STATERA
BALANCING THE GRID

East Claydon Battery Energy Storage System (BESS)

Environmental Statement

Chapter 4 - Hydrology and Flood Risk

December 2023

Contents

1 Introduction 3
1.1 Introduction 3
2 Assessment Methodology 4
2.1 Assessment Methodology 4
2.2 Legislation and Guidance 4
2.3 Study Area 9
2.4 Baseline Methodology 9
2.5 Consultation 9
2.6 Assessment Criteria and Assignment of Significance 10
2.7 Limitations of the Assessment 13
3 Baseline Environment 14
3.1 Baseline Environment 14
3.2 Site Description and Topography 14
3.3 Hydrological Setting 14
3.4 Surface Water Body Status 14
3.5 Geological and Hydrogeological Setting 15
3.6 Existing Flood Risk 15
3.7 Ecologically Designated Sites 16
3.8 Water Supplies and Abstraction 17
3.9 Future Baseline Conditions 17
4 Embedded Mitigation Measures 18
5 Assessment of Construction Effects 20
5.1 Impacts of Construction – Increased Flood Risk 20
5.2 Impacts of Construction – Field Drainage 20
5.3 Impacts of Construction – Ordinary Watercourse 21
6 Assessment of Operational and Maintenance Effects 23
6.1 Impacts of Operation – Increased Flood Risk 23
6.2 Impacts of Routine Maintenance – Ordinary Watercourses 23
6.3 Accidents/ Disasters 24
7 Assessment of Decommisioning Effects 26
7.1 Potential Changes to the Assessment as a Result of Climate Change 26
8 Assessment of Cumulative Effects 27
8.2 Construction Phase 27
8.3 Completed Development 27
8.4 Conclusions 28

1 INTRODUCTION

1.1 Introduction

1.1.1 This chapter reports on the assessment of the effects of the proposed development with regard to water resources and flood risk. The key issues identified to be addressed within this assessment relate to the potential effects of the proposed development on local flood risk (including effects of site drainage), and effects on water resources, including water quality, flow regimes and availability of water supply.

1.1.2 The chapter describes the assessment methodology; the baseline conditions currently existing at the site and in the surrounding area; the mitigation measures implemented as part of the proposed development to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. Any further mitigation or monitoring requirements are identified.

1.1.3 This chapter should be read in conjunction with the Flood Risk Assessment and Conceptual Drainage Strategy ‘HLEF85369 East Claydon Battery Storage R FRA v1 20231201’ which has also been prepared by RPS.

2 ASSESSMENT METHODOLOGY

2.1 Assessment Methodology

2.1.1 There are no specific EIA guidelines in relation to assessing the impact of energy storage developments on water resources, hydrology and flood risk. The assessment methodology used here is therefore adapted from the guidance provided in the Design Manual for Roads and Bridges (DMRB) LA104 (Environmental Assessment and Monitoring) (Highways England et. al., 2020a) and specific assessment techniques detailed in LA 113 - Road Drainage and the Water Environment (Highways England et. al., 2020b). This guidance provides robust assessment principles for infrastructure developments.

2.1.2 The following guidance documents have also been considered:

- Non-statutory technical standards for sustainable drainage systems (Defra, 2015); and
- Report C753: The SuDS Manual (Ciria, 2015).

2.1.3 The assessment of potential effects on water resources takes account of the impacts for the Project on the prevailing hydrological, surface water drainage, flooding and water quality environments.

2.2 Legislation and Guidance

National Planning Policy Framework

2.2.1 The National Planning Policy Framework (NPPF) was released in March 2012 and was updated in September 2023. The document sets out Government planning policies for England and how these are expected to be applied. The framework acts as guidance for local planning authorities and decision-takers, both in drawing up plans and making decisions about planning applications.

2.2.2 Section 14 sets out the need for an appropriate assessment of flood risk. Guidance on the minimum requirements for such an assessment is contained in Planning Practice Guidance (PPG) ID:7.

2.2.3 The NPPF requires the application of a sequential risk-based approach to determining the suitability of land for development in flood risk areas, and that flood risk assessment should be carried out to the appropriate degree, at all levels of the planning process.

2.2.4 Footnote 55 identifies that ‘A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use’.

Planning Practice Guidance

2.2.5 PPG ID:7 Flood Risk and Coastal Change provides guidance to ensure the effective implementation of the NPPF planning policy for development in areas at risk of flooding.

Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

2.2.6 The regulations implement the requirements for environmental impact assessment (EIA) procedures regarding nationally significant infrastructure. It outlines that the EIA process must identify, describe and assess impacts of the development to population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage, landscape and interaction between the above factors.

Legislative Background

2.2.7 Following the implementation of the Flood and Water Management Act 2010 local flood risk has become the responsibility of the Local Planning Authority. The Act places new duties on upper tier Councils, by designating them as Lead Local Flood Authorities (LLFAs) for the coordination of local flood risk management in their respective administrative areas.

2.2.8 From April 6 2015 the responsibility for drainage and surface water management design approval resides with the local planning authority and should be submitted as part of the planning process.

2.2.9 The local planning authority has responsibility for the approval of proposed drainage systems in new developments and redevelopments. Approval must be given before any developer can commence construction. In order to be approved, the proposed drainage system would have to meet national standards for sustainable drainage.

2.2.10 The local planning authority is also responsible for adopting and maintaining Sustainable Drainage Systems (SuDS) which serve more than one property, which they have approved. The Highways Authorities will be responsible for maintaining SuDS in public roads to National Standards.

2.2.11 The SuDS Manual C753 sets out the criteria by which the form of drainage appropriate to any particular site or development can be determined, as well as requirements for the design, construction, operation and maintenance of SuDS.

