



Morven Hawthorn Pit Grid Connection Project

Preliminary Environmental Information Report

Volume 3, Annex 2.2: Flood Risk Assessment

MVCNS-J4029-WSP-00020
October 2026
B01

Document status

Version	Purpose of document	Authored by	Checker	Approved by	Date
B01	PEIR	AM	CG	LS	October 2026

Prepared by:	Prepared for:
WSP	Morven Offshore Wind Limited

Table of contents

Executive summary	1
1 Introduction	3
1.1 Overview.....	3
1.2 Methodology.....	3
2 Legislative and policy context	6
3 Consultation and engagement.....	9
4 MHPGC Project Description	11
4.1 Proposed development.....	11
4.2 Embedded mitigation measures within the MHPGC Project.....	11
5 Baseline characterisation	14
5.1 Flood Risk Study Area	14
5.2 Site visit.....	14
5.3 Topography.....	14
5.4 Hydrological setting	15
5.5 Hydrogeological setting	16
6 Flood Risk Assessment	21
6.1 Fluvial and tidal flood risk.....	21
6.2 Surface water flood risk.....	26
6.3 Groundwater Flood Risk.....	28
6.4 Reservoirs, Canals and Other Artificial Sources Flood Risk	30
6.5 Summary of Flood Risk.....	30
7 Sequential and Exception Test Compliance	36
7.1 Sequential Test.....	36
7.2 Exception Test.....	36
8 Outline Surface Water Drainage Strategy.....	37
8.2 Greenfield Runoff Rates.....	37
8.3 Climate Change Allowances.....	38
8.4 Surface Water Attenuation Requirements	38
8.5 Use of SuDS	38
9 Conclusions	40
10 References.....	41

List of tables

Table 3.1: Summary of further consultation and engagement relevant to Volume 3, Annex 2.2: Flood Risk Assessment, of the PEIR	9
Table 6.1: Fluvial and tidal flood risk summary	25
Table 6.2: Summary of Risk of Flooding from Surface Water (RoFSW) status	27
Table 6.3: Summary of Groundwater Flood Risk status	29
Table 6.4: Summary of flood risk for onshore components of the MHPGC Project, taking into account embedded mitigation measures.....	30
Table 8.1 Greenfield runoff rate parameters for LSS Option Areas	37
Table 8.2 Existing greenfield runoff rates for the LSS Option Areas.....	38
Table 8.3 Indicative attenuation requirements for each LSS Option Area	38

List of figures

Figure 1.1: MHPGC PEIR Red Line Boundary: Onshore and associated Flood Risk Study Area.....	5
Figure 5.1: Environment Agency LiDAR data	18
Figure 5.2: Hydrological setting.....	19
Figure 5.3: Source Protection Zones	20
Figure 6.1: Environment Agency Flood Map for Planning.....	32
Figure 6.2: Environment Agency Flood Map for Planning (surface water spatial planning, present day)	33
Figure 6.3: Environment Agency Flood Map for Planning (surface water spatial planning, climate change) ..	34
Figure 6.4: National Coastal Erosion Risk Map for 2055 and 2105 95% Climate Change (upper end).....	35

Glossary

Term	Meaning
AC connection cables	Alternating Current (AC) cables that will connect the proposed onshore land substation to the National Grid Hawthorn Pit Substation
Alternating Current (AC) connection cable corridor	The corridor within which the AC connection cables will be located, from the onshore land substation to the National Grid Hawthorn Pit Substation.
Blue Onshore Land Substation (LSS) Option Area	Proposed location option for the onshore LSS, located west of the A19 and south of the access road to the Jade Business Park.
British Geological Survey (BGS)	The UK's principal provider of geological data, information and expertise.
Development Consent Order (DCO)	An order made under the Planning Act 2008, as amended, granting development consent.
Environment Agency	The public body responsible for environmental protection and flood risk management in England.
Environment Agency's Spatial Flood Defences	A digital map dataset in England that shows physical assets used to prevent or control flooding.
Exception Test	A test applied (after a 'Sequential Test') when a proposed development is in a higher-flood-risk area and there is no reasonably available lower-risk site. In accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG): Flood Risk and Coastal Change, the Exception Test requires it to be demonstrated that: (1) the development provides wider sustainability benefits to the community that outweigh the flood risk; (2) the development would be safe for its lifetime (accounting for the vulnerability of its users), would not increase flood risk elsewhere, and, where possible, would reduce flood risk overall.
Expert Working Groups (EWG)	A topic-specific group of specialists formed under the evidence plan process (EPP) to resolve technical issues and agree approaches for environmental assessments.
Flood Risk Assessment (FRA)	A site-specific assessment that identifies and evaluates flood risk from all relevant sources and, where necessary, recommends measures to manage and mitigate flood risk associated with a proposed development.
Flood Risk Study Area	The area considered within the flood risk assessment for the purpose of identifying potential flood risk receptors, sources, pathways and impacts associated with the proposed development.
Flood Zone 1 (Low Probability)	Land assessed as having a less than 0.1% (less than 1 in 1,000) annual probability of flooding from rivers or the sea.
Flood Zone 2 (Medium Probability)	Land having between a 1% and 0.1% annual probability of river flooding; or between a 0.5% and 0.1% annual probability of sea flooding.
Flood Zone 3a (High Probability)	Land having a 1% or greater annual probability of river flooding; or a 0.5% or greater annual probability of sea flooding.

Term	Meaning
Flood Zone 3b (Functional Floodplain)	Land that forms the functional floodplain, comprising areas where water from rivers or the sea has to flow or be stored during times of flood.
Fluvial Flood Risk	Flood risk arising from rivers and watercourses (i.e. flooding caused when a river or stream rises (due to heavy or prolonged rainfall, snowmelt etc.), exceeds its banks, and overflows onto adjacent land).
Green Onshore Land Substation (LSS) Option Area	Proposed location option for the onshore LSS, located between Jade Business Park (Spring Rd, Murton, Seaham SR7 9DR) and the National Grid Hawthorn Pit Substation.
Groundwater Flood Risk	The risk of flooding caused by groundwater levels rising above the ground surface or emerging from the subsurface.
H++ climate change scenario	A plausible high-end, extreme future condition that lies outside standard probabilistic projections, specifically targeting high-impact, low-likelihood events like extreme sea level rise or severe weather margins. The scenario exceeds the typical 10th to 90th percentile range of normal climate models.
High Voltage Direct Current (HVDC)	A HVDC electric power transmission system uses direct current for electric power transmission, in contrast to the more common alternating current systems. Most HVDC links use voltages between 100 kilovolts (kV) and 800kV.
High Voltage Alternating Current (HVAC)	A HVAC electric power transmission system uses alternating current for electric power transmission that periodically reverses direction at regular intervals.
Historical Flood Mapping	A GIS spatial dataset showing the maximum recorded extent of past flooding from rivers, the sea, and groundwater springs in England.
Landfall	The area in which the offshore export cables make landfall (come onshore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area between the trenchless technique exit pits and the transition joint bay inclusive of all construction works.
Light Detection and Ranging (LiDAR)	A remote sensing technique used to collect high-resolution topographic elevation data.
Main River	Main rivers are usually larger rivers or streams and are managed by the Environment Agency for flood risk purposes under the Water Resources Act 1991, with powers to maintain, improve or construct flood-defence works. All other watercourses are classified as 'ordinary watercourses'.
Marine Directorate Licensing Operations Team (MD-LOT)	The part of the Scottish Government's Marine Directorate responsible for assessing and administering applications for marine licences and Section 36 consent (offshore) in Scotland.
Marine Management Organisation (MMO)	The MMO, as a UK government body, is responsible for licensing, regulating and overseeing activities in the marine environment for English waters. For a DCO and deemed marine licence, the MMO acts as a statutory consultee, advising on

Term	Meaning
	marine planning, environmental impacts, habitats and compliance with marine licensing regulations.
Maximum design scenario (MDS)	The realistic worst-case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the MHPGC Project.
Mean High Water Springs (MHWS)	The most inshore level location reached by the sea at high tide during mean high water spring tide. This is defined as the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The average height of the low water levels of each pair of successful low waters during the periods of about 24 hours when the tidal range is at its greatest.
MHPGC PEIR Red Line Boundary: Onshore	Spatial extent used to define the environmental assessment within the PEIR. The area within which all onshore components of the MHPGC Project will be located landward of Mean High Water Springs, including areas required on a temporary basis during construction and/or decommissioning (e.g. construction compounds).
MHPGC Project Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach to, and information to support, the EIA and Habitats Regulations Assessment processes for certain topics.
MHPGC Project PEIR Red Line Boundary	The area within which all components of the MHPGC Project will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds).
MHPGC Project Preliminary Environmental Information Report (PEIR)	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project, and which helps to inform consultation responses.
MHPGC Project Scoping Opinions	Separate scoping opinions received from PINS (on behalf of the Secretary of State) and MD-LOT (on behalf of the Scottish Ministers) in response to the MHPGC Project Scoping Report. The MHPGC Project Scoping Opinions contain the range of issues that PINS, and MD-LOT in consultation with statutory stakeholders, have identified should be considered within the EIA process.
MHPGC Project Scoping Report	A Scoping Report for the MHPGC Project, scoping the likely significant effects of the project on the environment, was submitted and accepted by Planning Inspectorate (PINS) and submitted to the Scottish Ministers, via the MD-LOT in February 2025.
Morven Hawthorn Pit Grid Connection Project	The MHPGC Project is comprised of the offshore export cables in Scottish and English waters from the Morven North or the Morven South offshore substation platform(s) (OSP), landfall, onshore export cables, the onshore LSS and AC connection cables.

Term	Meaning
	Also referred to in this report as the MHPGC Project, for ease of reading.
National Coastal Erosion Risk Map (NCERM)	Environment Agency mapping that identifies areas potentially at risk from coastal erosion over various future time periods.
National Grid Hawthorn Pit Substation	The National Grid substation at Hawthorn Pit, County Durham, which the AC connection cables will connect into from the Onshore Land Substation.
National Planning Policy Framework (NPPF)	The NPPF sets out the core planning principles for England. It provides a framework within which locally-prepared plans can provide for housing and other development in a sustainable manner.
National Policy Statement (NPS)	Policy statements published by the Department for Energy Security and Net Zero and designated under the Planning Act 2008, setting out national policy for Nationally Significant Infrastructure Projects (NSIPs).
Nationally Significant Infrastructure Project (NSIP)	Large scale development which requires development consent under the Planning Act 2008.
Offshore substation platform(s) (OSP)	OSP(s) comprise the support structure, topside and electrical components used for collecting the electricity generated by the wind turbine generators, in Scottish waters, for the passage or transmission to landfall. These OSP(s) can be divided into two types: - HVAC collector substations; - HVDC converter substations.
Onshore components	Infrastructure landward of the transition joint bay at landfall, comprising onshore export cable, onshore export cable corridor, onshore LSS, AC connection cable and AC connection cable corridor and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses.
Onshore export cables	HVDC cables which bring electricity from the TJB to the onshore land substation.
Onshore land substation (LSS)	A purpose-built site comprising a compound containing the electrical components for converting the HVDC to HVAC power. The LSS site associated with the MHPGC Project adjusts the power quality and power factor to meet the requirements of power supply being fed to the National Grid Hawthorn Pit Substation.
Ordinary Watercourse	Any watercourse, which may be a river, stream, brook, ditch, drain, cut, culvert, dyke, sluice, non-public sewer, or other passage through which water flows, that is not designated as a "Main River". Ordinary watercourses are subject to local flood-risk management by the relevant local authority or internal drainage board.
Planning Inspectorate (PINS)	The PINS is an executive agency of the UK Government responsible for administering and examining DCO applications for NSIPs in England. PINS manages the application process, oversees consultation and examination, and makes a

Term	Meaning
	recommendation to the relevant Secretary of State on whether consent should be granted.
Pluvial Flood Risk	Flood risk arising from surface-water flooding, i.e. flooding caused by heavy or prolonged rainfall when drainage systems (sewers, drains, soakaways) and/or ground infiltration cannot cope. Surface water runs over land or collects in low-lying depressions, leading to flooding even though the site may be some distance from a river, sea or other watercourse.
Recorded Flood Outlines	Map layers showing past flood areas, starting from 1946, covering rivers, the sea, groundwater, and surface water.
Risk of Flooding from Surface Water (RoFSW)	Risk of Flooding from Surface Water mapping produced by the Environment Agency, showing areas potentially at risk from surface water flooding.
Sequential Test	A risk-based planning test set out in National Planning Policy Framework under which proposed new development should, where possible, be located on sites at lowest flood risk (from any source – rivers, sea, surface water, groundwater etc.). If no reasonably available low-risk site exists, then alternative sites in areas at higher flood risk are considered in order of increasing risk (medium first, then high). Only if there are no suitable lower-risk alternatives should development be considered in higher-risk areas.
Source Protection Zone (SPZ)	Environment Agency defined zone to protect groundwater abstraction sources (wells, boreholes and springs) from potentially polluting activities and accidental releases of pollutants. SPZs are primarily a policy tool used to control activities close to public water supplies.
Source Protection Zone 1: Inner	The 50-day travel time of pollutant to source and has a 50m default minimum radius. This zone is usually located adjacent to the abstraction, although in karst terrain it can extend some distance away due to rapid transport pathways. The Environment Agency's Approach to Groundwater Protection (2018) sets the tightest control of activities in this zone.
Source Protection Zone 2: Outer	The 400-day travel time of pollutant to source with a 250 or 500m minimum radius around the source depending on the amount of water abstracted.
Source Protection Zone 3: Total catchment	The area around a supply source within which all the groundwater ends up at the abstraction point. This is the area from where the recharge water is being taken and can extend some distance from the abstraction.
Strategic Flood Risk Assessment	A detailed study carried out (usually by local planning authorities or other strategic planning bodies) to assess flood risk across a wider area, from all sources now and in the future (including fluvial, tidal, surface-water/pluvial, groundwater, drainage/sewer risk, and climate change).
Surface Water Flood Risk	The risk of flooding resulting from rainfall that is unable to infiltrate the ground or enter drainage systems, causing overland flow and/or ponding.

Term	Meaning
the Study Area	For each environmental topic, the baseline environment will be characterised, and the likely significant effect will be described within a topic-specific Study Area. Specific Study Areas are defined for each topic and are based on the maximum spatial extent across which likely significant effects of the MHPGC Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Tidal Flood Risk	Risk of flooding caused by exceptionally high tides, storm surges, or a combination of the two, which can lead to sea or estuarine waters overtopping defences or inundating low-lying coastal areas. Tidal flood risk is influenced by factors such as coastal topography, wind direction, atmospheric pressure, wave action, and climate-change-driven sea-level rise. In England, the Environment Agency assesses and manages tidal flood risk in designated coastal and estuarine areas.
Transition Joint Bay	An underground bay housing a joint which connects the offshore export cables to the onshore export cables. The TJB will be located in the vicinity of the onshore side of the landfall.

