Flood Risk Sequential Assessment for

Land at Newfields Farm, Rownall Road, Wetley Rocks

Development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping and biodiversity enhancements, to provide balancing services to the local electricity grid.

On behalf of Newfields BESS Limited

Date: March 2025 | Pegasus Ref: P23-0415

LPA ref: SMD/2024/0019

Report ref. P23-0415_R005v4 PL

Author: Pegasus Group

Document Management.

Version	Date	Author	Checked/ Approved by:	Reason for revision
1	March 2025	ARG/DP	NC	-
2	March 2025	ARG/DP	NC	Draft
3	March 2025	ARG/DP	NC	Client comments
4	March 2025	DP	NC	Counsel & client comments

Contents.

Appendices.

1. INTRODUCTION

1.1. Pegasus Group has been commissioned by Newfields BESS Limited ("**the Appellant**") to undertake a Flood Risk Sequential Test in support of an appeal made under Section 78 of the Town and Country Planning Act 1990 against the refusal of planning application reference SMD/2024/0019 ("**the Planning Application**") by Staffordshire Moorlands District Council as the relevant Local Planning Authority ("**the LPA**") on 27th September 2024, related to land at Newfields Farm, Rownall Road, Wetley Rocks ("**the Site**"), for the following:

Development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping and biodiversity enhancements, to provide balancing services to the local electricity grid.

1.2. A Location Plan is included at **Appendix 1**.

1.3. A FRA & Drainage Strategy Addendum by Rennard Consulting Limited has been produced (see **Appendix 2**) which also contains the original Flood Risk & Surface Water Drainage Assessment ("**the FRA**") produced by KRS Enviro (see also **Core Document 3.33**). This demonstrates that the Appeal Scheme will not increase surface water runoff, nor the risk of flooding at the Site or elsewhere. The FRA concludes that the proposed development will considerably reduce the flood risk posed to the Site and to off-site locations due to the adoption of the proposed drainage strategy.

1.4. This sequential test has been prepared in accordance with the National Planning Policy Framework (NPPF) (December 2024) and the Planning Practice Guidance (PPG). The purpose of this report is to address national policy requirements with regards to suitability of the Site for the proposed development in terms of flood risk, having due regard to reasonable alternative sites within a 1.5-kilometre radius of the point of connection at Cellarhead Substation.

1.5. This report provides an overview of the site in **Section 2**. Relevant planning policy and guidance is outlined in **Section 3**. The methodology for the sequential test is set out in **Section 4**, and the sequential test is subsequently undertaken in **Section 5**. Having demonstrated that the sequential test is passed, the exception test is carried out in **Section 6**. Finally, **Section 7** concludes that the Site is sequentially preferable for a BESS development in flood risk terms within the search area.

2. SITE OVERVIEW & APPEAL PROPOSAL

The Site

2.1. The Site, including land to be used for access, comprises 2.48 hectares, and is located within the administrative boundary of Staffordshire Moorlands District Council. It is situated within Cheddleton Parish, around 1.2 kilometres to the north of the village of Werrington and approximately 11 kilometres east of the urban area of Stoke on Trent. The main part of the Site comprises agricultural land used for sheep grazing. The Site and the surrounding area is designated Green Belt land.

Figure 1: Site Location Plan

2.2. The main part of the Site is a single parcel of pastoral farmland. According to Natural England, this is classified as Grade 4 (Poor), and therefore does not fall within the definition of 'best and most versatile agricultural land', as set out in the National Planning Policy Framework (NPPF). The topography of the Site rises gradually from 225 metres Above Ordnance Datum (AOD) in the north-west of the Site to 230 metres AOD in the south-east.

2.3. Footpath Cheddleton 60 runs east-west along the southern edge of the field which contains the Site, whilst Cheddleton 48 follows the eastern boundary of the field, running between the

Site and Cellarhead Substation. There are other public rights of way within the vicinity of the Site which extend across the wider landscape, including Cheddleton 49, 47, 53, 58, and 59.

2.4. The Site is accessed from Rownall Road to the east and includes an existing tarmac access track. Agricultural buildings and a farmhouse, comprising Newfields Farm, are located to the south. The Site immediately adjoins the National Grid Cellarhead Substation to the east and north with intervening mature boundary vegetation. Beyond the Cellarhead Substation to the east are two sites approved for BESS development pursuant to planning permission references SMD/2022/0548 and SMD/2022/0444. Another site approved for BESS development is located to the south-east, pursuant to planning permission reference SMD/2024/0055, with a further site approved for BESS development located to the south-west, pursuant to planning permission reference SMD/2022/0574, granted at appeal.

Flood Constraints

Fluvial Flood Risk

2.5. The Environment Agency's National Flood Risk Assessment (NaFRA) data (January 2025) shows the site to be located in Flood Zone 1, where there is a less than 1 in 1,000 annual probability of flooding from rivers and the sea. Therefore, the site has a low risk of fluvial flooding.

Pluvial Flood Risk

2.6. The NaFRA data indicates that there is a very low risk of surface water flooding across most of the Site. However, there is a low-to-high risk of surface water flooding across much of the northern part of the Site, as well as a pocket of land at low risk of flooding from this source in the centre of the Site, as shown in Figure 2. This means the annual probability of pluvial flooding ranges from 1 in 1,000 to 1 in 30 in the northern part of the Site.

2.7. The FRA concluded that the risk of surface water flooding on the Site is of "low significance", when considering the nature of the proposed development. Having regard to the limited risk of surface water flooding, there was no objection from the Lead Local Flood Authority as part of the planning application (see **Core Document CD 2.8**), and flood risk did not form a reason for refusal.

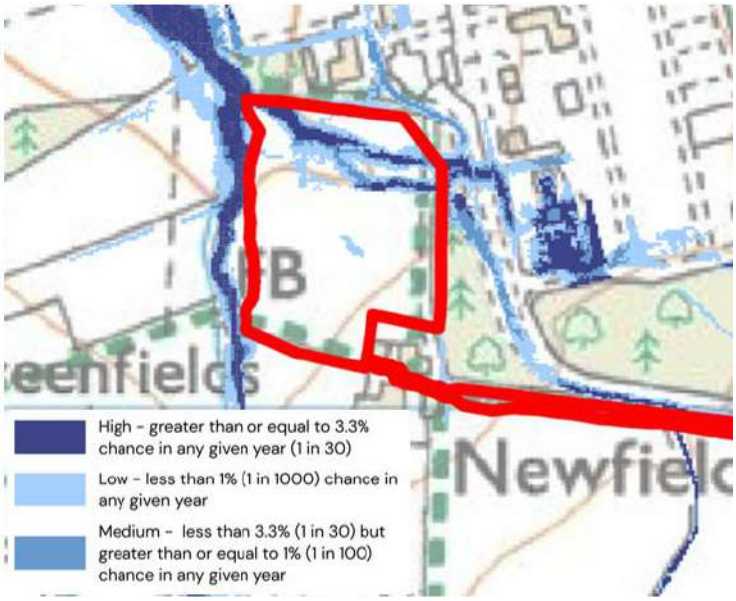


Figure 2: Risk of Surface Water Flooding. Source: Environment Agency's National Flood Risk Assessment data

Groundwater Flood Risk

2.8. According to data from the British Geological Survey, there is potential for groundwater flooding situated below ground level across the majority of the Site. There is potential for groundwater flooding to occur at the surface on the western edge of the Site. The risk of groundwater flooding was not raised by the LLFA (**Core Document CD 2.8**), with the FRA concluding that the risk is "not significant".

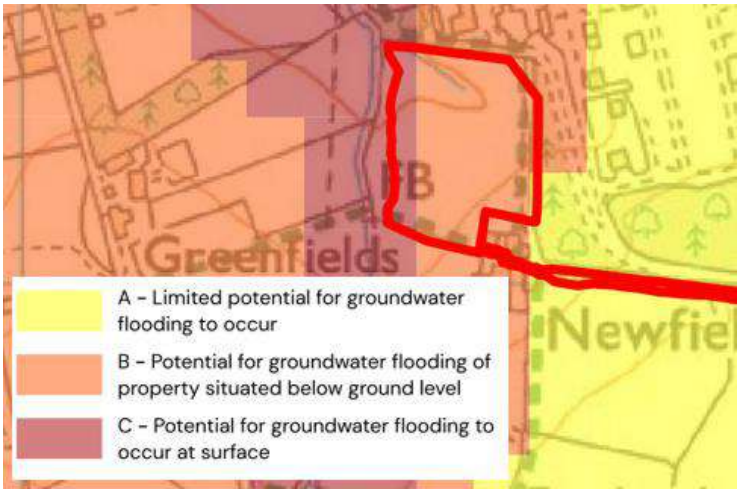


Figure 3: Risk of Groundwater Flooding. Source: British Geological Survey

2.9. The FRA demonstrates that the Appeal Scheme will not increase surface water runoff, nor the risk of flooding at the Site or elsewhere. The FRA concludes that the proposed development will considerably reduce the flood risk posed to the Site and to off-site locations due to the adoption of the proposed drainage strategy, consisting of permeable surfaces (crushed permeable stone and grass) and surface water attenuation storage in the form of an underground crate system attenuation tank. For clarity, all equipment within the area of the Appeal Site at risk of surface water flooding will be raised on a 300mm concrete plinth, in line with the maximum anticipated depth of surface water in the FRA.

Proposed Development

2.10. The Appeal Scheme seeks full planning permission for the following:

"*Development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping and biodiversity enhancements, to provide balancing services to the local electricity grid.*"

2.11. The updated proposals submitted with this appeal are shown on submitted Site Layout Plan (drawing reference 1105-02-05-NF-SL-04032025 Rev 5). The proposed BESS equipment is shown on the drawing titled "Plan and Elevations of BESS Units and MV SKID Solution" (drawing no. 88-10-05-P-PL-EQ-03 Rev 6). The proposed design includes 12No. rows of battery energy storage containers (from 14No. rows) with revised dimensions of 2.89m high, 2.43m wide & 6.05m long (from 2.59m high, 2.44m wide & 12.19m long). Each of the 12No. rows comprises transformer stations with revised dimensions of 2.89m high, 2.43m wide & 6.05 metres long (from 3.75m high, 2.06m wide & 9.04m long).

2.12. The proposed development incorporates a landscape strategy, which includes proposed woodland and scrub planting to the west and north, which integrates with existing neighbouring woodland to the north and east, and merges with a proposed 3-metre-high landscaping bund to the west; the bund has been scaled back as part of the amended appeal proposal, moving it away from land at risk of surface water flooding in the north of the site. A native hedgerow is proposed along the eastern boundary adjacent to footpath Cheddleton 48.

3. PLANNING POLICY CONSIDERATIONS

3.1. This section refers to relevant national policy and guidance and the Development Plan policies that provide the planning policy framework that are pertinent to the issue of flood risk.

3.2. It deals with the following tiers of policy and guidance:

- National Planning Policy Framework as revised December 2024 (NPPF)
- National Planning Policy Guidance (NPPG)
- The Development Plan: Staffordshire Moorlands Local Plan 2014-2033 (adopted September 2020)
- Staffordshire Moorlands Level 1 Strategic Flood Risk Assessment (October 2015)
- Recent case law

National Planning Policy Framework (NPPF)

3.3. The National Planning Policy Framework (NPPF) was published in December 2024. Policies relating to planning and flood risk are contained within the NPPF at Paragraphs 170 to 182.

3.4. Paragraph 170 confirms that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future).

3.5. Paragraph 172 states that:

> *"All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:*
>
> *a) applying the sequential test and then, if necessary, the exception test as set out below;*
>
> *b) safeguarding land from development that is required, or likely to be required, for current or future flood management;*

c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and

d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations".

3.6. Paragraph 173 states that a sequential risk-based approach should also be taken to individual applications in areas known to be at risk now or in future from any form of flooding, by following the steps set out below.

3.7. Paragraph 174 confirms that the aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a low risk of flooding. The strategic flood risk assessment will provide the basis for applying this test.

3.8. Paragraph 175 explains that the sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

3.9. Paragraph 177 then explains that if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification.

3.10. In respect of the exception test, Paragraph 178 states that:

"The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".

3.11. Paragraph 179 requires that:

"Both elements of the exception test should be satisfied for development to be allocated or permitted."

3.12. Paragraph 181 states that:

"When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."

3.13. Finally, Paragraph 182 states that:

"Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water

quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:

a) take account of advice from the Lead Local Flood Authority;

b) have appropriate proposed minimum operational standards; and

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development."

Planning Practice Guidance (PPG)

3.14. The relevant National Planning Policy Guidance Section for Flood Risk and Coastal Change was published on 6 March 2014 and last updated on 25 August 2022. It explains that:

"...Avoiding flood risk through the sequential test is the most effective way of addressing flood risk because it places the least reliance on measures like flood defences, flood warnings and property level resilience features. Even where a flood risk assessment shows the development can be made safe throughout its lifetime without increasing risk elsewhere, the sequential test still needs to be satisfied. Application of the sequential approach in the plan-making and decision-making process will help to ensure that development is steered to the lowest risk areas, where it is compatible with sustainable development objectives to do so, and developers do not waste resources promoting proposals which would fail to satisfy the test. Other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk."

Paragraph: 023 Reference ID: 7-023-20220825

3.15. It goes on to say:

"The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites:

• Within medium risk areas; and

• *Then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas"*

Paragraph: 024 Reference ID: 7-024-20220825

3.16. For individual schemes, the PPG explains that:

"subject to the Sequential Test, the area to apply the test will be defined by local circumstances relating to the catchment area for the type of development proposed. For some developments this may be clear, for example, the catchment area for a school. In other cases, it may be identified from other Plan policies. For example, where there are large areas in Flood Zones 2 and 3 (medium to high probability of flooding) and development is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives" (emphasis added)

Paragraph: 027 Reference ID: 7-027-20220825

3.17. It goes on to say:

"'Reasonably available sites' are those in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development.

These could include a series of smaller sites and/or part of a larger site if these would be capable of accommodating the proposed development. Such lower-risk sites do not need to be owned by the applicant to be considered 'reasonably available'."

Paragraph: 028 Reference ID: 7-028-20220825

3.18. The PPG subsequently confirms:

"Relevant decision makers need to consider whether the test is passed, with reference to the information it holds on land availability. The planning authority will need to determine an appropriate area of search, based on the development type proposed and relevant spatial policies. The applicant will need to identify whether there are any other 'reasonably available' sites within the area of search, that have not already been identified by the planning authority in site allocations or relevant housing and/or economic land availability assessments, such as sites currently available on the open market. The

applicant may also need to check on the current status of relevant sites to determine if they can be considered 'reasonably available'." (emphasis added)

Paragraph: 029 Reference ID: 7-029-20220825

3.19. In conclusion:

"Ultimately the local planning authority needs to be satisfied in all cases that the proposed development would be safe throughout its lifetime and not lead to increased flood risk elsewhere."

Paragraph: 029 Reference ID: 7-029- 20220825

3.20. In respect of the Exception Test, the PPG states:

"The Exception Test should only be applied when following application of the Sequential Test, it has been demonstrated that it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives). The applicant will need to provide the local planning authority with evidence to demonstrate how both elements of the Exception Test will be satisfied."

