed to be considered to establish the suitability of the different ground conditions.

We trust that this information is satisfactory. If you have any queries or would like any further information, please do not hesitate to contact us.

Yours Sincerely,

Ben Lawry BSc (Hons) FGS
Associate Director
For and on behalf of Roberts Environmental Ltd
Tel: 0191 230 4521
Mobile: 07496 794 242
Email: ben@robertsenvironmental.co.uk

Enclosures:

I. Indicative Trial Pit Location Plan.
II. Trial Pit Logs.
III. Soakaway Test Calculation Sheets

Enclosure I

Legend

Site Boundary

Trial Pit Locations

Location	Lat	Long
TP01	51.630997	-3.303463
TP02	51.630754	-3.307721
TP03	51.630835	-3.307547
TP04	51.633314	-3.311457
TP05	51.634231	-3.308894
TP06	51.634231	-3.308981
TP07	51.630592	-3.308416

PROJECT CLIENT:
Pegasus Group

PROJECT:
Trefechan Farm, Clifynydd

TITLE:
Exploratory Hole Location Plan

DRAWN BY:	DATE:
BL	September 2023

PROJECT NUMBER:	DRAWING NUMBER:
230820	230820.001

ROBERTS ENVIRONMENTAL LTD
experts in geo-environmental consultancy

0 75 150 m

Enclosure II

Trial Pit Log

Trialpit No **TP01**

Sheet 1 of 1

Project Name: Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309878.00 - 193270.00 Level: mbgl	Date 30-08-2023
Location: Pontypridd, CF37 4HN		Dimensions: 1.00m x 0.60m Inclination: ° Orientation: ° Depth: 1.50m	Scale 1:20
Client: Pegasus Group			Logged BL

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
								Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					0.25			Grey very sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular sandstone (DEVENSIAN TILL).
▽					0.75			Blueish grey completely weathered SANDSTONE recovered as sandy clayey GRAVEL with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER)
▼					1.50			End of pit at 1.50 m

1 2 3 4

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.50m bgl and backfilled with arisings. Groundwater encountered at 0.75m bgl.

Stability: Stable.

Trial Pit Log

Trialpit No **TP02**

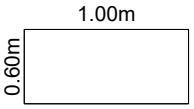
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309583.00 - 193248.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.50m
Client:	Pegasus Group		

Date: 30-08-2023

Scale: 1:20

Logged: BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					1.30			Greyish brown clayey sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular sandstone (DEVENSIAN TILL).
					1.50			Blueish grey completely weathered SANDSTONE recovered as sandy clayey GRAVEL with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER) End of pit at 1.50 m

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.50m bgl and backfilled with arisings. No groundwater encountered.

Stability: Stable.

Trial Pit Log

Trialpit No **TP03**

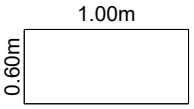
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309596.00 - 193257.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.50m
Client:	Pegasus Group		

Date: 30-08-2023

Scale: 1:20

Logged: BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
								Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					0.25			Greyish brown clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular sandstone (DEVENSIAN TILL).
					1.30			Blueish grey completely weathered SANDSTONE recovered as sandy clayey GRAVEL with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER)
					1.50			End of pit at 1.50 m

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.50m bgl and backfilled with arisings. No groundwater encountered.

Stability: Stable.

Trial Pit Log

Trialpit No **TP04**

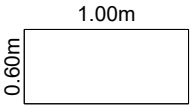
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309330.00 - 193538.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.50m
Client:	Pegasus Group		

Date: 30-08-2023

Scale: 1:20

Logged: BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
					0.25			Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					1.50			Orangish brown clayey gravelly SAND with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER). End of pit at 1.50 m

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.50m bgl and backfilled with arisings. No groundwater encountered.

Stability: Stable.

Trial Pit Log

Trialpit No **TP05**

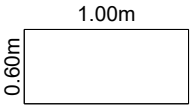
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309509.00 - 193636.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.10m
Client:	Pegasus Group		

Date: 30-08-2023

Scale: 1:20

Logged: BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					0.50			Orangish brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone (weathered HUGHES MEMBER).
					1.10			Reddish brown completely weathered SANDSTONE recovered as clayey gravelly SAND with medium to high cobble content. Sand is fie to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular sandstone (weathered HUGHES MEMBER)
								End of pit at 1.10 m

1
2
3
4

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.10m bgl and backfilled with arisings. No groundwater encountered.

Stability: Stable.

Trial Pit Log

Trialpit No **TP06**

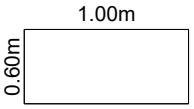
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309503.00 - 193636.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.10m
Client:	Pegasus Group		

Date: 30-08-2023

Scale: 1:20

Logged: BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					1.10			Orangish brown clayey gravelly SAND with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER).
								End of pit at 1.10 m

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.10m bgl and backfilled with arisings. No groundwater encountered.

Stability: Stable.

Trial Pit Log

Trialpit No **TP07**

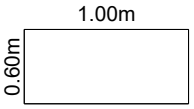
Sheet 1 of 1

Project Name:	Trefechan Farm, Clifynydd	Project No. 230820	Co-ords: 309535.00 - 193231.00 Level: mbgl
Location:	Pontypridd, CF37 4HN		Dimensions: Inclination: ° Orientation: ° Depth: 1.50m
Client:	Pegasus Group		

Date

Scale 1:20

Logged BL



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Information	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			Grass overlay. Brown clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone and mudstone (TOPSOIL).
					1.30			Greyish brown clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular sandstone (DEVENSIAN TILL).
					1.50			Blueish grey completely weathered SANDSTONE recovered as sandy clayey GRAVEL with medium to high cobble content. Sand is fine to coarse. Gravel is angular to sub-rounded sandstone. Cobbles are angular to sub-rounded sandstone (weathered HUGHES MEMBER) End of pit at 1.50 m

Remarks: Trial Pit logged in general accordance with BS5930:2015+A1:2020. Trial Pipt terminated at 1.50m bgl and backfilled with arisings. No ground water encountered.

Stability: Stable.