Acronyms

Acronym	Meaning
AC	Alternating Current
AEP	Annual Exceedance Probability
BGS	The British Geological Survey
CoCP	Code of Construction Practice
CYLTFR	Check Your Long-Term Flood Risk Service
DCC	Durham County Council
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DTM	Digital Terrain Model
EA	Environment Agency
EIA	Environmental Impact Assessment
EWG	Expert Working Group
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LSS	Onshore Land Substation
MAGIC	Multi-Agency Geographic Information for the Countryside

Acronym	Meaning
MD-LOT	Marine Directorate – Licencing Operations Team
MDS	Maximum Design Scenario
MHPGC	Morven Hawthorn Pit Grid Connection
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NaFRA2	National Flood Risk Assessment 2
NCERM	National Coastal Erosion Risk Map
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NWL	Northumbrian Water Limited
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPG	Planning Practice Guidance
RCP	Representative Concentration Pathway
RoFRS	Risk of Flooding from Rivers and Sea
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SPZs	Source Protection Zones
SuDS	Sustainable Drainage Systems
UKCP	United Kingdom Climate Projections

Units

Unit	Meaning
°C	Degrees Celsius
mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
ha	Hectares
km	Kilometres
km ²	Kilometres squared
m	Metres

Executive summary

This report presents the Flood Risk Assessment (FRA) for the Morven Hawthorn Pit Grid Connection Project (hereafter 'MHPGC Project'). It forms **Volume 3, Annex 2.2: Flood Risk Assessment, of the Preliminary Environmental Information Report (PEIR)** and supports **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**. The purpose of the FRA is to identify and assess potential sources of flood risk to the MHPGC PEIR Red Line Boundary: Onshore and associated Flood Risk Study Area, and to ensure the MHPGC Project's compliance with Overarching National Policy Statement (NPS) for Energy EN-1 (Department for Energy Security and Net Zero (DESNZ) (2025a), NPS for Electricity Networks Infrastructure EN-5 (DESNZ, 2025b), National Planning Policy Framework (NPPF, 2025) and associated Planning Practice Guidance (PPG).

The assessment has considered flood risk from potential sources including tidal, fluvial, pluvial (surface water), groundwater and artificial sources (reservoirs and infrastructure failure). The assessment has been undertaken using the maximum design scenario (MDS), as set out in **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**, to represent the greatest potential disturbance to surface and groundwater regimes across the MHPGC PEIR Red Line Boundary: Onshore.

The Environment Agency Flood Map for Planning (FMfP) (2026) identifies that the majority of the MHPGC PEIR Red Line Boundary: Onshore lies within Flood Zone 1 for the present-day and climate change scenario. A small portion of the Flood Risk Study Area to the north west of the MHPGC PEIR Red Line Boundary: Onshore is within Flood Zone 2 and extends across an existing drainage ditch, classified as an ordinary watercourse. Design development through micro-siting, where reasonably practicable, would avoid present-day and climate change extents of Flood Zones 2 and 3. Flood Zone 3 is present along the coastline. Due to the use of trenchless techniques at landfall, no temporary or permanent development is located within this Flood Zone.

Additional potential impacts from climate change to the MHPGC Project have also been assessed. The landfall is not assessed to be at risk from future rates of coastal erosion and the MHPGC Project is not deemed to be at risk from the H++ climate change scenario due to its design.

The FMfP surface water flood risk mapping shows several localised areas at risk of present-day surface water flooding, particularly south of the Jade Business Park access road and within low-lying areas of the Blue Onshore Land Substation (LSS) Option Area. Areas at risk of surface water flooding increase during the climate change scenario. Where practicable, siting of the temporary and permanent footprint of the MHPGC Project would avoid the surface water flood risk extents for the present-day and climate change scenario, and measures included in the Outline Operational Drainage Management Plan would ensure flood risk is not increased across the development lifetime as a result of new impermeable areas associated with the LSS.

Increased rates of surface water runoff generated by new impermeable areas associated with the LSS Option Area during the operation and maintenance phase will be managed via a surface water drainage strategy. An Outline Operational Drainage Management Plan (ODMP) for the onshore Land Substation (LSS) will be prepared and submitted with the application for development consent. The Outline ODMP will detail measures to ensure that existing land drainage is reinstated and/or maintained, and ensure surface water runoff generated at the chosen onshore LSS option by new impermeable areas is attenuated with an allowance for climate change and discharged from the site to an appropriate location at a restricted discharge rate. A Detailed ODMP will be developed substantially in accordance with the Outline ODMP and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (LLFA). Appropriate measures as part of the Outline Code of Construction Practice (CoCP) to manage surface water runoff and drainage during the construction phase to prevent an increase in surface water flood risk.

The entirety of the MHPGC PEIR Red Line Boundary: Onshore is underlain by a Principal Aquifer and Source Protection Zones (SPZ) 1, 2 and 3. Due to variations in underlying geology, the MHPGC PEIR Red Line Boundary: Onshore has a varying susceptibility to groundwater flooding. Appropriate measures detailed within the Outline Surface Water and Groundwater Management Plan would set out measures to protect surface water and groundwater during construction, and will also include surface water and drainage management measures, flood risk control measures and management of foul water from construction compounds to ensure compliance with the Environment Agency's groundwater protection policy. The Outline Code of Construction Practice (CoCP) will address flood protection and control measures together with the water environment and drainage would be implemented to prevent an increase in groundwater flood risk and to

protect the SPZ during the construction phase. Similar controls would be applied during decommissioning, where relevant.

The MHPGC Project is therefore considered appropriate for its location, in line with NPPF vulnerability classifications, where the development type ("Essential Infrastructure") is suitable within Flood Zone 1 and Flood Zone 2. The area of Flood Zone 3 along the coastline would be avoided due to the use of trenchless techniques at landfall. The Sequential Test is not considered to be required as the proposed infrastructure would be located in an area of low flood probability. Due to the low flood probability, demonstration of the Exception Test is also not considered to be required.

In summary, the FRA demonstrates that the MHPGC Project can be delivered without increasing flood risk on-site or elsewhere. With the proposed mitigation and design measures in place, the MHPGC Project is considered appropriate in flood risk terms, consistent with NPS EN-1 and the NPPF.

1 Introduction

1.1 Overview

- 1.1.1.1 This report presents the Flood Risk Assessment (FRA) for the Morven Hawthorn Pit Grid Connection Project (referred to hereafter as 'the MHPGC Project'). It forms **Volume 3, Annex 2.2: Flood Risk Assessment**, of the **Preliminary Environmental Information Report (PEIR)** prepared for the MHPGC Project and supports **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**.
- 1.1.1.2 This report considers risk from various sources of flooding to the MHPGC PEIR Red Line Boundary: Onshore and the potential for changes in risk of flooding to downstream receptors within the Flood Risk Study Area (such as people, property, habitats, infrastructure and statutory sites) as a result of the MHPGC Project during construction, operation and decommissioning. This includes consideration of potential changes in surface water runoff. A comparison is made between the current baseline and the proposed future development.
- 1.1.1.3 This report provides the following information:
- A review of the flood risk to the MHPGC PEIR Red Line Boundary: Onshore based upon flood data and the flood maps provided by the Environment Agency and the relevant Strategic Flood Risk Assessment (SFRA).
 - An assessment of flood risk from all sources including tidal, fluvial, pluvial, groundwater and infrastructure failure to the MHPGC PEIR Red Line Boundary: Onshore, and the potential for the MHPGC Project to alter flood risk to downstream receptors within the Flood Risk Study Area.
 - An assessment of the compatibility of the MHPGC Project for its location based on flood risk and its proposed usage.
 - Proposals for measures to mitigate the generation of surface water runoff as a result of the MHPGC Project.
 - Proposals to mitigate any residual flood risks to the MHPGC Project.
- 1.1.1.4 The report presented is informed by the following technical chapters:
- **Volume 1, Chapter 2: Project Description, of the PEIR;**
 - **Volume 3, Chapter 1: Geology, Hydrogeology and Ground Conditions, of the PEIR;**
 - **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR.**
- 1.1.1.5 The chapter also draws on information contained within the following annexes:
- **Volume 3, Annex 2.1: Surface water abstraction licenses, discharge consents and pollution incidents, of the PEIR;**
 - **Volume 3, Annex 2.3: Onshore Water Framework Directive, of the PEIR;**
 - **Volume 3, Annex 1.1: Phase 1 Geo-Environmental Preliminary Risk Assessment, of the PEIR.**

1.2 Methodology

1.2.1 Sources of information

- 1.2.1.1 This FRA has been carried out in accordance with the Overarching National Policy Statement (NPS) for Energy EN-1 (Department for Energy Security and Net Zero (DESNZ), 2025a), NPS for Electricity Networks Infrastructure EN-5 (DESNZ, 2025b) and the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2025). It is to be used to assist the Planning Inspectorate (PINS) and relevant statutory consultees including the Local Planning Authority (LPA) when considering flood risk in relation to the MHPGC Project, as part of the application for development consent.
- 1.2.1.2 A staged approach was adopted in preparing the FRA in accordance with NPS EN-1 and the NPPF. Initially, screening studies were undertaken utilising publicly available information within the MHPGC PEIR Red Line Boundary: Onshore. Flood risk was then assessed in relation to the onshore land substation (LSS) options, landfall, onshore export cables and Alternating Current (AC) connection cables. As the onshore export cable corridor and AC connection cable corridor locations have not

been further defined at this stage, the entire MHPGC PEIR Red Line Boundary: Onshore has been considered when assessing the impacts related to onshore export cables and AC connection cables.

1.2.1.3 The FRA has relied upon publicly available information and information provided by third parties as follows:

- British Geological Survey (BGS) – Superficial deposits 1:50,000 scale;
- BGS – Bedrock geology 1:50,000 scale;
- BGS – Hydrogeology 1:625,000 scale;
- BGS – Borehole records;
- Defra – ‘Multi-Agency Geographic Information for the Countryside (MAGIC) Map’ Online GIS Portal;
- Environment Agency – Statutory Main River Map for England;
- Environment Agency – Flood Map for Planning;
- Environment Agency – Long Term Flood Risk Map;
- Environment Agency – AIMS Spatial Flood Defences;
- Environment Agency – Coastal Design Sea Levels
- Environment Agency – Groundwater Source Protection Zones (SPZs);
- Environment Agency – Light Detection and Ranging (LiDAR) Digital Terrain Model;

1.2.1.4 Accordingly, the conclusions reached in this report are valid only to the extent that such information was accurate, complete and available within the reporting schedule. Unless stated otherwise, the geological information provided is for general environmental interpretation and should not be used for geotechnical and/or design purposes.

1.2.2 Study Area

1.2.2.1 All onshore components of the MHPGC Project will be located within the MHPGC PEIR Red Line Boundary: Onshore, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds). The Flood Risk Study Area extends from Mean High Water Springs (MHWS) at Blast Beach in the east, to the National Grid Hawthorn Pit Substation in the west, with the A19 dual carriageway running north-south through its central area.

1.2.2.2 The Flood Risk Study Area within **Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**, incorporates a 250m buffer beyond the MHPGC PEIR Red Line Boundary: Onshore during construction and a 1km buffer beyond the LSS Option Areas for the MHPGC Project during operation. This represents the maximum spatial extent across which likely significant environmental effects of the MHPGC Project may be experienced by flood risk receptors within the entire Water Resources and Flood Risk Study Area.

1.2.2.3 The MHPGC PEIR Red Line Boundary: Onshore and associated Flood Risk Study Area is presented within **Figure 1.1**.

1.2.3 Data limitations and uncertainties

1.2.3.1 This FRA has been prepared using publicly available datasets and information available at the time of writing. The assessment to inform the ES for the DCO consent application may be refined as further information from publicly available datasets and site specific investigation and/or surveys becomes available.

1.2.3.2 As the onshore export cable corridor and AC connection cable corridor have not been fully defined at this stage, a precautionary assessment has been undertaken for the PEIR stage which assesses the MHPGC PEIR Red Line Boundary: Onshore.

1.2.3.3 Detailed flood risk and drainage information for nearby proposed developments has not been reviewed as part of this assessment. However, it is assumed that any such development is compliant with relevant planning policy and flood risk requirements and where this is made available, will be reviewed at ES stage for the DCO application.

Figure 1.1: MHPGC PEIR Red Line Boundary: Onshore and associated Flood Risk Study Area

2 Legislative and policy context

2.1.1 National Policy Statements

- 2.1.1.1 The NPSs set out the primary policy framework for projects that are subject to an application for development consent. This framework includes guidelines, requirements and criteria that the MHPGC Project must meet to obtain consent and proceed with development. The FRA has been carried out in accordance with the following Overarching NPS for Energy EN-1 (DESNZ, 2025a) and NPS for Electricity Networks Infrastructure EN-5 (DESNZ, 2025b).

2.1.2 National Planning Policy Framework

- 2.1.2.1 The NPPF was most recently updated in August 2026 and relevant Flood Risk and Coastal Change PPG was most recently updated in September 2025. Flood risk remaining primarily regulated through planning policy; the NPPF requires that an FRA should be submitted with planning applications for all development sites within Flood Zones 2 and 3 and all development sites over 1 hectare (ha) in area, to determine the risks of flooding from all sources including rivers, the sea, sewers, groundwater and artificial sources.

- 2.1.2.2 In terms of flood risk, the NPPF Annex F: Managing Flood Risk and Coastal Change PPG classifies flood risk from rivers and sea into the following flood zones

- Flood Zone 1 – Land having a less than 0.1% annual probability of river or sea flooding. (Shown as ‘clear’ on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
- Flood Zone 2 – Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map for Planning)
- Flood Zone 3a – Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map for Planning)
- Flood Zone 3b – This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood, typically land having a 3.3% or greater annual probability of flooding. This classification is not displayed within the Flood Map for Planning.

- 2.1.2.3 The NPPF Annex 3 Flood Risk Vulnerability classifies land uses according to vulnerability as follows:

- Essential infrastructure: Vital transport and utility systems (e.g. power stations, infrastructure for electricity supply, water treatment, evacuation routes) that must operate even during floods;
- Highly vulnerable: Uses very sensitive to flooding, such as emergency services, permanently occupied caravans or basements and hazardous-substance installations;
- More vulnerable: Sites that may pose substantial consequences if flooding occurs, such as schools, hotels and chemical plants;
- Less vulnerable: Areas that would result in fewer impacts, including commercial and industrial buildings, which are less sensitive to flooding;
- Water-compatible development: Structures that can sustain functionality during floods, including docks, marinas and flood defences.

- 2.1.2.4 In line with NPPF Annex 3 Flood Risk Vulnerability, the MHPGC Project is classified as ‘Essential infrastructure’.