2.2.12 Additional guidance for the use of SuDS is provided via Construction Industry Research and Information Association (CIRIA) and Building Research Establishment (BRE) in the following:

- C609 Sustainable drainage systems. Hydraulic, structural and water quality advice (Superseded by C697 but remains current)
- C156 Infiltration Drainage – Manual of Good practice
- BRE Digest 365 Soakaway design

Climate Change

2.2.13 The NPPF and supporting planning practice guidance on Flood Risk and Coastal Change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account.

Peak River Flow Allowances

2.2.14 In 2023, the EA updated advice on climate change allowances to support the NPPF. Peak river flow allowances show the anticipated changes to peak flow by management

catchment. Management catchments are sub-catchments of river basin districts. Peak River Flow Allowances should be considered for locations that are currently in Flood Zone 1, but might be in Flood Zone 2 or 3 in the future.

2.2.15 EA guidance on the application of climate changes allowance is dependent on the proposed developments vulnerability. As the development is a Battery Storage facility this application is deemed as Essential Infrastructure. The EA require that for Essential Infrastructure developments located in Flood Zones 2, 3a or 3b, the higher central allowance should be used to assess climate change. Battery Storage developments have a lifetime of 40 years therefore will fall into the 2060s epoch.

2.2.16 The proposed East Claydon site is located within the Upper and Bedford Ouse Management Catchment for which the following peak river flow allowances are applicable.

Table 1: Upper and Bedford Ouse Management Catchment Peak River Flow Allowances

Epoch	Central	Higher Central	Upper End
2020s	5%	10%	24%
2050s	4%	11%	30%
2080s	19%	30%	58%

2.2.17 Based on the lifetime of the development and the vulnerability classification, an allowance of 11 – 30% is appropriate.

Peak Rainfall Allowances

2.2.18 Peak Rainfall Allowances are used to consider how increased rainfall affects surface water flood risk and the design of drainage systems to manage the increased rainfall.

2.2.19 New guidance requires that for developments with a lifetime of between 2061 and 2100, Flood Risk Assessments and Strategic Flood Risk Assessments should assess the central allowances for the 2070s epoch for both the 1% and 3.3% annual exceedance probability events. The proposed East Claydon site is located within the Upper and Bedford Ouse Management Catchment for which the following Peak Rainfall Allowances are applicable.

Table 2: Upper and Bedford Ouse Management Catchment Peak Rainfall Allowances

3.3% Annual Exceedance Rainfall Event		
Epoch	**Central**	**Upper**
2050s	20%	35%
2070s	25%	35%

1% Annual Exceedance Rainfall Event		
Epoch	**Central**	**Upper**
2050s	20%	40%
2070s	25%	40%

2.2.20 Based on the above information, an allowance of 20 - 25% is appropriate.

Local Planning Policy

2.2.21 The Vale of Aylesbury Local Plan was adopted in September 2021. The Local Plan contains the following policy relating to flood risk and drainage:

Policy I4: Flooding

Management of Flood Risk

In order to minimise the impacts of and from all forms of flood risk the following is required:

a. *Site-specific flood risk assessments (FRAs), informed by the latest version of the SFRA, where the development proposal is over 1ha in size and is in Flood Zone 1, or the development proposal includes land in Flood Zones 2 and 3 (as defined by the latest Environment Agency mapping). A site-specific FRA will also be required where a development proposal affects land in Flood Zone 1 where evidence, in particular the SFRA, indicates there are records of historic flooding or other sources of flooding, e.g. due to critical drainage problems, including from ordinary watercourses and for development sites located within 9m of any water courses (8m in the Environment Agency's Anglian Region)*

b. *All development proposals must clearly demonstrate that the flood risk sequential test , as set out in the latest version of the SFRA, has been passed and be designed using a sequential approach, and*

c. *If the sequential test has been satisfied, development proposals, other than those allocated in this Plan, must also satisfy the exception test in all applicable situations as set out in the latest version of the SFRA.*

Flood Risk Assessments

All development proposals requiring a Flood Risk Assessment in (a) above will assess all sources and forms of flooding, must adhere to the advice in the latest version of the SFRA and will:

d. *provide level-for-level floodplain compensation, up to the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change, and volume-for-volume compensation unless a justified reason has been submitted and agreed which may justify other forms of compensation*

e. *ensure no increase in flood risk on site or elsewhere, such as downstream or upstream receptors, existing development and/or adjacent land, and ensure there will be no increase in fluvial and surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event, with an allowance for climate change (the design storm event)*

f. *not flood from surface water up to and including the design storm event, or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site*

g. *explore opportunities to reduce flood risk overall, including financial contributions from the developer where appropriate*

h. *ensure development is safe from flooding for its lifetime (and remain operational where necessary) including an assessment of climate change impacts*

i. *ensure development is appropriately flood resistant, resilient and safe and does not damage flood defences but does allow for the maintenance and management of flood defences*

j. *take into account all sources and forms of flooding*

k. *ensure safe access and exits are available for development in accordance with Department for Environment, Food and Rural Affairs (DEFRA) guidance 51. Access to "safe refuges" or "dry islands" are unlikely to be considered safe as this will further burden the Emergency Service in times of flood*

l. *include detailed modelling of any ordinary watercourses within or adjacent to the site, where appropriate, to define in detail the area at risk of flooding and model the effect of climate change*

m. *provide an assessment of residual flood risk*

n. *provide satisfactory Evacuation Management Plans, where necessary, including consultation with the Emergency Services and Emergency Planners*

Sustainable Drainage Systems (SuDS)

