

FLOOD RISK ASSESSMENT

BRAXBESS STORAGE

Branxton, East Lothian

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1. Introduction

<u>Background</u>

- 1.1. Pegasus Group has been appointed by Braxbess Ltd to undertake a Flood Risk Assessment (FRA) for a proposed Battery Energy Storage System (BESS) in Branxton, East Lothian.
- 1.2. This assessment considers the risk of flooding from all sources including coastal, fluvial, surface water, groundwater, reservoirs, and drainage systems (sewers and culverts).
- 1.3. A proposed Surface Water Drainage Strategy to manage surface water runoff from the development and mitigate any potential negative water quality impacts has been prepared by David R Murray and Associates and is included as a separate part of the planning application.

Relevant Policy and Guidance

- 1.4. This report considers the recommendations and requirements outlined in:
 - National Planning Framework 4 (February 2023)
 - Scottish Planning Policy (SPP) (June 2014)
 - SEPA's Technical Flood Risk Guidance for Stakeholders (June 2022)
 - SEPA's Development Guidance: Flood Risk (July 2018)
 - SEPA's Climate Change Allowances for Flood Risk Assessment in Land Use Planning (April 2023)
 - SEPA's Flood Risk and Land Use Vulnerability Guidance (July 2018)
 - East Lothian Council Sustainable Drainage Systems (SuDS) Supplementary Planning Guidance (June 2019)
 - East Lothian Council Local Development Plan Strategic Flood Risk Assessment (2018)
- 1.5. The Flood Risk Framework in Scottish Planning Policy and SEPA's Technical Flood Risk Guidance for Stakeholders details that an FRA is required for development in areas at risk of flooding or where the proposed development may increase flood risk elsewhere. SEPA's Surface Water Flood Map shows areas at risk at the site. The development proposals, if left unmitigated, also have the potential to increase flood risk elsewhere. An FRA is therefore required for the proposals.
- 1.6. Scottish Planning Policy (Paragraph 255) details that the planning system should promote "avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS)". In accordance with this, a Surface Water



Drainage Strategy to manage surface water runoff from the development has also been prepared and is included elsewhere in the planning submission.



2. Existing Site and Hydrology

Site Location & Existing Conditions

- 2.1. The site is located in Branxton, East Lothian and comprises approximately 20ha of greenfield and agricultural land and associated access.
- 2.2. To the north of the site is the coastal parish and small village Innerwick. Around 100m to the south of the site runs Braidwood Burn, considered to be a Main River. The site is surrounded by agricultural and greenfield land.
- 2.3. Approximate co-ordinates at the centre of the site are E: 371995, N: 673625. The nearest postcode is EH42 ISE.
- 2.4. The site location is shown in Figure 2.1.



Figure 2.1 – Site Location

2.5. A topographic survey of the site was complete in June 2023 by L&M Survey Services and is included in Appendix A. The topographic survey of the site shows that existing ground levels on site generally fall in a southeasterly direction from a high point of approximately 153mAOD in the north to the low point of approximately 115mAOD in the south.



Existing Drainage and Hydrology

- 2.6. The are no watercourses located on site. The nearest identified watercourse is Braidwood Burn, located directly to the south of the site.
- 2.7. Geological data from the British Geological Survey (BGS) shows the site is underlain by "Great Conglomerate Formation - Conglomerate and sandstone, interbedded" bedrock.
- 2.8. BGS also record superficial deposits at the site comprising of "Till, Devensian Diamicton".
- 2.9. The National soil map of Scotland shows "Brown earths" extending across the entire site, with a parent material of "Drifts derived from sandstones and conglomerates of Upper Old Red Sandstone age".
- 2.10. Hydrogeology aquifer classification shows the site is underlain with a 'moderately productive aquifer'.



3. Proposed Development

- 3.1. The proposals are the construction and operation of Battery Energy Storage System (BESS), transformers, substations and associated infrastructure.
- 3.2. The proposed development will include:
 - BESS
 - Transformers
 - Invertors
 - Fire hydrant
 - Vegetation
- 3.3. The proposed site layout in included in Appendix B.



4. Flood Risk and Land Use Vulnerability

Flood Risk Classification

- 4.1. Scottish Planning Policy (SPP) (2014) set out three categories of coastal and fluvial flood risk:
 - 1) Little or No Risk less than a 1 in 1000 year probability of coastal or fluvial flooding
 - 2) Low to Medium Risk between a 1 in 1000 year and 1 in 200 year probability of coastal or fluvial flooding
 - 3) Medium to High Risk greater than a 1 in 200 year probability of coastal and fluvial flooding

Land Use Vulnerability

- 4.2. SEPA's Flood Risk and Land Use Vulnerability Guidance classifies land uses according to how they are impacted by flooding.
- 4.3. The proposed BESS development is defined as 'Essential Infrastructure' under the description "essential utility infrastructure that has to be located in a flood risk area for operational reasons (this includes electricity generating power stations and grid and primary sub-stations, sewage treatment plants and water treatment works, wind turbines and other energy generating technologies)".

