12 FLOOD RISK

12.1 Introduction

This section of the EIAR considers the potential impact of the Proposed Development on flood risk within the study area. It defines the baseline flood risk from a desk-based assessment and consultation, sets out the methodology to determine the potential effects of the Proposed Development on local flood risk, and then assesses the potential impact of the Proposed Development and the residual impact following mitigation. The assessment takes account of Scottish Planning Policy (SPP), SEPA guidance and the Argyll & Bute Council Local Development Plan.

12.2 Assessment Methodology

To determine the impact of the development upon flood risk, an assessment of flood risk will be made in line with Scottish Environmental Protection Agency's (SEPA's) requirements for flood risk assessment for new development.

The following tasks will be implemented to complete the assessment:

- Identify and assess the hazard from all sources of flooding to the Proposed Development;
- Appraisal of the Proposed Development with respect to the main sources of flooding;
- Consideration of the impact of the Proposed Development on flooding elsewhere;
- Identification of any mitigation measures required;
- Assessment of any residual impacts; and
- Demonstrate that the Proposed Development complies with national planning policy and guidance.

12.3 Baseline Scenario

12.3.1 Present Day

The existing Iona Ferry Terminal consists of a slipway and pier jutting out into the Sound of Iona. The Proposed Development consists of a new rock armour breakwater to the south of the existing pier and dredging to the north of the breakwater.

SEPA flood maps[24] have been used to determine the existing flood risk to the site. A review of the SEPA strategic flood mapping identifies a risk of coastal flooding within the proposed site for all mapped events (high, medium and low likelihood). An extract from the SEPA present day coastal flood extents map is shown in Figure 12-1 with the approximate site location illustrated in red. Under Scottish Planning Policy

[24] SEPA flood maps - https://map.sepa.org.uk/floodmaps

the site would be considered as ‘Medium to High Risk’, where the annual probability of coastal flooding is greater than 0.5% (1:200 years).

No other potential sources of flooding were identified within the site.

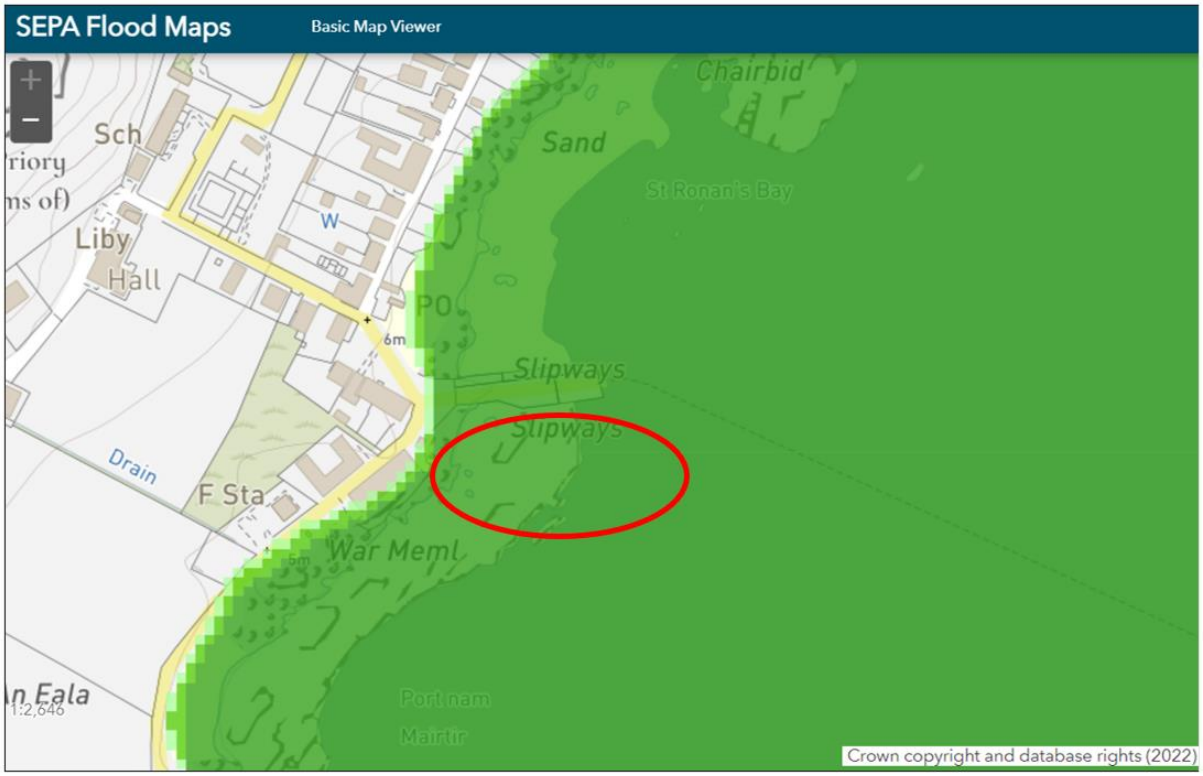


Figure 12-1 Extract from SEPA flood maps – present day coastal flood extents map (all events)

In accordance with ‘Technical Flood Risk Guidance for Stakeholders’, SEPA requires flood risk to be considered where available information indicates that there may be a risk of flooding to the site, or development of the site may increase risk elsewhere. As the site has been identified as at risk of coastal flooding then flood risk should be assessed.

12.3.2 Climate Change

An extract from the SEPA 2080 0.5% AEP coastal flood extents map is shown in Figure 12-2 with the approximate site location illustrated in red.

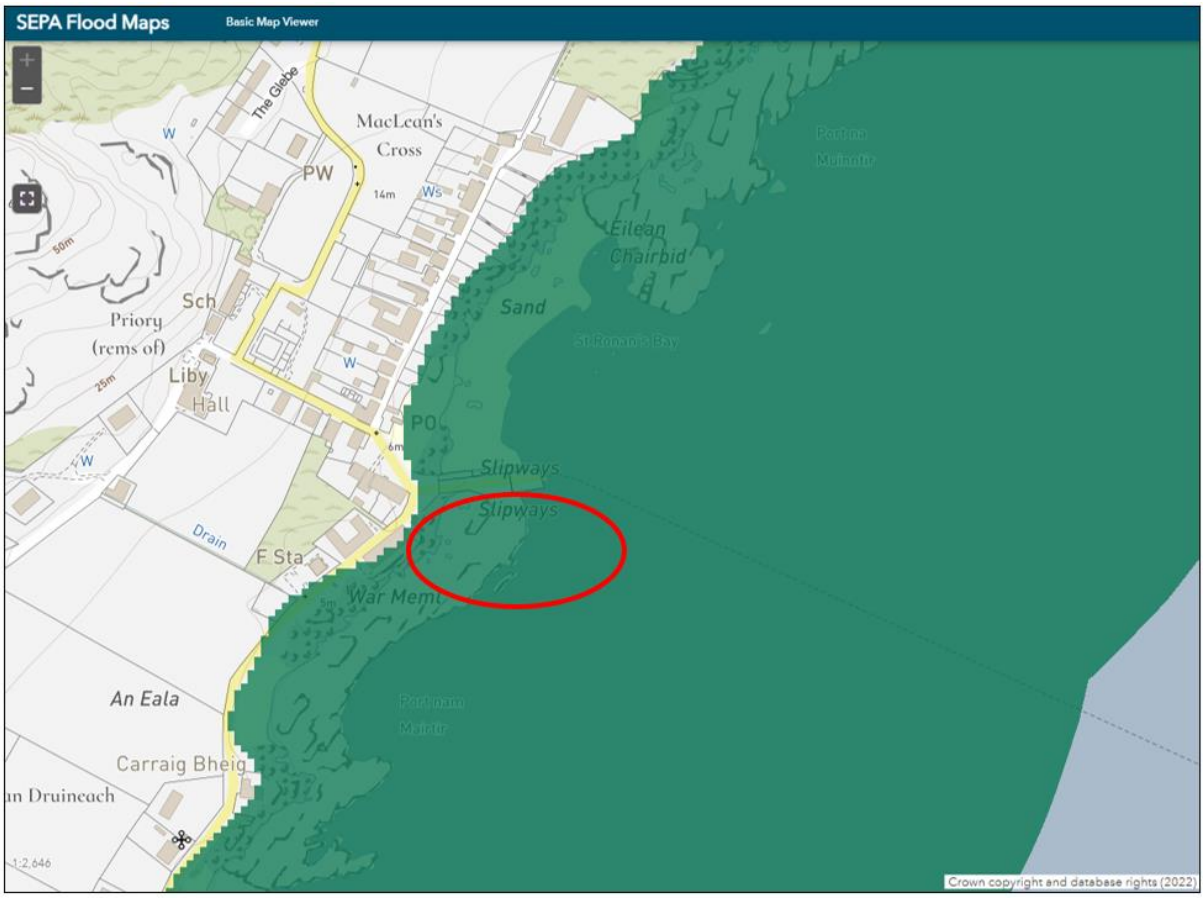


Figure 12-2 Extract from SEPA 2080 coastal flood extents map (0.5% AEP)

When considering coastal flooding, a sea level rise should be considered to account for future climate change. The SEPA publication 'Climate change allowances for flood risk assessment in land use planning' provides allowance for sea level from 2017 to 2100 based on the outputs from UK Climate Projections 2018 (UKCP18). For Argyll, which is the applicable River Basin District, the allowance is 0.86 m. As this area is vulnerable to coastal flooding, the sea level allowance of 0.86 m used by used.

12.4 Description of Likely Significant Effects

12.4.1 Classification of Proposed Development

As described in the SEPA 'Flood Risk & Land Use Vulnerability Guidance', the proposed works can be classified as 'Water Compatible Uses' (docks, marinas and wharves). This type of use is generally suitable for development in all flood risk areas, including 'Medium to High Risk' areas. There are no elements of the proposal that would be considered as unsuitable in terms of flood risk. It is important to note that the developments permitted in these areas will be at risk of flooding, so mitigation measures are required.

Policy SG LDP SERV 7 'Flooding and Land Erosion' of the Argyll & Bute Local Development Plan Supplementary Guidance states that '*Essential development such as navigation and water-based*

recreation use, agriculture and essential transport' is acceptable in 'medium to high risk areas'. The development is therefore in accordance with this policy.

12.4.2 Assessment of Construction Effects

As the area is at risk of coastal flooding (Figure 12-2), during construction, there is a risk of flooding to the works from extreme tidal events that will need to be managed.

12.4.3 Assessment of Operational Effects

The Proposed Development will be at risk of coastal flooding during the operational phase. The proposed breakwater is not designed for flood protection but rather for the protection of the ferries from rough seas. The breakwater will not be adversely affected during extreme tidal events as it has been designed to withstand these events.

Wider coastal processes should always be considered when assessing coastal flood risk, in particular thinking about how coastal flooding may be exacerbated in certain locations due to physical factors that can occur individually or in combination as a result of the project. Coastal process modelling has been undertaken (see Chapter 13). This shows that the tidal currents and levels within the Sound of Iona are predicted to remain substantially unchanged in the operational phase when the project is considered alone, and in combination with the Fionnphort project. Minor local changes to the currents are expected around the breakwater such as an increase in the current velocity around the structure. The impact on the existing tidal regime is, therefore, determined to be negligible. The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in the Sound of Iona during storm events from the southwest did not exceed ±0.20 m during high water springs. These increases were confined primarily to the outer face of the breakwater, with a large decrease in wave height behind the breakwater as per the design requirements. Minimal change in the wave height is observed elsewhere in the Sound of Iona, and when the project is considered in combination with the development at Fionnphort. These changes to the wave climate behind the structure are considered significantly beneficial to slipway users and ferry users and would not increase the risk of coastal flooding in the area. Overall, the Proposed Development does not increase the risk of coastal flooding by altering tidal levels or wave overtopping.

It should be noted that the existing slipway and pier are currently at risk of coastal flooding, and this will still be the case with the Proposed Development. As the site is already operating for the same use there will be no new receptors introduced into the flood hazard area and therefore there is no increase to the overall flood risk.

The proposed works will not create any surface water runoff that could cause a flood risk. No connections are required to the Scottish Water system.

12.5 Mitigation Measures

12.5.1 Construction Phase

During construction, there is a risk of flooding to the works from extreme tidal events. Floodline is operated by SEPA. It provides live flooding information and advice on how to prepare for or cope with the impacts of flooding 24 hours a day, 7 days a week. The contractor can sign up to the service and get notified when the area is at risk of flooding. The Scottish Flood Forecast is a new 3-day flood forecast which is produced by the Scottish Flood Forecasting Service (SFFS) daily. The SFFS is a partnership between SEPA and the Met Office. It is available on SEPA's website at www.sepa.org.uk/scottishfloodforecast. The Scottish Flood Forecast complements the existing regional flood alerting and local flood warning services. The use of these services can ensure that the risk of flooding to the construction works is minimised.

12.5.2 Operational Phase

Mitigation measures are elements of design that may be used to manage flood risk to the development, or to avoid an increase in flood risk elsewhere. The proposed rock armour breakwater has been designed to withstand extreme tidal events and therefore no mitigation measures are proposed to manage flood risk to the development itself. The impact of the Proposed Development on the existing tidal regime is determined to be negligible and no mitigation measures are required to avoid an increase in flood risk elsewhere.

Whilst the physical infrastructure of the Proposed Development will not be adversely impacted by flooding, mitigation measures are required for the users of the Proposed Development. Tidal warning will be the key mitigation measure for the operation of the site. The Floodline Warning Service and the Scottish Flood Forecast as described above can be used. If an extreme event is forecast, any sailings from the ferry terminal are likely to be cancelled. Given that the entire area is at risk of coastal flooding, it is likely to be completely closed and evacuated, which will ensure people are not at risk in the area.

12.6 Potential Cumulative Effects

There will be no cumulative impact on coastal flood risk when the Proposed Development is considered together with other Proposed Developments in the area.

12.7 Residual Effects

Residual flood risk is the risk that remains after all mitigation measures have been taken to reduce the frequency of flooding. Coastal flood risk will remain following the completion of the development. However, given the current risk of coastal flooding, sufficient warning will be available to evacuate the area. This means that there is a low likelihood of any potential flood risk areas being occupied. The proposed infrastructure is resilient to flooding in that no damage will be caused by extreme tidal events. The overall residual risk is considered to be low.

12.8 Conclusions and Summary of Effects

The flood risk to the application site has been assessed and the predominant source of flood risk emanates from coastal flooding. Under Scottish Planning Policy the site would be considered as 'Medium to High Risk', where the annual probability of coastal flooding is greater than 0.5% (1:200 years). No other potential sources of flooding were identified within the site.

As described in SEPA 'Flood Risk & Land Use Vulnerability Classification', the proposed works can be classified as 'Water Compatible Uses' which are generally suitable for development in all flood risk areas, including 'Medium to High Risk' areas. It is important to note that the developments permitted in these areas will be at risk of flooding, so mitigation measures are required. The proposed works are also in accordance with Policy SG LDP SERV 7 'Flooding and Land Erosion' of the Argyll & Bute Local Development Plan Supplementary Guidance which states that '*Essential development such as navigation and water-based recreation use, agriculture and essential transport' is acceptable in 'medium to high risk areas'*.

During construction, there is a risk of flooding to the works from extreme tidal events that will need to be managed. Floodline operated by SEPA and the Scottish Flood Forecasting Service (SFFS), which is a partnership between SEPA and the Met Office, can be used by the Contractor to ensure that the risk of flooding to the construction works is minimised.

It should be noted that the existing slipway and pier are currently at risk of coastal flooding, and this will still be the case with the Proposed Development. As the site is already operating for the same use there will be no new receptors introduced into the flood hazard area and therefore there is no increase to the overall flood risk.

The Proposed Development will be at risk of coastal flooding during the operational phase. Mitigation measures are elements of design that may be used to manage flood risk to the development, or to avoid an increase in flood risk elsewhere. The proposed rock armour breakwater has been designed for extreme tidal events and therefore no mitigation measures are proposed to manage flood risk to the development itself. The impact of the Proposed Development on the existing tidal regime is determined to be negligible and no mitigation measures are required to avoid an increase in flood risk elsewhere. Whilst the physical infrastructure of the Proposed Development will not be adversely impacted by flooding, mitigation measures are required for the users of the Proposed Development. Tidal warning will be the key mitigation measure for the operation of the site. The Floodline Warning Service and the Scottish Flood Forecast can be used. If an extreme event is forecast, any sailings from the ferry terminal are likely to be cancelled. The entire area is at risk of coastal flooding so it is likely to be closed and evacuated, which will ensure people are not at risk in the area.

13 COASTAL PROCESSES

13.1 Introduction

This chapter assesses the potential impact of the Proposed Development on the coastal processes in the Sound of Iona, including information about the tidal regime and the inshore wave climate, to enable the competent authority to determine the potential impacts on coastal processes.

As this chapter includes information regarding wave climate and sediments in the receiving environment along the proposed breakwater, as well as more generally within the Sound of Iona, its findings are also of relevance to Chapters 11 and 12, which concern Water Quality and Flood Risk, respectively.

The assessment presented in this Chapter is based on the project description detailed in Chapter 3 of this EIAR.

13.2 Assessment Methodology

13.2.1 Modelling Methodology

RPS used the MIKE 21 hydrodynamic numerical modelling software package developed by the Danish Hydraulic Institute (DHI), to address potential coastal processes impacts / issues. This was achieved by developing a range of two-dimensional numerical models to represent:

- the pre-project scenario; and
- the post-project scenario with the Iona breakwater in place.

These models were used in conjunction with hydrographic survey data and site-specific sediment data to assess the potential construction and operational impacts of the Proposed Development in the context of the following coastal processes:

- The tidal regime;
- The inshore wave climate at high water springs;
- Littoral currents; and
- Sedimentology.

The impact of the Proposed Development on these coastal processes has been quantified using difference plots throughout this chapter, i.e., post-project minus pre-project conditions. As such, the extent and magnitude of potential impacts as a result of the Proposed Development could be identified and compared against baseline conditions. To conclude the assessment, mitigation measures were proposed to reduce impacts, where appropriate. This enabled a “with mitigation” assessment to be made of any residual impact as a result of the construction and operational phases of the Proposed Development and/or in combination with other projects in the vicinity of Iona. In particular, this included the assessment of the in-combination effects resulting from the construction of a similar breakwater at Fionnphort to ensure all potential environmental effects were identified. The scoping response from

Marine Scotland Science supported the use of a 1 in 100-year event as a worst-case scenario, however, this assessment has used a 1 in 200-year event as the worst-case scenario to provide a more robust assessment.

13.2.2 Coastal Process Modelling Software

A suite of coastal process models, based on the MIKE software developed by DHI, was used to assess the potential impact of the Proposed Development on the coastal processes within the Sound of Iona. The MIKE system is a state-of-the-art, industry-standard, modelling system, based on a flexible mesh approach. This software was developed for applications within oceanographic, coastal and estuarine environments.

A brief synopsis of the MIKE system and modules used for this assessment is outlined below:

MIKE 21 & MIKE 3 Flow Model FM system - Using these flexible mesh modelling systems, it is possible to simulate the mutual interaction between currents, waves and sediment transport by dynamically coupling the relevant modules in both two and three dimensions. Hence, full feedback on the bed level changes on the waves and flow calculation can be included.

The Hydrodynamic module –This module can simulate water level variations and flows in response to various forcing functions in lakes, estuaries and coastal regions. The Hydrodynamic (HD) Module is the basic computational component of the MIKE 21 and MIKE 3 Flow Model systems, providing the hydrodynamic basis for the Sediment Transport and Spectral Wave modules.

The Hydrodynamic module solves the two/three-dimensional incompressible Reynolds averaged Navier-Stokes equations subject to the assumptions of Boussinesq and hydrostatic pressure. Thus, the module consists of continuity, momentum, temperature, salinity and density equations. When used in three dimensions, the free surface is considered using a sigma coordinate transformation approach whereby the vertical layer is divided equally into a discrete number of layers.

The Spectral Wave module – This module simulates the growth, decay and transformation of wind-generated waves and swell in offshore and coastal areas and accounts for key physical phenomena including wave growth by wave action, dissipation, refraction, shoaling and wave-current interaction.

13.2.3 Coastal Process Models and Data Sources

The models outlined above, were used to assess the impact of the Proposed Development on the coastal processes and were developed from RPS' present-day West Coast Model (waves) and Irish Storm Surge Forecasting (ISSF) Model (tides) (Figure 13-1).

These models were created using flexible mesh technology and provide detailed information on the coastal processes around the Sound of Iona. The model uses mesh sizes varying from 7 km at the outer boundary of the model down to 20 m along the approach channel and around the harbour. The bathymetry of this model was developed using data gathered from a hydrographic survey of the Sound of Iona undertaken in 2020 by Aspect Surveys Ltd and supplemented by data from the Admiralty, European Marine Observation and Data Network and CMap. The extent, mesh structure and

bathymetry of this model for the Sound of Iona are illustrated in Figure 13-2. The coverage of the scatter data used for interpolating the mesh for the tidal and wave models is included in Figure 13-3 and Figure 13-4.

The model used for the operational scenario was created using the proposed design for the Iona breakwater. It should be noted that the model does not consider the design elements below the seabed level, such as the base of the breakwater, as this does not affect the outcome of the coastal processes assessment. As such, the outline of the Iona breakwater in the figures in this chapter is used to show the location of the breakwater and outline of the main structure, rather than the outline of the structure below the seabed.

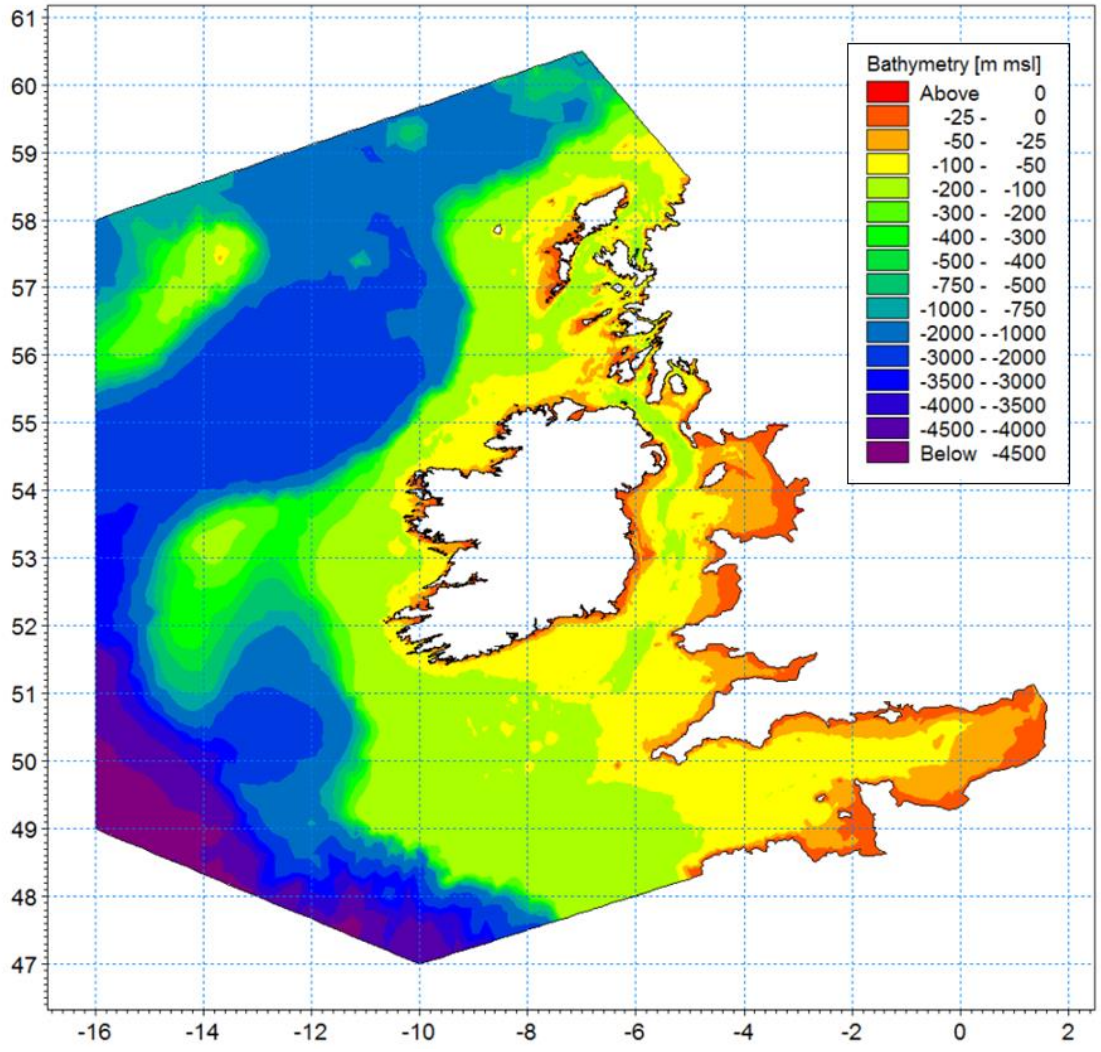


Figure 13-1 Extent of the Irish Storm Surge Forecast Model which includes the Study Area

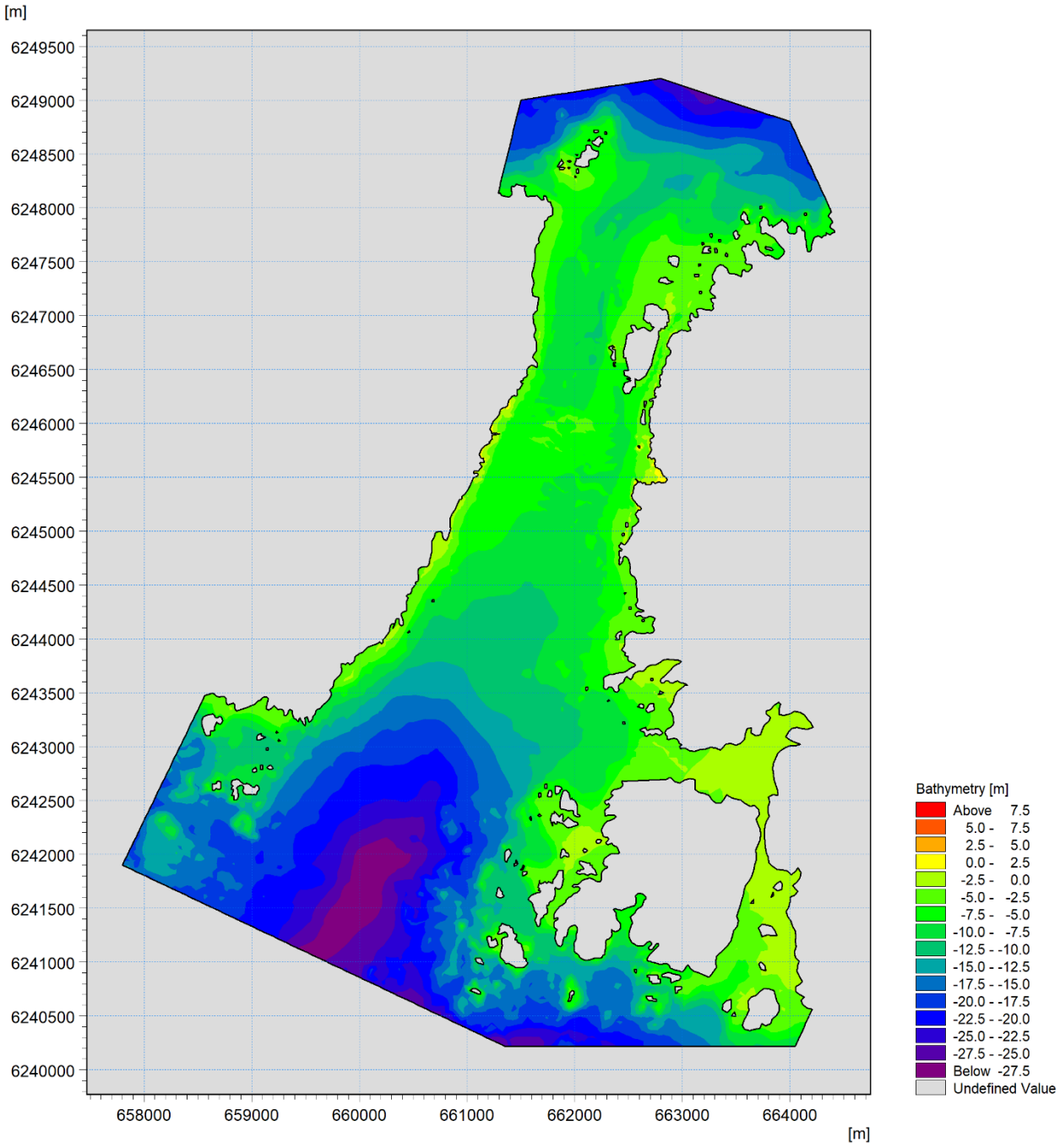


Figure 13-2 Extent and bathymetry of the Sound of Iona model

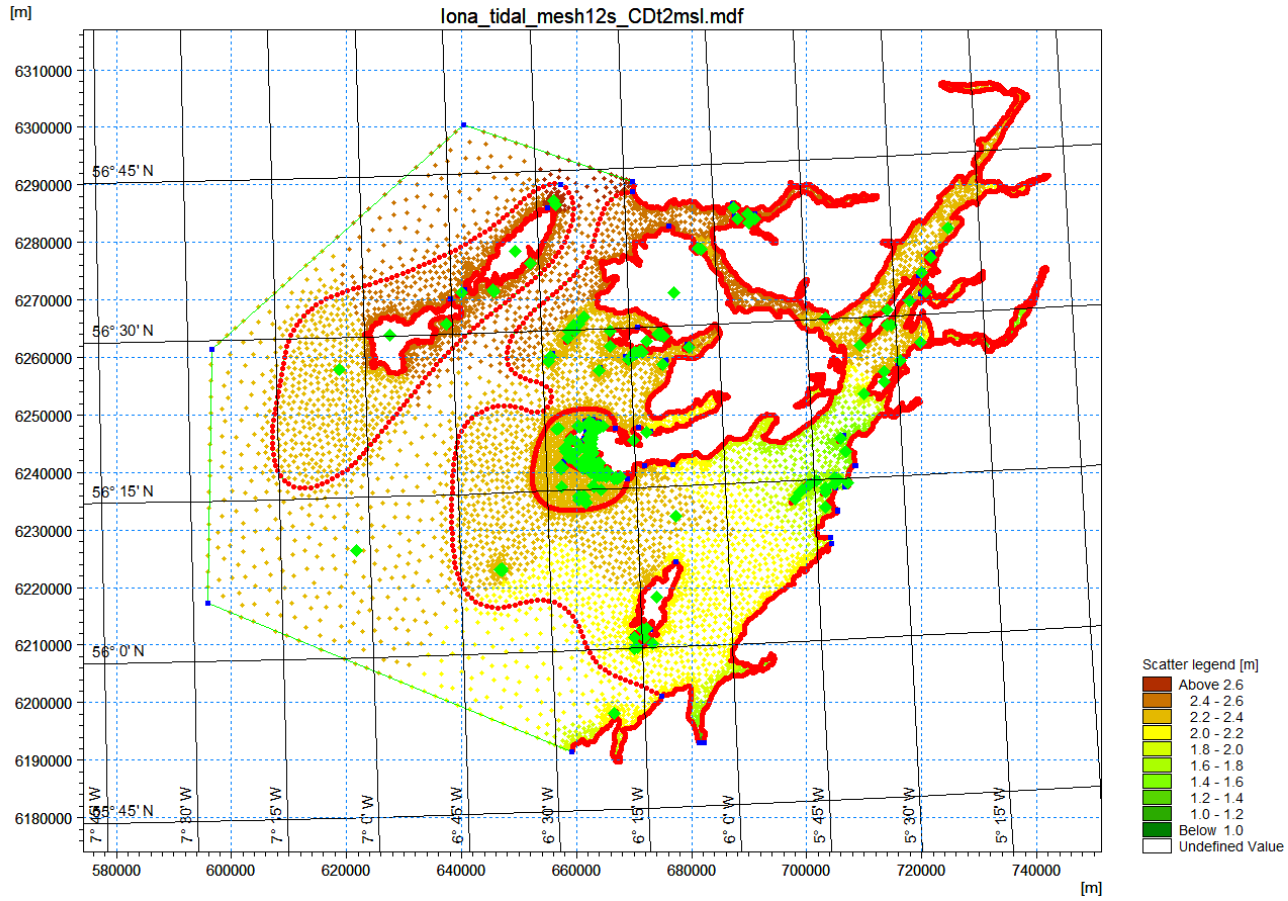


Figure 13-3 Scatter data coverage used for the tidal model bathymetry

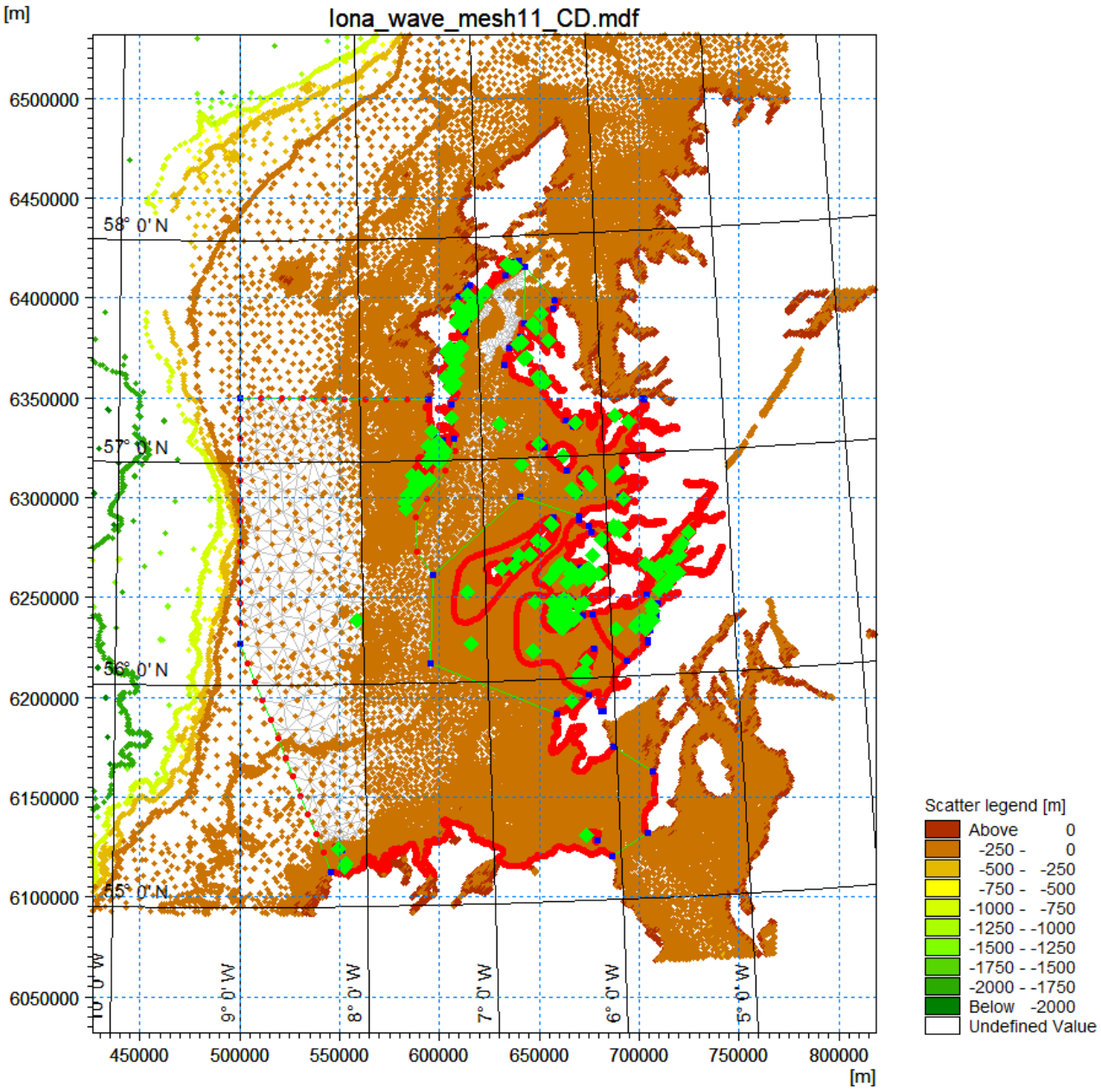
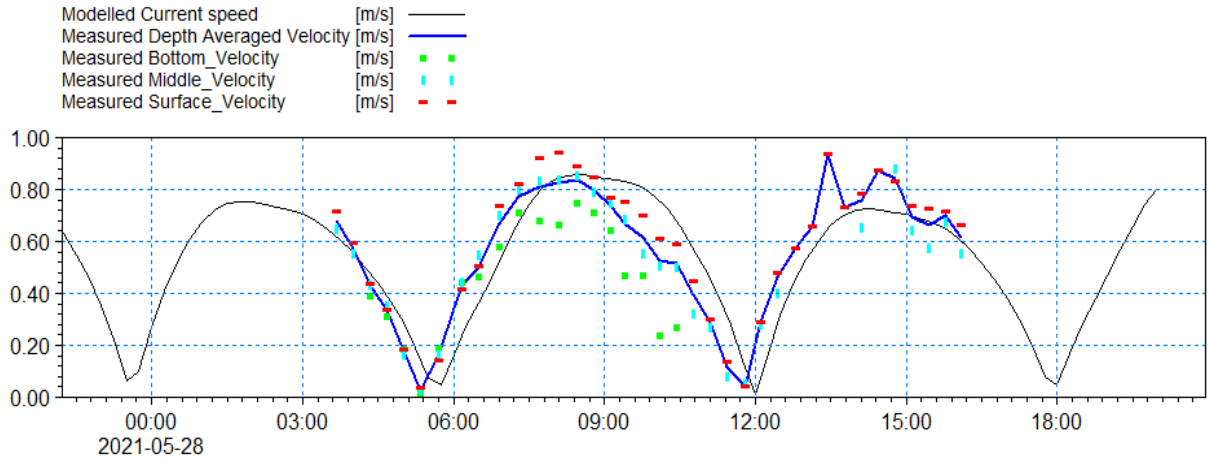


Figure 13-4 Scatter data coverage used for the wave model from the West Coast Model

The ISSF model was then updated to produce a 2D version of the model that represented the baseline scenario. The ISSF model was further updated to produce a second 2D version, representing the operational scenario with the Proposed Development in place. As such the post-project scenario model had updated bathymetry at the proposed breakwater and in the area of the dredging works. These 2D models were used to appraise the impact of the Proposed Development on the existing tidal regime, the inshore wave climate and the change in littoral currents in the area.

In addition to the Sound of Iona bathymetric survey, sediment samples were collected in the area for Particle Size Analysis (PSA). This supports the Marine Scotland Science (MSS) statement in the Scoping Opinion that further data collection was required for the validation of the assessment.

The tidal flows in and around the Sound of Iona were calibrated using the recorded acoustic doppler current profile (ADCP) data from the site. This data was collected by Environmental Tracing[25] during the Spring and Neap tides of May and June 2021. The model is seen to correlate well with both the current speed and direction for the spring tides (Figure 13-5). There is less correlation for the neap tide, however, it is less critical and considered adequate for the study. The ADCP sited offshore of Iona showed moderate tidal currents with the general direction of flow towards the north north-east during the flood tides and towards the south south-west during the ebb tide. Spring tidal current speeds are more than 0.8m/s on both flood and ebb tides. Lower current speeds were captured offshore of Fionnphort, with currents over 0.4 m/s towards the north-north-east during flood tide and similar magnitude currents towards the south south-west during the ebb. The model verification process confirmed that the present Sound of Iona model provides a very good representation of the baseline coastal processes in the area.



(n.b. x axis = time and y axis = tide height)

Figure 13-5 Comparison of model and recorded ADCP current direction at Iona during springs

13.2.3.1 Boundary Conditions

The UK Hydrographic Office states that the mean tidal range at the Secondary Port of Iona (closest measured / monitored location) is approximately 2.5 m with the following characteristics in metres referenced to Chart Datum (CD):

- Mean Low Water Springs (MLWS): +0.5
- Mean Low Water Neaps (MLWN): +1.5

[25] Environmental Tracing - https://environmentaltracing.com/

- Mean Sea Level (MSL): +2.4
- Mean High Water Neaps (MHWN): +3.0
- Mean High Water Springs (MHWS): +4.0
- Highest Astronomical Tide (HAT): +4.4

The geometry of the Sound of Iona means that relatively large tidal currents in excess of 0.8 m/s are experienced in the centre as a result of the water level gradient to the entrances to the north and south of the Sound. Tidal currents are similar on the western and eastern sides of the Sound.

The tidal flow simulations which form the basis of the study were undertaken using the MIKE21 FM flexible mesh modelling system. The FM Module is a 2D, depth-averaged hydrodynamic model which simulates the water level variations and flows in response to a variety of forcing functions in lakes, estuaries and coastal areas. The water levels and flows are resolved on a mesh covering the area of interest when provided with bathymetry, bed resistance coefficient, wind field, hydrodynamic boundary conditions, etc.

The tidal model mesh extends from the northwest of Coll and Tiree in the Inner Hebrides to the north coast of Islay in the south and includes details of the various estuaries within the domain, including Loch Linnhe extending to Fort William and beyond. The additional model extent was also included to incorporate the construction of the Proposed Development. This enabled the same cell arrangement to be used for the baseline and post-construction assessment, therefore omitting the introduction of any numerical mesh effects into the assessment.

The tidal model was driven using boundary conditions extracted from the RPS Irish Sea Surge model which is used for live storm surge forecasting on behalf of the Office of Public Works (OPW) for the coast of Ireland (Figure 13-6). These boundaries were fully defined ‘flather’ boundaries for which both surface elevation and current vectors are specified. The tidal flows in and around the Sound of Iona were calibrated using the recorded ADCP data from the site.

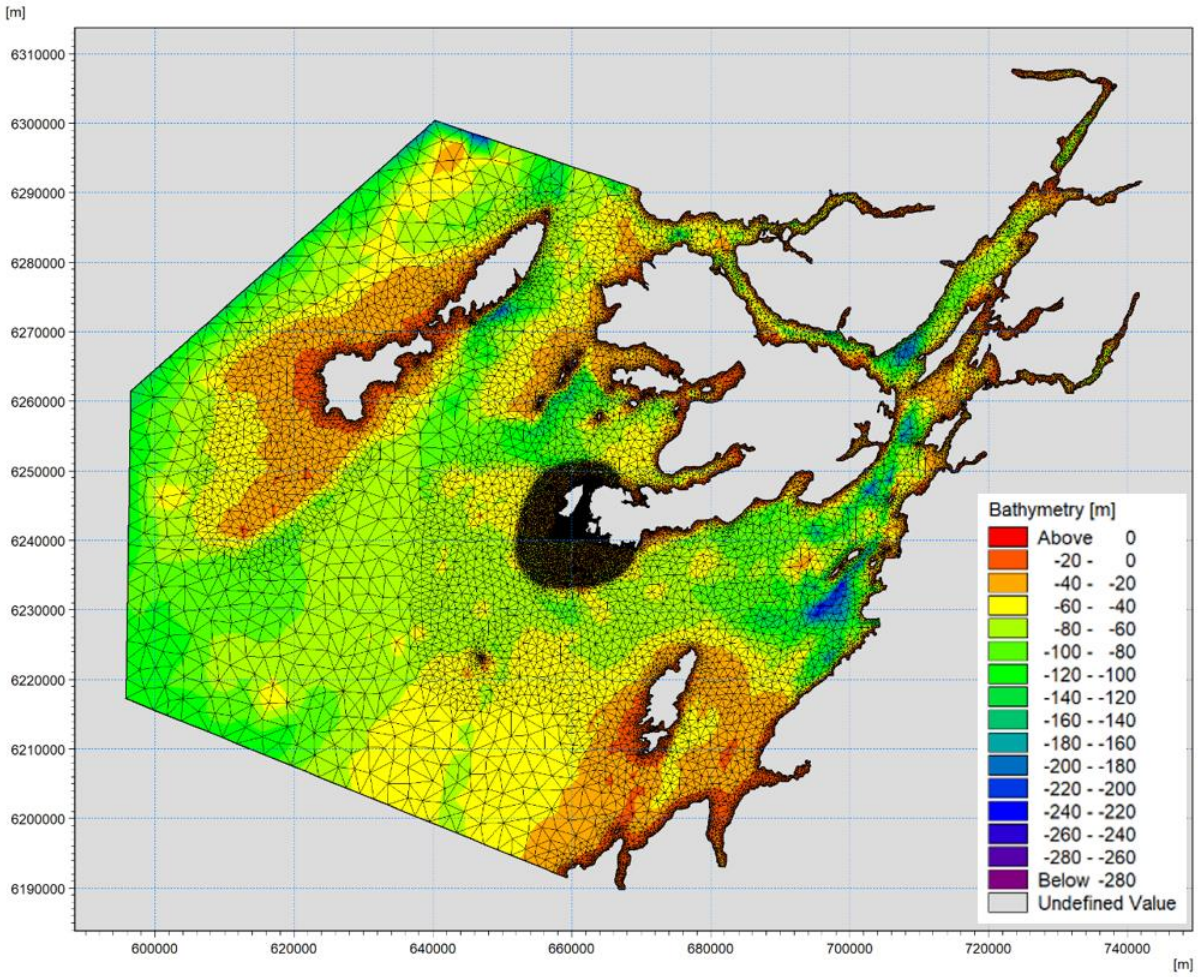


Figure 13-6 Extent and bathymetry of the ICPSS tidal surge model

An overall base wave model was developed to transform offshore waves from the Atlantic for storm directions from 210°-300° to the Sound of Iona. This model was also used to transfer waves generated over coastal waters such as the Sea of the Hebrides, the Minch and the North Channel, where Atlantic swell waves were not reaching the site, typically for storm directions from 300° to 360° and 180° to 210°. This model is shown in Figure 13-7.

