8 HYDROLOGY AND FLOOD RISK

Introduction

8.1.1 This chapter reports on the assessment of the effects of the Project with regards to hydrology and flood risk. This assessment focusses on the likely effects of the Project on local flood risk, and effects on water resources, including water quality and flow regimes.

8.1.2 This chapter describes the assessment methodology; the baseline conditions currently existing at the site and in the surrounding area; the mitigation measures adopted as part of the Project to prevent, reduce or offset any significant adverse effects; and the likely effects on the water environment after these measures have been employed. The need for any further mitigation or monitoring requirements is identified.

8.1.3 This chapter should be read in conjunction with the Flood Risk Assessment (FRA) (Appendix 8.1) and Surface Water Drainage Strategy (Appendix 8.1, Annex A).

Assessment Methodology

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

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

8.1.6 Joint Nature Conservation Committee WFD guidance (JNCC, 2020) indicates that waterbodies below 10 km^2 catchment area no longer need to be included in a waterbodies classification assessment.

8.1.7 The list below sets out the main legislative drivers for assessing and managing risks to human health and the environment, including controlled waters and groundwaters.

Relevant Legislative Drivers

8.1.8 Legislation relevant to the Project includes:

- Flood Risk Management (Scotland) Act 2009: Delivering Sustainable Flood Risk Management (Scottish Government, 2011);
- Flood Risk Management (Scotland) Act 2009: Surface Water Management Planning Guidance (Scottish Government, 2013);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide (Scottish Environmental Protection Agency (SEPA), 2019);
- The Water Environment (Miscellaneous) (Scotland) Regulations (Scottish Government, 2017); and
- Flood Risk Management (Scotland) Act (Scottish Government, 2009).

Planning Policy Context

National Planning Policy

8.1.9 Relevant national policy is set out within Section 2 of the Flood Risk Assessment Report in Appendix 8.1 and includes policy set out within the following documents:

- The National Planning Framework 3 (NPF3) for Scotland (Scottish Government, 2014a);
- The Draft National Planning Framework 4 (NPF4) for Scotland (Scottish Government, 2021a); and
- Scottish Planning Policy (SPP) (Scottish Government, 2014b).

Local Planning Policy

8.1.10 Relevant local policy is set out within Section 2 of the Flood Risk Assessment Report (Appendix 8.1). Current local planning policy is set out in:

- The North Ayrshire new Development Plan (North Ayrshire, 2019).

8.1.11 Relevant policies include Policy 14 and Policy 23. In addition, North Ayrshire Council published their developer's guide for development on drainage, sustainable urban drainage systems and flooding in 2019.

8.1.12 All assessment work has taken into account Flood Risk information outlined within the Local Development Plan and supplementary guidance.

Relevant Guidance

8.1.13 This chapter has been produced in accordance with the principles outlined in the following key guidance documents:

- Development Management Guidance: Flood Risk (Scottish Environmental Protection Agency (SEPA), 2017);
- Natural Flood Management Handbook (SEPA, 2015);
- SEPA Guidance Note 8 standing advice for planning authorities and developers on development management consultations (SEPA, 2012);
- Regulatory Position Statement – Developments on Peat (SEPA, 2010);
- Developments on Peatland; Guidance on the Assessment of Peat Volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables, 2012);
- Policy No. 19, Groundwater protection policy for Scotland (SEPA, 2009);
- WAT-SG-25, Good practice guide - river crossings (SEPA, 2010); and
- Climate Change Allowances for flood risk assessment in land use planning (SEPA, 2019).

8.1.14 The design and construction of the Project would also adhere to the relevant regulatory and industry best practice guidance, including, but not limited to:

- Guidance for Pollution Prevention (GPP) 1: A general guide to preventing pollution (SEPA *et al* 2020);
- GPP 2: Above ground oil storage tanks (SEPA et al 2017);
- GPP 4: Treatment and disposal where there is no connection to the public foul sewer (SEPA et al 2017);
- GPP 5: Works and maintenance in or near water (SEPA et al 2018);

- GPP 8: Safe storage and disposal of used oils (SEPA et al 2017);
- Pollution Prevention Guidelines (PPG18): Managing Fire Water and Major Spillages (SEPA et al June 2020);
- GPP 20: Dewatering of underground Ducts and Chambers (SEPA et al 2018);
- GPP 21: Pollution incident response Plans (SEPA et al 2017);
- GPP 22: Dealing with spills (SEPA et al 2018); and
- GPP 26: Safe storage of drums and Intermediate Bulk Containers (IBCs) (SEPA et al 2018).

8.1.15 Working at Construction and Demolition Sites: PPG 6 Pollution Prevention Guidelines (SEPA *et al* 2002) was withdrawn in December 2015. However, it still provides useful best practice guidance to inform this assessment.

Study Area

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

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

Baseline Methodology

8.1.18 The baseline conditions at the Project site have been established through a review of the literature and data from publicly available sources, including SEPA, British Geological Survey (BGS) and North Ayrshire Council.

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

- Ordnance Survey (OS) Mapping (Ordnance Survey 2021);
- BGS Geology of Britain Viewer: 1:50,000 Geological Mapping (British Geological Society 2021a);
- SEPA Flood Hazard and Risk Information Mapping (Scottish Environment Protection Agency 2021a);
- SEPA Scotland's Environment Data Centre (SEPA, 2021b);
- SEPA Water Environment Hub (SEPA, 2021c);
- SEPA Reservoir Flood Map (SEPA, 2021d);
- Nature Scot Site Link (Designated Sites) Mapping (Scotland's Nature Agency, 2021); and
- Scotland's Environment – Scotland's Soils (Scottish Government, 2021b).

8.1.20 In addition to the above, site-specific hydrological information has been requested via consultation with SEPA and North Ayrshire Council. A response is pending.

8.1.21 Further details of baseline conditions can also be found in Appendix 8.1: Flood Risk Assessment and Conceptual Drainage Strategy (Appendix 8.1, Annex A).

Consultation

8.1.22 Formal consultation was undertaken during the course of this assessment. Table 8.1 sets out consultation responses received in relation to hydrology and flood risk.

Table 8.1: Consultation Responses Relevant to this Chapter

Date	Consultee and Issues Raised	Response
1st November 2021	**SEPA** Initial consultation with SEPA Flood Team was undertaken to provide detailed flood risk information at the site.	SEPA do not have any information on who is responsible for the maintenance of the nearby watercourse. SEPA is unable to provide modelled river levels and flows and design sea level information is available through the Coastal Flood Boundary (CFB) dataset. SEPA are not aware of any flood defences relevant to the site, and they do not have historic floodplain extents.
1st November 2021	**North Ayrshire Council** Consultation with North Ayrshire Council Flood Team was undertaken to detailed flood risk information at the site. A consultation response is pending.	N/A at present
12th November 2021	**SEPA** Consultation with SEPA was undertaken to provide information on water abstraction and supply licences and SEPA CAR registered abstractions at or in the vicinity of the site. A consultation response is pending.	N/A at present
12th November 2021	**North Ayrshire Council** Consultation with North Ayrshire Council was undertaken to provide information on water abstraction and supply licences and SEPA CAR registered abstractions at or in the vicinity of the site. Historic records of surface water and groundwater flooding together with any recorded private water supplies or pollution incidents at or in the vicinity of the site have been requested. A consultation response is pending.	N/A at present
9th December 2021	**Scottish Water** *Trade effluent must never be discharged into surface water drainage systems as these are solely for draining rainfall run off.*	This has not been proposed.
13th December 2021	**NatureScot** *We advise that all direct and indirect impacts are assessed and addressed through appropriate mitigation and management, and are included in a Construction Environmental management Plan (CEMP), to ensure that water draining from the proposed site is free from pollutants.*	An outline Code of Construction Practice has been developed (Appendix 2.1), which will form the basis of a CEMP. The CoCP sets out good practice measures to ensure that pollution and water quality impacts are prevented.
13th December 2021	**NatureScot** *Utilising the Dynamic Coast data sets would help analyse risk of potential sea-level rise and coastal erosion impacts to 2100. An assessment of nature based solutions to managing coastal change and its impact on the adjacent Southannan sands SSSI*	This is included within the FRA (Appendix 8.1). The Project site will not be impacted as the site levels are higher than the predicted coastal designed flood level.