Enclosure III

Site: 230820 **Trial Pit: TP02** **Infiltration Assessment 1**

Worksheet for Soakaways: Soil Infiltration Rate Calculated as BRE Digest 365: Soakaway Design

START DATE: 30 August 2023

Manual Data Entry Cells

Test pit dimesions (m)	L	W	D
	1.600	0.600	1.500

Effective depth (ED):

	Depth of pit mbgl	Minus	**Water level at start mbgl =**	**ED**
Test 1	1.500	-	0.590	0.91
Test 2		-		0
Test 3		-		0

Vp75-25 =outflow vol between 75% & 25% effective depth (based on 0% voids)

a_{p50} - = 50% internal surface area of effective depth and the base

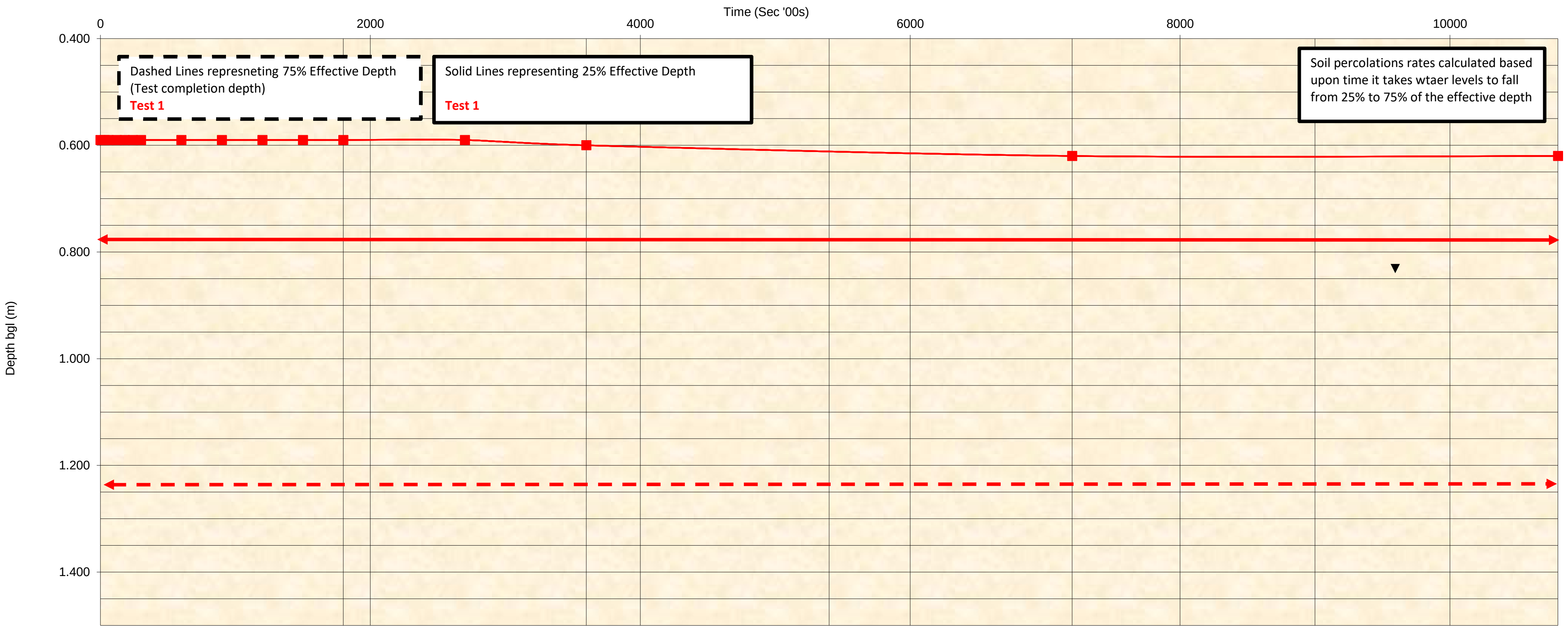
Test 1	25% of ED =	0.683	Depth bgl =	0.8175	m bgl		
	50% of ED =	0.455	Depth bgl =	1.045	m bgl		
	75% of ED =	0.228	Depth bgl =	1.2725	m bgl	V_{p75-25} = 0.4368 m^3	a_{p50} = 2.962 m^2
Test 2	25% of ED =	0	Depth bgl =	0	m bgl		
	50% of ED =	0	Depth bgl =	0	m bgl		
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} = 0 m^3	a_{p50} = 0.96 m^2
Test 3	25% of ED =	0	Depth bgl =	0	m bgl		
	50% of ED =	0	Depth bgl =	0	m bgl		
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} = 0 m^3	a_{p50} = 0.96 m^2

ROBERTS ENVIRONMENTAL LTD

Fig 1: Depth v's Time - Infiltration Rates

	Time (sec)	Depth bgl (m)		
		Test No.		
min	dt_0	1	2	3
0	0	0.590		
0.5	30	0.590		
1	60	0.590		
2	120	0.590		
3	180	0.590		
4	240	0.590		
5	300	0.590		
6	360			
7	420			
8	480			
9	540			
10	600	0.590		
15	900	0.590		
20	1200	0.590		
25	1500	0.590		
30	1800	0.590		
45	2700	0.590		
60	3600	0.600		
90	5400			
120	7200	0.620		
150	9000			
180	10800	0.620		

0.030



OBSERVATIONS:
Trial Pit stable.

	Time @ 25% ED	Time @ 75%ED
Test 1	*81900*	*245700*
Test 2		
Test 3		

Soil Infiltration Calculations

tp75-25 = time for infiltration (from fig 1)

	Test 1	Test 2	Test 3	
t_{p75-25} =	163800	0	0	secs

infiltration $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f=	9.00E-07			**ms^{-1}**
		Average	9.00E-07	**ms^{-1}**

Site: 230820 **Trial Pit: TP04** **Infiltration Assessment 1**

Worksheet for Soakaways: Soil Infiltration Rate Calculated as BRE Digest 365: Soakaway Design

START DATE: 30 August 2023

Manual Data Entry Cells

ROBERTS ENVIRONMENTAL LTD

Test pit dimesions (m)	L	W	D
	1.600	0.600	1.500

Effective depth (ED):

	Depth of pit mbgl	Minus	Water level at start mbgl =	ED
Test 1	1.500	-	0.520	0.98
Test 2		-		0
Test 3		-		0

						Vp75-25		a_{p50} -	
Test 1	25% of ED =	0.735	Depth bgl =	0.765	m bgl	=outflow vol between 75% & 25%		= 50% internal surface area of effective depth and the base	
	50% of ED =	0.49	Depth bgl =	1.01	m bgl	effective depth (based on 0% voids)			
	75% of ED =	0.245	Depth bgl =	1.255	m bgl	V_{p75-25} =	0.4704 m^3	a_{p50} =	3.116 m^2
Test 2	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2
Test 3	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2

Fig 1: Depth v's Time - Infiltration Rates

	Time (sec)	Depth bgl (m)		
		Test No.		
min	dt_0	1	2	3
0	0	0.520		
0.5	30	0.530		
1	60	0.550		
2	120	0.560		
3	180	0.560		
4	240	0.560		
5	300	0.560		
6	360	0.560		
7	420	0.560		
8	480			
9	540			
10	600			
15	900			
20	1200			
25	1500	0.600		
30	1800	0.620		
45	2700			
60	3600			
90	5400	0.660		
120	7200	0.670		
150	9000			
180	10800	0.700		

0.180

OBSERVATIONS:
Trial Pit stable.