A locally generated wave model was also developed to generate and transform waves over local fetches from the adjoining land and the mainland coast of Scotland to the site. This was undertaken for storm directions from west north-west through east northeast (285° to 60°) and also from the south-east to south (135° to 180°). Figure 13-8 shows the bathymetry of this local wave model for the waves generated over the areas immediately adjacent to the Sound of Iona. The mesh resolution in the vicinity of the Sound is shown in Figure 13-9, with an effective grid spacing of less than 20 metres in the central section of the Sound.

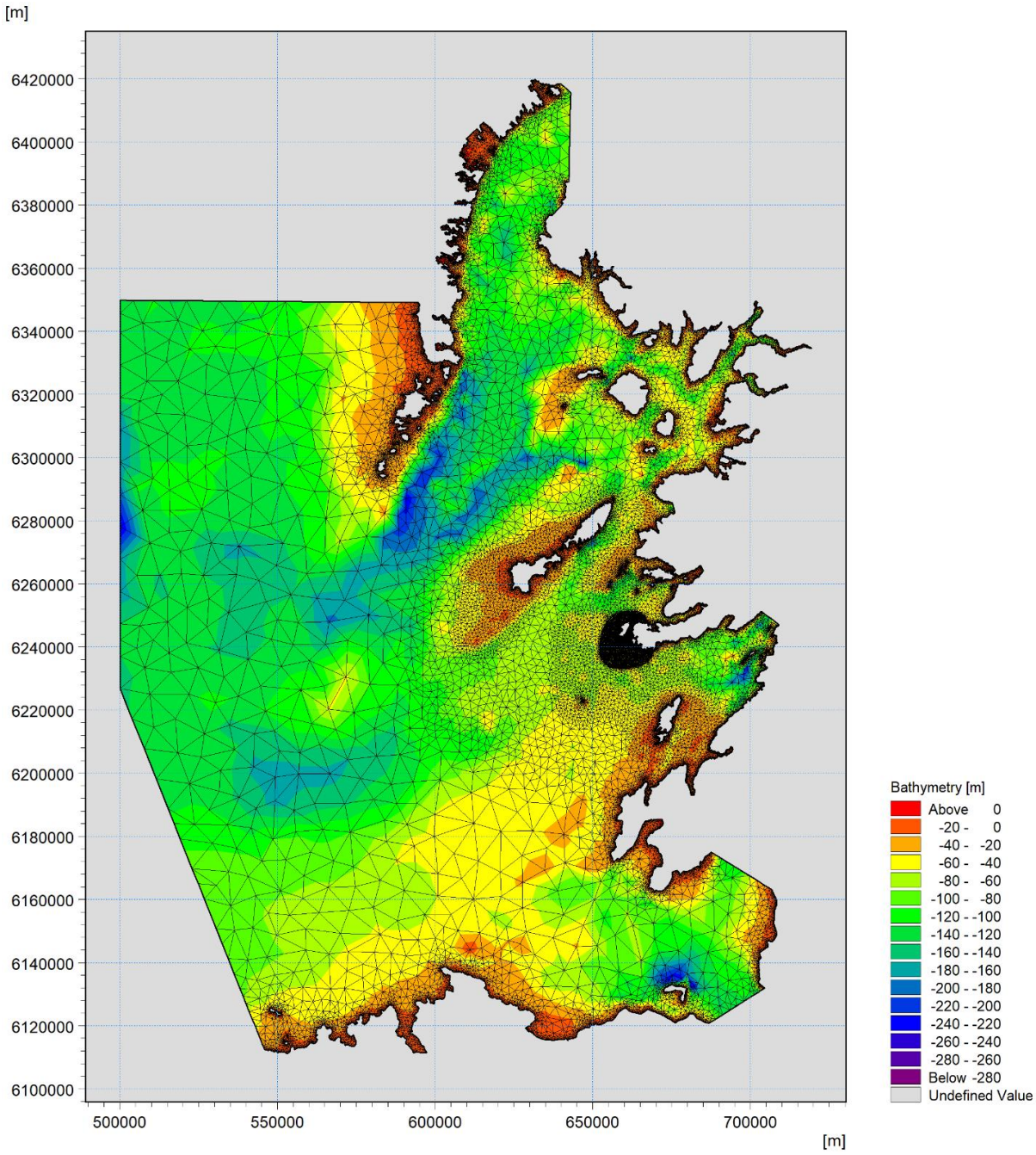


Figure 13-7 Bathymetry and mesh of the Overall Wave Model

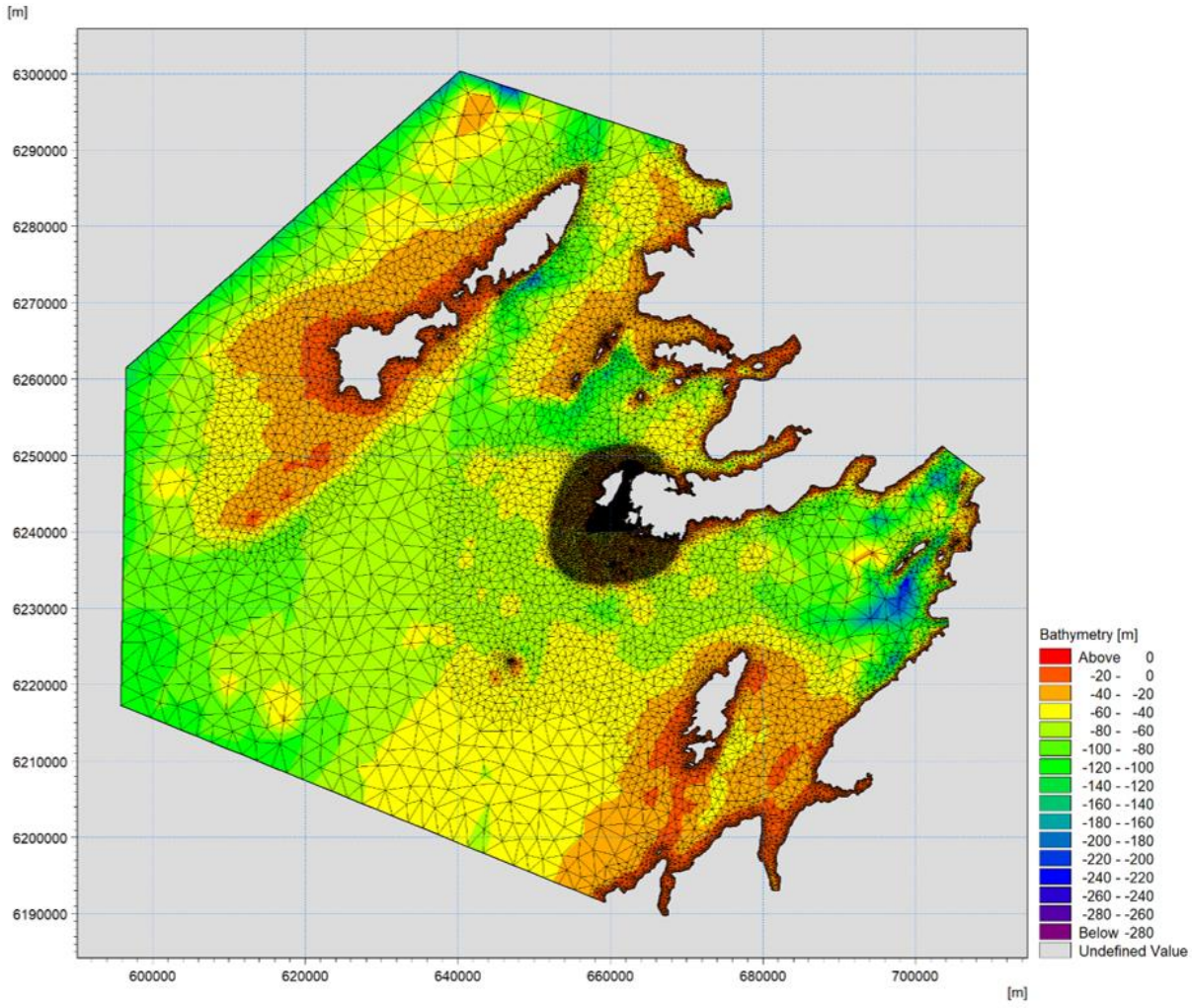


Figure 13-8 Bathymetry and Mesh of Local Wave Model

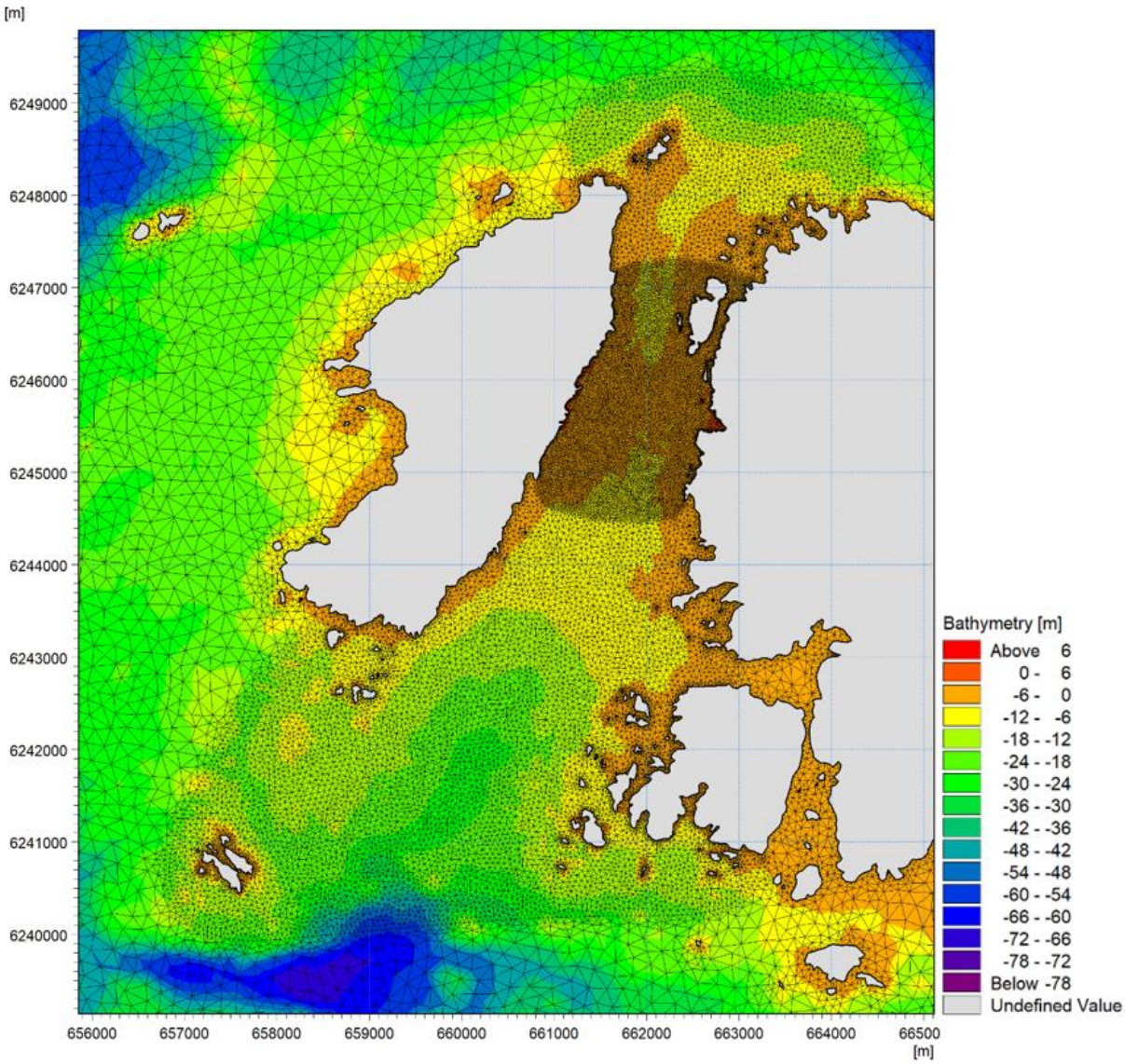


Figure 13-9 Model mesh resolution around the Sound of Iona

13.3 Baseline Scenario

13.3.1 Tidal Regime within the Sound of Iona

The MIKE 21 Hydrodynamic module described in Section 13.2.3 was used in conjunction with the baseline 2D model to derive baseline tidal regime information within the Sound of Iona.

Typical tidal flow patterns for a spring ebb and spring flood tide are presented in Figure 13-10 and Figure 13-11, respectively. The numerical model output demonstrates that tidal currents are greatly increased in the shallows between Iona and Fionnphort and around the island of Eilean nam Ban. These currents diminish rapidly as the tide flows into deeper waters to the north and south.

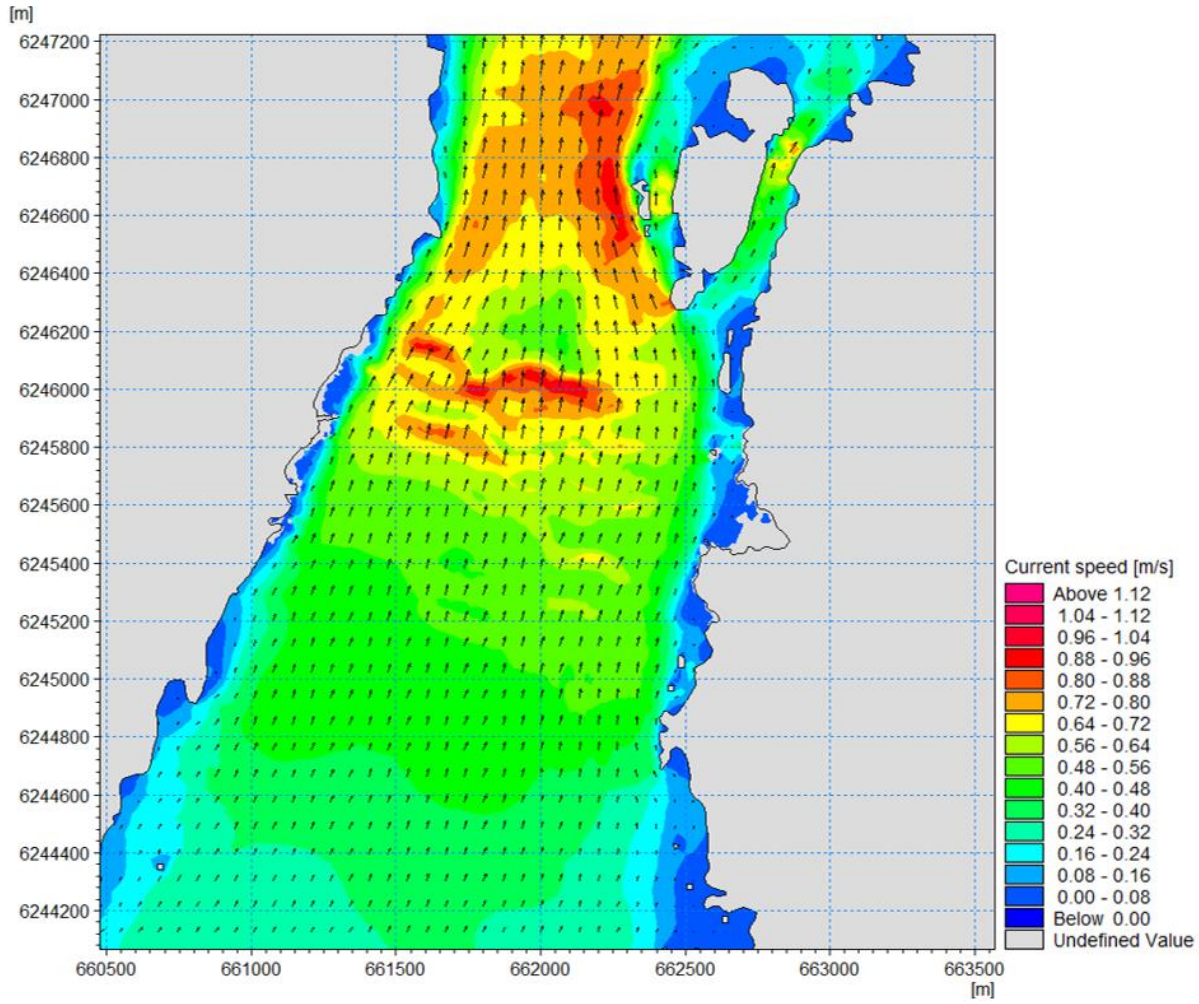


Figure 13-10 Tidal flow patterns – mid-flood

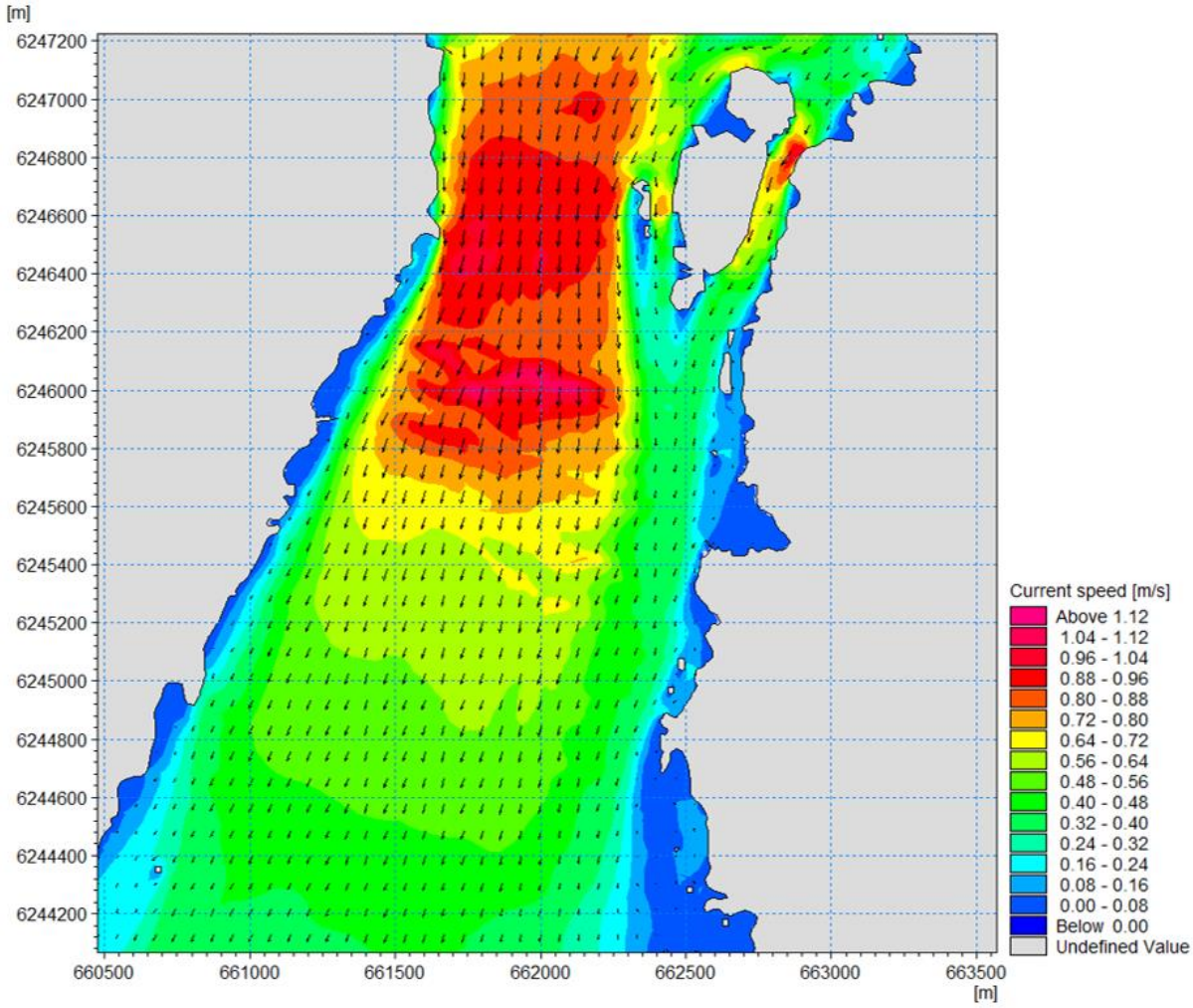


Figure 13-11 Tidal flow patterns – mid-ebb

Table 13-1 displays the return period values from the coastal flood boundary conditions for the UK. The point is extracted from the Sound of Iona and the levels are referenced to Ordnance Datum Newlyn. The previous study was carried out from 2017 to 2018 to develop and apply improved methods to update coastal extreme sea levels using a longer data record.

Table 13-1 Return period values from the coastal flood boundary conditions for the UK (Update 2018). The point is from the centre of the Sound of Iona (British National Grid Reference: X 129283, Y 723623)

Return period	Level (m OD)
1	2.81
5	3.05
10	3.18
50	3.43
100	3.54
200	3.65
500	3.81
1000	3.92

13.3.2 Wave Climate within the Sound of Iona

There is a dominance of south-westerly waves attributed to large Atlantic swells entering the Sound of Iona, however, smaller storms from the south, north and east also contribute to the wave climate within the sound. The prevailing wind conditions are also from the southwest.

To evaluate the potential changes in wave climate due to the Proposed Development, a comparative study was carried out. This meant that baseline wave climate was required; due to the comparative nature of the assessment, a full metocean study (the combined effect of the meteorology and oceanography) was not essential however representative sea-states were required.

Twenty-two years of data were obtained from the European Centre for Medium-range Weather Forecasting's (ECMWF's) operational dataset for locations on the north, east and south-western boundaries of the model domain. Extreme value analysis using peak over threshold was undertaken for the principal sectors to determine the extreme offshore wave climate for a range of return period events. Wave simulations were undertaken using the offshore wave climate as boundary conditions to determine the resultant wave climate at the site. This included the 1 in 1, 1 in 50 and 1 in 200 year return period offshore wave climate for every 15° directional sector from the south-east through south, west and north to 60°.

In addition to boundary wave data, it was necessary to analyse the wind field to include the contribution of local wind seas. For this, a basic wind speed for the area was taken from the British Standard Code of Practice for wind loads (BS CP3 prt2: 1972) and adjusted to represent various directional sectors and associated fetch lengths for a range of return periods.

The wave modelling was undertaken using the spectral wave model, MIKE21 SW for the overall and local meshes, to provide a full wave climate within the Sound of Iona. The model setups ensured that the detail of both locally generated wind waves and swell conditions from further afield were captured. The models resolve the wave field by simulating the wind generation of waves within the domain and the propagation of externally generated swell waves through the domain.

Flow data extracted from the tidal model discussed under Section 13.3.1 was introduced into the local wave model to determine the effects of wave-current interaction in the Sound of Iona. The tidal model

and local wave model domain extents are similar, with the tidal model covering some additional estuaries omitted from the wave model. These estuaries were included in the tidal model to ensure the accurate simulation of flows and levels within the model domain, however, were not relevant to the local wind wave generation in the local wave model. When the flow data was included in the sample wave model simulations, the effects on wave climate were small in the Sound, with some minor reduction in significant wave heights noted. Therefore, it was concluded that for extreme wave simulations, the effects of wave-current interaction in the Sound could be ignored.

Results of the baseline scenario are also provided at the locations of the outer end and inner knuckle of the proposed Iona breakwater as shown in Table 13-2. This data was used for the design of the Proposed Development. The results are given for the most arduous storm directions in terms of wave heights, wave periods and wave directions for a water level of 4.65m CD (2.83m to OD Newlyn). Greater wave heights were determined at the outer end of the Iona Breakwater for waves approaching from the south, whilst the heights were reduced at the inner knuckle for waves from a more south south-east direction. It was found that the wave heights at the breakwater sites were not significantly affected by changes in water levels.

Table 13-2 Modelled Baseline Wave Climate at Iona Breakwater

	Outer end			Inner knuckle		
	Hm0	**Tp**	**MWD**	**Hm0**	**Tp**	**MWD**
1 in 1 year	2.233	13.75	190.1	1.600	13.77	166.4
	2.203	15.00	190.0	1.584	15.02	165.7
	1.771	8.47	191.0	1.290	8.49	171.6
	1.521	6.07	188.9	1.201	6.07	173.2
	0.918	4.51	38.6	0.762	3.19	51.4
1 in 50 year	2.885	17.43	190.0	2.086	17.45	166.2
	2.686	19.31	189.6	1.962	19.32	165.4
	2.557	10.07	190.2	1.880	10.08	170.0
	2.245	7.28	187.2	1.785	7.29	169.5
	1.387	3.54	39.9	1.152	3.37	54.9
1 in 200 year	3.058	17.11	190.3	2.203	17.13	167.3
	2.828	21.00	189.7	2.063	21.01	165.7
	2.847	10.36	190.2	2.101	10.37	170.1
	2.538	7.52	186.7	2.002	7.52	168.4
	1.573	3.72	40.2	1.302	3.55	56.2

Hm0 refers to the wave height, Tp refers to the peak wave period and MWD refers to the mean wave direction.

The following set of figures shows the wave climate for some of the key directions modelled. Figure 13-12 shows the significant wave height and mean wave directions for a 1 in 1 year return period event from the 240° sector which includes swell waves from the Atlantic Ocean on the approach to the Inner Hebrides, whilst Figure 13-13 shows the same event within the Sound of Iona. Figure 13-14 and Figure 13-15 show the Sound of Iona when subjected to a 1 in 200 year return period event from 210° and 315° respectively with no Atlantic swell waves.

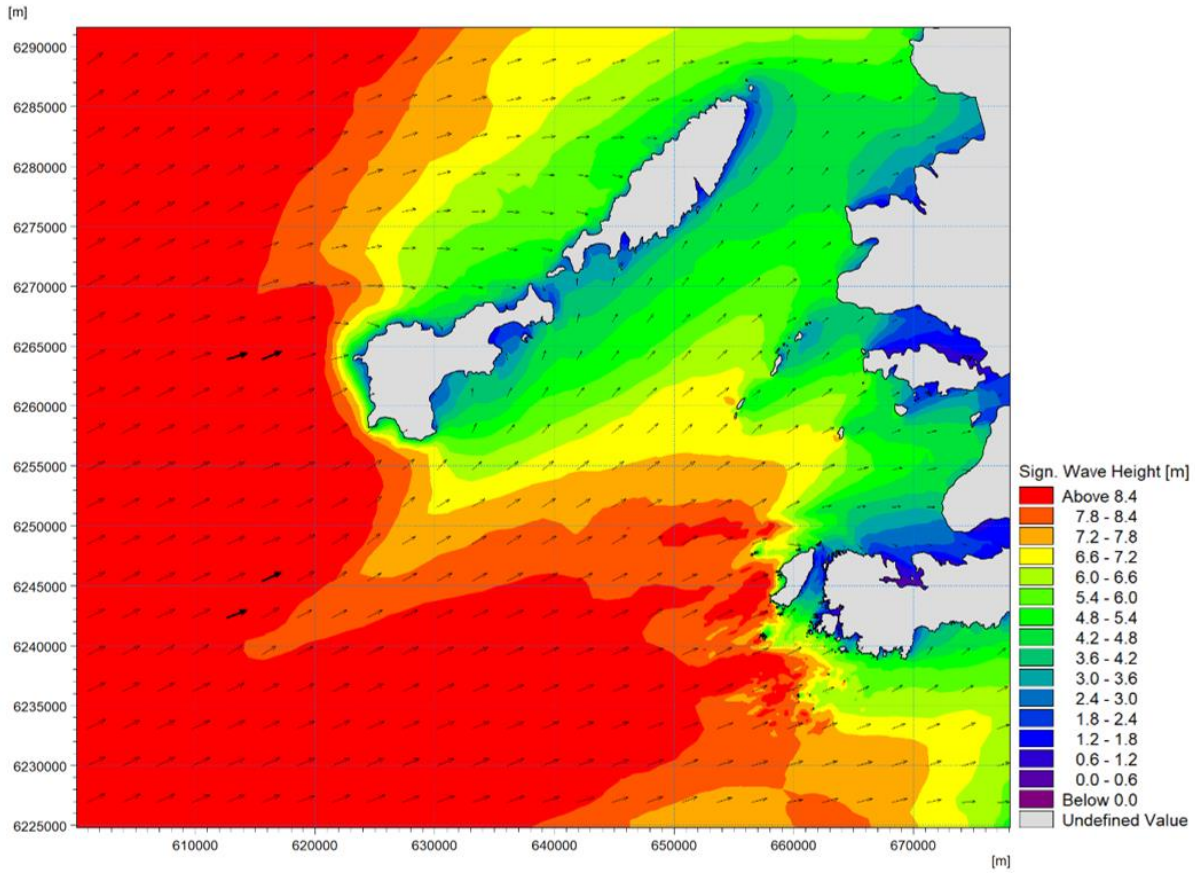


Figure 13-12 Significant wave heights and mean wave directions – 1 in 1-year storm from 240° including Atlantic swell waves

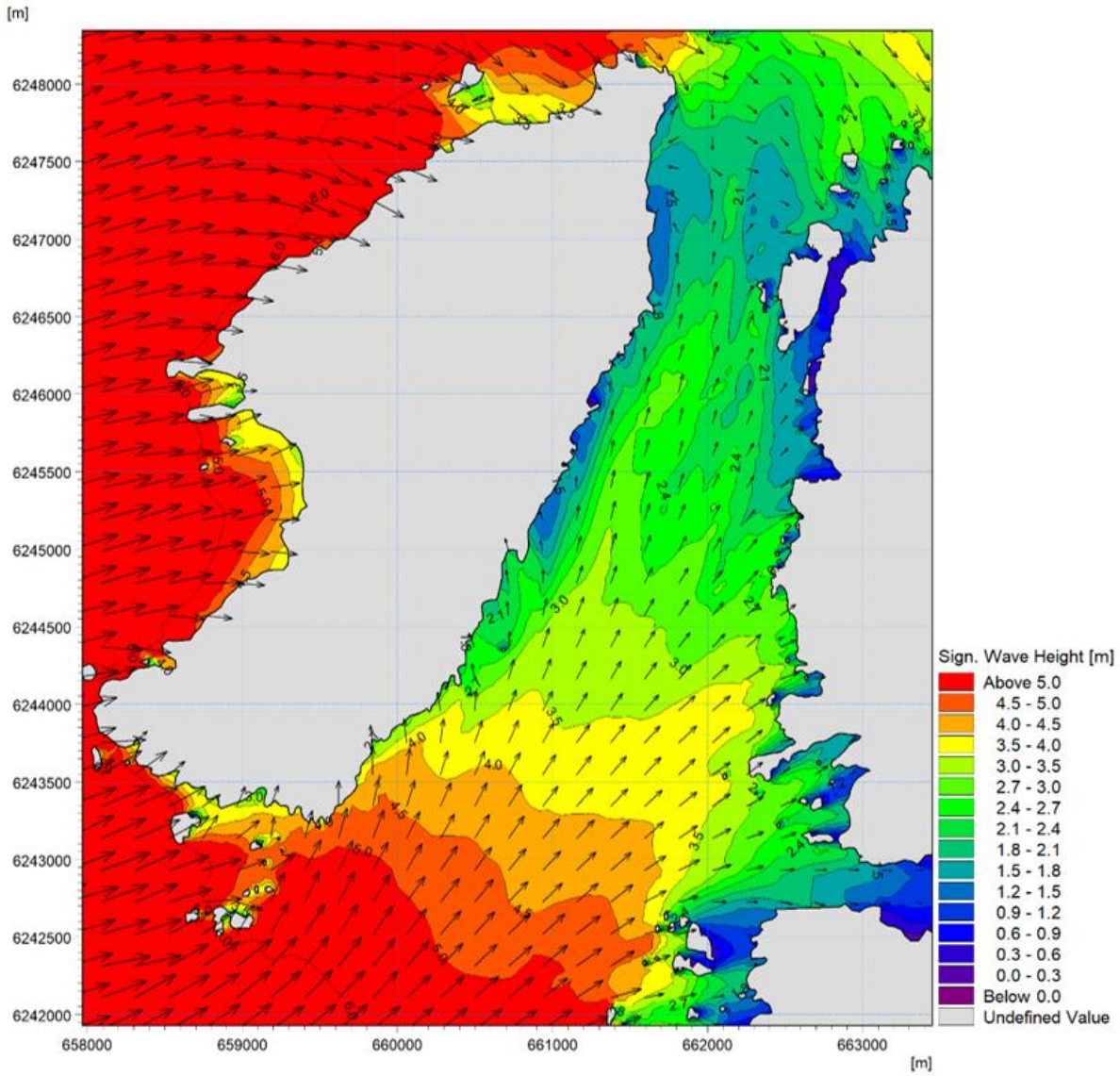


Figure 13-13 Significant wave heights and mean wave directions in the Sound of Iona – 1 in 1-year storm from 240° including Atlantic swell waves

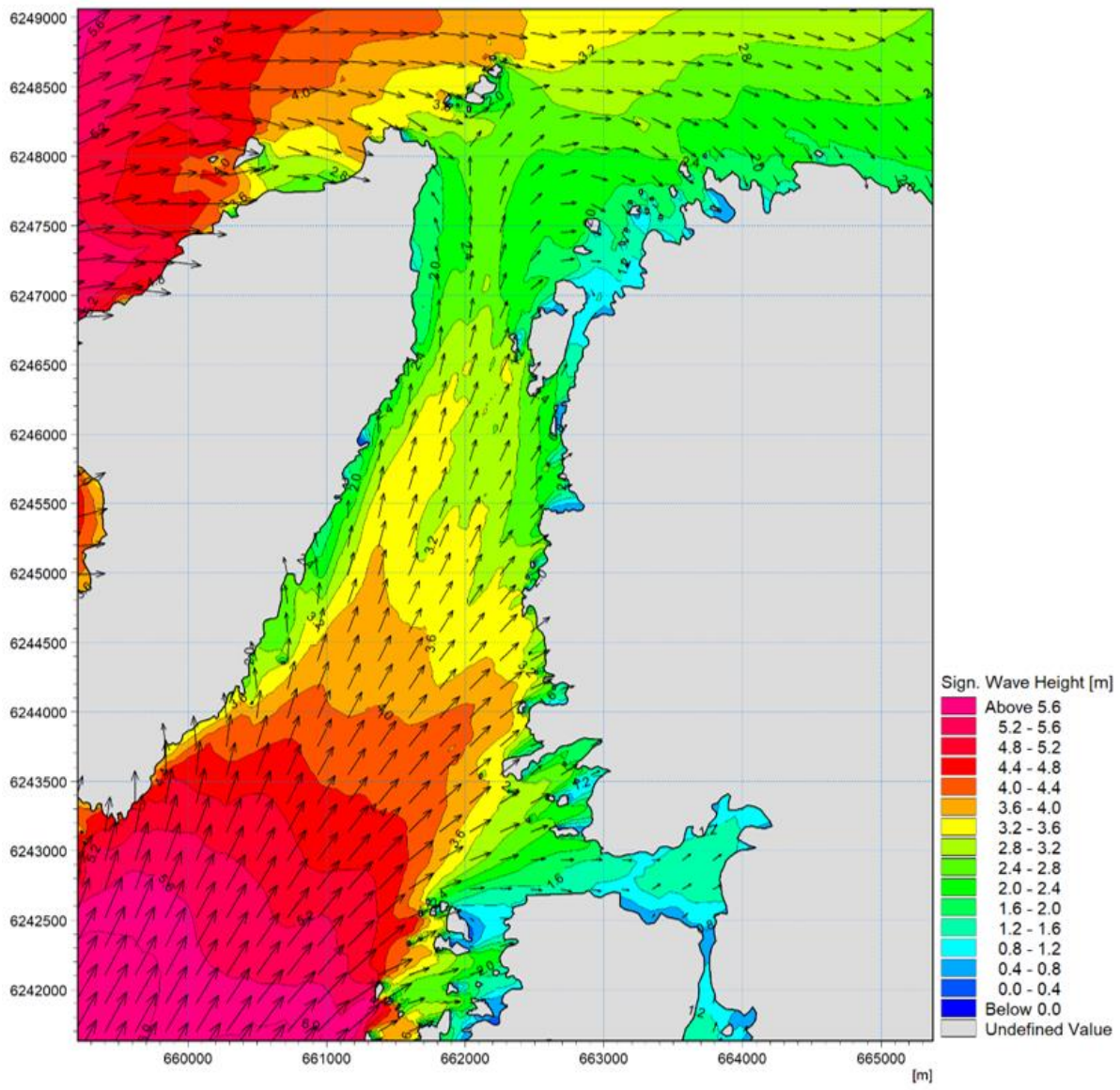


Figure 13-14 Significant wave heights and mean wave directions in the Sound of Iona – 1 in 200-year storm from 210° with no Atlantic swell waves

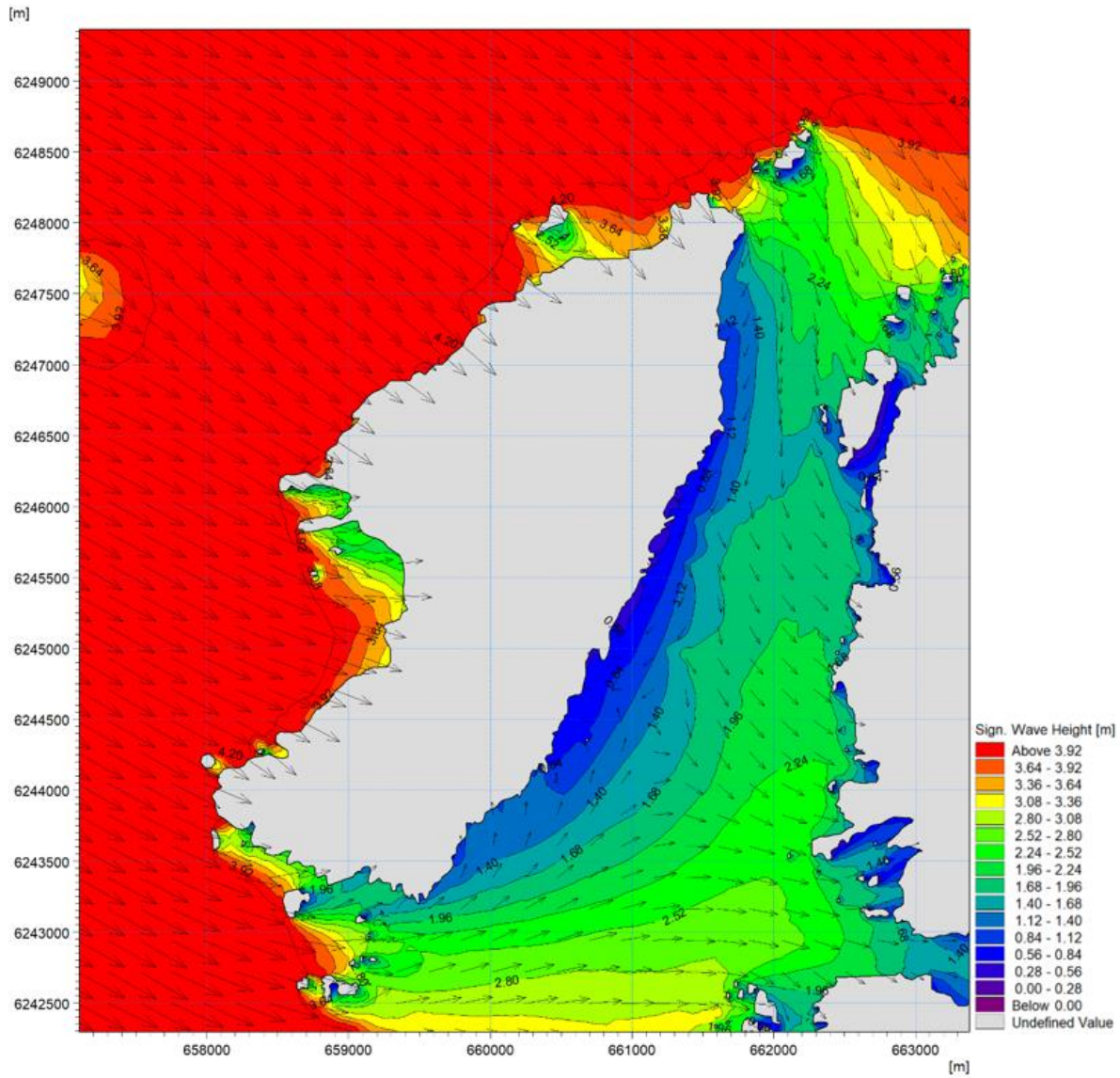


Figure 13-15 Significant wave heights and mean wave directions in the Sound of Iona – 1 in 200-year storm from 315° with no Atlantic swell waves

13.3.3 Littoral currents within the Sound of Iona

The MIKE suite facilitates the coupling of models. The depth-averaged hydrodynamic model, used for the tidal modelling, coupled with the spectral wave model, provides a full wave climate incorporating the impact of water levels and currents on waves and wave breaking. Using this, the littoral currents (i.e., those currents driven by tidal, wave and meteorological forces) were examined. This was undertaken using a mesh extracted from the original wave and tidal models and covers the Sound of Iona and its approaches. Mesh detail was included at the location of the Proposed Development to facilitate the same cell arrangement for the baseline and post-construction assessment, therefore omitting the introduction of any numerical mesh effects into the assessment.

Wave and tidal flow data were extracted from the results of the relevant simulations using the wave and tidal models discussed in previous sections. This data was used to drive the detailed coupled model of

the Sound of Iona using four boundaries located at the northern end of the Sound, and a further four boundaries to the south.

The 1 in 1-year storm from 240° was simulated with the inclusion of spring tides and the resulting mid-flood and mid-ebb currents are presented in Figure 13-16 and Figure 13-18 respectively. These correspond with the (calm) tidal plots presented in Figure 13-17 and Figure 13-19. As expected, the presence of the northeast going waves increases the currents on the flood tide whilst reducing them on the ebb.