Date	Consultee and Issues Raised	Response
	should also be undertaken to ensure that opportunities to utilise soft techniques to manage coastal flooding and erosion are undertaken where suitable whilst maintaining the condition of notified features of the SSSI.	
16th December 2021	**SEPA** *The site should be assessed for flood risk from all sources in line with Scottish Planning Policy*	This Chapter assesses flood risk in line with NPF and SPP. The assessment is based on data sourced from a number of different organisations (See 8.1.19).
16th December 2021	**SEPA** *The FRA should be commensurate with the level and sources of flood risk present and needs to be carried out following the guidance set out in technical flood risk guidance for stakeholders.*	See Appendix 8.1: Flood Risk Assessment. This report has been produced in accordance with the relevant guidance, including the Technical Flood Risk Guidance for Stakeholders.
16th December 2021	**SEPA** *Details of the wastewater provision for your development should be provided in the ER or planning submission, including consideration of options for wastewater treatment facilities.*	See Annex A of Appendix 8.1: Flood Risk Assessment.
16th December 2021	**SEPA** *We encourage surface water runoff from all developments to be treated by SUDS in line with Scottish Planning Policy.* *It is important to ensure that adequate space to accommodate SUDS is incorporated within the site layout.*	See Annex A of the Appendix 8.1: Flood Risk Assessment.
16th December 2021	**SEPA** *For all developments, run-off from areas subject to particularly high pollution risk (eg yard areas, service bays, fuelling areas, pressure washing areas, oil or chemical storage, handling and delivery areas) should be minimised and directed to the foul sewer.*	See Annex A of the Appendix 8.1: Flood Risk Assessment.
16th December 2021	**SEPA** *SUDS must be used on all sites, including those with elevated levels of contaminants. SUDS which use infiltration will not be suitable where infiltration is through land containing contaminants which are likely to be mobilised into surface water or groundwater.*	See Annex A of the Appendix 8.1: Flood Risk Assessment.
16th December 2021	**SEPA** *We note that Section 6.8.39 (Scoping Report) states that "that any temporary haul roads that are required will be located at least 10m from watercourses where practicable". On the basis that there could be off-site engineering actives that could have an impact on the water environment, in the event that a buffer strip is not practicable, this issue will need to be scope in. This is only with regards to any temporary haul roads and any coastal engineering works.*	The Project does not include any coastal engineering works or temporary haul roads, however, a development free easement greater than 8m has been provided between the Glenn Burn, the coastline and the Project. See Paragraph 8.1.109 for further details.
16th December 2021	**SEPA** *In order to meet the objectives of the Water Framework Directive of preventing any deterioration and improving the water environment, developments should be designed to avoid engineering activities in the water environment wherever possible. We require it to be demonstrated that every effort has been made to leave the water environment in its natural state.*	There would not be any engineering activities in the water environment and runoff will be limited through the drainage strategy and mitigation measures (See Paragraph 8.1.87 and Annex A, Appendix 8.1).
16th December 2021	**SEPA**	Increased flood risk will not have a significant impact on people or

Date	Consultee and Issues Raised	Response
	If the engineering works proposed are likely to result in increased flood risk to people or property then a flood risk assessment should be submitted in support of the planning application and we should be consulted as detailed below.	property; however, an FRA has been developed (See Appendix 8.1)
16th December 2021	**SEPA** *A site survey of existing water features and a map of the location of all proposed engineering activities in the water environment should be included in the ER or planning submission. A systematic table detailing the justification for the activity and how any adverse impact will be mitigated should also be included. The table should be accompanied by a photograph of each affected water body along with its dimensions. Justification for the location of any proposed activity is a key issue for us to assess at the planning stage.*	This has not been scoped into the assessment as the Project does not involve any engineering activities within the water environment.
16th December 2021	**SEPA** *Where developments cover a large area, there will usually be opportunities to incorporate improvements in the water environment required by the Water Framework Directive within and/or immediately adjacent to the site either as part of mitigation measures for proposed works or as compensation for environmental impact. We encourage applicants to seek such opportunities to avoid or offset environmental impacts.*	Will Project will include drainage, treatment and mitigation measures to compensate for any impacts. Measures to mitigate against water pollution will be incorporated into the final detailed drainage design and may include, where appropriate and feasible, silt and oil interceptors
16th December 2021	**SEPA** *If other development projects are present or proposed within the same water catchment then we advise that the applicant considers whether the cumulative impact upon the water environment needs to be assessed.*	A cumulative assessment has been included (See Paragraph 8.1.164).
16th December 2021	**SEPA** *In the SEPA Flood Risk Standing Advice for Planning Authorities and Developers, "We recommend that a 6m minimum (for channels less than 1m in width and increasing proportionally to channel width) undeveloped buffer strip is provided in perpetuity between all development types and watercourses, allowing space for natural fluvial processes to occur (as well as other attendant environmental benefits, not limited to but including biodiversity, open space, channel maintenance, pollution reduction and river restoration)*	A development free easement greater than 8m has been provided between the Glenn Burn, the coastline and the Project. See Paragraph 8.1.109 for further details.
17th December 2021	**North Ayrshire Council** *The site should be assessed for flood risk, commensurate with the risk level. Details of wastewater provision should be provided. The impact on Private Water Supplies should be considered.*	This Chapter assesses flood risk in line with NPF and SPP. Drainage strategy is shown within Annex A of Appendix 8.1: Flood Risk Assessment.
17th December 2021	**North Ayrshire Council** *SEPA advise that the effect of engineering works in the water environment should be scoped in if temporary haul roads, and a 10m buffer cannot be achieved, or coastal engineering works are required."*	The Project does not include any coastal engineering works or temporary haul roads, however, a development free easement greater than 8m has been provided between the Glenn Burn, the coastline and the Project. See Paragraph 8.1.109 for further details.

Assessment Criteria and Assignment of Significance

8.1.23 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts of those receptors. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on recognised EIA methodology, which is described in further detail in Chapter 4: Environmental Assessment Methodology.

Receptor Sensitivity/Value

8.1.24 The following terms have been used to describe receptor sensitivity.

Table 8.2: Definitions of Sensitivity or Value (Water Resources & Hydrology)

Sensitivity	Typical Descriptors
Very High	Receptor with little to no capacity to accommodate change, is high value or critical importance to the local, regional or national economy. Receptor is highly vulnerable to impacts that may arise from the development and recoverability is long term or not possible. **Surface Water:** Water Framework Directive (WFD) current overall status of high. The surface water body supports sensitive aquatic ecological receptors and is extensively used for public water supply and large-scale agricultural use. **Groundwater:** Groundwater body supports public and/or large-scale industrial water supply and is a very high productivity aquifer. **Flood Risk:** Land is within a high-risk flood zone or nationally significant infrastructure is present which is protected from flooding by natural floodplain storage.
High	Receptor with a low a capacity to accommodate change, is of moderate value with reasonable contribution to the local, regional or national economy. Receptor is generally vulnerable to impacts that may arise from the development and recoverability is flow and/or costly. **Surface Water**: WFD current overall status of 'Good'. Surface water body may support sensitive aquatic ecological receptors and is used is used for public water supply / medium scale industrial or agricultural use. **Groundwater**: Groundwater body supports public water and/or large-scale industrial water supply and is a high productivity aquifer. **Flood Risk**: Land is within a high to medium risk flood zone or locally significant infrastructure is present which is protected from flooding by natural floodplain storage.
Medium	Receptors with a moderate capacity to accommodate change, is of minor value with small levels of contribution to the local, regional and national economy. Receptor is somewhat vulnerable to impacts that may arise from the development and has moderate to high levels of recoverability. **Surface Water**: WFD current overall status of moderate. The surface water features may be locally important for spawning of Salmonid species. Surface water body is used for private water supply or small scale industrial/agricultural use. **Groundwater**: Groundwater body supports private water supply or medium scale agricultural/industrial abstractions. **Flood Risk**: Land is within a medium risk flood zones or has limited constraints and a low probability of flooding of commercial / industrial properties.
Low	Receptor with a high capacity to accommodate change, is of low value with little contribution to the local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the development and/or has high recoverability. **Surface Water**: WFD current overall status of poor. Surface water bodies are not significant in terms of sensitive ecological receptors or fish spawning. Small scale (single residential or commercial use) abstraction licences are present in close proximity. **Groundwater**: Low or very low productivity aquifer with no abstraction licences. **Flood Risk**: Land within a low risk flood zone or had limited constraints and a very low probability of flooding of commercial / industrial properties.
Negligible	Receptor with a very high capacity to accommodate change, is of negligible value with no contribution to local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the development and/or has high recoverability.