2.1.3 Climate Change Guidance

- 2.1.3.1 The government’s current climate change guidance (Ministry of Housing, Communities and Local Government, 2023) for developers and their agents on the preparation of FRAs for planning applications and applications for development consent, is provided online and seeks to minimise vulnerability and provide resilience to flooding and coastal change.

- 2.1.3.2 Guidance requires demonstration of how flood risk would be managed across the development lifetime, taking into account the effects of climate change to peak river flows, rainfall intensity and sea level rise. This online guidance was originally published in February 2016 and has been updated

periodically, most recently in May 2022, to reflect the UKCP18 Representative Concentration Pathway (RCP) 8.5 (corresponding to a 4.3°C change in temperature) climate change projections.

2.1.3.3 Climate change allowances to be applied within FRAs are dependent on the development lifetime and development vulnerability classification. The MHPGC Project is classified as 'Essential Infrastructure' and would be fully operational by 2038 with an operational design life of 35 years. In line with advice from the Environment Agency during consultation, a development lifetime of 75 years has been used to assess the impacts of climate change on the development from 2038 and the end of development is assessed as 2113. As such, the following climate change allowances have been applied to the project:

- Wear Management Catchment 2080's epoch (2070 - 2115) 'Upper End' allowance for peak river flows with an uplift of 50% on the 1% AEP fluvial event;
- Wear Management Catchment 2070's epoch (2061 to 2125) 'Central' allowance for peak rainfall intensity with an uplift of 30% on the 1% AEP rainfall event; and
- Based on the 'Upper End' allowance for the Northumbria River Basin District sea level allowances, 140.2 mm of sea level rise is projected until 2038, the year the Project would become fully operational, and an additional 978mm of sea level rise is predicted between 2038 and 2113, the end of the 75 year development lifetime. In total, 1118.2mm of sea level rise is predicted until the end of the development lifetime.

2.1.3.4 Furthermore, in-line with NPS EN-1 guidance, it must be demonstrated that the MHPGC Project can be adapted to remain resilient to the credible maximum climate change scenario. This is defined as the 'Upper End' allowance for peak river flows, and the H++ is the credible maximum scenario for sea level rise to 2100 and informed by including a 1.9m allowance onto the design flood level.

2.1.4 National Standards for Sustainable Drainage Systems (SuDS)

2.1.4.1 National Standards for Sustainable Drainage Systems (SuDS) guidance was introduced in 2025 to provide a consistent, national framework for the design, approval and adoption of surface water drainage systems in England. Previous guidance focused primarily on flood risk management, while the new standards were developed to strengthen delivery of Schedule 3 of the Flood and Water Management Act 2010 by establishing mandatory requirements for managing runoff quantity, water quality, amenity, biodiversity, maintenance and resilience to climate change, while requiring drainage systems to mimic natural drainage processes as closely as practicable.

2.1.5 Durham Local Plan

2.1.5.1 The Durham County Council (DCC) Local Plan (2020) sets out the strategic framework for sustainable development across the county up to 2035. It outlines the spatial vision, policies and site allocations to guide housing, employment, transport and infrastructure growth while protecting the environment and managing flood risk.

2.1.5.2 Policy 35 – Water Management, requires that all development proposals must avoid increasing flood risk on-site or elsewhere, must be informed by appropriate FRA (including sequential and exception tests where relevant), and must incorporate sustainable drainage systems (SuDS) wherever feasible. The policy also directs that surface water run-off rates should be no greater than pre-development levels (unless otherwise justified) and development must demonstrate how it would ensure long-term operation and maintenance of drainage infrastructure.

2.1.5.3 Policy 36 – Water Infrastructure, sets out the requirements for new development to ensure that the necessary infrastructure is provided, secured and maintained so that it supports development without undue adverse impacts on the environment, people or resources. In particular, proposals must demonstrate that the water supply, wastewater treatment, drainage and flood risk infrastructure (including SuDS where appropriate) are capable of serving the development alongside other existing commitments, without placing unacceptable burdens on existing systems. The policy also expects the long-term maintenance of infrastructure and for development to avoid exacerbating flood risk or water quality issues.

2.1.6 Durham Strategic Flood Risk Assessment

- 2.1.6.1 The SFRA produced by DCC (2018) provides a comprehensive overview of flood risk across the county, identifying areas susceptible to flooding from rivers, surface water and groundwater, and assessing the implications of climate change on flood risk. It serves as an evidence base for the local development plan and guides decision-making on land use, infrastructure investment and flood mitigation measures.

3 Consultation and engagement

3.1.1 Scoping

- 3.1.1.1 A Scoping Report for the MHPGC Project was issued to the PINS and the Marine Directorate – Licencing Operations Team (MD-LOT) in February 2025 (RPS, 2025). Following consultation with the appropriate statutory bodies, PINS (on behalf of the Secretary of State) and MD-LOT provided a Scoping Opinion in March 2025 (PINS, 2025; MD-LOT, 2025, respectively).
- 3.1.1.2 **Section 2.3 of Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR** sets out the key comments raised during the scoping process specific to water resources and flood risk.

3.1.2 Further consultation and engagement

- 3.1.2.1 Further consultation and engagement with stakeholders have been undertaken via Hydrology and Flood Risk Expert Working Group (EWG) meetings and via email correspondence.
- 3.1.2.2 Additional consultation, specifically in relation to the FRA, is summarised in **Table 3.1**.

Table 3.1: Summary of further consultation and engagement relevant to Volume 3, Annex 2.2: Flood Risk Assessment, of the PEIR

Date	Consultee and response type	Comment	How and where considered in the PEIR
11 November 2025	Hydrology and Flood Risk EWG meeting	Discussion on initial mitigation and commitments for hydrology and flood risk.	Embedded mitigation measures for each onshore component of the MHPGC Project are detailed in Section 4.2 .
11 November 2025	Hydrology and Flood Risk EWG meeting	Detailed review of proposed agreements regarding surface water discharge and Ordinary Watercourse Consents.	The FRA has incorporated the agreed approach regarding surface water discharge; this is detailed in Section 4.2 .
11 November 2025	Hydrology and Flood Risk EWG meeting	Agreement on using surface water mapping for FRA in the absence of fluvial data for small catchment areas.	The agreed method of assessing surface water flood risk has been incorporated in the FRA in Section 6.2 .
11 November 2025	Hydrology and Flood Risk EWG meeting	Scoping comments and discussion on Groundwater Source Protection Zones (SPZ), flood map updates and mitigation overlaps.	Groundwater SPZs are detailed in Section 5.5 . Mitigation measures for each onshore component of the MHPGC Project are detailed in Section 4.2 .
14 November 2025	Email consultation response from the Environment Agency	The Environment Agency provided an email consultation response for detailed site specific flood risk data.	The consultation response confirmed there are no Main Rivers within the vicinity of the MHPGC Project, and as such the Environment Agency does not hold any detailed flood modelling relevant for the MHPGC Project. Further details are provided within Section 6 . The response also confirmed datasets to be used within the FRA. These datasets are incorporated in the report within Section 6 .
13 August 2026	Hydrology and Flood Risk EWG2 meeting	Further justification was requested by the EA regarding the 250m Flood Risk study area for temporary construction works	The FRA demonstrates the landfall, onshore export cables and AC connection cables have a low risk of flooding from all assessed sources throughout the development lifetime of the MHPGC Project. During the construction phase, the Outline CoCP (CoT18) will ensure flood

Date	Consultee and response type	Comment	How and where considered in the PEIR
			risk and surface water drainage associated with the construction of these elements is managed to prevent an increase in flood risk. During the operation phase, these elements of the MHPGC are to be buried underground and not generate a flood risk. The only above ground development associated with the onshore export cables and AC connection cables are link box covers which will be flush with existing ground levels (see Volume 1, Chapter 2: Project Description, of the PEIR). New impermeable areas arising from link box covers are unlikely to result in a notable change in surface water runoff rates or surface water flow routes as there will be no perceptible change to the hydrological catchment characteristics. Based on the above, a 250m buffer study area for elements of the project has been deemed to be appropriate.
13 August 2026	Hydrology and Flood Risk EWG2 meeting	The Environment Agency requested more information regarding the assessment of the credible maximum scenario	It was confirmed that the credible maximum scenario has been assessed and is presented within Section 6. Due to project design, the MHPGC Project is not considered to be at risk from credible maximum scenario, including H++ scenario, storm surge and extreme wave height, as well as the upper end allowance for peak river flow.
13 August 2026	Hydrology and Flood Risk EWG2 meeting	The use of hydraulic modelling within the Flood Risk Assessment	A consultation response from the Environment Agency received in November 2025 noted that they held no hydraulic modelling data for the MHPGC PEIR Red Line Boundary: Onshore or surrounding areas. Due to the limited watercourse network within the area, and the low risk of flooding posed to the MHPGC Project from these flood sources, and availability and use of alternative data sources within the FRA, detailed hydraulic modelling was not deemed to be required.
13 August 2026	Hydrology and Flood Risk EWG2 meeting	Presentation of updated commitments	An updated list of commitment measures to be included within the MHPGC Project was presented during EWG2. Commitments relevant to flood risk are provided within Section 6 and Volume 3 Chapter 2: Water Resources and Flood Risk of the PEIR.

4 MHPGC Project Description

4.1 Proposed development

- 4.1.1.1 **Volume 1, Chapter 2: Project Description, of the PEIR** sets out the description of the MHPGC Project and **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** sets out the overarching approach that has been used in developing the preliminary environmental information.
- 4.1.1.2 The maximum design scenario (MDS) represents, for the purposes of the FRA, the range of design parameters for construction, operation and maintenance and decommissioning phases likely to result in the greatest potential for disturbance to surface and groundwater regimes and therefore the highest possible flood risk. The MDS is detailed in **Section 2.6 of Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**. The MDS includes design parameters under consideration for landfall, the LSS Option Areas, onshore export cables and AC connection cables, including associated temporary construction works.
- 4.1.1.3 The MHPGC PEIR Red Line Boundary: Onshore is shown in **Figure 1.1**. While the location of the LSS option areas and landfall have definition for the PEIR, the onshore export cable corridor and AC connection cable corridor have not been spatially defined at this stage. As a result, a precautionary assessment has been undertaken which considers the MHPGC PEIR Red Line Boundary: Onshore when assessing the onshore export cables and AC connection cables.
- 4.1.1.4 It is assumed that the MHPGC Project would be fully operational by 2038 with an operational design life of 35 years until 2073. At the end of the operation and maintenance phase, the MHPGC would be depowered and decommissioned. In line with advice from the Environment Agency during consultation, a development lifetime of 75 years from commissioning in 2038 has been used to assess the impacts of climate change on the development.

4.2 Embedded mitigation measures within the MHPGC Project

- 4.2.1.1 Embedded mitigation measures are defined as measures included as part of the project design and as a result, have been taken into account within this FRA. Embedded mitigation measures relevant to flood risk are detailed below. Details of commitments made by the Applicant are included in **Volume 1, Annex 4.1: Draft Commitments Register, of the PEIR** with reference numbers provided (e.g. CoT01) in this report.

4.2.2 Landfall

- 4.2.2.1 A Landfall Construction Method Statement (CoT59) will be submitted with the application for development consent based on the refined design for the application. The following features will be crossed using trenchless techniques:
- A, B and Classified unnumbered roads (known as C roads) (including the A19 and B1432);
 - all railway lines (including the section of railway line which runs between Seaham and Horden);
 - the Durham Coast SSSI and SAC;
 - Hesledon Moor East SSSI.
- 4.2.2.2 This installation methodology substantially reduces direct interaction with coastal processes and therefore minimise flood risk. Potential impact from the trenchless drill to the groundwater body will be managed through measures to be detailed in the Outline Surface Water and Groundwater Management Plan (CoT23). Any measures required specific to the trenchless methodology would be detailed in the Outline Landfall Construction Method Statement (CoT 59).
- 4.2.2.3 No O&M activities would affect the groundwater. The cables would be left in place during decommissioning therefore no impact would occur.
- 4.2.2.4 Temporary working areas would incorporate appropriate water quality and drainage controls to manage runoff, prevent erosion and avoid pollution. These measures would be detailed in the Outline Code of Construction Practice (CoCP) (CoT18) and Outline Surface Water and Groundwater Management Plan (SWGMP) (CoT23).

- 4.2.2.5 Above-ground access points for the TJB will be required. This would result in extremely small operational land-take areas (25m²) and would not introduce significant impermeable surfaces or create barriers to surface water flow. Following construction, ground levels at the trenchless technique entry pits and temporary compounds would be reinstated to pre-existing contours, ensuring that natural hydrology and greenfield runoff characteristics are maintained.

4.2.3 Onshore export cables and AC connection cables

- 4.2.3.1 Localised trenching and the presence of temporary compounds could increase surface water runoff and affect local drainage patterns during heavy rainfall. However, these effects are expected to be short-term and manageable through the implementation of the Outline CoCP (CoT18) and Outline SWGMP (CoT23) which would include measures to protect surface water and groundwater during construction, covering surface water and drainage management measures, flood risk control measures, and management of foul water from construction compounds.
- 4.2.3.2 The onshore export cables and AC connection cables would be completely buried along the cable route (CoT27), with no above-ground permanent infrastructure. As a result, the long-term hydrological and flood-risk implications are negligible.
- 4.2.3.3 Where groundwater is encountered during trench excavation, appropriate controls such as temporary dewatering and managed discharge would be implemented in accordance with the Outline SWGMP to prevent adverse effects on groundwater flows and flood risk.
- 4.2.3.4 Following cable installation, all temporary working areas, would be reinstated to pre-existing condition as far as reasonably practicable (CoT29), in line with best practice guidance.

4.2.4 LSS Option Areas

- 4.2.4.1 The Outline CoCP (CoT18), Outline SWGMP (CoT23) and Outline Pollution Prevention Plan (PPP) (CoT34) will set out the approach to managing construction phase drainage, including measures to manage surface water runoff, minimise flood risk and avoid uncontrolled discharge. Where possible, the siting of temporary aspects of the MHPGC Project during construction would be sited to avoid areas of flood risk (CoT17). The Outline PPP (CoT34) and Outline SWGMP (CoT23) would incorporate pollution prevention and groundwater protection measures, particularly within SPZs 1 and 2, to safeguard water quality.
- 4.2.4.2 Where groundwater is encountered during excavations associated with the construction of the LSS, appropriate controls such as temporary dewatering and managed discharge would be implemented. These will be included in the Outline SWGMP (CoT23) to prevent adverse effects on groundwater flows and flood risk.
- 4.2.4.3 An Outline ODMP (CoT22) for the onshore land substation will be prepared and submitted with the application for development consent. The Outline ODMP will detail measures to ensure that existing land drainage is reinstated and/or maintained, and ensure surface water runoff generated at the chosen onshore LSS option by new impermeable areas is attenuated with an allowance for climate change and discharged from the site to an appropriate location at a restricted discharge rate. A Detailed ODMP will be developed in accordance with the Outline ODMP and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (LLFA).