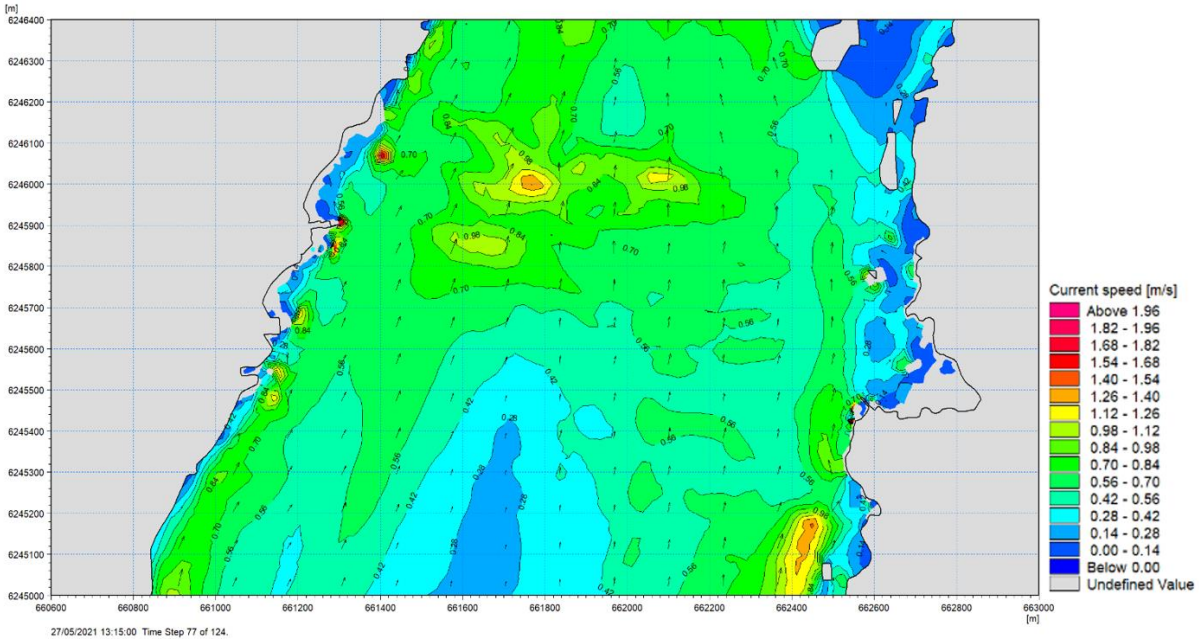


Figure 13-16 Littoral current 1:1 year storm from 240° - flood tide

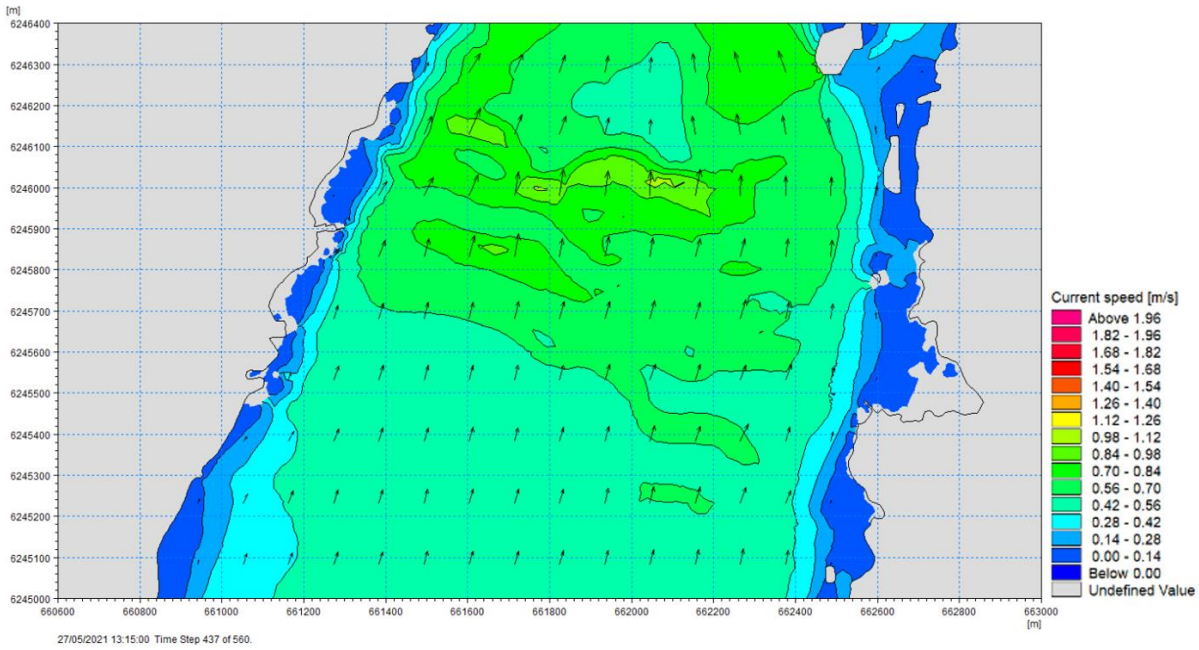


Figure 13-17 Tidal current - flood tide

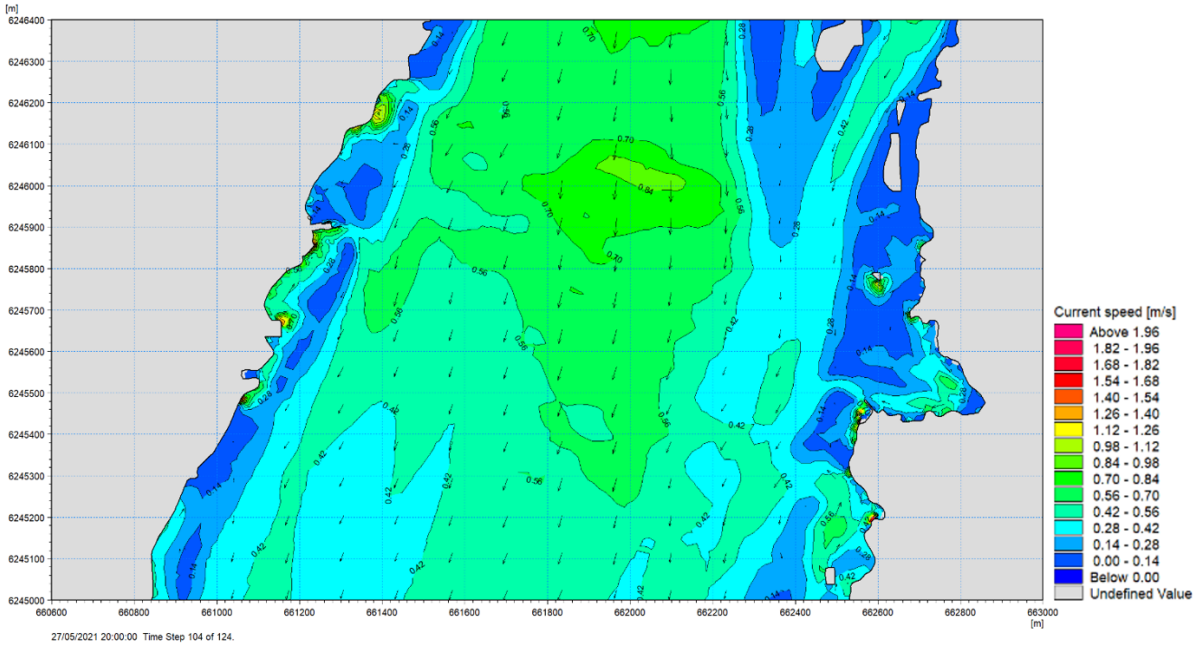


Figure 13-18 Littoral current 1:1 year storm from 240° - ebb tide.

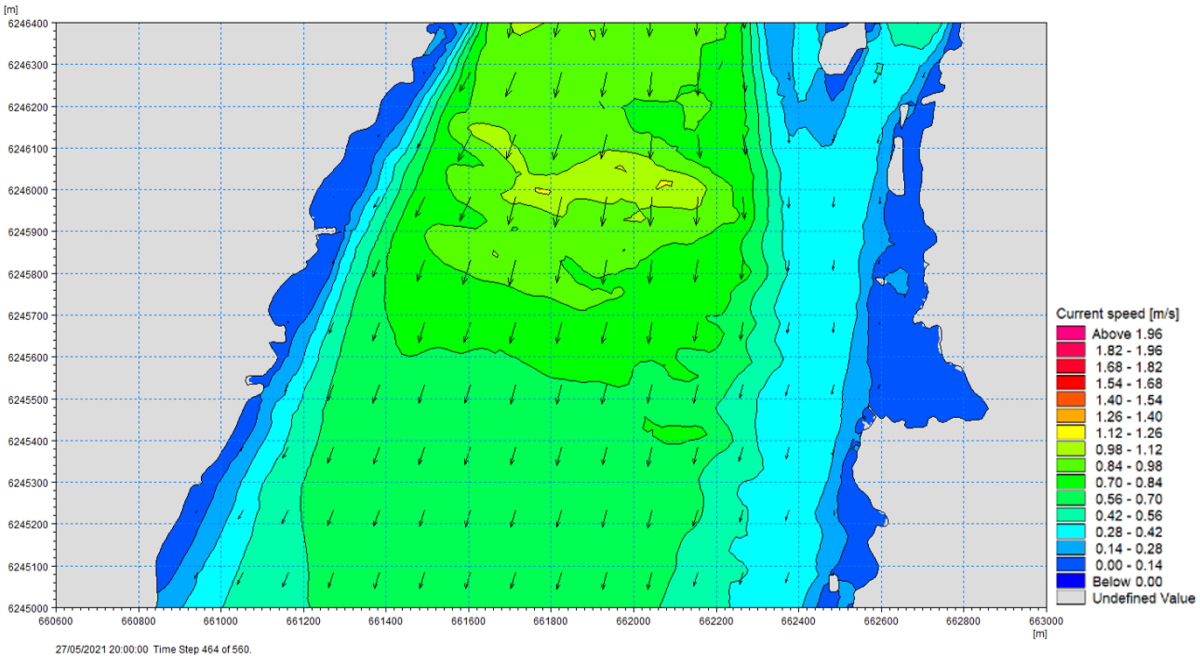


Figure 13-19 Tidal current - ebb tide.

13.3.4 Sedimentology within the Sound of Iona

Figure 13-20 and Figure 13-21 show the locations and results of the sediment grab samples and boreholes in the central section of the Sound and Iona, respectively. The area is composed mainly of fine to coarse sands and gravel, with minimal silts at the nearshore areas. As per the scoping response from Marine Scotland, an assessment of the sandwaves within the Sound of Iona must be included in the chapter. This is undertaken through assessing the sediment size from results obtained from the sediment grab samples and boreholes and through visual assessment of the sandwaves over time.

Figure 13-22 and Figure 13-23 demonstrate that there is limited migration of the sandwaves within the Sound of Iona with most of the sandwave crests not moving significantly within 6 years.

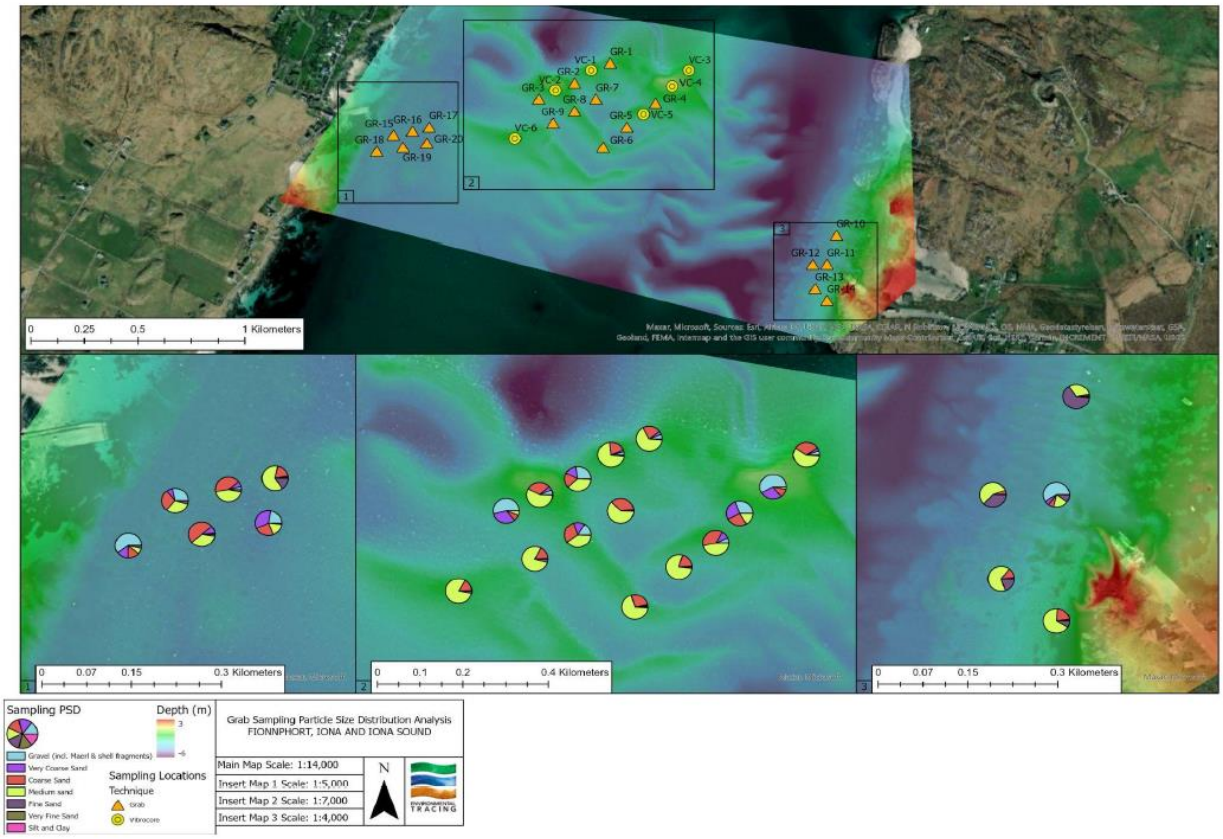


Figure 13-20 Percentage of grain sizes and locations from samples taken by Environmental Tracing Ltd in the Sound of Iona. The main sediment in Iona and the Sound of Iona are medium and coarse sands.

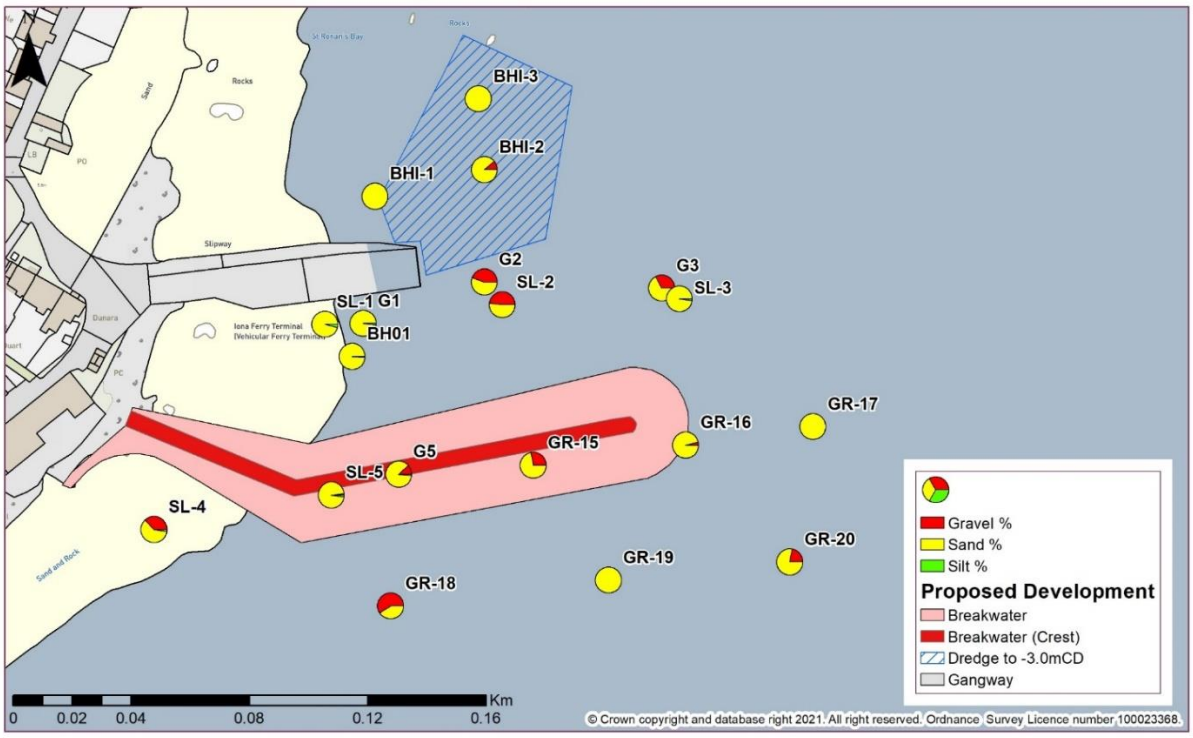


Figure 13-21 Percentage of grain sizes at the Iona breakwater site. The sediment samples comprise larger particles of sand and gravel rather than silts and clays

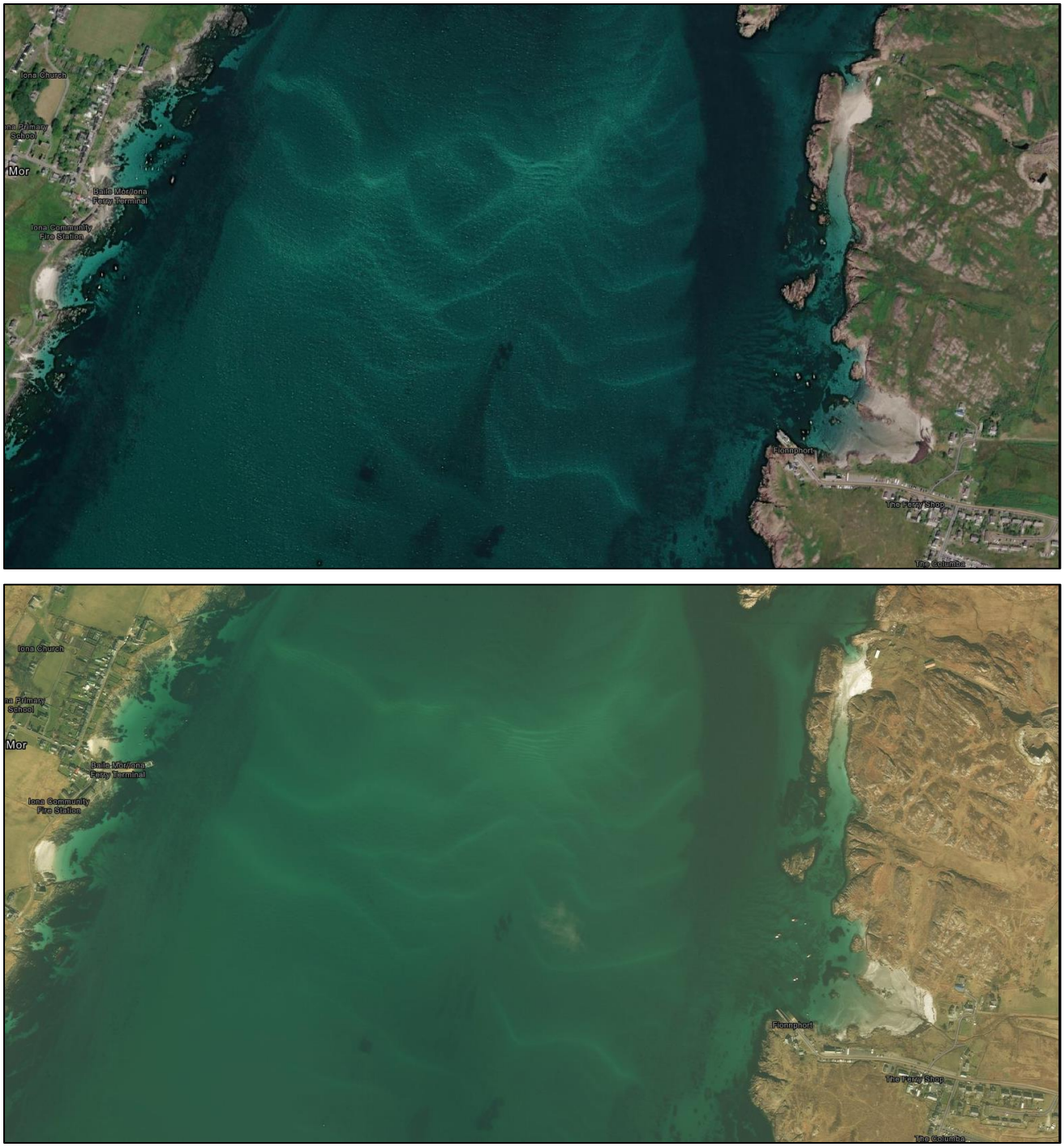


Figure 13-22 Sandwaves in the Sound of Iona in 2022 (top image) and 2016 (bottom image), demonstrating there is limited movement of the features. Source: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

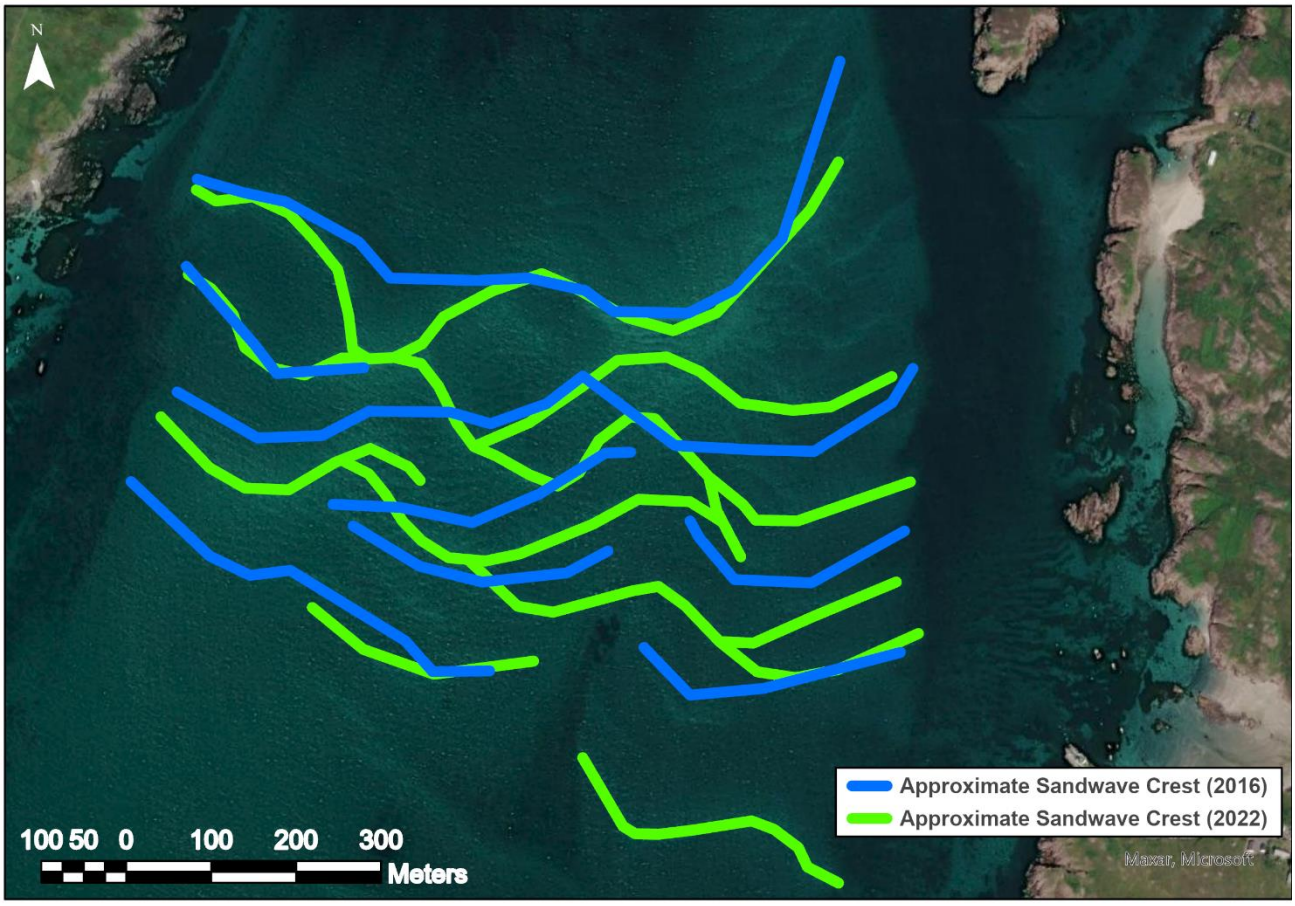


Figure 13-23 Sandwave movement analysis in the Sound of Iona in 2022 and 2016, demonstrating there is limited movement of the features.

13.4 Description of Likely Significant Effects

The impact on coastal processes arising from the Proposed Development is assessed in relation to the construction phase of the project and the subsequent operational phase. Various elements of construction and operation and the types of impacts on the tidal, wave and sediment transport regimes that they could potentially result in are identified for assessment in the following sections.

The assessment has been informed by a robust numerical modelling programme and, where applicable, hydrographic survey data and sediment sampling (see Section 13.2.3).

13.4.1 Assessment of Construction Effects

13.4.1.1 Potential Impacts as a result of dredging works

As described in Chapter 3, the Proposed Development would include dredging to accommodate the new navigation channel requirements at the Iona ferry slipway. The dredging operations will result in the removal of 1,225 m^3 of marine sediments.

The process of dredging unavoidably causes disturbance of sediment on the channel bed and dispersal of some material in the water column, however, due to the dredging area containing sand and gravel (Section 13.3.4) which has a larger particle size when compared to silt particles which are easily

suspended in the water column, the impact of dredging would be low due to the immediate settlement of the sand and gravel particles from any overspill. Sand and gravels dumped at the licensed offshore dumping site are expected to remain at that site and not increase the background level of suspended sediments outside of the area. Within the working area, other activities such as the construction of the breakwater and the use of jack-up barges would have a minimal impact on the coastal processes. Changes in the coastal processes would become apparent as construction progresses, these changes in their entirety are assessed in the operational section below.

It should be noted that chemical sediment analysis found that the sediments to be dredged from the navigation channel are below the Marine Scotland Revised Action Levels (AL) 1 and 2.

13.4.2 Assessment of Operational Effects

13.4.2.1 Potential changes to the existing tidal regime

The potential for changes with the elements of the Proposed Development was assessed to consider the potential for operational phase impact. The MIKE 21 Hydrodynamic module described in Section 13.2 was used in conjunction with the Proposed Development 2D model to simulate the tidal regime in the Sound of Iona following the implementation of the Proposed Development. Typical tidal flow patterns for a spring ebb and spring flood tide from the operational simulation are presented in Figure 13-24 and Figure 13-25. Table 13-3 displays the change in water level at the point of high water during a spring tide. No change is observed in the centre of the Sound of Iona, whilst a very minor change of ±1cm is observed to the north and south of the breakwater at Iona.

Table 13-3 The change in sea level during a spring high water at 3 locations in the Sound of Iona

Location Name	X (UTM 29)	Y (UTM 29)	Existing Water Level (m MSL)	Proposed Water Level (m MSL)
Sound of Iona	661948	6245596	1.97	1.97
North of the Iona Breakwater	661345	6245903	1.98	1.99
South of the Iona Breakwater	661259	6245772	1.97	1.96

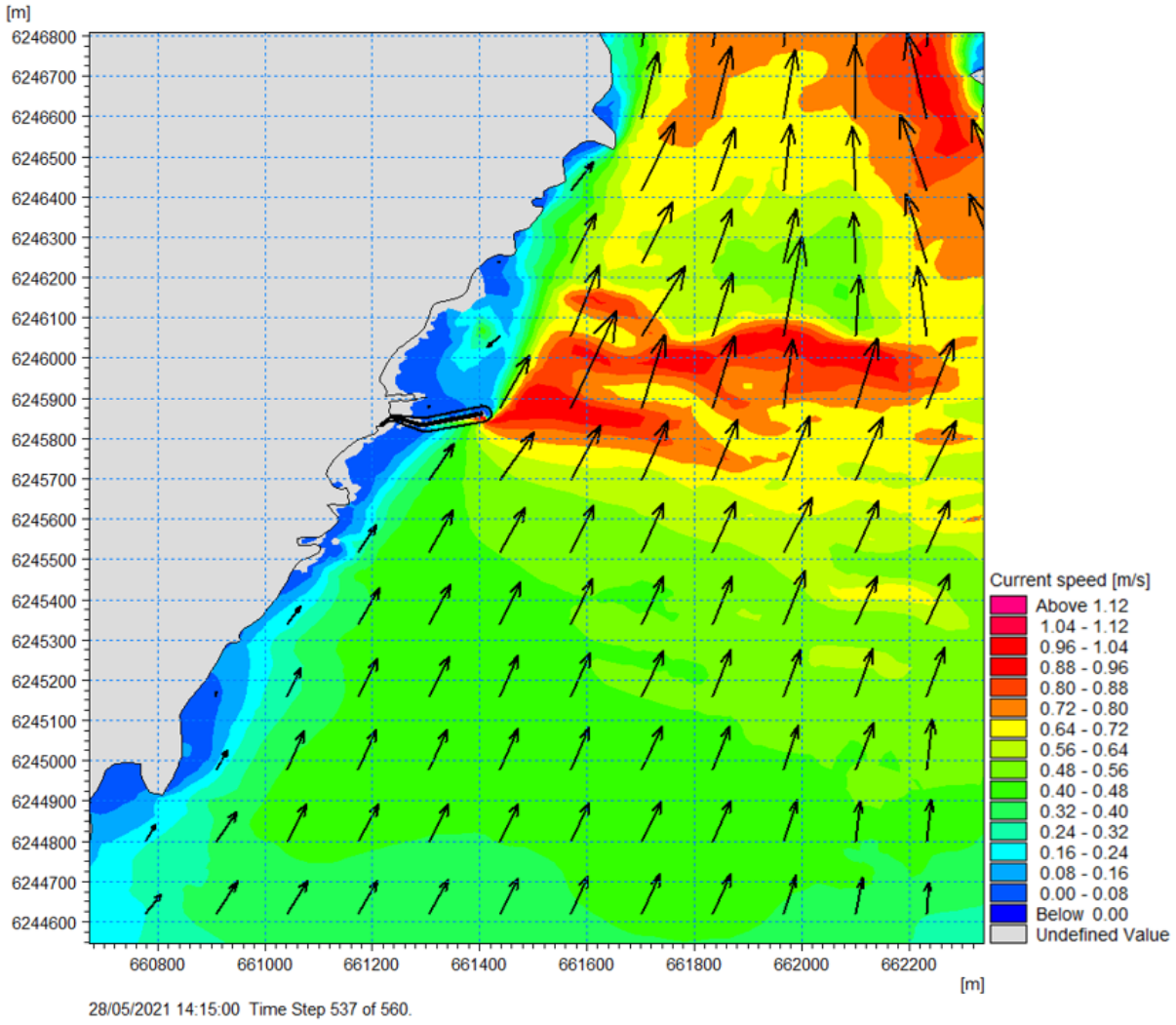


Figure 13-24 Typical spring flood tidal flow patterns as a result of the Proposed Development at Iona

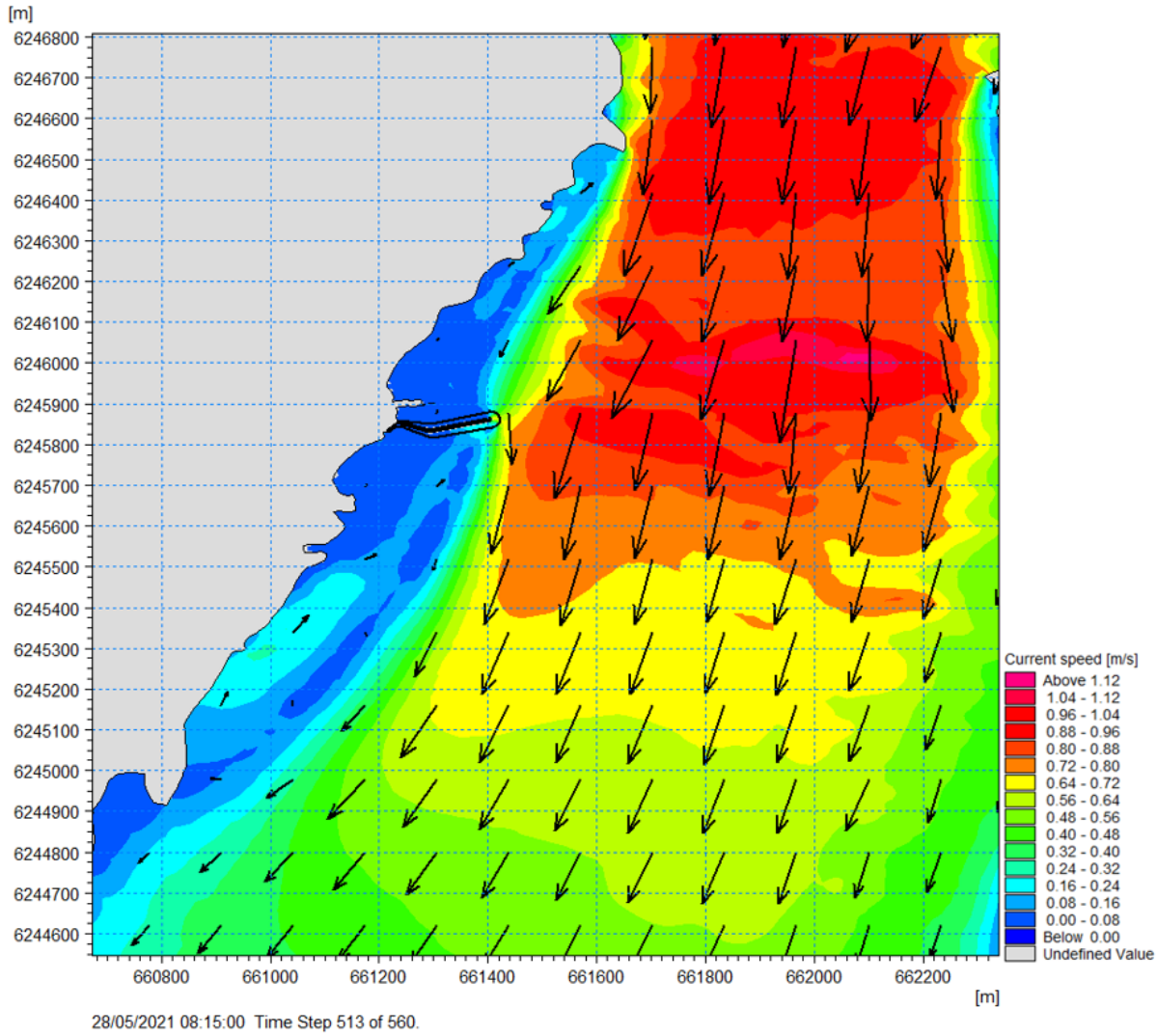


Figure 13-25 Typical spring mid-ebb flow patterns as a result of the Proposed Development at Iona

The difference between the baseline and operation flows for the flood and ebb tides are presented in Figure 13-26 and Figure 13-27.

Spring tides are periods of greatest current velocities. The outputs show that the current velocity remains substantially unchanged throughout most of the Sound of Iona. The maximum predicted change to the mid-ebb or flood current speeds is less than ±0.6m/s. The greatest changes are around the footprint of the works at Iona breakwater, with current speed reduced during the ebb tide behind the breakwater (velocity decreased by 0.66 m/s to 0.06 m/s). An increase in current velocity is also observed during the flood tide just outside the breakwater, with an increase of 0.3 m/s. This increase is not reciprocated outside the breakwater during the ebb tide, with increases below 0.12 m/s. Predicted changes in current speed reduce rapidly outside the works areas in the centre of the Sound of Iona and changes to mid-ebb or mid-flood current speeds are less than ±0.12m/s.

Therefore, the tidal regime is predicted to remain substantially unchanged during operation. Given the localised nature and small absolute magnitude of any predicted changes in tidal current velocity, it is

unlikely that there will be any significant change in net scouring or deposition of sediments within the centre of the Sound of Iona. The risk of impact is determined to be negligible, and no mitigation is required.

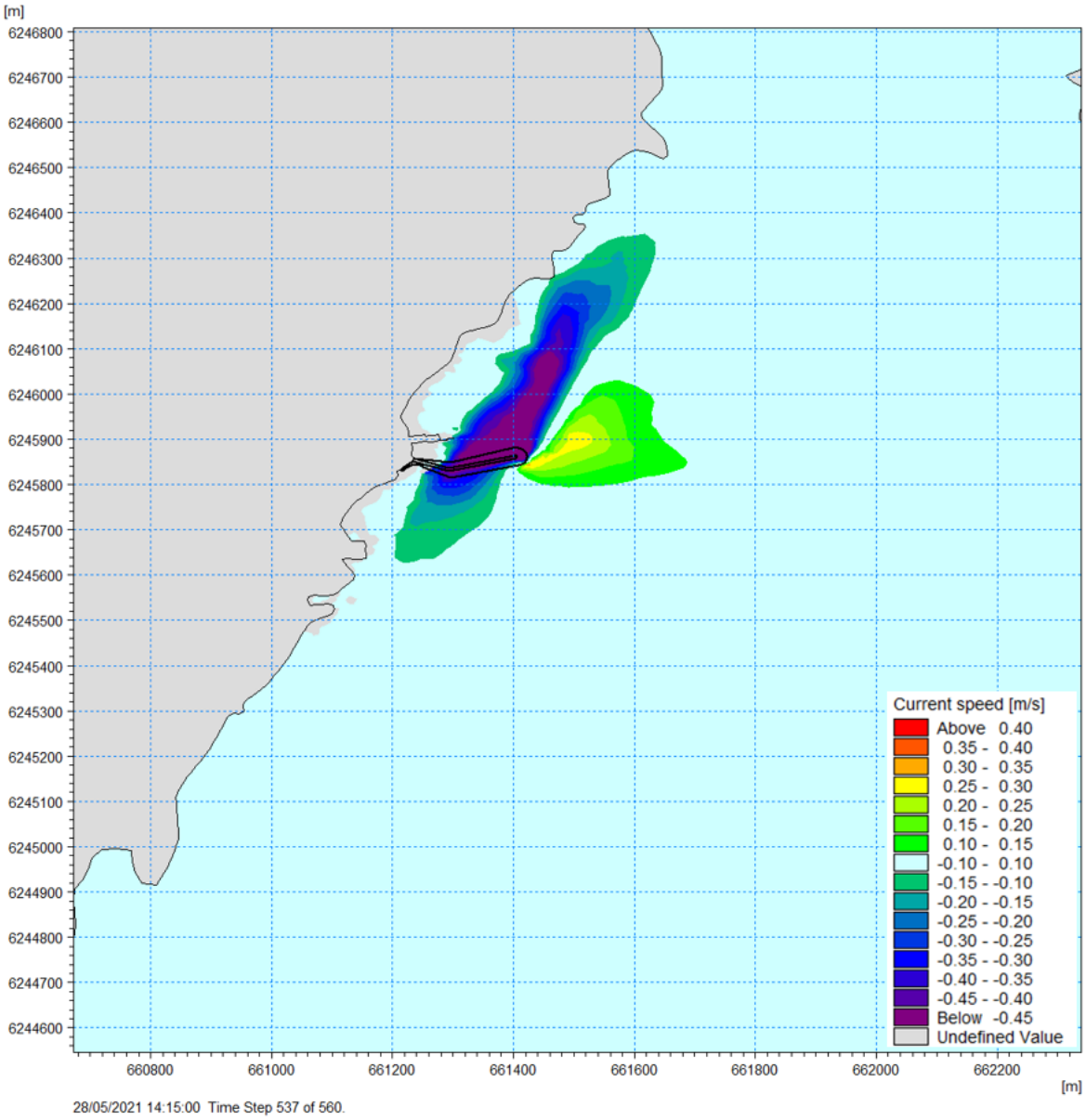


Figure 13-26 Difference in typical spring mid-flood flow patterns as a result of the Proposed Development at Iona

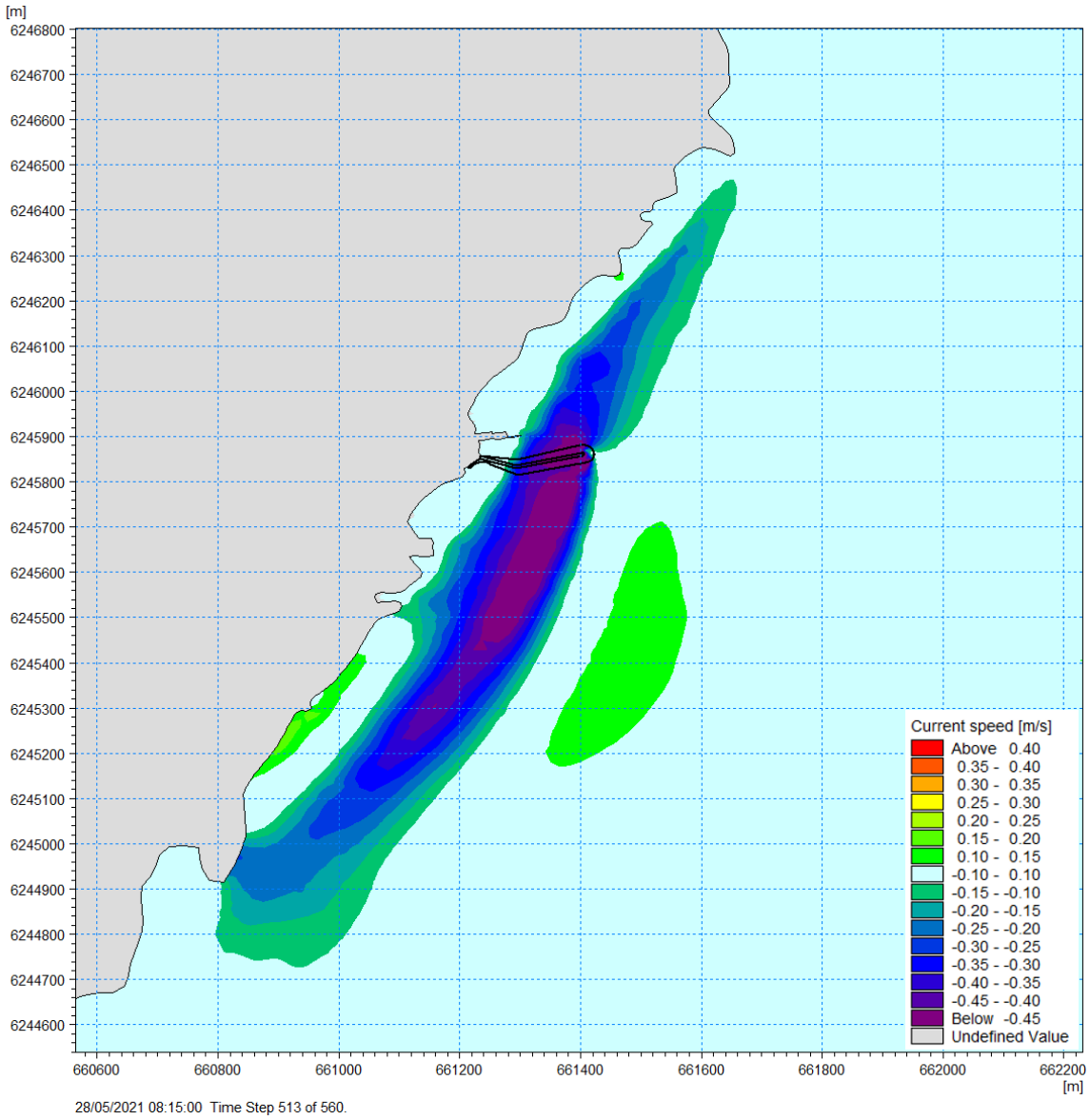


Figure 13-27 Difference in typical spring mid-ebb flow patterns as a result of the Proposed Development at Iona

13.4.2.2 Potential changes to the existing inshore wave climate

Operational phase impacts are also considered relating to potential alteration to the wave climate (and its associated possible impact on flood risk). The MIKE 21 Spectral Wave module described in Section 13.2 was used in conjunction with the operation scenario 2D model to re-run the offshore wave climate simulations in the Sound of Iona based on various wave directions as described in Section 13.3. The simulated inshore wave climate in the Sound of Iona during the operation of the Proposed Development is illustrated in the figures below for 1 in 1 year (Figure 13-28), 1 in 50 year (Figure 13-29), and 1 in 200 year (Figure 13-30) storm events at spring high tide from a 240° direction. Figure 13-31, Figure 13-32 and Figure 13-33 display the localised reduction in wave height behind the breakwater in a 1 in 1 year, 1 in 50 year, and 1 in 200 year event.