The Development Plan

3.21. Section 38 (6) of the Planning and Compulsory Purchase Act 2004 requires that applications for planning permission must be determined in accordance with the Development Plan, unless material considerations indicate otherwise. The statutory Development Plan comprises the Staffordshire Moorlands Local Plan 2014-2033 (adopted September 2020).

3.22. **Policy SD5 (Flood Risk)** states that a sequential approach will be taken to managing flood risk. It states:

"… New development will be guided to the areas with the lowest risk of current and future flooding where this is viable and compatible with other polices aimed at achieving a sustainable pattern of development. The development of sites within areas at greater risk of flooding will only be considered where they are deemed acceptable due to national or other policies or material considerations. […]

schemes in flood risk areas should demonstrate how the sequential approach has been used to locate the most vulnerable parts of the development in the areas of lowest flood risk."

3.23. The Policy also requires suitable measures to deal with surface water arising from development to minimise the impact from the development.

3.24. The supporting text for Policy SD 5 adds that:

"*A level 1 Strategic Flood Risk Assessment has been undertaken for the District. In accordance with the NPPF, areas of 'low', 'medium' and 'high' risk have been mapped using data collected from the Environment Agency (EA), Staffordshire Moorlands District Council, Severn Trent Water, United Utilities, the Highways Agency and British Waterways. This has included information on flooding from rivers, surface water (land drainage), groundwater, artificial water bodies and sewers. This provides the basis for the Sequential Test to be applied….*

The Council will expect the Sequential Test to be applied to all sites within the 'high' and 'medium' risk flood zones to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed."

Staffordshire Moorlands Level 1 Strategic Flood Risk Assessment

3.25. The Level 1 Strategic Flood Risk Assessment (SFRA) **(Core Document CD 4.3)** was produced in support of the production of the Staffordshire Moorlands Local Plan[1]. The SFRA was published in October 2015, thus the guidance set out for the sequential test does not reflect the latest updates to national policy, nor the implications of case law such as *Mead Realisations Limited v Secretary of State for Levelling Up, Housing and Communities* [2024] EWHC 279 (Admin), which is discussed further below. The SFRA assesses sites in Staffordshire Moorlands District only.

[1] AECOM report titled "Staffordshire Moorlands Level 1 Strategic Flood Risk Assessment Update" reference 47074340 final version revision 1, dated 1st October 2015.

3.26. The SFRA states developers are required to apply the sequential test to all development sites, unless the site is:

- An allocation in the Development Plan and the test has already been carried out by the LPA
- A change of use (except for changes of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site)
- A minor development
- A development in Flood Zone 1 unless the SFRA indicates that there may be flooding issues now or in the future
- Redevelopment of existing properties providing they are not placed in an area with an unacceptable level of flood risk; would not increase the number of dwellings in an area of flood risk and would not increase the net footprint of buildings

3.27. The SFRA draws on the Environment Agency's '*Demonstrating the Flood Risk Sequential Test for Planning Applications*' publication, identifying the procedure for the sequential test as follows:

- *"Identify the geographical area of search over which the test is to be applied; this could be the District area, or a specific catchment if this is appropriate and justification is provided (e.g. school catchment area or the need for affordable housing within a specific area identified for regeneration in Local Plan policies);*
- *Identify the source of 'reasonably available' alternative sites; usually drawn from evidence base / background documents produced to inform the Local Plan;*
- *State the method used for comparing flood risk between sites; for example the Environment Agency Flood Map for Planning, the SFRA mapping, site-specific FRAs if appropriate, other mapping of flood sources;*
- *Apply the Sequential Test; systematically consider each of the available sites, indicate whether the flood risk is higher or lower than the application site, state whether the alternative option being considered is allocated in the Local Plan,*

identify the capacity of each alternative site, and detail any constraints to the delivery of the alternative site(s);

- *Conclude whether there are any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed;*
- *Where necessary… apply an Exception Test;*
- *Apply the Sequential approach to locating development within the site" (emphasis added)*

3.28. The SFRA provides guidance on adopting a sequential approach to site layouts, noting that vulnerable elements of development should be located in the areas of the site with the lowest risk of flooding. Appropriate mitigation measures should be incorporated that do not increase the risk of flooding to surrounding areas, and where opportunity exists, aim to reduce flood risk to surrounding areas. It states that consideration should also be given to the impact of any development on pluvial flow routes. Following the sequential approach to the layout of buildings and provision of SuDS will assist in mitigating any increase in risk from surface water to surrounding areas.

3.29. Decision-makers should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific FRA following the sequential test, and if required an Exception Test, it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of SuDS.

Recent Case Law

3.30. The co-joined case of *Mead Realisations Limited v Secretary of State for Levelling Up, Housing and Communities* [2024] EWHC 279 (Admin) (contained at **Core Document CD 6.24**), concerned the interpretation and application of the sequential test in national policy on flood risk.

3.31. In his judgment dated 12 February 2024, Mr. Justice Holgate held that the PPG has the same legal status as the NPPF. This is significant because the PPG on Flood Risk and Coastal Change provides much more detail than the NPPF when it comes to the sequential test. In particular, the PPG is clear on two key points:

- The sequential test should take account of all sources of flood risk – this means fluvial (river and tidal) and surface water flood risk
- Flood risk management infrastructure should be ignored initially. This means that a sequential test cannot be avoided on sites that are at risk of flooding from any source, even if a site-specific FRA concludes that there is a low risk of flooding due to existing flood defences or proposed development mitigation measures

3.32. It is in this context that this sequential test is undertaken.

Summary

3.33. The above shows that there are a range of national and local policy and guidance documents which consider the flood risk sequential test. This has been used to inform the methodology of the sequential test set out in Section 4 of this document.

4. SEQUENTIAL TEST METHODOLOGY

Area of Search

4.1. There is no prescribed guidance or standard on what constitutes a reasonable search area for renewable and low carbon energy schemes. Since they require a viable connection to the existing grid network, it is essential that there is a connection point with sufficient capacity. The grid connection point must be able to offer sufficient capacity and must remain viable for the lifetime of the BESS facility (i.e. 40 years).

4.2. Cable trenching costs and thermal power losses limit the distance of a site from a suitable grid connection to 1.5 kilometres, thus any sites beyond this distance cannot be considered for the development. This provides the necessary justification for the sequential test to not cover Staffordshire Moorlands district in its entirety, in accordance with the PPG and SFRA, which allow for a specific catchment to be defined for the sequential test where such justification exists. This approach is also consistent with that taken for other appeals including a BESS development at Staythorpe, Newark (PINS ref: APP/B3030/W/23/3334043), where a 1.5-kilometre radius was accepted (see **Appendix 3**).

4.3. In this instance, only sites within a **1.5-kilometre radius** of the agreed point of connection at **Cellarhead Substation** have been considered. The study area is shown drawing ref. P23-0415_EN_03B contained in **Appendix 4.**

Reasonably Available Sites

4.4. The PPG states that 'reasonably available sites' are those in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development. The PPG suggests that this could include a series of smaller sites. On this matter, Mr Justice Holgate, in the case of *Mead Realisations Limited v Secretary of State for Levelling Up, Housing and Communities* [2024] EWHC 279 (Admin) (contained at **Core Document CD 6.24a**) comments:

> "*The PPG states that reasonably available sites may include "a series of smaller sites and/or part of a larger site if these would be capable of accommodating the proposed development." Whether such an arrangement is so capable depends on the judgments to be made by the decision-maker on such matters as the type and size of development, location, ownership issues, timing and flexibility. Taking into account his assessment of*

any case advanced by the developer on need and/or market demand, the decision-maker may consider smaller sites (or disaggregation) if appropriate for accommodating the proposed development".

Paragraph 109 - emphasis added

"I note that the PPG refers to a "series of smaller sites." The word "series" connotes a relationship between sites appropriate for accommodating the type of development which the decision-maker judges should form the basis for the sequential assessment. This addresses the concern that a proposal should not automatically fail the sequential test because of the availability of multiple, disconnected sites across a local authority's area. The issue is whether they have a relationship which makes them suitable in combination to accommodate any need or demand to which the decision-maker decides to attach weight"

Paragraph 110 - emphasis added

4.5. This High Court judgement was upheld in the Court of Appeal; *Mead Realisations Ltd v Secretary of State for Housing, Communities and Local Government [2025] EWCA Civ 32* (contained at **Core Document CD 6.24b**).

4.6. In this instance, for a site to be reasonably available, having regard to the above referenced PPG and relevant case law, there must be scope to accommodate a BESS development with a storage capacity of up to 99.9MW, which can connect to the grid at Cellarhead Substation, with such a connection to be in place by 2030, to contribute towards meeting the targets in the Clean Power 2030 Action Plan (December 2024). The development must be confined to a single site, as the BESS equipment, switchyard, and associated buildings need to be co-located within a single compound. A series of sites have been considered but those within separate landownerships cannot be considered to be suitable.

Site Requirements

4.7. The Appeal Site covers an area of **2.48 hectares**. Excluding the access track, its area reduces to approximately 2 hectares. Any alternative site should be capable of accommodating the proposed development; thus, alternative sites below **2 hectares** have not been considered.

4.8. According to the PPG and the SFRA, potential sources of information on reasonably available alternative sites can include site allocations in the Development Plan, sites in housing and/or economic land availability assessments, and sites currently available on the open market.

4.9. There are no site allocations within the study area, a limited number of sites have been assessed negatively in the Staffordshire Moorlands Local Plan Strategic Housing Land Availability Assessment (July 2015), adjacent to the settlement boundary for Werrington, which have been considered accordingly.

4.10. According to 'OntheMarket', there is currently no land for sale within the study area.

4.11. In addition, alternative sites should be free of major constraints and available, and thus the following land has been excluded:

- Listed buildings (with a 100 metre buffer)
- Sites of Special Scientific Interest (with a 100 metre buffer)
- Sites of Biological Importance (with a 100 metre buffer)
- Biodiversity Action Sites (with a 100 metre buffer)
- Open Woodland
- Open Space
- Open Access Land
- Other sites for renewable and low-carbon schemes within the search area, both consented and awaiting determination
- Cellarhead Substation
- Residential plots/gardens and farmsteads.
- OS main roads (with a 5 metre buffer)
- National Grid overhead lines (with a 5m buffer)

4.12. A Constraints Plan (drawing ref. P23-0415_EN_04B) is included in **Appendix 5**.

4.13. A consideration for detailed assessment of sites needs to relate to whether a site can accommodate the proposed development at the point in time required related to its grid connection offer, and which also is physically capable of accommodating the development safely and viably with regard to matters such as steep topography.

Method for Comparing Flood Risk

4.14. Data from the Environment Agency's National Flood Risk Assessment (NaFRA) (January 2025) has been used to identify the fluvial (drawing ref. P23-0415_EN_05B - **Appendix 6**) and pluvial flood risk (drawing ref. P23-0415_EN_06B - **Appendix 7**) within the area of search. For groundwater flooding, data from the British Geological Survey has been used (drawing ref. P23-0415_EN_07B - **Appendix 8**). For flooding from sewers and artificial waterbodies, data from the ST DG5 External Records has been reviewed for the former, with Environmental Agency data reviewed for the latter (drawing ref. P23-0415_EN_09B - **Appendix 9)**.

Summary

4.15. To summarise, the sequential test considers sites within 1.5 kilometres of the point of connection at Cellarhead Substation against the following criteria:

- Sites with a size of at least 2 hectares in the same ownership
- Sites which are free of the above constraints and are available for development
- Flooding constraint type – the appeal site is free from fluvial flooding but at some risk of surface water and groundwater flooding. Any sequentially preferable site would need to have less flood risk than the flood risk identified at the site.

5. THE SEQUENTIAL TEST

5.1. The drawing (reference P23-0415_EN_10B) contained at **Appendix 10** shows all land that is unsuitable for the proposed development, having regard to the constraints identified in Section 4, as well as land of equivalent or higher flood risk than the appeal site. It also identifies all land less than 2 hectares which is considered to be too small for the proposed development. A series of smaller sites within the same ownership that collectively comprise two hectares or more have been considered, even if in reality a scheme over a series of small sites would not be practical, related to the need to remove existing field boundaries for example. As shown on the drawing at Appendix 10, significant areas of land within the area of search are constrained from being developed for the proposed development; or on land of equivalent or higher flood risk; or comprising residential plots or land parcels under 2 hectares adjoining other land that is within separate land ownership, preventing a series of small sites being considered.

5.2. There are however still areas of unconstrained land that are of less flood risk than the appeal site which requires further assessment having regard to the ability of such sites to be reasonably available. Sites located within the unconstrained land within Appendix 10 are potentially affected by additional constraints including steep topography that would prevent the development being able to be constructed safely or viably (such as land to the south-east of the Site located north of Little Southlow Farm) as well as land at greater landscape & visual sensitivity (such as land to the north of Thornyedge Road) which would make such sites less suitable for development, with the potential for unacceptable landscape and visual effects. In addition, whilst the extent of the area of search shown within Appendix 10 has been indicated as a 1.5 km radius of the point of connection, in reality the connection made from a BESS scheme to the point of connection would be via cable routes, which beyond the immediate vicinity of Cellarhead Substation would require connection through public highway(s). The required connections would therefore, in reality, not be a direct line of course ('as the crow flies') and may therefore require connection routes of a larger distance than 1.5km which could therefore potentially make such a connection unviable.

5.3. It should also be noted that the site selection process for the Appeal Site was undertaken at a point in time prior to more recent legal judgement (including aforementioned *Mead Realisations* judgements) as well as correlating subsequent changes to national planning policy.

5.4. Latest national planning policy is clear that 'reasonably available sites' are those in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development, as set out in the PPG.

5.5. In this regard, the crucial issue pertaining to the proposed development and key to the assessment of whether any potential alternative sites in the area are reasonably available sites relates to the requirement for the proposed development to connect to the grid by 2028 in order to meet national targets for clean power by 2030, in line with the Clean Power 2030 Action Plan (December 2024). The Action Plan emphasises the importance of flexible capacity in complementing wind and solar power, setting out ambitions for 23-27 GW of battery storage capacity by 2030. There is currently only 4.5 GW of battery storage capacity in Great Britain, thus there is a need to act immediately and bring forward all BESS schemes where there are agreed connections prior to 2030, as is the case in this instance, at pace in order to meet these ambitious national targets.

5.6. There are a limited number of projects waiting in the queue with confirmed National Energy System Operator (NESO) energisation dates as the transmission network requires significant reinforcement to facilitate connections and to be able to exercise decentralised energy schemes as it was not designed for intermittent energy generation. Thus, a new connection reform has been implemented, which indicates that schemes with energisation dates before 2030 will be protected and expedited to accommodate the Government's Action Plan to achieve clean power by 2030.

5.7. NGED West Midlands has produced a regional report [2] in line with Clean Power 2030 which highlights that in order to achieve clean power by 2030, an additional 3.2 GW of BESS capacity will be required in the West Midlands region. Currently, there is less than 0.1 GW of flexible energy generation, such as BESS, installed in the region.

5.8. The Site has a confirmed and secured connection to the National Grid with the energisation date scheduled for October 2028 with minimal transmission works required to accommodate this scheme. It will provide direct ESO auxiliary services (e.g., restoration services, formally Black Start) to Cellarhead Substation. The appeal scheme provides no

[2] National Grid DFES 2022 Regional Review: West Midlands (December 2022)

restriction on the Distribution Network Operator and will feed directly into the balancing requirements set out in Clean Power 2030.