All development proposals must adhere to the advice in the latest version of the SFRA and will:

o. *Ensure development layouts are informed by drainage strategies incorporating SuDS and complete site specific ground investigations to gain a more local understanding of groundwater flood risk and inform the design of sustainable drainage components*

p. *All development will be required to design and use sustainable drainage systems (SuDS) for the effective management of surface water run-off on site, as part of the submitted planning application and not increase flood risk elsewhere, including sewer flooding. All development should adopt exemplar source control SuDS techniques to reduce the risk of flooding due to post-development runoff. SuDS design should follow current best practice (CIRIA Manual 2015 or as replaced) and Buckinghamshire Council guidance on runoff rates and volumes to deliver wider environmental benefits. Where the final discharge point is the public sewerage network the runoff rate should be agreed with the sewerage undertaker.*

q. *Where site-specific FRAs are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems*

r. *In considering SuDS solutions, the need to protect groundwater quality must be taken into account, especially where infiltration techniques are proposed in considering a response to the presence of any contaminated land. The Environment Agency need to be consulted where infiltration is proposed in contaminated land. SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits. Opportunities will be sought to enhance natural river flows and floodplains, increasing their amenity and biodiversity value and a watercourse advice note is being prepared for further guidance*

s. *Applicants will be required to provide a management plan to maintain SuDS in new developments, and a contribution will be required for maintenance of the scheme/SuDS*

t. *Onsite attenuation options should be tested to ensure that changing the timing of peak flows does not exacerbate flooding downstream, and*

u. *Only in exceptional circumstances will surface water connections to the combined or surface water system be permitted. Applicants will need to demonstrate in consultation with the*

sewerage undertaker that there is no feasible alternative and that there will be no detriment to existing users.

Applicants will be required to liaise with the lead local flood authority, Internal Drainage Boards, and the Environment Agency on any known flood issues, and identify issues from the outset via discussions with statutory bodies

Climate Change

v. *Climate change modelling should be undertaken using the relevant allowances (February 2016) for the type of development and level of risk*

w. *Safe access and egress should be demonstrated in the 1 in 100 plus climate change event, and*

x. *Compensation flood storage would need to be provided for the built footprint as well as any land-raising within the 1 in 100 plus appropriate climate change flood event. This compensation would need to be demonstrated within a Flood Risk Assessment (FRA).*

2.3 Study Area

2.3.1 The hydrology and flood risk study area comprises a 1km buffer around the Project site. The same study area has been used for the construction phase as all construction, activity including compounds and storage is assumed to take place wholly within the Project site boundary.

2.3.2 A 1km study area is considered appropriate for data collection taking into account the nature of the Project and likely zone of influence on hydrological receptors. Given the landscape surrounding the Project site, local land use activities and roadways, effects are likely to be relatively contained and effects on receptors located over 1 km from the Project site are unlikely.

2.4 Baseline Methodology

2.4.1 The Baseline characterisation defines how baseline conditions have been assessed (e.g. site visits/surveys/review of publicly available data) and which sources of data have been used.

2.4.2 The baseline assessment has included the review of available historical information, available data and technical reports relating to the sites, the surroundings and environmental sensitivity. The baseline assessment is based on data sourced from a number of different organisations / authorities including:

- Ordnance Survey;
- British Geological Survey;
- Environment Agency and;
- Buckinghamshire Council
- The following baseline studies have been used to inform the baseline conditions:
- Flood Risk Assessment and Conceptual Drainage Strategy for East Claydon Battery Storage Site, reference HLEF85369 East Claydon Battery Storage R FRA v1 20231201.

2.5 Consultation

2.5.1 Formal consultation was undertaken during the course of this assessment. Table 1 sets out consultation responses received in relation to hydrology and flood risk.

Table 3. Consultation Responses Relevant to this Chapter

Date	Consultee and Issues Raised	How/ Where Addressed
December 2022	**Environment Agency** For completeness, the EA has been contacted with request for information for the flood history in the area and any other flood related issues at the site.	Full response is included in Appendix A within the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201)
March 2023	**Buckinghamshire Council** Flagged guidance documents produced by the Council	Appendix B within the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201)
March 2023	**Buckingham & River Ouzel Internal Drainage Board** No development shall be permitted within the Board's byelaw of 9m, measured from the bank top of any watercourse, and any surface water discharge shall be restricted to the equivalent of 4 l/s per contributing impermeable hectare.	Full response is included in Appendix C within the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201) Considerations included within Drainage Strategy

2.6 Assessment Criteria and Assignment of Significance

2.6.1 The significance of the potential effects of the proposed development takes into account the sensitivity of potential receptors to effects and the likely magnitude of the impact. The assessment methodology has been developed based on RPS's experience of carrying out assessments for a range of developments, reference to policy, legislation and best practice guidance, and reference to environmental designations (for example river quality, aquifer and ecological designations).

Receptor Sensitivity/ Value

2.6.2 The sensitivity of the receiving environment is defined in Table 2. This table also provides examples of the characteristics that define receptor sensitivity.

Table 4.Definitions of Sensitivity or Value

Sensitivity	Sensitivity / Typical Descriptors
Very High	Very high importance and rarity, national scale, and very limited potential for substitution, e.g. watercourse in use for potable supply, 'other' abstractions, good cyprinid fisheries and natural ecosystems, or those corresponding to good cyprinid ecosystems; watercourse of 'high' chemical or ecological quality under the River Basin Management Plans; Principal Aquifers within groundwater Source Protection Zones; and geological features of national importance.
High	High importance and rarity, national scale, and limited potential for substitution, e.g. watercourse suitable for potable supply, 'other' abstractions, good cyprinid fisheries and natural ecosystems, or those corresponding to good cyprinid ecosystems; watercourse of 'high' chemical or ecological quality under the River Basin Management Plans; Principal Aquifers outside groundwater Source Protection Zones; geological features of regional importance; and human users of residential dwellings.
Medium	Medium importance and rarity, regional scale, limited potential for substitution, e.g. watercourses abstracted for non-potable use; watercourse of 'moderate' chemical or ecological quality under the River Basin Management Plans; Secondary Aquifers; catchments locally important for fisheries; watercourses not widely used for recreation, or recreation use not directly related to watercourse quality; geological features of local importance; and human users of commercial property or construction workers.
Low	Low or medium importance and rarity, local scale, e.g. watercourses not subject to abstractions; watercourse of 'poor' or 'bad' chemical or ecological quality under the River Basin Management Plans, receptors not used for recreation; Unproductive Strata; geological features without specific designations. Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Significance of Effects