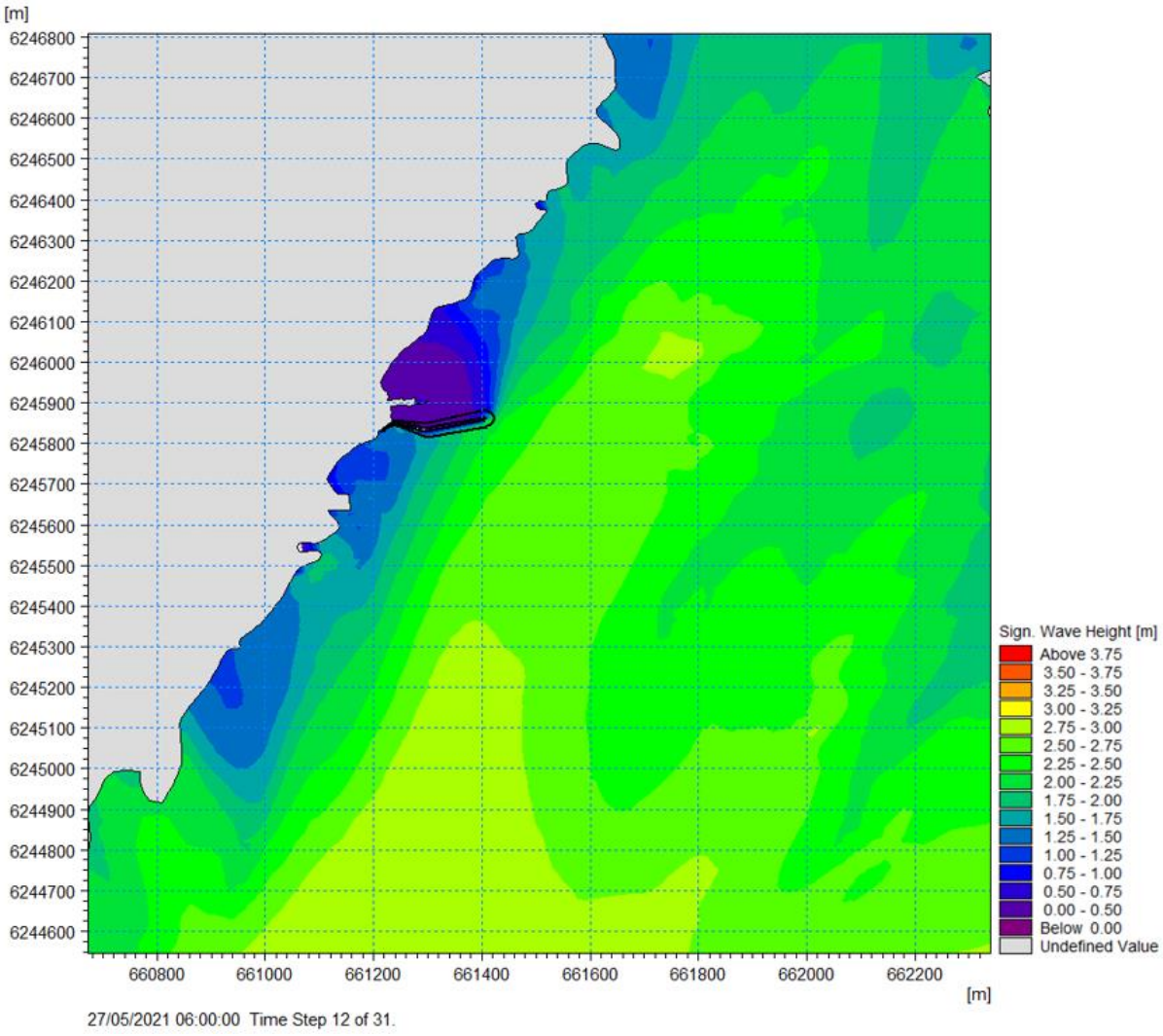


Figure 13-28 Post-construction wave climate 1 in 1 year storm 240° HW

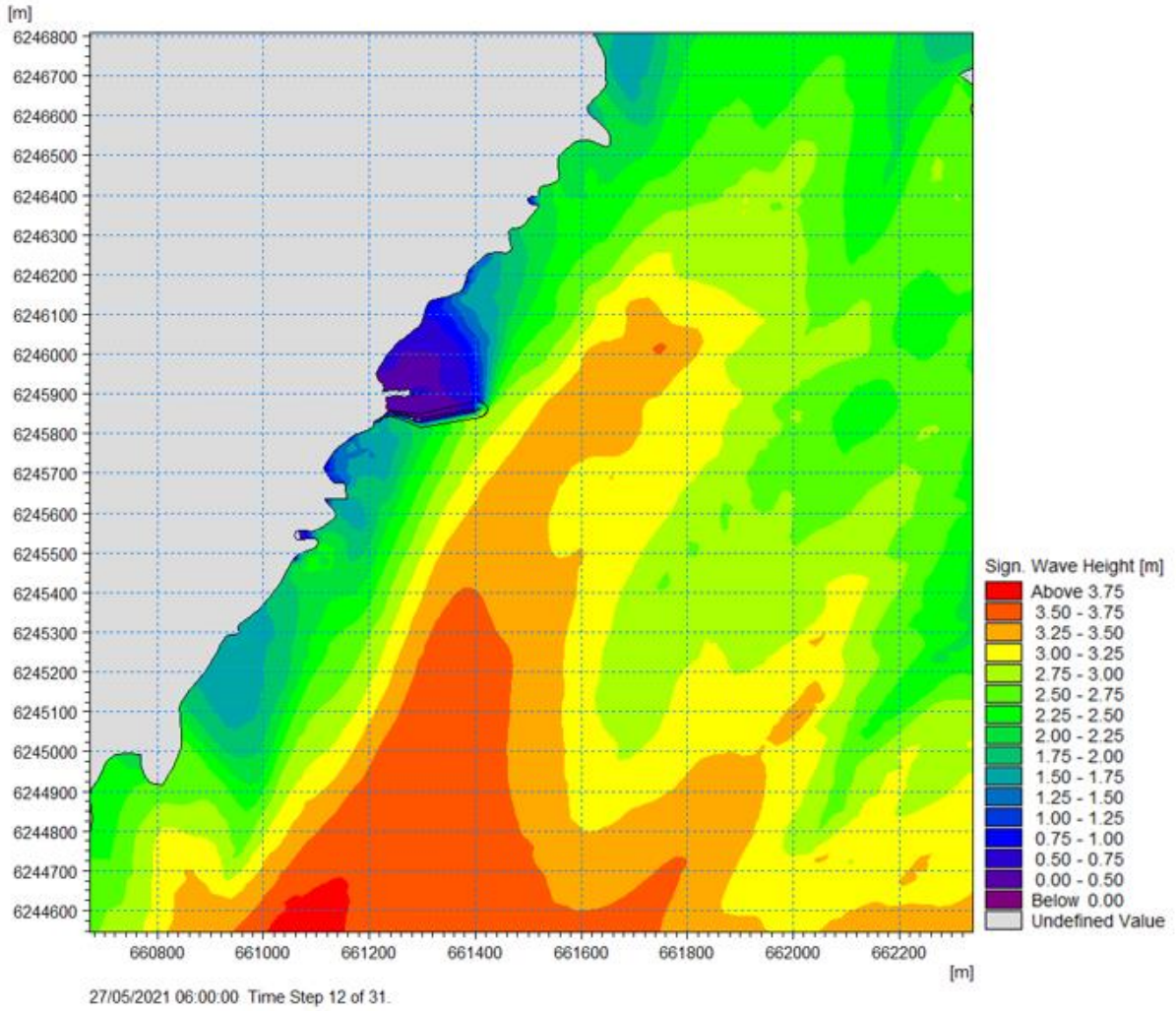


Figure 13-29 Post-construction wave climate 1 in 50 year storm 240° HW

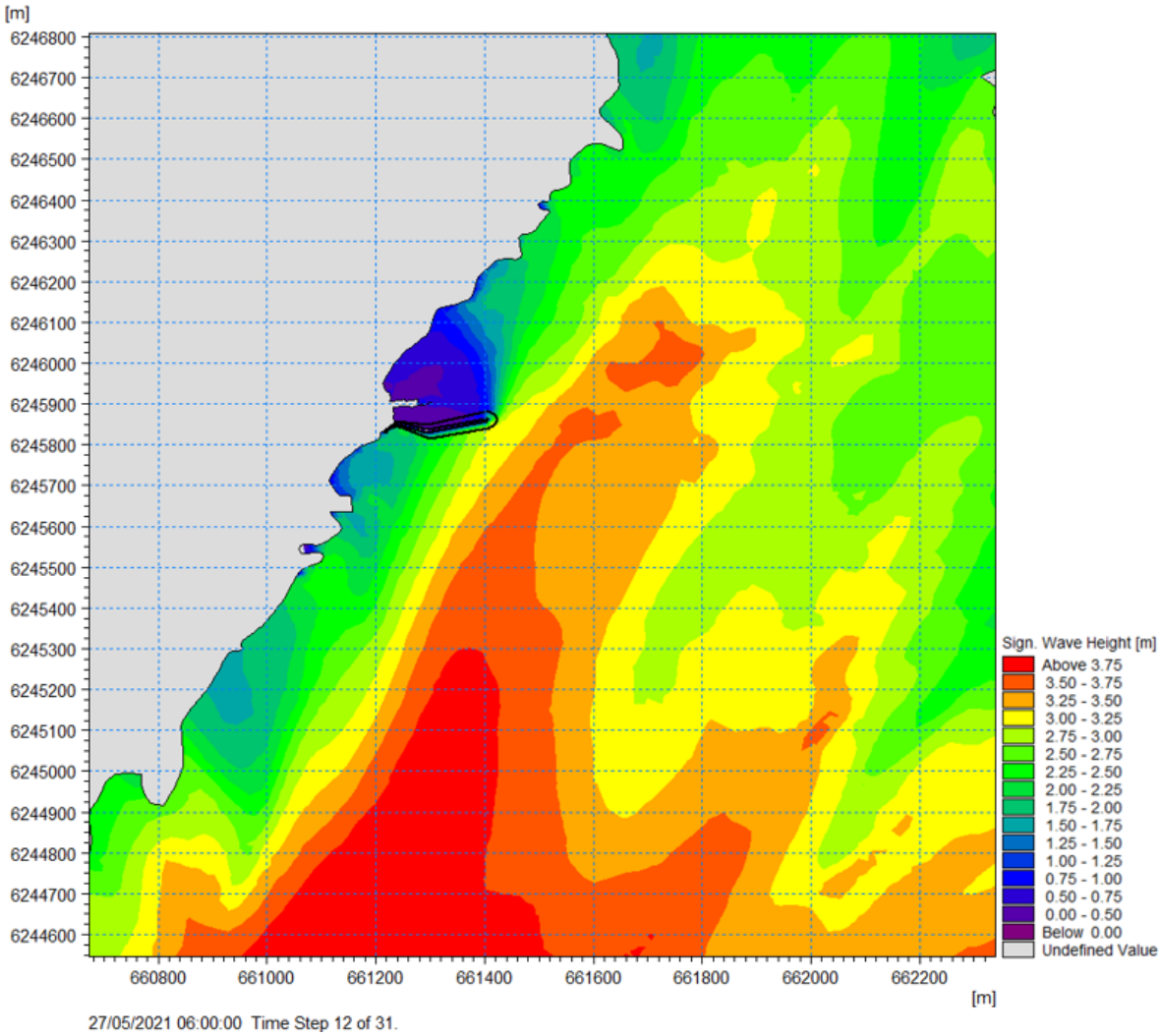


Figure 13-30 Post-construction wave climate 1 in 200 year storm 240° HW

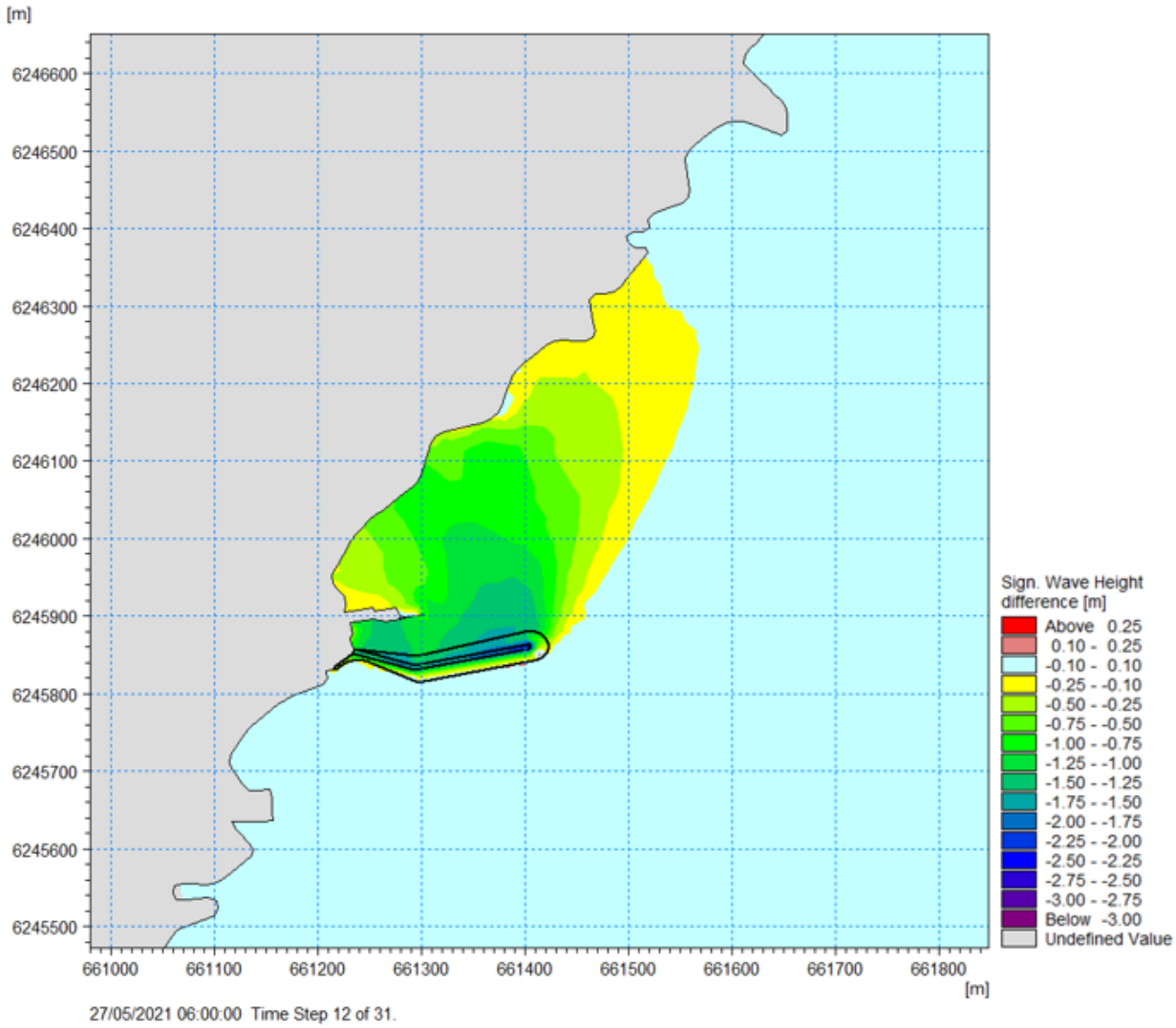


Figure 13-31 Baseline and operation comparison wave climate 1 in 1 year storm 240° HW

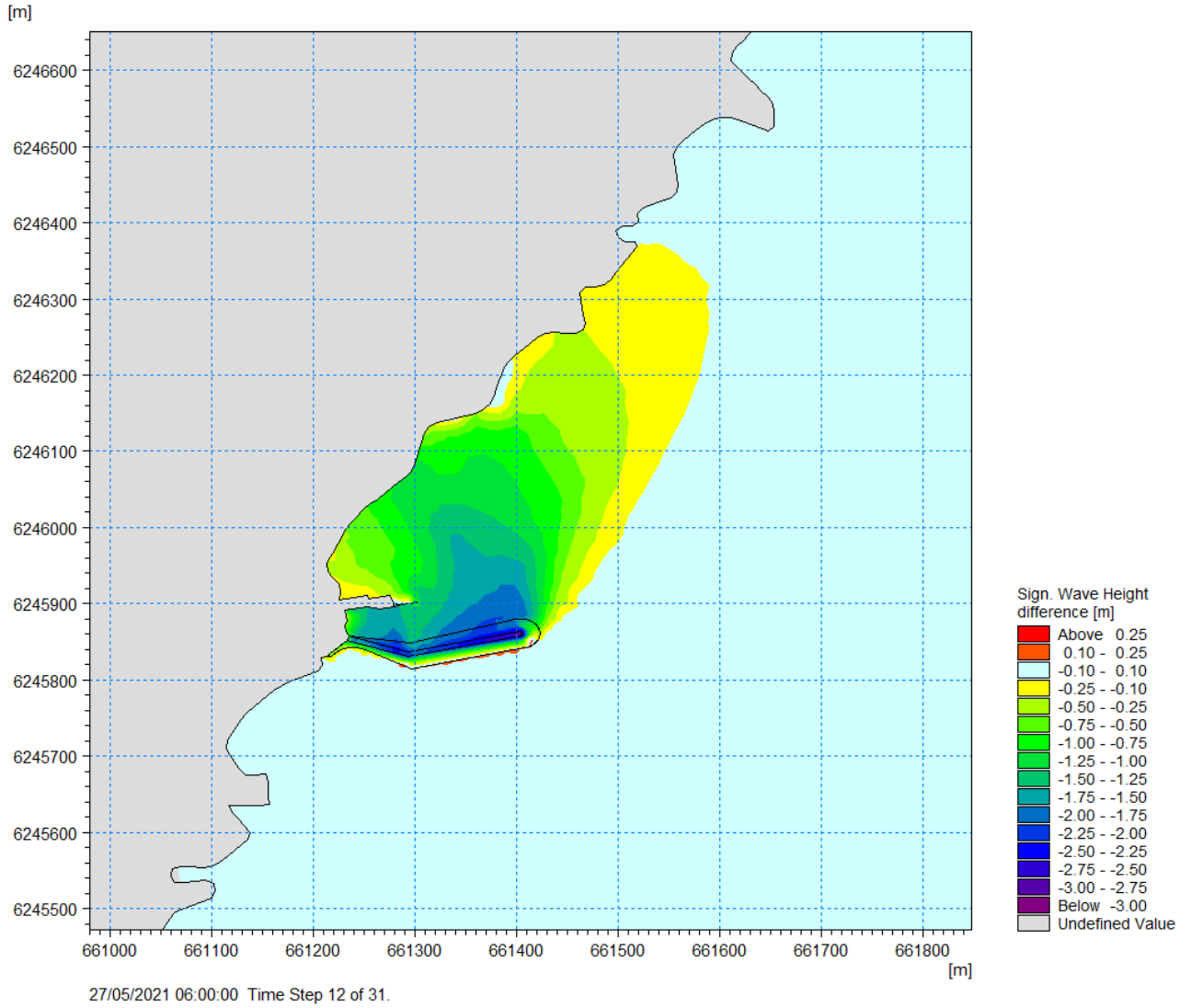


Figure 13-32 Baseline and operation comparison wave climate 1 in 50 year storm 240° HW

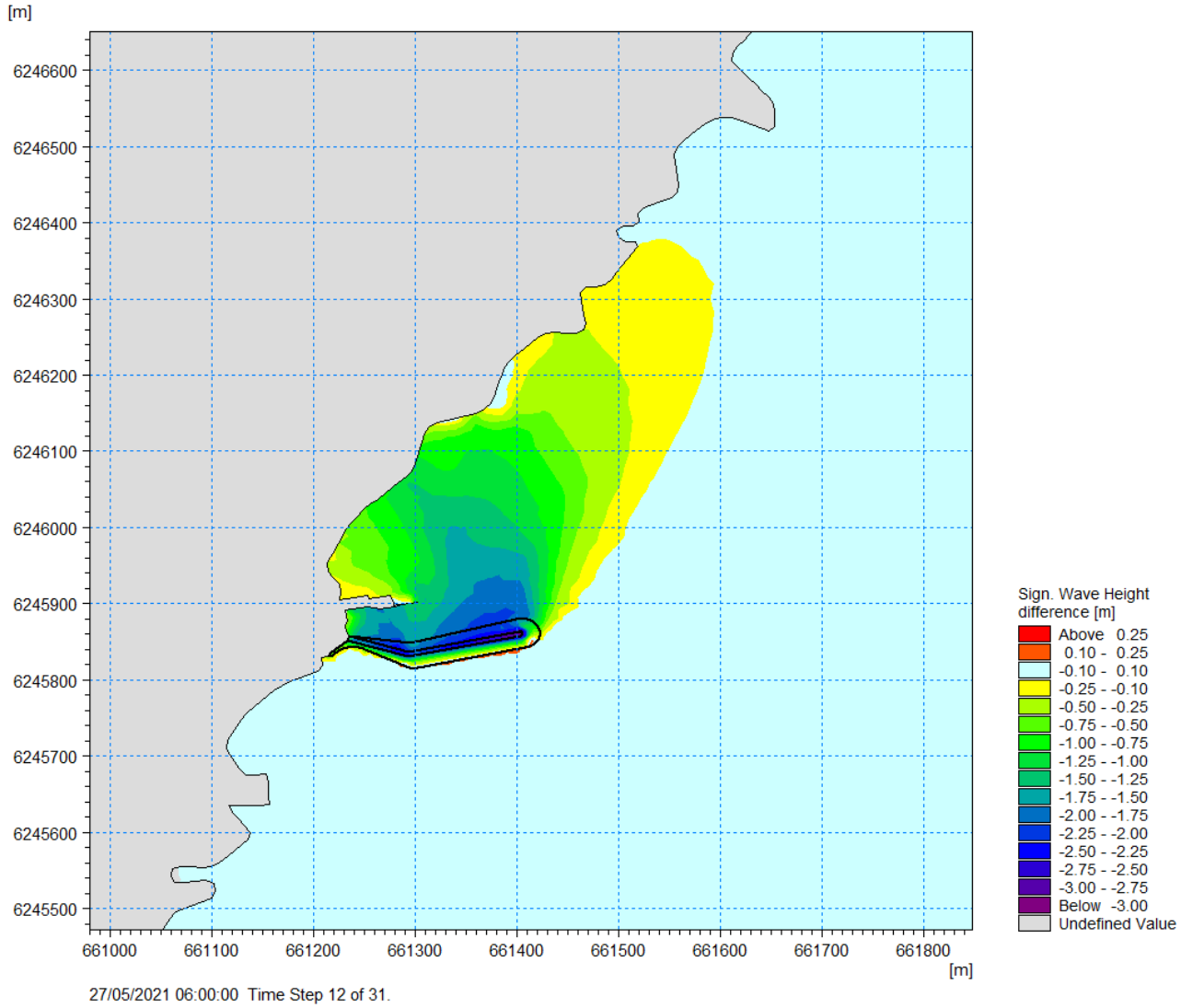


Figure 13-33 Baseline and operation comparison wave climate 1 in 200 year storm 240° HW

13.4.2.3 Potential changes to the existing littoral currents

The previous sections established the magnitude of the changes in tidal currents and wave conditions individually, however sediment transport regimes are driven by a combination of these factors. Although the modelling has demonstrated that the principal contribution comes from tidal currents, for the sake of completeness and to understand the impact upon sediment transport, the influence on littoral currents was examined.

The modelling was extended to include the post-construction scenario for the 1 in 1 year storm from 240°. The baseline littoral currents for mid flood and mid ebb were presented in Section 13.3.3 The post-construction littoral currents are shown in Figure 13-34 and Figure 13-35 for the flood and ebb tides respectively. The corresponding changes are presented in Figure 13-36 and Figure 13-37.

During the ebb tide, the tidal flow is in opposition to the wave climate and the resultant littoral current is reduced in magnitude. The presence of the structures has a limited influence on the reduced flow and there is little difference between changes in littoral current magnitude and the tidal flows alone due to the construction. During the flood tide, the outside of the breakwater exhibits an increase in littoral current by around 0.45 m/s, while an increase of 0.3 m/s is observed during the ebb tide. There are areas where littoral currents are reduced within the lee of the breakwater for both phases of the tide, both with a reduction of 0.6 m/s.

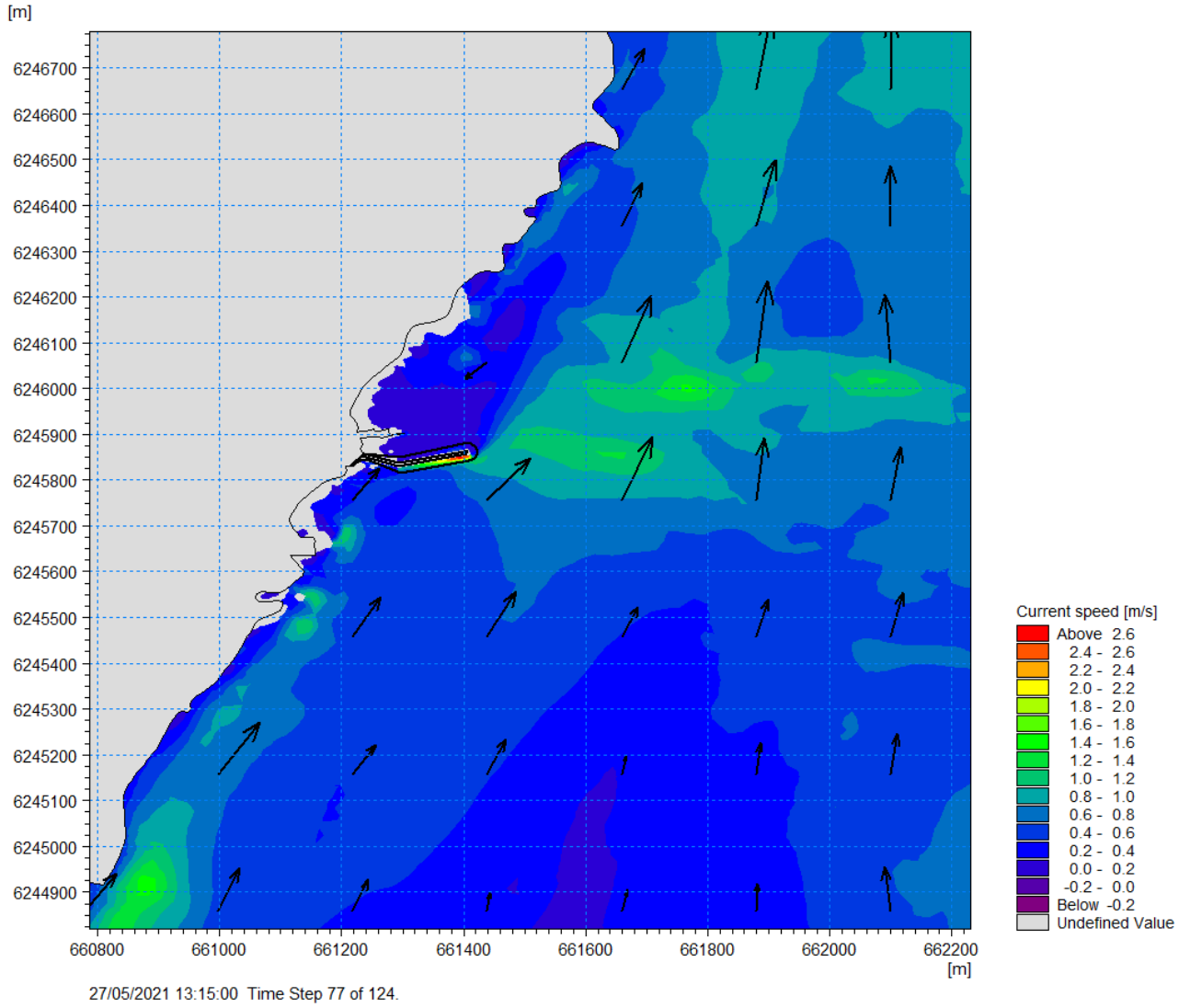


Figure 13-34 Post-construction littoral current 1 in 1 year storm from 240° - flood tide

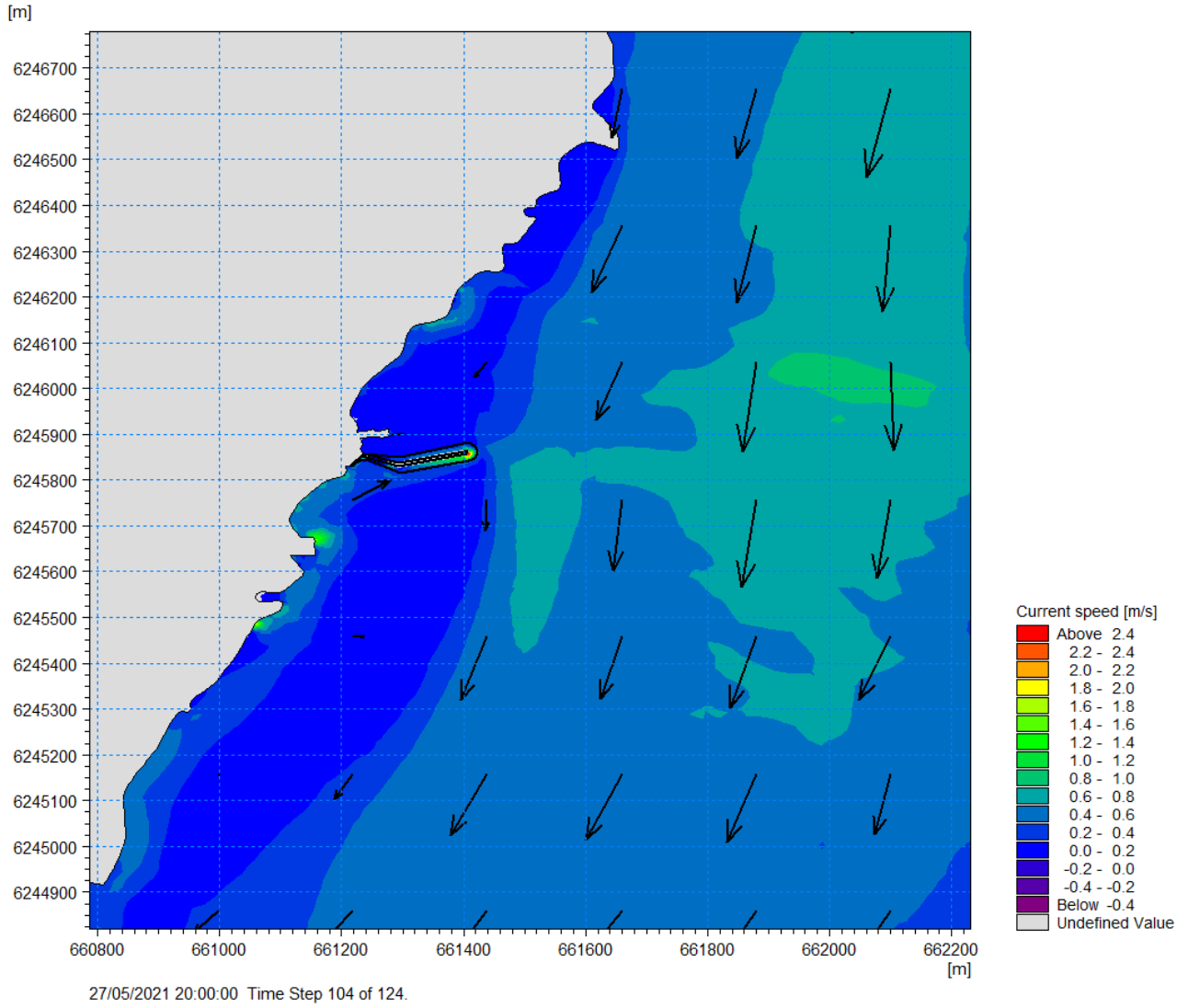


Figure 13-35 Post-construction littoral current 1 in 1 year storm from 240° - ebb tide

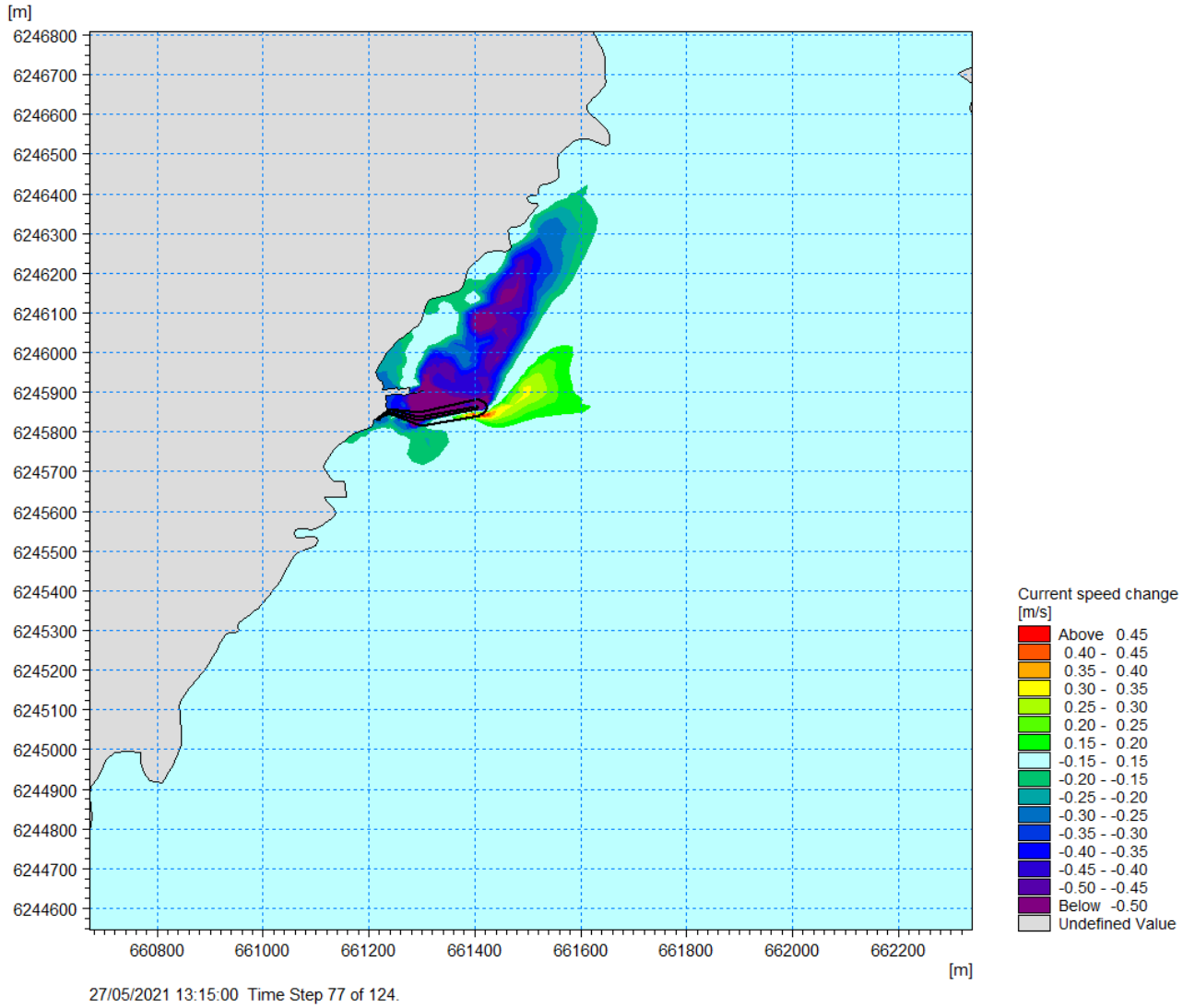


Figure 13-36 Comparison of baseline and post-construction littoral current 1 in 1 year storm from 240° - flood tide

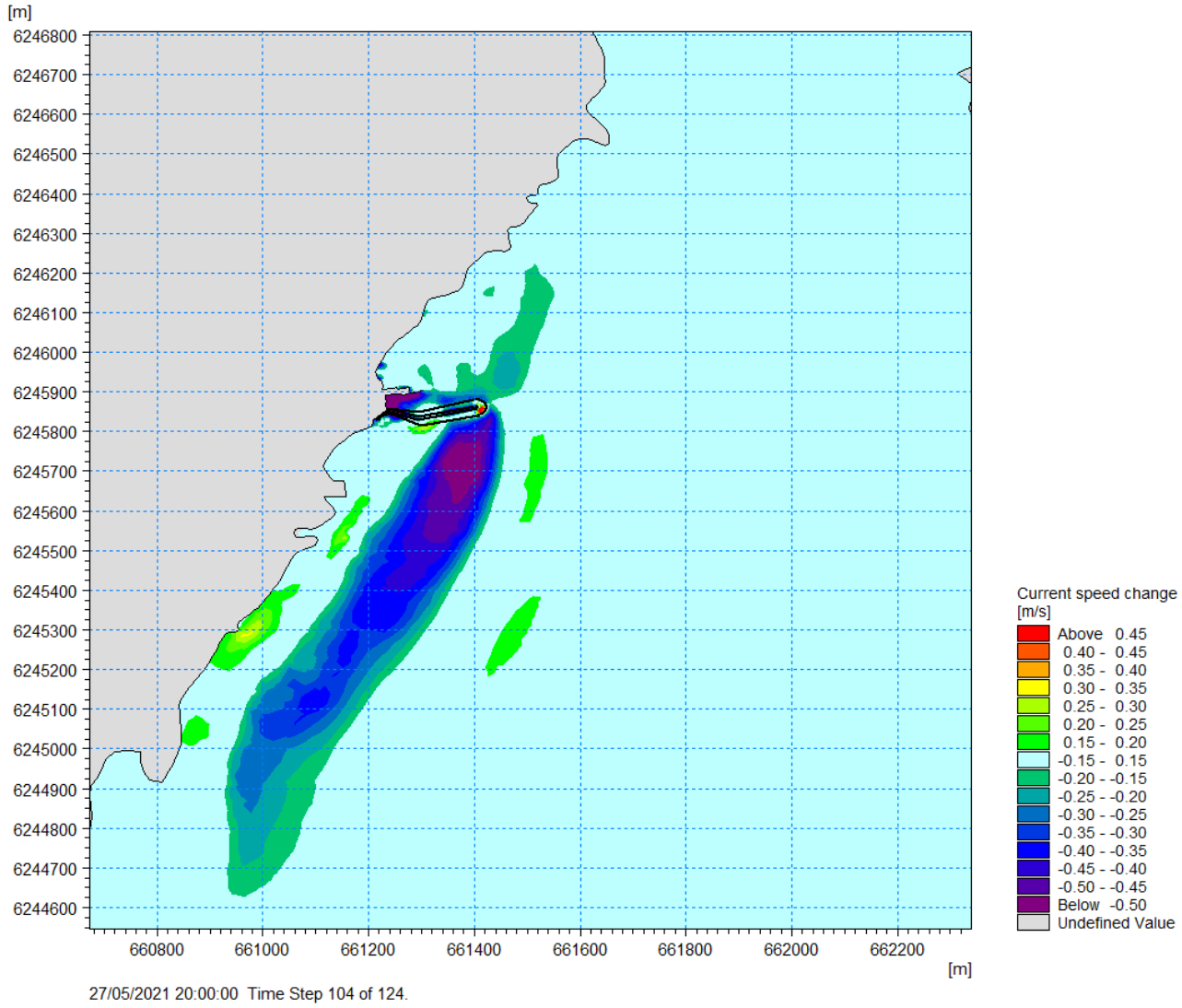


Figure 13-37 Comparison of baseline and post-construction littoral current 1 in 1 year storm from 240° - ebb tide

The potential for the greatest scour to occur around the ends of the proposed breakwater occur during flood tide when the greatest littoral current speeds occur due to the tidal flow and wave climate travelling in the same direction, from the south to the north of the Sound of Iona. The timestep in the modelling which yielded the greatest littoral current speeds around the breakwaters is included in the following figures. Figure 13-38 shows the maximum littoral current speeds in the vicinity of the Proposed Development for the post-construction scenario, the largest increase being located at the end of the breakwater. Figure 13-39 show the expected elevated littoral current speeds around the proposed Iona breakwater in more detail. The greatest scour current at the toe of the Iona breakwater is seen to have a current velocity of circa 1.5 m/s over the sea bed just clear of the breakwater rock armour slope.

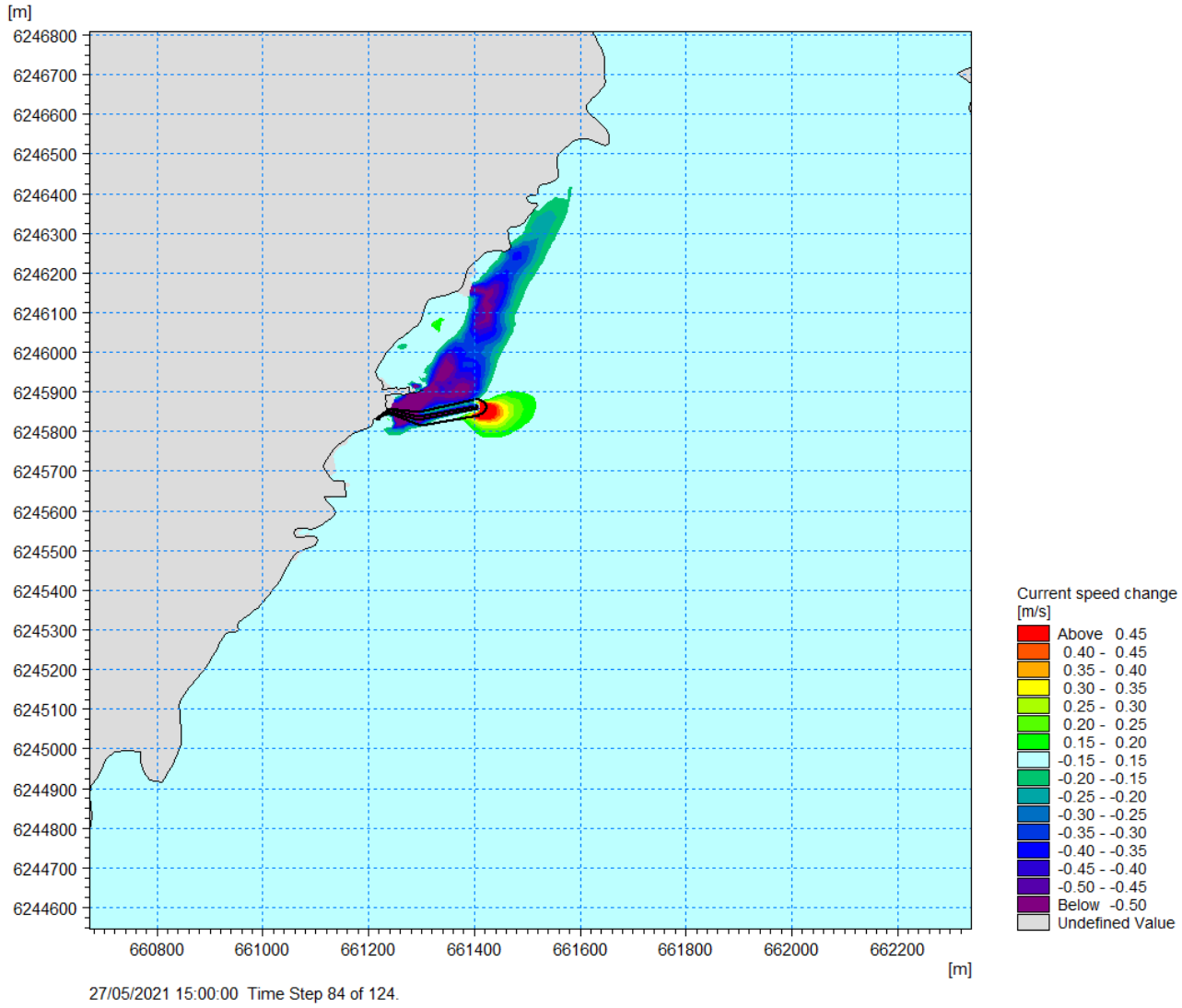


Figure 13-38 Post-construction Littoral current 1:1 year storm from 240° - maximum increase scour current at flood tide

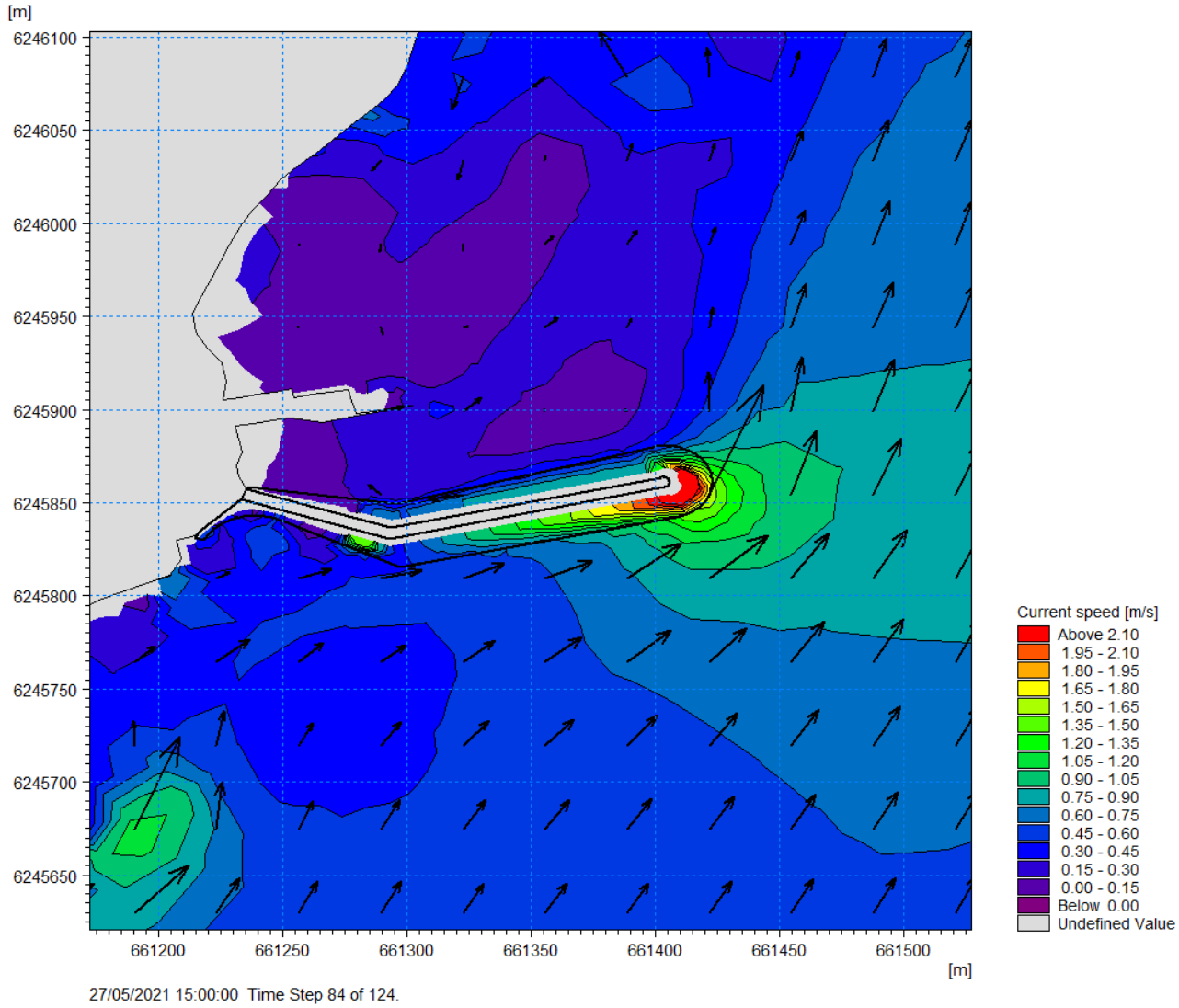


Figure 13-39 Post-construction Littoral current 1:1 year storm from 240° - maximum scour current velocity and direction at mid-flood spring tide at Iona Breakwater

13.4.2.4 Potential changes to the sediment transport regime

Due to the larger grain size evident from the sampling regime around the proposed breakwater (sands and gravels), there is limited potential for sediment transport around the breakwater. Any movement of sediment would likely occur during high energy storm events which allow larger sediment particles to be suspended. Due to the lower currents expected behind the breakwater, sediment disposition resulting from several high-energy events would be expected which would be mitigated by periodic dredging of the breakwater area in the future which is discussed further below.