5.9. All land identified in Appendix 10 as potentially unconstrained land that is of less flood risk would not be available to deliver the proposed development to meet these crucial 2030 targets. If an application was made to connect the proposed development to the National Grid on any land identified as a potential alternative site in the plan contained at Appendix 10 then given the above context it would not be possible to connect before 2030. National Grid Electricity Transmission indicates new connections at Cellarhead Substation cannot be accommodated before 2036[3]. Consequently, there are no reasonably available alternative sites for the proposed development and taking the above into account, the sequential test for flood risk has been passed. The exception test therefore needs to be applied, and this is considered in the next section.

Conclusion

5.10. As outlined in Section 4, sites within 1.5 kilometres of the point of connection at Cellarhead Substation, which constitutes the defined search area, have been assessed against flood constraints. A series of sites were discounted at the initial stages based on their size, location relative to key environmental constraints (such as designated ecology sites, heritage assets, and woodland), and the ability to accommodate the proposal subject to this appeal, including sites that have already obtained planning permission or the subject of pending planning applications or appeals.

5.11. The remaining areas of land have then been assessed as to whether they are truly 'reasonably available' to the Appellant.

5.12. All identified unconstrained sites that are of less flood risk would not be reasonably available to deliver the proposed development to meet its energisation date, and the 2030 targets set out in the Government's Clean Power 2030 Action Plan. In addition, the Site's position immediately adjacent to Cellarhead Substation makes it commercially preferable and efficient for the required connection, which would also limit disruption to the local area via the connecting cable route, compared to sites located further away from the point of connection (Cellarhead Substation) which would require long cable routes via public

[3] See https://customer.nationalgridet.com/s/pre-application for Cellarhead 400kV

highway(s). The Site is also positioned on land that doesn't contain topographical constraints or potential unacceptable landscape & visual constraints, when compared with other sites in the area.

5.13. Therefore, it is concluded that this is a sequentially preferable site for the proposed development, and the sequential test is thus passed.

5.14. Notwithstanding this position, if it were determined that the sequential test was not passed, then in line with Appeal Reference APP/D0121/W/24/3343144 (Land at Rectory Farm (North), Chescombe Road, Yatton BS49 4BZ) (see **Core Document CD 6.26**), the Appellant submits that weight to be given to any failure of the sequential test should be reduced, and outweighed in the planning balance in this instance, due to the following considerations:

- the need for the proposed BESS development at the Site, with consideration to the associated material considerations of the Appeal Scheme as outlined in the Appellant's Statement of Case; and

- that it is shown within the submitted FRA & Drainage Strategy Addendum by Rennard Consulting Limited contained at **Appendix 2**, as well as the Flood Risk & Surface Water Drainage Assessment (see **Core Document CD 3.33**) submitted with the planning application (and this appeal); that the proposed development would not be at risk of flooding due to the nature of the development and mitigation proposed, and would not increase flood risk elsewhere including on adjoining land.

6. THE EXCEPTION TEST

6.1. The exception test requires two additional elements to be satisfied (as set out in Paragraph 178 of the National Planning Policy Framework and the PPG) before allowing development to be permitted in situations where suitable sites at lower risk of flooding are not available following application of the sequential test.

6.2. It should be demonstrated that:

- development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and
- the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

6.3. Both elements of the exception test should be satisfied for development to be permitted.

Sustainability Benefits

6.4. Paragraph 8 of the NPPF explains that there are three dimensions to sustainable development, which are interdependent and need to be pursued in mutually supportive ways. Specifically, these are economic, social and environmental objectives.

6.5. Criterion (c) of Paragraph 8 notes that the environmental objective includes mitigating and adapting to climate change. Paragraph 161 states that the planning system should support the transition to net zero by 2050, with Paragraph 168 adding that significant weight should be given to the benefits associated with renewable and low carbon energy generation and the degree to which a proposal will contribute to a net zero future.

6.6. The Clean Power 2030 Action Plan (December 2024) states that 40-50 GW of flexible capacity will be needed by 2030 to support our power system in periods of low renewable output. The Action Plan emphasises that energy storage will be key to ensuring energy security, and that large amounts of distribution-connected renewable generation and storage must be accelerated to meet 2030 targets.

6.7. The proposal will make a positive contribution to bringing environmental and sustainability benefits not just to Staffordshire Moorlands District, but to the wider county and country. Its

delivery will directly contribute towards reducing emissions and tackling climate change, to ensure the local area and wider country can fully transition to renewable sources without compromising on energy security, and to help achieve climate targets for 2030 and beyond. These significant sustainability benefits clearly outweigh the identified surface and groundwater flood risk.

Safety of the Development

6.8. The FRA demonstrates that the Appeal Scheme be safe for its lifetime and will not increase surface water runoff, nor the risk of flooding at the Site or elsewhere. In fact, the FRA concludes that the proposed development will considerably reduce the flood risk posed to the Site and to off-site locations due to the adoption of the proposed drainage strategy, consisting of permeable surfaces (crushed permeable stone and grass) and surface water attenuation storage in the form of an underground crate system attenuation tank.

6.9. The above assessment demonstrates that both requirements of the exceptions test are met.

6.10. Additionally, Paragraph 181 of the NPPF states that:

> *"…Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and the exception tests, as applicable) it can be demonstrated that:*
>
> *a) within the site, the most vulnerable development is located in areas if lowest flood risk, unless there are overriding reasons to prefer a different location;*
>
> *b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it can be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be in appropriate;*
>
> *d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan"*

6.11. The SFRA also requires the above to be demonstrated.

6.12. The majority of the development and its most vulnerable elements are located in lowest flood risk areas on site where possible as required by criterion (a). All equipment within the surface

water flood zone will be raised on a 300mm concrete plinth, in line with the maximum anticipated depth of surface water set out in the FRA, increasing its resistance and resilience to flooding, satisfying criterion (b). The proposal incorporates sustainable drainage systems, as detailed above, in line with criterion (c). Residual risk can be managed safely as required by criterion (d), and safe access routes are included as per criterion (e).

6.13. The requirements of Paragraph 181 and the SFRA are therefore also met.

7. CONCLUSIONS

7.1. This Flood Risk Sequential Test has been prepared by Pegasus Group on behalf of Newfields BESS Limited in support of an appeal made under Section 78 of the Town and Country Planning Act 1990 against the refusal of planning application reference SMD/2024/0019 by Staffordshire Moorlands District Council as the relevant Local Planning on 27th September 2024, related to land at Newfields Farm, Rownall Road, Wetley Rocks for the following:

Development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping and biodiversity enhancements, to provide balancing services to the local electricity grid.

7.2. This sequential test has been prepared in accordance with national and local policies and guidance. The purpose of this report is to address the policy requirements in respect of the suitability of the Site for the proposed development in terms of flood risk, having due regard to the reasonably alternative sites within a 1.5-kilometre radius of the agreed point of connection at Cellarhead Substation.

7.3. It has been concluded that all identified unconstrained sites that are of less flood risk would not be available to deliver the proposed development to meet its energisation date and the 2030 targets set out in the Government's Clean Power 2030 Action Plan. In addition, the Site's position immediately adjacent to Cellarhead Substation makes it commercially preferable and efficient for the required connection. Therefore, it is concluded that this is a sequentially preferable site for the proposed development, and the sequential test is therefore passed.

7.4. Notwithstanding this position, if it were determined that the sequential test was not passed, then in line with Appeal Reference APP/D0121/W/24/3343144 (Land at Rectory Farm (North), Chescombe Road, Yatton BS49 4BZ) (see **Core Document CD 6.26**), the Appellant submits that weight to be given to any failure of the sequential test should be reduced, and outweighed in the planning balance in this instance, due to the following considerations:

- the need for the proposed BESS development at the Site, with consideration to the associated material considerations of the Appeal Scheme as outlined in the Appellant's Statement of Case; and

- that it is shown within the submitted FRA & Drainage Strategy Addendum by Rennard Consulting Limited contained at **Appendix 2**, as well as the Flood Risk & Surface Water Drainage Assessment (see **Core Document CD 3.33**) submitted with the planning application (and this appeal); that the proposed development would not be at risk of flooding due to the nature of the development and mitigation proposed, and would not increase flood risk elsewhere including on adjoining land.

7.5. With regards to the exception test, it has been demonstrated that the development proposal will provide wider sustainability benefits to the community, and that the development will be safe for its lifetime, without increasing flood risk elsewhere. The exceptions test is therefore also passed.

7.6. The appeal scheme therefore accords with national and local planning policies and guidance with regards to flood risk. Consequently, there is no reason why planning permission should be withheld on the basis of flood risk.

APPENDIX 1 – LOCATION PLAN

KEY

Site Boundary

NOTES:
REVISIONS:

SITE LOCATION PLAN

NEWFIELDS FARM

CLIENT
Newfields BESS Ltd

0 90 Meters

DATE	SCALE	TEAM	APPROVED
22/12/2023	1:2,500@A2	CS	EB

SHEET	REVISION
-	D

DRAWING NUMBER
P23-0415_EN_02

PEGASUS GROUP

APPENDIX 2 – FRA & DRAINAGE ADDENDUM

FRA and Drainage Strategy Addendum

Rennard Consulting Limited
Ebenezer House
Ryecroft
Newcastle
ST5 2BE

Project: Newfields Farm BESS Facility		
Job Number:	00123	**No. of Sheets:**
Subject: FRA and Drainage Strategy Addendum		
Originator: F. Gennard		**Date:** 21.03.2025

Purpose of Calculation:

The following has been submitted as a supplement to the Flood Risk Assessment produced by KRS Environmental (Ref: KRS.0612.002.R.001.G).

The findings of the original Flood Risk Assessment report and the accompanying drainage strategy remain unchanged and should be read in conjunction with this report.

This document has been produced for planning purposes only.

Contents:

Project: Newfields Farm BESS Facility	Rennard Consulting Limited Helping our clients to make every drop count!	Rennard Consulting Limited Ebenezer House Ryecroft Newcastle ST5 2BE

Document Title: Addendum to FRA and Drainage Strategy	**Job Location:**		**Sheet No:**
	Originator: F. Gennard	**Date:** 21.03.2025	
	Revision: B	**Status:** PLANNING	

1.0 Introduction

The following has been submitted as a supplement to the Flood Risk Assessment produced by KRS Environmental (Ref: KRS.0612.002.R.001.G). A copy of which has been included within Appendix A.

The findings of the original Flood Risk Assessment report and the accompanying drainage strategy remain unchanged and should be read in conjunction with this report.

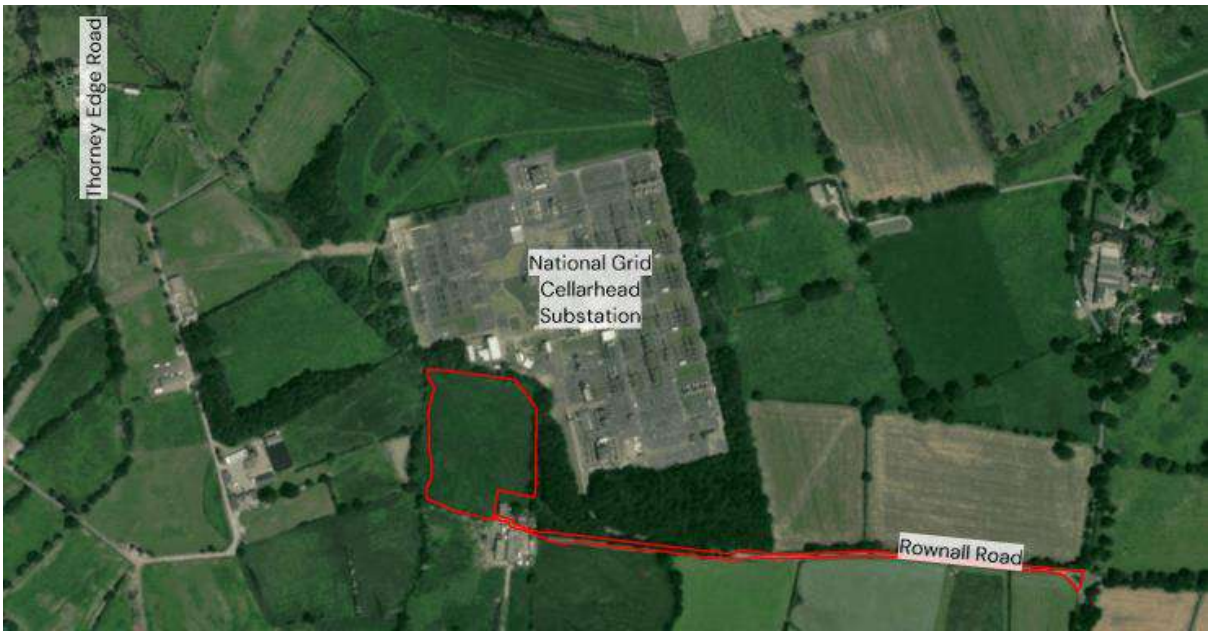
This document has been produced for planning purposes only.

2.0 Site Overview

The Site is situated on land north of Newfields Farm, off Rownall Road, Wetley Rocks, Stoke on Trent, Staffordshire, ST9 9LA. The Site is centred on approximate National Grid Reference 394387, 349120.

A site location plan is shown in Figure 1.

Figure 1: Site Location Plan



Source: Extract from P23-O415_EN_0001_C_1 SL

The site is currently agricultural land and is bounded by the Cellarhead National Grid Substation to the north, an existing drainage ditch and open fields to the west, an access road and open fields to the east and Newfield Farm to the south.

A topography survey was undertaken and found the site generally falls from southeast to northwest.

The Proposed Development is for a battery energy storage facility and associated infrastructure (see Appendix C). Further details with regard to the Proposed Development can be found in the accompanying information submitted within the planning application.

3.0 Key findings of the Flood Risk Assessment

The Flood Risk Assessment produced by KRS Environmental assessed the site for the following sources of flooding:

- Fluvial Flooding
- Tidal Flooding
- Groundwater Flooding
- Surface Water Flooding
- Sewer Flooding
- Flooding from Artificial Drainage Systems/ Infrastructure Failure

It found that the site was in Flood Zone 1 with the only other source of flooding being from surface water.