Suitability of Proposed Development

- 4.4. From a flood risk perspective (considering coastal and fluvial flooding only), SEPA's Flood Risk and Land Use Vulnerability Guidance details that Essential Infrastructure is generally:
 - Suitable in areas of 'Little or No Risk'.
 - Suitable in areas of 'Low to Medium Risk'.
 - Suitable in areas of 'Medium to High Risk' subject to being designed and constructed to remain operational during a flood event (1 in 200 year) and not impede water flow.
 - Suitable in areas of 'Medium to High Risk' within sparsely developed/undeveloped areas, where a flood risk location is required for operational reasons and an alternative lower-risk location is not available. Development should be designed and constructed to remain operational during a flood event (1 in 200 year) and not impede water flow.
- 4.5. The site is at Little to No Risk of coastal and fluvial flooding, as discussed in detail in Section 5. The proposed Essential Infrastructure development is therefore in accordance with SEPA's Flood Risk and Land Use Vulnerability Guidance (see above).



- 4.6. SPP (2014) also states that areas at Little or No Risk have "no constraints due to coastal or watercourse flooding". The development is therefore considered appropriate.
- 4.7. In addition to the above, this FRA assesses the risk of flooding to the site from all sources, including from surface water. SPP (2014) states that "Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years)". Surface water flood risk, and the suitability of the development is considered below in Section 5.



5. Site Specific Flood Risk

- 5.1. In accordance with SPP (2014), this Flood Risk Assessment considers the risk of flooding from all sources including:
 - a) Coastal Flooding from the sea
 - b) Fluvial Flooding from rivers and streams
 - c) Surface Water Flooding overland surface water flow and exceedance
 - d) Groundwater Flooding from elevated groundwater levels or springs
 - e) Reservoir Flooding from failure of reservoir dams
 - f) Drainage System Flooding exceedance flows from an existing sewer system and culverts.

Flood Risk Classification

5.2. SEPA's flood maps define areas that are subject to a High, Medium or Low likelihood of flooding from coastal, fluvial and surface water sources. Table 5.1 below details the flood events associated with each of SEPA's likelihood categories.

Likelihood of Flooding Event	Flood Event Impacting the Area	
High	1 in 10 year	
Medium	1 in 200 year	
Low	1 in 1000 year	

Table 5.1 – SEPA Flood Map – Likelihood Classification

Coastal Flooding

- 5.3. SEPA's Coastal Flooding flood map defines the entire site to be at Little or No Risk of flooding, not predicted to be impacted by a 1 in 1000 year flood event (see Figure 5.1).
- 5.4. East Lothian Council's Strategic Flood Risk Assessment (2018) highlights that historically, coastal flooding has impacted the coastal areas of the region, referring to winter storms in 2010 and 2012. Branxton is not considered coastal. Further, neither Branxton nor Innerwick are mentioned in the SFRA.
- 5.5. Overall, the site is considered to be at Little or No Risk of coastal flooding.



Figure 5.1 – SEPA's Coastal Flooding Flood Map



Fluvial Flooding

- 5.6. SEPA's River Flooding flood map defines the entire site to be at Little or No Risk of flooding, not predicted to be impacted by a 1 in 1000 year flood event (see Figure 5.2).
- 5.7. 50cm resolution LiDAR data downloaded from the 'Scottish Remote Sensing Portal' does not highlight any watercourses on site that may pose a risk to the site.
- 5.8. The SFRA (2018) does not highlight any fluvial flood risk in Branxton.
- 5.9. Overall, the site is considered to be at Little or No Risk of fluvial flooding.



Figure 5.2 – SEPA's River Flooding Flood Map



Surface Water Flooding

- 5.10. SEPA's Surface Water flood map defines the entirety of the site to have a Low Likelihood of flooding, not predicted to be impacted by a 1 in 1000 year rainfall event (see Figure 5.3).
- 5.11. The site generally falls southeasterly without exhibiting any significant dips in local topography. As a result, site topography is not considered to be conducive to surface water flooding, with any buildup of surface water expected to flow southeasterly, away from the site and into the Braidwood Burn.
- 5.12. Given the above, the site is considered to have a **Very Low** Likelihood of surface water flooding.