Figure 13-40 and Figure 13-41 display the potential for sand transport during the mid-ebb and mid-flood tide around the proposed breakwater during a 1 in 1 year 240° storm. As expected, the suspended total load is expected to marginally increase around the breakwater during the flood tide, indicating the potential for erosion to occur during the storm. A slight decrease in sediment load rate is visible in the lee of the breakwater in both tides indicating sediment deposition is likely to occur in these locations, particular between the breakwater and the existing slipway. As the modelling represents a 1 in 1 year

storm, the sand transport during typical spring and neap tides is expected to be far less and would not have a significant impact.

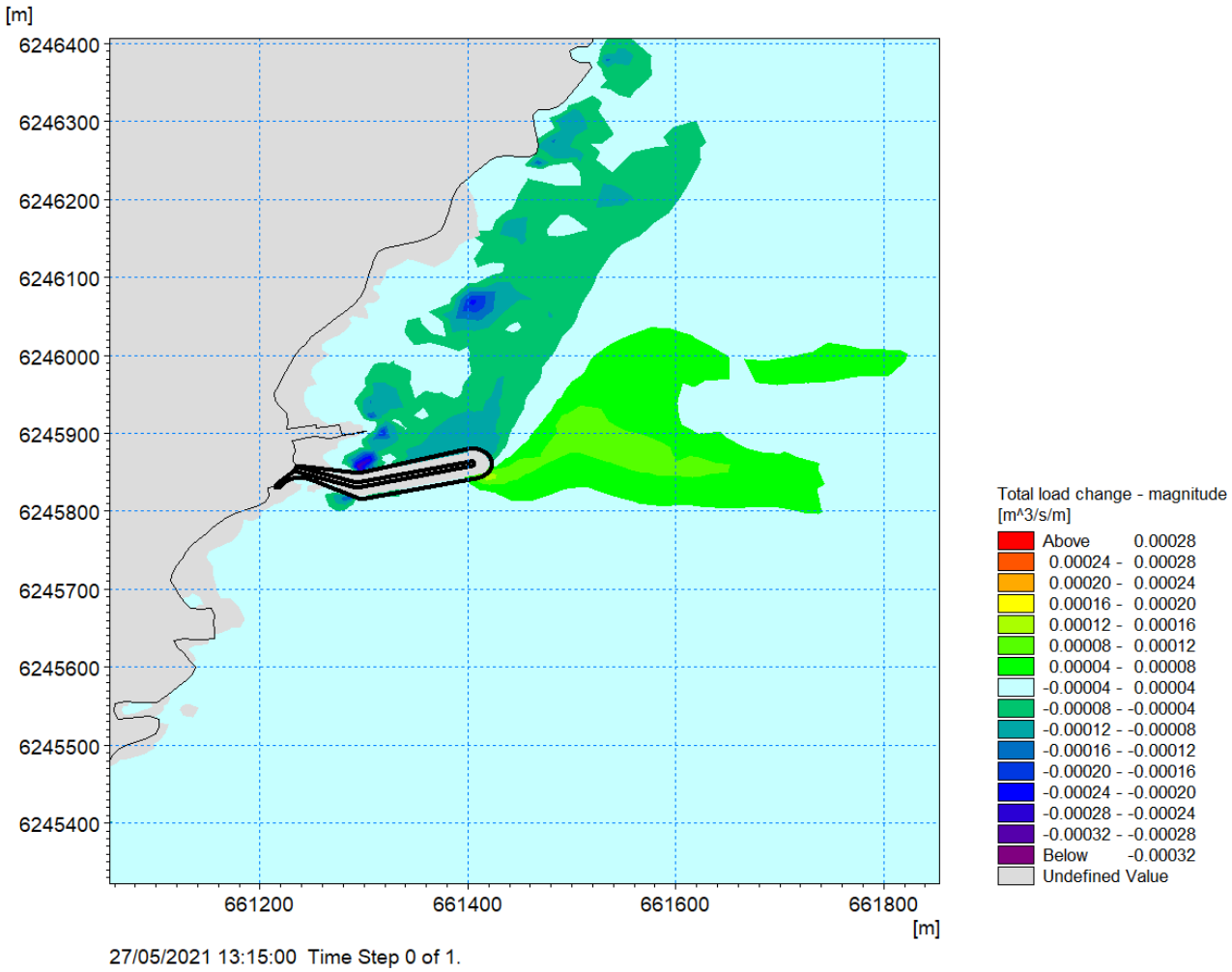


Figure 13-40 Comparison of baseline and post-construction sediment total load during a 1 in 1 year storm from 240° - flood tide

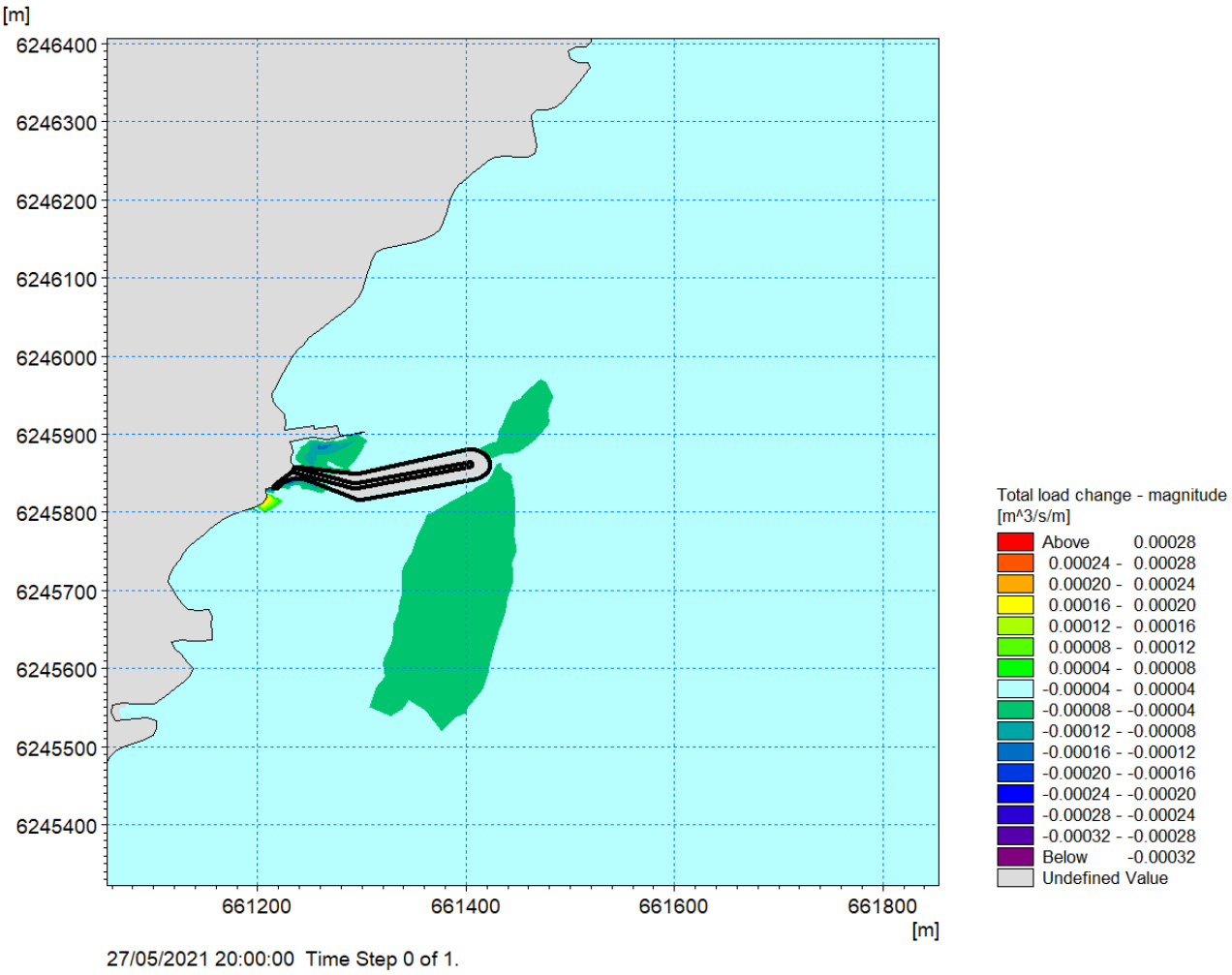


Figure 13-41 Comparison of baseline and post-construction sediment total load during a 1 in 1 year storm from 240° - ebb tide

As storm waves from the dominant south-westerly direction impact upon the proposed new breakwater at Iona, the effect of the structure is to diffract the waves around the end of the breakwater such that the waves in the lee of the structure are greatly reduced and bend around to come from an easterly direction. This effect is shown in Figure 13-42, taken from a Boussinesq wave disturbance model of a 1 in 1 year return period storm from 240º.

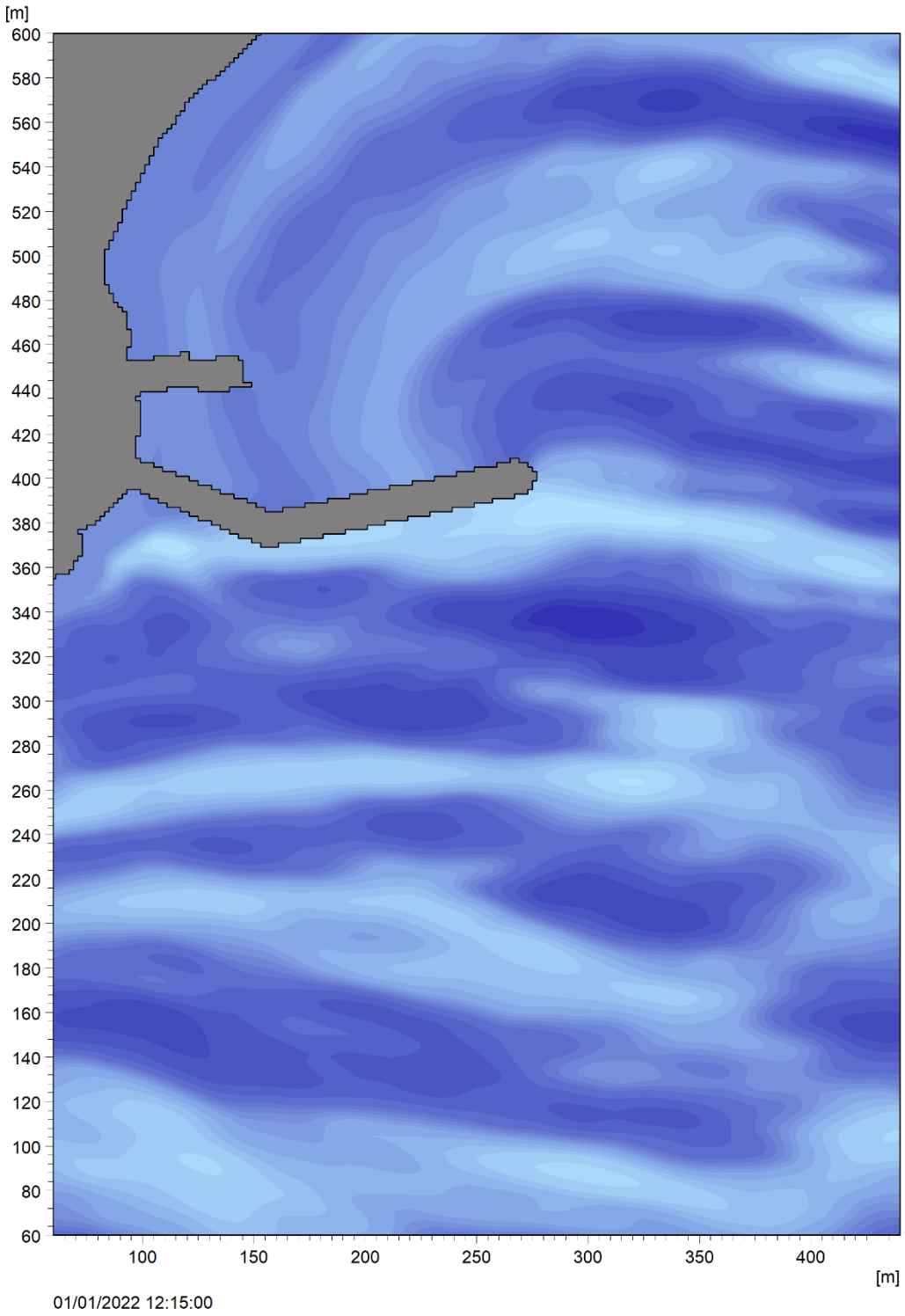


Figure 13-42 Typical wave disturbance patterns during 1 in 1 year return period storm from 240° at Iona

The effect of wave diffraction at the breakwater results in a steep gradient in the wave heights, and therefore in the wave energy, between the waves beyond the breakwater compared to those behind the breakwater. This energy difference results in a flow from the high energy area to the low energy

area which forms an anticlockwise eddy circulation in the lee of the breakwater as shown by the purple arrow in Figure 13-43.

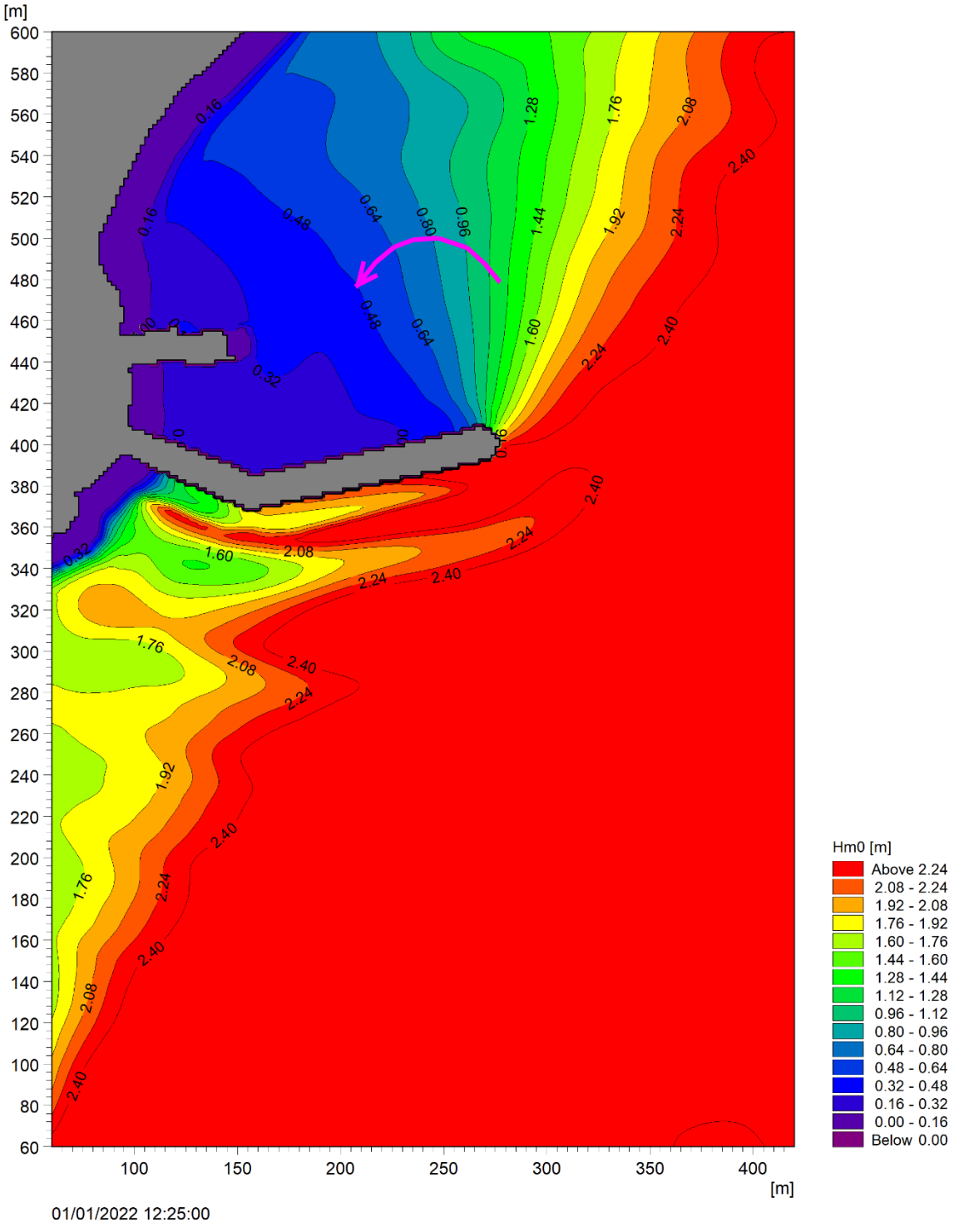


Figure 13-43 Storm wave height gradient will form an anticlockwise circulation behind the Iona breakwater

This anticlockwise eddy flow will result in sediment being carried into the lee of the breakwater which will tend to infill the proposed dredged pocket immediately to the east and northeast of the end of the

slipway. Thus, it is expected that regular maintenance dredging of this pocket will be required to keep the approach to the slipway to the design depth. This infilling material is expected to be sand and hence there will be no significant sediment plume resulting from the maintenance dredging of bed material carried into the dredged pocket.

13.5 Mitigation Measures

13.5.1 Construction Phase Mitigation Measures

As the impacts associated within the working area upon the coastal processes are expected to be negligible, no mitigation measures are proposed during capital dredging and disposal operations.

13.5.2 Operational Phase Mitigation Measures

Scour protection is proposed as part of the operational phase of the Proposed Development to mitigate the impact of scour around the toe of the breakwater during periods of maximum flood velocity which would be expected during a 1 in 1 year 240° storm event during the flood tide.

Maintenance dredging would be required after construction is completed. The frequency of maintenance dredging would be established as part of the construction contract following the construction of the breakwater. Maintenance of the breakwater would be required as rock armour would move/adjust for a period of time. The defect period is expected to be 104 weeks during which the breakwater would be monitored, and any movement recorded and reported. After this, the breakwaters would be inspected as part of the seabed bathymetric surveys regime.

13.6 Potential Cumulative Effects

In line with the scoping response received from MSS, the cumulative effects of the Proposed Development along with other developments were considered quantitively in a numerical model. The potential development at Fionnphort would be most relevant as it most likely has the greatest possibility of creating in-combination effects upon the coastal processes within the Sound of Iona when the two developments are in operation. The same factors previously considered in this chapter, are considered for both developments present in the Sound of Iona.

13.6.1 Tidal Regime within the Sound of Iona

The tidal regime was assessed within the Sound of Iona during the presence of both schemes. As demonstrated in Figure 13-44 and Figure 13-45, the effect of each scheme on the tide is predominantly localised to each development. The Iona breakwater has the greatest influence on current velocity, experiencing a larger decrease in velocity during the ebb and flood tide in the lee of the breakwater. A slight increase of the ebb and flood current within the Sound of Iona is present, up to 0.12 m/s, with the very centre of the Sound experiencing a smaller increase between 0 – 0.06 m/s, as a result of both developments. The effects associated with both developments on the tidal regime are deemed negligible due to the small changes in current velocities in the centre of the Sound of Iona.

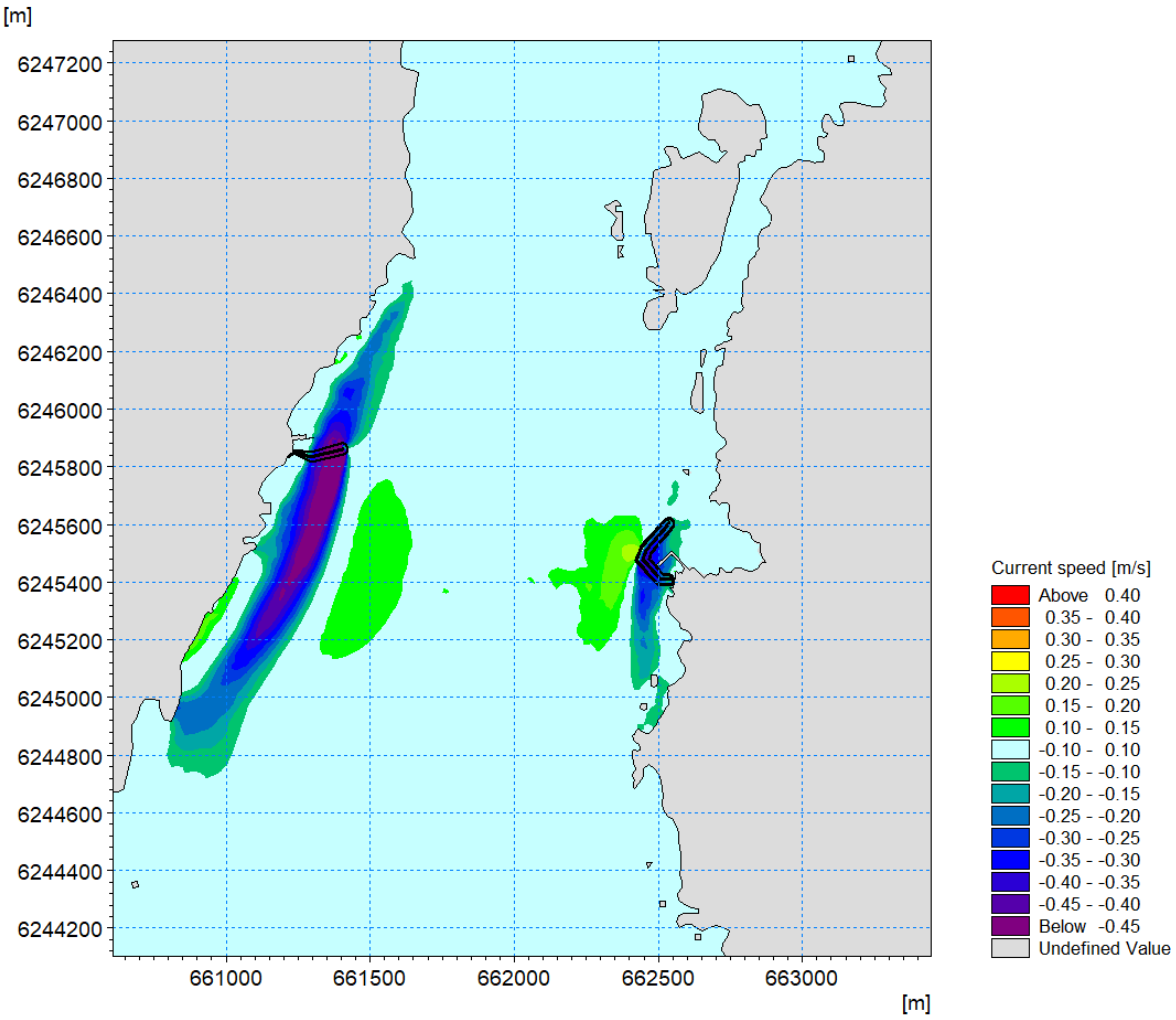


Figure 13-44 Difference in typical spring mid-ebb flow patterns as a result of the Proposed Developments at Iona and Fionnphort

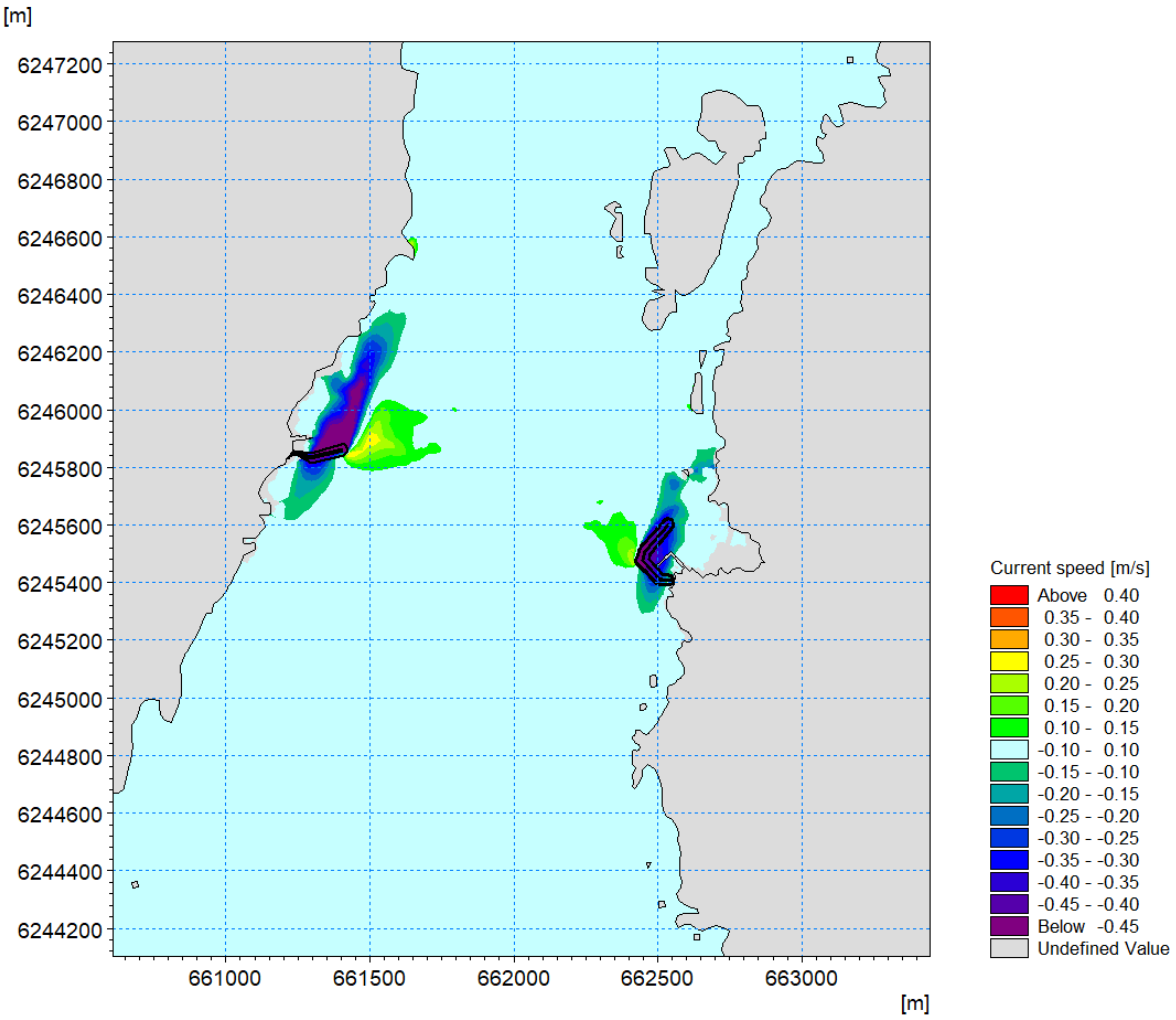


Figure 13-45 Difference in typical spring flood tidal flow patterns as a result of the Proposed Developments at Iona and Fionnphort

13.6.2 Wave climate within the Sound of Iona

As demonstrated in Figure 13-46, Figure 13-47 and Figure 13-48 below, both schemes reduce the significant wave height behind the respective breakwaters in storms with a direction of 240°. In terms of creating a cumulative effect on the wave climate, the reduction of wave height is localised to the breakwaters and no cumulative effect is expected resulting from the presence of both structures. The effects associated with both developments on the wave climate are deemed negligible due to the expected decreases behind the breakwaters only as per the design parameters for the Proposed Development.

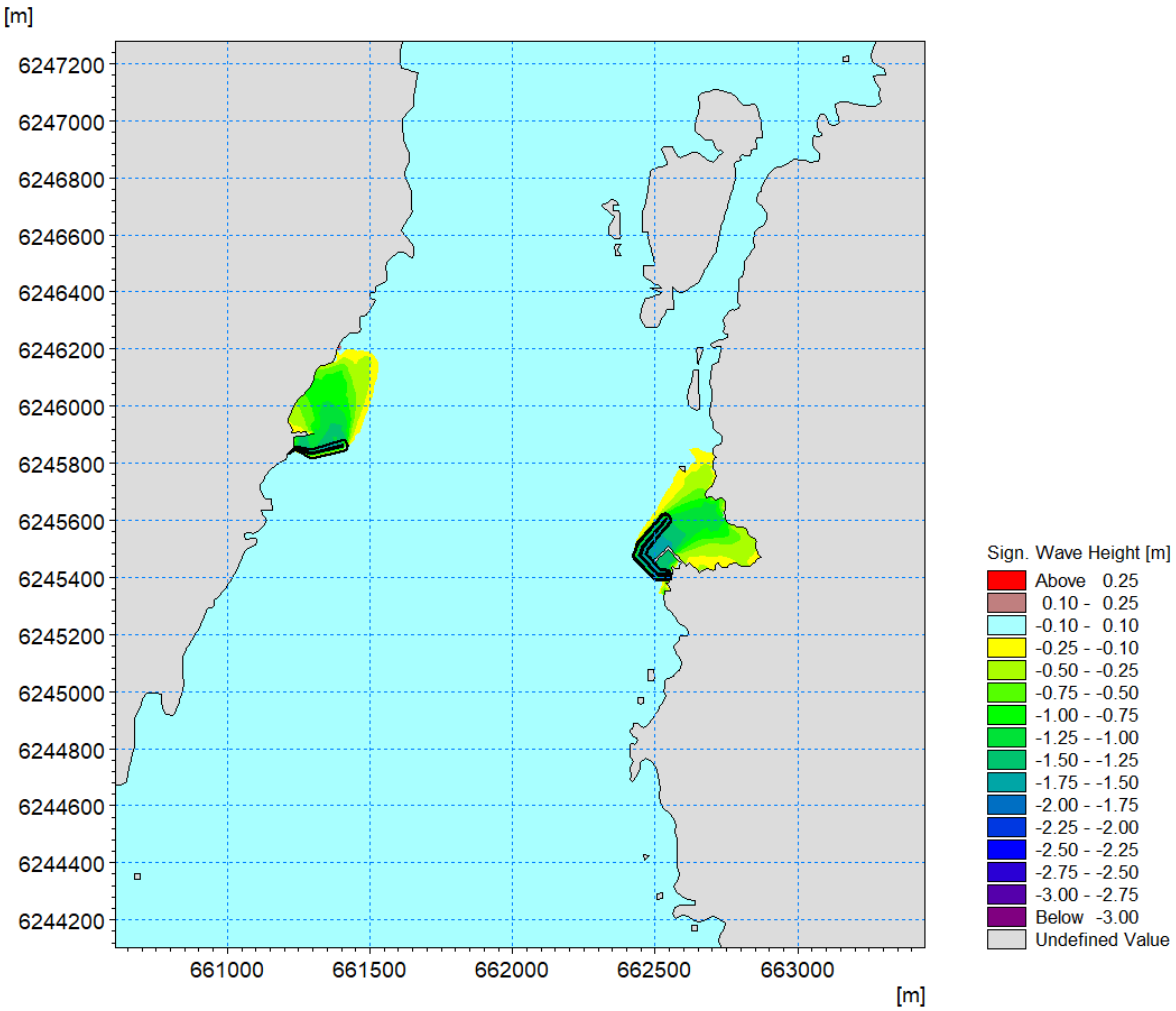


Figure 13-46 Difference in wave heights during a 1 in 1 year storm 240° HW

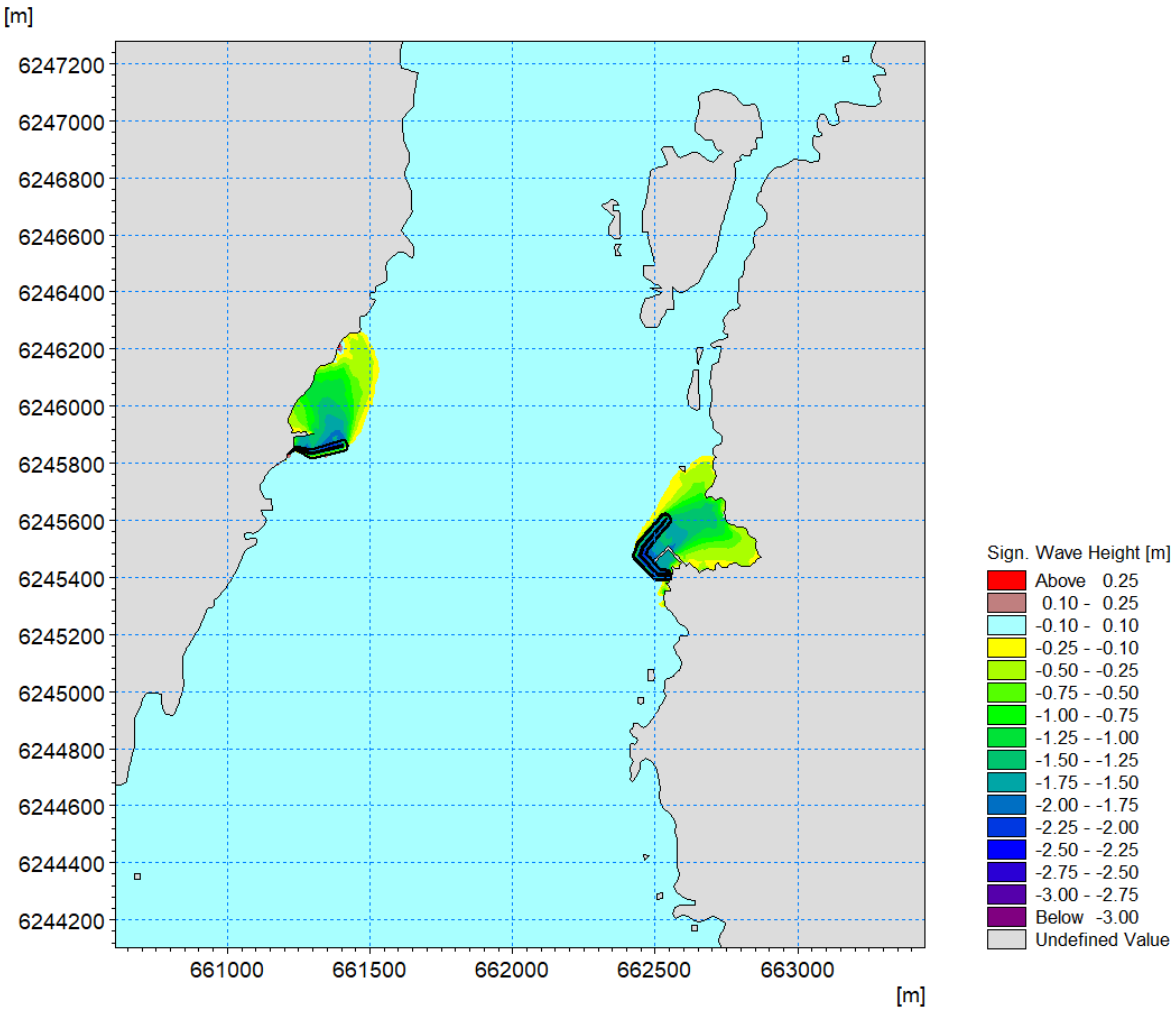


Figure 13-47 Difference in wave heights during a 1 in 50 year storm 240° HW

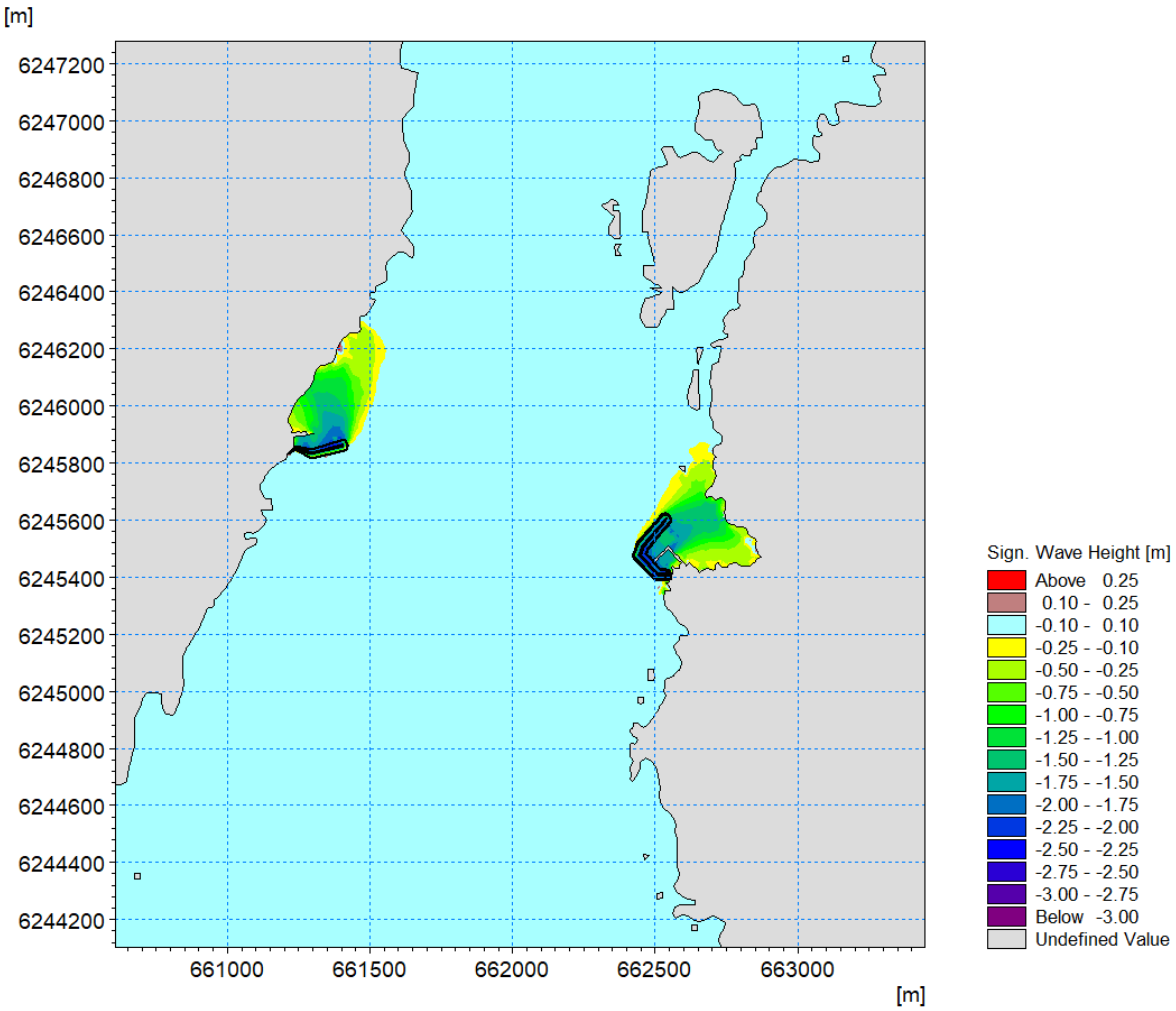


Figure 13-48 Difference in wave heights during a 1 in 200 year storm 240° HW

13.6.3 Littoral current within the Sound of Iona

The effect of the changing littoral currents within the Sound of Iona due to both developments is located primarily around the footprint of each development and does not result in any cumulative impact (Figure 13-49 and Figure 13-50). Within the centre of the Sound of Iona, there is a minor change in current velocities for both the ebb and flood tide during a 1 in 1-year storm, with an increase between 0 - 0.15 m/s. The effect associated with both developments on the littoral currents is deemed negligible due to the small changes in current velocities in the centre of the Sound of Iona.

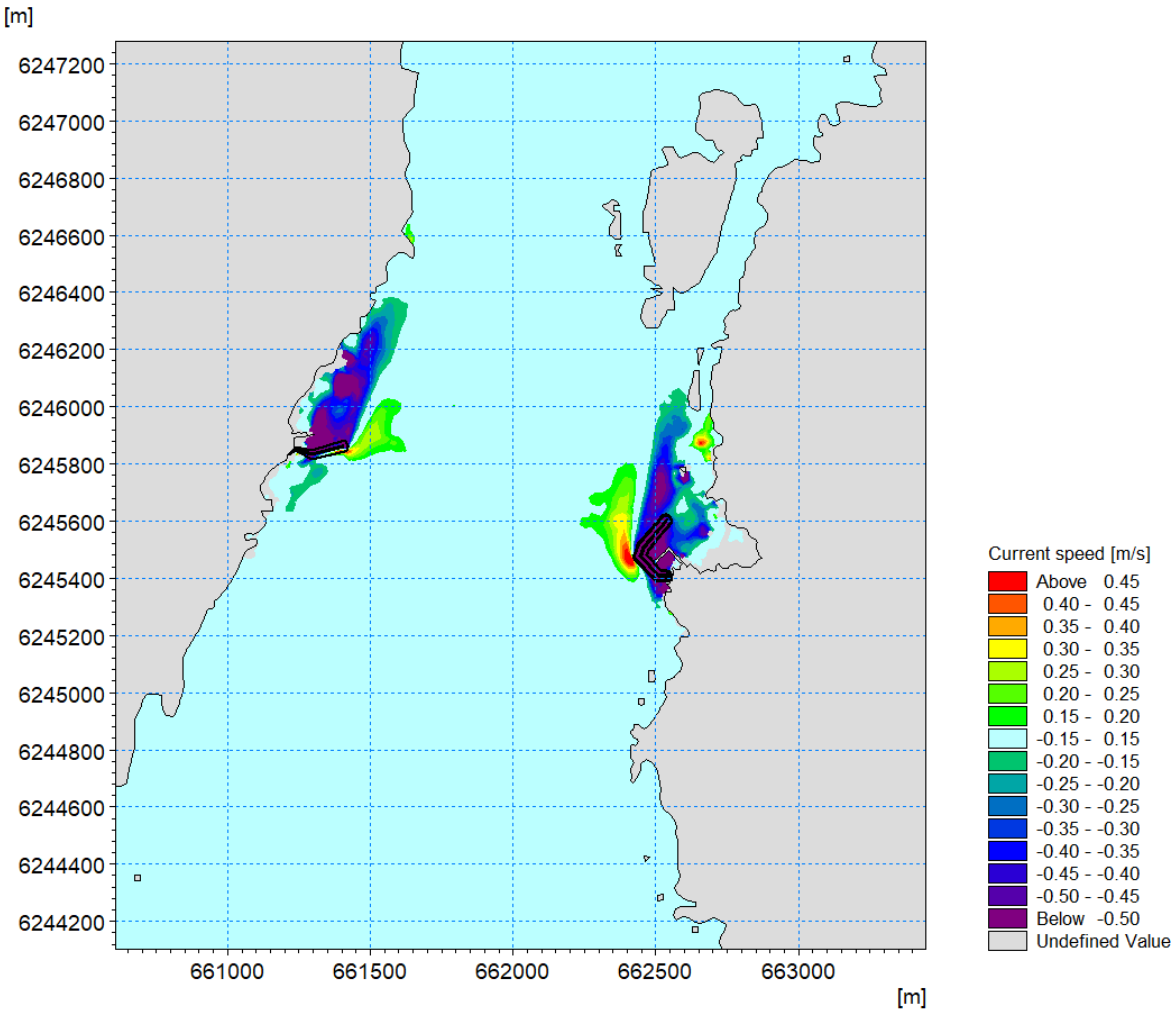


Figure 13-49 Change in littoral current 1 in 1 year storm from 240° - flood tide (post-construction minus baseline)

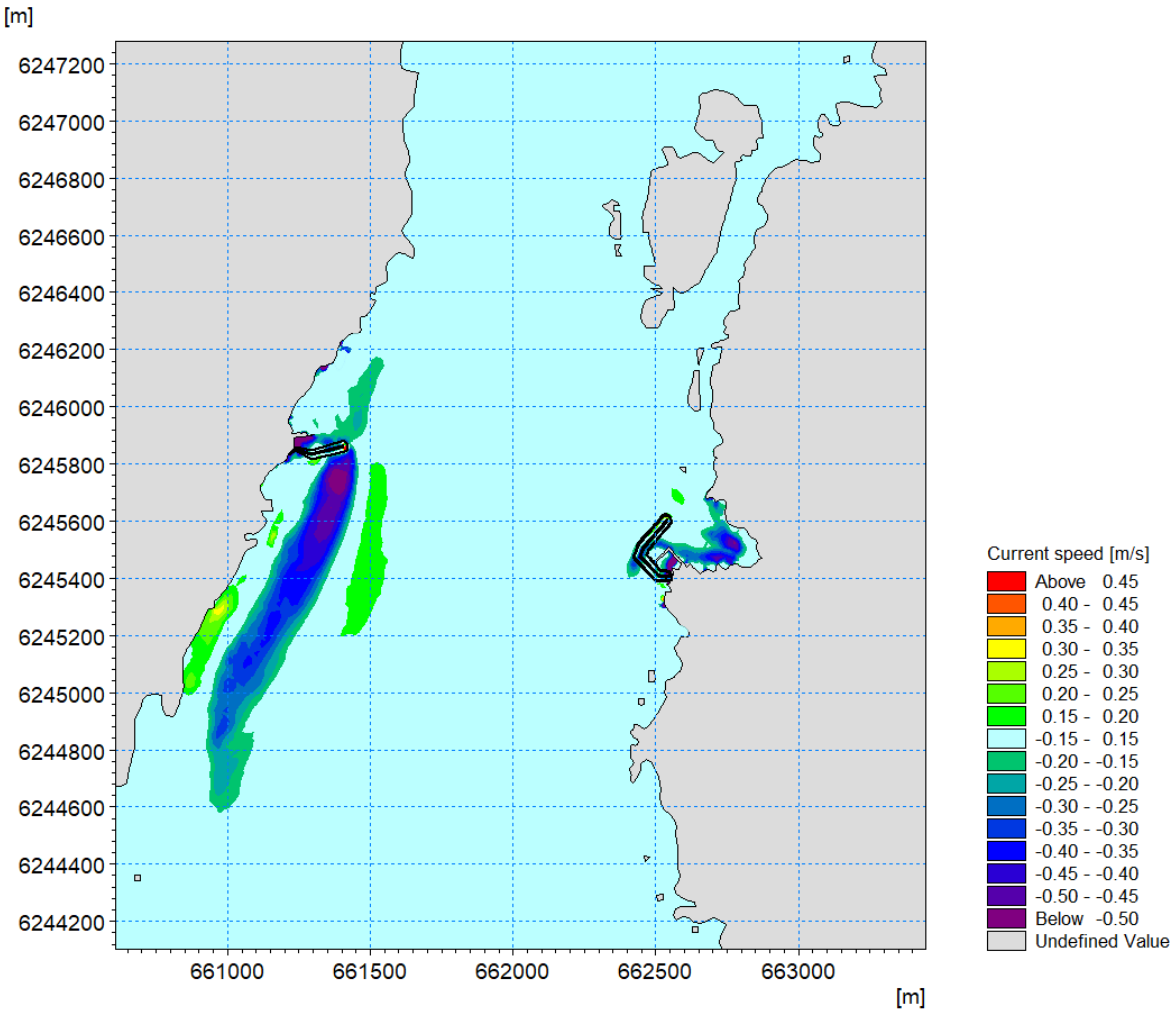


Figure 13-50 Change in littoral current 1 in 1 year storm from 240° - ebb tide (post-construction minus baseline)

13.6.4 Sedimentology within the Sound of Iona

As per the scoping response from Marine Scotland concerning the mobility of the sandwaves in the Sound of Iona due to both developments being operational, an assessment has been included in this section. In Section 13.3, it has already been established by sandwave analysis that there is limited movement of the sandwaves, which could be a result of the particle sizes and the net flow of the tidal current. As presented in Figure 13-51 and Figure 13-52, the change of the littoral current over the location of the sandwaves, when both developments are considered, is within a value of 0.15 m/s. As a result, the cumulative impact on the sedimentology within the Sound of Iona is expected to be negligible.