2.6.3 The significance of predicted effects upon hydrology and flood risk is determined by taking into account the sensitivity of the receptor by taking into account the publicly available

flood risk and environmental data provided by the EA, Buckinghamshire Council and the BGS. The magnitude of impact criteria for national and a local flood risk policies are outlined above, these define key objectives in relation to flood risk and drainage, to minimise the risk of flooding and polluting runoff within a site and surrounding area.

2.6.4 The overall significance of an effect is expressed as negligible, minor, moderate, major or substantial based on the definitions below.

- Substantial: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- Moderate: These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

2.6.5 Table 3 below provides an Assessment Matrix for the above sensitive and magnitude of impact.

Table 5. Assessment Matrix (Complex)

Sensitivity	Magnitude of Impact				
	No Change	**Negligible**	**Low**	**Medium**	**High**
Negligible	No Change	Negligible	Negligible or minor	Negligible or minor	Minor
Low	No Change	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	No Change	Negligible or minor	Minor	Moderate	Moderate or major
High	No Change	Minor	Minor or moderate	Moderate or major	Major or substantial
Very High	No Change	Minor	Moderate or major	Major or substantial	Substantial

2.6.6 For the purpose of this assessment, any effect that is moderate, major or substantial is considered to be significant. Any effect that is minor or below is considered not significant.

2.7 Limitations of the Assessment

2.7.1 The hydrological site setting presented within this chapter is based on publicly available information, and no sampling or testing of water quality has been undertaken as part of this assessment.

2.7.2 The assessment within this chapter is based on publicly available data obtained from the EA, Buckinghamshire Council and BGS.

2.7.3 The EA do not hold detailed modelling in this area and the flood map is the best information available.

2.7.4 It is noted that the EA Flood Zone risk maps do not take into account the impact of local flood defences and climate change on flooding, and do not provide information on flood depth, speed or volume of flow. Additionally, the maps do not provide any information on flooding from other sources such as groundwater, direct runoff from fields or surcharging of sewers. However, a description of these sources of flooding is provided in the FRA: HLEF85369 East Claydon Battery Storage R FRA v1 20231201.

2.7.5 The assessment is limited by the lack of detailed information on:

- Data on ground conditions at the site;
- Flow data for watercourse and drainage channels; and
- Water quality data for specific locations.

2.7.6 Overall, considering the factors stated abovel, there is a moderate to high level of certainty associated with details of the baseline environment and with the findings of the assessment presented in this chapter. The available information is considered sufficient to establish baseline within the East Claydon Battery site hydrological and flood risk study areas for the purposes of EIA. Therefore, there are no data limitations that affect the robustness of the conclusions of this assessment.

3 BASELINE ENVIRONMENT

3.1 Baseline Environment

3.1.1 This section describes the hydrological resources and flood risk within the study area. Observations have been summarised from the baseline of the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201.

3.2 Site Description and Topography

3.2.1 The site is irregular in shape and size, centred on National Grid Reference SP 75482 25102 and occupies an area of approximate 25.5 hectares (ha). The site is located to the west of Granborough village.

3.2.2 The site is bounded on all sides by undeveloped greenfield land. The East Claydon substation is located to the north of the site. To the south of the site located just outside of the site boundary there is an electric pylon.

3.2.3 Areas within the north west and south west of the site will be retained for landscaping, including wildflower planting and a new woodland. Construction access is proposed to the north of the site and a further access point is proposed to the southeast of the site.

3.2.4 No site-specific topography data has been supplied. Therefore, LiDAR DTM Data was obtained for the site (dated 2020). The data indicates that in general the ground levels slope from east to west with levels recorded at approximately 98m AOD to 87m AOD respectively. It should be noted that LiDAR has an error margin of +/- 150 mm.

3.3 Hydrological Setting

3.3.1 The hydrology and flood risk study area is located within the Claydon Brook Tributary Catchment (ID: GB105033030550). The catchment is 17.024 km^2, is designated as 'Heavily Modified' and has 'Moderate Ecological Status' under the WFD classifications.

3.3.2 Reference to OS Mapping indicates that the nearest surface watercourse feature is Claydon Brook, which is located directly adjacent to the north western boundary of the site.

3.3.3 As the site is located within the Buckingham & River Ouzel Internal Drainage Board District, no development shall be permitted within the Board's byelaw of 9m, measured from the bank top of any watercourse and any surface water discharge shall be restricted to the equivalent of 4 l/s per contributing impermeable hectare.

3.3.4 No significant artificial features such as canals, culverts or reservoirs have been identified within 1 km of the site.

3.4 Surface Water Body Status

3.4.1 The EA outlines that Claydon Brook, located north west of the site is defined under the Water Framework Directive (WFD) surface water classification.

3.4.2 Joint Nature Conservation Committee WFD guidance (JNCC, 2020) indicates that waterbodies below 10 km^2 catchment area no longer need to be included in a waterbody's classification assessment. Therefore, many of the identified surface water bodies in the vicinity of the site are too small to be classified as WFD waterbodies, with no further data available.