4.0 Reason for Addendum

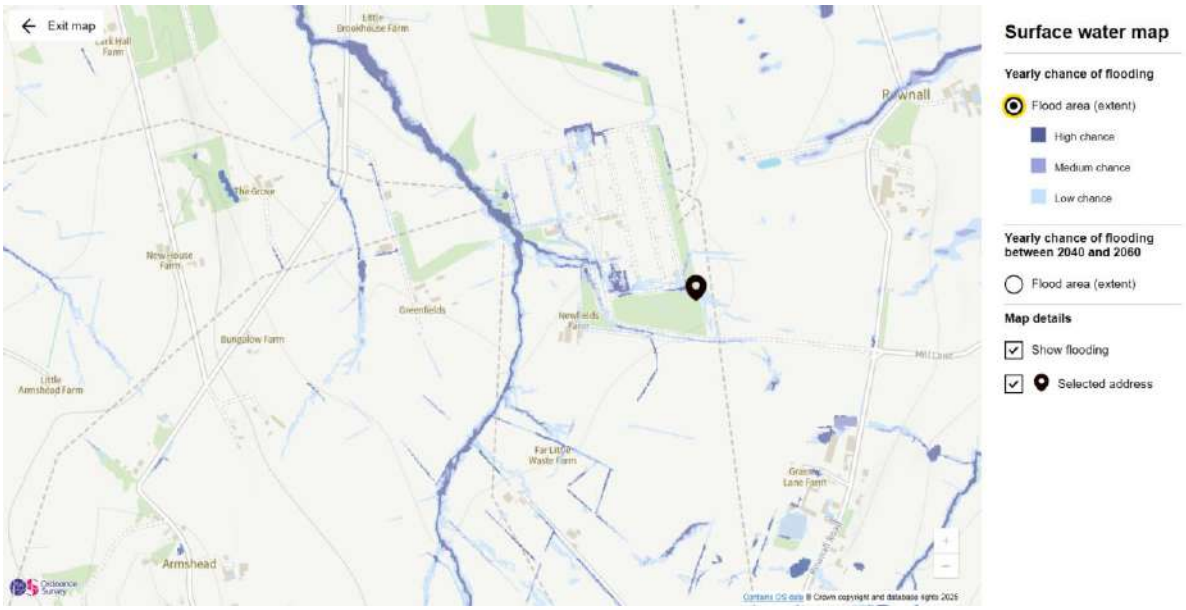
While the site sits in Flood Zone 1, due to the presence of a surface water flood risk, it was felt that an additional assessment should be provided. This is to ensure that the site had been set out with surface water flood risk in mind and that there is no increase in flood risk pre or post development.

5.0 Overview of Surface Water Flood Risk

With reference to the EA's online mapping, data related to the risk of potential surface water inundation or flooding is shown in Figure 2.

From looking at the map, there is a medium to high risk of surface water flooding which crosses the northern part of the site from east to west, before connecting into the existing drain which runs down the western boundary.

Figure 2: Surface Water Flood Maps



Source: https://check-long-term-flood-risk.service.gov.uk/map?easting=394720&northing=349077&map=SurfaceWater

This was confirmed by the LLFA who provided the following response as part of their assessment on the original Planning Application.

"Yes, the updated Flood Map for Surface Water(uFMfSW) does affect the proposed site area. The northern portion of the site is affected by surface water flooding during the 1 in 30-year event. Small areas of localised flooding are shown along the length of the unnamed watercourse flowing adjacent to the site's western boundary. In addition, there is localised surface water flooding shown in the vicinity of an existing land drain which heads towards the sites north-western boundary.

During the 100-year rainfall period, there is the start of a route for surface water to flow through the northern end of the development site.

Surface water is shown to pool on the access road to the east of the site before heading west through the development site toward the unnamed watercourse along the site western site boundary.

This flow path becomes more evident during the 1000-year rainfall event with the extent of surface water flooding also affecting a greater area within the northern areas of the development site."

The flood maps were overlain onto the proposed layout (see Appendix D) and showed that surface water collected on the accessway before heading northwest across the site towards the drainage ditch.

The key areas affected are the 132/33 kV switchyard, DNO control building, customer switch room, customer store building, auxiliary transformer.

6.0 Analysis of design proposals

While the site sits in Flood Zone 1, due to the presence of a surface water flood risk, it was felt that an additional assessment should be provided. This is to ensure that the site had been set out with the surface water flood risk in mind and that there is no increase in flood risk pre or post development.

6.1 Overview

The site is currently classed as being wholly in Flood Zone 1, however, from looking at the surface water flood maps, surface water is shown to pool on the access road to the east of the site before heading west through the development site toward the unnamed watercourse along the western site boundary.

This flow path becomes more evident during the 1000-year rainfall event with the extent of surface water flooding also affecting a greater area within the northern areas of the development site.

As such, the site will need to be set out with this risk in mind to ensure that there is no increase in flood risk pre or post development.

6.2 Analysis

The development is for a battery energy storage facility and associated infrastructure (see Appendix C). Further details regarding the Proposed Development can be found in the accompanying information submitted as part of the planning application.

From overlying the surface water flood maps (see Appendix D), surface water appears to collect on the accessway before heading northwest across the site towards the drainage ditch. The key areas affected are the 132/33 kV switchyard, DNO control building, customer switch room, customer store building, auxiliary transformer.

The KRS report highlighted that the maximum depth of water would be 300mm.

This was confirmed by a SCARLO analysis which predicted that the depth of water according to the Environment Agency Flood Mapping would range from 150mm to 300mm.

From looking at a more detailed SCARLO analysis, which takes closer contours it can be seen that the surface water flood risk is reduced as the area slopes quite steeply from southeast to northwest with no obvious plateaus or low spots where water could naturally collect (see Figure 3).

In addition, it is currently proposed that any equipment will sit on concrete pads which are raised at least 300mm above ground level (as per industry standard, see Appendix E) which would raise equipment above the maximum depth of water.

As such it is believed that the proposed equipment would be above any anticipated flood event.

Finally, while an acoustic bund is proposed, this has been designed so that the existing flow paths would be maintained as part of the development and as such would not have a detrimental impact on the depth, location or extent of flooding.

Figure 3: Extract from SCARLO Assessment

Source: SCARLO Analysis

In summary, the proposal will bring much needed energy storage infrastructure to the region which will help balance the electrical grid by storing energy when it's abundant and releasing it when demand is high.

These Battery Energy Storage Systems are important for integrating renewable energy sources like wind and solar into the grid.

While it is noted that the Environment Agency does highlight a surface water flood risk through the site, it is believed that this is more in relation to overland flow as opposed localised low spots and ponding. As such, as the existing flow paths will be maintained as part of the development, and, critical equipment will be positioned on plinths which are at a higher level than the maximum anticipated flood depth, it is therefore considered that the development has been positioned in the most suitable location and the risk of surface water flooding will not be increased as part of this development.

Appendix A – KRS Flood Risk Assessment

Newfields Farm, Wetley Rocks, Stoke on Trent, ST9 9LA

Flood Risk & Surface Water Drainage Assessment

For Newfields BESS Ltd

KRS.0612.002.R.001.G

January 2024

www.krsenvironmental.com

CONTACT DETAILS

Registered Office:
KRS Environmental Ltd
3 Princes Square
Princes Street
Montgomery
Powys
SY15 6PZ

Tel: 01686 668957
Mob: 07857 264 376

Email: keelan@krsenvironmental.com
Web: www.krsenvironmental.com
LinkedIn: uk.linkedin.com/in/keelanserjeant/

Office also at:
KRS Environmental Ltd
The Media Centre
7 Northumberland Street
Huddersfield
West Yorkshire
HD1 1RL

Tel: 01484 437420
Mob: 07857 264 376

Newfields Farm, Wetley Rocks, Stoke on Trent

Project	Flood Risk & Surface Water Drainage Assessment
Client	Newfields BESS Ltd
Status	Final
Prepared by	Emma Serjeant LL.B, MSc
Reviewed by	Keelan Serjeant BSc (Hons), MSc, MCIWEM
Date	January 2024

CONTENTS

TABLES & FIGURES

EXECUTIVE SUMMARY

The Site would be expected to remain dry in all but the most extreme conditions. The consequences of flooding are acceptable, and the development would be in accordance with the requirements of the National Planning Policy Framework (NPPF). The Proposed Development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The Proposed Development will considerably reduce the flood risk posed to the Site and to off-site locations due to the adoption of a Sustainable Drainage Systems (SuDS) Strategy.

The Proposed Development should not therefore be precluded on the grounds of flood risk or drainage.

1.0 INTRODUCTION

1.1 Background

This Flood Risk and Surface Water Drainage Assessment (FRA) has been prepared by KRS Environmental Limited at the request of Newfields BESS Ltd to support a planning application for the development of a battery storage facility ("the Proposed Development") on land north of Newfields Farm, off Rownall Road, Wetley Rocks, Stoke on Trent, Staffordshire, ST9 9LA ("the Site").

This FRA has been carried out in accordance with guidance contained in the National Planning Policy Framework (NPPF)[1] and associated Planning Practice Guidance (PPG)[2]. This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works.

1.2 National Planning Policy Framework

One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall. A risk-based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FRA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all sources;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- if necessary, provide the evidence to the Local Planning Authority (LPA) that the Sequential Test can be applied; and
- whether the development will be safe and pass part c) of the Exception Test if this is appropriate.

1.3 Report Structure

This FRA has the following report structure:

- Section 2 details the sources of information that have been consulted;
- Section 3 describes the location and the existing and proposed development;

[1] Ministry of Housing, Communities and Local Government (2023) National Planning Policy Framework.
[2] Communities and Local Government (2022) Planning Practice Guidance - Flood Risk and Coastal Change.

- Section 4 outlines the flood risk to the existing and proposed development;
- Section 5 details the proposed surface water drainage for the site and assesses the potential impacts of the proposed development on surface water drainage;
- Section 6 details the sequential and exception tests; and
- Section 7 presents conclusions.

2.0 SOURCES OF INFORMATION

2.1 Discussion with Regulators

Consultation and discussions with the relevant regulators have been undertaken during this FRA including the Environment Agency, the Local Planning Authority (LPA), the Lead Local Flood Authority (LLFA) and Sewerage Undertakers.

2.1.1 Environment Agency

The Flood and Water Management Act 2010 gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The Environment Agency is the statutory consultee with regards to flood risk and planning.

Environment Agency Flood Risk Standing Advice for England, the NPPF and PPG have been consulted and reviewed during this FRA. This has confirmed the level of FRA required and that a surface water drainage assessment is to be undertaken. Information regarding the current flood risk at the Site and local flood defences has been obtained from the Environment Agency.

2.1.2 Staffordshire Moorlands District Council

Staffordshire Moorlands District Council is the LPA. Planning guidance written by Staffordshire Moorlands District Council regarding flood risk was consulted to assess the mitigation policies in place. The Staffordshire County Council Preliminary Flood Risk Assessment (PFRA) which covers the Site has been reviewed.

2.1.3 Staffordshire County Council

Staffordshire County Council as the LLFA is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a SuDS Strategy. The aim of the SuDS Strategy is to identify water management measures, including SuDS, to provide surface water runoff reduction and treatment. Whilst the Proposed Development would not constitute a 'major development' due to its scale, a SuDS approach has been adopted.

2.1.4 Severn Trent Water

Severn Trent Water is responsible for the disposal of wastewater and supply of clean water for this area. Information with regards to sewer and water main flooding contained within Staffordshire Moorlands District Council SFRA and the Staffordshire County Council Preliminary Flood Risk Assessment (PFRA) have been consulted. All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system, and this is shown on the DG5 Flood Register.

3.0 LOCATION & DEVELOPMENT DESCRIPTION

3.1 Site Location

The Site is situated on land north of Newfields Farm, off Rownall Road, Wetley Rocks, Stoke on Trent, Staffordshire, ST9 9LA. The Site is centred on approximate National Grid Reference 394387, 349120. The location of the Site is shown in Figures 1 and 2.

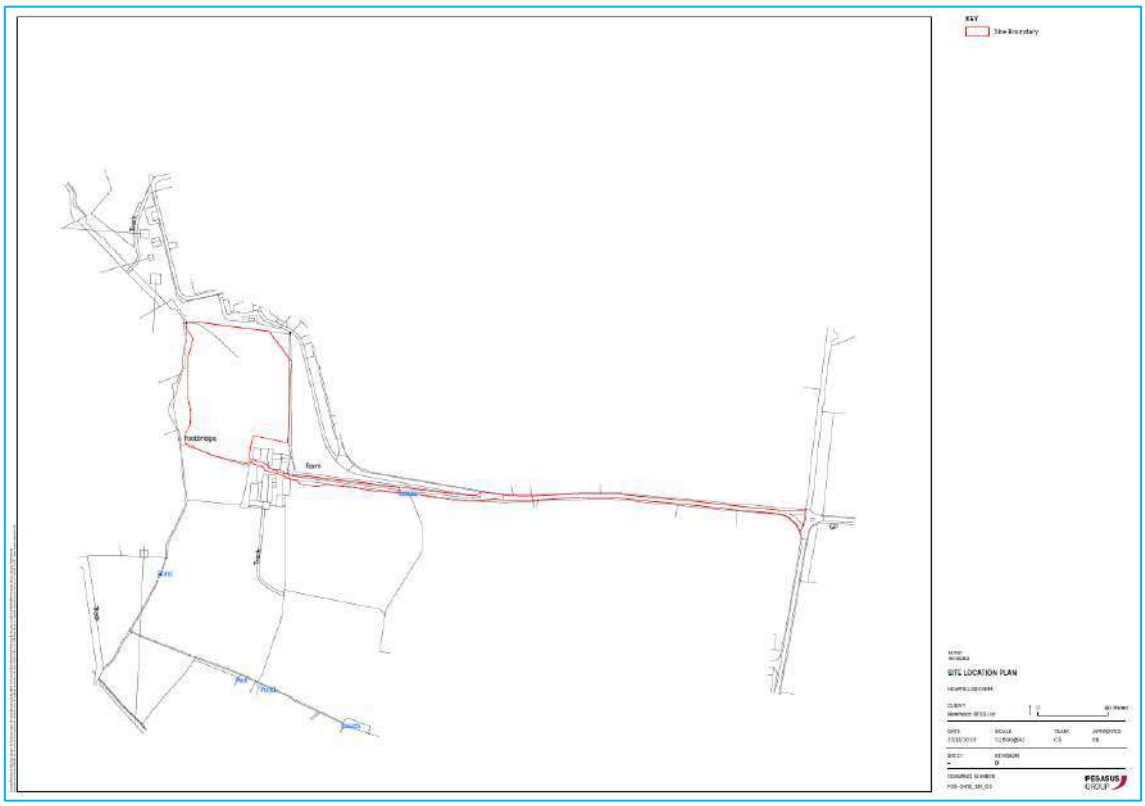


Figure 1 - Site Location

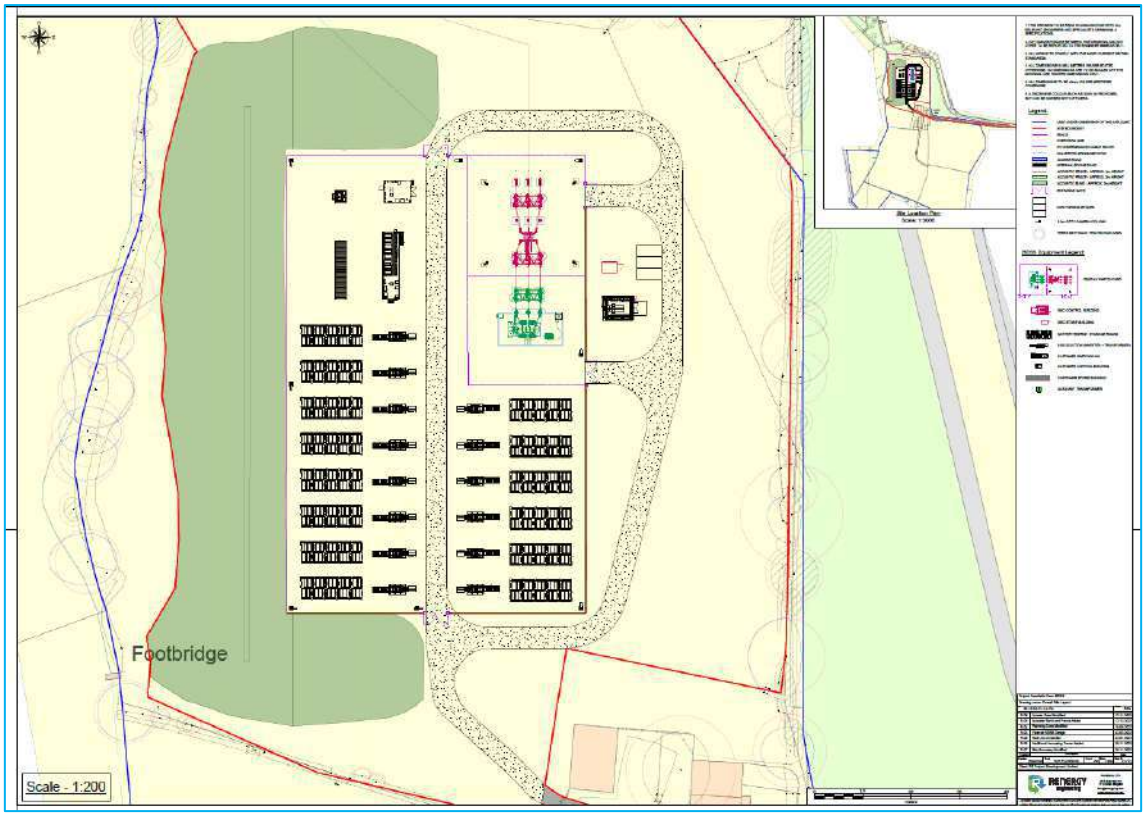


Figure 2 - Statutory Plan

3.2 Existing Development

The Site is currently agricultural land adjacent to an existing electricity substation.