Blue LSS Option Area

- 4.2.4.4 As the Blue LSS Option Area is currently greenfield in nature, the introduction of new hardstanding would, if not managed, increase surface water runoff rates. The use of SuDS to mitigate an increase in flood risk is set out through NPS EN-1, the NPPF and SuDS Manual (CIRIA 2015), as well as the Durham Local Plan. Further information on proposed measures would be included in the Outline ODMP (CoT22).

Green LSS Option Area

- 4.2.4.5 The Green LSS Option Area currently comprises both greenfield and brownfield land. The introduction of new hardstanding would, if not managed, increase surface water runoff rates. The

use of SuDS to mitigate an increase in flood risk is set out through NPS EN-1, the NPPF (and online PPG) and SuDS Manual (CIRIA 2015), as well as the Durham Local Plan. Further information on proposed measures would be included in the Outline ODMP (CoT22).

- 4.2.4.6 SuDS measures would seek to reduce peak flows from the Green LSS Option Area to watercourses or sewers and therefore, avoid any increase in downstream flood risk. As any surface water attenuation would be sized such that the Green LSS Option Area would accommodate a 1 in 100 annual probability critical storm event and include an allowance for climate change, it is considered that there would be a reduction in downstream flood risk. SuDS measures could also offer an opportunity to improve water quality by removing pollutants from diffuse pollutant sources and could also assist in the provision of habitat improvements. Further details would be provided as the design progresses and included in the Outline ODMP (CoT22).

5 Baseline characterisation

5.1 Flood Risk Study Area

- 5.1.1.1 The Flood Risk Study Area is located in the northeast of England, immediately south of Murton Village, with its centre positioned at approximately OSGB36, British National Grid Reference NZ 41255, 46043. The Flood Risk Study Area extends from MHWS at Blast Beach in the east to the National Grid Hawthorn Pit Substation in the west, with the A19 dual carriageway running north-south through its central area.
- 5.1.1.2 To the north, the Flood Risk Study Area is bounded by Murton Village, the A182 and surrounding agricultural land. The eastern extent of the Flood Risk Study Area adjoins the North Sea and adjacent farmland, while Hawthorn Village lies to the south. To the west, the Flood Risk Study Area is bordered by the village of South Hetton, as well as areas of elevated ground at Croup Hill and Murton Moor.

5.2 Site visit

- 5.2.1.1 A site visit to the Flood Risk Study Area was undertaken on the 20th July 2026. Weather conditions were dry, with little rain recorded for the previous month in the local area. The walkover was limited due to access constraints associated with the construction of Eastern Green Link cable route and converter station as well as the construction of a new substation at Hawthorn Pit.
- 5.2.1.2 The drainage ditch (ordinary watercourse) associated with Coop House Wood was identified to be flowing however vegetation growth and access restraints prevented further visual observations. Surface water flow pathways noted within **Section 6.2** were observed to be dry.

5.3 Topography

5.3.1 Landfall

- 5.3.1.1 Elevations across the landfall area within the Flood Risk Study Area increase in a westerly direction, the lowest elevation recorded is adjacent to the railway sidings in the eastern extent at approximately 39 metres above ordnance datum (mAOD), this increases in a northerly and westerly direction to a peak of approximately 72mAOD.

5.3.2 Onshore export cables and AC connection cables

- 5.3.2.1 LiDAR aerial topographic data, acquired from the Environment Agency (Environment Agency, 2023) has been reviewed in order to estimate external ground elevations for the Flood Risk Study Area. The data is presented as a Digital Terrain Model (DTM) which is filtered to remove buildings and structures, with a 1m grid resolution.
- 5.3.2.2 The onshore export cable corridor and AC connection cable corridor have not been explicitly defined at this stage. Therefore, as a conservative approach the entire MHPGC PEIR Red Line Boundary: Onshore within the Flood Risk Study Area has been considered when assessing the onshore export cables and AC connection cables, as shown in **Figure 5.1**.
- 5.3.2.3 The LiDAR data indicates that the MHWS lies at approximately 5mAOD, rising rapidly to approximately 35mAOD at the top of the adjacent cliffs. Ground elevations typically increase progressively westward across the MHPGC PEIR Red Line Boundary: Onshore. A hill located in the eastern portion reaches an elevation of approximately 102mAOD, while Batter Law (hill), situated centrally to the west of the A19, peaks at 143mAOD. The western extent of the MHPGC PEIR Red Line Boundary: Onshore comprises predominantly flat terrain at circa 120mAOD with minor localised changes in elevations.

5.3.3 Blue LSS Option Area

- 5.3.3.1 The Blue LSS Option Area is located within the centre of the Flood Risk Study Area. The elevations along the eastern boundary of the Blue LSS Option Area adjacent to the A19 are approximately 117mAOD, and those along the western boundary are approximately 118mAOD. Both areas

experience a decrease in elevation towards the centre of the Blue LSS Option Area, where the lowest point reaches approximately 108mAOD. The land immediately south of the access road to Jade Business Park is situated in a region of lower elevation relative to the rest of the Blue LSS Option Area, with elevations ranging from 102mAOD to 106mAOD.

5.3.4 Green LSS Option Area

- 5.3.4.1 The Green LSS Option Area is located within the western portion of the Flood Risk Study Area and is situated at approximately 117mAOD with minimal variation in elevations throughout the area. The land to the north of Jade Business Park experiences a decrease in elevation in an easterly direction, ranging from approximately 117mAOD to 114mAOD.

5.4 Hydrological setting

5.4.1 Landfall

- 5.4.1.1 The landfall is characterised by shallow overland flow paths, which convey runoff from higher ground in the west toward low-lying areas near the railway sidings to the east. No defined watercourses are present, and drainage is dominated by natural runoff processes during rainfall events.

5.4.2 Onshore export cables and AC connection cables

- 5.4.2.1 The hydrological setting for the MHPGC Project is presented within **Figure 5.2**. No main rivers are located within the MHPGC PEIR Red Line Boundary: Onshore.
- 5.4.2.2 Tributaries of Dalton Beck are noted to convey flow westwards within Jade Business Park and are understood to be culverted under the business park access roads.
- 5.4.2.3 Dalton Beck flows northeast from southeast of South Hetton, passing through Murton and Seaham before discharging to the North Sea approximately 1.8km north of the MHPGC PEIR Red Line Boundary: Onshore. The watercourse becomes intermittently discontinuous around Cold Hesledon and is joined by several unnamed tributaries, including flows from Watergate Fishing Lake. It subsequently flows through Dawdon Dene before outfalling to the coast.
- 5.4.2.4 A tributary of Hawthorn Burn is located within the eastern part of the MHPGC PEIR Red Line Boundary: Onshore, flowing south to join Hawthorn Burn approximately 180m beyond the site boundary. Hawthorn Burn (originating as Loaning Burn southeast of Easington) flows northeast through Hawthorn Dene, an ecologically designated SSSI, located immediately upstream of the coast, before turning west and discharging to the North Sea approximately 640m south of the site boundary.
- 5.4.2.5 A tributary of Coldwell Burn is located approximately 270m west of the MHPGC PEIR Red Line Boundary: Onshore and flows westwards toward Coldwell Burn approximately 1.5km downstream of the site. Coldwell Burn originates southeast of Haswell and flows north and west through a rural catchment, becoming Coalford Beck and subsequently Pitlington Beck before joining Sherburnhouse Beck.

5.4.3 Blue LSS Option Area

- 5.4.3.1 Surface water flow paths within the Blue LSS Option Area drain toward land adjacent to the access road to Jade Business Park, where runoff accumulates. Flow is subsequently conveyed northwards via a culvert.

5.4.4 Green LSS Option Area

- 5.4.4.1 The Green LSS Option Area comprises two surface water catchments:
- Eastern catchment: drains northeast from land around Jade Business Park;
 - Western catchment: drains south toward Dalton Beck, including land across the wider western extent of the area.

5.5 Hydrogeological setting

5.5.1 Landfall

- 5.5.1.1 BGS Bedrock geology 1:50,000 scale mapping notes the predominant bedrock geology of the area consists of the Roker Formation (Dolostone), along with a small linear section of the Shelf Edge Reef Ford Formation located towards the western extent of the landfall area.
- 5.5.1.2 BGS Superficial Deposits geology 1:50,000 scale mapping notes no superficial deposits have been recorded in the northeastern portion of the landfall area adjacent to the railway sidings. The remainder of the site is characterised by superficial deposits of Devensian Till.
- 5.5.1.3 MAGIC mapping notes the landfall area is within a Principal Aquifer and Groundwater SPZ 3.

5.5.2 Onshore export cables and AC connection cables

- 5.5.2.1 As the onshore export cable corridor and AC connection cable corridor have not been defined at this stage, the baseline hydrogeological assessment has been undertaken across the full extent of the MHPGC PEIR Red Line Boundary: Onshore.
- 5.5.2.2 The BGS map of the area (1:50,000 scale map series), accessed via online digital mapping (British Geological Survey, 2025), indicates that the eastern extent of the MHPGC PEIR Red Line Boundary: Onshore is underlain by bedrock geology of the Roker Formation (Dolostone), a small linear section of the bedrock Shelf Edge Reef Ford Formation is located to the east of Kinley Hill in the eastern section of the MHPGC PEIR Red Line Boundary: Onshore. The remainder of the bedrock geology is formed of the Ford Formation (Dolostone).
- 5.5.2.3 BGS Superficial Deposits geology 1:50,000 scale mapping notes the majority of the MHPGC PEIR Red Line Boundary: Onshore is covered by superficial deposits of Devensian Till. Scattered regions of superficial Glaciofluvial Deposits are predominantly found in the central and western sections of the MHPGC PEIR Red Line Boundary: Onshore. Superficial deposits of Alluvium are present across the existing drainage channels in the western part of the MHPGC PEIR Red Line Boundary: Onshore.
- 5.5.2.4 MAGIC mapping notes the onshore export cables are located within a Principal Aquifer. The majority of the MHPGC PEIR Red Line Boundary: Onshore is situated within SPZ 3. The central part of the MHPGC PEIR Red Line Boundary: Onshore lies within SPZ 2 and a small area adjacent to the A19 on the northern boundary of the MHPGC PEIR Red Line Boundary: Onshore falls within SPZ 1. Source Protection Zones are displayed within **Figure 5.3**.

5.5.3 Blue LSS Option Area

- 5.5.3.1 BGS Bedrock geology 1:50,000 scale mapping notes the Dolostone Ford Formation is located to the south of the Access Road to Jade Business Park, within the northern extent of the Blue LSS Option Area. The remainder of the Blue LSS Option Area is predominantly composed of the Dolostone Roker Formation.
- 5.5.3.2 BGS Superficial Deposits geology 1:50,000 scale mapping notes most of the Blue LSS Option Area features superficial deposits of Diamicton Devensian Till. Additionally, small, isolated areas in the southern extent of the Blue LSS Option Area, to the east of Batter Law Hill, consist of Devensian Glaciofluvial deposits.
- 5.5.3.3 MAGIC mapping notes the Blue LSS Option Area is located within a Principal Aquifer and the majority of the Blue LSS Option Area is situated within Groundwater SPZ 2. The northeast corner of the Blue LSS Option Area is within SPZ 1.

5.5.4 Green LSS Option Area

- 5.5.4.1 BGS Bedrock geology 1:50,000 scale mapping notes the entire Green LSS Option Area comprises of bedrock geology of the Dolostone Ford Formation. BGS Superficial Deposits geology 1:50,000 scale mapping notes this area is underlain by superficial deposits of Devensian Till.

- 5.5.4.2 The Green LSS Option Area is located within a Principal Aquifer and the northeast corner of the Green LSS Option Area is within Groundwater SPZ 2. The remainder of the Green LSS Option Area lies within Groundwater SPZ 3.

5.5.5 Boreholes

- 5.5.5.1 The BGS hold records of a number of historical boreholes within the MHPGC PEIR Red Line Boundary: Onshore and these are presented within **Volume 3 Annex 1.1: Phase 1 geo-Environmental Preliminary Risk Assessment, of the PEIR** (including **Figure 1.5 BGS Borehole Locations** of that document), together with data on groundwater levels from third party Ground Investigations and geotechnical desk studies. Shallow groundwater levels are understood to be present within 10m of the ground surface within areas of the MHPGC PEIR Red Line Boundary: Onshore.

Figure 5.1: Environment Agency LiDAR data

Figure 5.2: Hydrological setting

Figure 5.3: Source Protection Zones

6 Flood Risk Assessment

6.1 Fluvial and tidal flood risk

6.1.1 Recorded and historical flooding

6.1.1.1 The Environment Agency supports two data sets, the Recorded Flood Outlines and the Historical Flood Mapping. The Recorded Flood Outlines contains every instance of flooding that the Environment Agency has on record including by fluvial, coastal, surface water and groundwater flooding. The Historic Flood Mapping typically contains recorded instances of fluvial, coastal and groundwater flooding. Surface water is generally not recorded but has been in some instances, if it is seen to be a contributing factor to the aforementioned sources of flooding.

6.1.1.2 Both mapping tools are consistent and show that there has been no recorded historic flooding experienced within the MHPGC PEIR Red Line Boundary: Onshore.

6.1.2 Flood defences

6.1.2.1 The Environment Agency's Spatial Flood Defences layer indicates that no formal flood defences are present on the watercourses within the MHPGC PEIR Red Line Boundary: Onshore.

6.1.3 Flood Alerts and Flood Warnings

6.1.3.1 The Environment Agency Flood Alert and Flood Warnings dataset indicates the entirety of the MHPGC PEIR Red Line Boundary: Onshore is not located within an Environment Agency Flood Warning or Flood Alert area.

6.1.4 Hydraulic modelling

6.1.4.1 The Environment Agency confirmed in November 2025 via a consultation response that it does not hold detailed hydraulic models for watercourses within the MHPGC PEIR Red Line Boundary: Onshore. Data used to assess flood risk is from the National Flood Risk Assessment (NaFRA2) which was published in December 2024. The NaFRA2 uses new national modelling alongside local models, where present (noting that none are present within the MHPGC PEIR Red Line Boundary: Onshore).

6.1.4.2 Flood risk from watercourses as defined within Ordnance Survey mapping is discussed within **Section 6.1.5**. Flood risk from watercourses that drain catchment areas typically greater than 3km² have been identified within the Environment Agency Flood Map for Planning. For such smaller watercourse catchments under 3km², the Environment Agency does not typically designate a formal fluvial flood zone. Flood risk from watercourse catchments under 3km² have been assessed via the Environment Agency's Flood Map for Planning Surface Water Spatial planning dataset which defines additional areas at risk of flooding than shown within the Flood Map for Planning Flood Zones mapping.