	Time @ 25% ED	Time @ 75%ED
Test 1	*14700*	*44100*
Test 2		
Test 3		

Soil Infiltration Calculations

tp75-25 = time for infiltration (from fig 1)

	Test 1	Test 2	Test 3	
t_{p75-25} =	29400	0	0	secs
infiltration $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$				
f=	5.13E-06			**ms^{-1}**
		Average	5.13E-06	**ms^{-1}**

Site: 230820 **Trial Pit: TP05** **Infiltration Assessment 1**

Worksheet for Soakaways: Soil Infiltration Rate Calculated as BRE Digest 365: Soakaway Design

START DATE: 30 August 2023

Manual Data Entry Cells

Test pit dimesions (m)	L	W	D
	1.600	0.600	1.500

Effective depth (ED):

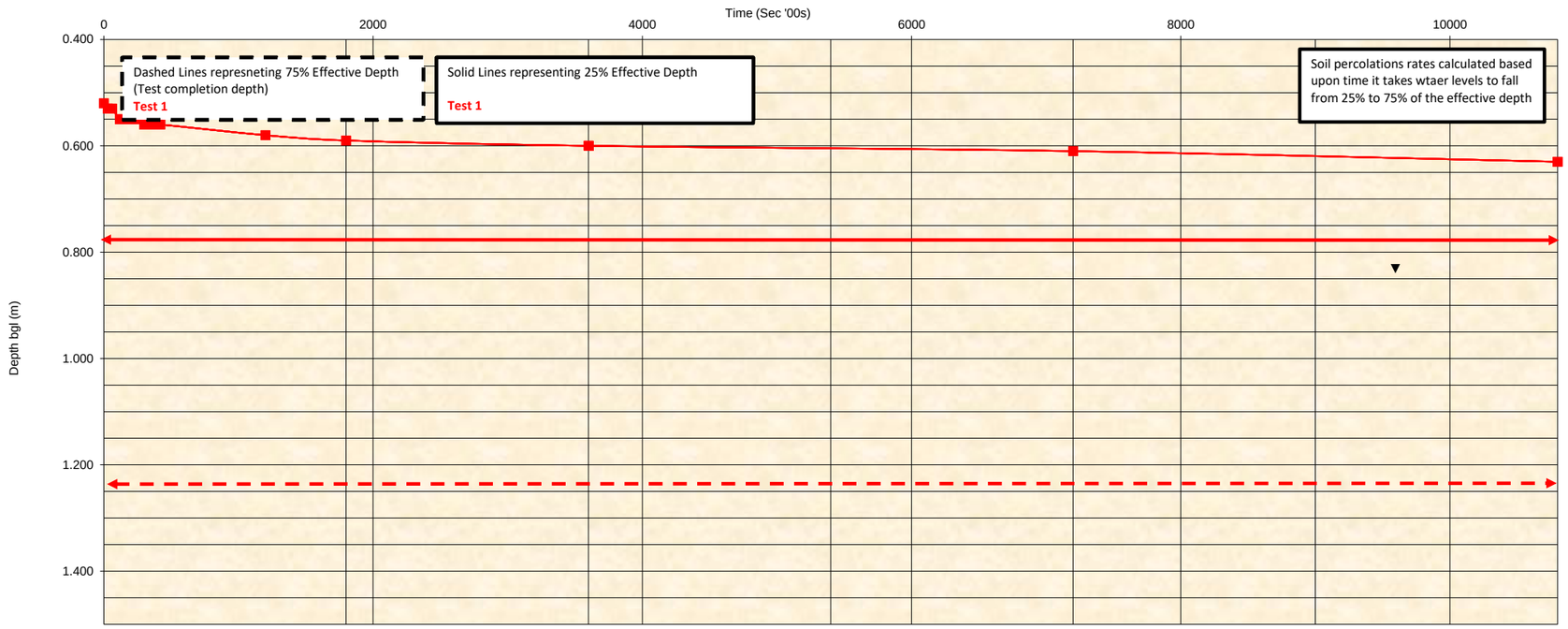
	Depth of pit mbgl	Minus	Water level at start mbgl =	ED
Test 1	1.500	-	0.520	0.98
Test 2		-		0
Test 3		-		0

						Vp75-25		a_{p50} .	
Test 1	25% of ED =	0.735	Depth bgl =	0.765	m bgl	=outflow vol between 75% & 25%		= 50% internal surface area of effective depth and the base	
	50% of ED =	0.49	Depth bgl =	1.01	m bgl	effective depth (based on 0% voids)			
	75% of ED =	0.245	Depth bgl =	1.255	m bgl	V_{p75-25} =	0.4704 m^3	a_{p50} =	3.116 m^2
Test 2	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2
Test 3	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2

	Time (sec)	Depth bgl (m) Test No.		
min	dt_0	1	2	3
0	0	0.520		
0.5	30	0.530		
1	60	0.530		
2	120	0.550		
3	180	0.550		
4	240	0.550		
5	300	0.560		
6	360	0.560		
7	420	0.560		
8	480			
9	540			
10	600			
15	900			
20	1200	0.580		
25	1500			
30	1800	0.590		
45	2700			
60	3600	0.600		
90	5400			
120	7200	0.610		
150	9000			
180	10800	0.630		

0.110

Fig 1: Depth v's Time - Infiltration Rates



OBSERVATIONS:
Trial Pit stable.

	Time @ 25% ED	Time @ 75%ED
Test 1	*24055*	*72164*
Test 2		
Test 3		

Soil Infiltration Calculations

tp75-25 = time for infiltration (from fig 1)

	Test 1	Test 2	Test 3	
t_{p75-25} =	48109.09	0	0	secs

infiltration $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f=	3.14E-06			ms^{-1}
Average	3.14E-06			ms^{-1}

Site: 230820 **Trial Pit: TP07** **Infiltration Assessment 1**

Worksheet for Soakaways: Soil Infiltration Rate Calculated as BRE Digest 365: Soakaway Design

START DATE: 30 August 2023

Manual Data Entry Cells

Test pit dimesions (m)	L	W	D
	1.600	0.600	1.500

Effective depth (ED):

	Depth of pit mbgl	Minus	Water level at start mbgl =	ED
Test 1	1.500	-	0.550	0.95
Test 2		-		0
Test 3		-		0

						Vp75-25		a_{p50} .	
Test 1	25% of ED =	0.713	Depth bgl =	0.7875	m bgl	=outflow vol between 75% & 25%		= 50% internal surface area of effective depth and the base	
	50% of ED =	0.475	Depth bgl =	1.025	m bgl	effective depth (based on 0% voids)			
	75% of ED =	0.238	Depth bgl =	1.2625	m bgl	V_{p75-25} =	0.456 m^3	a_{p50} =	3.05 m^2
Test 2	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2
Test 3	25% of ED =	0	Depth bgl =	0	m bgl				
	50% of ED =	0	Depth bgl =	0	m bgl				
	75% of ED =	0	Depth bgl =	0	m bgl	V_{p75-25} =	0 m^3	a_{p50} =	0.96 m^2

	Time (sec)	Depth bgl (m) Test No.		
min	dt_0	1	2	3
0	0	0.550		
0.5	30	0.550		
1	60	0.550		
2	120	0.550		
3	180	0.550		
4	240	0.550		
5	300	0.560		
6	360			
7	420			
8	480			
9	540			
10	600	0.560		
15	900	0.560		
20	1200	0.560		
25	1500	0.560		
30	1800	0.560		
45	2700	0.560		
60	3600	0.570		
90	5400	0.570		
120	7200	0.580		
150	9000			
180	10800	0.590		

0.040

Fig 1: Depth v's Time - Infiltration Rates

OBSERVATIONS:
Trial Pit stable.