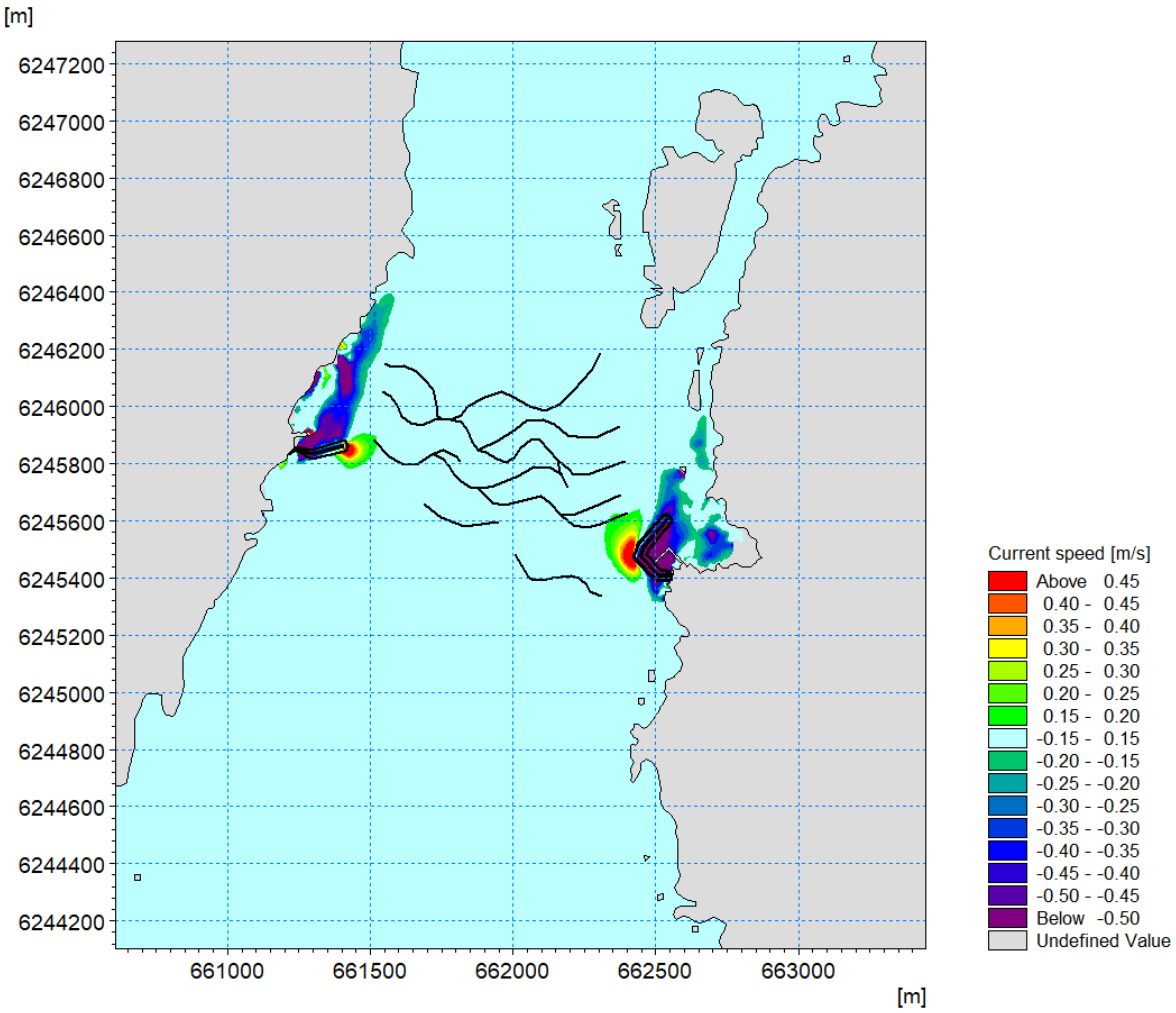


Figure 13-51 Post-construction Littoral current difference 1:1 year storm from 240° - mid- flood. The black lines show the location of sandwave crests within the Sound of Iona in 2022

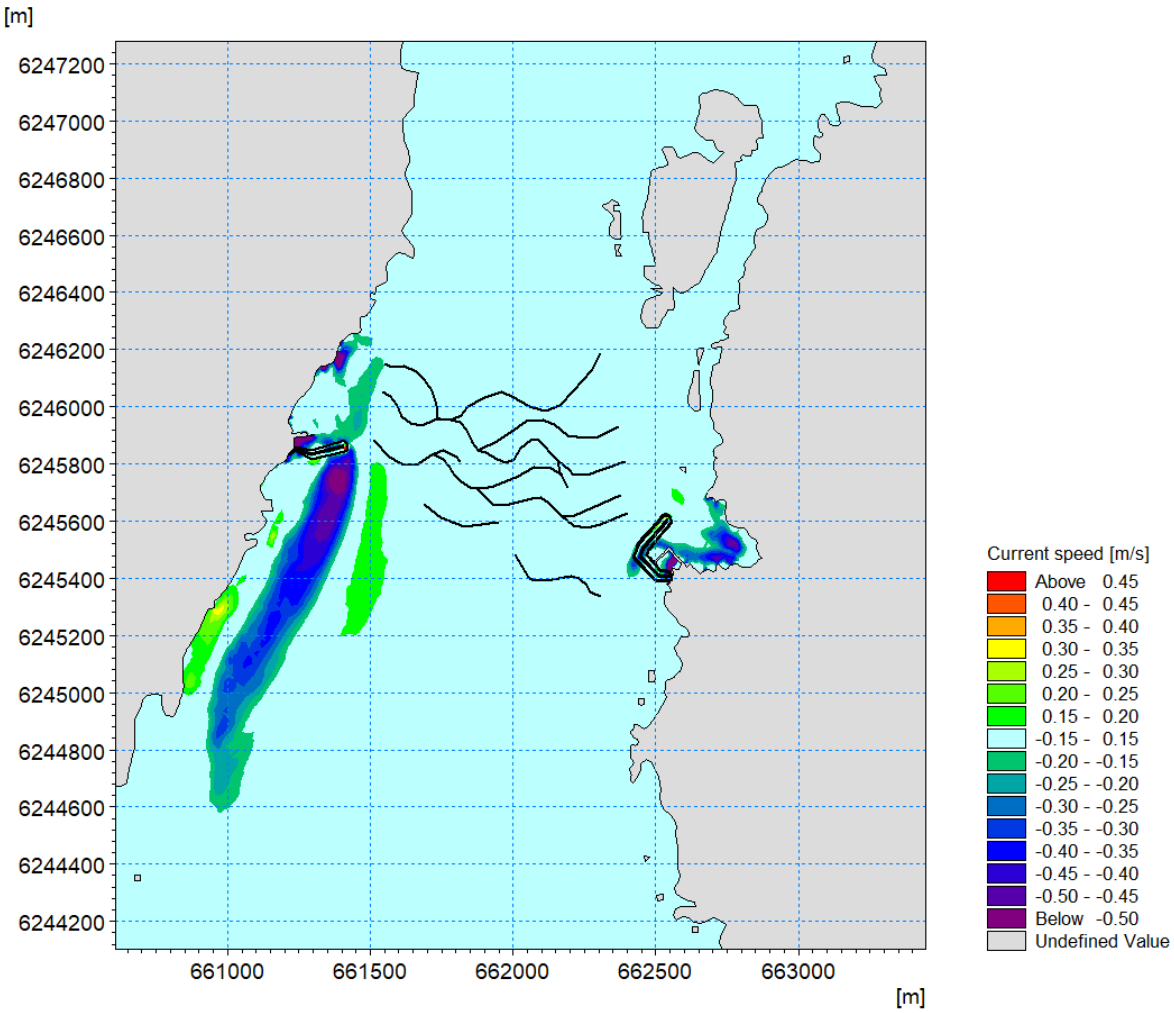


Figure 13-52 Post-construction Littoral current difference 1:1 year storm from 240° - mid- ebb. The black lines show the location of sandwave crests within the Sound of Iona in 2022

13.7 Residual Effects

In circumstances where the mitigation measures are fully implemented during the construction and operational phases as outlined in Section 13.5, the impact of the Proposed Development on the coastal processes within the Sound of Iona would consist of small-scale, low magnitude changes in the tidal regime, wave climate, littoral currents, and sedimentology.

The Proposed Development is therefore not expected to have a significant effect on coastal processes or make a significant change to the existing morphology.

13.8 Conclusions and Summary of Effects

The assessment of coastal processes was based on an extensive numerical modelling programme which was undertaken using RPS' in-house suite of MIKE coastal process modelling software developed by DHI. Baseline models were calibrated and verified against a range of project-specific hydrographic data and subsequently used to assess the construction and operational impacts of the Proposed Development.

The assessment concluded that dredging operations required for the Proposed Development would not result in any significant impact on water quality in terms of suspended sediments with mitigation measures in place. The assessment of disposal of dredge spoil arising from the Proposed Development at the potential licenced offshore disposal site concluded that the disposal operations would not likely result in any significant increases to the background level of suspended sediments and would not, therefore, impact the existing water quality in the area. This is due to the sediment particle size being large (sand and gravels) and settling quickly, rather than fine sediments such as silt and clay which would be suspended in the water column for a period of time and transported by tidal currents. Likewise, any overspill during the dredging of the slipway area would settle around the dredging area rather than being transported in the water column due to the larger particle sizes of sand and gravels established in recent sediment sampling.

The tidal regime in the Sound of Iona is predicted to remain substantially unchanged in the operational phase, and when considered in combination with the Fionnphort project. Minor local changes to the currents are expected around the breakwater such as an increase in the current velocity around the structure. The risk of impact to the existing tidal regime is, therefore, determined to be negligible and no mitigation is required.

The assessment of potential changes to the inshore wave climate found that the maximum change in wave heights in the Sound of Iona during storm events from the southwest did not exceed ±0.20m. These changes were confined primarily to the outer face of the breakwater, with a large decrease in wave height behind the breakwater as per the design specification. Minimal change in the wave height is observed elsewhere in the Sound of Iona from the Proposed Development, and when it is considered in combination with the Proposed Development at Fionnphort.

These changes to the wave climate behind the structure are considered significantly beneficial and would improve the safety and general operations of the ferry terminal at Iona. Furthermore, the change in risk of potential coastal flooding due to the Proposed Development at neighbouring sites is considered to be negligible and no mitigation is required.

As demonstrated in the assessment, the littoral currents within the Sound of Iona during a 240° 1 in 1-year event would not change by a significant amount. In terms of sediment transport, scour would be expected around the toe of the Iona breakwater during the flood tide during a 240° 1 in 1-year storm which requires scour protection with current velocities up to 1.5 m/s. As the change of littoral currents confined to the areas around Iona and Fionnphort, the cumulative effect upon the sandwaves within the Sound of Iona would be negligible. Periodic dredging may be required behind the Iona breakwater due to the reduced currents and accumulation of sediment over time as demonstrated by a reduction of total load in the sand transport modelling in Section 13.4.2.4.

On the basis that the appropriate mitigation measures are fully implemented during the construction and operational phases, the impact of the Proposed Development on coastal processes will be negligible.

14 POPULATION & HUMAN HEALTH

14.1 Introduction

This chapter outlines the population health assessment for the Proposed Development at the existing Iona Ferry Terminal, Iona, an island located west of Mull, on the west coast of Scotland.

Health is a *"state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity"* (World Health Organization, 1948). Mental health is a "*state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community"* (World Health Organization, 2007). 'Population health' refers to the health outcomes of a group of individuals, including the distribution of such outcomes within the group (Kindig and Stoddart, 2003).

Health and wellbeing are influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.

This chapter assess potential impacts and likely significant effects (both adverse and beneficial) on population health associated with the construction and operation of the Proposed Development. Table 14-1 summarises the issues covered in this assessment and explains why some health determinants have been scoped out.

Table 14-1: Scope of health determinants based on the Institute of Environmental Management and Assessment (IEMA) guidance

Categories	Wider determinant of health	Scoped in/ out	Rationale
Health related behaviours	physical activity	OUT	The potential for effects is covered under 'open space, leisure and play' below. This issue is not separately assessed.
	risk taking behaviour	OUT	Construction: Conduct of the construction workforce is not expected to affect their own or the communities risk taking behaviours. Operation: Improved access to Mull and the mainland plays a role in behavioural choices and markets, both in supporting healthy choices and unhealthy behaviours. However, the change in access is unlikely to drive a significant population level health effect.
	diet and nutrition	OUT	Construction phase: the construction works are not expected to affect food production or limit food delivery access for Iona. Operation: Food options are influenced by access to Mull and the mainland. However, the change in access is unlikely to drive a significant population level health effect.
Social environment	housing	OUT	Construction: It is assumed that the non-local workforce will be housed off the island and best practice for construction management (e.g., transport of the construction workforce) will be implemented via the Construction Environmental Management Plan (CEMP). There is no expectation of a scale of workforce accommodation on Iona that could affect population health. Operation: The improved harbour facilities support the viability of the population, including the importing of material required to support new housing. However, the change is unlikely to drive significant population level health effects.
	relocation	OUT	No relocations are involved. This issue is therefore scoped out.
	open space, leisure and play	IN	Construction phase: There is the potential for construction to affect sea users including sea kayakers, who may be pushed further into more dangerous waters due to the Proposed Development and sail boats which are used for

Categories	Wider determinant of health	Scoped in/ out	Rationale
			leisure boating in the Sound of Iona. (Scoping Opinion para 5.21.5). This has been assessed in Chapter 6 (Navigation & Safety), Section 6.4.1.10 and Section 6.4.2.2. The risk of sea users being pushed into dangerous waters resulting in collisions has been identified to be of minor adverse significance. The corresponding population health effects of construction on open space, leisure and play have been scoped in for further assessment in this chapter. Operation phase: The Proposed Development will improve breakwaters in the sound of Iona making the waters potentially safer for recreational use.
	transport modes, access and connections	IN	Construction: There is the potential for temporary disruption during construction. This is not expected to prevent access to or from the island, so is scoped out. Operation: The Scottish Ministers highlight the positive impacts the Proposed Works may have, including the reduction in weather related disruption to the ferry service (Scoping Opinion para 5.21.4). This issue is therefore scoped in to discuss improved and safer access to the island, and improved ability for lifeline services to travel to and from Iona.
	community safety	OUT	Construction: Injury risk will be avoided through clearly marked or fenced work areas. Standard good practice measures would be followed, set out in the contractors Construction Environmental Management Plan (CEMP) which will include Traffic & Navigation Management Plan (TNMP) and a Method Statement (MS). Operation: The finished works are expected to improve community safety, including relating to embarking and disembarking during poor weather conditions, and would improve safety for ferry boat operators. It is noted that the Scottish Ministers highlight the positive impacts the Proposed Development may have, including the reduced health and safety risk to ferry boat operators (Scoping Opinion para 5.21.4). Assessment of operational health and safety risks of users of ferry boats and the pier does not fall within the scope of this planning application and will be addressed by relevant contractors. Community safety related to recreation, leisure and play, as well as access to lifeline services, are addressed elsewhere in the scope of this report (refer to Chapter 6: Navigation & Safety).
	community identity, culture, resilience and influence	OUT	Construction: The presence of a construction workforce has the potential to influence cultural norms and traditions, including use of Gaelic. The construction works visual impacts also have the potential to influence community identity through built form. However, a non-resident workforce is not expected to be large in number or be accommodated on the island and the construction works are limited to approximately 52 weeks. Furthermore, the outcomes of the works are likely to be viewed positively by the community, limiting the potential for adverse effects. This issue is therefore scoped out. Operation: The Proposed Development helps to safeguard the way of life for the people of Iona through for example, increasing access to training, jobs and income from Iona This includes safeguarding community culture and identity. This issue is partly assessed within Chapter 16: Cultural Heritage and is also covered under the related issue of opportunities for 'education and training', and 'employment and income'.
	social participation, interaction and support	OUT	The planning process is an opportunity for community involvement in decision making. This issue is however scoped out as it is not expected to be of a scale that would lead to the potential for significant adverse effects. Notwithstanding this, the importance of community participation and channels of communication during construction is noted and should be a feature of the CEMP.
Economic environment	education and training	IN	Construction: The development may include some construction upskilling opportunities. Whilst they may be limited in number their impact within a small community may be disproportionally beneficial if they can be appropriately targeted to vulnerable groups. Operation: The improvements will facilitate access to and from the island, which includes access to education and training opportunities on Mull and the mainland. This is likely to be beneficial for the Iona community.
	employment and income	IN	Construction: In a small island context even a small amount of employment may be influential to the population's health. The potential for local direct or indirect employment is scoped in. It is also noted that disruption to important

Categories	Wider determinant of health	Scoped in/ out	Rationale
			income streams for the island may be detrimental, including associated tourism and fishing. This issue is also considered. Operation: Scoped in during operation to discuss improved access to and from Iona facilitating wider forms of economic development such as through tourism (indirect effect).
Bio-physical environment	climate change mitigation and adaptation	OUT	Construction: The Proposed Development involves materials with embodied carbon and emissions of climate altering pollutants. However, these are not of a scale to result in likely significant population health effects. Construction effects are scoped out. Operation: The Proposed Development has the potential to increase resilience to climate change for the community of Iona. This is likely to be associated with avoiding adverse effects associated with climate change, including resilience to extreme weather events and maintaining economically viable access to markets and resources. Changes in access to Iona are discussed as part of other issues in the scope. Climate change is therefore scoped out.
	air quality	OUT	Construction: the Iona Community Council (ICC) have raised concerns regarding the effects of dust and debris on the local population. Within the CEMP the Applicant has committed to include a dust and emissions management plan, the Scottish Ministers advise that this must address ICC's concerns and include assessment of the effects of dust and debris on the local population as well as mitigation that will minimise the impacts. (Scoping Opinion para 5.21.3). Given this and noting that traffic via the road network will be minimal, this issue is therefore scoped out. Operation: as detailed in the EIA Scoping Report, the assessment of operational air quality impacts has been scoped out of the EIA, and therefore no further population and health assessment is considered necessary.
	water quality or availability	OUT	Based on the construction and operation activities described in Chapter 3 (Project Description), the Proposed Development is not anticipated to impact water quality during construction and operation. In addition, this is assessed in detail in Chapter 11. This issue is therefore scoped out.
	land quality	OUT	Based on the construction and operation activities described in Chapter 3 (Project Description), the Proposed Development is not anticipated to impact land quality during construction and operation. This issue is therefore scoped out.
	noise and vibration	IN	Construction: construction activities have the potential to result in noise nuisance, both during daytime and night-time, with associated health effects, and is therefore scoped in. Operation: As stated in Chapter 10 (Noise & Vibration) of the EIAR, assessment of operational noise impacts is scoped out due to there being no new noise sources that are likely to generate perceptible noise levels during operation. Assessment of health effects from operational noise is therefore scoped out.
	radiation	OUT	Based on the construction and operation activities described in Chapter 3 (Project Description), the Proposed Development is not anticipated to change risk of radiation. This issue is therefore scoped out.
Institutional and built environment	health and social care services	OUT	Construction: It is assumed that the non-local workforce will be housed off the island and will access healthcare and social services within their local area. It is therefore not expected that there would be any change in the provision or access of health and social services. Construction effects are therefore scoped out. Operation: The Scottish Ministers highlight the positive impacts the Proposed Development may have. These include potential benefits for services such as medical supplies (Scoping Opinion para 5.21.4). Beneficial changes to transport and access of health care goods and services are discussed under "transport modes and access". Therefore, a separate assessment is not considered necessary.
	built environment	OUT	The Proposed Development provides important new harbour infrastructure for the community of Iona. This infrastructure is likely to indirectly support a wider range of determinants of health as discussed above. This issue is not separately assessed.

Categories	Wider determinant of health	Scoped in/ out	Rationale
	wider societal infrastructure and resources	OUT	The Proposed Development will support climate change adaptation. This is discussed under the issues discussed above. This issue is not separately assessed.

14.2 Assessment Methodology

14.2.1 Legislation, Policy and Guidance

14.2.1.1 Legislation

The following legislation is relevant to the assessment of the effects on human health:

- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 201 – sets the requirement to consider the likely significant direct and indirect effects on human health.
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations") – sets the requirement to consider the likely significant direct and indirect effects on human health.
- Islands (Scotland) Act 2018 – sets out the requirements for National Islands Plan to include effects on human health.
- Health and Safety at Work etc. Act 1974 – primary piece of legislation covering occupational health and safety in Great Britain.

14.2.1.2 Policy

The National Islands Plan (December 2019) works in conjunction with The Islands (Scotland) Act 2018. The Plan provides a framework for action in order to meaningfully improve outcomes for island communities. The Plan has a duration of five years (2019-2024) and includes 13 Strategic Objectives. These objectives are underpinned by four key values: fairness, integration, environmental protection (green) and inclusiveness. The Strategic Objective related to health is Strategic Objective 7 Health and Social Care and Wellbeing. To improve and promote health and wellbeing, the objective states:

- Work with NHS Boards, Local Authorities and health and Social Care partnerships to ensure there is fair, accessible health and social care for those on the islands.
- Identify and promote good practice, especially as regards the improvement of services in islands and other remote areas.
- Ensure that health, social care and wellbeing services are available through the medium of Gaelic to support Gaelic speaking island communities
- Work with partners to consider a range of options to ensure that adequate mental health care is available, whilst taking into consideration the uniqueness of our island communities.

- Work with partners to eliminate unlawful discrimination, harassment and victimisation and take steps to assist with promoting equality and meeting people's different needs.

There is also wider Scottish policy that relates to health (Table 14-2):

Table 14-2: Health Policy

Policy referencing health	Description of current policies
National Planning Framework 3	Scottish Government's Strategy for Scotland's long term spatial development
Scottish Planning Policy	Health is mentioned numerous times throughout all Subject Policies
Cleaner Air for Scotland 2: Towards a better place for everyone	*"Human health improvements are not related solely to direct reductions in air pollution. Policies that improve air quality can potentially have multiple co-benefits for population health, for addressing inequality and for mitigating and adapting to climate change. A prime example is policy to promote active travel. Walking, wheeling and cycling increase physical activity, significantly reduce cardiovascular incidence and mortality, and have been shown to reduce all-cause mortality, even after controlling for other physical activity."*

14.2.1.3 Guidance

The following guidance (Table 14-3) is relevant to the assessment of the effects on human health:

Table 14-3: Health Guidance

Health Guidance	Description
Scottish Health and Inequality Impact Assessment Network (SHIIAN): Health Impact Assessment Guidance for Practitioners (August 2016)	Practicable guide for health impact assessment (HIA). It is intended primarily for people working in Scotland and identifies relevant Scottish resources.
Institute of Environmental Management and Assessment (IEMA) 2022 guidance on health in EIA series, effective scoping *Invalid source specified.* ***and determining significance*** *Invalid source specified.**.***	Practitioner guidance on the coverage of human health in EIA for England, Wales, Scotland, Northern Ireland and the Republic of Ireland. This includes methods for determining population health sensitivity, magnitude and significance. This is the key methods citation.
International Association for Impact Assessment (IAIA) and European Public Health Association. A reference paper on addressing Human Health in EIA *Invalid source specified.**, and academic discussion of the same*** *Invalid source specified.**.***	The publication explains EIA for public health stakeholders and sets out transparent assessment approaches.
International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles, 2021*Invalid source specified.**.***	Confirms the relationship between HIA and EIA. Confirms the application of HIA principles when undertaking health in EIA.

14.2.2 Study Area

The following study areas are used in the assessment:

- The ‘site-specific’ study area is the intermediate zone[26] of Mull, Iona, Coll and Tiree.
- The ‘local’ study area is the local council area of Argyll and Bute.
- The ‘national’ area is Scotland (and beyond for climate related effects).

As study areas do not necessarily define the boundaries of potential health effects, particularly mental health effects, the health chapter uses study areas to broadly define representative population groups, including in relation to sensitivity, rather than to set boundaries on the extent of potential effects.

The health assessment has regard to the zones of influence defined by other EIAR chapters. Those chapters have provided data inputs to the health assessment. Those zones of influence are relevant and inform the health chapter’s consideration of effect magnitude.

14.2.3 Baseline Methodology

Data from other EIAR chapters have been used to inform the population and health assessment. Data informs the health assessment by identifying potential receptors and community assets for these disciplines, such as schools, residential properties, walking and cycling routes, as well as tourism and recreational amenities. No bespoke baseline population or human health surveys have been undertaken as part of the assessment. The population and health analysis has been informed by project wide consultation.

The following data sources have informed the health baseline assessment:

- Public Health Scotland “ScotPHO” profile tool[27];
- National Records of Scotland mid-year population estimates[28];
- Scottish Index of Multiple Deprivation (SIMD) 2020[29]; and
- Google Earth Pro 2021 aerial and street level photography review.

14.2.4 Assessment Criteria and Assignment of Significance

14.2.4.1 General approach

This section sets out the methods for assessment of any likely significant population health effects of the Proposed Development.

The generic project-wide approach to the assessment methodology is set out in Chapter 1 of the EIAR. This section sets how the generic approach is refined to address the specific needs of the EIA health assessment.

[26] Intermediate zones are a statistical geography that sit between data zones and local authorities, created for use with the Scottish Neighbourhood Statistics (SNS) programme and the wider public sector.

[27] https://www.scotpho.org.uk/

[28] https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates

[29] https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/

Namely criteria for sensitivity, magnitude and significance that inform a professional judgment and reasoned conclusion as to the public health implications of the Proposed Development.

The methodology outlined in this section follows the IEMA 2022 guidance, which sets out best practice for the consideration of health in EIA. The IEMA guidance was informed by the international consensus publication between impact assessment and public health practitioners, the IAIA/EUPHA Reference Paper 2020.

Where significant adverse population health effects are identified, including for vulnerable groups, then mitigation has been proposed to avoid or reduce the effects. Mitigation is secured as part of the Proposed Development design or development consent. In line with good practice the Proposed Development takes a proportionate approach to identifying opportunities to enhance beneficial population health effects, including for vulnerable groups.

Cumulative effects are considered, including inter-related effects of the Proposed Development. This analysis considers how the same geographic or vulnerable group populations may be affected by more than one change in relevant health determinants, for example the combined effects of changes in air quality and noise on population health outcomes.

Where proportionate, the need for monitoring has been considered, including relevant governance.

14.2.4.2 Determinants of health, risk factors and health outcomes

Health and wellbeing are influenced by a range of factors, termed the ‘wider determinants of health’. Determinants of health span environmental, social, behavioural, economic and institutional factors. Determinants therefore reflect a mix of influences from society and environment on population and individual health.

Impacts of the Proposed Development that result in a change in determinants have the potential to cause beneficial or adverse effects on health, either directly or indirectly. The degree to which these determinants influence health varies, given the degree of personal choice, location, mobility and exposure.

A change in a determinant of health does not equate directly to a change in population health. Rather the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Development. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

Typically, the change in a risk factor may need to be large, sustained and widespread within a population for there to be a significant influence on public health outcomes.

14.2.4.3 Population health approach and vulnerable groups

In line with guidance a population health approach has been taken (see Table 14-1). This is informed by discussion of receptors within the other technical chapters of the EIAR.

For each determinant of health, the health chapter identifies relevant inequalities through consideration of the differential effect to the ‘general population’ of the relevant study area and effects to the ‘vulnerable population

group' of that study area. The vulnerable population group is comprised of relevant sensitivities for that determinant of health.

The methods draw on the list of vulnerable population groups set out in the Institute of Public Health (IPH) 2021 guidance Part 3, Table 09. The following six broad population groups are used to inform a consistent narrative on potential health inequalities across the assessment; people falling into more than one group may be especially sensitive:

1. Young age: Children and young people (including pregnant women and unborn children).
2. Old age: Older people (particularly frail elderly).
3. Low income: People on low income, who are economically inactive or unemployed/workless.
4. Poor health: People with existing poor health; those with existing long-term physical or mental health conditions or disability that substantially affects their ability to carry out normal day-to-day activities.
5. Social disadvantage: People who suffer discrimination or other social disadvantage, including relevant protected characteristics or groups who may experience low social status or social isolation for other reasons.
6. Access and geographical factors: People experiencing barriers in access to services, amenities and facilities and people living in areas known to exhibit high deprivation or poor economic and/or health indicators. Island communities are acknowledged to face particular barriers.

The following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction, operation and decommissioning.

- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).
- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.

- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Proposed Development. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources (e.g., the road network).
- The general population includes the proportion of the community whose outlook on the Proposed Development includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Proposed Development.

14.2.4.4 Temporal Scope

The temporal scope of the assessment is consistent with the period over which the Proposed Development will be carried out and therefore covers the construction, operational and decommissioning periods.

Where relevant EIAR chapters defined specific assessment years, the health chapter assessment used those same assessment years.

The temporal scope of the health chapter assessment used the following summary terms:

- 'Very short term' relates to effects measured in hours, days or weeks (e.g., effects associated with changes in exposure during weather conditions);
- 'Short term' relates to effects measured in months (up to 12 months duration) (e.g., activities near particular dwellings within the construction stage);
- 'Medium term' relates to effects of more than one year and up to five years (e.g., the entire construction stage); and
- 'Long term' relates to effects of more than five years (e.g., the long-term effects on population and health from the Proposed Development).

14.2.4.5 Determining Effect Significance

The assessment of EIA health significance is an informed expert judgement about what is important, desirable or acceptable for public health with regards to changes triggered by the Proposed Development. These judgements are: value dependant (underpinned by scientific data, but also informed by professional perspectives); and are context-dependent (judgements reflect relevant social, economic and political factors for the population)[30]

The determination of significance has two stages:

- Firstly, the sensitivity of the receptor affected, and the magnitude of the effect upon it are characterised. This establishes whether there is a relevant population and a relevant change to consider; and

[30] European Commission. 2017. Environmental Impact Assessment of Projects: Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU). European Union. Luxembourg. http://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

- Secondly, a professional judgement is made as to whether the expected change in a population's health outcomes would be significant in public health terms. This judgement is explained using an evidence-based narrative setting out reasoned conclusions.

Table 14-4, Table 14-5, Table 14-6 and Table 14-7 together summarise the assessment methodology that has been adopted for health sensitivity, magnitude, magnitude vs sensitivity, and significance, respectively. Terms in bold within these tables show indicative qualitative terminologies to indicate levels (e.g., high, medium, low or negligible) within the criteria described by the IPH 2021 guidance. This approach shows how the general EIA methods of using sensitivity and magnitude to inform a judgement of significance, are applied for human health. The approach uses professional judgement, drawing on consistent and transparent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for public health in terms of a change in population health outcomes.

The EIA population health assessment uses qualitative analysis following the IPH 2021 guidance approach. This draws on qualitative and quantitative inputs from other EIA topic chapters. This is considered the most appropriate methodology for assessing wider determinants of health proportionately, consistently and transparently.

Table 14-4: Health sensitivity methodology criteria

Category/ Score	**Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories). The narrative explains that the population or sub-population's sensitivity is driven by:**
High	**high** levels of deprivation (including pockets of deprivation); **reliance** on resources shared (between the population and the project); existing **wide** inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or **concern**; people who are **prevented** from undertaking daily activities; **dependants**; people with **very poor** health status; and/or people with a **very low** capacity to adapt.
Medium	**moderate** levels of deprivation; **few alternatives** to shared resources; existing **widening** inequalities between the most and least healthy; a community whose outlook is predominantly **uncertainty** with some concern; people who are **highly limited** from undertaking daily activities; people providing or requiring **a lot of care**; people with **poor** health status; and/or people with a **limited** capacity to adapt.
Low	**low** levels of deprivation; **many alternatives** to shared resources; existing **narrowing** inequalities between the most and least healthy; a community whose outlook is predominantly **ambivalence** with some concern; people who are **slightly limited** from undertaking daily activities; people providing or requiring **some care**; people with **fair** health status; and/or people with a **high** capacity to adapt.
Very low	**very low** levels of deprivation; **no** shared resources; existing **narrow** inequalities between the most and least healthy; a community whose outlook is predominantly **support** with some concern; people who are **not limited** from undertaking daily activities; people who are independent (not a carer or dependant); people with **good** health status; and/or people with a **very high** capacity to adapt.

Table 14-5: Health magnitude methodology criteria

Category/ Score	**Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories). The narrative explains that the project change has:**
High	**High** exposure or scale; **long-term** duration; **continuous** frequency; severity predominantly related to **mortality** or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; **majority** of population affected; **permanent** change; **substantial** service quality implications.
Medium	**Low** exposure or **medium** scale; **medium-term** duration; **frequent** events; severity predominantly related to moderate changes in **morbidity** or major change in quality-of-life; **large minority** of population affected; **gradual** reversal; **small** service quality implications.

Low	**Very low** exposure or **small** scale; **short-term** duration; **occasional** events; severity predominantly related to minor change in **morbidity** or moderate change in quality-of-life; **small minority** of population affected; **rapid** reversal; **slight** service quality implications.
Negligible	**Negligible** exposure or scale; **very short-term** duration; **one-off** frequency; severity predominantly relates to a minor change in **quality-of-life**; very few people affected; immediate reversal once activity complete; no service quality implication.

14.2.4.6 Significance of Effects

The assessment of significance is a professional judgement. That judgment is informed by the indicative matrix of sensitivity and magnitude set out in Table 14-6. Table 14-7 provides additional explanation of how contextual evidence also informs the significance conclusion and what the conclusion means for public health.

Table 14-6: Assessment Matrix (indicative)

	Sensitivity			
Magnitude of Impact	**High**	**Medium**	**Low**	**Very low**
High	Major	Moderate or major	Moderate or minor	Minor or negligible
Medium	Moderate or major	Moderate	Minor	Minor or negligible
Low	Moderate or minor	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or negligible	Negligible	Negligible

Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.

Moderate and major effects are considered significant in terms of the EIA Regulations.

Table 14-7: Health significance methodology criteria

Category/ Score	**Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories)**
Major	The narrative explains that this is significant for public health because (most relevant statements used as appropriate): • Changes, due to the Proposed Development, have a **substantial** effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by **consensus** in consultation themes among stakeholders, particularly public health stakeholders. • Change, due to the Proposed Development, could result in a regulatory threshold or standard being **crossed** (if applicable). • There is likely to be a **substantial** change in the health baseline of the population, including as evidenced by the scientific literature showing there is a **causal** relationship between changes that would result from the Proposed Development and changes to health outcomes. • Health priorities for the relevant study area are of **specific** relevance to the determinant of health or population group affected by the Proposed Development.
Moderate	The narrative explains that this is significant for public health because (most relevant statements used as appropriate): • Changes, due to the Proposed Development, have an **influential** effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by **mixed views** in consultation themes among stakeholders. • Change, due to the Proposed Development, could result in a regulatory threshold or standard being **approached** (if applicable).

Category/ Score	Indicative criteria (judgment based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories)
	• There is likely to be a **small** change in the health baseline of the population, including as evidenced by the scientific literature showing there is a **clear** relationship between changes that would result from the Proposed Development and changes to health outcomes. • Health priorities for the relevant study area are of **general** relevance to the determinant of health or population group affected by the Proposed Development.
Minor	The narrative explains that this is not significant for public health because (most relevant statements used as appropriate): • Changes, due to the Proposed Development, have a **marginal** effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by **no** consultation themes emerging among stakeholders. • Change, due to the Proposed Development, would be **well within** a regulatory threshold or standard (if applicable). • There is likely to be a **slight** change in the health baseline of the population, including as evidenced by the scientific literature showing there is only a **suggestive** relationship between changes that would result from the Proposed Development and changes to health outcomes. • Health priorities for the relevant study area are of **low** relevance to the determinant of health or population group affected by the Proposed Development.
Negligible	The narrative explains that this is not significant for public health because (most relevant statements used as appropriate): • Changes, due to the Proposed Development, are **not related** to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by consultation for the Proposed Development having **no responses** on this issue among stakeholders. • Change, due to the Proposed Development, would **not affect** a regulatory threshold or standard (if applicable). • There is likely to be a **very limited** change in the health baseline of the population, including as evidenced by the scientific literature showing there is an **unsupported** relationship between changes that would result from the Proposed Development and changes to health outcomes. • Health priorities for the relevant study area are **not** relevant to the determinant of health or population group affected by the Proposed Development.

Ultimately a likely significant health effect is one that should be brought to the attention of the determining authority, as the effect of the Proposed Development is judged to provide, or be contrary to providing, a high level of protection to population health.

Where significant adverse effects are identified, mitigation is considered to reduce the significance of such effects. Similarly, enhancements are considered where significant and proportionate opportunities to benefit population health are identified.

14.2.5 Limitations of the Assessment

This assessment is based on publicly available statistics and evidence sources. No new primary research or bespoke analysis of non-public data was undertaken for the assessment.

In line with proportionate EIA coverage of the human health topic, comprehensive HIA methods, e.g., setting up of a steering group or generating new primary evidence, do not form part of the approach. The health chapter has been informed by wider consultation for the Proposed Development and good practice methods have been used to proportionately reflect HIA elements as appropriate to EIA; these include a wider determinants of health scope and consideration of vulnerable groups and health inequalities.

Such limitations do not affect the robustness of the assessment for EIA purposes.

14.3 Baseline Scenario

Different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstances.

The aim of the following information is to put into context the local health and socio-economic circumstance of local communities surrounding the Proposed Development, forming the basis to the assessment and any associated mitigation. Statistics have been analysed for the Mull, Iona, Coll and Tiree intermediate zone (used as the study area), using national (Scotland) averages as relevant comparators. Where information for Mull, Iona, Coll and Tiree is not available, data for the Argyll and Bute local council has been collected as a representative alternative geography.

It should be noted that the description of the whole population, and the populations within the local and wider study area, does not exclude the probability that there will be some individuals or groups of people who do not conform to the overall profile.

14.3.1 Demography, Socio-economic Circumstance and Deprivation

According to the Scotland 2011 census, in Iona there were 177 usual residents. There were 67 economically active residents in full time work in 2011, with only 3 residents unemployed at economically active age ranges. According to the Scottish Index of Multiple Deprivation 2020 for Mull, Iona, Coll and Tiree, overall deprivation was ranked 3664, which is 6th least deprived. Housing domain and geographic access to domain was ranked the 2nd most deprived and 10% most deprived respectfully. Health and Crime rank was ranked high, 9th least deprived and least deprived 10% respectively.

14.3.2 Life Expectancy and Physical Health

Table 14-8 indicates life expectancy, physical health and mortality statistics. The average life expectancy for males in Mull, Iona, Coll and Tiree is 76.93 compared to 77.16 for Scotland, therefore there was no real difference. For females, Mull, Iona, Coll and Tiree has a better average for life expectancy (85.45) compared to Argyll and Bute (81.69). For emergency patient hospitalisations, Mull, Iona, Coll and Tiree have a better average (5997.96) compared to Argyll and Bute (6552.94) and Scotland (7358.5).

Table 14-8 Life Expectancy, Physical Health and Mortality

Indicator	Year	Local Mull, Iona, Coll & Tiree	Regional Argyll & Bute	*Scotland*
		Life expectancy		
Life expectancy for males	2018	76.93	78.34	***77.16***
Life expectancy for females	2018	85.45	81.69	***81.14***
		Hospital admissions		
Emergency patient hospitalisations	2018-2020	5997.69	6552.94	***7358.5***
Coronary Heart Disease Patient Hospitalisations	2019/20-2021/22	262.18	246.11	***228.02***
Chronic Obstructive Pulmonary Disease Patient Hospitalisations	2018/19-2020/21	162.81	169.04	***230.89***
		Mortality		

Indicator	Year	Local Mull, Iona, Coll & Tiree	Regional Argyll & Bute	*Scotland*
Deaths all ages	2018/2020	1236.41	1087.71	***1166.3***
Early deaths from cancer, aged <75 years	2018-2020	171.6	137.97	***152.8***
Early deaths from coronary heart disease, aged <75 years	2018-2020	28.87	49.97	***50.57***
Key				
	Better than the Scotland average			
	Worse than the Scotland average			
	No different to the Scotland average			

14.3.3 Mental Health and Lifestyle Factors

Table 14-9 provides statistics on mental health and lifestyle factors. Child healthy weight in primary 1 in Argyll and Bute (66.82) was worse than Scotland (69.76) in 2020/21. In alcohol related hospital admissions in Mull, Iona, Coll and Tiree (254.6) was better than the Scotland average (621.29).

Table 14-9 Mental Health and Lifestyle Factors

Indicator	Year	Local Mull, Iona, Coll & Tiree	Regional Argyll & Bute	*Scotland*
Mental health				
Psychiatric Patient Hospitalisations	2018/19/2020/21	N/A	202.84	***242.8***
Deaths from Suicide	2016-2020	N/A	15.05	***14.07***
Lifestyle and behavioural risk factors				
Child healthy weight in primary 1	2020/21	79.17	66.82	***69.76***
Smoking prevalence ages 16-64	2019	N/A	17.5	***19.5***
Alcohol Related Hospital Admissions	2020/21	254.6	524.9	***621.29***
Key				
	Better than the Scotland average			
	Worse than the Scotland average			
	No different to Scotland average			

14.4 Description of Likely Significant Effects

14.4.1 Assessment of Construction Effects

14.4.1.1 Bio-physical environment

This section discusses changes to environmental conditions, in particular, *noise* during the construction of the Proposed Development, and related effects on population health.

This section therefore focusses on construction noise. Construction of the Proposed Development has the potential to result in noise nuisance from construction activities, particularly night-time noise that may be

detrimental to population health where sleep is disturbed to a high degree. Changes in the distribution of daytime noise are also considered. As stated in Chapter 10 (Terrestrial Noise and Vibration), there is no potential for noise impacts from construction traffic as transport by road will be minimal, therefore no population and health effects are anticipated. This section has been informed by Chapter 10, which sets out relevant assessment findings and mitigation measures that have been taken into account.

Potential effects on human health are considered likely because there is a plausible source-pathway-receptor relationship:

- The source is noise generated by construction activities.
- The pathway is pressure waves through the air.
- Receptors are residents and long-term occupiers of nearby properties and community buildings.

Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.

The population groups relevant to this assessment are:

- The 'site-specific' geographic population of the Isle of Iona.
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people).
  - Old age vulnerability (older people).
  - Poor health vulnerability (people with existing poor physical or mental health).
  - Low-income vulnerability (people living in deprivation, including those on low incomes may have fewer resources to adapt, e.g., seek respite or install insulation furthermore, those who are economically inactive may spend more time in affected dwellings).
  - Access and geographical vulnerability (people for whom close proximity to the proposed changes increases sensitivity).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Iona, and the vulnerable sub-population for this area. The latter is a comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

During construction, there is potential for noise to temporarily arise from construction works, road works and movement of construction related vehicles.

The literature highlights cardiovascular effects, annoyance and sleep disturbance (and consequences arising from inadequate rest) as being the main pathways by which population health may be affected. The literature also notes the potential for chronic noise to have a detrimental effect on learning outcomes (e.g., noise distracting and affecting communication within classrooms). Whilst the literature supports there being thresholds at which effects (such as annoyance and sleep disturbance) are likely, it also acknowledges the subjective nature of responses to noise. In this regard noise effects can be considered to have non-threshold effects, with characteristics other than sound levels also determining the influence on health outcomes. The assessment

had regard to the population groups identified in the literature that may be particularly sensitive. For example, children, the elderly, the chronically ill, people with a hearing impairment, shift-workers and people with mental illness (e.g., schizophrenia or autism).