Sensitivity	Typical Descriptors
	Surface Water: WFD current overall status of bad. No sensitive ecological receptors or fish spawning are present within the surface water bodies. No abstraction licences present within the area. **Groundwater**: Very low productivity aquifer with no abstraction licences. **Flood Risk**: Land is within a little to no flood risk zone and no major flood risk areas are present within a 250 m radius of the site.

Magnitude of Impact

8.1.25 In determining impact magnitude, the impact duration and the nature of the impact has been taken into account. The following definitions have been used in the assessment.

- Temporal Scale.
  - Short Term: A period of months, up to one year;
  - Medium Term: A period of more than one year, up to five years; and
  - Long Term: A period of greater than five years.
- Geographical scale: whether the effect would be experienced at the local, regional or national level.
- Adverse or Beneficial – whether the nature of the effect increases or decreases potential contamination risks to sensitive receptors.
- Temporary – effects that persist for a limited period only (due for example, to particular activities taking place for a short period of time).
- Permanent – effects that result from an irreversible change to the baseline environment (e.g. land-take) or which persist for the foreseeable future.
- Reversible/irreversible effect: effects can be reversed by mitigation measures or by natural environmental recovery within reasonable timescales (e.g. 5-10 years following cessation of construction).
- Direct – effects that arise from the impact of activities that form an integral part of the Project (e.g. direct employment and income generation).
- Indirect – effects that arise from the impact of activities that do not explicitly form part of the Project.

8.1.26 The assessment of impact is based on the Project parameters outlined in Chapter 2, Project Description.

Table 8.3: Definitions of Magnitude Used within this Assessment (Water Resources & Hydrology)

Sensitivity	Typical Descriptors
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).

Sensitivity	Typical Descriptors
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Significance of Effects

8.1.27 The significance of predicted effects will be determined using publicly available environmental data to take into account the sensitivity of the receptor and the magnitude of each impact. Table 8.4 will be used to inform the evaluation of the significance of effects.

Table 8.4 Assessment of Significance (Water Resources & Hydrology)

Magnitude of Impact	Sensitivity or Value of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

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

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

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

Limitations of the Assessment

8.1.30 The hydrological site setting presented within this chapter is based on publicly available information. RPS has reviewed the publicly available data found within the desk-based search and where possible looked to corroborate the information through obtaining data from SEPA, BGS, Scottish Water and North Ayrshire Council.

8.1.31 The information collected through publicly available searches and through consultation with the relevant stakeholders is considered sufficient to characterise the baseline environment.

8.1.32 The characterisation of the baseline environment could further benefit from further detailed information on:

- flow data for surrounding watercourses and drainage channels;
- detailed site specific ground investigation data; and
- detailed groundwater flow information.

8.1.33 Notwithstanding the above, overall, a moderate to high level of certainty has been applied to the baseline and assessment presented in this chapter. Where available, catchment data regarding water quality has been used to inform the assessment. The information which was available is considered sufficient to establish baseline within the hydrological and geological study areas for the purposes of EIA. Therefore, there are no data limitations that affect the robustness of the conclusions of this assessment.

Baseline Environment

8.1.34 This section describes the hydrological resources and flood risk within the study area.

Site Description and Topography

8.1.35 The Project site is located on part of the former Hunterston Coal Yard within the wider Hunterston Port and Resource Centre, located on the coast of the West of Scotland, south of the settlement of Fairlie, and north of the EDF Hunterston Power Station.

8.1.36 Primary vehicular access to the site can be gained from the existing site access to the Hunterston Yard via Irvine Road (A78).

8.1.37 The site is irregular in shape and occupies an area of approximately 50.7 hectares (ha).

8.1.38 A topographic survey was completed at the Project site by Survey Solutions in November 2021, reference 37006GLLS, and indicates that the levels at the Project site predominantly range between 5m AOD to 6m AOD. The access road to the north of the Project site sits at elevation ranging from 5.46m AOD in the east to 6.09m AOD in the west. Levels of the concrete bridge (pier) in the north west of the site vary from 5.95m AOD in the east to 7.49m AOD in the west. The majority of the development would occur in the rectangular central area of the site. Levels in this area range between 4.90m AOD in the north east and 5.07m AOD in the south west to approximately 6.30m AOD along the west boundary. The proposed location of the Project's buildings/structures predominately sit between 5.20m AOD and 5.80m AOD. The east and west boundaries lie on slightly higher elevation at approximately 5.95m AOD and 6.35m AOD respectively.

Hydrological Setting

8.1.39 The Project site is located on land 50m to the west of the Ayrshire Coastal path, adjacent to the Largs Channel, approximately 950m to the south west of Fairlie Railway Station. It is part of the Hunterston port.

8.1.40 The Burn Grill runs along the south boundary of the site. The Burn Grill catchment covers an area of 8.99 km^2 and flows from West Kilbride in the south to the south of the site, discharging to the sea. A tributary of the Burn Gill, known locally as the Kilruskin Burn drains the east of the catchment.

8.1.41 The Glenn Burn runs along the east boundary of the site. Its catchment covers an area of 4.9 km^2 flowing west before passing under the A78 at Glenburn Bridge, where it is diverted north, around the Hunterston Terminal, before finally flowing out onto Southannan Sands Site of Special Scientific Interest (SSSI).

Surface Water Body Status

8.1.42 The SEPA Water Environment Hub (SEPA, 2021) outlines that the Burn Grill and the Glenn Burn, in close proximity to the site, are not defined under the Water Framework Directive (WFD) surface water classification.

8.1.43 A number of smaller burns and tributaries are present within the study area. Joint Nature Conservation Committee WFD guidance (JNCC, 2020) indicates that waterbodies below 10 km^2 catchment area no longer need to be included in a waterbodies classification assessment. The Burn Grill and smaller tributaries are therefore too small to be classified as WFD waterbodies, with no further data available. For the smaller unclassified waterbodies, a classification was derived from nearby waterbodies and the Project location. Based on the above classification stipulations, the nearby watercourses in close proximity to the site are considered to have a 'Moderate' overall status in line with the Caaf Water, which is the closest monitored waterbody in the proximity to the site.

8.1.44 The Caaf Water is a river (ID:10389) in the River Garnock catchment of the Scotland river basin district. The main stem is approximately 13.6km in length. The waterbody has been assigned as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for public drinking water.

8.1.45 The nearby coastal waterbody Largs Channel, adjacent to the west boundary of the site, is also classified under WFD. The WFD surface water classification is summarised in Table 8.5. It is considered to have an overall 'Good' status.

Table 8.5: WFD Surface Water Classification

Name (SEPA ID)	Water Body Type	Classification (2019)
Caaf Water (ID: 10389)	River (main stem approximately 13.6km in length)	Overall – Moderate ecological potential Physical condition & barriers – Moderate Water Quality - Pass
Largs Channel (Fairlie Roads) (ID: 200026)	Coastal Water Body (approximately 29.9 km^2 in area)	Overall – Good Physical condition & barriers – Good Water Quality – Good

8.1.46 The Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000) is a European Union Directive which committed member states to achieve 'Good' qualitative and quantitative status of all water bodies by 2015. Under the Directive water bodies are defined as all ground and surface waters, including rivers, lakes, transitional waters and coastal waters (up to one nautical mile from shore).

8.1.47 It was not possible to achieve 'Good' status of all water bodies by 2015 and therefore the outstanding water bodies have objectives set for 2021 or 2027.