3.3 Proposed Development

The Proposed Development is for a battery storage facility and associated infrastructure (see Appendix 1). Further details with regard to the Proposed Development can be found in the accompanying information submitted with the planning application.

3.4 Catchment Hydrology / Drainage

A drainage ditch is located adjacent to the western boundary of the Site which ultimately discharges into Stanley Pool. The Site currently comprises permeable land with no formal drainage system.

3.5 Ground Levels

The Site is relatively flat with an approximate ground level of 230 metres Above Ordnance Datum (mAOD).

3.6 Ground Conditions

The British Geological Survey (BGS) map shows that the superficial deposits consist of Till, Devensian - diamicton. The bedrock deposits consist of the Morridge formation group - mudstone, siltstone and sandstone. Sedimentary bedrock formed approximately 320 to 329 million years ago in the Carboniferous Period.

Information from the National Soil Resources Institute details the Site area as being situated on slowly permeable, seasonally wet acid loamy and clayey soils with impeded drainage. The Wallingford

Winter Rain Acceptance Potential (WRAP) map indicates that the site lies within WRAP Class 4: clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

A Ground Investigation Report has been prepared by Greencat Geotechnical in August 2023. The Groundsure Report referred to within the Ground Investigation Report indicates that the permeability of the natural superficial soils beneath the site is likely to vary between low and high, most likely depending on the fraction of clay and/or silt within the soils. An estimate of the permeability of the made ground shown to lie on the north-east of the site is not given in the report but is likely to be similar to the natural soils. Therefore, the permeability of the bedrock at the site is indicated to vary between low and high, with water flow most likely along fractures and other discontinuities within the rock mass

4.0 FLOOD RISK

4.1 Sources of Flooding

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

4.2 Environment Agency Flood Zones

A review of the Environment Agency's Flood Zones indicates that the Site is located within Flood Zone 1 and therefore has a 'low probability' of flooding as shown in Figure 3, with less than a 1 in 1000 annual probability of river in any year (<0.1%).

The Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. They show the worst-case scenario.

The Environment Agency Flood Zones and acceptable development types are explained in Table 1. Table 1 shows that all development types are generally acceptable in Flood Zone 1.

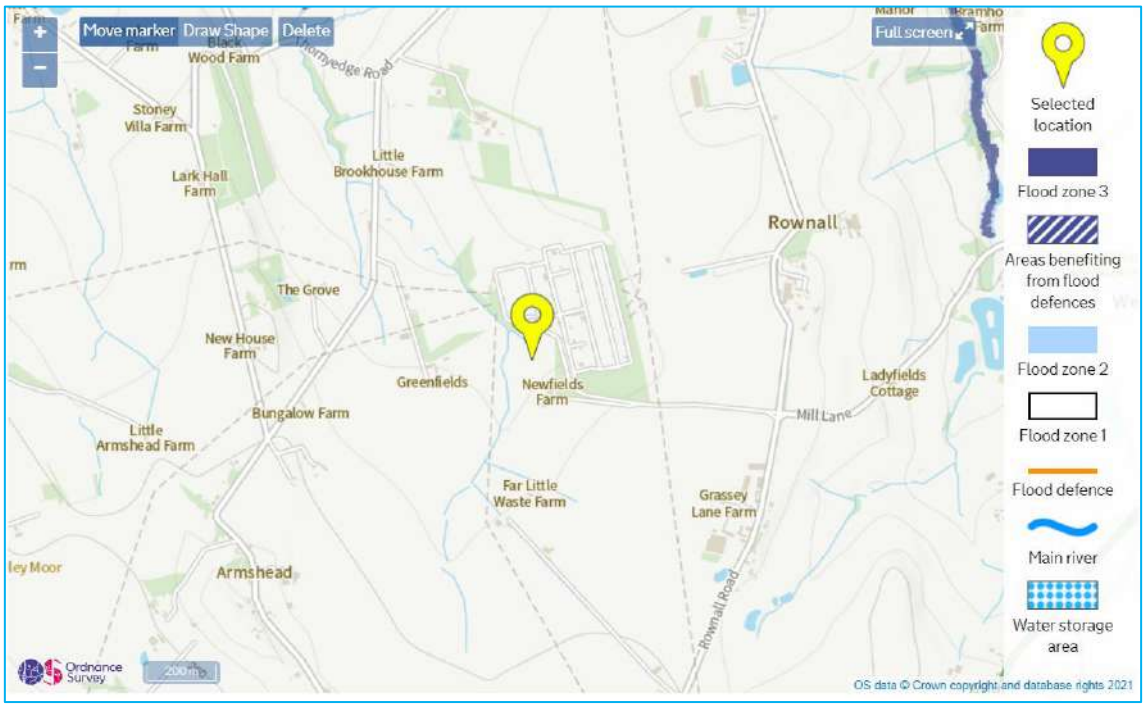


Figure 3 - Environment Agency Flood Zones

Table 1 - Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types generally acceptable
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development type are generally acceptable
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	Some development types not acceptable
Zone 3b	'Functional Floodplain'	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)	Some development types not acceptable

4.3 Flood Vulnerability

In the Planning Practice Guidance to the NPPF, appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in the PPG, the proposed use is classified as 'essential infrastructure'. Table 2 of this report and the PPG states that 'essential infrastructure' uses are appropriate within Flood Zone 1 after the completion of a satisfactory FRA.

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	×	×	×

Key: *✓: Development is appropriate, ×: Development should not be permitted.*

4.4 Historic Flooding

Environment Agency data shows that the Site has not historically flooded. There are no records of anecdotal information of flooding at the Site including within the British Hydrological Society "Chronology of British Hydrological Events[4]". No other historical records of flooding for the Site have been recorded. Therefore, it has been concluded that the Site has not flooded within the recent past.

4.5 Existing and Planned Flood Defence Measures

Environment Agency data confirms that the Site is not protected against flooding by existing flood defence measures (see Figure 3).

4.6 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA's. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the flood risk assessments: climate change allowances guidance[3]. Table 3 shows peak river flow allowances by river basin district.

As per Environment Agency guidance, the anticipated lifetime of the development is deemed to be 75 years however, the actual lifetime of the development will be less. The flood risk assessments: climate change allowances guidance recommends that for 'essential infrastructure' uses in Flood Zone 1 that the central allowances are used. Therefore, the design flood level for the Site is the 1 in 100 year (+31%) event.

Table 3 - Peak River Flow Allowances

River basin district	Allowance category	2020s	2050s	2080s
Dove Management Catchment	Upper	+28%	+39%	+62%
	Higher	+17%	+24%	+40%
	Central	+13%	+18%	+31%

[3] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances

4.7 Fluvial (river) Flooding

The Environment Agency Surface Water flood map is representative of the fluvial flood risk posed to the Site. The Environment Agency Surface Water flood map shows that the Site has a very low risk (see Figure 4) with an annual probability of flooding of less than 1 in 1000 (0.1%) years.

The Environment Agency Surface Water flood map shows that the majority of the Site has a very low risk of surface water flooding (see Figure 4) with an annual probability of less than 1 in 1000 (0.1%) years. However, small areas of the Site are shown to have a low to medium risk of surface water flooding with an annual probability of flooding of between a 1 in 1000 (0.1%) and 1 in 100 (1%) years and 1 in 100 (1%) and 1 in 30 (3.3%) and may result in water depths of below 300mm.

The low to medium risk of surface water flooding is associated with drainage ditches within the vicinity of the Site and are confined to areas immediately adjacent to the drainage ditches. The flooding source will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the Proposed Development only affecting the northern area of the Site to the north of the proposed infrastructure.

Given the scale and nature of the proposed development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a low flood risk to the Site and the risk of fluvial flooding is considered to be of **low significance**.

4.8 Tidal (coastal) Flooding

The Site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be **not significant.**

4.9 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site ground conditions suggest a low potential for groundwater flooding, it is unlikely that rapid rises in groundwater levels would be facilitated through these deposits. Additionally, the topography of the site indicates that it is conductive to good drainage. A review of current and historical maps identified no springs within 500m of the Site. The natural or anthropogenic drainage network in the area does not suggest that large yielding springs are present in the area surrounding the Site and also no below surface buildings are proposed for the site. The risk of flooding from groundwater flooding is considered to be **not significant**.

4.10 Surface Water (pluvial) Flooding

The Site is not situated near to large areas of poor permeability which may result in surface water flooding. The Environment Agency Surface Water flood map shows that the majority of the Site has a very low risk of surface water flooding (see Figure 4) with an annual probability of flooding of less than 1 in 1000 (0.1%) years. However, a small proportion of the Site is shown to have a low to medium risk of surface water flooding with an annual probability of flooding of between a 1 in 1000 (0.1%) and 1 in 100 (1%) years and 1 in 100 (1%) and 1 in 30 (3.3%) and may result in water depths of below 300mm.

The low to medium risk of surface water flooding is associated with drainage ditches within the vicinity of the Site and are confirmed to areas immediately adjacent to the drainage ditches. The flooding source will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the Proposed Development only affecting the northern area of the Site to the north of the proposed infrastructure.

Given the scale and nature of the proposed development and the size and location of the surface water flooding sources it has been concluded that surface water flooding poses a low flood risk to the Site and the risk of surface water flooding is considered to be of **low significance**.

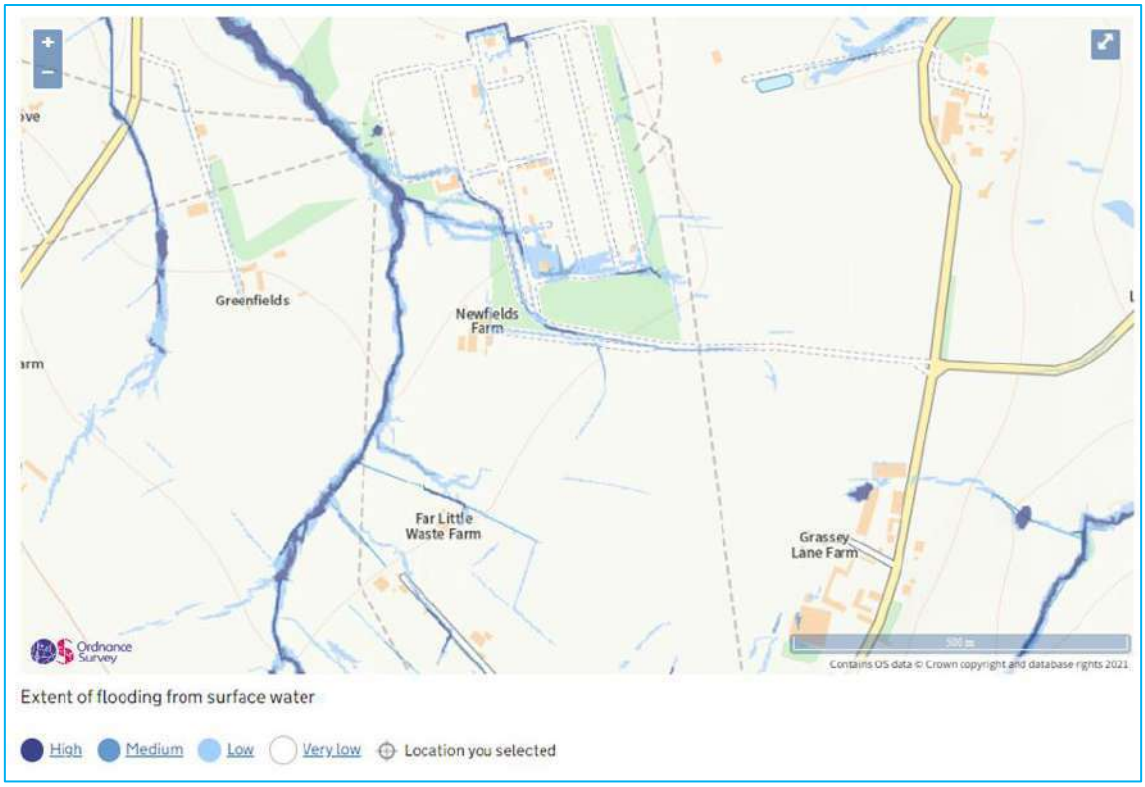


Figure 4 - Environment Agency Surface Water Flood Map

4.11 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development.

Flood flows could also be generated by burst water mains, but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment. There are no public sewers located within the vicinity of the Site therefore, the risk of flooding from sewer flooding is considered to be **not significant**.