The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section 14.2.4.3 of this report. The general population comprise those members of the community in *good* physical and mental health and with resources that enable a *high* capacity to adapt to change.

The sensitivity of the vulnerable group population is high. This reflects that the sub-population includes a high representation of *dependants*, both children, elderly and those receiving care due to poor health. This sub-population may experience existing *widening* inequalities due to living in areas with increasing noise and *moderate* deprivation, with *limited* capacity to adapt to changes. Vulnerability particularly relates to those living close to the construction activities, including those spending more time in affected dwellings, e.g., due to low economic activity, shift work or *poor* health. People who are *concerned* or have high degrees of *uncertainty* about construction noise and its effect on their wellbeing may be more sensitive to changes in noise.

As reported in Chapter 10 (Terrestrial Noise and Vibration), construction of the Proposed Development will involve two primary activities: construction of the breakwater and dredging. Construction noise is predicted to be within limits set to be protective of health and the environment in most cases. However, when considering a worst-case scenario, Chapter 10 identifies that there is potential for construction noise to exceed limits (both daytime and night-time) at a small number of individual receptors that are located closest to the construction activities, with the receptors most likely to be impacted being non-residential. These changes will be mitigated as set out in Chapter 10 section 10.6.1, which includes the use of silencers for mechanical plant and equipment. Residents will also be informed of the timing and duration of activities that may produce high noise. The residual effects reported in Chapter 10 are not anticipated to result in significant changes in population health outcomes.

The magnitude of change due to the proposed construction works is low. In terms of population health, the *small* scale of change in noise levels is likely to predominantly relate to a *minor* change in quality of life for a *large minority* of the community, and a *very minor* change in cardiovascular and mental wellbeing morbidity for the *small minority* of the community closest to construction activities. The changes would be of *short-term* duration and relate to *frequent* construction related noise exposures. Prolonged periods of construction noise at night or daytime disruption of educational activities at schools are not anticipated.

Construction noise impacts of the Proposed Development are considered to result in a minor adverse (not significant) effect on population health. This assessment conclusion reflects that although the scientific literature indicates a *clear association* between elevated and sustained noise disturbance and reduced health outcome, the changes would result in a very limited effect in the health baseline of the site-specific populations. The temporary and localised construction noise effects are not expected to affect health inequalities.

14.4.1.2 Social environment

This section considers the effects on *open space, leisure and play* during construction of the Proposed Development. Supporting people to be active is an important determinant of physical health. Time spent on or near blue space (i.e., outdoor environments that feature water) can positively affect mental wellbeing.

This section has been informed by Scoping Opinion para 5.21.5.

It is noted that leisure boating is a priority identified in the 2013 Sound of Iona Piers Development Framework and Masterplan (section 4.5). There is the potential for construction to affect sea users including sea kayakers and sail boats which are used for leisure boating and recreation in the Sound of Iona. This effect would possibly occur during dredging or when there is other disruption in the construction area. This change would mostly affect residents in the local community.

Potential effects on human health are considered likely because there is a plausible source-pathway-receptor relationship:

- The source is changes in access to the Sound of Iona due to construction.
- The pathway is disruptions to recreation generated by construction activities.
- Receptors are residents and recreational users of the Sound of Iona.

Furthermore, the potential effect is probable as the source-pathway-receptor relationship occurs under usual conditions of the construction phase of the Proposed Development.

The population groups relevant to this assessment are:

- The ‘site-specific’ geographic population of the Isle of Iona;
- The ‘local’ population of Argyll and Bute; and
- The sub-population vulnerable due to:
  - young age, specifically children who are overweight or who have low physical activity levels.
  - Poor health vulnerability (people with existing poor physical or mental health).
  - Social disadvantage (people who may have limited access to other forms of recreation).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Iona, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section 14.2.4.3 of this report. The general population comprise those members of the community in *good* physical and mental health and with resources that enable a *high* capacity to adapt to change such as selecting alternative forms of recreation or different sea routes to avoid any temporary disruption.

The sensitivity of the vulnerable sub-population is high. This reflects that the sub-population includes representation of dependants including children and people with existing poor physical or mental health. This sub-population may have fewer resources and less capacity to adapt to changes. The population may therefore be more reliant on recreation within the affected area with greater likelihood that any disruption or disturbance could affect physical activity behaviours.

The significance of the population health effect for this determinant of health is minor adverse (not significant). The professional judgment is that there would, at most, be a very slight adverse change in the health baseline

for the local population. This conclusion reflects that physical activity is a local public health priority and the scientific literature on the benefits of physical activity to health is well established, however the level of change due to the Proposed Development is small and can be appropriately mitigated by standard good practice measures that minimise disruption and disturbance through a CEMP, such as designating and communicating safe routes through the Sound during construction. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, no widening of health inequalities would be expected, and no influence is expected on the ability to deliver local or national health policy.

14.4.1.3 Economic environment

This section considers the effects on *education and training*, and *employment and income* from construction of the Proposed Development. In a small island context, even minor changes to employment and income can be influential to the populations' health.

There is the potential for construction to include upskilling opportunities for the local population. Employment of the local population for construction of the Proposed Development is also possible. Upskilling has the potential to lead to increased employment and income, and both these determinants positively affect health and mental wellbeing. It is also noted that construction works have the potential to disrupt important income streams for the island, including tourism and fishing.

Potential effects on human health are considered likely because there is a plausible source-pathway-receptor relationship:

- The source is construction activities associated with the Proposed Development.
- The pathway is changes in training, employment and income due to construction.
- Receptors are residents and other people who rely on access to the Sound of Iona for income.

Furthermore, the potential effect is probable as the source-pathway-receptor relationship occurs under usual conditions of the construction phase of the Proposed Development.

- The population groups relevant to this assessment are:
- The 'site-specific' geographic population of the Isle of Iona and other fishermen from the surrounding area who rely on access to the Sound of Iona.
- The sub-population vulnerable due to:
    - Low income: People on low income, who are economically inactive or unemployed/workless.
    - Access and geographical factors: People experiencing barriers in access such as the ability to access training, employment and income outside the local area.

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Iona, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section 14.2.4.3 of this report. The general population comprise those members of the community in employment with good socio-economic status and low levels of deprivation.

The sensitivity of the vulnerable sub-population is high. While unemployment on Iona remains low, as stated in the baseline profile, sub-populations are likely to be sensitive to changes in employment given the small size of the population and limited access to other training, employment and income opportunities.

The magnitude of change due to the Proposed Development is low. Changes in access to training, employment and income for local populations and sub-populations are likely to be more significant given the relative access to alternative opportunities. However, given the low unemployment on the isle, only a small minority of the population is likely to be affected. While changes in training and upskills can cause long-term effects, changes to employment and income would likely be short-term and reverse on completion of the construction work.

The significance of the population health effect for this determinant of health is minor beneficial (not significant). The professional judgment is that training and upskilling opportunities can be provided to the local community as well as prioritisation of employment for the construction workforce (as set out in the Construction Environmental Management Plan). These opportunities are likely to affect a small part of population and to last for a relatively short period of time, yet increased income can have beneficial health effects even in the short-term. Changes to income through fishing and tourism can also be mitigated through a CEMP by designating safe alternative transport through the Sound of Iona during construction. There is therefore expected to be limited changes from income associated with fishing and tourism. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, no widening of health inequalities would be expected, and no influence is expected on the ability to deliver local or national health policy.

14.4.2 Assessment of Operational Effects

14.4.2.1 Social environment

This section considers *transport modes, access and connections* and *open space, leisure and play.* The Proposed Development may improve safety of local residents and current users of the existing pier and slipway, as well as improved access to and from the Sound of Iona for lifeline services. This section has been informed by Chapter 3 (Project Description), Scoping Opinion para 5.21.4, as well as the EIA Scoping Report.

The Proposed Development will reduce wave heights in the vicinity of the breakwater, making recreational use of the water including for sea kayakers and boaters, potentially safer. Both real and perceived safety of recreational activities support people engaging in physical activity and can be beneficial to physical and mental health. Improved access on and off Iona can also improve access to future lifeline services and medical supplies. Time-critical injuries require lifeline services and are particularly relevant for more vulnerable populations (particularly children and elderly people). Improvements in lifeline services and medical supplies have the potential to improve physical and perceived access, particularly for old age populations, and can in turn reduce anxiety and stress leading to improved mental wellbeing.

The potential effect is considered likely because there is a plausible source-pathway-receptor relationship:

- The source is the proposed breakwater infrastructure;
- The pathway is changes in access to the Sound of Iona, including safety (real and perceived) due to the proposed breakwater infrastructure; and
- The receptors are users of the pier and local residents of Iona.

Furthermore, the potential effect is probable as no highly unusual conditions are required for the source-pathway-receptor linkage.

The population groups relevant to this assessment are:

- The 'site-specific' geographic population of Iona;
- The 'local' population of Argyll and Bute; and
- The sub-population vulnerable due to:
  - Young age vulnerability (children and young people as potentially more vulnerable to safety hazards);
  - Old age vulnerability (older people as potentially more vulnerable to safety hazards);
  - Poor health vulnerability (people with existing poor physical and mental health in relation to emergency service journey times); and
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on the existing modes of access).

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Iona, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been considered and are listed in Section 14.2.4.3 of this report. The general population comprise those members of the community in good physical and mental health who are more able to mitigate safety hazards.

The sensitivity of the vulnerable sub-population is high. This reflects that the sub-population includes a high representation of dependants including children, elderly and those receiving care due to poor health. This population may be more sensitive to safety hazards and more reliant on lifeline services.

The magnitude of change due to the Proposed Development is high. Improvements to safety associated with the Proposed Development will be permanent and will affect all residents of the island, as well as visitors and those transporting goods and services to and from the island (including the transport of medical supplies). Improved safety of the pier and breakwater area will also encourage the continuation and uptake of water sports and other recreational activities in the area, which will support good physical and mental health, as well as have the potential to support tourism and provide indirect economic benefits in the area (the latter is discussed further in Section 14.4.2.2 below). Additionally, safe and improved access to the island will facilitate improved lifeline and emergency services, further supporting the health of the population. The benefits will therefore represent a *medium* scale of change relating to a *moderate* change in morbidity for a *small minority* of the local population

with regards to the uptake of recreational activities, and the *majority* of the population with regards to increased access to lifeline services (given the small island context). The changes will be *long-term* in duration and relate to *one-off* effects when it comes to access of lifeline services, and *frequent* effects with regard to improved opportunities for recreational users and transport of goods and services.

Overall, operational impacts on transport modes; access and connections; and open space, leisure and play are considered to result in a moderate beneficial (significant) effect on population health. This assessment conclusion is supported by a strong evidence base in the scientific literature for a *causal* relationship between physical activity and good physical and mental health, and professional judgement on the effect of physical and perceived safety for the uptake of healthy behaviours.

14.4.2.2 Socio-economic conditions

This section considers the effects on *education and training* and *employment and income* from operation of the Proposed Development. In a small island context, even minor changes to employment and income can be influential to the populations' health.

There is the potential for the Proposed Development to improve access on and off Iona. This may indirectly affect access to education, training, and employment for Iona residents seeking opportunities on Isle of Mull and beyond. Improvements in the ferry service may also support income associated with tourism. This also aligns with the Sound of Iona Piers Development Framework and Masterplan policy to *"encourage a diverse, balanced mix of sectors to operate and develop sustainably with consideration of other interests and environmental capacity".* Changes in employment and income have the potential to positively affect health through increasing access to other health-supporting goods, services and activities, and secure employment can be a source of mental wellbeing. Improved access to education and training can improve access to employment and income but also has positive effects associated with physical health (through e.g., improved health literacy) and mental wellbeing (through e.g., increased self-efficacy).

Potential effects on human health are considered likely because there is a plausible source-pathway-receptor relationship:

- The source is improvements associated with the Proposed Development.
- The pathway is changes in access to/from Iona.
- Receptors are residents and other people who rely on access on and off Iona for education, employment and income.

Furthermore, the potential effect is probable as the source-pathway-receptor relationship occurs under usual conditions of the operation of the Proposed Development.

The population groups relevant to this assessment are:

- The 'site-specific' geographic population of the Isle of Iona.
- The sub-population vulnerable due to:
    - Low income: People on low income, who are economically inactive or unemployed/workless.

- Access and geographical factors: People experiencing barriers in access such as the ability to access employment and income outside the local area.

The assessment covers these populations within two groups. The general population for the geographic area, notably residents of Iona, and the vulnerable sub-population for this area. The latter is comprised of the vulnerabilities listed above. The differentiation of these two groups, allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

The sensitivity of the general population is low. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in Section 14.2.4.3 of this report. The general population comprise those members of the community in employment with good socio-economic status and low levels of deprivation.

The sensitivity of the vulnerable sub-population is high. While unemployment on Iona remains low, as stated in the baseline profile, sub-populations are likely to be sensitive to changes in employment given the small size of the population and limited access to employment and income opportunities on the isle.

The magnitude of change due to the Proposed Development is low. There are likely to be beneficial changes in access to education, employment and income for local populations and sub-populations, given the relative lack of access to alternative opportunities. While unemployment on Iona is low, improved access to employment outside of the local area can lead some people to change jobs to higher-paid jobs. Changes in access to education and training opportunities can also lead to higher-paid jobs. Changes in education, employment and income have the potential to cause long-term benefits for health. Effects relate to a *small* scale of change that would be experienced by a *small minority* of the local population. The benefits of good quality employment and education contribute to quality-of-life, as well as being protective against adverse changes in morbidity (i.e., avoiding economic hardship or unemployment which are associated with poor physical and mental health outcomes). Changes will be *long-term* in duration and relate to *continuous* indirect effects associated with improved employment and educational opportunities.

The significance of the population health effect for this determinant of health is minor beneficial (not significant). The professional judgment is that improved access on and off Iona can lead indirectly to improvements in education, training, employment, job quality and income. This has the potential to be beneficial for health and wellbeing, although not significant at a population level. While the change is likely to affect only a small sub-set of the population, this has the potential to provide greater benefit to the vulnerable sub-population (high sensitivity), which can help to narrow health inequalities.

14.5 Mitigation Measures

14.5.1 Construction Phase

An outline Construction Environmental Management Plan (oCEMP) has been included as Appendix 20.1.

A CEMP will be produced by the successful contractor, which will outline how the effects of construction can be managed by good practice and environmental controls which are routinely and successfully applied on other similar development proposals.

The CEMP should also set out a clear plan for managing access to the Sound of Iona during construction. This would include designating safe alternative transport routes and appropriately communicating these to local populations (including through the use of Gaelic materials).

The CEMP should also set out a plan for engagement with the local population. This could include information on timings updates, affects to any services/deliveries/access and a complaints procedure. Engagement should be culturally appropriate, including provision of non-technical information and communication in Gaelic.

Opportunities to include the local population in construction of the Proposed Development can be beneficial for health. Actions to ensure positive outcomes include providing opportunities for training and upskilling as well as prioritisation of hiring for local populations.

14.5.2 Operational Phase

No further mitigation is proposed.

14.6 Potential Cumulative Effects

Consistent with the findings of relevant technical assessments on the EIA, including Chapter 10 (Noise and Vibration), no additional cumulative population and health effects are anticipated during construction and operation of the Proposed Development.

14.7 Residual Effects

14.7.1 Construction Phase

Following the implementation of suggested mitigation measures outlined in Section 14.5 above, no significant adverse residual effects on population and health (relating to bio-physical and social environment) are anticipated during construction of the Proposed Development.

Construction of the Proposed Development will result in beneficial residual effects (relating to education and training, employment and income), although these are not significant.

14.7.2 Operational Phase

Operation of the Proposed Development is anticipated to result in significant (moderate beneficial) residual population and health effects across multiple determinants of health. This includes improved transport modes; access and connections; and open space, leisure and play. Operation will also give rise to beneficial residual effects relating to education and training and employment and income, although these are not significant.

14.8 Conclusions and Summary of Effects

This assessment has been undertaken in accordance with relevant published guidance on assessment of population and health within Environmental Impact Assessment.

Construction of the Proposed Development has the potential to result in population and health impacts, both beneficial and adverse. Beneficial impacts relate to changes in opportunities for education and training, employment and income, and adverse impacts relate to changes in environmental conditions such as noise,

and the social environment (in this case, effects on open space, leisure and play). Given the scale, duration and frequency of these impacts, and following appropriate mitigation, no significant effects on population and health are anticipated during construction.

Operation of the Proposed Development will result in improved and safer access to and from the Isle of Iona, as well as facilitating improved transport of goods and services, including lifeline services and medical supplies. It will also support the uptake of physical activity for the local population, through facilitating safer recreational water sports. Accordingly, operation of the Proposed Development is anticipated to result in significant (moderate beneficial) population and health effects relating to improved transport modes; access and connections; and open space, leisure and play. While improved access to the island will also indirectly benefit the local population through increased opportunities for education, training, employment and income, this will more greatly benefit vulnerable groups, and therefore these effects are not judged to be significant at a population level.

15 LANDSCAPE & VISUAL

15.1 Introduction

RPS was commissioned by Argyll & Bute Council to prepare a Landscape and Visual Impact Assessment (LVIA) in support of its Proposed Development at the existing Iona Ferry Terminal, located west of Mull, on the west coast of Scotland.

The purpose of this LVIA is to identify and assess the effects on landscape character, landscape features, visual receptors, and visual amenity as a result of the works described in the Planning Support Statement and project description contained therein.

This assessment has been prepared and reviewed by chartered landscape architects at RPS.

15.2 Assessment Methodology

15.2.1 General Approach

The methodology and approach to the assessment contained within this chapter has been derived and carried out in accordance with best practice guidance described in the following documents:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (The Landscape Institute and Institute of Environmental Management & Assessment, 2013) (GLVIA3);
- Technical Guidance Note 06/19 Visual Representation of Development Proposals (The Landscape Institute, 2019).

GLVIA3 recommends that an LVIA '*concentrates on principles and process*' and '*does not provide a detailed or formulaic 'recipe"* to assess effects, it being the '*responsibility of the professional to ensure that the approach and methodology adopted are appropriate to the task in hand*' (preface to the third edition).

The effects on the landscape resources and visual receptors (people) have been assessed by considering the proposed change in the baseline conditions (the impact of the development) against the type of landscape resource or visual receptor (including the importance and sensitivity of that resource or receptor). These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement. The assessment methodology is summarised in Figure 15-1.

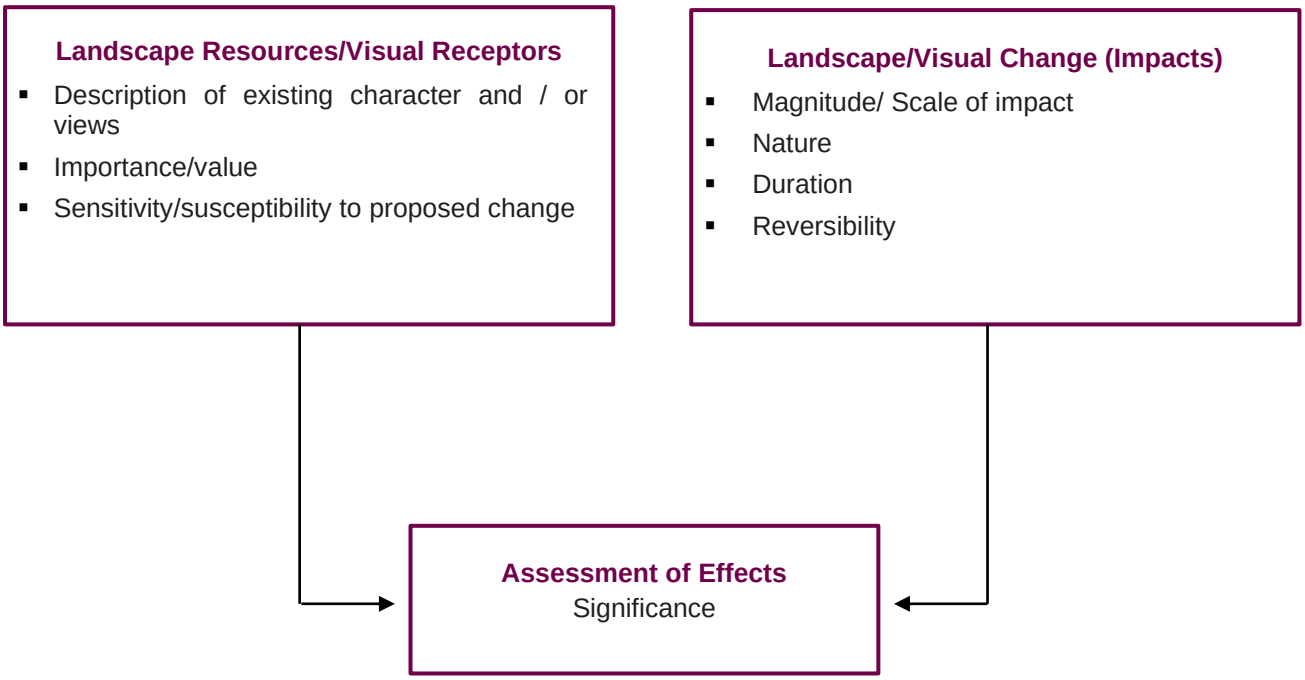


Figure 15-1 Assessment Methodology Summary

The LVIA considers the potential effects of the project upon:

- Individual landscape features and elements;
- Landscape character; and
- Visual amenity and the people who view the landscape.

15.2.2 Identification of Baseline Conditions

Baseline conditions has been identified and assessed through analysis of:

- Up to date digital copies of Ordnance Survey Discovery Series raster and OS vector maps;
- Aerial photography;
- Adopted Argyll & Bute Local Development Plan (LDP – March 2015);
- Proposed Local Development Plan (LDP2) (November 2019);
- NatureScot Landscape Character Assessment;
- Historic Environment Scotland – Inventory of Gardens and Designed Landscapes; and
- Drawings of the Proposed Development.

Site visits were undertaken in 2021 and 2022 to assess the existing environment, to establish the existing visual resource and to identify sensitive receptors, i.e., residential properties, scenic viewpoints. These site visits were also used to consider the potential effects on landscape character and visual impacts arising as a result of the Proposed Development.

15.2.3 Identifying Effects

Assessing the significance of an effect is a key component of the LVIA and involves an evidence-based process combining professional judgment on the nature of a landscape or visual receptor's sensitivity, their susceptibility or ability to accommodate change and the value attached to the receptor. It is important to note that judgments in this LVIA are impartial and based on professional experience and opinion informed by best practice guidance.

The effects of a Proposed Development are considered to be of variable duration and are assessed as being of either short-term, medium-term or long-term duration, and permanent or reversible. Effects are considered to be long-term during the operational phase of the development, whilst operations and infrastructure works apparent during the construction and initial operating period are considered to be temporary, short-term effects.

The reversibility of an effect is also variable. The effects on the landscape and visual resource that occurs during the construction period such as the use of construction machinery are considered to be reversible.

Where effects arise during the construction period, these are most likely to be as a result of: movement of construction machinery within the landscape; construction of new structures and construction activities within the site boundary all of which are considered to be short-term in duration.

To avoid repetition, the duration and reversibility of effects are not reiterated throughout the assessment.

15.2.4 Study Area

Using terrain-modelling techniques combined with the development specifications, a map was created which identified areas from which the Proposed Development may theoretically be visible (Figure 15-1).

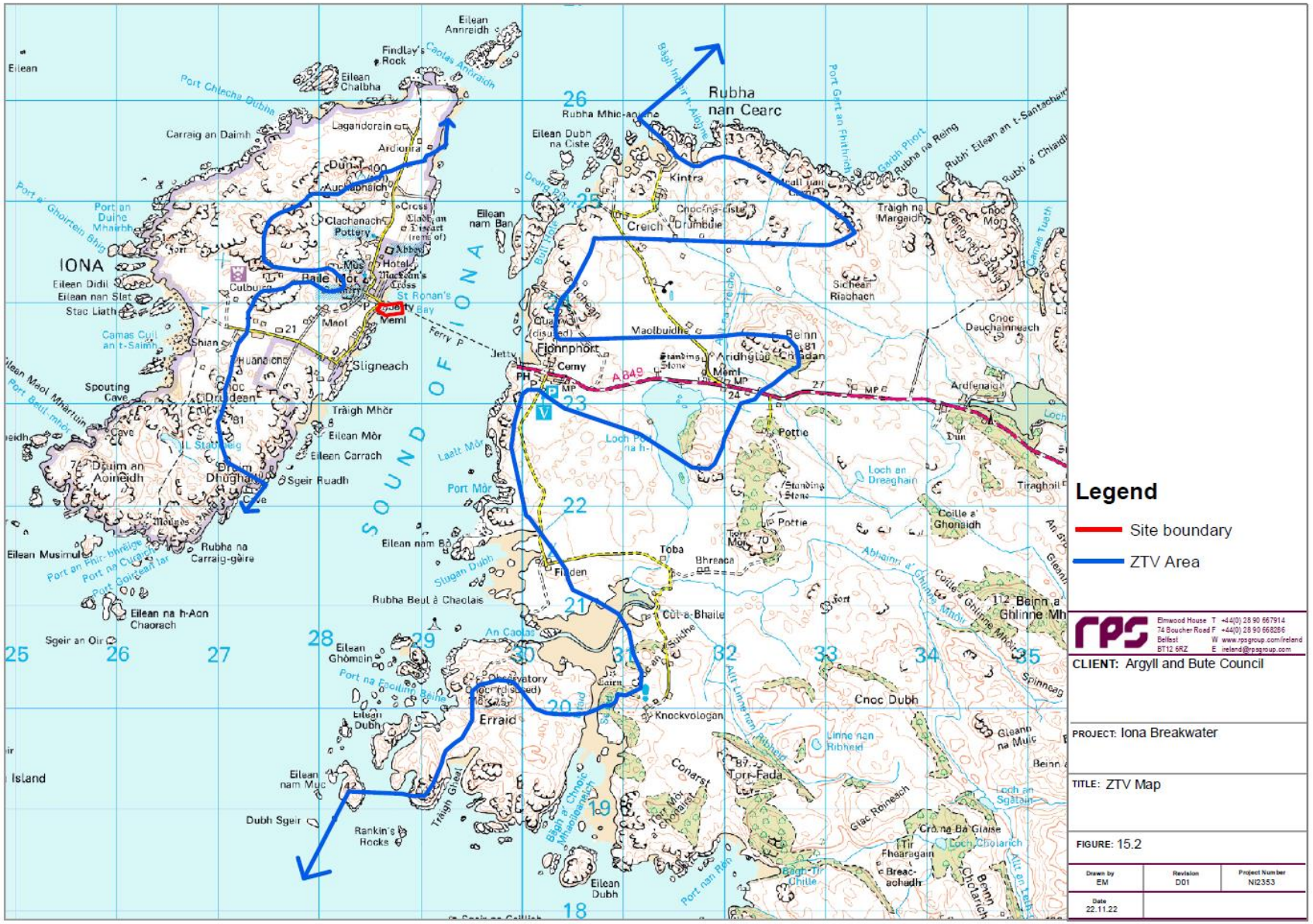


Figure 15-1 Zone of Theoretical Visibility (ZTV) Map

This Zone of Theoretical Visibility (ZTV) is the area within which views of the Proposed Development can theoretically be obtained, determined by the topography of the area only and is representative of a theoretical worst-case scenario in line with current guidance.

The ZTV forms the basis for the study area associated with the Proposed Development for both landscape and visual impact assessment. It is noted that the ZTV does not take into account local features such as roadside hedgerows, field boundary hedgerows, woodland planting, coniferous forestry or buildings. In practise the actual visibility of the Proposed Development is considerably less in extent than the theoretical one, since individual elements of the proposal are difficult to focus on at long distances and localised changes in topography, hedges, trees and woodland tend to restrict views.

The ZTV was assessed against the elements of the Proposed Development, the footprint, the receiving landscape and the perceptibility of elements of the Proposed Development particularly when viewed against surrounding topographical changes and vegetation cover. Survey and assessment established that vertical elements associated with the Proposed Development are not easily perceived within the wider landscape due to intervening topographical changes and vegetation cover.

15.2.5 Assessment Criteria

The objective of the assessment process is to identify and evaluate the predicted significant effects arising from a Proposed Development. Significance is a function of:

- The sensitivity of the affected landscape or visual receptors, determined through consideration of the susceptibility of the receptor to the type of change arising from the specific proposals and the value attached to the receptor; and
- The scale or Magnitude, derived from a consideration of the size/ scale, geographical extent, duration and reversibility of the Proposed Development.

These definitions recognise that landscapes vary in their capacity to accommodate different forms of development according to the nature of the receiving landscape and the type of change being proposed.

As with any new development, it is acknowledged that the introduction of a Proposed Development into the existing landscape or visual context could cause either a deterioration, improvement or neutral impact on the existing landscape or visual resource.

15.2.6 Landscape Impact Assessment

The LVIA firstly assesses how the Proposed Development would impact directly on any landscape features and resources. This category of effect relates to specific landscape elements and features (e.g., woods, trees, walls, hedgerows, watercourses) that are components of the landscape that may be physically affected by the Proposed Development, such as the removal or addition of trees and alteration to ground cover.

The LVIA then considers impacts on landscape character at two levels. Firstly, consideration is given to how the landscape character is affected by the removal or alteration of existing features and the introduction of new features. This is considered to be a direct impact on landscape character.

Secondly, the indirect impacts of the Proposed Development on the wider landscape are considered. The assessment of impacts on the wider landscape is discussed using the surrounding character areas identified in the relevant landscape character assessments. It is acknowledged there is an overlap between perception of change to landscape character and visual amenity, but it should be remembered that landscape character in its own right is generally derived from the combination and pattern of landscape elements within the view.

The significance of effects on landscape features and character is determined by considering both the sensitivity of the feature or landscape character and the magnitude of impact.

Consideration of the sensitivity of the landscape resource against the magnitude of impact caused by the Proposed Development is fundamental to landscape and visual assessment and these two criteria are defined in more detail below.

15.2.7 Landscape Sensitivity

The determination of the sensitivity of the landscape receptor is based upon an evaluation of the elements or characteristics of the landscape likely to be affected. The evaluation reflects such factors as its quality, value, contribution to landscape character and the degree to which the particular element or characteristic can be replaced or substituted.

GLVIA 3 at paragraph 5.39 states that:

> '*…landscape receptors need to be assessed firstly in terms of their sensitivity, combining judgments of their susceptibility to the type of change or development proposed and the value attached to the landscape."*

Susceptibility is defined by GLVIA 3 at paragraph 5.40 as:

> *"…the ability of the landscape receptor (whether it be the overall character or quality/ condition of a particular landscape type or area, or an individual element and/ or feature, or a particular aesthetic and perceptual aspect) to accommodate the Proposed Development without due consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies'* "

The value of a landscape receptor is determined with reference to the presence of relevant landscape designations, such Areas of Outstanding Natural Beauty (AONB) and their level of importance. For the purpose of this assessment, the value of the landscape has been categorised as either:

- **Very High**: Areas of landscape acknowledged through designation such as AONBs or other landscape based sensitive areas. These are of regional or national landscape significance;
- **High**: Areas that have a very strong positive character with valued and consistent distinctive features that gives the landscape unity, richness and harmony. These are of landscape scale significance within the district;
- **Medium**: Areas that exhibit positive character, but which may have evidence of alteration/degradation or erosion of features resulting in a less distinctive landscape. These may be of some local landscape significance with some positive recognisable structure; and

- **Low**: Areas that are generally negative in character, degraded and in poor condition. No distinctive positive characteristics and with little or no structure. Scope for positive enhancement.

As previously discussed, landscape sensitivity is influenced by a number of factors including susceptibility to change, value and condition. In order to assist with bringing these factors together, judgements regarding susceptibility and value have been used which define the landscape resource as being either, negligible, low, medium, high or very high. Table 15-1 defines the criteria that have guided the judgement as to the overall sensitivity of Landscape Resources.

Assessments of susceptibility and value of a particular landscape resource may be different and professional judgement will always be used to conclude on the judgement of sensitivity. For example, value may be high, and susceptibility may be low, and professional judgement will be used to determine whether sensitivity is high, low or in between, supported by narrative explanation.

Table 15-1 Landscape Sensitivity

Definition		Sensitivity
Landscape resource susceptibility	**Landscape resource value**	
Exceptional landscape quality, no or limited potential for substitution. Key elements / features well known to the wider public. Little or no tolerance to change	Nationally / internationally designated/ valued landscape, or key elements or features of national/ internationally designated landscapes. Little or no tolerance to change	Very High
Strong/ distinctive landscape character; absence of landscape detractors. Low tolerance to change.	Regionally/ nationally designated/ valued countryside and landscape features. Low tolerance to change.	High
Some distinctive landscape characteristics; few landscape detractors. Medium tolerance to change.	Locally/ regionally designated/ valued countryside and landscape features. Medium tolerance to change.	Medium
Absence of distinctive landscape characteristics; presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Low
Absence of positive landscape characteristics. Significant presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Negligible

15.2.8 Magnitude of Landscape Effect

The effect on landscape receptors and the overall judgement of the magnitude of landscape effect is based on combining judgements on ‘size or scale, the geographic extent of the area influenced, and its duration and reversibility’ (GLVIA3, paragraph 5.48),

Direct resource changes on the landscape character in the study area are brought about by the introduction of the Proposed Development and its impact on the key landscape characteristics. Judgements regarding the magnitude of landscape impact are indicated in Table 15-2 below.

Table 15-2 Magnitude of Landscape Impact

Definition	Magnitude of Impact
Total loss or addition or/ very substantial loss or addition of key elements / features / patterns of the baseline, i.e., pre-development landscape and/ or introduction of dominant, uncharacteristic elements with the attributes of the receiving landscape	Large
Partial loss or addition of or moderate alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and / or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic with the attributes of the receiving landscape.	Medium
Minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and or introduction of elements that may not be uncharacteristic with the surrounding landscape.	Small
Very minor loss or addition of or alteration to one or more key elements / features / patterns of the baseline, i.e., pre-development landscape and/or introduction of elements that are not uncharacteristic with the surrounding landscape approximating to a 'no-change' situation.	Negligible
No loss, alteration or addition to the receiving landscape resource	No change

15.2.9 Visual Impact Assessment

As outlined in GLVIA 3 (Paragraph 6.1):

> '*An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity'.*

The assessment of visual effects is an assessment of how the introduction of a Proposed Development will affect views within the study area. The Assessment of visual effects therefore needs to consider the following:

- Direct impacts of a Proposed Development upon views of the landscape through intrusion or obstruction;
- The reaction of viewers who may be affected, e.g., residents, walkers, road users; and
- The overall impact on visual amenity.

15.2.10 Sensitivity Of Visual Receptors

For visual receptors, judgements of susceptibility and value are closely interlinked. For example, the most valued views are likely to be those which people go and visit because of the available view. The value attributed to visual receptors also relates to the value of the view (e.g., a National Trail is nationally valued for its access, not necessarily for its views).

Paragraph 6.32 of the GLVIA refers to the susceptibility of different visual receptors to changes in views and states that susceptibility is mainly a function of:

> "…*the occupation or activity of different people experiencing the view at particular locations*" and "*the extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations*."

Other factors affecting visual sensitivity include:

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor; and

- The importance of the view.

Judgements on the overall visual sensitivity/ susceptibility are provided in Table 15-3 and overall sensitivity of the visual resource is based on combining judgements on the sensitivity of the human receptor (e.g., resident, commuter, tourist, walker, recreationist or worker, and the numbers of viewers affected) and judgements on the visual resource value (e.g., views experienced from residential properties, workplace, leisure venue, local beauty spot, scenic viewpoint, commuter route, tourist route or walkers' route).

Table 15-3 Visual Receptor Sensitivity

Definition	Sensitivity
Visual Receptor Sensitivity	
Observers, drawn to a particular view, including those who have travelled to experience the views. Little or no tolerance to change	Very High
Observers enjoying the countryside from their homes or pursuing quiet outdoor recreation are more sensitive to visual change. Little tolerance to change	High
Observers enjoying the countryside from vehicles on quiet/ promoted routes are moderately sensitive to visual change. Medium tolerance to change	Medium
Observers in vehicles or people involved in frequent or infrequent repeated activities are less sensitive to visual change. High tolerance to change	Low
Observers in vehicles or people involved in frequent or frequently repeated activities are less sensitive to visual change. High tolerance to change	Negligible

15.2.11 Magnitude of Visual Effects

The magnitude of impact on the visual resource results from the scale of change in the view, with respect to the loss or addition of features in the view, and changes in the view composition. Important factors to be considered include: proportion of the view occupied by the Proposed Development, distance and duration of the view. Other vertical features in the landscape and the backdrop to the Proposed Development will all influence resource change. Judgements regarding the magnitude of visual impact are provided in Table 15-4.

Table 15-4 Magnitude of Visual Impact

Definition	Magnitude
Complete or very substantial change in view dominant involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g., through removal of key elements	Large
Moderate change in view: which may involve partial obstruction of existing view or partial change in character and composition of baseline, i.e., pre-development view through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter scale and character of the surroundings and the wider setting. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant	Medium
Minor change in baseline, i.e., pre-development view - change would be distinguishable from the surroundings whilst composition and character would be similar to the pre change circumstances.	Small
Very slight change in baseline, i.e., pre-development view - change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.	Negligible
No alteration to the existing view	No change

15.2.12 Significance of Effects

The purpose of this LVIA is to determine, in a transparent way, the likely significant landscape and visual effects of the Proposed Development. It is accepted that, due to the nature and scale of development, the Proposed Development could potentially give rise to some notable landscape and visual effects.

GLVIA3 identifies that:

> *"…a final judgment is made about whether or not each effect is likely to be significant. There are no hard and fast rules about what effects should be deemed 'significant' but LVIAs should always distinguish clearly between what are considered to be significant and non-significant effects."*

Significance can only be defined in relation to each particular development and its specific location. The relationship between receptors and effects is not typically a linear one. It is for each LVIA to determine how judgements about receptors and effects should be combined to derive significance and to explain how this conclusion has been arrived at.

The identification of significant effects would not necessarily mean that the effect is unacceptable in planning terms. What is important is that the likely effects on the landscape and visibility are transparently assessed and understood in order that the determining authority can bring a balanced, well-informed judgement to bear when making the planning decision.

The significance of effects on landscape, views and visual amenity have been judged according to the following six-point scale:

- Substantial;
- Major;
- Moderate;
- Minor;
- Negligible; or
- None .

This scale is presented in Table 15-5 below, which also contains a description of the significance of effect criteria.

Table 15-5 Significance of Effect Criteria

Significance of Effect	Landscape Resource	Visual Resource
None	Where the project would not alter the landscape character of the area.	Where the project would retain existing views.
Negligible	Where proposed changes would have an indiscernible effect on the character of an area.	Where proposed changes would have a barely noticeable effect on views/visual amenity.
Minor	Where proposed changes would be at slight variance with the character of an area.	Where proposed changes to views, although discernible, would only be at slight variance with the existing view.
Moderate	Where proposed changes would be noticeably out of scale or at odds with the character of an area.	Where proposed changes to views would be noticeably out of scale or at odds with the existing view.
Major	Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of (or a high quality) landscape.	Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality.
Substantial	Where proposed changes would be uncharacteristic and/or would significantly alter a landscape of exceptional landscape quality (e.g., internationally designated landscapes), or key elements known to the wider public of nationally designated landscapes (where there is no or limited potential for substitution nationally).	Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated landscapes or key features or elements of nationally designated landscapes that are well known to the wider public.

For the purposes of this assessment those effects indicated, in Table 15-6 below, as being Substantial or 'Major' to 'Substantial' are regarded as being significant. Effects of 'Minor' to 'Moderate' and lesser significance have been identified within the assessment, though are not considered significant. For those effects indicated as being of 'Moderate' or 'Moderate' to 'Major' the assessor has exercised professional judgement in determining if the effect is considered to be significant, taking account of site specific or location specific variables which are given different weighting in each instance according to location.

Table 15-6 Significance of effects matrix

Magnitude of Impact	Sensitivity				
	Negligible	Low	Medium	High	Very High
No Change	No Change	No Change	No Change	No Change	No Change
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor	Minor
Small	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate	Moderate to Major
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major	Major to Substantial
Large	Minor	Minor to Moderate	Moderate to Major	Major to Substantial	Substantial

A conclusion that an effect is 'significant' should not be taken to imply that the Proposed Development is unacceptable. Significance of effect needs to be considered with regard to the scale over which it is experienced and whether it is beneficial or adverse.

15.2.13 Cumulative Landscape and Visual Impact Assessment Methodology

The methodology for Cumulative Landscape and Visual Impact Assessment (CLVIA) has been based on Guidelines for Landscape and Visual Impact Assessment, Third Edition (The Landscape Institute and Institute of Environmental Management & Assessment, 2013) (GLVIA3).

The purpose of the CLVIA is to consider the landscape and visual impacts of the Proposed Development when viewed in context with other developments within the study area.

Cumulative effects consist of direct effects on the physical landscape and the character of the site containing the development, and indirect, perceived effects on the landscape character of areas within the study area from which the developments would be visible. GLVIA3 identifies effects as follows:

- **Cumulative effects** as "*the additional changes caused by a Proposed Development in conjunction with other similar developments or as the combined effect of a set of developments, taken together*" (SNH, 2012:4);
- **Cumulative landscape effects** as effects that *"can impact on either the physical fabric or character of the landscape, or any special value attached to it*" (SNH, 2012:10); and
- **Cumulative visual effects** as effects that can be caused by combined visibility, which *"occurs when the observer is able to see two or more developments from one viewpoint*" and/or sequential effects which *"occur when the observer has to move to another viewpoint to see different developments*" (SNH, 2012:11).

The significance of any identified cumulative landscape and visual effect has been assessed and has been based on the same combination of receptor sensitivity and predicted magnitude of impact described previously in order to identify the significance of cumulative effect.

15.2.14 Cumulative Baseline

The CLVIA, in line with GLVIA 3, considers the additional landscape and visual effects arising from the Proposed Development in combination with other consented, as yet unbuilt developments and Proposed Developments that are the subject of a valid planning application but have yet to be determined (GLVIA 3, Paragraph 7.13), which may give rise to cumulative landscape and visual effects.

A review of planning applications associated with other Proposed Developments has been undertaken to determine the likelihood for potential significant cumulative landscape and visual effects, taking consideration of the following criteria:

- Type and extent of identified proposal;
- The distance between the identified proposal and the Proposed Development;
- Likely visual influence of the identified proposal;
- Potential inter-visibility between the identified proposal and the Proposed Development;
- Potential for cumulative landscape effects on the physical fabric of the landscape or its scenic qualities; and

- The potential for combined, successive and sequential visual effects in the context of the Proposed Development.

There are two proposed projects in the vicinity of the Proposed Development. These are listed below and more detailed on the proposed projects is provided in EIAR Chapter 17:

- The Fionnphort Breakwater and Overnight Berthing Project; and
- British Telecom (BT) Cable installation – Iona to Fionnphort

15.3 Baseline Scenario

15.3.1 General Overview

The Proposed Development is located at the existing Iona Ferry Terminal which consists of a slipway and pier jutting out into the Sound of Iona. Iona is best known for Iona Abbey and other historic buildings on the island as well as its scenic and tranquil quality and is a popular visitor destination. Iona is known as an important gateway to Christianity in Scotland with St Columba and his followers who were said to have landed on the island in AD 563. The landscape of Iona consists of undulating moorland with frequent rocky hills and outcrops.

To the east of Iona is located the settlement of Fionnphort and the Ross of Mull that broadly consists of landscape similar to Iona with a coarse textured landscape with frequent rocky knolls over areas of flat moorland. The openness of the landscape on this part of the Ross of Mull allows extensive views from the Fionnphort coastal area towards the wider seascape including Iona and its distinctive features such as the Abbey.

A range of vessels operate from the existing pier at Iona including:

- Caledonian MacBrayne; Caledonian MacBrayne operate the MV Loch Buie between Fionnphort and Iona. This is a 30m long vessel with a draught of 1.6m.
- Crab/fishing vessel operators;
- Leisure boat operators; and
- Private boat owners.

The sound of Iona is less than a mile across, served by a short and frequent ferry linking Iona and Fionnphort. The CalMac Ferries Ltd. operated ferry takes about 10 mins per crossing and runs approximately every half hour in summer months and less regularly in winter. Visitors are not allowed to take cars on to Iona unless a special permit is granted.

The Proposed Development is located within Baile Mòr Conservation Area (including the existing slipway), which contains a number of heritage sites including St Mary's Abbey (Category A listed building) and the Iona Nunnery (scheduled monument). The Pilgrims' Way extends from Iona – Mull – Oban – Tyndrum – St Andrews. There are number of Core Paths as described below.

15.3.2 NatureScot Landscape Character Type

The Proposed Development is located within the Island Mixed Farmland Landscape Character Type (Type 49 – Landscape Character Assessment 2019).