Geological and Hydrogeological Setting

Geology and Hydrogeology

8.1.48 British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is situated on Marine Beach Deposits comprising of sand and gravel. This is underlain by bedrock geology classified as Kelly Burn Sandstone Formation. The bedrock is classified as a Secondary A Aquifer, defined as 'formations formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers'.

8.1.49 There are two designated Sites of Special Scientific Interest (SSSI) within close proximity to the site indicated as Southannan Sands and Hunterston Sands to the west and southwest of the site respectively.

8.1.50 A number of BGS publicly available borehole records are available within the Project site boundary. Boreholes record reference no. NS25SW73 indicate the following:

- loose brown clayey fine to medium sand up to 2.45m bgl;
- medium dense brown clayey fine to medium sand with fine to coarse gravel-size fragments of sandstone up to 3.65m bgl;
- medium dense brown clayey fine to medium sand up to 6.40m bgl;
- firm brown very sandy silty clay up to 6.7m bgl;
- medium dense fine to coarse gravel-size fragments of sandstone with traces of sand below up to 8.55m bgl;
- red-brown fine to medium grained sandstone up to 9.45m bgl; and
- Water in the boreholes is subject to tidal fluctuations.

8.1.51 The soils beneath the site are described as 'Raised beach sands and gravels derived from Carboniferous rocks with some Old Red Sandstone material' by the National Soils of Scotland Map (Scottish Government, 2021).

8.1.52 According to the BGS Aquifer Designation Mapping (BGS 2021, online), the bedrock is classified as a moderately productive aquifer.

Groundwater Body Status

8.1.53 The SEPA Water Environment Hub (SEPA, 2021c) indicates that two groundwater bodies are present within or in close proximity to the Project site. The groundwater bodies are allocated a WFD groundwater classification which is outlined in Table 8.6.

Table 8.6: WFD Groundwater Classification

Name (SEPA ID)	Water Body Type	Classification (2019)
West Kilbride (ID: 150534)	Groundwater (approximately 61.2 km^2 in area)	Overall – Good Water flows and levels – Good Water Quality – Good
North Ayrshire Coastal (ID: 150785)	Groundwater (approximately 43.7 km^2 in area)	Overall – Good Water flows and levels – Good Water Quality – Good

8.1.54 The WFD stipulates that groundwater must achieve 'Good' quantitative status and 'Good' chemical status by their objective year.

8.1.55 Further details of the geological and hydrogeological nature of the Project site can be found in Chapter 9: Hydrogeology, Geology and Ground Conditions.

Existing Flood Risk

8.1.56 SEPA and Scottish Planning Policy identify four specific flood risk categories to assess the potential risk of flooding at a site. These four categories are set out below.

- High likelihood (risk): A flood event is likely to occur in the defined area on average once in every ten years (1:10). Or a 10% chance of happening in any one year.
- Medium likelihood (risk): A flood event is likely to occur in the defined on average once in every two hundred years (1:200). Or a 0.5% chance of happening in any one year.
- Low likelihood (risk): A flood event is likely to occur in the defined area on average once in every thousand years (1:1000). Or a 0.1% chance of happening in any one year.
- Little or no risk: A flood event is likely to occur in the defined area on average less than once in every thousan year (1:1000). or <0.1% chance of happening in any one year.

8.1.57 Detail on all sources of flood risk can be found within the Flood Risk Assessment and Conceptual Surface Water Drainage Strategy (Appendix 8.1).

Fluvial and Coastal Flood Risk

8.1.58 The SEPA Flood Map (SEPA, 2021), which is available online, identifies that the majority of the site is located within an area which is designated as having little to no risk of fluvial flooding, whereby the annual probability of flooding is classified as less than 0.1%. An analysis of the topographic survey however indicates that fluvial flooding would potentially impact the northern area of the Project site including part of the access road up to a level of approximately 5.70m AOD. However, the flood is unlikely to extent to the water sump and to the location of the Project as this is bounded to the north by higher elevations.

8.1.59 The SEPA Flood Map (SEPA, 2021 online) also indicates that the Project site is located within an area which is designated as having little to no risk of coastal flooding, whereby the annual probability of flooding is classified as less than 0.1%, with the exception of the pier in the north east of the site which lies within the tidal range of the Firth of Clyde during all modelled scenarios.

8.1.60 The SEPA flood maps are provided in the Flood Risk Assessment (Appendix 8.1).

Surface Water Flood Risk

8.1.61 SEPA Flood Map for Surface Water (SEPA, 2021) indicates that the Project site is predominantly located in an area at little to no risk of flooding from surface water. This corresponds with an annual probability of flooding that is less than 0.1%. The northern boundary and localised areas across the site are classified as having medium to high risk from surface water flooding. The area of high risk appears to correlate with low-lying areas (localised depressions) within the site, which corresponds to an annual probability of 10%.

8.1.62 In a 1 in 10 year (10%) event, surface water flood depths are indicated to be between 0.3m and 1m in the area at ‘high’ risk. In both the 1 in 200 year (0.5% - medium risk) and 1 in 1000 year (0.1% - low risk) events, flood depths remain less than 1m in the respective affected areas. The site will predominantly remain dry during all modelled scenarios.

8.1.63 The topographic survey at the Project site confirms that the majority of the areas impacted by surface water flooding are currently located at or below 5.20m AOD. As the majority of the Project site sits between 5.00m AOD and 6.00m AOD flood depths are unlikely to exceed 200mm during extreme surface water events except from some site-specific low-lying depressions where flood depths could potentially reach 500-600mm.

Reservoir Flood Risk

8.1.64 The access road to the site and the area along the east boundary lie within the extent from reservoir flooding. The map shows that the potential source of flooding in this instance is the Glenburn reservoir which is located at approximately 1.6 km to the southeast of the site.

8.1.65 Flooding from reservoirs is however extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925.

Groundwater Flood Risk

8.1.66 SEPA identifies the site as lying within a potential vulnerable area to groundwater flooding.

8.1.67 However, BGS borehole records within the site boundary outline that groundwater in the boreholes is subject to tidal fluctuations.

8.1.68 Further detail on all sources of flood risk can be seen within the Flood Risk Assessment Report (Appendix 8.1).

8.1.69 Further details of the geological and hydrogeological nature of the Project site can be found in Chapter 9: Hydrogeology, Geology and Ground Conditions.

Ecologically Designated Sites

8.1.70 No designated sites are present within the Project site boundary. There are two designated Sites of Special Scientific Interest (SSSI) within close proximity to the site indicated as Southannan Sands and Hunterston Sands to the west and southwest of the site respectively. They are marine water dependent SSSI.

8.1.71 No special areas of conservation have been identified within 1 km from the site.

8.1.72 Clyde Muirshiel Regional Park is located in the vicinity of the site at approximately 400m to the east of the site.

8.1.73 Further information regarding designated sites can be found in Chapter 5: Ecology and Nature Conservation.

Water Supplies and Abstraction

8.1.74 Water supplies and Controlled Activity Regulations (CAR) abstractions may be present in close proximity to the Project site.

8.1.75 Consultation with SEPA and North Ayrshire Council has requested all abstraction and water supply licences within a 1 km radius of the Project site. **A consultation response is pending.**

Private Water Supplies

8.1.76 Private water supplies in Scotland are the responsibility of owners and users and are regulated by the Local Authorities. The Private Water Supplies (Scotland) Regulations 2006 helps to ensure clean drinking water is provided from private sources. SEPA has been consulted with regards to Private Water Supplies in the area. **At the time of writing, a response is awaiting.**

Public Water Supplies

8.1.77 Public water supplies in Scotland are provided by Scottish Water, who are governed by the Public Water Supplies (Scotland) Regulations 2014. There are no public water mains at the Project site, the nearest such pipe is located beneath the A78 along the eastern boundary of the site and is a freshwater network asset. No Wastewater Network has been identified at or in the vicinity of the site.