4.12 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no other nearby artificial water bodies, reservoirs, water channels and artificial drainage systems that could be considered a flood risk to the Site. The Environment Agency Reservoir flood map shows that the Site is not at risk of flooding from reservoir failure (see Figure 5). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

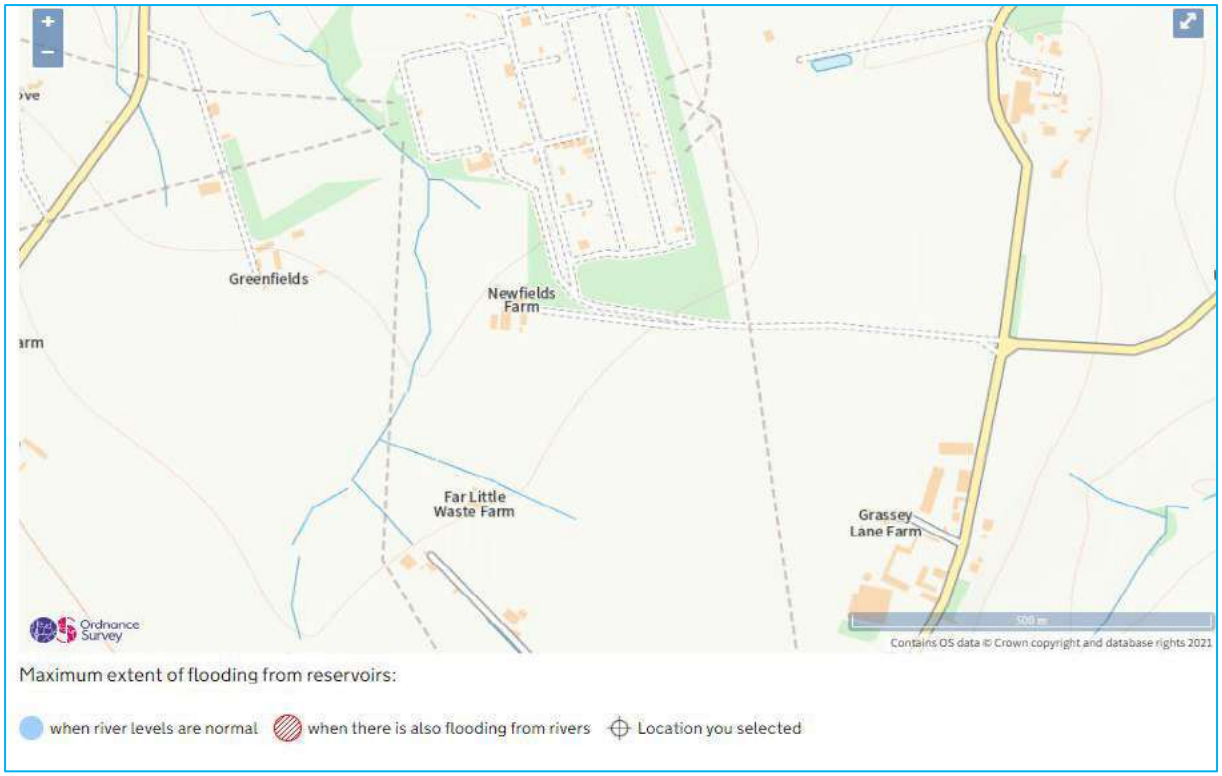


Figure 5 - Environment Agency Reservoir Flood Map

4.13 Summary of Site-Specific Flood Risk

A summary of the sources of flooding and a review of the risk posed by each source at the site is shown in Table 4. A number of flooding sources have been identified which may pose a **low significant** risk to the Site. These are:

- Fluvial Flooding
- Surface Water Flooding

The only element of the Proposed Development that is shown to be at risk of fluvial flooding is outside of the built area of the Site. The flooding sources will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the Proposed Development.

There will be no net loss in flood storage capacity or impact on movement of floodwater across the Site. The overall direction of the movement of water will be maintained within the developed Site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed.

The proposed use of the Site is 'essential infrastructure', 'essential infrastructure' uses are appropriate within Flood Zones 1 after the completion of a satisfactory FRA. In conclusion, the flood risk to the Site can be considered to be limited, with a low annual probability of flooding and from all sources. The Site is unlikely to flood except in very extreme conditions.

Table 4 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial Flooding	Yes	Drainage Ditch	Low
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	Yes	Drainage Ditch	Low
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	No	None Reported	None

5.0 SURFACE WATER DRAINAGE

5.1 Surface Water Management Overview

It is recognised that consideration of flood issues should not be confined to the floodplain. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. For example, replacing vegetated areas with roofs, roads and other paved areas can increase both the total and the peak flow of surface water runoff from the development site. Changes of land use on previously developed land can also have significant downstream impacts where the existing drainage system may not have sufficient capacity for the additional drainage.

An assessment of the surface water runoff rates has been undertaken, in order to determine the surface water options and attenuation requirements for the Site. The assessment considers the impact of the Proposed Development compared to current conditions. Therefore, the surface water attenuation requirement for the developed site can be determined and reviewed against existing arrangements.

The requirement for managing surface water runoff from developments depends on the predeveloped nature of the site. If it is an undeveloped greenfield site, then the impact of the development will need to be mitigated so that the runoff from the site replicates the natural drainage characteristics of the pre-developed site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development, unless specific offsite arrangements are made and result in the same net effect.

It should be acknowledged that the satisfactory collection, control and discharge of surface water runoff are now a principle planning and design consideration. This is reflected in implemented guidance as well as the Defra non-statutory technical standards for SuDS.

5.2 Climate Change

Projections of future climate change in the UK indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF (see Section 14) recommends that the effects of climate change are incorporated into FRA's. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the associated Planning Practice Guidance to the NPPF[4].

The recommended national precautionary sensitivity range for peak rainfall intensity are summarised in Table 5. The proposals will take into account a 40% increase in rainfall intensity due to climate change.

Table 5 - Peak Rainfall Intensity Allowance

Parameter	2050s	2070s
Upper end	+40%	+40%
Central	+25%	+30%

[4] Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

5.3 Opportunities for Discharge of Surface Water

Possible receptors for runoff generated onsite have been assessed in line with the prioritisation set out in the Defra non-statutory technical standards for SuDS. There are four possible options to discharge the surface water. The Runoff Destination is (in order of preference):

a) To ground;

b) To surface water body;

c) To road drain or surface water sewer;

d) To combined sewer

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local runoff profile by using systems that can either attenuate runoff and reduce peak flow rates or positively impact on the existing surface water runoff.

5.3.1 Discharge to Ground

In determining the future surface runoff from the Site, the potential of using infiltration has been considered. As detailed previously, information from the National Soil Resources Institute details the site area as being situated on slightly acid loamy and clayey soils with impeded drainage.

BRE 365 soakaway tests were carried out by a third party on 20th July 2022. Four trial pits were excavated at the Site. The infiltration testing results are presented in Appendix 2; these results indicate that no appreciable infiltration was observed at any of the trial pits (reflecting the fine grained nature of the encountered soils). As such, no representative infiltration rates have been calculated. Therefore, the ground conditions suggest infiltration would provide inception storage, but disposal of significant volumes of runoff may not be appropriate.

5.3.2 Discharge to Surface Water Body

Should infiltration be found to be unsuitable, the next option is discharge to a surface waterbody. A drainage ditch is located adjacent to the northern and western boundaries of the Site which ultimately discharge to Stanley Pool to the north west of the Site. Therefore, it would be possible to discharge surface water runoff from the site into a watercourse. This is the preferred option for the discharge of surface water runoff from the Site.

5.3.3 Discharge to Road Drain or Surface Water Sewer

This option is not required.

5.3.4 Discharge to a Combined Sewer

This option is not required.

5.3.5 Summary

For the purposes of this assessment the most likely scenario of discharging to the drainage ditch with attenuation and a restricted runoff rate is proposed. The ground conditions suggest infiltration would provide inception storage, but disposal of significant volumes of runoff may not be appropriate.

5.4 Surface Water Runoff

Currently the majority of rainfall infiltrates into the soil substrate and/or runoff from the Site. It is proposed that the Site will be surfaced with grass, crushed permeable stone and compacted impermeable stone or similar. The proposed impermeable area will total approximately 7,500m^2.

An estimation of surface water runoff is required to permit effective site surface water management and prevent any increase in flood risk to off-site receptors. In accordance with The SuDS Manual, the Greenfield runoff from the Site has been calculated using the IoH124 method[5]. Table 6 shows the IoH124 method Greenfield runoff rates calculated for the proposed impermeable area of 4,230m^2. The mean annual maximum flow rate from a Greenfield site (QBAR: approximately a 2.30 year return period) has been calculated to be 2.40 litres/second (l/s) (see Appendix 3).

Table 6 - IoH124 Method Greenfield Runoff Rates

Rainfall Event	Runoff Rate (l/s)
1	2.00
QBAR (rural)	2.40
30	4.80
100	6.30

The method used for calculating the runoff complies with the NPPF, as well as the new Defra non-statutory technical standards for SuDS, and assumes that the excess runoff associated with the Proposed Development (plus an allowance for future climate change) will need to be managed by the proposed SuDS scheme.

5.5 SuDS Strategy

One of the aims of the NPPF is to provide not only flood risk mitigation but also to maximise additional gains such as improvements in runoff quality and provision of amenity and biodiversity. Systems incorporating these features are often termed SuDS and it is the requirement of NPPF that these are considered as the primary means of collection, control and disposal for storm water as close to source as possible.

The objective of this SuDS Strategy is to ensure that a sustainable drainage solution can be achieved which reduces the peak discharge rate to manage and reduce the flood risk posed by the surface water runoff from the site. The SuDS Strategy takes into account the following principles:

- No increase in the volume or runoff rate of surface water runoff from the Site.
- No increase in flooding to people or property off-site as a result of the Proposed Development.
- No surface water flooding of the Site.
- The proposals take into account a 40% increase in rainfall intensity due to climate change during the lifetime of the development.

In line with adopting a 'management train' it is recommended that water is managed as close to source as possible. This will reduce the size and cost of infrastructure further downstream and also shares the maintenance burden more equitably. The proposed SuDS Strategy will take the form of:

- Permeable surfaces - crushed permeable stone and grass.

[5] Institute of Hydrology, Flood Estimation of Small Catchments, June 1994.

- Surface water attenuation storage in the form of underground crate system attenuation tank. Runoff rates would be restricted to 5.00l/s to the drainage ditch to the north west corner of the site.

One of the aims of the NPPF is to provide not only flood risk mitigation but also to maximise additional gains such as improvements in runoff quality and provision of amenity and bio-diversity. Systems incorporating these features are often termed SuDS and it is the requirement of NPPF that these are considered as the primary means of collection, control and disposal for storm water as close to source as possible.

The principle applied in the design of storage is to limit the discharge rate of surface water runoff from the developed site for events of similar frequency of occurrence to the same peak rate of runoff as that which takes place from a greenfield site prior to development. It would not be practical to include a pond, or lagoon within the site it would also not be sustainable to install a green roof on the buildings/structures.

The SuDS Strategy is shown in Appendix 4. This Strategy will reduce peak flows, the volume of runoff, and slow down flows and will provide a suitable SuDS solution for this site. The adoption of a SuDS Strategy for the site represents an enhancement from the current conditions as the current surface water runoff from the site is uncontrolled, untreated, unmanaged and unmitigated. In adopting these principles, it has been demonstrated that a scheme can be developed that does not increase the risk of flooding to adjacent properties and development further downstream.

The equipment will sit on concrete rafts, the apron in front of the equipment will be constructed from compacted impermeable surfaces. These areas, where possible, will be constructed to shed water to any adjacent permeable areas. The rest of the site will be constructed from free draining stone or grass which will allow infiltration of rainfall.

The free draining stone will have a sufficient void ratio of 30% and permeability of granular fill to allow adequate percolation and to control the risk of blockage (examples include coarse aggregate 4-40mm (4/40), 4-20mm (4/20) as defined in BS 753313:2009 or Type 3 sub-base 0-40mm (0/40)). A permeable/open-graded (reduced fines) sub-base layer (i.e. Type 3 with a void ratio of 30%) will be used as a drainage layer below the permeable surfaces which will be sufficiently permeable to allow water to drain through and to store water temporarily. The selected gravel fill and bedding would be clean, free-draining, angular shaped material in the specified size range.

Infiltration capacities of free draining stone are significantly greater than the design rainfall intensities and are not a limiting factor. A minimum value of 2500mm/hr is considered reasonable within The SuDS Manual (see Section 20.5.1 of the SuDS Manual). These are SuDS source control compliant and will as a minimum provide storage for the first 5mm (interception storage). Permeable surfaces, together with their associated substructures, are an efficient means of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium. These systems encourage biological treatment of flow and extraction of oils and heavy metals from the runoff. Treatment processes that occur within the surface structure and the geotextile layers include:

- Filtration
- Absorption
- Biodegradation
- Sedimentation

It will also assist in reducing the flood profile of the site by significantly attenuating the runoff from the proposed development within the sub-base material.

It is proposed that an underground crate system attenuation tank will be used to provide the required attenuation storage volume for the impermeable areas consisting of the equipment and roadways within the Site. Additional storage would be provided within the manholes and pipes which will provide betterment over and above the 1 in 100 year (+40%) event.

The QBAR runoff rate has been calculated to be 2.40l/s. A value of 5.00l/s has been used as the limiting discharge rate before discharge off the Site. Appendix 5 shows the drainage network and volume of storage required for the proposed development estimated within the MicroDrainage Software for the 1 in 100 year event, with a 40% allowance for climate change (increase in peak rainfall) with 5.00l/s used as the limiting discharge rate before discharge off the Site.

Given the nature of the energy storage within the proposed development, there is a potential risk of fire which may negatively affect upon the local water environment by mobilising pollution within surface water runoff, ultimately discharging to the nearby watercourses or infiltrating to ground. Fire risk and negative effects on the local water environment will be minimised by ensuring that firewater run-off is contained and treated, with measures in place which will be detailed within the Emergency Response Plan, such as the valve to the attenuation tank being turned off to ensure no contaminated fire water gets into the system and the provision of a gravel sump and oil interceptor underneath the BESS compound to capture pollutants.

5.6 Designing for Local Drainage System Failure

When considering residual risk, it is necessary to make predictions as to the impacts of a storm event that exceeds the design event, or the impact of a failure of the local drainage system. The SuDS Strategy applies a safe and sustainable approach to discharging rainfall runoff from the site and this reduces the risk of flooding however, it is not possible to completely remove the risk.

As part of the SuDS Strategy it must be demonstrated that the flooding of property would not occur in the event of local drainage system failure and/or design exceedance. It is not economically viable or sustainable to build a drainage system that can accommodate the most extreme events. Consequently, the capacity of the drainage system may be exceeded on rare occasions, with excess water flowing above ground. However, this is considered unlikely in the immediate future due to the 40% allowance for climate change used in the calculations.

The design of the Proposed Development provides an opportunity to manage this local drainage system failure/exceedance flow and ensure that indiscriminate flooding of property does not occur. There will not be an extensive sewerage network on the Proposed Development and therefore any potential exceedance flooding would be from the sewers and lateral drains connecting the impermeable areas to the storage areas. It is very unlikely that a catastrophic failure would occur. An exceedance or blockage event of the sewers would not affect the proposed buildings/structures because the finished floor level will be raised above surrounding ground levels, ensuring any exceedance flooding would not affect the buildings/structures. Exceedance flows would be contained within the permeable areas within the site and would flow to the lower ground levels. It is not considered that there is an increased risk to the site or properties located adjacent to the site.

Surface water runoff would be directed to the drainage system through drainage gullies located around the perimeter of the structures and through contouring of the hardstanding areas. When considering the impacts of a storm event that exceeds the design event, there is safety factor, even under the design event conditions. Consequently, if this event were to be exceeded there is additional capacity with the system to accommodate this (i.e. within the manholes, pipes etc.). If this freeboard was to be exceeded the consequences would be similar, if not less than for the local drainage system

failure. Consequently, the impact of an exceedance event is not considered to represent any significant flood hazard.

The above manages and mitigates the flood risk from surface water runoff to the adjacent premises and site infrastructure from surface water runoff generated by the Proposed Development.

6.0 SEQUENTIAL APPROACH

6.1 Sequential and Exception Tests

The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The flood risk to the Site can be considered to be limited; the Site is situated in Flood Zone 1, with a low annual probability of flooding and from all sources. The Site is unlikely to flood except in very extreme conditions. Therefore, the Sequential and Exception Tests will not need to be undertaken as part of this planning application.