Figure 5.3 – SEPA's Surface Water Flooding Flood Map



Groundwater Flooding

- 5.13. BGS data shows that the site is underlain by conglomerate and sandstone bedrock. Conglomerate is considered highly permeable, generating excellent surface drainage. Sandstone is also expected to be permeable.
- 5.14. Superficial deposits on site are also recorded by BGS generally comprising till. Till deposits are generally relatively impermeable are likely to restrict the potential emergence of groundwater on site.
- 5.15. Brown earths soils are recorded by the National soil map of Scotland to be present across the entire site. These soils are made up of equal parts silt, sand and clay and are freely draining.
- 5.16. The Hydrogeology Aquifer Classification defines bedrock at the site as a 'Moderately Productive Aquifer'.
- 5.17. Regarding above the information, the bedrock, soil and hydrogeology makeup of the site mean that groundwater may emerge. However, The likely permeability of the bedrock and soils mean that the groundwater will easily soak back into the ground.
- 5.18. The East Lothian SFRA (2018) does not report any issues with groundwater flooding in Branxton, highlighting risk in east Musselburgh, Port Seton and Dunbar only.



- 5.19. The site generally falls southeasterly without exhibiting any significant dips in local topography. As a result, site topography is not considered to be conducive to groundwater flooding, with any groundwater to emerge expected to flow southeasterly, away from the site and into the local burn.
- 5.20. Overall, the site is considered to be at **Low** risk of flooding from groundwater.

Drainage System Flooding

- 5.21. The East Lothian SFRA (2018) does not highlight any risk of flooding from sewers in Branxton, with Humbie being the only area mentioned.
- 5.22. The site generally falls southeasterly without exhibiting any significant dips in local topography. As a result, site topography is not considered to be conducive to sewer flooding, with any water from drainage system flooding expected to flow southeasterly, away from the site and into the local burn.
- 5.23. The site is therefore considered to be at **Low** risk of sewer flooding.

Reservoir Flooding

- 5.24. There are no Reservoirs identified in the vicinity of the site that are expected to pose a risk to the proposed development should they fail.
- 5.25. SEPA's Reservoir Inundation maps do not highlight the site or any land in the immediate vicinity to be at risk of reservoir flooding.
- 5.26. Reservoirs in Scotland are regulated under the Reservoirs (Scotland) Act 2011. The Act implements a proportionate and risk-based set of regulations to manage the consequence of uncontrolled water release from reservoirs. The strict regulations involved with reservoir operations ensures that the likelihood of a significant breach event occurring is very low, and that the associated risk is also low.
- 5.27. Overall, the site is considered to be at **Very Low** risk of flooding from reservoirs.

Access & Egress

- 5.28. The site is proposed to be accessed via the farmer's access off Barns Ness Terrace, to the east of the site.
- 5.29. Barns Ness Terrace is not considered to be a significant flood risk from any source.
- 5.30. Furthermore, the proposed BESS will be controlled remotely and only visited occasionally for maintenance operations. Consequently, there will be no requirement for site access or egress during times of extreme flood.

Cumulative Impacts

5.31. It is noted that there are several other planning applications for energy developments around the site that have been submitted to either East Lothian Council or the Energy Consents Unit.



- 5.32. It is assumed that each of these applications has been submitted alongside a sufficient FRA and surface water drainage strategy and as a result, will not increase flood risk elsewhere.
- 5.33. The cumulative impact of these additional site proposals is therefore not considered significant.

Flood Risk Summary

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

Table 5.2 - Flood Risk to the Site from All Sources

Flood Source	Flood Risk	Mitigation/Comments
Coastal	Little or No Risk	• SEPA does not predict the site to be impacted by a 1 in 1000 year coastal flood event
Fluvial	Little or No Risk	• SEPA does not predict the site to be impacted by a 1 in 1000 year fluvial flood event
Surface Water	Very Low	• SEPA does not predict the site to be impacted by a 1 in 1000 year surface water flood event.
Groundwater	Low	 Ground conditions on site are potentially suitable for groundwater emergence Site topography is not considered conducive to groundwater flooding
Drainage Systems	Low	 The East Lothian SFRA does not highlight any risk of flooding from sewers in Branxton. Site topography is not considered conducive to sewer flooding
Reservoirs	Very Low	 SEPA's Reservoir Inundation maps do not highlight the site or any land in the immediate vicinity to be at risk of reservoir flooding. The likelihood of a reservoir breach is considered to be very low



6. Summary

- 6.1. The site comprises approximately 20ha of greenfield and agricultural land and associated access. The site is proposed for the construction and operation of a Battery Energy Storage System (BESS) and relevant infrastructure.
- 6.2. The proposed development (Essential Infrastructure) is in accordance with SEPA's Flood Risk and Land Use Vulnerability Guidance.
- 6.3. The site is not considered to be a significant risk of flooding from any source.



Appendix A – Topographic Survey





Appendix B – Proposed Site Layout





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