6.1.4.3 Flood risk from surface water flow pathways which coalesce to form ordinary watercourses is further described within **Section 6.2.1**.

6.1.4.4 Given the hydrological setting of the MHPGC PEIR Red Line Boundary: Onshore, and data available from the Environment Agency NaFRA2 dataset, site specific hydraulic modelling is not deemed to be required to inform flood risk.

6.1.5 Environment Agency Flood Map for Planning

Flood Zone mapping (Present Day scenario)

6.1.5.1 In England flood risk is regulated through planning policy, with key requirements outlined in the NPPF. The primary resource for reviewing fluvial and tidal flood risk is the Environment Agency's Flood Map for Planning (Environment Agency, 2026), which was most recently updated in May 2026.

6.1.5.2 The Environment Agency's Flood Map for Planning has been consulted to provide Flood Zone mapping and is presented within **Figure 6.1**. This indicates the majority of the Flood Risk Study Area is within Flood Zone 1 (Low Probability). The following areas of Flood Zone 2 and 3 are noted:

- A small area of fluvial Flood Zone 2 (Medium Probability), located to the south of Hesledon Moor East, extends into the north of the MHPGC PEIR Red Line Boundary: Onshore. The extent of Flood Zone 2 is associated with Dalton Beck downstream of the culvert under Jade Business Park and is deemed to be approximately less than 1% of the total MHPGC PEIR Red Line Boundary: Onshore.
- An area of tidal Flood Zone 3 (High Probability) extends along the Mean Low Water Springs (MLWS) to the east of the MHPGC PEIR Red Line Boundary: Onshore.

Flood Zone mapping (Climate change scenario)

6.1.5.3 As well as the present day risk of flooding from rivers and the sea, the Environment Agency's Flood Map for Planning includes climate change flood extents of Flood Zones. These extents represent the modelled risk in the 2070 – 2125 epoch for the 'Central' allowance and are created by adding climate change scenarios from local and national modelling, using the maximum extents from:

- Rivers and sea with defences 3.3%, 1%/0.5% and 0.1% Annual Exceedance Probabilities (AEPs);
- River and sea without defences 1%/0.5% and 0.1% AEPs.

6.1.5.4 The extents are merged to create a single 'Flood Zones plus Climate Change' outline which is shown in **Figure 6.1**. The mapping indicates a small increase in the flood extent on the northern boundary of the MHPGC PEIR Red Line Boundary: Onshore situated to the south of Hesledon Moor East associated with Dalton Beck.

Surface Water Spatial Planning Extents (Present Day scenario)

6.1.5.5 It is noted the Flood Map for Planning Flood Zone mapping does not generally provide flood zone data for watercourses with hydrological catchments of less than 3km². Flood Zones associated with Dalton Beck once the watercourse outfalls from a culvert running under Jade Business Park are provided within the Flood Map for Planning and are discussed within paragraphs above. To assess flood risk along its upstream reaches (which are not included within the Flood Map for Planning Flood Zone mapping), the separate Flood Map for Planning Surface Water Spatial Planning Extents dataset has been used.

6.1.5.6 The Environment Agency Flood map for Planning was most recently updated in May 2026 to include the Flood Map for Planning Surface Water Spatial Planning Extents dataset which classifies flooding risk by the following return periods:

- Up to 1 in 30-year (3.3%) AEP;
- Between the 1 in 30-year (3.3% AEP) to the 1 in 100-year (1%) AEP;
- Between the 1 in 100-year (1% AEP) to the 1 in 1,000-year (0.1%) AEP.

6.1.5.7 The Environment Agency's Surface Water Spatial Planning extents dataset is presented **Figure 6.2**. Out of bank flooding is associated with Dalton Beck to the south of Jade Business Park which flows within a valley to the south of Coop House Wood. Levels drop some 15m over a distance of 110m between the watercourse and Little Coop House Farm. Out of bank flows are evident during the 1 in 30-year rainfall event and increase in extent with the 1 in 100-year and 1 in 1,000-year events rainfall. Flood extents are constrained by topography, with marginal extents present outside the valley.

6.1.5.8 The watercourse is culverted within Coop House Wood to enable its crossing by Jade Business Park access road, and flood extents are captured within the Flood Map for Planning downstream of the culvert outlet to the north of Jade Business Park. It is assumed the culvert is not explicitly captured within the NaFRA2 data which is used to inform the dataset, resulting in the backing up of flows upstream of the culvert. Furthermore, it is expected the raised elevation of the Jade Business Park access road blocks flows from following local topography to the north-east.

Surface Water Spatial Planning Extents (Climate change scenario)

- 6.1.5.9 The Environment Agency's Flood Map for Planning Surface Water Spatial Planning dataset includes climate change flood extents. These extents represent the modelled risk in the 2060 – 2125 epoch Upper End allowance for peak rainfall intensity. Climate change extents are shown in **Figure 6.3**.
- 6.1.5.10 Flood extents are noted to marginally increase during the climate change event for all return period events.

6.1.6 Environment Agency Coastal Design Sea Levels

- 6.1.6.1 The Coastal Design Sea Levels – Coastal Flood Boundary Extreme Sea Levels (2018) dataset has been used to inform flood risk at landfall from the tidal design flood level using the T200 peak sea level at chainage 3654 within the dataset.
- 6.1.6.2 The base year for the dataset is 2017 and has a peak sea level of 4.04mAOD associated with the T200 or tidal design flood level. Using sea level rise calculated within **section 2.1.3**, the T200 peak sea level increases to 4.18mAOD by 2038, the end of construction and 5.16mAOD by 2113, the end of the 75 year development lifetime.
- 6.1.6.3 The landfall is to be located circa 200m inland of MHWS and 35mAOD and is therefore not assessed to be affected by the present day or future tidal design flood level.

6.1.7 National Coastal Erosion Risk Map

- 6.1.7.1 The National Coastal Erosion Risk Map (NCERM) (Environment Agency, 2024) shows the projected areas at risk from erosion. The erosion risk zones are created by splitting the coastline into 'frontages'. These frontages are defined as lengths of coast with consistent characteristics based on location, the cliff behaviour characteristics and the defence characteristics.
- 6.1.7.2 The data presents three epochs for the present day, 2055 and 2105 scenarios. Climate change is represented by the Higher Central and Upper End allowances. Due to the Upper End scenario providing a 'worse case' climate change scenario, coastal erosion for 2055 and 2105 associated with this scenario are presented within **Figure 6.4**.
- 6.1.7.3 The predicted 2055 and 2105 erosion extents for the Upper End scenario remain approximately 90m seaward of the landfall area which is to be located to the west of the Durham Coastal Line. As a result the landfall is not anticipated to be affected by coastal erosion over the assessment period.

6.1.8 SFRA Data

- 6.1.8.1 The Durham County Council SFRA (2018) report and associated mapping has been reviewed and summarised below:
- There are no reports of historical flooding within the MHPGC PEIR Red Line Boundary: Onshore.
 - The majority of the MHPGC PEIR Red Line Boundary: Onshore is located within Flood Zone 1 with the exceptions of the following areas of Flood Zone 3b:
 - Along the coastline;
 - Extents of Hawthorn Burn beyond the south of the MHPGC PEIR Red Line Boundary: Onshore and within the Flood Risk Study Area;
 - Where Dalton Beck is crossed by Matthews Road beyond the north of the MHPGC PEIR Red Line Boundary: Onshore and within the Flood Risk Study Area.

6.1.9 Credible Maximum Scenario

- 6.1.9.1 NPS-EN1 (2025a) also requires evidence that new developments can remain resilient in a credible maximum climate change scenario, otherwise known as the H++ climate change scenario. The H++ climate change scenario assesses a 1.9m uplift to tidal design flood levels applied up to 2100 and the upper end peak river flow, which is 50% in the Wear Management Catchment.

H++ climate change scenario, maximum wave height and storm surge

- 6.1.9.2 Sea level rise to 2100 has been calculated using the Environment Agency climate change guidance noted in **section 2.1.3** and applied to the 2017 design flood level of 4.04mAOD from the Coastal Design Sea Levels – Coastal Flood Boundary Extreme Sea Levels (2018) dataset. The 2100 design flood level is 4.96mAOD, and the H++ climate change scenario design flood level is 6.86mAOD. Furthermore, the NCERM predicted 2055 and 2105 erosion extents for the Upper End scenario remain approximately 90m seaward of the Durham Coastal Line.
- 6.1.9.3 The offshore export cables at landfall will be installed via trenchless techniques and the TJB joining the onshore and offshore cables is to be located to the west of the Durham Coast railway line. The railway line is located some 200m inland from the coastline and elevations are circa 35mAOD.
- 6.1.9.4 Aside from access covers, there is no above ground development associated with the landfall, onshore export cable and AC connection cables proposed; with cables buried underground during operation. Based on the above, the MHPGC project is not considered to be at risk from the H++ scenario, storm surge, extreme wave height and coastal erosion, and further assessment is not deemed necessary.

Upper end allowance for peak river flow

- 6.1.9.5 The Flood Zone 3 climate change extent for fluvial flooding uses the 'Central' allowance for the 2080s epoch (2070 to 2125) corresponding to a 32% uplift in peak river flows for the Wear Management Catchment. 'Essential Infrastructure' and the H++ climate change scenario assesses the 'Upper End' allowance, corresponding to a 50% uplift in peak river flows for the management catchment for the 2080's epoch.
- 6.1.9.6 Aside from access covers, there is no above ground development associated with the landfall, onshore export cable and AC connection cables proposed; with cables buried underground during operation. Based on the above, the MHPGC project is not considered to be at risk from the 'Upper End' allowance for peak river flow.
- 6.1.9.7 Closest extents of climate change scenario Flood Zone 3 to the LSS Option Areas are located 575m to the east of the Green LSS Option Area and 830m to the west of the Blue LSS Option Area. The extent of Flood Zone 3 is located within Hesledon Moor East and broadly follows the 105m contour line. It is noted the extent of climate change Flood Zone 3 is associated with the 'Central' allowance for the 2080's epoch, rather than the 'Upper End' allowance.
- 6.1.9.8 The extent of Both LSS Option Areas are located within Flood Zone 1 for present day and climate change scenarios. The Green LSS Option Area is located between 115m – 120mAOD while the Blue LSS Option Area is located between 103m – 118m AOD.
- 6.1.9.9 Further information regarding fluvial flood risk as informed by the Environment Agency's Flood Map for Planning climate change mapping and Surface Water Spatial Planning Extents mapping (which is informed by the 'Upper End' allowance for the 2080's epoch) is discussed in **Section 6.1**. Given the location and distance of onshore elements of the MHPGC Project from areas identified to be at risk from fluvial flood risk under the climate change scenario, the MHPGC Project is not assessed to be at risk from the 'Upper End' allowance and credible maximum scenario and further assessment is not deemed necessary.

6.1.10 Summary

- 6.1.10.1 A summary of fluvial and tidal flood risk for each onshore component is presented below within **Table 6.1**. A summary of embedded mitigation measures forming part of the MHPGC Project are presented within the below table, with further information provided within **Section 4.2**. Taking into consideration these measures, the onshore components of the MHPGC Project have a low assessed risk of fluvial and tidal flooding for the development lifetime.

Table 6.1: Fluvial and tidal flood risk summary

MHPGC Project onshore component	Summary of fluvial and tidal flood risk	Embedded mitigation measures
Landfall area	- No historical flooding identified. - No formal Environment Agency flood defences present. - The majority of the landfall area is located within Flood Zone 1 for the present-day and climate change scenarios. Flood Zone 3 associated with tidal flooding is located along the coastline. - Not inundated by RoFRS extents. - Not affected by coastal erosion or the credible maximum scenario.	Trenchless installation at the landfall would be used which would minimise flood risk by crossing underneath the extent of tidal Flood Zone 3 (CoT59). As a result there would be no temporary or permanent development to be located within present-day or climate change tidal Flood Zone 3. An Outline Landfall Construction Method Statement (CMS) will form part of the Outline Code of Construction Practice (CoCP), which will be prepared and submitted as part of the application for development consent. The method statement will include trenchless installation at the landfall which will minimise flood risk by crossing underneath the extent of tidal Flood Zone 3 (CoT59). As a result there would be no temporary or permanent development to be located within present-day or climate change tidal Flood Zone 3. A Detailed Landfall CMS will be produced substantially in accordance with the Outline Landfall CMS and will include details of cable installation and methodology. Where practicable, the siting of the temporary and permanent footprint of the MHPGC Project will avoid areas of Flood Risk Zone 2 and 3, sensitive historic, cultural, ecological and other environmental receptors, both statutory and non-statutory, during the site selection process for the MHPGC Project (CoT17). An Onshore Decommissioning Plan will be developed prior to decommissioning. It will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention, protection of soils and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable (CoT16).
Onshore export cables and AC connection cables	- No historical flooding identified. - No formal Environment Agency flood defences present. - The majority of the Onshore export cables and AC connection cables is located within Flood Zone 1 for the present-day and climate change scenarios. A small area of Flood Zone 2 is located to the south of Hesledon Moor East. - RoFRS indicate an area of 'High' risk is adjacent to the MLWS mark, a small	Where practicable, the siting of the temporary and permanent footprint of the MHPGC Project will avoid areas of Flood Risk Zone 2 and 3, sensitive historic, cultural, ecological and other environmental receptors, both statutory and non-statutory, during the site selection process for the MHPGC Project (CoT17). The onshore export cables and the AC connection cables will be completely buried underground for the entire length. No

MHPGC Project onshore component	Summary of fluvial and tidal flood risk	Embedded mitigation measures
	area of Low risk is located to the south of Hesledon Moor East. Not affected by the credible maximum scenario.	overhead pylons will be installed as part of the MHPGC Project (CoT27). An Onshore Crossing Schedule (CoT51) will be submitted with the application for development consent based on the refined design for the application. The following features will be crossed using trenchless techniques: - A, B and Classified unnumbered roads (known as C roads) (including the A19 and B1432); - all railway lines (including the section of railway line which runs between Seaham and Horden); - the Durham Coast SSSI and SAC; - Hesledon Moor East SSSI. An Onshore Decommissioning Plan will be developed prior to decommissioning. It will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention, protection of soils and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable (CoT16).
Blue LSS Option Area	- No historical flooding identified. - No formal Environment Agency flood defences present. - Flood Zone 1 for the present-day and climate change scenarios. - Not inundated by RoFRS extents. - Not affected by the credible maximum scenario.	
Green LSS Option Area	- No historical flooding identified. - No formal Environment Agency flood defences present. - Flood Zone 1 for the present-day and climate change scenarios. - Not inundated by RoFRS extents. - Not affected by the credible maximum scenario.	