SEPA CAR Registered Abstractions

8.1.78 Water abstractions in Scotland are regulated by the Water Environment (Controlled Activities) (Scotland) Regulations 2011. An abstraction licence is required where abstractions are carried out on a permanent or temporary basis. North Ayrshire Council and SEPA have been contacted regarding records of licensed abstractions. **A consultation response is pending.**

Scottish Pollution Release Inventory Water and Wastewater Releases

8.1.79 The Scottish Pollutant Release Inventory (SPRI) is a pollutant release and transfer register which has the purpose to report annual specified releases of SEPA-regulated sites. The SEPA Scotland Environment web service is currently unavailable and therefore it cannot be determined whether there have been any SPRI designated water and wastewater releases have occurred within a 1 km radius of the site.

Future Baseline Conditions

8.1.80 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, Schedule 4, requires that "*A description of the relevant aspects of the current state of the environment… and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*" is included within the EIA Report.

8.1.81 This section considers the likely future baseline conditions has been carried out in the absence of the Project.

8.1.82 The main change to the hydrology and flood risk future baseline is associated with the potential effects of climate change, which may impact on future peak river flow rates, extreme sea levels and rainfall intensity. A summary of potential climate change allowances, as outlined within the SEPA climate change allowances for flood risk assessment in land use planning (April 2019) can be found at https://www.sepa.org.uk/media/426913/lups_cc1.pdf.

8.1.83 The increase in peak river flow rates and rainfall intensity, as outlined within the Centre for Ecology & Hydrology (CEH) 2011 study is likely to significantly affect Scotland and North Ayrshire Council.

8.1.84 In the absence of detailed flood risk data for the Burn Grill and Glenn Burn, it is not possible to apply climate change allowances. SEPA has however produced river future flood risk maps for 0.5% flood events for the 2080s climate change scenario. As described in the FRA in Appendix 8.1, the SEPA map indicates that the flood extents for fluvial flooding would not increase with respect to the current scenario. The majority of the Project site is not at risk from fluvial flooding with only a linear area to the north of the site being impacted by it.

8.1.85 The allowances set out in the SEPA's 2019 Guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning (SEPA, 2019b) provides the cumulative sea level rise from 2017 to 2100 based on the outputs from UK Climate Projections 2018 (UKCP18). The cumulative sea level rise allowance for this region up to 2100 is 0.85m. As such, the extreme sea level in the vicinity of the site could potentially reach 4.50m AOD during the 1 in 200-year (2100) coastal event. Given that the site sits on higher elevations, it will not be impacted during this event.

8.1.86 The impacts of climate change on rainfall intensity have been accounted for in the conceptual design within the surface water drainage strategy report available in Appendix 8.1: Flood Risk Assessment, Annex A.

Mitigation Measures Adopted as Part of the Project

8.1.87 This section details the mitigation measures that are proposed as part of the Project during both the construction and operational phases.

8.1.88 Potential impacts on the water environment would be avoided where practicable through careful consideration of the drainage design, construction techniques and operational best practices. SEPA and North Ayrshire Council will be consulted through the construction works and planning process to ensure that any appropriate permits and consents are in place. Operational and construction mitigation measures are outlined below.

8.1.89 As part of the design process, a number of mitigation measures have been proposed to reduce the potential for impact on the flood risk and hydrological environment. These measures are considered best industrial practice for this type of development and therefore have been incorporated as 'designed in' mitigation and management measures within the base scheme design as assessed within the potential impacts.

8.1.90 Committed operational and construction mitigation measures are outlined below. Construction phase mitigation would be implemented through the Code of Construction Practice (CoCP).

Construction Phase

Construction Drainage Systems

8.1.91 During the construction phase of the Project, temporary drainage mitigation techniques would be used, including, but not limited to, runoff interceptor channels installed prior to the construction of the operational drainage design to ensure that discharge from the site is controlled in quality and volume during construction. The construction drainage system would be designed to ensure that any runoff produced would be treated before being discharged to the surrounding environment. This may include the use of settling tanks and/or ponds to remove sediment, temporary interceptors, and hydraulic brakes. Any drainage service runs would be surrounded by appropriate granular bedding material to reduce any potential leaks from infiltrating into the below groundwater body. Monitoring would be undertaken and any damage to the temporary drainage network would be repaired/replaced.

Construction Techniques and Processes

8.1.92 Construction material and / or spoil within construction compounds would be positioned away from surface waterbodies and no hazardous substances would be stored within close proximity of the drainage network.

8.1.93 Any area at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) would be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage systems, the local watercourses, surface water bodies and significant ecological areas. Additionally, the bunded areas would have impermeable bases to limit the potential for migration of contaminants into surrounding watercourses, surface water bodies and significant ecological habitats following any potential leakage/spillage event.

8.1.94 In line with standard building practices and as a precautionary measure, it is recommended that ground floor threshold levels of buildings would be raised a minimum of 150 mm above external ground levels, where feasible. This would provide a degree of mitigation should groundwater emergence, fluvial flooding or surface water flooding occur.

Excavation and Piling Mitigation Measures

8.1.95 Mitigation measures would be incorporated into the construction techniques to ensure the continued protection of groundwater flow and quality. During any piling and / or foundation excavation the area would be isolated from surface water until completed. Should any groundwater be encountered during excavation, appropriate dewatering methods would be considered. Any water arising from excavations would be disposed through the temporary drainage system (if uncontaminated) and following removal of silt. Should contamination be encountered during excavation, work would be stopped until appropriate measures are in place to

prevent mobilisation. Best practice construction techniques and design would be used for any excavation and piling undertaken during the installation of foundations.

Pollution Prevention Measures

8.1.96 Refuelling of machinery would be undertaken within designated areas where spillages can be easily contained. Machinery would be routinely checked to ensure it is in good working condition.

8.1.97 Any tanks and associated pipe work containing hazardous substances included in List 1 of the Groundwater Directive (2006/118/EC) would be double skinned and be provided with intermediate leak detection equipment.

8.1.98 The following specific mitigation measures for the protection of surface water during construction activities would be implemented.

- Management of construction works to comply with the necessary standards and consent conditions as identified by the SEPA and North Ayrshire Council;
- A briefing for all staff highlighting the importance of water quality, the location of watercourses, waterbodies and pollution prevention included within the site induction;
- Areas with prevalent runoff to be identified and drainage actively managed, e.g. through bunding and / or temporary drainage;
- Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) to be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses and waterbodies. Additionally the bunded areas would have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage / spillage. Bunds used to store fuel, oil etc. would have a 110% capacity of the volume of fuel, oil etc. to be stored;
- Disturbance in areas close to watercourses and other water bodies reduced to the minimum necessary for the work;
- Excavated material to be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and other water bodies and any spillage into the waterbodies;
- Construction materials to be managed in such a way as to effectively minimise the risk posed to the aquatic environment;
- Plant machinery and vehicles to be maintained in a good condition to reduce the risk of fuel leaks;
- Drainage works to be constructed to relevant statutory guidance and approved by SEPA and North Ayrshire Council prior to the commencement of construction; and
- Consultation with SEPA during the construction period to promote best practice and to implement proposed mitigation measures.

Water Quality Monitoring

8.1.99 Water quality monitoring would be carried out throughout the construction phase to ensure no discharge of pollutants or increase in suspended sediment occurs. A water quality monitoring methodology and schedule would be agreed with consultees.

Best Practice Measures

8.1.100 The following measures have been determined as best practice measures based on local and national guidance. Construction work would be undertaken in accordance with the CoCP, and relevant guidance, where appropriate. This guidance includes, but is not limited to the following:

- Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C532; 2001);
- CIRIA - SuDS Manual (C753; 2015a);
- CIRIA (C741; 2015b) Environmental good practice on site guide;
- Prevent surface water being affected during earthwork operations. No discharge to surface watercourses or other waterbodies would occur without permission from the SEPA (SuDS Manual);
- wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants (SuDS Manual);
- regular cleaning of roads of any construction waste and dirt to be carried out (SuDS Manual); and
- a construction method statement to be submitted for approval by the responsible planning authority (SuDS Manual).

8.1.101 SEPA's Guidance for Pollution Prevention would also be enforced during the construction of the Project.

Operational Phase

Conceptual Surface Water Drainage Strategy

8.1.102 A conceptual surface water drainage strategy is proposed for the Project, presented in Appendix 8.1: Flood Risk Assessment, Annex A. In summary, it is proposed that surface water from the site is collected, treated and discharged uncontrolled to the Firth of Clyde via an existing outfall to the Southannan Sands SSSI.