3.4.3 The WFD classification for the Claydon Brook is summarised in Table 8.5 below (Defra, 2022c).

Table 6. WFD Surface Waterbody Classification (Defra, 2023)

Waterbody Name	Waterbody Type	Overall Classification (2019)	Anticipated Classification (2027)	Summary of Pressures
Claydon Brook Tributary Water Body (ID:GB105033030550)	River	Moderate	Good – Low Confidence	• Diffuse Source – Poor Soil Management • Diffuse Source – Poor Nutrient Management • Point Source – Sewage Discharge (continuous) • Physical modification – Land Drainage

3.5 Geological and Hydrogeological Setting

Geology

3.5.1 British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the area of the site adjacent to the watercourses is located on Alluvium, comprising clay, silt, sand and gravel. There are no records of superficial deposits for the remainder of the site. The site is underlain by the Weymouth Member, comprising mudstone.

3.5.2 No available BGS borehole logs are located within the surrounding area.

3.5.3 The soils are described as 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' by the National Soils Research Institute.

Hydrogeology

3.5.4 According to the MAGIC's Aquifer Designation Mapping, the Alluvium is classified as a 'Secondary A' aquifer. These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers. The Weymouth Member is classified as 'Unproductive'. These rocks have negligible. significance for water supply or baseflow to rivers, lakes and wetlands.

3.5.5 MAGIC's online groundwater Source Protection Zone (SPZ) mapping indicates that the site is not located within a groundwater SPZ.

3.6 Existing Flood Risk

3.6.1 Detail on all sources of flood risk can be found within the Flood Risk Assessment and Conceptual Surface Water Drainage Strategy (HLEF85369 East Claydon Battery Storage R FRA v1 20231201).

Fluvial and Coastal Flood Risk

3.6.2 The EA Flood Map for Planning, which is available online, indicates that the majority of the site is located within Flood Zone 1, which is land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding. The western and southern portions of the site are located in Flood Zone 2 and 3. Flood Zone 3 is an area whereby the annual probability of flooding from fluvial sources is classified as 1 in 100 or greater. Flood Zone 2 is an area whereby the annual probability of flooding from fluvial sources is classified as between 1 in 100 and 1 in 1,000. The EA Flood Map for Planning is provided in the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201).

3.6.3 The site is not located in a Flood Warning Area. The EA defines a flood warning area as "geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater."

Surface Water Flood Risk

3.6.4 The EA's updated Flood Map for Surface Water, which is available online, identifies areas at risk of surface water flooding. The classification of the risk is based on the following annual probability of flooding:

- High risk; area has a chance of flooding greater than 1 in 30.
- Medium risk; area has a chance of flooding between 1 in 30 and 1 in 100.
- Low risk; area has a chance of flooding between 1 in 100 and 1 in 1000.
- Very low risk; has a chance of flooding less than 1 in 1000.

3.6.5 The EA surface water map indicates that a portion of the site is at a 'Very Low' risk of surface water flooding.

3.6.6 Areas of 'Low' to 'High' risk are identified along the northern boundary, western boundary and southern portion of the site.

3.6.7 Mapping for the low-risk scenario indicates that in areas adjacent to the watercourses at the site boundaries, velocities are expected to reach over 2.00 m/s and depths are expected to reach up over 1200mm. Across the wider site areas, velocities are expected to reach up to 1.00 m/s and depths are expected to reach up to 600mm.

3.6.8 The EA Map for Surface Water Food Risk is provided in the Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201).

Reservoir Flood Risk

3.6.9 EA mapping indicates that the site is predicted to fall within the maximum extent of reservoir flooding, when there is also flooding from rivers, however, is not indicated to be flooded in the event of flooding occurring from the reservoir alone.

3.7 Ecologically Designated Sites

3.7.1 The mapping also indicates that there are no designated sensitive areas e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI) within 1km of the site.

3.8 Water Supplies and Abstraction

Public and Private Water Supplies

3.8.1 No drainage records have been provided for the site. The land is currently agricultural land and therefore it is assumed that no artificial drainage systems will be present within the site area.

3.9 Future Baseline Conditions

3.9.1 The FRA includes consideration of the effects of climate change on flood risk at the site over the lifetime of the proposed development. The frequency and severity of flood events could increase with the predicted increase in the frequency and intensity of rainfall events. The site is located within the Upper and Bedford Ouse Management Catchment, where an allowance of 20 - 25% is appropriate for the development of Essential Infrastructure. RPS have taken a conservative approach to the design of the conceptual drainage system and added 40% to all attenuation / runoff calculations for the development to account for climate change.

3.9.2 The FRA includes mitigation measures to ensure the development will remain safe over its lifetime (based on available data assessed to date), and the Drainage Strategy takes into account projected increases in rainfall over the lifetime of the development.

3.9.3 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that “an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge” is included within the Environmental Statement.

3.9.4 An assessment of the future baseline conditions has been carried out and is described within this section.

3.9.5 The main impact on hydrology and flood risk future baseline is as a result of the potential effects of climate change. Climate change can have potential/may impacts on peak river flow rates, rainfall intensity and sea levels that occur in the future. As presented in Section 2, the proposed East Claydon site is located within the Upper and Bedford Ouse Management Catchment. Based on the lifetime of the development and the vulnerability classification, a peak river flow allowance of 11 – 30% and a peak rainfall intensity allowance of 20 - 25% is appropriate. The above allowances have been considered further with the associated Flood Risk Assessment (HLEF85369 East Claydon Battery Storage R FRA v1 20231201).

4 EMBEDDED MITIGATION MEASURES

4.1.1 This section details the mitigation measures that are proposed during both the construction and operational phases of the development as part of the proposed development. Table x below outlines the designed in measures which are proposed to reduce the potential impacts for hydrology and flood risk.