6.2 Surface water flood risk

6.2.1 Environment Agency Flood Map for Planning

Present day scenario

6.2.1.1 In England flood risk is regulated through planning policy, with key requirements outlined in the NPPF. Surface water flooding is also included within the Environment Agency's Flood Map for Planning (Environment Agency, 2026), which was most recently updated in May 2026 which classifies flooding risk by the following return periods:

- Up to 1 in 30-year (3.3%) AEP;
- Between the 1 in 30-year (3.3% AEP) to the 1 in 100-year (1%) AEP;
- Between the 1 in 100-year (1% AEP) to the 1 in 1,000-year (0.1%) AEP.

6.2.1.2 The Environment Agency's present day surface water Flood Map for Planning mapping is presented within **Figure 6.2** and indicates the majority of the Flood Risk Study Area is located outside the mapped risk of surface water flooding. Surface water flood risk comprises of isolated areas of ponding and surface water flow pathways, including the following:

- Several surface water flow paths form during the 1 in 1,000-year event which inundate access roads to Jade Business Park and Hawthorn Pit substation in the northwest of the MHPGC PEIR Red Line Boundary: Onshore. Flood depths are predominantly up to 0.3m.
- Smaller surface water flow paths originate from the agricultural fields across the MHPGC PEIR Red Line Boundary: Onshore during the 1 in 30-year event, converging towards Dalton Beck and Hawthorn Burn watercourses within the Flood Risk Study Area. Flood risk is generally

- constrained by local topography, with the 1 in 30-year event presenting flood depths predominantly up to 0.6m. Flood extents marginally increase during the 1 in 1,000-year event.
- Several small flow paths originate from agricultural fields within the far east of the MHPGC PEIR Red Line Boundary: Onshore and flow towards the coastline. Flood depths are predominantly up to 300mm, with isolated areas of ponding up to 2.3m to the west of the railway line.
 - An area of surface water ponding with a 1 in 30-year and greater chance of flooding is located to the south of the Jade Business Park Access Road; extending along the southern edge of the access road in a westerly direction. Flood depths are generally up to 1.2m during the 1 in 30-year flood event, increasing to over 2.3m for the 1 in 100-year and 1 in 1,000-year events.
 - Land to the south of the National Grid Hawthorn Pit Substation has a 1 in 30-year and greater chance of surface water ponding, presenting flood depths up to 1.2m during the 1 in 30-year flood event and increasing to over 2.3m for the 1 in 100-year and 1 in 1,000-year events. This area is approximately 6m lower than the National Grid Hawthorn Pit Substation.
 - Land to the east and west of the B1432 has a 1 in 30-year and greater chance of flooding, presenting surface water ponding up to 0.6m. During the 1 in 1,000-year event flood depths increase up to 1.2m.

Climate change scenario

- 6.2.1.3 The Environment Agency's Flood Map for Planning Surface Water Spatial Planning dataset includes climate change flood extents. These extents represent the modelled risk in the 2060 – 2125 epoch Upper End allowance for peak rainfall intensity. Climate change extents are shown in **Figure 6.3**.
- 6.2.1.4 The mapping indicates a general increase in the flood extents across the whole of the MHPGC PEIR Red Line Boundary: Onshore, in particular land to the south of the Jade Business Park Access Road. Flood depths remain as described in **Section 6.2.1.2**.

6.2.2 SFRA Data

- 6.2.2.1 The Durham County Council SFRA (2018) report and associated surface water mapping indicates there are sporadic areas of 'low' (between a 1 in 1000 (0.1%) and 1 in 100 (1%) chance of flooding in any given year), 'medium' (between a 1 in 100 (1%) and 1 in 30 (3.3%) chance of flooding in any given year) and 'high' (greater than a 1 in 30 (3.3%) chance of flooding in any given year) flood risk across the MHPGC Project PEIR Red Line Boundary: Onshore. Flooding is associated with surface water flow pathways and areas of surface water ponding.

6.2.3 Summary

- 6.2.3.1 A summary of surface water flood risk to and from each onshore component is presented below within **Table 6.2**. A summary of embedded mitigation measures of the MHPGC Project are presented within the below table, with further information provided within **Section 4.2**. Taking into consideration these measures, the MHPGC onshore components have a low assessed risk of surface water flooding for the development lifetime, and the MHPGC Project is not anticipated to result in an increase in surface water flood risk to downstream receptors.

Table 6.2: Summary of Risk of Flooding from Surface Water (RoFSW) status

MHPGC Project onshore component	Summary of RoFSW status	Embedded mitigation measures
Landfall	Flow paths associated with the 1 in 30-year to 1 in 1,000-year event follow the existing drainage regime to the west of the railway line associated with the present day and climate change scenario, presenting flood depths predominantly up to 300mm with isolated areas of ponding up to 2.3m to the west of the railway line. Ponding is present at the bottom of the cliffs at Blast Beach, associated with the 1 in 30-year to	Outline CoCP (CoT18) which includes an Outline Surface Water and Groundwater Management Plan (Outline SWGMP) (CoT23). The Outline SWGMP will set out measures to protect surface water and groundwater during construction, covering surface water and drainage management measures, flood risk control measures, and management of foul water from construction compounds. A Detailed SWGMP will be developed

MHPGC Project onshore component	Summary of RoFSW status	Embedded mitigation measures
	1 in 1,000-year event, presenting flood depths up to 2.3m during the present day and climate change scenario.	substantially in accordance with the Outline SWGMP.
Onshore export cables and AC connection cables	Sporadic areas of flood risk from surface water flow pathways and ponding associated with the 1 in 30-year to 1 in 1,000-year event are present across the onshore export cable and AC connection cables route. The majority of flow pathway flood depths are generally shallow and up to 0.15m during the 1 in 1,000-year event. A flow pathway within Coop House Wood presents flood depths over 2.3m for the 1 in 30-year to 1 in 1,000-year event during the present day and climate change scenario. Small, isolated areas of ponding associated with the 1 in 30-year to 1 in 1,000-year event are present, limited to the east and west of the B1432, to the south of National Grid Hawthorn Pit Substation and to the south of Jade business park access road. Flood depths up to 2.3m are present during the present day and climate change scenario.	The onshore export cables and the AC connection cables will be completely buried underground for the entire length. No overhead pylons will be installed as part of the MHPGC Project (CoT27). A summary of the surface water drainage strategy for the LSS Option Areas during the operation and maintenance phase is presented within Section 8. An Outline Operational Drainage Management Plan (ODMP) (CoT22) for the onshore Land Substation (LSS) will be prepared and submitted with the application for development consent. The Outline ODMP will detail measures to ensure that existing land drainage is reinstated and/or maintained, and ensure surface water runoff generated at the chosen onshore LSS option by new impermeable areas is attenuated with an allowance for climate change and discharged from the site to an appropriate location at a restricted discharge rate. A Detailed ODMP will be developed substantially in accordance with the Outline ODMP and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the LLFA. An Onshore Decommissioning Plan (CoT16) will be developed prior to decommissioning. It will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention, protection of soils and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable.
Blue LSS Option Area	An area of surface water ponding associated with the 1 in 30-year event along the bottom of the Jade Business Park access road embankment within the north of the Blue LSS Option Area presents flood depths up to 2.3m during the present day and climate change scenario. Small, isolated areas of surface water flooding associated with the 1 in 30-year event are present within the Blue LSS Option Area. Flood depths of up to 300mm during the present day and climate change scenario. Small, isolated areas of surface water ponding is present within the Blue LSS Option Area, associated with the 1 in 30-year to 1 in 1,000-year event, presenting flood depths up to 300mm during the present day and climate change scenario.	
Green LSS Option Area	Small, isolated areas of surface water ponding is present within the Green LSS Option Area, associated with the 1 in 30-year to 1 in 1,000-year event, presenting flood depths up to 300mm during the present day and climate change scenario.	

6.3 Groundwater Flood Risk

- 6.3.1.1 Groundwater flooding occurs when the water table rises above ground elevations, or it rises to depths containing basement level development. It is most likely to happen in low lying areas underlain by permeable geology.
- 6.3.1.2 The MHPGC PEIR Red Line Boundary: Onshore is wholly underlain by a Principal Aquifer which provides drinking water for the region. For further information, see **Volume 3, Annex 2.1: Water abstraction licenses, discharge consents and pollution incidents, of the PEIR**.

- 6.3.1.3 The BGS hold records of a number of historical boreholes within the MHPGC PEIR Red Line Boundary: Onshore, for more details refer to **Section 5.5**.

6.3.2 SFRA Data

- 6.3.2.1 The Durham County Council SFRA (2018) indicates the eastern and western portion of the MHPGC PEIR Red Line Boundary: Onshore is within an area of 50% to 75% susceptibility to groundwater flooding, whilst the centre of the MHPGC PEIR Red Line Boundary: Onshore across the A19 is identified as being 25% to 50% susceptible to groundwater flooding.
- 6.3.2.2 The Susceptibility to Groundwater Map is a strategic scale (1km square grid) map showing the proportion of each 1km square which may be susceptible to groundwater emergence. As such, the mapping does not represent site-specific groundwater levels, flow pathways, or the depth, duration, or frequency of groundwater flooding at a local scale. Within each grid square, groundwater emergence is typically controlled by localised factors such as superficial deposit thickness, permeability contrasts, topography and proximity to surface water features.
- 6.3.2.3 Consequently, even within areas mapped as having moderate to high susceptibility, groundwater flooding is likely to be limited to discrete low-lying or hydraulically constrained locations rather than occurring uniformly across the wider area. Therefore, it is likely that only isolated locations within the overall susceptible area suffer the consequences of groundwater flooding.

6.3.3 Summary

- 6.3.3.1 A summary of groundwater flood risk to and from each onshore component is presented below within **Table 6.3**. A summary of embedded mitigation measures of the MHPGC Project are presented within the below table, with further information provided within **Section 4.2**. Taking into consideration these measures, the MHPGC Project onshore components have a low assessed risk of groundwater flooding for the development lifetime, and the MHPGC Project is not anticipated to result in an increase in groundwater flood risk to downstream receptors.

Table 6.3: Summary of Groundwater Flood Risk status

MHPGC Project onshore component	Summary of groundwater flood risk status	Embedded mitigation measures
Landfall	None identified.	Outline CoCP (CoT18) which includes an Outline Surface Water and Groundwater Management Plan (Outline SWGMP) (CoT23). The Outline SWGMP will set out measures to protect surface water and groundwater during construction, covering surface water and drainage management measures, flood risk control measures, and management of foul water from construction compounds. A Detailed SWGMP will be developed substantially in accordance with the Outline SWGMP. Potential impact from the trenchless drill to the groundwater body will be managed through measures to be detailed in the Outline Surface Water and Groundwater Management P (CoT23), these could include further investigation of groundwater levels and quality, establishing the influence of the tidal cycle and proposals for monitoring during the trenchless installation. Any measures required specific to the trenchless methodology including would be detailed in the Outline Landfall Construction Method Statement (CoT 59). During further consultation with the Environment Agency, the need for a
Onshore export cables and AC connection cables	50 to 75% susceptibility to groundwater flooding is located to the east and northwest of the A19 and to the north of the A182. Areas of 25% to 50% susceptibility to groundwater flooding are located across the A19.	
Blue LSS Option Area	Located in an area of 50% to 75% susceptibility to groundwater flooding.	
Green LSS Option Area	Located in an area of 50% to 75% susceptibility to groundwater flooding.	

MHPGC Project onshore component	Summary of groundwater flood risk status	Embedded mitigation measures
		Hydrogeological Risk Assessment to inform the application for development consent would be determined along with the necessary scope. The onshore export cables and the AC connection cables will be completely buried underground for the entire length. No overhead pylons will be installed as part of the MHPGC Project (CoT27). Due to the nature of the MHPGC Project, groundwater mitigation measures are not required for the operation and maintenance phase. An Onshore Decommissioning Plan will be developed prior to decommissioning. It will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention, protection of soils and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant legislation and available guidance at the time of production, as far as reasonably practicable (CoT16). The cables would be left in place during decommissioning therefore no impact would occur. No O&M activities would affect the groundwater.

6.4 Reservoirs, Canals and Other Artificial Sources Flood Risk

- 6.4.1.1 The Environment Agency's online mapping (Environment Agency, 2021) suggests that the MHPGC PEIR Red Line Boundary: Onshore is not located in an area with a potential flood risk associated with reservoir failure. No canals have been identified at or near the MHPGC PEIR Red Line Boundary: Onshore. Northumbrian Water Limited (NWL) assets (sewer and water supply lines) are noted to be located within the MHPGC PEIR Red Line Boundary: Onshore and pre-construction surveys are to be undertaken to confirm the location of any below-ground assets prior to commencement of works.
- 6.4.1.2 The MHPGC onshore components have a low assessed risk of flooding from reservoirs, canals and other artificial sources for the development lifetime.

6.5 Summary of Flood Risk

- 6.5.1.1 A summary of the assessment of flood risk for the onshore components of the MHPGC Project with embedded mitigation measures taken into account is provided in **Table 6.4** below.

Table 6.4: Summary of flood risk for onshore components of the MHPGC Project, taking into account embedded mitigation measures.

MHPGC Project onshore component	Fluvial and Tidal	Surface water	Groundwater	Reservoirs, canals and other artificial resources
Landfall	Low	Low	Low	Low

Onshore export cables and AC connection cables	Low	Low	Low	Low
Blue LSS Option Area	Low	Low	Low	Low
Green LSS Option Area	Low	Low	Low	Low

Figure 6.1: Environment Agency Flood Map for Planning

Figure 6.2: Environment Agency Flood Map for Planning (surface water, present day)

Figure 6.3: Environment Agency Flood Map for Planning (surface water climate change 2061 to 2125)

Figure 6.4: National Coastal Erosion Risk Map for 2055 and 2105 95% Climate Change (upper end)

7 Sequential and Exception Test Compliance

7.1 Sequential Test

7.1.1 Landfall

- 7.1.1.1 Landfall is assessed to have a low flood risk from all assessed sources. The majority of the landfall is located within Flood Zone 1, with an area of Flood Zone 3 associated with tidal flooding located along the coastline. Landfall has a low chance of surface water flooding. Trenchless installation at the landfall and underground cabling along the route would be used to cross this Flood Zone, with the entry point located within Flood Zone 1. No temporary or permanent above ground development would be located within Flood Zone 3. As such, potential impacts to tidal flood risk would be prevented.
- 7.1.1.2 In line with national guidance, the Sequential Test is not required to be applied in this instance to the Landfall area, which is primarily located within Flood Zone 1.

7.1.2 Onshore export cables and AC connection cables

- 7.1.2.1 The onshore export cables and AC connection cables are located predominantly within Flood Zone 1 and with a low chance of surface water flooding. A small area of Flood Zone 2 is located to the south of Hesledon Moor East. The further development of design will include consideration of siting the onshore export cables and AC Connection cables outside of this Flood Zone, where practicable.
- 7.1.2.2 In line with national guidance, the Sequential Test is not required to be applied in this instance for the onshore export cables and AC connection cables that are primarily located within Flood Zone 1.