7.0 CONCLUSIONS

7.1 Conclusion

In conclusion, the Site would be expected to remain dry in all but the most extreme conditions. The Proposed Development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The Proposed Development will considerably reduce the flood risk posed to the Site and to off-site locations due to the adoption of a SuDS Strategy.

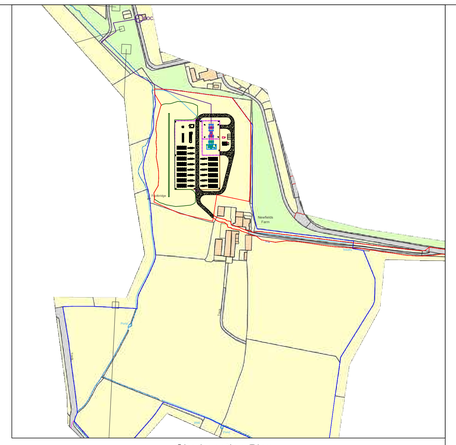
The Proposed Development should not therefore be precluded on the grounds of flood risk or drainage.

APPENDIX 1 – Proposed Site Layout

N
W E
S

Footbridge

Scale - 1:200



Site Location Plan
Scale: 1:3000

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS AND SPECIALISTS DRAWINGS & SPECIFICATIONS.

2. ANY DISCREPANCIES BETWEEN THIS DRAWING AND ANY OTHER TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

3. ALL WORKS TO COMPLY WITH THE MOST CURRENT BRITISH STANDARDS.

4. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE. NO DIMENSIONS ARE TO BE SCALED OFF THE DRAWING. USE FIGURED DIMENSIONS ONLY.

5. ALL DIMENSIONS TO BE ±3mm UNLESS SPECIFIED OTHERWISE.

6. A RECESSIVE COLOUR SUCH AS GREY IS PROPOSED, BUT CAN BE AGREED WITH OFFICERS.

Legend:

- LAND UNDER OWNERSHIP OF THE APPLICANT
- SITE BOUNDARY
- FENCE
- OVERHEAD LINE
- HV UNDERGROUND CABLE ROUTE
- CULVERTED DRAINAGE DITCH
- ACCESS ROAD
- INTERNAL STONE ROAD
- ACOUSTIC FENCE - APPROX. 4m HEIGHT
- ACOUSTIC FENCE - APPROX. 2m HEIGHT
- ACOUSTIC BUND - APPROX. 3m HEIGHT
- ENTRANCE GATE
- CAR PARKING SPACES
- 5.0m CCTV CAMERA COLUMN
- TREES WITH ROOT PROTECTION AREA

BESS Equipment Legend:

- 132/33 kV SWITCHYARD
- DNO CONTROL BUILDING
- DNO STORE BUILDING
- BATTERY ENERGY STORAGE RACKS
- SKID SOLUTION (INVERTER + TRANSFORMER)
- CUSTOMER SWITCHROOM
- CUSTOMER CONTROL BUILDING
- CUSTOMER STORE BUILDING
- AUXILIARY TRANSFORMER

0 10 20 30 40
meters

Project: Newfields Farm BESS
Drawing name: Overall Site Layout
No: 88-10-05-PL-LA-OA
Drawn: REN

Revision	Description	Date
R.06	Access Road Modified	17.11.2023
R.05	Acoustic Bund and Fence Added	12.10.2023
R.04	Planning Zone Modified	19.06.2023
R.03	Fluence BESS Design	02.03.2023
R.09	Red Line Amended	02.01.2024
R.08	Additional Acoustic Fence Added	29.11.2023
R.07	Site Boundary Modified	28.11.2023

Discipline: Electrical | Phase: FOR PLANNING | Format: A0 | Scale: 1:200 | Sheet No: 01 / 01

Client: RE Project Development Limited

RENERGY LTD
28 E Samokov str.
1113 Sofia, Bulgaria
info@renergy-bg.com
www.renergy-bg.com

APPENDIX 2 – BRE 365 Soakaway Tests

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.423	Urban	0.000
SAAR (mm)	883	Region Number	Region 4

Results l/s

QBAR Rural	2.4
QBAR Urban	2.4
Q100 years	6.3
Q1 year	2.0
Q30 years	4.8
Q100 years	6.3

APPENDIX 3 – IoH 124 Method Calculations

Groundfirst

Reliable ground quality advice

Infiltration testing: Newfields Farm, Rownall Road, Wetley Rocks

Prepared for: RE Projects Development Ltd.
565 High Road
Leytonstone
London
E11 4PB

Report reference: 4272R1

Date of reporting: 21st July 2022

Report status: Final report

Prepared by
Ground First Ltd

26 Victoria Street, Castlefields, Shrewsbury, SY1 2HS
Tel: 07484 542827
email: info@groundfirst.com
Registered in England and Wales, number 10418394

Groundfirst

Reliable ground quality advice

Infiltration testing: Newfields Farm, Rownall Road, Wetley Rocks

Revision record:

Issue	Date	Status	Comment	Author	Recipient
1	21st July 2022	Final		AJS	RE Projects Development Ltd.

Prepared by
Ground First Ltd

26 Victoria Street, Castlefields, Shrewsbury, SY1 2HS
Tel: 07484 542827
email: info@groundfirst.com
Registered in England and Wales, number 10418394

CONTENTS

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 Background

Planning permission is being sought from Staffordshire Moorlands District Council (application ref: SMD/2022/0180) for the '*development of a Battery Energy Storage System (BESS) with ancillary infrastructure, security fence, access, landscaping and biodiversity enhancements'* at Newfields Farm near Wetley Rocks in Staffordshire (herein referred to as the 'Site'). The Site location is shown on Figure 1.1. The proposed development plan is shown on Figure 1.2.

In support of the planning process KRS Environmental Ltd prepared a flood risk and surface water drainage assessment report for the study Site in March 2022. The KRS report identified two drainage options; discharge to ground is the preferred approach (option 1), although discharge to an adjacent water course (option 2) may be required, should infiltration to ground be unfeasible.

A consultation response provided by the Lead Local Flood Authority (Staffordshire County Council) on 16th May 2022 provided the following recommendations:

- *Infiltration testing to BRE 365 standards should be undertaken to confirm the suitability of the ground conditions for infiltration methods for surface water drainage option 1.*
- *The results from the infiltration testing shall determine the confirmation of the final drainage option in line with the hierarchy of surface water disposal as described in Part H of the Building Regulations.*

1.2 Instruction

Ground First was instructed by Third Revolution Projects Ltd., on behalf of RE Project Developments Ltd., on 24th June 2022 to undertake infiltration testing as outlined in proposal reference 4272P1.

1.3 Objectives

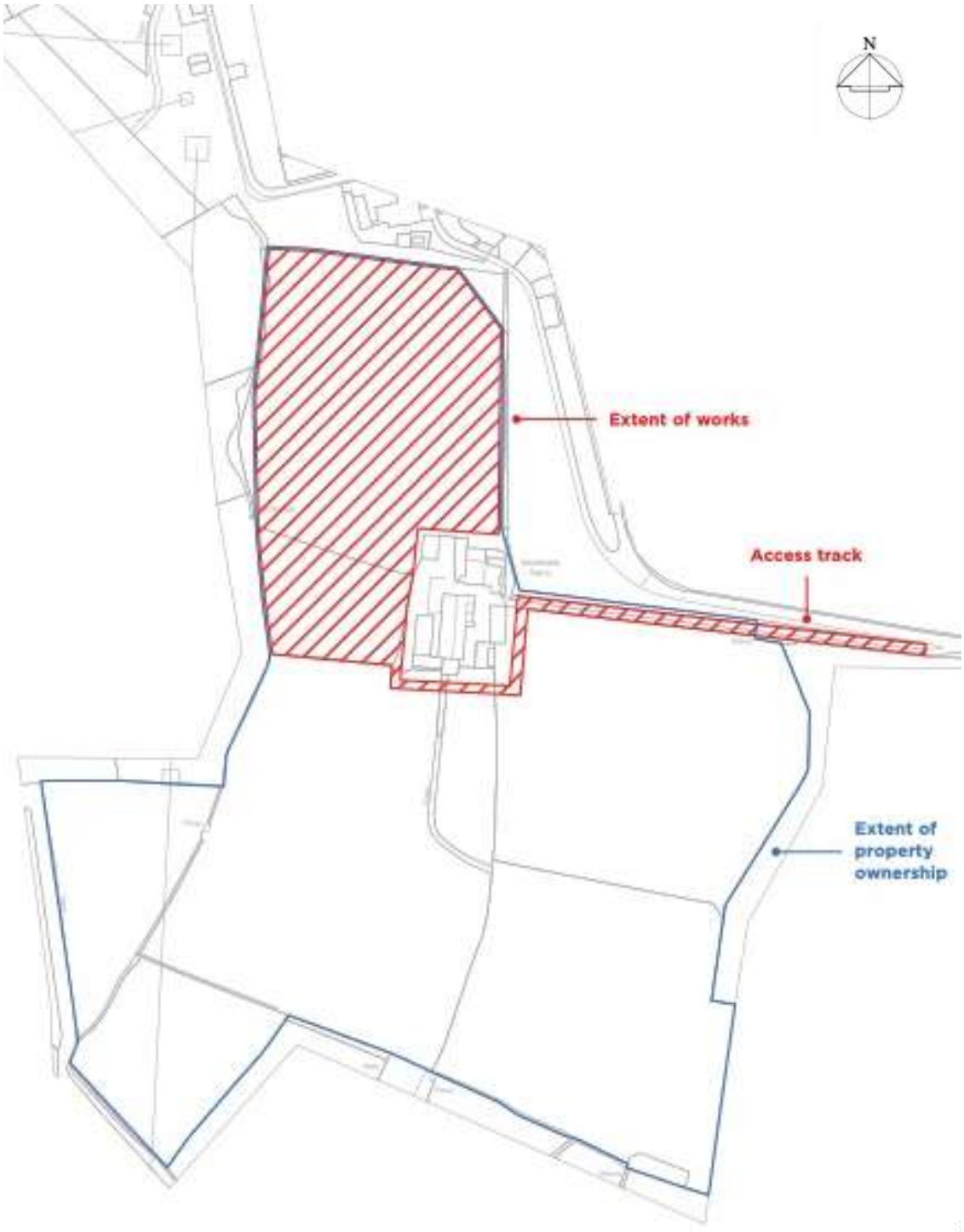
The objective of the work was to undertake appropriate site investigations designed to determine representative soil infiltration rates in line with the requirements of BRE Digest 365 (Soakaway Design).

It is understood that the infiltration rate information will be used by a third-party consultant to further inform a suitable drainage design in line with the requirements of the Lead Local Flood Authority.

1.4 This report

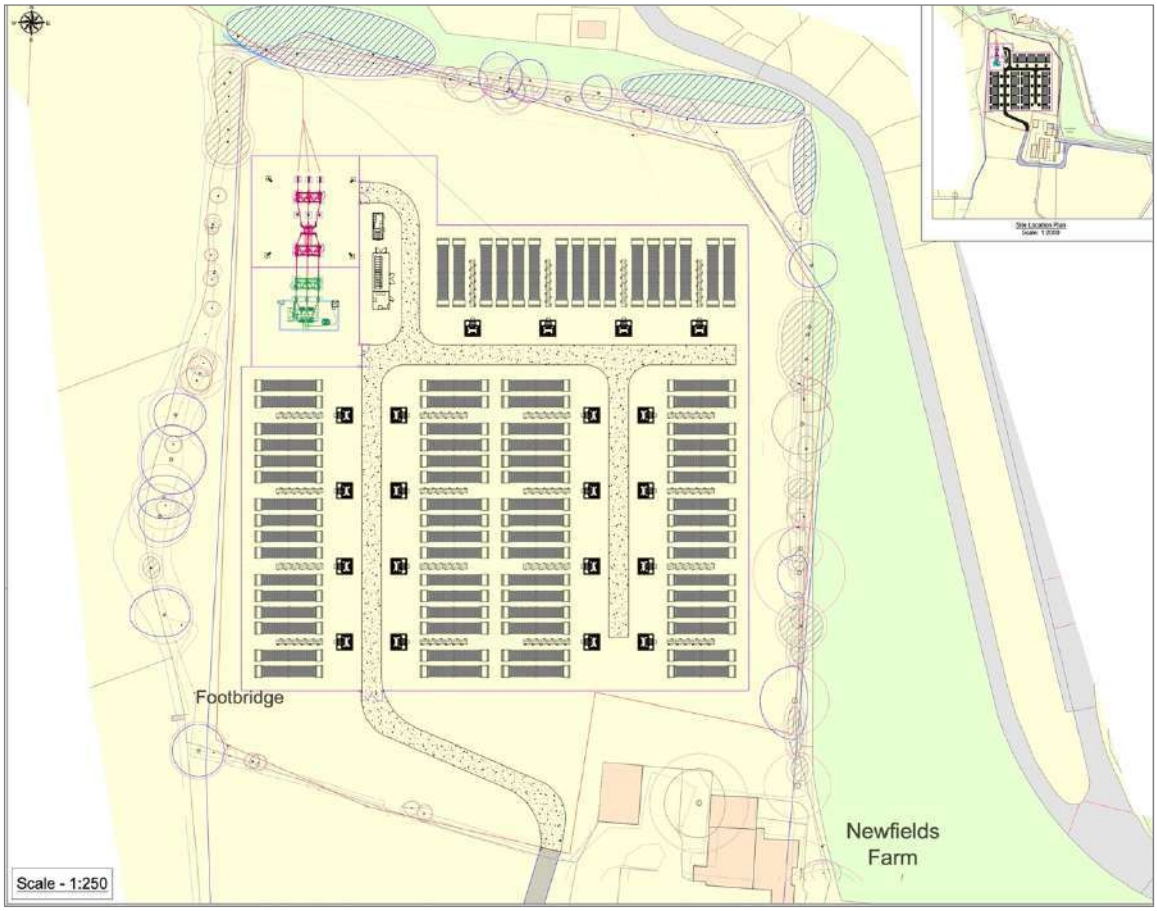
This report provides factual records of all relevant fieldwork observations and test results as well as indicative soil infiltration rates.

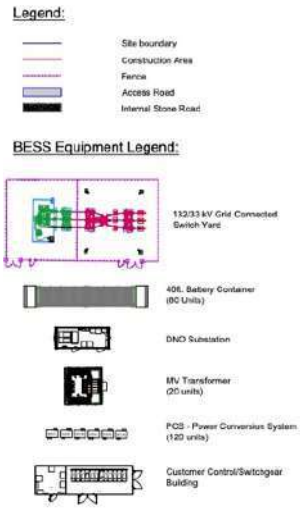
Figure 1.1 Site location plan



Site location	**July 2022**	**Drawn: AJS**
	4272R1	**Rev 1**

Figure 1.2 Development plan





Development plan: BESS facility	**July 2022**	**Drawn: AJS**
	4272R1	**Rev 1**

2 SITE SETTING AND HISTORY

The following section provides a summary of the Site setting, land use history and local geological and hydrological conditions.

2.1 Basic site information

Information relating to the Site location is summarised in Table 2.1.