Measures Adopted within Scheme	Justification
Construction Phase	
Surface water drainage scheme The proposed battery storage development will result in the construction of low permeability surfacing, therefore increasing the rate of surface water run off from the site. A surface water drainage scheme will ensure that the existing runoff rates are maintained. The surface water drainage strategy for the proposed development is detailed in the associated Flood Risk Assessment and Conceptual Drainage Strategy 'HLEF85369 East Claydon Battery Storage R FRA v1 20231201'.	Addresses the requirements of Natural England and Buckinghamshire Council
Flood control measures Surface water flowing into the filter drains during the construction period will be pumped via a vortex grit separator to remove sediment, before being discharged into local watercourses. Any field drainage intercepted during the construction will either be reinstated following installation or diverted to a secondary channel. Any works undertaken will be in agreement with the appropriate stakeholders	Controls flood risk
Pollution prevention measures Refuelling of machinery will be undertaken within designated areas where spillages can be easily contained. Machinery will be routinely checked to ensure it is in good working condition. • The following specific mitigation measures for the protection of surface water during construction activities will be implemented: Management of construction works to comply with the necessary standards and consent conditions as identified by the EA; • A briefing highlighting the importance of water quality, the location of watercourses and pollution prevention included within the site induction; • Areas with prevalent runoff to be identified and drainage actively managed (e.g. through bunding and/or temporary drainage); • Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) to be carefully sited to minimise the risk of	Prevents pollution of water courses

hazardous substances entering the drainage system or the local watercourses. • Excavated and construction materials to be managed in such a way as to effectively minimise the risk posed to the aquatic environment; • Drainage works to be constructed to relevant statutory guidance and approved via the LLFA prior to the commencement of construction; and • Consultation with the EA and Natural England to be ongoing throughout the construction period to promote best practice and to implement proposed mitigation measures.	
Best practice measures All construction work will be undertaken in accordance with good practice guidance including, but not limited to: • Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650); • CIRIA – SuDS Manual (CIRIA, 2015); • No discharge to surface watercourses will occur without permission from the EA (SuDS Manual); • Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants (SuDS Manual); • Regular cleaning of roads of any construction waste and dirt to be carried out (SuDS Manual); and • A construction method statement to be submitted for approval by the responsible authority (SuDS Manual).	Accords with guidance and best practice for construction works.
Operation and Maintenance Phase	
Operational practices to incorporate measures to prevent pollution and increased flood risk, to include emergency spill response procedures, clean up and remediation of contaminated water runoff.	Reduces the risk of surface water pollution.
Decommissioning Phase	
Decommissioning practices to incorporate measures to prevent pollution and increased flood risk.	Protects the local water environment (should align with relevant guidelines at the time of decommissioning)

5 ASSESSMENT OF CONSTRUCTION EFFECTS

5.1 Impacts of Construction – Increased Flood Risk

Magnitude of Impacts

5.1.1 The impacts of the construction of East Claydon Battery Site have been assessed on Hydrology and Flood Risk.

5.1.2 In the study area, impacts on the flood risk would arise from any temporary change in runoff over the areas affected during construction. Construction methodologies will be implemented to ensure the risk of flooding is not increased for example, permeable gravel overlying a permeable geotextile membrane of an appropriate standard for construction compounds, haul road and construction accesses and drainage features to maintain land drainage flow).

5.1.3 The site consists of the inclusion of approximately 3.5 hectares of impermeable ground cover. In order to offset any potential increase in flood risk there has been the proposed implementation of an Attenuation Pond – the construction of this drainage feature will be implemented to ensure that the risk of flooding is not increased.

5.1.4 This method statement will be developed further (in discussion with the EA) during the detailed design stage.

5.1.5 The impacts on flood risk from the temporary change in runoff are only likely to affect the surrounding local receptors and, assuming that designed-in and construction measures are implemented, there is unlikely to be any observable degradation in flood risk. The magnitude is therefore, considered to be negligible.

Sensitivity of the Receptors

5.1.6 The East Claydon Battery site will be mainly situated within a rural area, with few residential properties within the surrounding area. The site is partially located within Flood Zones 2 and 3, however when the limited residential properties within the study area are considered, it is deemed that the sensitivity of the receptor is therefore, considered to be medium.

Significance of Impacts

5.1.7 Overall, the sensitivity of the site is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms. Impacts of construction may affect drainage infrastructure.

5.2 Impacts of Construction – Field Drainage

Magnitude of Impact

5.2.1 The impact on the drainage infrastructure and irrigation could arise as a result of the construction/development of the battery site as it could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates.

5.2.2 Any removal of field drains within the battery site could potentially cause a backup on surrounding field drains, in turn increasing the flood risk to the site and the surrounding

receptors. Measures to manage the surface water flows include the installation of an attenuation pond across the site and inclusion of a wildflower grassland.

5.2.3 With the incorporation of the appropriate constructions techniques and mitigation accompanied by the drainage plans for the site, the impact is deemed to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and temporary with field drains to be re-established where appropriate. It is predicted that any impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of Receptors

5.2.4 Field drains are considered to be of moderate vulnerability at the site, high recoverability and moderate value. The sensitivity of the receptor, is therefore considered to be medium.

Significance of the Effect

5.2.5 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of impact is deemed to be minor. The effect will therefore, be of minor adverse significance, which is not significant in EIA terms.

5.3 Impacts of Construction – Ordinary Watercourse

Magnitude of Impacts

5.3.1 Ordinary watercourses within the vicinity of the site may be crossed by access points associated with the development. This may lead to damage along the banks and alterations in flow pathways. The construction of the battery storage site will involve the displacement of sediment and the use of chemicals, oils and greases and therefore there is potential for contamination to occur. By ensuring that construction methodologies are implemented and substances are secured in covered areas, are used by trained persons and are regularly inspected, this can prevent contamination impacting ordinary watercourses.