	Time @ 25% ED	Time @ 75%ED
Test 1	*64125*	*192375*
Test 2		
Test 3		

Soil Infiltration Calculations

tp75-25 = time for infiltration (from fig 1)

	Test 1	Test 2	Test 3	
t_{p75-25} =	128250	0	0	secs

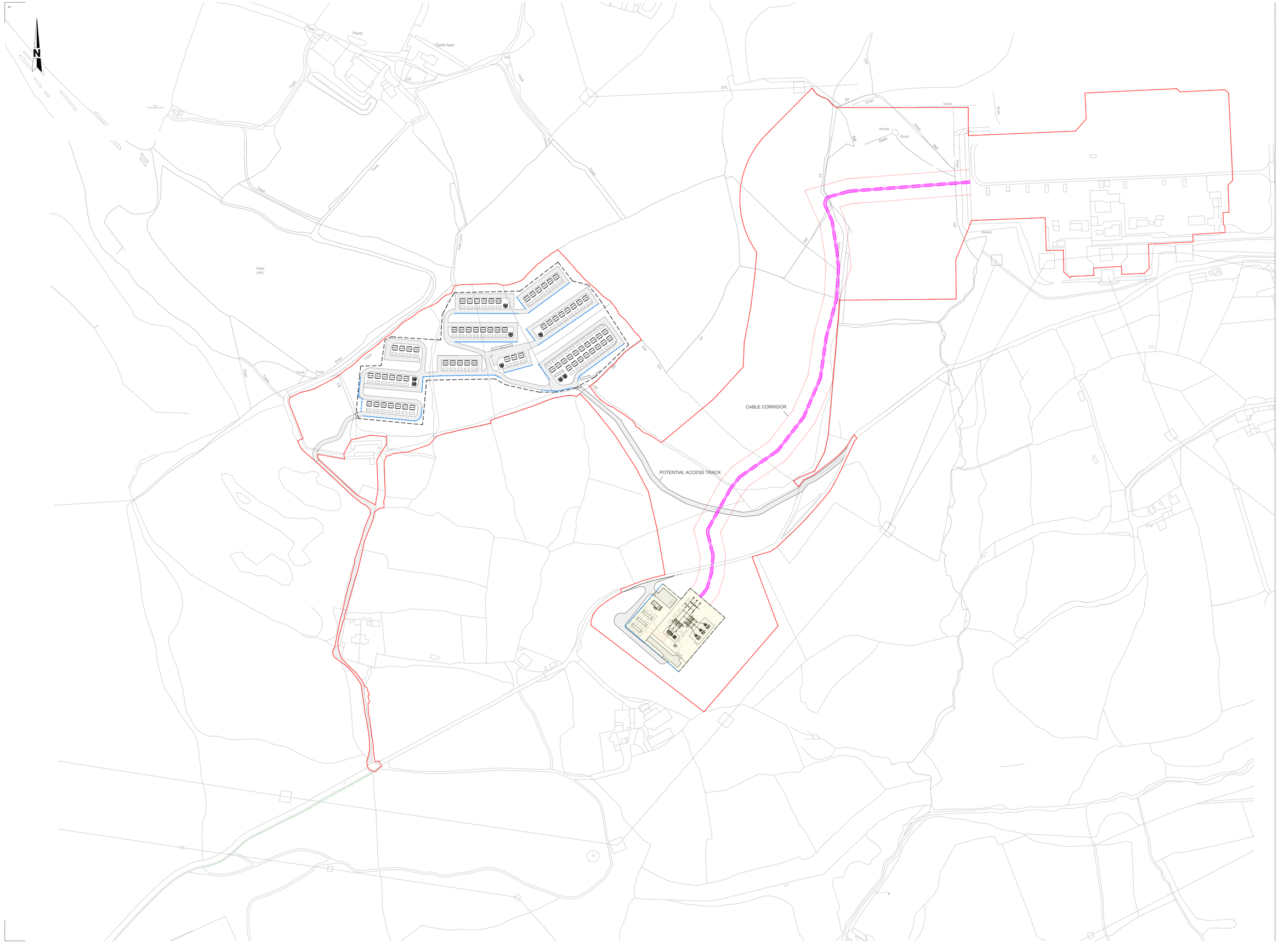
infiltration V_{p75-25} / a_{p50} x t_{p75-25}

f=	1.17E-06			**ms^{-1}**

Average	1.17E-06	**ms^{-1}**

Appendix D – Proposed Site Layout

A1



NOTES:

1. ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO INSTALLATION
2. ALL DIMENSIONS ARE INDICATIVE AND IN METERS (M) UNLESS STATED OTHERWISE

LEGEND:

- RED LINE BOUNDARY
- ACCESS
- LOCATIONS OF ACOUSTIC FENCING
- 5m WIDE ACCESS TRACK
- LOCATION OF SECURITY FENCING
- 40ft. SPARE PARTS CONTAINER
- 2 BESS CONTAINERS IN BACK TO BACK ARRANGEMENT
- INVERTER/TRANSFORMER STATION (SMA)
- AUXILIARY TRANSFORMER
- INDICATIVE 400kV CABLE ROUTE

Yellow Area indicates Substation area, for details on equipment please see substation plan and elevations.

REV	DATE	BY	CHECKED	APPROVED
10	27-01-25	WS	MS	LS
RED LINE AMENDED				
09	20-01-25	WS	MS	LS
RED LINE AMENDED AND 400kV ROUTE ADDED				
08	13-08-24	WS	LS	JK
KEY AMENDED AND FENCING AMENDED				
07	01-08-24	WS	LS	JK
ANNOTATION AMENDED				
06	01-07-24	WS	LS	JK
ACOUSTIC FENCING SHOWN				
05	01-05-24	WS	LS	JK
RED LINE CHANGED				
04	02-02-24	WS	LS	JK
TRACKS AMENDED FOLLOWING LEVELING STUDY				
03	06-11-23	WS	LS	JK
SITE DROPPED TO 200MW				
02	12-10-23	WS	LS/EB	GT
AMENDED FOR LEVELLING				
01	22-09-23	WS	LS/EB	GT
FIRST ISSUE				

Windel Energy
510 Blyth Workspace, Commissioners Quay, Quay Road, Blyth NE24 3AG
Phone: +44 (0) 191 406 8209
www.windelenergy.co.uk

CLIENT
REWE 2 LIMITED

PROJECT TITLE
CILFYNYDD

DRAWING TITLE
INDICATIVE BESS LAYOUT - WITH SMA INVERTERS - 200MW

SCALE @ A1
1:2000

JOB No.
02

REV.
10

DRAWING No.
WIN-SOL-02-DR-03-01-01

Appendix E – Surface Water Drainage Strategy

N

1:500
0 12.5m 25m

Key:
- Proposed Manhole
- Proposed Pipe
- Proposed Attenuation Crates
- Proposed Gravel Trench
- Overland Flow Route

Proposed Attenuation Crates
Water Volume: 290m³
Height: 1.5m
Porosity: 0.95

Proposed Attenuation Crates
Water Volume: 370m³
Height: 1.5m
Porosity: 0.95

Proposed flow control

Proposed Attenuation Crates
Water Volume: 385m³
Height: 1.5m
Porosity: 0.95

Proposed flow control

Proposed Attenuation Crates
Water Volume: 196m³
Height: 1.5m
Porosity: 0.95

Proposed Firefighting Supply
Proposed attenuation crates to supply 228m³ of water in the event of a fire.