7.1.3 Blue LSS Option Area

- 7.1.3.1 The Blue LSS Option Area is located within Flood Zone 1 with a low chance of surface water flooding. In line with national guidance, the Sequential Test is not required to be applied to the Blue LSS Option Area that is located within Flood Zone 1.

7.1.4 Green LSS Option Area

- 7.1.4.1 The Green LSS Option Area is located within Flood Zone 1 with a low chance of surface water flooding. In line with national guidance, the sequential test is not required to be applied to the Green LSS Option Area that is located within Flood Zone 1.

7.2 Exception Test

- 7.2.1.1 According to Table 2: Flood risk vulnerability and flood zone 'incompatibility' of the PPG 'essential infrastructure' the exception test is required if development is proposed within Flood Zone 3 (including 3a and 3b).
- 7.2.1.2 The only area of Flood Zone 3 to be crossed is associated with the landfall. Cables would be installed via trenchless techniques, underneath this flood zone, avoiding any potential impacts to the flood zone. No above ground temporary or permanent development is proposed within this Flood Zone and therefore the Exception Test is not deemed to be required.

8 Surface Water Drainage Strategy

- 8.1.1.1 The sustainable management of surface water is an essential element of reducing future flood risk to the site and its surroundings. This section of the FRA details a high-level drainage strategy for new impermeable areas that would arise from the Green and Blue LSS Option Areas.
- 8.1.1.2 This drainage strategy will be developed into the Outline Operational Drainage Management Plan (ODMP) which will be prepared and submitted with the application for development consent. This will be undertaken for the chosen onshore LSS site. The Outline ODMP will detail measures to ensure surface water runoff generated at the chosen onshore LSS option by new impermeable areas is attenuated with an allowance for climate change and discharged from the site to an appropriate location at a restricted discharge rate.
- 8.1.1.3 A Detailed ODMP will be developed post development consent substantially in accordance with the Outline ODMP and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the LLFA/LPA.

8.2 Greenfield Runoff Rates

8.2.1 Greenfield runoff rate characteristics

- 8.2.1.1 The Blue LSS Option Area comprises agricultural land use and is deemed to be wholly greenfield land. The Green LSS Option Area predominantly comprises previously developed land associated with Hawthorn Mine and is considered to be brownfield.
- 8.2.1.2 The proposed land use for each LSS Option Area comprises a substation and associated permanent infrastructure and will have a footprint of up to 6.5 ha, within which up to 3.5 ha will be impermeable. To provide the MDS for the restricted discharge rate and volume of surface water attenuation required for each LSS Option Area, the greenfield runoff rate would be based on the assumption that the proposed 3.5 ha impermeable area currently comprises of 100% permeable surfacing.
- 8.2.1.3 The greenfield runoff rate for each LSS Option Area was calculated using the HR Wallingford greenfield runoff rate estimation tool (2025) which provides greenfield site runoff rates based on basic site characteristics and data from the Flood Estimation Handbook (FEH) webservice (UK Centre for Ecology and Hydrology, 2026) and Flood Studies Report. Parameters used within the greenfield site runoff calculations for each LSS Option Area are presented within **Table 8.1**.

Table 8.1 Greenfield runoff rate parameters for LSS Option Areas

Parameter	Blue LSS Option Area	Green LSS Option Area
Standard period average annual rainfall	708	703
BFI Host19 (scaled)	0.333	
Hydrological region	3	

8.2.2 Existing greenfield runoff rates

- 8.2.2.1 Runoff rates have been determined using the current 'industry best practice' guidelines as outlined in the SuDS Manual (C753) (CIRIA, 2015) and National Standard for SuDS (DEFRA, 2025). Greenfield runoff rates for the Green LSS and Blue LSS have been calculated as described in paragraph 8.2.1.3 and are shown in **Table 8.2**. Calculations are provided in **Appendix A**.

Table 8.2 Existing greenfield runoff rates for the LSS Option Areas

Return Period (years)	Blue LSS Option Area Runoff rate (l/s)	Green LSS Option Area Runoff rate (l/s)
1 in 1	14.5	14.2
1 in 2	15.8	15.5
1 in 30	29.4	28.9
1 in 100	35.0	34.4

8.2.2.2 The Green LSS Option Area was previously developed and is considered to be brownfield land. The potential to take potential brownfield site constraints in development of runoff rates for the Green LSS Option Area will be explored via further consultation with DCC during the drafting of the Outline ODMP.

8.3 Climate Change Allowances

8.3.1.1 Climate change allowances to be applied within FRAs are dependent on the development lifetime and development vulnerability classification, with further details presented within **Section 2.1.3**. The MHPGC Project is classified as 'Essential Infrastructure' and would be fully operational by 2038 with an operational design life of 35 years, however a 75-year development lifetime will be applied following the EA consultation response.

8.3.1.2 Both LSS Option Areas are located within the Wear Management Catchment. In line with the Environment Agency climate change guidance as presented within **Section 2.1.3**, the 2070's epoch (2061 to 2125) 'Central' allowance for peak rainfall intensity with an uplift of 30% on the 1% AEP rainfall event is to be incorporated within surface water attenuation calculations.

8.4 Surface Water Attenuation Requirements

8.4.1.1 Surface water runoff from the 1 in 100-year critical storm event plus an allowance for climate change is to be appropriately managed on-site to ensure flood risk is not increased elsewhere.

8.4.1.2 Indicative attenuation storage requirements for each LSS Option Area have been calculated within InfoDrainage based on the critical 1 in 100-year storm event with a 30% uplift to account for climate change, and are presented within **Table 8.3** and in **Appendix B**.

Table 8.3 Indicative attenuation requirements for each LSS Option Area

Blue LSS Option Area attenuation volume (m ³)	Green LSS Option Area attenuation volume (m ³)
Up to 3,684	Up to 3,765

8.4.1.3 Discharge rates for each LSS Option Area have been set to the 1 in 1-year greenfield runoff rate, as presented within **Table 8.2**. Current calculations are indicative and subject to refinement within the Outline ODMP following consultation with the LLFA/LPA and within the detailed ODMP as detailed design is developed.

8.4.1.4 Surface water attenuation will be provided within the wider 6.5 ha LSS area within options such as an attenuation basin. Consideration of SuDS and water quality treatment is to be incorporated within the Outline ODMP and submitted as part of the application for development consent.

8.5 Use of SuDS

8.5.1.1 NPS EN-1 and the NPPF require the use of SuDS within developments to provide water treatment and surface water attenuation prior to discharge of surface water run-off from site.

8.5.1.2 The National Standards for SuDS established mandatory requirements for managing runoff quantity, quality, amenity, biodiversity, maintenance and resilience to climate change and identifies seven national standards to be included within surface water design. Demonstration of the adherence to the standards will be incorporated within the Outline ODMP and submitted as part of the application for development consent. A summary of the seven standards is as follows:

- **Standard 1** – Application of the Drainage Hierarchy which states that surface water must be discharged in accordance with the hierarchy below, priority 1 being the highest;
- Priority 1: collected for non-potable use
- Priority 2: infiltrated to ground
- Priority 3: discharged to an above ground surface water body
- Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- Priority 5: discharged to a combined sewer
- **Standard 2** – Interception of the first 5mm of rainfall for most storm events on-site prior to runoff entering the drainage system;
- **Standard 3** - Surface water runoff is required to be managed safely during extreme rainfall events, including allowances for climate change and urban creep, to ensure flood risk is not increased as a result of development;
- **Standard 4** – Protection of surface waters, groundwater and coastal waters by ensuring an appropriate level of water treatment is made to runoff prior to flows being discharged off-site via a robust pollution risk assessment;
- **Standard 5** – The drainage system design should maximise benefits for amenity through the creation of multi-functional places and landscapes;
- **Standard 6** – The drainage system should maximise biodiversity benefits by contributing to Biodiversity Net Gain, Local Nature Recovery Strategies and habitat connectivity; and
- **Standard 7** - a comprehensive maintenance and management plan should be prepared alongside the drainage strategy for the development lifetime, with clear ownership frameworks, and designated adoption responsibilities.

9 Conclusions

- 9.1.1.1 This report presents the FRA for the MHPGC Project. It forms **Volume 3, Annex 2.2: Flood Risk Assessment, of the PEIR** and **supports Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR**.
- 9.1.1.2 This report has considered risk from various sources of flooding to the MHPGC PEIR Red Line Boundary: Onshore and the potential for consequent change in risk of flooding to downstream receptors within the Flood Risk Study Area (such as people, property, habitats, infrastructure and statutory sites) as a result of the MHPGC Project due to factors such as surface water runoff.
- 9.1.1.3 This FRA has been carried out in accordance with the NPPF and the NPS EN-1, ensuring that the approach to flood risk aligns with the national policy requirements for an application for development consent.
- 9.1.1.4 As the onshore export cable and AC connection cable routes have not been defined at this stage, the entire MHPGC PEIR Red Line Boundary: Onshore has been considered when assessing the onshore export cables and AC connection cables. Flood risk was also assessed in relation to the LSS Option Areas and Landfall area.
- 9.1.1.5 The majority of the MHPGC PEIR Red Line Boundary: Onshore is located within Flood Zone 1. An area of Flood Zone 2 located in the Flood Risk Study Area to the northwest of the MHPGC PEIR Red Line Boundary: Onshore, extends across an existing drainage ditch, classified as an ordinary watercourse. It is anticipated that where practicable, siting of the temporary and permanent footprint of the MHPGC Project would avoid this Flood Zone. An extent of Flood Zone 3 is present along the coast, however due to trenchless techniques being used at the landfall, there would be no interactions with this Flood Zone.
- 9.1.1.6 During the climate change scenario, extents of Flood Zone 3 marginally increase in extent. Careful siting of the MHPGC Project would further avoid development within the Flood Zone 3 climate change extent. Due to project design, the MHPGC Project is not considered to be at risk from credible maximum scenario, including H++ scenario, storm surge and extreme wave height, as well as the upper end allowance for peak river flow. Flood risk from fluvial and tidal sources is therefore assessed to be low.
- 9.1.1.7 A surface water drainage strategy has been outlined in this Annex and will be developed prior to the application for development consent. An Outline Operational Drainage Management Plan (ODMP) for the onshore Land Substation (LSS) will be prepared and submitted with the application for development consent. The Outline ODMP will detail measures to ensure that existing land drainage is reinstated and/or maintained, and ensure surface water runoff generated at the chosen onshore LSS option by new impermeable areas is attenuated with an allowance for climate change and discharged from the site to an appropriate location at a restricted discharge rate. During detailed design a Detailed ODMP will then be developed substantially in accordance with the Outline ODMP and in line with the latest relevant drainage guidance notes, in consultation with the Environment Agency and the LLFA prior to implementation.
- 9.1.1.8 Taking into consideration embedded mitigation measures as part of the MHPGC Project, including the implementation of an Outline CoCP and Outline SGWMP to control surface water and groundwater flows and quality during construction, and the Outline ODMP to manage surface water flows and quality from the LSS during operation and maintenance, flood risk from all other sources including surface water, groundwater and artificial sources is assessed to be low.
- 9.1.1.9 The MHPGC Project is therefore considered appropriate for its location, in line with NPPF vulnerability classifications, where the development type ("Essential Infrastructure") is suitable within Flood Zone 1 and Flood Zone 2. The Sequential Test is not considered to be required as the proposed infrastructure would be located in an area of low flood probability. Due to the low flood probability, demonstration of the Exception Test is also not considered to be required.
- 9.1.1.10 In conclusion, the FRA demonstrates that the MHPGC Project can be delivered without increasing flood risk on-site or elsewhere. With the proposed mitigation and design measures in place, the MHPGC Project is considered appropriate in flood risk terms, and consistent with the requirements of NPS EN-1 and the NPPF.

10 References

AECOM, 2023. Morven Offshore Wind Geohazards Desk Study and Terrain Evaluation, Ref. 60705572

British Geological Survey (2025). GeoIndex. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.102324097.1435060994.1706713164-1937611093.1706713164 (Accessed: October 2025).

CIRIA (2015) The SuDS Manual (C753F). Available at: https://www.ciria.org/CIRIA/Books/Free_publications/C753F.aspx

Ministry of Housing, Communities and Local Government. (2023). Flood risk assessments: climate change allowances. Available at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (Accessed: October 2025).

Ministry of Housing, Communities and Local Government. (2025). National Planning Policy Framework. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework-2> (Accessed: October 2025).

Department for Energy Security and Net Zero (DESNZ) (2025a). Overarching National Policy Statement for Energy (NPS EN-1). Available at: <https://assets.publishing.service.gov.uk/media/695d1015f41883f4e50ed9ab/overarching-national-policy-statement-for-energy-en-1-web-accessible.pdf> (Accessed: January 2026).

Department for Energy Security and Net Zero (DESNZ) (2025b). National Policy Statement for Electricity Networks Infrastructure (NPS EN-5). Available at: <https://assets.publishing.service.gov.uk/media/695d12e1b5c46330350ed9a1/national-policy-statement-for-electricity-networks-infrastructure-en-5-web-accessible.pdf> (Accessed: January 2026).

Department for Environment, Food and Rural Affairs (2025) National Standards for Sustainable Drainage Systems (SuDS). Available at: <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds> (Accessed: August 2026).

Durham County Council (2020). County Durham Plan – Adopted 2020. County Durham: Durham County Council. Available at: <https://www.durham.gov.uk/media/34069/County-Durham-Plan-adopted-2020-/pdf/CountyDurhamPlanAdopted2020vDec2020.pdf> (Accessed: October 2025).

Durham County Council (2020). Strategic Flood Risk Assessment. Available at: <https://www.durham.gov.uk/media/45686/Strategic-Flood-Risk-Assessment/pdf/StrategicFloodRiskAssessment.pdf?m=1730981351503> (Accessed: October 2025).

Environment Agency (2019) Coastal Design Sea Levels (2018) bundle. Available at: <https://environment.data.gov.uk/dataset/6e856bda-0ca9-404f-93d7-566a2378a7a8> (Accessed July 2026).

Environment Agency (2025). Flood Map for Planning. Available at: <https://flood-map-for-planning.service.gov.uk/> (Accessed: September 2026).

Environment Agency (2023). LIDAR Composite Digital Terrain Model (DTM) – 1 m. Available at: <https://environment.data.gov.uk/dataset/13787b9a-26a4-4775-8523-806d13af58fc> (Accessed: October 2025).

Environment Agency. 2025. National Coastal Erosion Risk Mapping (NCERM) – National (2024). Version published 28 January 2025. Defra Data Services Platform. Available at: <https://environment.data.gov.uk/dataset/9fede91f-5acd-4fd2-9bd8-98153fa3c2ff> (Accessed: September 2026).