5.3.2 With the incorporation of mitigation measures, the impact to ordinary watercourses is predicted to be of location spatial extent only impacting on surrounding receptors, short term duration, intermittent occurrence and can be reversible. The magnitude is therefore considered to be negligible.

Sensitivity of Receptors

5.3.3 Taking a precautionary approach in assuming all watercourses have achieved ‘Good’ status at the time when construction begins, the surface watercourses within the East Claydon hydrology and flood risk study area have been assessed with a WFD status of ‘Good’. Ordinary watercourses that are found in the vicinity of substations and battery sites are considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. Therefore, the sensitivity of the receptor is therefore, considered to be high.

Significance of the Effect

5.3.4 Overall, the sensitivity of the receptors is considered to be high, and the magnitude of the impact is deemed to be negligible. The effect on the ordinary watercourse will therefore be minor adverse significance which is not deemed to be significant in EIA terms.

Further Mitigation, Monitoring and Residual Effects

5.3.5 The implementation of a CEMP will ensure that the removal and storage of excavated materials at the site is controlled to reduce the occurrence of contamination reaching local at risk sources. At present, the layout does not require extensive excavation and relevelling of the site, however some works will be necessary. Excavation and re-use of soils will only be completed subject to detailed ground investigations. Further mitigation may be deemed necessary depending upon the results of the detailed investigations.

5.3.6 It is anticipated that monitoring of water quality will be routinely undertaken as part of ongoing WFD assessments. This is likely to be sufficient to ensure that the local environment is not impacted as a result of the construction. However, further monitoring may be deemed necessary depending upon the results of the detailed investigations to ensure local flora and fauna are not affected.

5.3.7 It is deemed that the proposed measures and monitoring will be sufficient to address residual effects that remain.

Accidents and/or Disasters

5.3.8 There is the possibility of sediment displacement, leaks of oils/chemicals and pollutant release from unmanaged excavated material during the construction phase. It is recommended that the site contractors implement a spill procedure for oil and chemicals, a containment procedure for excavated materials and temporary drainage measures to contain runoff within the development site boundary. Details of the above will be included within a CEMP for the development and work to ensure that contaminants from the site are not released into the local environment.

6 ASSESSMENT OF OPERATIONAL AND MAINTENANCE EFFECTS

6.1 Impacts of Operation – Increased Flood Risk

Magnitude of Impact

6.1.1 The proposed battery site has been subjected to an FRA in order to meet the requirements of planning policy and best practice. The proposed development of the battery site has been designed to ensure that surface water discharge from the site does not exceed the greenfield run off rate. With the incorporation of mitigation measures and the outline drainage strategy within the FRA, it has been determined that there will be no change from the baseline hydrological environment. The magnitude is therefore, considered to be negligible.

6.1.2 As the battery site will be developed upon an agricultural/green field site, the design plans have ensured that the existing land drainage flow is maintained through in the implementation of an Attenuation Pond, loose permeable gravel and areas of new wildflower planting. Therefore, it is determined that there will not be an increase in flood risk due to the operation and maintenance of the battery site.

Sensitivity of Receptors

6.1.3 The proposed battery storage development is partially located within Flood Zone 2 and 3 and is indicated to be at risk from surface water flooding. The areas of development are located outside of the flood extents. The land adjoining the site is mainly formed of agricultural land. Therefore, it has a high recoverability and low value with limited residential, commercial and industrial properties within the vicinity. The sensitivity is of the receptor is therefore considered to be low.

Significance of the Effect

6.1.4 Overall, the sensitivity of the receptor and the magnitude of the impact are both considered to be minor, due to the incorporation of mitigation measures and an outline of a drainage strategy for the development of the site. The effect will therefore, be of minor adverse significance, which is not significant in EIA terms.

6.2 Impacts of Routine Maintenance – Ordinary Watercourses

Magnitude of Impact

6.2.1 The operation and maintenance of the battery storage site will require the involvement of routine maintenance. Maintenance may involve the use of chemicals, oils and greases and therefore there is potential for spillages or leakages to occur. By ensuring that maintenance substances are secured in covered areas, are used by trained persons and are regularly inspected, this can prevent spills impacting ordinary watercourses.

6.2.2 With the incorporation of mitigation measures, the impact to ordinary watercourses is predicted to be of location spatial extent only impacting on surrounding receptors, short

term duration, intermittent occurrence and can be reversible. The magnitude is therefore considered to be negligible.

Sensitivity of Receptors

6.2.3 Taking a precautionary approach in assuming all watercourses have achieved 'Good' status at the time when construction begins, the surface watercourses within the East Claydon hydrology and flood risk study area have been assessed with a WFD status of 'Good'. Ordinary watercourses that are found in the vicinity of substations and battery sites are considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. Therefore, the sensitivity of the receptor is therefore, considered to be high.

Significance of the Effect

6.2.4 Overall, the sensitivity of the receptors is considered to be high, and the magnitude of the impact is deemed to be negligible. The effect on the ordinary watercourse will therefore be minor adverse significance which is not deemed to be significant in EIA terms.

Further Mitigation, Monitoring and Residual Effects

6.2.5 The implementation of operational practices incorporating measures to prevent pollution, including emergency spill response procedures, clean up and remediation of contaminated water should satisfactorily address the risk of pollution reaching local sources. As the likelihood of a spill occurring is low, it is deemed unnecessary to conduct monitoring.

6.2.6 It is anticipated that monitoring of water quality will be routinely undertaken as part of ongoing WFD assessments. This is likely to be sufficient to ensure that the local environment is not impacted as a result of ongoing maintenance. However, further monitoring may be deemed necessary depending upon the results of the detailed investigations to ensure local flora and fauna are not affected.