Proposed Attenuation Crates
Water Volume: 300m³
Height: 1.5m
Porosity: 0.95

Crate sized to hold 228m³ of water in event of BESS fire, in line with National Fire Chiefs Council's guidance for 1,900l/m for 2 hour duration.

Proposed flow control

Proposed Attenuation Crates
Water Volume: 374m³
Height: 1.5m
Porosity: 0.95

Proposed Hydrobrake to limit discharge. Total discharge from full site to be restricted to QBAR runoff rate of 18.9l/s, for all storm events up to and including the 1 in 100 year event + 45% climate change.

Hydrobrake fitted with penstock to close in the event of a fire

Proposed gravel trench
Surface water to discharge via overtopping and flowing overland inline with existing conditions.

Proposed Hydrobrake to limit discharge. Total discharge from full site to be restricted to QBAR runoff rate of 18.9l/s, for all storm events up to and including the 1 in 100 year event + 45% climate change.

Hydrobrake fitted with penstock to close in the event of a fire

Proposed Attenuation Crates
Water Volume: 328m³
Height: 1.5m
Porosity: 0.95

Crate sized to hold 228m³ of water in event of BESS fire, in line with National Fire Chiefs Council's guidance for 1,900l/m for 2 hour duration.

Proposed Attenuation Crates
Water Volume: 304m³
Height: 1.5m
Porosity: 0.95

Proposed Hydrobrake to limit discharge. Total discharge from full site to be restricted to QBAR runoff rate of 18.9l/s, for all storm events up to and including the 1 in 100 year event + 45% climate change.

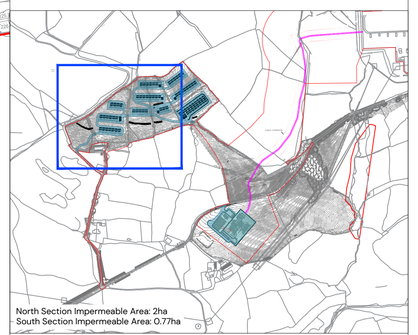
Hydrobrake fitted with penstock to close in the event of a fire

Proposed gravel trench
Surface water to discharge via overtopping and flowing overland inline with existing conditions.

Area to be landscaped as per LAndscape Masterplan (P22-2733_EN_04B) to slow overland surface water discharge.

Area to be landscaped as per LAndscape Masterplan (P22-2733_EN_04B) to slow overland surface water discharge.

Ford
Ford
Drain
Track
Field
Stables
Stables



REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P2	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P1	07/02/2025	First issue.	AJM	SAJ	SAJ

Drainage Strategy
Sheet 1

Land North and South of National Road
Cilfynydd

CLIENT:
REWE 2 Ltd

DATE: 07/02/2025
SCALE: 1:500@A1
DRAWN BY: AJM
CHECKED BY: SAJ
APPROVED BY: SAJ

DRAWING NUMBER: P22-2733-PEG-XX-XX-DR-C-3001-P2
PG OFFICE / TEAM: BRS-IN

PEGASUS REF No: P22-2733
DRAWING STATUS: S2

PEGASUS GROUP

N

1:500
0 12.5m 25m

Key:
- Proposed Manhole
- Proposed Pipe
- Proposed Attenuation Crates
- Proposed Gravel Trench
- Overland Flow Route

Path (um)

Proposed Attenuation Crates
Water Volume: 290m³
Height: 1.5m
Porosity: 0.95

Proposed Attenuation Crates
Water Volume: 370m³
Height: 1.5m
Porosity: 0.95

Proposed flow control

Proposed Attenuation Crates
Water Volume: 440m³
Height: 1.5m
Porosity: 0.95

Proposed Attenuation Crates
Water Volume: 385m³
Height: 1.5m
Porosity: 0.95

Proposed flow control

Proposed Attenuation Crates
Water Volume: 400m³
Height: 1.8m
Porosity: 0.95

Crate sized to hold 228m³ of water in event of BESS fire, in line with National Fire Chiefs Council's guidance for 1,900l/m for 2 hour duration.

Proposed flow control

Proposed Attenuation Crates
Water Volume: 196m³
Height: 1.5m
Porosity: 0.95

Proposed Firefighting Supply
Proposed attenuation crates to supply 228m³ of water in the event of a fire.

Proposed flow control

Proposed Attenuation Crates
Water Volume: 304m³
Height: 1.5m
Porosity: 0.95

Proposed Attenuation Crates
Water Volume: 300m³
Height: 1.5m
Porosity: 0.95

Crate sized to hold 228m³ of water in event of BESS fire, in line with National Fire Chiefs Council's guidance for 1,900l/m for 2 hour duration.

Proposed Hydrobrake to limit discharge. Total discharge from full site to be restricted to QBAR runoff rate of 18.9l/s, for all storm events up to and including the 1 in 100 year event + 45% climate change.

Hydrobrake fitted with penstock to close in the event of a fire

Proposed Attenuation Crates
Water Volume: 374m³
Height: 1.5m
Porosity: 0.95

Proposed Hydrobrake to limit discharge. Total discharge from full site to be restricted to QBAR runoff rate of 18.9l/s, for all storm events up to and including the 1 in 100 year event + 45% climate change.

Hydrobrake fitted with penstock to close in the event of a fire

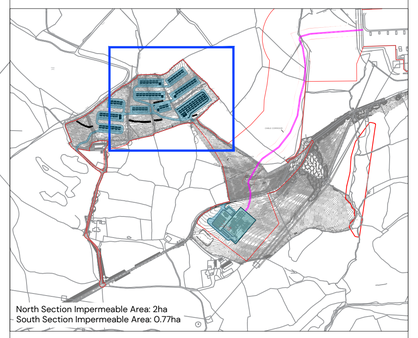
Proposed Attenuation Crates
Water Volume: 328m³
Height: 1.5m
Porosity: 0.95

Crate sized to hold 228m³ of water in event of BESS fire, in line with National Fire Chiefs Council's guidance for 1,900l/m for 2 hour duration.

Proposed gravel trench
Surface water to discharge via overtopping and flowing overland inline with existing conditions.