8.1.103 The runoff from roof areas will discharge without any treatment. The runoff from the car parking areas will be collected via a permeable surface, achieving a stage of treatment, and discharge to the wider roof runoff network. The runoff from all external concrete yard areas will be collected via high-capacity slot drains and discharge through a two-stage treatment train. These slot drains will act as conveyancing pipework, discharging the flows to localised full retention separators, offering an initial stage of treatment. The runoff will then discharge to proprietary devices, offering the second stage of treatment.

8.1.104 The drainage channels will direct the water to separators and proprietary devices before it can be discharged into the sea through the proposed outfall. Rainwater from roof areas will be discharged without any treatment.

8.1.105 Measures to mitigate against water pollution will be incorporated into the final detailed drainage design and may include, where appropriate and feasible, silt and oil interceptors.

8.1.106 No connection to the nearby watercourses is proposed as part of the Project.

Conceptual Foul Water Drainage Strategy

8.1.107 There are two options for the discharge of the foul water from the site:

- Option 1 – treat onsite domestic flows and discharge treated effluent to the sea, attenuate flows from processing and any contaminated flows, dispose offsite. The onsite treatment plant will be operated by a third party and subject to an independent planning application.
- Option 2 – discharge to the nearest Scottish Water sewer.

Operational Procedures and Measures

8.1.108 A number of operational procedures would be developed for the Project which would look to prevent any increase in pollutants to the surrounding environment. Under the Environmental Permit, an emergency spill response procedure and a site storage procedure would outline how a spill would be cleaned when the site is operational and where any potential pollutants would be stored. This would be available within an operational management plan which would be kept in the main office with technical notes of important procedures available within each area of the site.

8.1.109 A development free easement greater than 8m has been provided between the Glenn Burn, the coastline and the Project, to ensure that there is no impact on the channels through loss of capacity or impedance to flows and that they can be accessed for future maintenance.

Assessment of Construction Effects

8.1.110 The construction effects of the Project have been assessed in relation to hydrology and flood risk within the defined study area. Temporary impacts during the construction phase would mainly be due to any alteration of the existing surface water flow regimes as a consequence of the Project. The construction impacts assessed are as follows:

- impacts which may affect temporary (construction) flood risk;
- impacts on surrounding ecological areas; and
- impacts on surrounding surface water resources.

8.1.111 A description of the significance of impacts upon hydrology and flood risk receptors caused by each identified impact is given below.

Temporary (Construction) Flood Risk

8.1.112 The majority of the Project site, including the location of all built development, has been assessed as being at ‘little to no flood risk’ from fluvial or coastal flooding.

8.1.113 Only a small area to the north of the site, including part of the access road, would be impacted by fluvial flooding. In the absence of detailed fluvial modelling for the Glenn Burn, the 2080 SEPA Future Flood Map shows that the built development would be located outside of the associated area of risk. Therefore, the Project would not result in a loss of floodplain storage or alter fluvial flow paths.

8.1.114 The allowances set out in the SEPA’s 2019 Guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning (SEPA, 2019b) give the cumulative sea level rise from 2017 to 2100 based on the outputs from UK Climate Projections 2018 (UKCP18). The cumulative sea level rise allowance for this region up to 2100 is 0.85m. As such, the extreme sea level in the vicinity of the site could potentially reach 4.50m AOD during the 1 in 200-year (2100) coastal event. Given that the site sits on higher elevations, it will not be impacted during this event.

8.1.115 SEPA identifies the site as lying within a potential vulnerable area to groundwater flooding. However, BGS data with regards to groundwater levels was not available at the Project site. Water in the boreholes was subject to tidal fluctuations.

8.1.116 The Project Description (See Chapter 2) identifies that a c.8 m deep excavation may be required creating a basement level, which during construction may be subject to groundwater ingress and connectivity to sensitive groundwater receptors. As outlined in the current baseline conditions section, the Project site currently comprise of 100% hardstanding. On the basis of the above, the impact to construction workers (who are of medium sensitivity) is considered to be negligible and the overall effect would be negligible.

8.1.117 The construction methodologies would ensure that off-site surface water flows during construction are not materially increased during the construction phase. The CoCP would implement mitigation

measures to manage the flood risk caused by the construction phase. This would include a suitable temporary drainage network which would be constructed to discharge any surface water falling on the site to an underground drainage network, incorporating oil interceptors, settlement ponds and filtration tanks (where appropriate) before being discharged to the existing sea outfall to the south west of the site. With respect to groundwater, appropriate assessments would be undertaken prior to any construction works to confirm the groundwater table and any specific mitigation measures.

8.1.118 The impact on the local area is predicted to be of local spatial extent, short term duration, intermittent and reversible. With the above construction engineering methods adopted as part of the Project it is predicted that the impact would not affect surrounding local receptors directly. The magnitude is therefore, considered to be low adverse. The overall significance of effect on flood risk is assessed as minor adverse significance, which is not significant.

Impact on Surrounding Ecological Areas

8.1.119 There are two designated Sites of Special Scientific Interest (SSSI) within close proximity to the site indicated as Southannan Sands and Hunterston Sands to the west and southwest of the site respectively. They are marine water dependent SSSI. Designated for its intertidal sand flats, the Project site has particular interest as a host for nationally scarce dwarf eelgrass *Zostera noltei*.

8.1.120 Construction activities, including the use of heavy machinery on site, excavations, and replacement of existing hardstanding, could lead to an increase in ground disturbance, sediment scour and surface water runoff from the Project site.

8.1.121 The SSSI are considered to be highly vulnerable and of high value and the sensitivity is therefore considered to be high.

8.1.122 The construction methodologies and designed-in mitigation would ensure that no increase in uncontrolled off-site flows would occur during the construction phase. For example, areas with prevalent runoff would be actively managed and a suitable temporary drainage network, including temporary oil interceptors, would be constructed.

8.1.123 All construction compounds would be contained and positioned in the eastern part of the site away from the SSSI. All stockpiled material and potential contaminant sources would be positioned in the construction compounds in the eastern part of the site and suitably bunded within the compounds. The maintenance of plant machinery and vehicles would help reduce the risk of fuel leaks. The use of dust suppression equipment would reduce the spread of sediment within the site, so that it would not exit the site in surface water without first passing through a sediment interceptor. Areas undergoing piling / excavation would be isolated from the drainage network to help prevent material entering the network.

8.1.124 Drainage runs would be surrounded by appropriate granular material to reduce the potential for any leaks to enter the groundwater supply. Maintenance of the temporary drainage system, sediment and pollution mitigation measures would be undertaken to optimise protection of the SSSI, with water quality monitoring evaluating the efficiency of the mitigation measures. Should monitoring indicate a decline in discharge water quality, construction works would be halted until action could be taken to appropriately restore mitigation.

8.1.125 The above measures will manage construction activities to help prevent pollutants and sediments forming a ‘source’, with the potential pathways in terms of surface water run-off managed within the Project site boundary so as to prevent the transportation of any poor-quality water to the Southannan Sands and Hunterston Sands SSSI.

8.1.126 With the above construction engineering methods and mitigation measures adopted as part of the Project it is predicted that the impact would not affect surrounding receptors directly. The magnitude is, therefore, considered to be negligible.

8.1.127 The significance of effects of any construction actives on the designated ecological sites to the west, with the implementation of the construction measures, would be minor adverse, which is not significant.

Impact on Surrounding Water Resources

8.1.128 During construction, there is a potential risk of accumulation of standing water on site and accidental discharges of untreated runoff whilst the operational surface water drainage system is being constructed.

8.1.129 The sensitivity of the receiving waterbody is considered to be high given that the surface water runoff is directly discharged into the Hunterston Sands SSSI. As a basement is proposed as part of the Project, the sensitivity of the groundwater waterbody is also classified as being high. There are a number of potential pollutants which could arise during construction, and hence which may affect the water quality of receiving waterbodies. These are outlined below:

- fine particulate materials (e.g. silts and clays);
- cement;
- oil and chemicals (from plant machinery and processes); and
- other wastes such as wood, plastics, sewage and rubble.