Table 2.1 Site details

Site Address	Newfields Farm BESS, Rownall Road, Wetley Rocks, Stoke on Trent, Staffordshire, ST9 0BS
Site area	c. 2.1 hectares
General setting and ground coverage	The Site is located within a predominantly rural land use setting c. 1.2 km to the north of Werrington. An existing electricity sub-station is positioned to the north and east of the Site. Structures associated with Newfields Farm are positioned directly to the south-east of the Site. The Site topography generally slopes down towards the north-west. The high point of the Site is located in the south-east corner at an elevation of c. 231 m AOD. The ground level in the north-west corner of the Site is c. 223 m AOD. Photographs of the current Site condition are included in Appendix A.

2.2 Site history

Available historical land use maps suggest that the Site has remained undeveloped during the last 100 years. Aerial photography indicates that the Site has been occupied by grassed fields, potentially used for animal pasture, since at least 2003.

Note: no historical landfills are mapped by the Environment Agency at or within 100 m of the Site.

2.3 Geological setting

British Geological Survey mapping (BGS, 2022) indicates that the Site and surrounding land area is underlain by superficial deposits comprising of Till (diamicton). The bedrock deposits comprise predominantly of the Morridge Formation group (mudstone, siltstone and sandstone), with a possible sub crop of Kniveden Sandstone in the south-west corner of the Site.

The nearest available BGS borehole record relates to borehole ref: SJ94NW13 located c. 500 m to the south of the Site (within the boundaries of Newfields Farm). The borehole was drilled to a depth of around 21.9 m in 1961; the encountered geological sequence comprised c. 0.6 m of ‘soil’, 0.6 m of ‘rock’, 3.1 m of blue marl and over 17 m of very hard sandstone. The borehole record showed a rest groundwater level of c. 8 m bgl.

Note: several confidential BGS records exist for boreholes previously drilled on the site of the neighbouring electricity sub station. Further to an email enquiry, the BGS has confirmed that these borehole records cannot be supplied without the permission of National Grid.

The following additional information regarding in-situ ground conditions is presented within KRS Environmental’s flood and drainage report (KRS, 2022):

- Information from the National Soil Resources Institute details the site area as being situated on slowly permeable, seasonally wet acid loamy and clayey soils with impeded drainage.

- The Wallingford Winter Rain Acceptance Potential (WRAP) map indicates that the site lies within WRAP Class 4: clayey, or loamy over clayey soils with an impermeable layer at shallow depth.
- Site ground conditions suggest a low potential for groundwater flooding.

2.4 Hydrological setting

OS mapping shows the presence of a surface water channel positioned alongside the western Site boundary (see Figure 3.1); this feature ultimately discharges into Stanley Pool, located c. 2.4 km to the north. A potential surface water channel is also mapped in the north-west corner of the Site; this appears to be a perennial water feature which drains into the surface water channel located along the western Site boundary. A recent topographic survey identified further drainage ditches along the southern and eastern Site boundaries (see Figure 3.1).

3 SITE INVESTIGATION WORKS

3.1 Site investigation programme

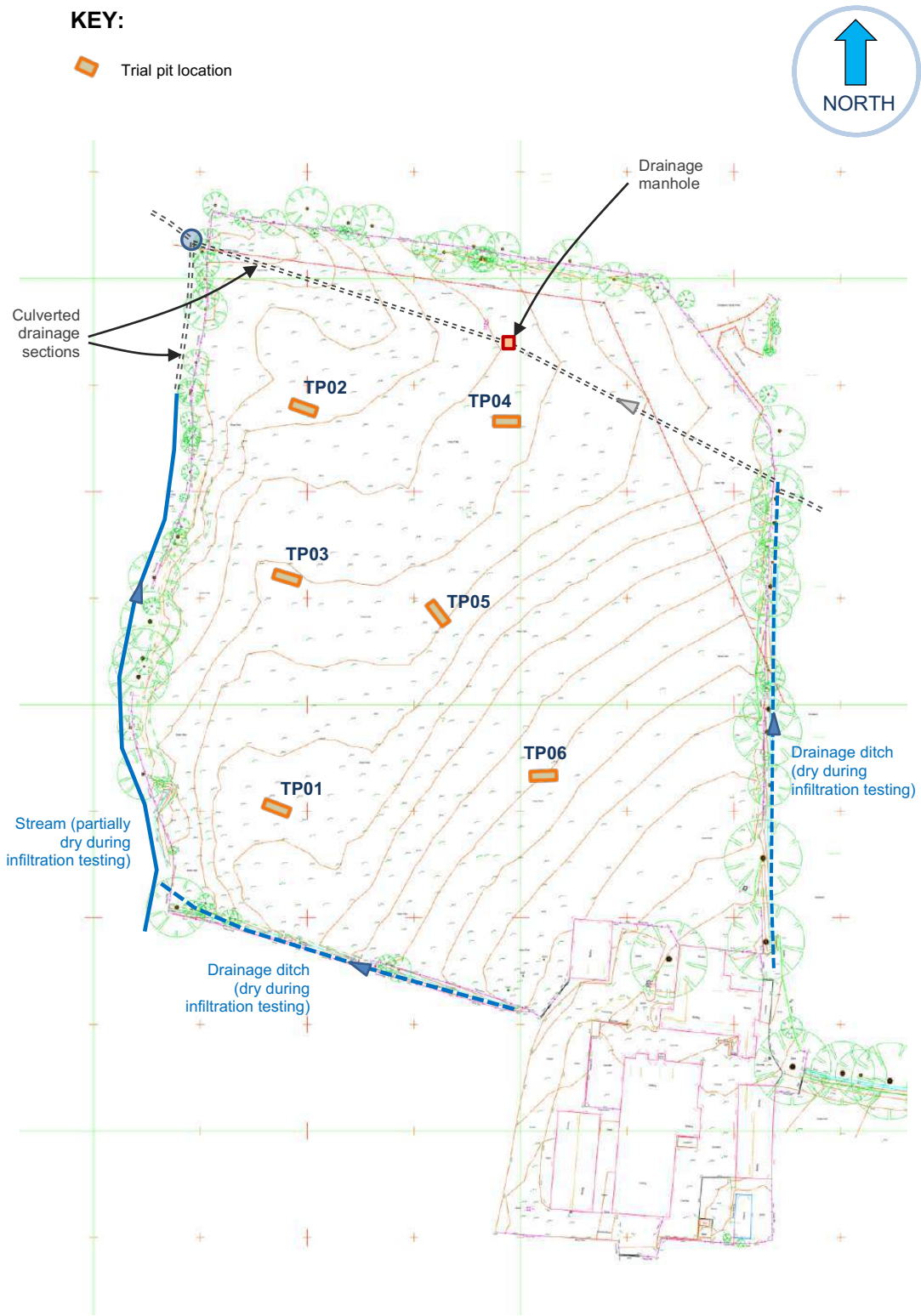
Trial pitting and infiltration testing was coordinated by Ground First at the study site on 20th July 2022. The purpose of the infiltration testing was to characterise the infiltration / drainage capabilities of the shallow sub strata.

A summary of the site investigation activities undertaken is presented in Table 3.1. The site investigation locations are shown on Figure 3.1. A photographic record of the Site works is provided in Appendix A.

Table 3.1 Site investigation activities

Element of investigation	Details	Comments / rationale
Utilities and service avoidance	Prior to undertaking the site investigation works gas and electricity service plans were obtained for the Site; no buried services were mapped on-Site. All exploratory trial pit locations were checked with a CAT scan prior to the intrusive works.	To minimise the potential for encountering buried services during the intrusive site investigation works.
Trial pitting	Six trial pits (TP01 to TP06) were excavated at the study Site using a tracked 3.5 tonne excavator. The sides and bases of each excavation were trimmed to make the pits as rectangular as practically possible. The pits were positioned in order to provide an indication of ground conditions across the Site, including the lower lying areas in the south-west and north-west. The trial pit locations are shown on Figure 3.1. The pits were excavated to depths of between 2.1 m and 2.4 m bgl. Note: all trial pits were observed to be stable; i.e., no collapse was observed within any of the trial excavations. All of the trial pits were backfilled on completion. The excavated spoil was replaced in broadly the same order as it was excavated. The backfilled spoil was compacted with a small mound left at each location. All excavated materials were logged by an experienced site supervisor (see Appendix B).	To assess the extent, thickness and composition of any Made Ground. To assess the composition of the natural superficial geology. To clarify the depth to any shallow groundwater. To make a visual assessment of any ground contamination. To enable infiltration testing.
Infiltration testing	Infiltration testing was carried out in accordance with BRE 365 (2016) at four of the trial pits (TP01, TP02, TP03 and TP04); these locations were all located at relatively low elevations in the north and west of the Site. A 1,300 gallon water bowser was used to discharge water into the pits using a wide diameter hose. The excavations were all filled in less than 60 seconds. Water level measurements were taken within each excavation using a dip tape at regular intervals following the cessation of infilling. Note: the residual water was pumped out of the trial pits prior to backfilling.	To enable representative infiltration rates to be calculated.

Figure 3.1 Site investigation location plan



Indicative site investigation locations plus salient field observations	**July 2022**	**Drawn: AJS**
	4272R1	**Rev 1**

4 SITE INVESTIGATION RESULTS

4.1 Encountered ground conditions

The sequence of strata encountered within each of the trial pits is described in Appendix B.

In summary, no obvious Made Ground was observed within any of the trial pits. The encountered lithology included an upper topsoil layer comprising a c. 0.3 m thickness of slightly gravelly fine sand with roots, typically underlain by slightly clayey slightly gravelly fine sand to depths of around 1.0 m. The material observed below c. 1.0 m predominantly comprised slightly gravelly sandy silt and slightly gravelly sandy clay. Friable dark grey mudstone was observed at the base of several trial pits.

No shallow groundwater was identified in any of the trial pits.

4.2 Infiltration test results

Four of the trial pits (TP01, TP02, TP03 and TP04) were subjected to infiltration testing.

The infiltration testing results are presented in Appendix C; these results indicate that no appreciable infiltration was observed at any of the trial pits (reflecting the fine grained nature of the encountered soils). As such, no representative infiltration rates have been calculated.

4.3 Other site observations

Salient observations made during the site investigation works included:

- The Site was covered by short grass (see Photographs 1 and 2 in Appendix A).
- No standing water was observed across the Site at the time of the infiltration testing.
- The modest drainage ditch present along the south-western Site boundary (see Figure 3.1) contained appreciable vegetation and was observed to be dry (see Photograph 3 in Appendix A).
- The drainage ditch present along the eastern Site boundary (see Figure 3.1) contained some vegetation and was also observed to be dry (see Photograph 8 in Appendix A).
- The stream channel located adjacent to the western Site boundary (see Figure 3.1) contained variable amounts of vegetation; ponded water was present within the channel to the south-west of the Site whereas the stream section adjacent to the central-western Site area was dry (see Photographs 4 to 6 in Appendix A).
- The stream section adjacent to the north-western part of the Site was culverted (see Figure 3.1).
- The culverted stream section ended in a small depression located close to the north-western corner of the Site (see Figure 3.1 and also Photograph 7 in Appendix A). A second culvert, which passes beneath the northern part of the Site, also discharges into this depression. The outflow from the depression is via a large diameter (c. 0.8 m wide) concrete pipe.

5 REFERENCES

BGS, 2022. Geology of Britain Viewer. https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/. Accessed 19th July 2022.

BRE, 2016. BRE Digest 365. Soakaway design.

KRS, 2022. Newfields Farm, Wetley Rocks, Stoke on Trent, ST9 9LA. Flood Risk & Surface Water Drainage Assessment. Report ref: KRS.0612.002.R.001.B, dated March 2022.

APPENDICES

APPENDIX A

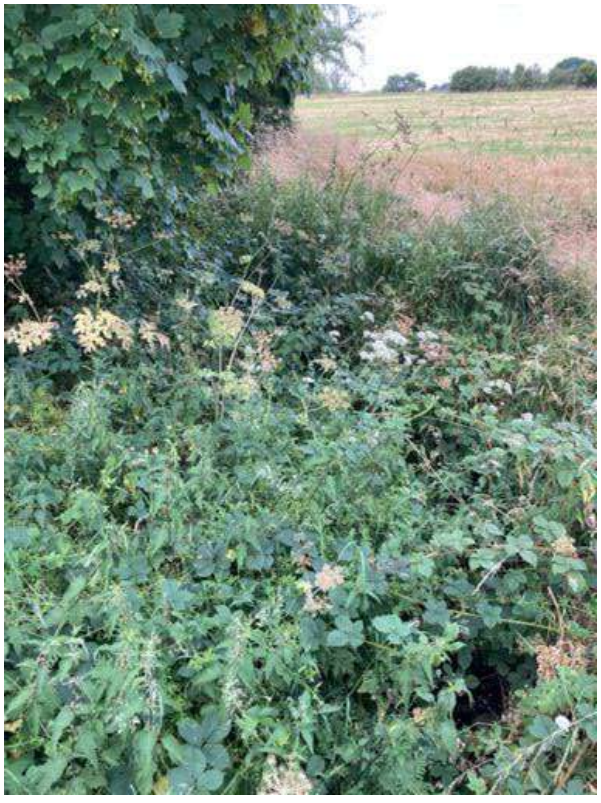
Site photographs

Selected photograph locations:

Photograph 1 **Description:** View across the Site from Newfield Farm; looking to the west
Date: 20/07/2022

Photograph 2 **Description:** View across the Site from Newfield Farm; looking to the north
Date: 20/07/2022

Photograph 3 **Description:** View of shallow drainage ditch along the south-western Site boundary; looking to the south-east
Date: 20/07/2022



Photograph 4 **Description:** View of stream directly adjacent to the south-western Site boundary
Date: 20/07/2022

Photograph 5 **Description:** View of stream directly adjacent to the western Site boundary
Date: 20/07/2022

Photograph 6 **Description:** View of stream (dry river bed) directly adjacent to the western Site boundary
Date: 20/07/2022

Photograph 7 **Description:** Culverted drainage sections located directly beyond the north-western corner of the Site
Date: 20/07/2022

Photograph 8 **Description:** View of drainage ditch (dry) directly adjacent to the eastern Site boundary
Date: 20/07/2022

Photograph 9 **Description:** Excavation at trial pit TP01
Date: 20/07/2022

Photograph 10 **Description:** Trial pit TP01
Date: 20/07/2022

Photograph 11 **Description:** Soil layer excavated from trial pit TP01
Date: 20/07/2022

Photograph 12 **Description:** Spoil excavated from TP01
Date: 20/07/2022

Photograph 13 **Description:** Discharge of water into trial pit TP01
Date: 20/07/2022

Photograph 14 **Description:** Water level monitoring at trial pit TP01
Date: 20/07/2022

Photograph 15 **Description:** Trial pit TP01; water level c. 5 hours after infilling
Date: 20/07/2022

Photograph 16 **Description:** Trial pit TP02
Date: 20/07/202

Photograph 17 **Description:** Soil layer excavated from trial pit TP02
Date: 20/07/2022

Photograph 18 **Description:** Spoil excavated from TP02
Date: 20/07/2022

Photograph 19 **Description:** Trial pit TP02; water level directly after infilling
Date: 20/07/2022

Photograph 20 **Description:** Trial pit TP02; water level c. 4.5 hours after infilling
Date: 20/07/2022