Area to be landscaped as per LAndscape Masterplan (P22-2733_EN_04B) to slow overland surface water discharge.

CW
CH
BB
ED Bdy
FW



REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P2	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P1	07/02/2025	First issue.	AJM	SAJ	SAJ

Drainage Strategy
Sheet 2

Land North and South of National Road
Cilfynydd

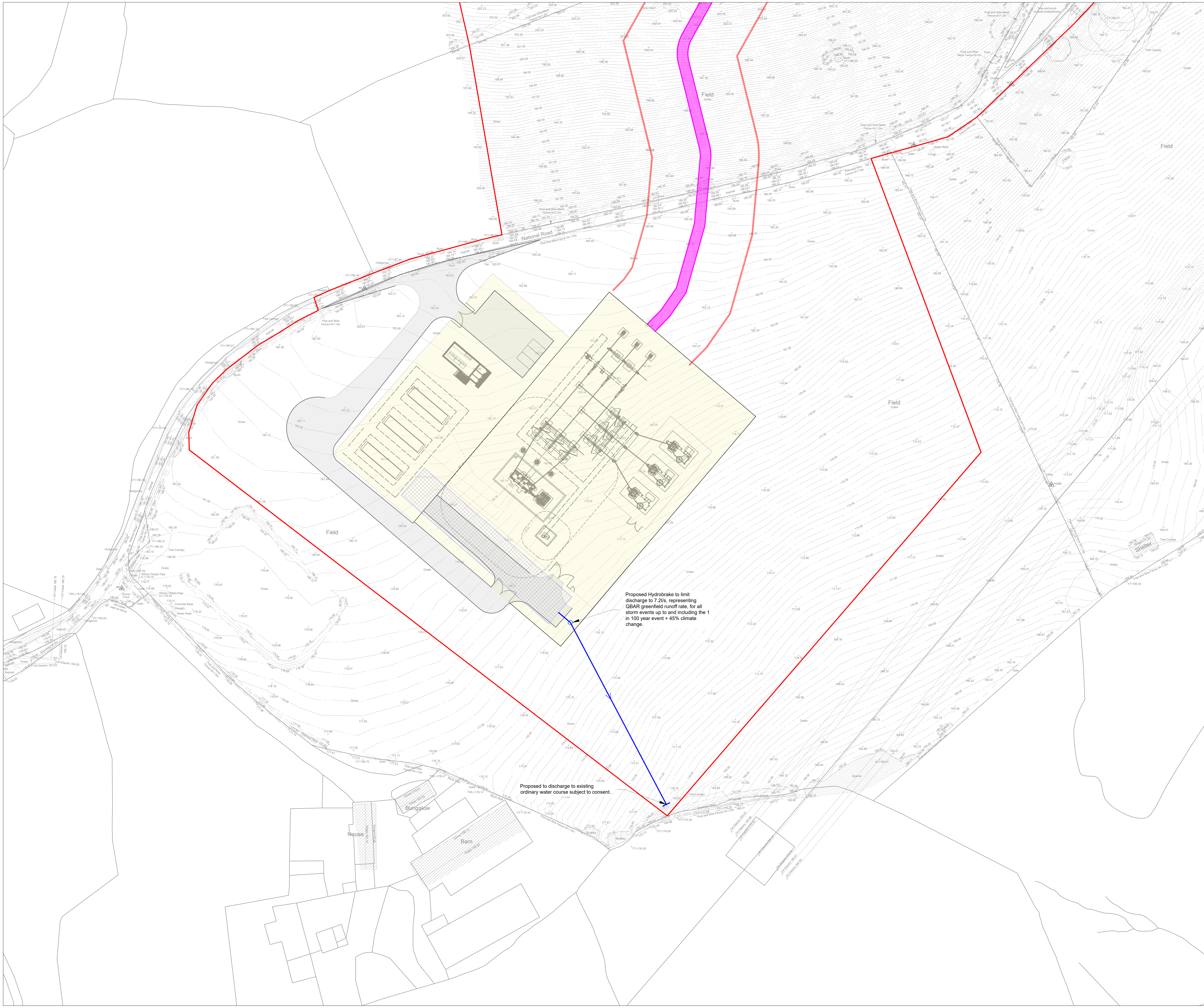
CLIENT:
REWE 2 Ltd

DATE: 07/02/2025
SCALE: 1:500@A1
DRAWN BY: AJM
CHECKED BY: SAJ
APPROVED BY: SAJ

DRAWING NUMBER: P22-2733- PEG - XX - XX - DR - C - 3002 - P2
PG OFFICE / TEAM: BRS-IN

PEGASUS REF No: P22-2733
DRAWING STATUS: S2

PEGASUS GROUP

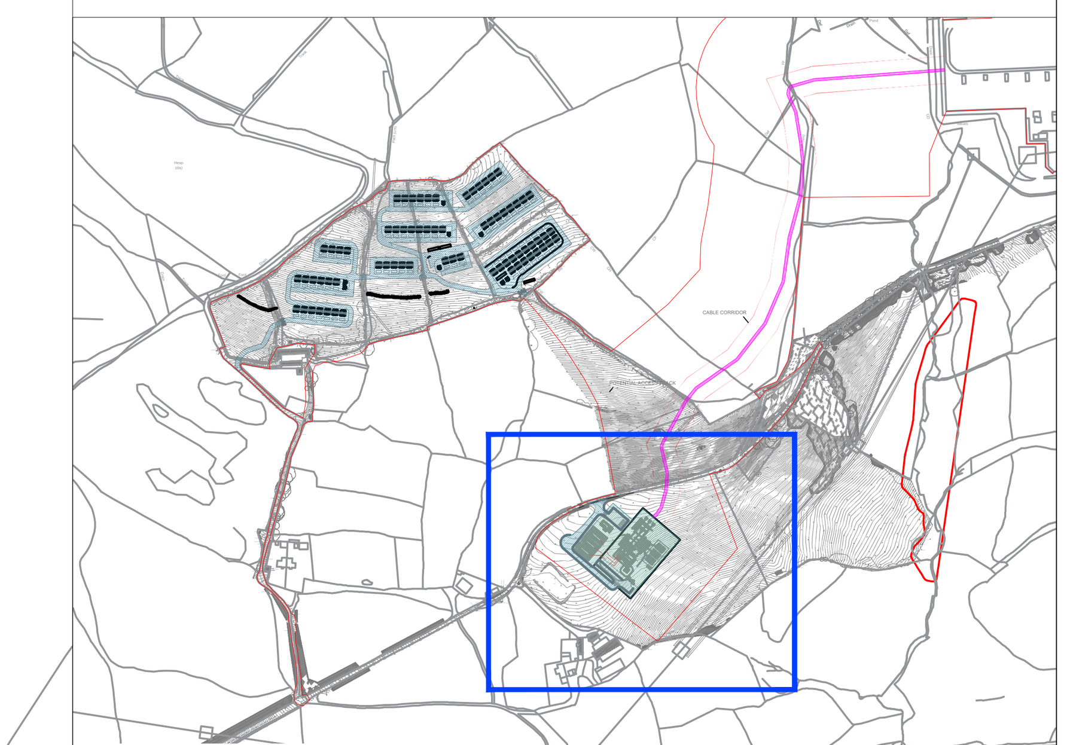


N

1:500
0 12.5m 25m

Key:

- Proposed Manhole
- Proposed Pipe
- Proposed Attenuation Crates
- Proposed Gravel Trench
- Overland Flow Route



North Section Impermeable Area: 2ha
South Section Impermeable Area: 0.77ha

REV	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED
P2	13/02/2025	Updated client and site details	HYC	SAJ	SAJ
P1	07/02/2025	First issue.	AJM	SAJ	SAJ

Drainage Strategy
Sheet 3

Land North and South of National Road
Cilfynydd

CLIENT:
REWE 2 Ltd

DATE: 07/02/2025
SCALE: 1:500@A1
DRAWN BY: AJM
CHECKED BY: SAJ
APPROVED BY: SAJ

DRAWING NUMBER: P22-2733- PEG - XX - XX - DR - C - 3003 - P2
PG OFFICE / TEAM: BRS-IN

PEGASUS REF No: P22-2733
DRAWING STATUS S2

PEGASUS GROUP

Appendix F – Microdrainage and Greenfield Runoff Calculations

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	50.000	Urban	0.000
SAAR (mm)	1675	Region Number	Region 9

Results	l/s
QBAR Rural	472.1
QBAR Urban	472.1
Q100 years	1029.3
Q1 year	415.5
Q2 years	438.5
Q5 years	571.3
Q10 years	670.4
Q20 years	770.1
Q25 years	804.5
Q30 years	832.5
Q50 years	914.1
Q100 years	1029.3
Q200 years	1166.2
Q250 years	1213.4
Q1000 years	1506.1

North Site Area = 2ha
QBAR= 472.1/50 x 2 = 18.9 l/s

South Site Area= 0.77ha
QBAR= 472.1/50 x 0.77 = 7.2 l/s

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.206	0.206	18.8	617.5	O K
30 min Summer	99.297	0.297	18.9	891.7	O K
60 min Summer	99.408	0.408	18.9	1225.3	O K
120 min Summer	99.504	0.504	18.9	1513.0	O K
180 min Summer	99.570	0.570	18.9	1708.7	O K
240 min Summer	99.618	0.618	18.9	1855.1	O K
360 min Summer	99.686	0.686	18.9	2059.2	O K
480 min Summer	99.728	0.728	18.9	2185.5	Flood Risk
600 min Summer	99.755	0.755	18.9	2264.0	Flood Risk
720 min Summer	99.771	0.771	18.9	2312.4	Flood Risk
960 min Summer	99.783	0.783	18.9	2350.2	Flood Risk
1440 min Summer	99.777	0.777	18.9	2331.0	Flood Risk
2160 min Summer	99.760	0.760	18.9	2280.5	Flood Risk
2880 min Summer	99.745	0.745	18.9	2235.5	Flood Risk
4320 min Summer	99.723	0.723	18.9	2167.8	Flood Risk
5760 min Summer	99.707	0.707	18.9	2120.3	Flood Risk
7200 min Summer	99.701	0.701	18.9	2101.6	Flood Risk
8640 min Summer	99.699	0.699	18.9	2095.7	O K
10080 min Summer	99.701	0.701	18.9	2103.3	Flood Risk
15 min Winter	99.206	0.206	18.8	617.4	O K
30 min Winter	99.297	0.297	18.9	892.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	126.694	0.0	631.9	19
30 min Summer	92.181	0.0	920.2	34
60 min Summer	64.188	0.0	1282.6	64
120 min Summer	40.712	0.0	1627.3	124
180 min Summer	31.339	0.0	1879.0	182
240 min Summer	26.024	0.0	2080.2	242
360 min Summer	19.937	0.0	2391.0	362
480 min Summer	16.425	0.0	2626.2	482
600 min Summer	14.089	0.0	2816.4	602
720 min Summer	12.406	0.0	2906.8	720
960 min Summer	10.107	0.0	2941.4	960
1440 min Summer	7.524	0.0	2832.1	1226
2160 min Summer	5.614	0.0	4039.7	1620
2880 min Summer	4.590	0.0	4405.5	2020
4320 min Summer	3.513	0.0	5034.0	2856
5760 min Summer	2.948	0.0	5659.7	3696
7200 min Summer	2.609	0.0	6261.3	4544
8640 min Summer	2.382	0.0	6858.8	5440
10080 min Summer	2.221	0.0	7460.9	6248
15 min Winter	126.694	0.0	631.9	19
30 min Winter	92.181	0.0	920.3	33

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.409	0.409	18.9	1225.6	O K
120 min Winter	99.505	0.505	18.9	1514.0	O K
180 min Winter	99.570	0.570	18.9	1710.6	O K
240 min Winter	99.619	0.619	18.9	1857.2	O K
360 min Winter	99.687	0.687	18.9	2062.1	O K
480 min Winter	99.730	0.730	18.9	2189.6	Flood Risk
600 min Winter	99.757	0.757	18.9	2270.4	Flood Risk
720 min Winter	99.774	0.774	18.9	2321.4	Flood Risk
960 min Winter	99.788	0.788	18.9	2364.9	Flood Risk
1440 min Winter	99.779	0.779	18.9	2335.9	Flood Risk
2160 min Winter	99.749	0.749	18.9	2248.1	Flood Risk
2880 min Winter	99.720	0.720	18.9	2159.0	Flood Risk
4320 min Winter	99.657	0.657	18.9	1972.0	O K
5760 min Winter	99.597	0.597	18.9	1790.4	O K
7200 min Winter	99.551	0.551	18.9	1652.9	O K
8640 min Winter	99.513	0.513	18.9	1539.2	O K
10080 min Winter	99.481	0.481	18.9	1444.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	64.188	0.0	1282.0	62
120 min Winter	40.712	0.0	1626.7	122
180 min Winter	31.339	0.0	1879.2	180
240 min Winter	26.024	0.0	2080.3	238
360 min Winter	19.937	0.0	2390.6	356
480 min Winter	16.425	0.0	2626.1	472
600 min Winter	14.089	0.0	2816.7	586
720 min Winter	12.406	0.0	2908.4	700
960 min Winter	10.107	0.0	2945.5	924
1440 min Winter	7.524	0.0	2843.2	1340
2160 min Winter	5.614	0.0	4041.0	1668
2880 min Winter	4.590	0.0	4404.6	2160
4320 min Winter	3.513	0.0	5057.5	3072
5760 min Winter	2.948	0.0	5660.2	3928
7200 min Winter	2.609	0.0	6262.4	4760
8640 min Winter	2.382	0.0	6860.9	5616
10080 min Winter	2.221	0.0	7462.1	6448

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 309290 193340 ST 09290 93340
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 2.000