8.1.130 These pollutants may be present as a result of normal site activities, incorrect storage of oils and chemicals and/or accidental spillage. The significance of the incident is dependent on the nature of the pollutant, on the mitigation measures adopted and their timing and effectiveness, and on the sensitivity of the receiving waterbody.

8.1.131 SEPA has designated that all waterbodies should achieve a ‘Good’ WFD status in the future. Therefore, surface water resources are considered to be of high sensitivity (moderate vulnerability and high value).

8.1.132 The Glenn Burn and Burn Grill classifications are unlikely to be impacted by the Project proposal. The ‘Largs Channel’ is the nearest potentially impacted waterbody. Its classification is considered to have a ‘Good’ overall status. Given the ‘Good’ WFD status, its overall sensitivity is considered to be high.

8.1.133 Activities associated with machinery during construction could lead to an increase in turbid runoff and spillages/leaks of fuel, oil etc. This could cause a direct loss, disturbance or other effects on aquatic habitats and species of nature conservation value.

8.1.134 The construction process includes measures to intercept run-off and ensure that discharges from the site are controlled in quality, as well as water quality monitoring carried out throughout the construction phase to ensure no discharge of pollutants or increase in suspended sediment occurs with respect to both surface water and groundwater. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. The magnitude is therefore, considered to be low adverse.

8.1.135 The significance of effects in relation to runoff from construction sites and spillages, including the integration of construction measures, would be minor adverse, which is not significant.

Further Mitigation

8.1.136 Suitable mitigation measures have been adopted as part of the Project and would be implemented through the CoCP. The assessment has demonstrated that the construction of the Project would not cause any exceedances of the hydrology and flood risk objectives and that the overall effect would be ‘not significant’. It is, therefore, not considered necessary to propose further mitigation measures for this Project.

Future Monitoring

8.1.137 The construction process includes measures to intercept run-off and ensure that discharges from the Project are controlled in quality and volume, as well as water quality monitoring carried out throughout the construction phase to ensure no discharge of pollutants or increase in suspended sediment occurs.

Accidents and/or Disasters

8.1.138 As with most construction sites, there is potential for a spillage of fuel or oil onsite during the construction phase of works. Measures included within the CoCP would reduce the risk and mitigate any such incidence.

Assessment of Operational Effects

8.1.139 The effects associated with operation and maintenance of the Project have been assessed in relation to hydrology and flood risk within the defined study area. The environmental impacts arising from the operation and maintenance of the Project are listed below:

- impact of operation on flood risk;
- impact of operation on surrounding ecological areas; and
- impact of operation on surrounding surface watercourses and waterbodies.

Impact of Operation on Flood Risk

8.1.140 The majority of the Project site, including the location of all built development, has been assessed as being at ‘little to no flood risk’ from fluvial or coastal flooding.

8.1.141 Only a small area to the north of the site, including part of the access road, would be impacted by fluvial flooding. In the absence of detailed fluvial modelling for the Glenn Burn, the 2080 SEPA Future Flood Map shows that the built development would be located outside of the associated area of risk. Therefore, the Project would not result in a loss of floodplain storage or alter fluvial flow paths.

8.1.142 Glenn Burn is considered to be of high sensitivity and the magnitude of impact is considered to be negligible in the medium term, resulting in a minor adverse effect, which is not significant.

8.1.143 The allowances set out in the SEPA’s 2019 Guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning (SEPA, 2019b) give the cumulative sea level rise from 2017 to 2100 based on the outputs from UK Climate Projections 2018 (UKCP18). The cumulative sea level rise allowance for this region up to 2100 is 0.85m. As such, the extreme sea level in the vicinity of the site could potentially reach 4.50m AOD during the 1 in 200-year (2100) coastal event. Given that the site sits on higher elevations, it will not be impacted during this event.

8.1.144 Largs Channel is considered to be of high sensitivity and the magnitude of impact is considered to be negligible in the medium term, resulting in a minor adverse effect, which is not significant.

8.1.145 SEPA identifies the site as lying within a potential vulnerable area to groundwater flooding. However, BGS data with regards to groundwater levels was not available at the Project site. Water in the boreholes was subject to tidal fluctuations.

8.1.146 As outlined in the current baseline conditions section, the Project would not increase the impermeable area at the site given that the Project site currently comprise 100% hardstanding. Additionally, as described in Appendix 8.1: Flood Risk Assessment, Annex A, the surface water drainage strategy shows that overall surface water runoff rates will be reduced to respect to existing conditions. The magnitude of this impact is therefore considered to be low (beneficial), resulting in a minor beneficial effect in the medium term.

8.1.147 The Flood Risk Assessment (see Appendix 8.1) demonstrates that the Project would be safe over its lifetime. Mitigation measures to ensure the safety of the Project include the location of built development outside of the key flood risk areas, elevation of threshold levels by 150 mm and an 8 m undeveloped standoff from the watercourses and other surface water bodies.

Impact of Operation of Surrounding Ecological Areas

8.1.148 There are two designated Sites of Special Scientific Interest (SSSI) within close proximity to the site indicated as Southannan Sands and Hunterston Sands to the west and southwest of the site respectively. They are marine water dependent SSSI.

8.1.149 Operation and maintenance activities could lead to an increase in polluted surface water runoff from the Project site. This section considers the potential for effects on the SSSI.

8.1.150 The SSSI are considered to be highly vulnerable and high value and their sensitivity is considered to be high.

8.1.151 Operational management systems and procedures, including accidental spill kits, would be on site to limit any potential accident or spillage. The surface water drainage strategy would be designed to limit any polluted runoff to the surrounding waterbodies, through the incorporation of SuDS techniques as well as interceptors (where required in line with best practice, to be detailed at detailed design stage. SuDS techniques, such as permeable paving, and the incorporation of separators and proprietary devices will provide water quality benefits, prior to surface water flowing in the outfall.

8.1.152 The provision of operational measures, including on-site drainage networks featuring water quality measures, would control the potential impacts to negligible.

8.1.153 The significance of effects of operation and maintenance activities on the ecologically designated site to the west and southwest, with the implementation of the operational measures, would be minor adverse, which is not significant.

Impact of Operation on Surface Watercourses and Waterbodies

8.1.154 During the operation of the site there are a number of potential pollutants, which may give rise to water quality effects on the surrounding surface waterbodies. These include:

- fine particulate materials (e.g. silts and clays); and
- oils and chemicals (from plant machinery and processes).

8.1.155 A new surface water drainage network would be constructed which will incorporate pollution mitigation in the form of permeable paving, localised full retention separators and proprietary devices, offering a second stage of treatment. Therefore, water quality would not be adversely affected by typical run-off from the Project. No process or ‘dirty’ water will be produced as part of the Project. The Project would incorporate a number of emergency procedures in the operational phase which will be used as a result of accidental spillage.

8.1.156 In summary, pollutants may be present as a result of normal operations, traffic and emergency or accidental spillage. Surface water quality is considered to be of high sensitivity (due to the aim to achieve a ‘Good’ WFD status by 2027), with slow to medium recoverability and of high value. The significance of any such incident is dependent on the nature of the pollutant, on the operational measures adopted and their timing and effectiveness, and on the sensitivity of the receiving waterbody.

8.1.157 Pollution arising from accidental spillages on site could result in a range of impacts from negligible to high. The provision of operational mitigation measures, including an on-site drainage network and emergency procedure plan, reduces the range of potential impacts to low adverse in the medium term.

8.1.158 The significance of effect of operational activities on surface waterbodies has been assessed as minor adverse, which is not significant.

Further Mitigation

8.1.159 The Project includes a drainage strategy in order to effectively control operational flood risk and water quality. The assessment has demonstrated that the operation of the Project would not cause any exceedances of the hydrology and flood risk objectives and that the overall effect would be 'not significant'. It is, therefore, not considered necessary to propose further mitigation measures for this Project.