6.2.7 It is deemed that the proposed measures and monitoring will be sufficient to address residual effects that remain.

6.3 Accidents/ Disasters

6.3.1 Overall, due to the nature of the development there could be potential for accidents or disasters to occur. Due to the nature of the site being a battery storage site there is a possible of a leak of oils and chemicals, therefore they will need to be stored away from surface watercourse and avoid being leaked onto the site. Therefore, the site will require a spill procedure for oil and chemicals.

6.3.2 During construction of the development, the building contractor will be responsible for management and disposal of rainwater runoff generated from the site in its temporary condition.

6.3.3 The contractor shall develop a formal site management plan, which will address pollution management and control in relation to site plant and vehicles, raw materials storage and waste generation, to ensure that all surface water runoff generated in the temporary condition will be free of contamination.

6.3.4 The site will be subject to topsoil strip and bulk earthworks to prepare the site to the correct level for development. The contractor shall provide temporary drainage measures to

contain runoff within the development site boundary ensuring that this is sized appropriately, and that means to remove excess surface water are available for use at all times.

7 ASSESSMENT OF DECOMMISIONING EFFECTS

7.1 Potential Changes to the Assessment as a Result of Climate Change

7.1.1 Taking into account the information identified in the future baseline section above, it is considered that the proposed mitigation would be applicable for future conditions at the site.

8 ASSESSMENT OF CUMULATIVE EFFECTS

8.1.1 The cumulative assessment has considered a number of proposed developments in and around East Claydon Battery Site. A schedule of committed developments to be included within the cumulative assessment for the EIA is provided in the table below. Without mitigation, these schemes have the potential to result in significant effects on flood risk and water resources. The 1km flood risk study area as also been applied to the identification of other developments.

Application	Details	Included in Cumulative Assessment
New Substations (Substation and Substation Extension)	The development of a substation onsite in the northern portion.	No – the development of the substations forms part of the planning application so should not be considered as part of the 'cumulative' development.
Grid Connection	The substations will be required to be connected to the national grid, this will require consenting and other necessary permissions.	Yes – the grid connection will be required to be implemented by others therefore should be considered cumulative.

8.2 Construction Phase

8.2.1 No significant effects have been identified with the proposed developments during the construction phase. Other developments within the area would be subject to the same mitigation requirements as the proposed East Claydon Battery development, to protect the quality of water resources and restrict surface water runoff during the construction phase, in line with the requirements of the NPPF, PPG and Ciria SuDS Manual (C753). In addition, it is important to bear in mind that any other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the current development. Therefore, although some schemes can result in surface water discharges, they would not cumulatively result in a significant adverse effect on flood risk or water quality. Additionally, it seems unlikely that there would be any significant effects due there being a lack of local developments alongside the site.

8.2.2 Should construction work for a number of development schemes run concurrently, there is the potential for a high demand for water supply. In this situation, the water supplier is likely to impose restrictions on water use. Good practice on site would help minimise water usage during the construction phase. Given the temporary nature of the impact and given that it can be managed through restrictions on water usage and phasing of works, the cumulative effect is not considered to be significant.

8.3 Completed Development

8.3.1 All developments will be required to comply with similar planning obligations as the proposed East Claydon Battery Site development, which would ensure there is no

increase in flood risk or significant impact on water quality or water resources for any of the individual developments. Relevant planning conditions have been placed on each of the nearby schemes to ensure that an appropriate surface water drainage scheme is implemented. The fundamental requirement of the NPPF is that there is no increase in flood risk as a result of a development, and consent will not be granted where this has not been adequately demonstrated. The cumulative impact on flood risk and water quality would therefore be negligible.

8.3.2 With all new developments there would be an increased demand for water. The effects can be minimised through the adoption of water saving measures as part of all new developments and through upgrades such as booster stations.

Inter-relationships

8.3.3 This chapter should be read in conjunction with other technical chapters relating to the hydrological environment. However, no significant effects relating to the hydrological environment or flood risk are anticipated other than those discussed within this chapter.

8.4 Conclusions

8.4.1 During the construction phase, the best practice measures are considered to control any risks associated with the accidental release of materials and contaminated runoff, which would be one of the bigger risks associated with a storage battery site. With the temporary drainage system ensuring that that there would be no increase in flood risk during the construction phase. Water usage during construction would be minimised through water efficiency measures and given the temporary nature of associated impacts the effect is not considered to be significant.

8.4.2 The FRA identifies that the vast majority of the site is located within Flood Zone 1. A small section is shown to be assessed as Flood Zone 2 and 3. The development layout shows that the built development has been steered to Flood Zone 1. The site is indicated to be at risk from surface water flooding. Typically, the areas at risk from surface water flooding will be as a result of the local topography, however the redevelopment of the site should include the installation of a surface water drainage scheme consisting of attenuation ponds and permeable gravel, this will help alleviate the risk. Based upon the layouts, access/egress at the site would not be impacted during a flood event. Overall, the risks during the construction phase are considered to be low.

8.4.3 During the operational phase, the proposed SuDS would restrict surface water runoff to greenfield rates through the provision of on-site storage such as loose permeable gravel, attenuation ponds and new wildflower planting. These strategies would mitigate the surface water flood risk at the site and ensure that there would be no increase in flood risk elsewhere as a result of the proposed development. It would also provide treatment prior to discharge to the watercourse.

8.4.4 During the maintenance phase, the routine maintenance operations have the ability to potentially affect ordinary water courses through spiling or leakages of oils and chemicals, which can impact the water quality. However, the suggested mitigation measures should ensure that the overall risk is considered to be negligible.