Time (mins) From:	To:	Area (ha)
0	4	2.000

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3000.0	1.000	3000.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0192-1890-1100-1890
Design Head (m)	1.100
Design Flow (l/s)	18.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	192
Invert Level (m)	98.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	18.9	Kick-Flo®	0.769	16.0
Flush-Flo™	0.352	18.9	Mean Flow over Head Range	-	16.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	1.200	19.7	3.000	30.5	7.000	46.0
0.200	17.8	1.400	21.2	3.500	32.9	7.500	47.5
0.300	18.8	1.600	22.6	4.000	35.1	8.000	49.0
0.400	18.8	1.800	23.9	4.500	37.1	8.500	50.5
0.500	18.5	2.000	25.1	5.000	39.1	9.000	51.9
0.600	18.1	2.200	26.3	5.500	40.9	9.500	53.3
0.800	16.2	2.400	27.4	6.000	42.7		
1.000	18.1	2.600	28.5	6.500	44.3		

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.237	0.237	7.2	236.8	O K
30 min Summer	99.342	0.342	7.2	341.9	O K
60 min Summer	99.470	0.470	7.2	469.6	O K
120 min Summer	99.580	0.580	7.2	579.8	O K
180 min Summer	99.655	0.655	7.2	655.3	O K
240 min Summer	99.710	0.710	7.2	710.3	Flood Risk
360 min Summer	99.783	0.783	7.2	783.2	Flood Risk
480 min Summer	99.827	0.827	7.2	827.0	Flood Risk
600 min Summer	99.853	0.853	7.2	853.3	Flood Risk
720 min Summer	99.868	0.868	7.2	868.3	Flood Risk
960 min Summer	99.876	0.876	7.2	876.2	Flood Risk
1440 min Summer	99.862	0.862	7.2	861.6	Flood Risk
2160 min Summer	99.838	0.838	7.2	838.0	Flood Risk
2880 min Summer	99.822	0.822	7.2	821.6	Flood Risk
4320 min Summer	99.799	0.799	7.2	799.2	Flood Risk
5760 min Summer	99.784	0.784	7.2	784.0	Flood Risk
7200 min Summer	99.779	0.779	7.2	778.5	Flood Risk
8640 min Summer	99.778	0.778	7.2	777.5	Flood Risk
10080 min Summer	99.781	0.781	7.2	780.6	Flood Risk
15 min Winter	99.237	0.237	7.2	236.8	O K
30 min Winter	99.342	0.342	7.2	342.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	126.694	0.0	243.4	19
30 min Summer	92.181	0.0	354.4	34
60 min Summer	64.188	0.0	493.9	64
120 min Summer	40.712	0.0	626.6	124
180 min Summer	31.339	0.0	723.4	182
240 min Summer	26.024	0.0	800.8	242
360 min Summer	19.937	0.0	920.6	362
480 min Summer	16.425	0.0	1011.2	482
600 min Summer	14.089	0.0	1084.5	602
720 min Summer	12.406	0.0	1137.3	720
960 min Summer	10.107	0.0	1137.7	960
1440 min Summer	7.524	0.0	1106.2	1200
2160 min Summer	5.614	0.0	1555.5	1596
2880 min Summer	4.590	0.0	1696.3	2016
4320 min Summer	3.513	0.0	1946.6	2852
5760 min Summer	2.948	0.0	2178.3	3696
7200 min Summer	2.609	0.0	2411.6	4544
8640 min Summer	2.382	0.0	2641.5	5360
10080 min Summer	2.221	0.0	2871.9	6160
15 min Winter	126.694	0.0	243.4	19
30 min Winter	92.181	0.0	354.4	33

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.470	0.470	7.2	469.8	O K
120 min Winter	99.581	0.581	7.2	580.5	O K
180 min Winter	99.656	0.656	7.2	656.3	O K
240 min Winter	99.712	0.712	7.2	711.6	Flood Risk
360 min Winter	99.786	0.786	7.2	785.7	Flood Risk
480 min Winter	99.831	0.831	7.2	830.8	Flood Risk
600 min Winter	99.859	0.859	7.2	858.6	Flood Risk
720 min Winter	99.875	0.875	7.2	875.3	Flood Risk
960 min Winter	99.887	0.887	7.2	886.7	Flood Risk
1440 min Winter	99.868	0.868	7.2	867.7	Flood Risk
2160 min Winter	99.831	0.831	7.2	831.5	Flood Risk
2880 min Winter	99.798	0.798	7.2	797.5	Flood Risk
4320 min Winter	99.738	0.738	7.2	738.2	Flood Risk
5760 min Winter	99.683	0.683	7.2	682.6	O K
7200 min Winter	99.635	0.635	7.2	635.2	O K
8640 min Winter	99.583	0.583	7.2	583.2	O K
10080 min Winter	99.539	0.539	7.2	538.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	64.188	0.0	493.9	62
120 min Winter	40.712	0.0	626.4	122
180 min Winter	31.339	0.0	723.2	180
240 min Winter	26.024	0.0	801.1	238
360 min Winter	19.937	0.0	920.7	356
480 min Winter	16.425	0.0	1011.4	472
600 min Winter	14.089	0.0	1084.4	584
720 min Winter	12.406	0.0	1135.7	700
960 min Winter	10.107	0.0	1134.9	922
1440 min Winter	7.524	0.0	1104.3	1326
2160 min Winter	5.614	0.0	1556.0	1664
2880 min Winter	4.590	0.0	1696.3	2136
4320 min Winter	3.513	0.0	1946.5	3068
5760 min Winter	2.948	0.0	2179.2	3984
7200 min Winter	2.609	0.0	2410.5	4904
8640 min Winter	2.382	0.0	2641.4	5784
10080 min Winter	2.221	0.0	2872.4	6552

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 309290 193340 ST 09290 93340
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.770

Time (mins) From:	To:	Area (ha)
0	4	0.770

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.000	1000.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0124-7200-1100-7200
Design Head (m)	1.100
Design Flow (l/s)	7.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	124
Invert Level (m)	98.900
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	7.2
Flush-Flo™	0.325	7.2
Kick-Flo®	0.707	5.9
Mean Flow over Head Range	-	6.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4	1.200	7.5	3.000	11.5	7.000	17.3
0.200	6.9	1.400	8.1	3.500	12.4	7.500	17.9
0.300	7.2	1.600	8.6	4.000	13.2	8.000	18.4
0.400	7.1	1.800	9.1	4.500	14.0	8.500	19.0
0.500	7.0	2.000	9.5	5.000	14.7	9.000	19.5
0.600	6.7	2.200	10.0	5.500	15.4	9.500	20.0
0.800	6.2	2.400	10.4	6.000	16.1		
1.000	6.9	2.600	10.8	6.500	16.7		

PEGASUS GROUP

Expertly Done.

DESIGN | ECONOMICS | ENVIRONMENT | HERITAGE | LAND & PROPERTY | PLANNING | TRANSPORT & INFRASTRUCTURE

Pegasus_Group pegasusgroup Pegasus_Group

PEGASUSGROUP.CO.UK