Environment Agency (2025). Recorded Flood Outlines. Available at: <https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590> (Accessed: September 2026).

Environment Agency. (2021). Reservoir Flood Extents (Individual). Available at: <https://environment.data.gov.uk/dataset/2c8553c9-aa45-4666-9824-8ce0c7faf6a9> (Accessed: September 2026).

HR Wallingford (2025) Greenfield runoff rate estimation tool. Available at: <https://www.uksuds.com/tools/greenfield-runoff-rate-estimation> (Accessed September 2026).

Marine Directorate – Licencing Operations Team (2025) Scoping Opinion - Morven Offshore Wind Farm, Hawthorn Pit Grid Connection. Available at: https://marine.gov.scot/sites/default/files/morven_offshore_wind_farm_-_scop-0058_-_hawthorn_pit_grid_connection_-_scoping_opinion.pdf (Accessed: August 2026).

Marine Management Organisation. (2025). Scoping request under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 for the proposed Morven Offshore Windfarm Transmission Assets Project by Morven Offshore Wind Limited. MMO Reference: DCO/2025/00005 (Accessed: August 2026).

Met Office. (2018) UKCP18 Guidance: Representative Concentration Pathways. Met Office (Accessed: August 2026).

PINS (2025) Scoping Opinion: Proposed Morven Hawthorn Pit Grid Connection Project - EN0210005. Available at: <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0210005-000005-Scoping%20Opinion%20-%20Morven%20Hawthorn%20Pit%20Grid%20Connection%20Project.pdf>.

RPS (2025) Morven Hawthorn Pit Grid Connection Project Environmental Impact Assessment Scoping Report. Available at: <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0210005-000004-Morven%20Hawthorn%20Pit%20Grid%20Connection%20Project%20Scoping%20Report.pdf>

UK Centre for Ecology and Hydrology (2025) the FEH 2025 Statistical Updates. Available at: <https://www.ceh.ac.uk/services/feh-2025-statistical-updates> (Accessed September 2026).

UK Centre for Ecology and Hydrology (2026) Flood Estimation Handbook webservice. Available at: <https://fehweb.ceh.ac.uk/> (Accessed September 2026).

Appendix A Existing greenfield run off rates

A.1 Blue LSS Option Area



Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (<https://www.uksuds.com/>)

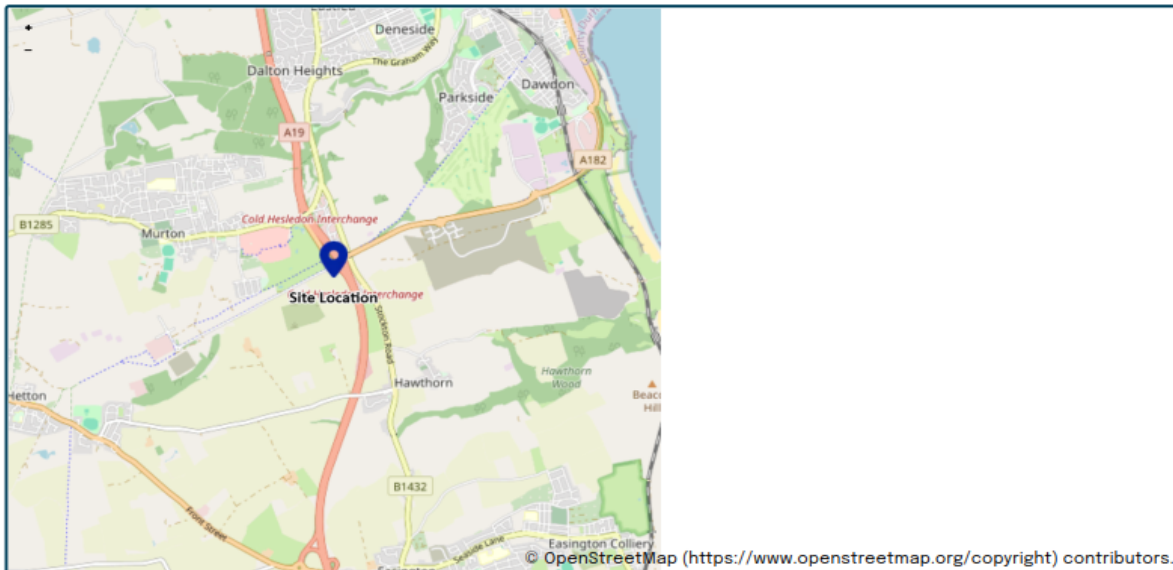
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	01/09/2026
Calculated by	AM
Reference	Morven
Model version	2.2.3

Location

Site name	Blue LSS
Site location	



Site easting (British National Grid)	440971
Site northing (British National Grid)	546329

Site details

Total site area (ha)	3.5	ha
----------------------	----------------------------------	----

Greenfield runoff

Method

Method

FEH statistical (2025)

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	708	mm
BFIHOST19scaled	0.333	
QMed-QBar conversion	1.064	1.064
QMed (l/s)	15.8	l/s
QBar (FEH statistical 2025) (l/s)	16.8	l/s

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	3	3
1 year growth factor	0.86	
2 year growth factor	0.94	
10 year growth factor	1.45	
30 year growth factor	1.75	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	14.5 l/s
Flow rate 2 year (l/s)	15.8 l/s
Flow rate 10 years (l/s)	24.4 l/s
Flow rate 30 years (l/s)	29.4 l/s
Flow rate 100 years (l/s)	35.0 l/s
Flow rate 200 years (l/s)	39.9 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

A.2 Green LSS Option Area



Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (<https://www.uksuds.com/>)

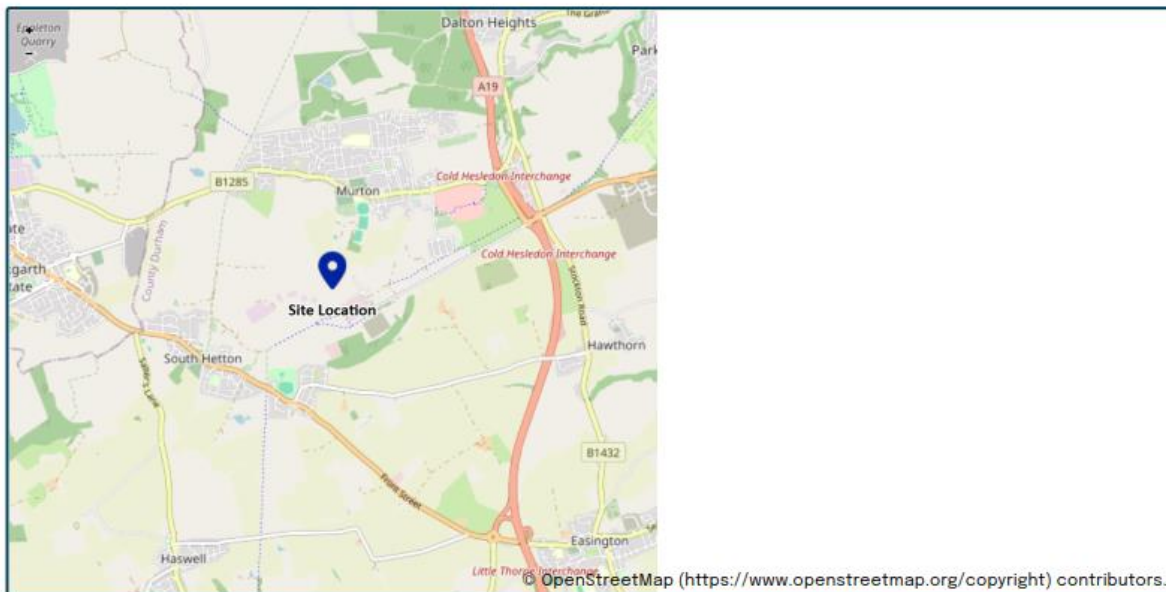
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	01/09/2026
Calculated by	AM
Reference	Morven
Model version	2.2.3

Location

Site name	Green LSS
Site location	



Site easting (British National Grid)	439080
Site northing (British National Grid)	545798

Site details

Total site area (ha)	3.5 ha
----------------------	-------------------------------------

Greenfield runoff

Method

Method

FEH statistical (2025)

FEH statistical (2025)

	My value	Map value
SAAR9120 (mm)	703	mm
BFIHOST19scaled	0.333	
QMed-QBar conversion	1.064	1.064
QMed (l/s)	15.5	l/s
QBar (FEH statistical 2025) (l/s)	16.5	l/s

Growth curve factors

	My value	Map value
Hydrological region	3	3
1 year growth factor	0.86	
2 year growth factor	0.94	
10 year growth factor	1.45	
30 year growth factor	1.75	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	14.2
Flow rate 2 year (l/s)	15.5
Flow rate 10 years (l/s)	24.0
Flow rate 30 years (l/s)	28.9
Flow rate 100 years (l/s)	34.4
Flow rate 200 years (l/s)	39.2

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

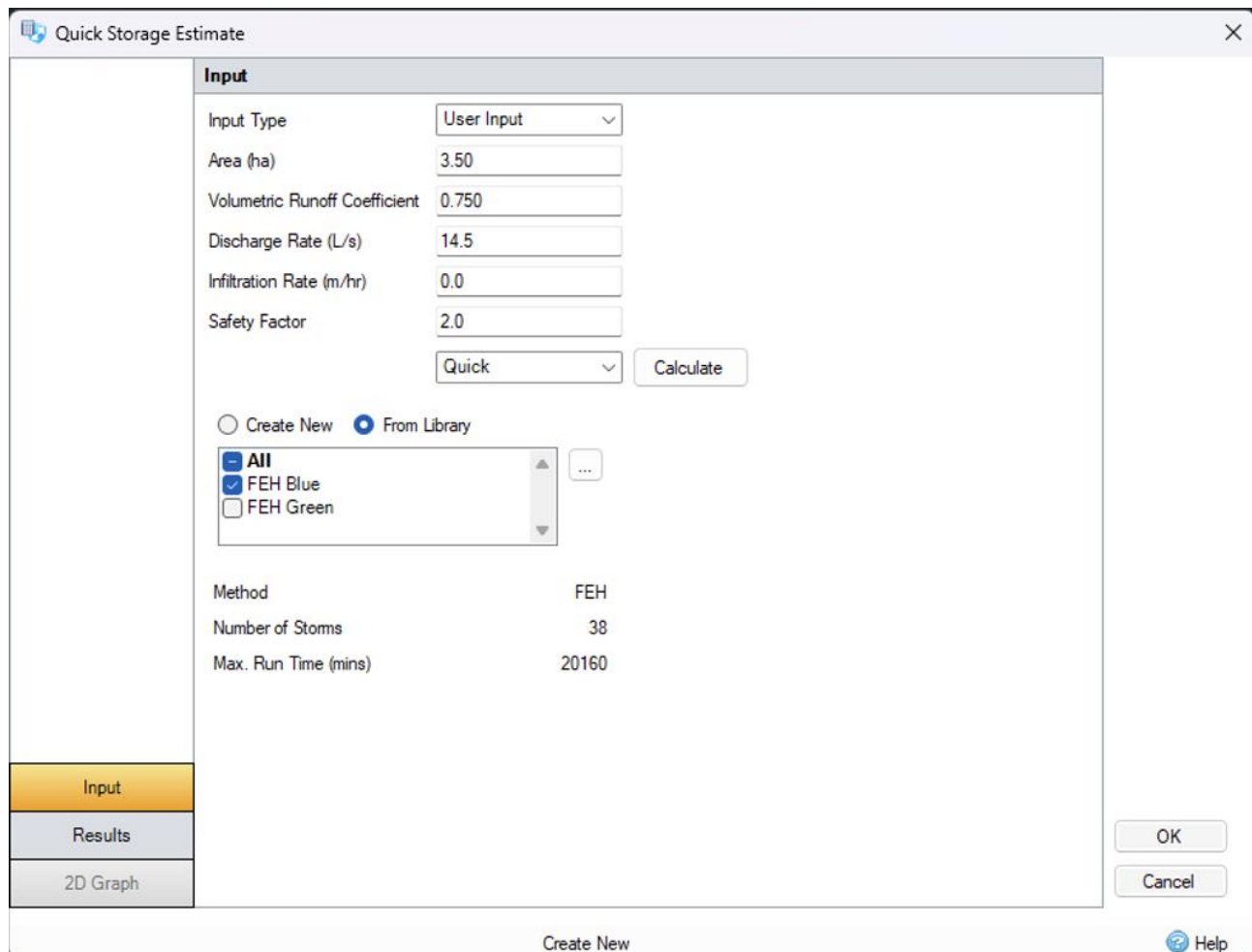
Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford HydroSolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix B Indicative attenuation requirements for each LSS Option Area

B.1 Blue LSS Option Area

B.1.1 Input



The screenshot displays the 'Quick Storage Estimate' application window. The 'Input' tab is active, showing various input fields for storage estimation. The fields are as follows:

Field	Value
Input Type	User Input
Area (ha)	3.50
Volumetric Runoff Coefficient	0.750
Discharge Rate (L/s)	14.5
Infiltration Rate (m/hr)	0.0
Safety Factor	2.0
Quick	Quick

Below the input fields, there are two radio buttons: 'Create New' (unselected) and 'From Library' (selected). A list box shows the following options:

- ☒ All
- ☒ FEH Blue
- ☐ FEH Green

Below the list box, there are three fields:

Field	Value
Method	FEH
Number of Storms	38
Max. Run Time (mins)	20160

At the bottom left, there are three tabs: 'Input' (selected), 'Results', and '2D Graph'. At the bottom right, there are 'OK' and 'Cancel' buttons. At the very bottom, there is a 'Create New' button and a 'Help' button with a question mark icon.

B.1.2 Results

Quick Storage Estimate

Results

Quick Storage Estimate variables require approximate storage of between 2213m³ - 3684m³.

These values are estimates only and should not be used for final design purposes.

Input

Results

2D Graph

OK

Cancel

Create New

Help

B.2 Green LSS Option Area

B.2.1 Input

Quick Storage Estimate

Input Type

User Input

Area (ha)

3.50

Volumetric Runoff Coefficient

0.750

Discharge Rate (L/s)

14.2

Infiltration Rate (m/hr)

0.0

Safety Factor

2.0

Full (inc. graphs)

Calculate

Create New

From Library

All

FEH Blue

FEH Green

Method

FEH

Number of Storms

38

Max. Run Time (mins)

20160

Input

Results

2D Graph

OK

Cancel

Create New

Help

B.2.2 Results

Quick Storage Estimate

Results

Quick Storage Estimate variables require approximate storage of between 2246m³ - 3765m³.

These values are estimates only and should not be used for final design purposes.

Input

Results

2D Graph

OK

Cancel

Create New

Help