Future Monitoring

8.1.160 No further monitoring measures are required during the operational phase of the Project.

Accidents/Disasters

8.1.161 Potential direct effects on hydrology and flood risk would be limited at the Project, which incorporates permeable paving, drainage channels (slot drains), separators and proprietary devices that provides an opportunity to intercept spillages prior to discharge to the waterbody. As a result, any direct and/or indirect water quality effects associated with the Project would be unlikely.

8.1.162 On the above basis, in the event of an accident/disaster, the Project includes a number of features and measures to contain, treat and manage pollution risk. Overall, the risk to population health and water quality is not considered significant.

Potential Changes to the Assessment as a Result of Climate Change

8.1.163 The assessment has demonstrated that the Project would not cause any exceedances of the hydrology and flood risk objectives including an appropriate allowance for climate change (40%) as detailed in the National Planning Framework (Scottish Government 2014a) and Scottish Planning Policy (Scottish Government 2014b).

Assessment of Cumulative Effects

8.1.164 This section considers the cumulative effects of the Project on flood risk and hydrology in conjunction with the other developments set out in Chapter 4 Environmental Assessment Methodology. Without mitigation, these developments have the potential to result in significant effects on flood risk and water resources.

8.1.165 Only no. 8 of these applications are within the defined 1 km study area of the Project and they are summarised in Table 8.7 below. Notwithstanding this, all of the schemes have been considered for their cumulative effects.

Table 8.7: Cumulative projects within scope

Application Number	Status	Description	Distance from Project site
21/01135/PPM	Pending Consideration	Installation of synchronous compensator and cable route with associated infrastructure	390m
20/00942/PP	Approved subject to Conditions	Installation of a synchronous compensator and ancillary infrastructure	460m
21/01044/EIA	Scoping Agreed	EIA screening request for proposed synchronous condenser plant	0m
21/00480/EIA	Scoping Agreed	EIA screening request for proposed synchronous compensator	400m

Application Number	Status	Description	Distance from Project site
20/00652/EIA	Scoping Agreed	Request for a screening opinion for installation of a synchronous compensator and ancillary infrastructure	510m
21/00107/EIA	Pending Consideration	Request for EIA screening opinion for the renewal of planning permission 18/00132/PP for the erection of Caisson gates and removal of existing bund	750m
21/00109/EIA	Pending Consideration	Request for EIA Screening Opinion in relation to the replacement and enlargement of existing jetty at Hunterston Marine Yard.	630 m
21/00622/EIA	Scoping Agreed	EIA Screening Request for a proposed 49.9MW cryogenic energy storage facility | Hunterston Construction Yard Fairlie Largs Ayrshire.	850 m

Construction Phase

8.1.166 No significant effects have been identified associated with the Project during the construction phase. It is assumed that other developments at Hunterston PARC would be subject to the same good practice construction mitigation requirements as the Project, to protect the quality of water resources and restrict surface water runoff during the construction phase.

8.1.167 Construction of the Project could occur simultaneously with some of the other developments listed in Table 8.7 above. For the purposes of this cumulative assessment, it has been assumed that all development would occur during the same time period.

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

8.1.169 Therefore, the cumulative effects on hydrology and flood risk are not predicted to be significant in EIA terms.

Operational Phase

8.1.170 The other developments listed in Chapter 4: Methodology would be subject to local and national policy, including the National Planning Framework (NPF), the Scottish Planning Policy (SSP) and North Ayrshire Council Local Development Plan (LDP) (North Ayrshire, 2019). For the consent to be provided the developer is required to demonstrate that the risk of flooding during the lifetime of the development could be mitigated to a level acceptable to SEPA and North Ayrshire Council. Furthermore, it would also need to be demonstrated that there would not be a detrimental impact on water quality and that any foul water generated can be appropriated managed by the local utility. Without this, the developments would not be granted planning permission and therefore not be in operation.

8.1.171 Therefore, it has been determined that no significant cumulative operational effects on the hydrology and flood risk receptors are likely.

Inter-relationships

8.1.172 This chapter should be read in conjunction with other technical chapters relating to the hydrological environment, particularly Chapter 5: Ecology and Nature Conservation and Chapter 9: Hydrogeology, Geology and Ground Conditions. Effects on groundwater resources are set out in Chapter 9.

Summary of Effects

8.1.173 Although construction has the potential to cause a degradation of water quality to waterbodies through an increase in soil erosion and accidental release of sediment, appropriate embedded mitigation measures, such as a CoCP, have been identified within this chapter to minimise potential impacts. The effect is considered to be of minor adverse significance.

8.1.174 The majority of the Project site has been assessed as being at 'little to no flood risk' from fluvial or coastal flooding. Using SEPA's 2080 coastal and fluvial mapping, the built development is located outside of the associated area of risk. Therefore, the Project would not result in a loss of floodplain storage or alter fluvial flow paths.

8.1.175 SEPA identifies the site as lying within a potential vulnerable area to groundwater flooding. However, BGS data with regards to groundwater levels was not available at the Project site. Water in the boreholes was subject to tidal fluctuations. Upon confirmation of the groundwater table specific mitigation measures will be incorporated to appropriately manage risks as well as inform concrete specifications and dewater requirements.

8.1.176 Further details of the geological and hydrogeological nature of the Project site can be found in Chapter 9: Hydrogeology, Geology and Ground Conditions.

8.1.177 The operation of the Project will not result in an increase of surface water runoff as shown in the surface water drainage strategy available in Appendix 8.1: Flood Risk Assessment, Annex A.

8.1.178 The FRA in Appendix 8.1 demonstrates that the Project would be at a low risk of flooding over the lifetime of the Project and not result in an increase in flood risk off-site.

8.1.179 The operation of the Project would require routine maintenance of key elements. Maintenance may involve the use of chemicals and oils, as such there is the potential for spillages to occur which may affect the water quality of surrounding waterbodies. Operational practices would involve management plans under appropriate Environmental Permits (where required) including spill procedures and clean up and remediation of contaminated water runoff in order to mitigate against any decrease in water quality status. Furthermore, an 8 m development free easement has been provided from the Glenn Burn and the coastline. The effects of operation on surrounding waterbodies are considered to be of minor beneficial to minor adverse significance, which is not significant.

8.1.180 Cumulative impacts from nearby projects have been assessed and no significant cumulative effects have been identified. Any new development is required to attenuate surface water runoff where practicable, to the greenfield runoff rate and provide appropriate management techniques to treat potentially contaminated runoff prior to discharge into the local drainage network in accordance with local planning policies.

8.1.181 A summary of the findings of the hydrology and flood risk EIA Report is presented in Table 8.7.

Table 8.7: Summary of Likely Environmental Effects on Hydrology and Flood Risk

Receptor	Sensitivity of receptor	Description of impact	Short / medium / long term	Magnitude of impact	Significance of effect	Significant / Not significant	Notes
Construction phase							
Construction workers	Medium	Flood risk to construction workers	Short term	Negligible	Negligible	Not Significant	No significant flood risk to construction workers
Local receptors	Medium	Limited increase in local flood risk due to temporary increased surface water runoff rates	Short term	Low Adverse	Minor Adverse	Not Significant	Temporary drainage system installed to minimise off-site effects. To be implemented through CoCP
Surface watercourses and other waterbodies	High	Reduction in water quality (risk of pollution)	Short term	Low Adverse	Minor Adverse	Not significant	Embedded mitigation: CoCP
Operational phase							
Largs Channel	High	Floodplain storage and flow paths (flood risk)	Medium term	Negligible	Minor Adverse	Not significant	8m development easement provided, development outside floodplain
Glenn Burn	High	Floodplain storage and flow paths (flood risk)	Medium term	Negligible	Minor Adverse	Not significant	8m development easement provided, development outside floodplain
Surface waterbodies	High (SSSIs)	Slowing of surface water flows to receiving waterbodies through using SuDS (flood risk and water quality)	Medium term	Low Beneficial	Minor Beneficial	Not significant	SuDS will be included in Project
Surface waterbodies	High (SSSIs)	Reduction in water quality (risk of pollution from maintenance activities)	Medium term	Low Adverse	Minor Adverse	Not significant	Emergency procedures plan to be prepared

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