15.3.2.1 Island Mixed Farmland (LCT 49)

NatureScot state that LCT49 forms the farmed fringe of the uplands on the island of Islay, Jura, Colonsay, Iona, Coll and Tiree. The Landscape Character Assessment details that the landform varies according to the underlying geology, but is typically undulating lowland, which becomes increasingly steep, uneven and rocky on the slopes leading to the upland moors. It is generally small-scale and complex. The slopes on the fringes of the lowland moors are typically shallow, but there are often rocky outcrops and areas of undulating terrain. These act as scale reference points in the landscape. The coastal landscape is also varied, with low cliffs, rocky outcrops, rock slabs and off-shore islands in areas of relatively elevated terrain, and narrow bays of sand or shingle at points where a river or burn meets the sea. It is an extremely diverse landscape, with a patchy mix of moorland, farmland, scrub, bog and woodland. Fields vary in size. They tend to be smaller on undulating terrain and in areas close to settlements, but many are extensive and there is a gradual transition to open, rough grazing on the fringes of the surrounding moorland. The fields are partially enclosed by a historic pattern of stone walls on higher slopes and by wire fencing elsewhere. The marginal landscape supports very small, scattered farming communities; and is peppered with early ecclesiastical sites, which retain a spiritual importance, such as the medieval monastery on Iona. It dominates the coastline and commands international renown as the cradle of Scottish or Celtic Christianity. The marginal landscape supports very small, scattered farming communities, with larger crofts in areas influenced by machair. Crofts are typically clustered in isolated groups at the end of long, narrow tracks. Smallholdings are commonly found in this landscape type. This landscape is described as relatively accessible and well-settled, and there are properties scattered in small groups along the network of narrow roads.

Key Characteristics of LCT 49 are identified by NatureScot include:

- Undulating, uneven landform with rocky outcrops on the lower margins of the upland moor;
- Indented rocky coastline with some small sandy bays;
- Diverse patchy mix of moorland, grassland, peaty marsh and woodland;
- Typically geometric fields, divided by broken stone walls on upper slopes and wire fences or straight drainage ditches on the glen floor;
- Some conifer plantations and deciduous woodland associated with larger farms and estates on sheltered glen slopes;
- Many scattered small settlements and isolated farms and cottages; and
- Archaeological sites.

15.3.3 Argyll & Bute Landscape Capacity Study - Landscape Character Type

The Proposed Development is located within the Boulder Moors LCT 11 in the Argyll & Bute Landscape Capacity Study 2009.

The key characteristics of this landscape character type are described as:

- Boulder strewn moorland;
- Rocky bays with off-shore islands;
- Peat bogs, moorland grasses and heather;
- Derelict stone cottages on windswept moorland. Modern development along the principal road; and
- Wind, rugged landscape.

The landscape capacity study lists the main landscape issues that need to be considered, with regard to development, within this landscape type are stated as;

- Take up opportunities for sensitive restoration and conservation of derelict farm buildings and cottages, particularly those in prominent positions which are an important part of the local cultural landscape.

The landscape capacity study identifies a number of Rural Opportunity Areas on Mull but none of these areas are in close proximity to the Proposed Development.

15.3.4 Seascape Character Area

The Proposed Development is identified within National Coastal Character Type - Deposition Coasts of Islands Coastal Character Type (CCT) (Type 12) in Guidance on Coastal Character Assessment (NatureScot 2017).

In the absence of a published Seascape Character Assessment at a tier down from the National level for the area potentially influenced by the Proposed Development, as part of this assessment a Seascape Character Area – Sound of Iona – has been identified by the LVIA completed for the Proposed Development to assist in the identification of the potential effects on seascape at the Proposed Development as described below.

15.3.4.1 Deposition Coasts of Islands (CCT 12)

The Coastal Character Assessment (2017) states that the physical characteristics of CCT 12 are crofting and farms are set back from the coast in an open, low lying, largely treeless and windswept landscape with views of the Atlantic Ocean or North Sea, although dunes can often screen views of open sea and coast inland. The area is described as sparsely settled, low-key land management and lack of coastal development that has an experiential character often wild, remote ‘edge of ocean’ feel with big breakers and low-lying exposure of island landscapes, with few sights of land in large scale sea views. The combination of mountains with coast is stated as providing particularly high scenic quality and drama. The document does not identify the sensitivity of the Deposition Coasts of Islands.

15.3.4.2 Sound of Iona Coastal Character Area

The Sound of Iona Coastal Character Area (CCA) consists of a narrow stretch of water that separates the island of Iona from the Ross of Mull in the southwest of Mull (Argyll & Bute). The Sound is approx. 5.5 km long and 1 km wide at its narrowest. The coastline on the Iona side is predominantly less rugged than on the Ross of Mull side with a smoother coastal topography that is aligned in a southwest to northeast axis. The Iona side of the Sound has small inlets and bays that are frequently sandy backed by small dunelands/machair. The coastal topography rises in the southern part of Iona to form high rocky hills and cliffs that do have a more rugged

appearance similar to the coastline of the Ross of Mull. Settlement on Iona is confined to the central coastline of the island at Baile Mòr and immediately south of the harbour where scattered single croft dwellings follow small narrow laneways. The medieval monastery on Iona visually dominates the coastline locally and is recognised as the origins of Scottish or Celtic Christianity. The coastal character on Iona is generally small-scale and complex.

On the Ross of Mull the coastal topography is higher than on Iona but is typically undulating lowland, which becomes increasingly steep, uneven and rocky on the slopes leading to the upland moors further inland. The coastal landscape is also varied, with low cliffs, rocky outcrops, rock slabs and small off-shore islands/outcrops, and narrow bays of sand or shingle at points where a river or burn meets the sea. Like Iona the coastal character on Mull is generally small-scale and complex.

Fionnphort is the only other small settlement within this CCA and it is well screened from coastal views due its sheltered setting in the topography. There is an almost complete absence of visible settlement along the Ross of Mull coastline in the Sound of Iona. Where settlement is found it consists of crofts that are typically clustered in isolated groups at the end of long, narrow tracks.

15.3.5 Landscape Policies – Argyll & Bute Local Development Plan 2015

A review of the current, adopted Local Development Plan, has identified the following policies of relevance to this LVIA:

Policy LDP DM1 Development within the Development Management Zones: Encouragement shall be given to sustainable forms of development as follows*: (C) Within the Villages and Minor Settlements up to small scale*on appropriate sites.*

Policy LDP STRAT 1 Sustainable Development: *In preparing new development proposals, developers should seek to demonstrate the following sustainable development principles, which the planning authority will also use in deciding whether or not to grant planning permission: a) Maximise the opportunity for local community benefit; b) Make efficient use of vacant and/or derelict land including appropriate buildings; c) Support existing communities and maximise the use of existing infrastructure and services; d) Maximise the opportunities for sustainable forms of design including minimising waste, reducing our carbon footprint and increasing energy efficiency; e) Avoid the use of locally important good quality agricultural land; f) Utilise public transport corridors and active travel networks; g) Avoid the loss of important recreational and amenity open space; Chapter 1 Introduction 8 h) Conserve and enhance the natural and built environment and avoid significant adverse impacts on biodiversity, natural and built heritage resources;* ***i) Respect the landscape character of an area and the setting and character of settlements;*** *j) Avoid places with significant risk of flooding, tidal inundation, coastal erosion or ground instability; and k) Avoid having significant adverse impacts on land, air and water environment.*

Policy LDP 3 Supporting the Protection, Conservation and Enhancement of our Environment: *In all development management zones, Argyll & Bute Council will assess applications for planning permission with the aim of protecting conserving and where possible enhancing the built, human and natural environment.*

A development proposal will not be supported when it: (A) ***does not protect, conserve or where possible enhance biodiversity, geodiversity, soils and peat, woodland, green networks, wild land, water environment and the marine environment.*** *(B) does not protect, conserve or where possible enhance; (i)* ***the***

established character and local distinctiveness of the landscape and seascape in terms of its location, scale, form and design*; and (ii) the "Dark Skies" status of the Isle of Coll. (C) does not protect, conserve or where possible enhance the established character of the built environment in terms of its location, scale, form and design. (D) has not been ascertained that it will avoid adverse effects, including cumulative effects, on the integrity or special qualities of international or nationally designated natural and built environment sites. Further information and detail on matters relating to the natural environment, landscape, and the historic environment will be provided in Supplementary Guidance. (E) has significant adverse effects, including cumulative effects, on the special qualities or integrity of locally designated natural and built environment sites. Where there is significant uncertainty concerning the potential impact of a Proposed Development on the built, human or natural environment, consideration will be given to the appropriate application of the precautionary principle, consistent with Scottish Planning Policy*

Policy LDP 6 Supporting the Sustainable Growth of Renewables: *The Council will support renewable energy developments where these are consistent with the principles of sustainable development and it can be adequately demonstrated that there would be no unacceptable significant adverse effects, whether individual or cumulative, including on local communities, natural and historic environments,* ***landscape character and visual amenity****, and that the proposals would be compatible with adjacent land uses.*

Policy LDP 9 Development Setting, Layout and Design: *The Council will require developers and their agents to produce and execute a high standard of appropriate design in accordance with the following criteria: The design of developments and structures shall be compatible with the surroundings. Particular attention shall be given to massing, form and design details within sensitive locations such as National Scenic Areas, Areas of Panoramic Quality, Greenbelt, Very Sensitive Countryside, Sensitive Countryside, Conservation Areas, Special Built Environment Areas, Historic Landscapes and Archaeologically Sensitive Areas, Historic Gardens and* ***Designed Landscapes*** *and the settings of listed buildings and Scheduled Ancient Monuments. Within such locations, the quality of design will require to be higher than in other less sensitive locations and, where appropriate, be in accordance with the guidance set out in "New Design in Historic Settings" produced by Historic Scotland, Architecture and Place, Architecture and Design Scotland.*

15.3.6 Landscape Designations Argyll & Bute Local Development Plan 2015

As mentioned previously, the Proposed Development sites lies wholly within the Argyll & Bute Council Area covered by the LDP 2015. A review of the LDP 2015 and other relevant landscape related designations that may influence the assessment. Identified designations are listed below and are taken forward for detailed assessment.

15.3.6.1 National Scenic Areas

National Scenic Areas (NSA) purpose is both to identify the finest scenery in Scotland and to ensure its protection from inappropriate development. This is achieved through the planning system. For each NSA the landscape qualities that make each NSA special have been identified. The Proposed Development is not located with an area designated as NSA. The nearest NSA is located approximately 23 km away, on the northwest side of the Isle of Mull known as Loch na Keal NSA.

15.3.6.2 Area of Panoramic Quality

Iona coastline is designated as an Area of Panoramic Quality within the Plan. These are areas which are designated in terms of their landscape quality. Planning policy aims to protect these areas against development which would diminish their high scenic value.

15.3.6.3 Local Landscape Areas

Local Landscape Areas (LLA) are areas of regional importance in terms of their landscape quality as identified by the Local Development Plan. The island of Iona is identified as lying within an LLA.

15.3.6.4 Conservation Areas

Conservation Areas are areas of special architectural or historic interest which have a statutory basis under the Planning (Listed Building and Conservation Areas) (Scotland) Act 1997, the character or appearance of which the LDP identifies as desirable to preserve or enhance. As set out above the Proposed Development is located within Baile Mòr Conservation Area (including the existing slipway), which contains a number of heritage sites including St Mary's Abbey (Category A listed building) and the Iona Nunnery (scheduled monument).

15.3.7 Argyll & Bute Local Development Plan – Supplementary Guidance (adopted 2016)

The Council has adopted Supplementary Guidance which provides additional detail on the policies within the adopted Local Development Plan. Supplementary Guidance is a material consideration in determining applications for planning permission. A review of the adopted Supplementary Guidance has identified the following policies of relevance to this LVIA:

SG LDP ENV 13 Development Impact on Areas of Panoramic Quality (APQs): *Argyll & Bute Council will resist development in, or affecting, an Area of Panoramic Quality where its scale, location or design will have a significant adverse impact on the character of the landscape unless it is adequately demonstrated that: (A) Any significant adverse effects on the landscape quality for which the area has been designated are clearly outweighed by social, economic or environmental benefits of community wide importance*.

SG LDP ENV 14 Landscape: *Outwith National Scenic Areas and Areas of Panoramic Quality, Argyll & Bute Council will consider landscape impact when assessing development proposals, and will resist development when its scale, location or design will have a significant adverse impact on the character of the landscape unless it is demonstrated that: (A) Any such effects on the landscape quality are clearly outweighed by social, economic or environmental benefits of community wide importance; and (B) The Council is satisfied that all possible mitigation measures have been incorporated into the development proposal to minimise adverse effects*.

SG LDP ENV 15 Development Impact on Historic Gardens and Designed Landscapes: *In assessing proposals for development in, or adjacent to, gardens or designed landscapes particular attention will be paid to the impact of the proposal on: (A) The archaeological, historical or botanical interest of the site; (B) The site's original design concept, overall quality and setting; (C) Trees and Woodland and the site's contribution to local landscape character within the site including the boundary walls, pathways, garden terraces or water features; and, (D) Planned or significant historic views of, or from, the site or buildings within it.*

15.3.8 Landscape Policies – Proposed Argyll & Bute Local Development Plan 2

The landscape policies in the Proposed Argyll & Bute LDP 2 reflect those set out in the adopted 2016 LDP with the following:

Policy 10 Design – All Development: The design of any development must demonstrate an understanding of and appropriate response to the Proposed Development site and wider context including consideration of character.

Policy 20 Gardens and Designed Landscapes: There will be a presumption in favour of retaining, protecting, conserving and enhancing gardens and designed landscapes, either listed in the inventory of gardens and designed landscapes, or otherwise deemed to be of significant value.

Policy 71 Development Impact on Local Landscape Area (LLA): Argyll & Bute Council will resist development in, or affecting, a Local Landscape Area where its scale, location or design will have a significant adverse impact on the character of the landscape unless it is adequately demonstrated that: a) Any significant adverse effects on the landscape quality for which the area has been designated are clearly outweighed by social, economic or environmental benefits of community wide importance; and b) The proposal is supported by an LVIA and consistent with the relevant Argyll & Bute Landscape Capacity Assessment.

Policy 42 – Safeguarding Piers, Ports and Harbours: Development within established commercial harbour, port and pier areas will be supported where:

- It has been clearly demonstrated that the proposal requires a pier, port or harbourside location or is ancillary to activities taking place within that particular facility; and
- It has been clearly demonstrated that the proposal would not adversely affect the commercial viability or efficient operation of the facility for marine related uses.

15.3.9 Gardens and Designed Landscapes

The Inventory of Gardens and Designed Landscapes (GDL), under the remit of Historic Environment Scotland (HES) has prepared surveys of GDL's within Scotland. A review of the inventory held by HES has identified that no GDLs will be directly affected by the Proposed Development as there are none in proximity to the Proposed Development.

15.3.10 Visual Receptors

Core Paths and Recreational Routes

A number of Core Paths (Figure 15-2) lie within close proximity to the Proposed Development and have been identified from the available GIS information associated with the LDP. Identified Core Paths include:

- Core Path ID C044; North Beach Walk Iona 0.6km linear route to the north of the development site.
- Core Path ID C483; Baile Mòr to Culbuirg dunes, Iona, a 2.8km circular route south of the development site.
- Core Path ID C484 - Culbuirg Dunes to Port na Curaich, Iona a 2.4km linear route to the south-west of the site.

In addition to the Core Paths identified by the LDP a further walk known as St Columba's Way is a promoted long-distance walk that extends for approx. 200 miles from Iona – Mull – Oban – Tyndrum – St Andrews.

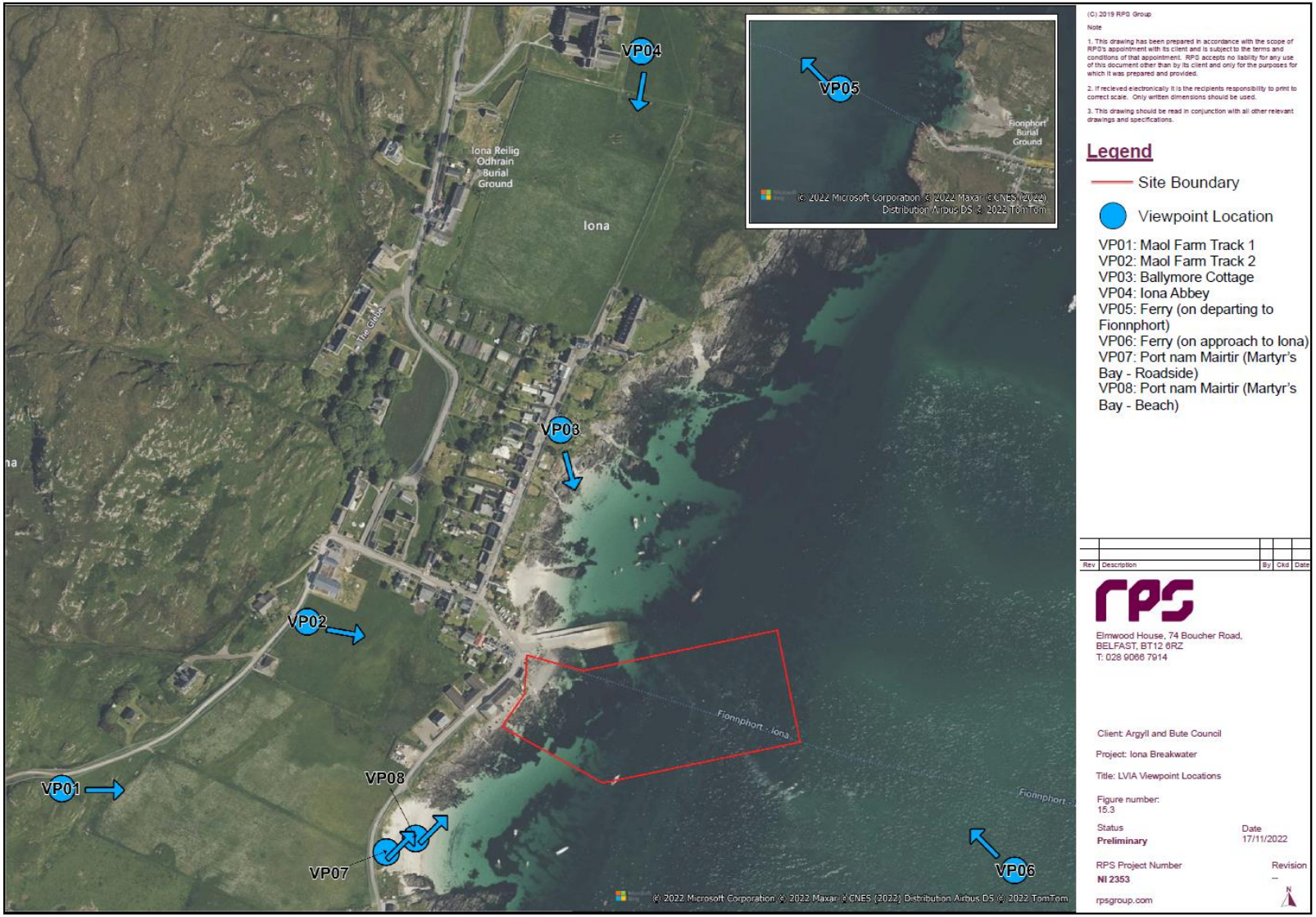


Figure 15-2 Core paths and viewpoint locations

Water Users

There are several mobile water-based receptors using the water along the coastline of the sound of Iona including ferry users, kayaks, pleasure boats and fishing vessels.

Roads

On Iona narrow access lanes extend north and south from Baile Mòr linking with the harbour area. It is important to note that visitor cars are not permitted on the island with the exception of blue badge holder with mobility issues who can apply for a permit.

The A849 runs in a west to east direction from Fionnphort across the Ross of Mull. This is the only Class A Road in proximity to the Proposed Development. South of Fionnphort a small access road runs off the A849 providing access to Fidden and Fidden Farm Campsite.

Viewpoints

A selection of representative viewpoints has been established via the EIA Scoping Response and feedback from Consultees that included the request for two additional viewpoints; view from ferry approach to the Island; and view from the Bay of Martyrs.

The eight viewpoints selected for use in the LVIA are as follows:

1. Maol Farm Track 1
2. Maol Farm Track 2
3. Ballymore Cottage
4. Iona Abbey
5. Ferry (on departing to Fionnphort)
6. Ferry (on approach to Iona)
7. Port nam Mairtir (Martyrs Bay - Roadside)
8. Port nam Mairtir (Martyrs Bay - Beach)

15.4 Likelihood of Effects

15.4.1 Construction Phase

The Proposed Development, as described in detail in EIAR Chapter 3, has the potential to affect the following landscape and visual resources during construction:

- Landscape/Seascape character of the Proposed Development site and the surrounding area;
- Landscapes designated for their special qualities or scenic beauty; and
- The visual amenity of people in the surrounding area.

During the construction phase the Proposed Development has potential to result in impacts that may be prominent though largely temporary in duration. The construction phase effects are taken forward for detailed consideration in the landscape & visual impact assessment below.

15.4.2 Operational Phase

The Proposed Development, as described in detail in EIAR Chapter 3, has the potential to affect the following landscape and visual resources during operation:

- Landscape/Seascape character of the Proposed Development site and the surrounding area;
- Landscapes designated for their special qualities or scenic beauty; and
- The visual amenity of people in the surrounding area.

The Proposed Development therefore has the potential to give rise to landscape and visual effects during the operational phase. Operational phase effects are taken forward for consideration in the detailed landscape and visual impact assessment below.

15.5 Description of Likely Significant Effects

15.5.1 Seascape/Landscape Character Effects

The Proposed Development is located within the Argyll & Bute Council area and the predicted landscape effect of the Proposed Development is set out in Table 15-7.

Table 15-7 Seascape/Landscape Character Effects

Island Mixed Farmland – LCT 49	
Sensitivity	This LCT forms the fringe of uplands and the island of Iona and is small scale and complex with open long-distance views. The Proposed Development consists of the proposal to locate a breakwater at the existing Iona Ferry Terminal. Taking account of the above characteristics the susceptibility of the LCT to the type of development proposed is judged to be high. This LCT includes parts of the landscape at Iona that have been designated as Areas of Panoramic Quality, Local Landscape Area and Conservation Area at Baile Mòr. Taking account of the above characteristics the value of the LCT to the type of development proposed is judged to be high. Based on the susceptibility and value attached to this LCT, the overall sensitivity of this LCT is judged to be high.
Magnitude of Change – Construction Phase	Sea based traffic and construction activities within proximity to the Proposed Development in the Sound of Iona will have a temporary, indirect effect upon coastal fringe areas of the LCT only. Away from the coastal fringe areas the construction activities will have limited to no influence on this LCT due to intervening topography. The predicted magnitude of change associated with the construction phase is considered to be medium, as activities will be temporary in nature and limited to a localised portion of this much wider LCT that will remain unaltered resulting in a small magnitude of change for the remaining LCT.
Magnitude of Change – Operational Phase	During the operational phase, the Proposed Development will form a new, noticeable feature in local views from the eastern coastline of Iona and will be less noticeable but still visible from the western coastal fringe Ross of Mull. The Proposed Development will alter the existing coastline, but magnitude of change is off set by the fact that it is located at the site of the existing harbour that is already a landscape feature itself and the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed and tideline etc. The Proposed Development is also read in the context with the settled area on the eastern side of Iona. Visibility of the Proposed Development will diminish rapidly further inland on both Iona and Ross of Mull within LCT 49, due to screening effects provided by existing topography resulting in a medium magnitude of change locally and small magnitude of change for the remaining LCT.
Significance of Effect during Construction Phase	Moderate to major, localised direct, temporary duration and considered to be significant, reducing to minor to moderate and not significant effects with increasing distance from the coastal fringe of this LCT.
Significance of Effect during Operational Phase	Moderate to major localised direct long-term duration and considered to be significant for localised coastal fringe areas at Sound of Iona, reducing to minor to moderate and not significant with increasing distance from the coastal fringe of this LCT.
Deposition Coast of Islands – CCT 12 – Seascape Character	
Sensitivity	This CCT is described as an open, low lying, largely treeless and windswept landscape with views of the Atlantic Ocean or North Sea, although dunes can often screen views of open sea and coast inland. The area is described as sparsely settled, low-key land management and lack of coastal development that has an experiential character often wild, remote ‘edge of ocean’ feel with big breakers and low-lying exposure of island landscapes, with few sights of land in large scale sea views. Taking account of the above characteristics the susceptibility of the CCT to the type of development proposed is judged to be high. This CCT includes parts of the landscape at Iona that have been designated as Areas of Panoramic Quality, Local Landscape Area and Conservation Area at Baile Mòr. The Coastal Character Assessment 2017 states that this CCT provides particularly high scenic quality and drama. Taking account of the above characteristics the value of the CCT to the type of development proposed is judged to be high. Based on the susceptibility and value attached to this CCT, the overall sensitivity of this CCT is judged to be high.
Magnitude of Change – Construction Phase	Sea based traffic and activities within proximity to the Proposed Development in the Sound of Iona will have a temporary, indirect effect upon coastal fringe areas of the CCT only. Away from the coastal fringe areas the construction activities will have no influence on this CCT due to intervening topography.

Island Mixed Farmland – LCT 49	
	The predicted magnitude of change associated with the construction phase is considered to be medium, as activities will be temporary in nature and limited to a small and localised portion of this much wider CCT that will remain unaltered resulting in a small magnitude of change for the remaining CCT.
Magnitude of Change – Operational Phase	During the operational phase, the Proposed Development will form a new, noticeable feature in local views from the eastern coastline of Iona and will be less noticeable but still visible from the western coastal fringe Ross of Mull. The Proposed Development will alter the existing coastline, but magnitude of change is off set by the fact that it is located at the site of the existing harbour that is already a landscape feature itself and the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed and tideline etc. The Proposed Development is also read in the context with the settled area on the eastern side of Iona. Visibility of the Proposed Development will diminish rapidly further inland on both Iona and Ross of Mull within this CCT, due to screening effects provided by existing topography resulting in a medium magnitude of change locally and small magnitude of change for the remaining CCT.
Significance of Effect during Construction Phase	Moderate to major, localised direct, temporary duration and considered to be significant, reducing to minor to moderate and not significant effects with increasing distance from the coastal fringe of this CCT.
Significance of Effect during Operational Phase	Moderate to major localised direct long-term duration and considered to be significant for localised coastal fringe areas at Sound of Iona, reducing to minor to moderate and not significant with increasing distance from the coastal fringe of this CCT.
Sound of Iona CCA – Local Seascape Character	
Sensitivity	This local CCA forms the fringe of uplands on western Ross of Mull and of the island of Iona and is small scale and complex with open long distance views. The Proposed Development consists of the proposal to locate a breakwater at the existing Iona Ferry Terminal. Taking account of the above characteristics the susceptibility of the CCA to the type of development proposed is judged to be high. This CCA includes parts of the landscape at Iona that have been designated as Areas of Panoramic Quality, Local Landscape Area and Conservation Area at Baile Mòr. Taking account of the above characteristics the value of the CCA to the type of development proposed is judged to be high. Based on the susceptibility and value attached to this CCA, the overall sensitivity of this CCA is judged to be high.
Magnitude of Change – Construction Phase	Sea based traffic and activities within proximity to the Proposed Development in the Sound of Iona will have a temporary, direct effect upon coastal fringe areas of the CCA only. Away from the coastal fringe areas the construction activities will have no influence on this CCA due to intervening topography. The predicted magnitude of change associated with the construction phase is considered to be high, as activities will be temporary in nature and limited to a small and localised portion of this much wider CCA that will remain unaltered
Magnitude of Change – Operational Phase	During the operational phase, the Proposed Development will form a new, noticeable feature in local views from the eastern coastline of Iona and will be less noticeable but still visible from the western coastal fringe Ross of Mull. The Proposed Development will alter the existing coastline, but magnitude of change is off set by the fact that it is located at the site of the existing harbour that is already a landscape feature itself and the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed and tide line etc. The Proposed Development is also read in the context with the settled area on the eastern side of Iona. Visibility of the Proposed Development will diminish rapidly further inland on both Iona and Ross of Mull within this CCA, due to screening effects provided by existing topography resulting in a medium magnitude of change locally and small magnitude of change for the remaining CCA.
Significance of Effect during Construction Phase	Moderate to major, localised direct, temporary duration and considered to be significant at the eastern coastal fringe of Iona, reducing to minor to moderate and not significant effects with increasing distance from this coastal fringe area elsewhere in this CCA.
Significance of Effect during Operational Phase	Moderate to major localised direct long-term duration and considered to be significant for localised eastern coastal fringe areas at Iona, reducing to minor to moderate and not significant with increasing distance from this coastal fringe area.

15.5.2 Landscape Designation Effects

15.5.2.1 National Scenic Areas

The Proposed Development is not located with an area designated as NSA. The nearest NSA is located on the northwest side of the Isle of Mull known as Loch na Keal NSA. No significant effects are predicted for any NSA.

15.5.2.2 Area of Panoramic Quality

Iona coastline is designated as an Area of Panoramic Quality (APQ) within the LDP. These are areas which are designated in terms of their landscape quality. Planning policy aims to protect these areas against development which would diminish their high scenic value.

The Proposed Development will form a new, noticeable feature in local views from the eastern coastline of Iona but will be less noticeable elsewhere but still visible from the western coastal fringe Ross of Mull however, from Ross of Mull it will be read as part of the Iona shoreline (see Viewpoint 5). The Proposed Development in views along the eastern Iona shoreline will visibly alter the existing coastline but magnitude of change is off set by the fact that it is located at the site of the existing harbour that is already a landscape feature itself and that the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed etc. Vessels coming and going to and from the Iona harbour will not change. Visibility of the Proposed Development will diminish rapidly further inland on both Iona and Ross of Mull within this designation, due to screening effects provided by existing topography resulting in a medium magnitude of change locally and small to negligible magnitude of change for the remaining APQ.

The significance of effect is predicted to be Moderate to major localised direct and long-term duration and considered to be significant for localised eastern coastal fringe areas at Iona, reducing to minor to moderate and not significant with increasing distance from this localised area.

15.5.2.3 Local Landscape Areas

Local Landscape Areas (LLA) are areas of regional importance in terms of their landscape quality as identified by the Local Development Plan. The island of Iona is identified as lying within an LLA.

The Proposed Development will form a new, noticeable feature in local views from the eastern coastline of Iona but will be less noticeable elsewhere along the eastern side of Iona and not visible beyond the localised area north and south of the existing harbour due to intervening topography. The Proposed Development in views along the eastern Iona shoreline will visibly alter the existing coastline but magnitude of change is off set by the fact that it is located at the site of the existing harbour that is already a landscape feature itself and that the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed etc. Vessels coming and going to and from the Iona harbour will not change. Visibility of the Proposed Development diminishes rapidly further inland on Iona within this designation, due to screening effects provided by existing topography resulting in a medium magnitude of change locally and small to negligible magnitude of change for the remaining LLA.

The significance of effect is predicted to be moderate to major localised direct and long term duration and considered to be significant for localised eastern coastal fringe areas at Iona, reducing to minor to moderate and not significant with increasing distance from this localised area.

15.5.2.4 Conservation Areas

Conservation Areas are areas of special architectural or historic interest which have a statutory basis under the Planning (Listed Building and Conservation Areas) (Scotland) Act 1997, the character or appearance of which the LDP identifies as desirable to preserve or enhance. As set out above the Proposed Development is located within Baile Mòr Conservation Area (including the existing slipway), which contains a number of heritage sites including St Mary's Abbey (Category A listed building) and the Iona Nunnery (scheduled monument).

The Proposed Development is located directly within the Baile Mòr Conservation Area and as such will alter the appearance of immediate surroundings at the existing slipway. The proposed breakwater will be a new and prominent feature in views from within the conservation area (see Viewpoints 1, 2 and 3). The magnitude of change is off set by the fact that the Proposed Development is located at the site of the existing harbour that is already a landscape feature itself within this conservation area and that the rock used to construct the breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed etc. Vessels coming to and going from the Iona harbour will not change.

The significance of effect is predicted to be moderate to major localised direct and long-term duration and considered to be significant for the Baile Mòr Conservation Area.

A summary of the predicted townscape/landscape and visual effect on landscape designations is provided in the summary Table 15-8.

Table 15-8 Summary of Predicted Landscape/Seascape and Designation Effects

Landscape/Seascape Character / Designation	Predicted Landscape & Visual Effects (Construction Stage)	Predicted Landscape & Visual Effects (Operational Stage)
Island Mixed Farmland – LCT 49	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance
Deposition Coasts of Islands - CCT 12	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance
Sound of Iona CCA	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance
National Scenic Areas	No change	No change
Area of Panoramic Quality	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance
Local Landscape Area	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance	Moderate to major localised, reducing to minor to moderate and not significant with increasing distance
Conservation Area	Moderate to major	Moderate to major

15.5.3 Visual Effects

15.5.3.1 Core Paths and Recreational Routes

There are four identified Core Paths namely:

- Core Path ID C044; North Beach Walk Iona 0.6km linear route to the north of the development site.
- Core Path ID C483; Ballie Mòr to Culbuirg dunes, Iona, a 2.8km circular route south of the development site.
- Core Path ID C484 - Culbuirg Dunes to Port na Curaich, Iona a 2.4km linear route to the southwest of the site.

Core Path ID C044 the North Beach Walk on Iona will have intermittent but direct views towards the Proposed Development that fade out with increased distance northwards due to intervening topography. The built environment on the north side of Baile Mòr breaks up views towards the Proposed Development. Where direct views are available the Proposed Development will appear as new and prominent feature in views albeit associated with the existing harbour and settlement at Baile Mòr (see Viewpoint 3). The viewer sensitivity is high. The predicted magnitude of change is large. The predicted significance of effect is Major to substantial and significant for direct views from Core Path ID C044.

Core Path ID C483 the Ballie Mòr to Culbuirg dunes walk on Iona extends south from the harbour area and locally in close proximity will have direct views towards the Proposed Development that fade out with increased distance southwards due to intervening topography to no view at all. The built environment on the south side of Baile Mòr does breaks up views towards the Proposed Development but where direct views are available the Proposed Development will appear as new and prominent feature in views albeit associated with the existing harbour and settlement at Baile Mòr (see Viewpoint 7). The viewer sensitivity is high. The predicted magnitude of change is large. The predicted significance of effect is Major to substantial and significant for direct views from Core Path ID C483. The remainder of this Core Path will have no significant effects.

Core Path ID C484 from the Culbuirg Dunes to Port na Curaich is located on the western side of Iona and will not have any direct views towards the Proposed Development due to intervening topography. The viewer sensitivity is high. The predicted magnitude of change is no change. The predicted significance of effect is no change for views from Core Path ID C044.

15.5.3.2 Viewpoints

A series of eight representative viewpoints have been selected to illustrate the existing visual context of the Proposed Development and as an aid to the visual impact assessment. All of the viewpoints have been located on publicly accessible roads, footways and verges as well as from the ferry approaches to Iona (Figure 15-2).

Views available from each of the selected viewpoint locations are presented in Volume III, Appendix 15.1: Photomontages, which should be read in conjunction with the following viewpoint assessments below.

Visual effects from the representative viewpoints considered in the LVIA are described in Table 15-8 to Table 15-15 below.

Table 15-8 Viewpoint 1; Maol Farm Track 1

Viewpoint 1 – Maol Farm Track 1			
Grid Ref	128188, 723902	**Existing Viewpoint Location**	Figure 15.3
Direction of View	90^0	**Approx Distance to Proposed Development**	0.425km

Description of existing view and potential receptors	This viewpoint is located at Maol Farm Track which is circa.425m south west of the Proposed Development. The existing view at this location is slightly elevated above the relatively flat topography along the coast offering clear views towards the harbour. The topography of the landscape offers uninterrupted views to Ross of Mull on the other side of the Sound of Iona. The settlement of Fionnphort is just visible in tyhe cnetre right of the view. There are a number of buidings clearly visible within this view that are located on the immediate southern side of Baile Mor. The existing harbour at Baile Mòr is not visible as it is screened by buildings but the existing ferry will be clearly visible from this viewpoint coming and going from Iona to Fionnphort. Livestock, overhead electrictiy lines on wooden posts and timber/ wire fences transverse through the landscape. This viewpoint is representative of recreational users travelling north along the track towards Baile Mòr.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are recreational receptors. The view is representative of views from a recognised stopping place or promoted walk, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre of the view. Vessels transporting rock will be a large but transitory feature in views during construction. The construction activities will be partially screened by topography and existing buildings at Baile Mòr particulary ground level activities. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will appear as a new feature on the Iona coastline but occupying a small portion of the overall view. The new breakwater will be read with and in the context of urban built form at Baile Mòr. A small part of the visible sea is lost in the view but the western coastline of the Ross of Mull remains viisble in the view along with distant mountains and hills that draw the eye upwards. At nighttime the warning light on the breakwater will be noticeable but difficult to discern from adjacent lights associated with properties at Baile Mòr. The magnitude of visual change during construction is judged to be medium. The magnitude of visual change during operation will be small.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a moderate to major and not significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a minor to moderate and not significant visual effect.

Table 15-9 Viewpoint 2; Maol Farm Track 2

Viewpoint 2 – Maol Farm Track 2			
Grid Ref	128407, 724031	**Existing Viewpoint Location**	Figure 15.3
Direction of View	110^0	**Approx Distance to Proposed Development**	210 m

Description of existing view and potential receptors	This viewpoint is located at Maol Farm Track which is circa.210m west of the Proposed Development. The existing view at this location is slightly elevated above the relatively flat topography along the coast offering clear views towards the harbour. The topography of the landscape offers uninterrupted views Ross of Mull in the distance. Fionnphort is visible in the distance on the opposite side of the Sound of Iona. There are a number of modern buidings clearly visible within this view that dominate the foreground. The closest building visible within this view is a 2 storey dwelling to the left which sits adjacent to the Cnoc a' Chalmain which is a Catholic House of Prayer. A break in the building line at Baile Mòr permits a partial view of the existing harbour area with the light columns at the slipway visible. The taller buildings to the left of the view obscure visibility of the coastline at Ross of Mull in this view direction. The existing ferry when crossing the Sound will be visible within this view. Livestock, overhead electrictiy lines on wooden posts and timber/ wire fences transverse through the landscape. This viewpoint is representative of recreational users travelling north along the track towards the harbour.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are recreational receptors. The view is representative of views from a recognised stopping place or promoted walk, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre of the view but partially screened by the existing buildings at Baile Mòr with glimpse views only. Vessels transporting rock will be a large but transitory feature in views during construction. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will appear as a new feature on the Iona coastline but occupying a very small portion of the overall view. The new breakwater will be read with and in the context of more prominent urban built form at Baile Mòr in the foreground. A very small part of the visible sea is lost in the view but the western coastline of the Ross of Mull and view to Fionnphort remains viisble in the view along with distant mountains and hills on Mull and beyond. At nighttime the warning light on the breakwater will be noticeable but very difficult to discern from adjacent lights associated with properties at Baile Mòr and the existing lights at the harbour slipway. The magnitude of visual change during construction is judged to be small. The magnitude of visual change during operation will be small.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a minor to moderate and not significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a minor to moderate and not significant visual effect.

Table 15-10 Viewpoint 3; Ballymore Cottage

Viewpoint 3 – Ballmore Cottage			
Grid Ref	128634, 724181	**Existing Viewpoint Location**	Figure 15.3
Direction of View	185^0	**Approx Distance to Proposed Development**	0.2km

Description of existing view and potential receptors	This viewpoint is located at Ballymore Cottage within the northern side of Baile Mòr which is circa.220m north of the Proposed Development. The existing view at this location is slightly elevated above the shoreline offering partial and glimpse views towards the harbour. The existing slipway is visible along with vehicles and lighting columns. The viewpoint also offers partly interrupted views of the southern portion of Ross of Mull in the distance. If the viewer turns their head to the left Fionnphort is visible in the distance on the opposite side of the Sound of Iona. The immediate foreground is filled with gardens associated with local dwellings at Baile Mòr. The existing ferry when crossing the Sound will be visible within this view. This viewpoint is representative of views available to residential receptors at this location in Baile Mòr towards the harbour.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are residential receptors. The view is representative of views from within the Baile Mòr Conservaion Area, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the direct visibility of machinery and activities associated with the construction of the breakwater that will be located across much of the view. Vessels transporting rock will be a large but transitory feature in views during construction. The direct and open visibility available from this location will result in the majority of construction activities being visible from ground/sea level up. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will appear as a prominent new feature on the Iona coastline extending across the majority of the view. The new breakwater will be read with and in the context of the existing harbour and slipway at Baile Mòr in the foreground. A large part of the visible sea is lost in the view but the southern coastline of the Ross of Mull remains visible beyond the proposed breakwater. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels the proposed breakwater will be less visible in the view. At nighttime the warning light on the breakwater will be noticeable and read with the existing lights at the harbour slipway. The magnitude of visual change during construction is judged to be large. The magnitude of visual change during operation will be large.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a major to substantial and significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a major to substantial and significant visual effect.

Table 15-11 Viewpoint 4; Iona Abbey

Viewpoint 4 – Iona Abbey			
Grid Ref	128724, 724500	**Existing Viewpoint Location**	Figure 15.3
Direction of View	185^0	**Approx Distance to Proposed Development**	550m

Description of existing view and potential receptors	This viewpoint is located at within the grounds of Iona Abbey and is adjacent to the eastern side of the Abbey and Abbey Museum approximately 0.5km north of the Proposed Development. The view is taken looking south towards the harbour and is considered to be representative of direct views experienced by members of the public / tourists visiting Iona Abbey and Museum. The existing views available from this location are expansive and panoramic in nature over the Sound of Iona with views of Fionnphort and the more elevated land forming the Ross of Mull visible in the horizon. The immediate foreground is comprised of arable pastoral land, bounded by timber and wire post which spearates the field boundaries. There is little covering of hedgerows and trees within the immediate landscape in the foreground leaving views of the surrounding fields open. Due to the openess and topography of the land the existing harbour infrastructure and ferry are visible in the central portion of the view, forming a minor point of interest. However, buildings on the nortehrn side of Baile Mòr are prominent on shoreline breaking up views to the sea.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are tourist and recreational receptors. The view is representative of views from within the Iona Abbey complex, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the direct visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre of the view. Vessels transporting rock will be a large but transitory feature in views during construction. The direct and open visibility available from this location will result in the majority of construction activities being visible from ground/sea level up but a distance of more than 0.5km that will lessen the prominence of activities. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will appear as a prominent new feature on the Iona coastline extending across the centre of the view. The new breakwater will be read with and in the context of the existing harbour and slipway and built form at Baile Mòr in the foreground. A small part of the visible sea is lost in the view but the southern coastline of the Ross of Mull remains visible beyond the proposed breakwater in the panoramic view and the eye remains drawn to the distant horizon. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels the proposed breakwater will be less visible in the view. At nighttime the warning light on the breakwater will be noticeable and read with the existing lights at the harbour slipway and properties at Baile Mòr in the foreground. The magnitude of visual change during construction is judged to be medium. The magnitude of visual change during operation will be medium.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a moderate to major and not significant temporary, adverse visual effect during the construction phase due to the separation distance and existing urban/harbour context of the view.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a moderate to major and not significant visual effect due to the separation distance and existing urban/harbour context of the view.

Table 15-12 Viewpoint 5; Ferry (on departing Fionnphort)

Viewpoint 5 – Ferry (on departing Fionnphort)			
Grid Ref	129621; 723584	**Existing Viewpoint Location**	Figure 15.3
Direction of View	305^0	**Approx Distance to Proposed Development**	1000m

Description of existing view and potential receptors	This viewpoint is located at within the the Sound of Iona on the ferry crossing from Fionnphort approaching Iona approximately 1 km east of the Proposed Development. The view is taken looking west towards Iona and directly at Baile Mòr that is in the centre of the view and is considered to be representative of direct views experienced by the local community and tourists visiting Iona. The existing views available from this location are enclosed but panoramic in nature over the Sound of Iona with views of Iona filling the view and the higher ground on the island forming the horizon. The immediate foreground is comprised of open water extending to the eastern shoreline of Iona that appears well settled from this distance with numerous buildings visible across the full width of the view. The harbour and slipway at Baile Mòr is discernible in the centre of the view. The sandy Martyr's Bay is visible to the left of the harbour area. The distinctive Iona Abbey is prominent to the centre right of the view.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are the local community, tourist and recreational receptors. The view is representative of views from panoramic views within recognised designations including the the APQ and while not located in a specific designation the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the direct visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre of the view but distant. Vessels transporting rock will be a large but transitory feature in views during construction and read with other vessels using the harbour and Sound of Iona. The direct and open visibility available from this location will result in the majority of construction activities being visible from ground/sea level up but at distance of more than 1 km that will make the activities difficult to discern and be read with the background of buildings and settled appearance of this side of the island that will lessen the prominence of activities. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will be visible as new feature on the Iona coastline but not prominent as it is read as part of the settled rocky coastline and with the existing harbour. The existing harbour is already a minor landscape feature itself within this view and the rock used to construct the new breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed, tideline etc increasingly read more as a part of the eastern Iona coastline. No significant views are lost. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels the proposed breakwater will be less visible in the view. At nighttime the warning light on the breakwater will be noticeable and read with the existing lights at the harbour slipway and properties at Baile Mòr in the background. The magnitude of visual change during construction is judged to be small. The magnitude of visual change during operation will be small.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a minor to moderate and not significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a minor to moderate and not significant visual effect.

Table 15-13 Viewpoint 6; Ferry (on approaching Iona)

Viewpoint 6 – Ferry (on approach to Iona)			
Grid Ref	128999; 723780	**Existing Viewpoint Location**	Figure 15.3
Direction of View	305^0	**Approx Distance to Proposed Development**	265m

Description of existing view and potential receptors	This viewpoint is located at within the the Sound of Iona on the ferry crossing from Fionnphort approaching Iona approximately 250 m east of the Proposed Development. The view is taken looking westwards Iona and directly at Baile Mòr that is in the centre of the view and is considered to be representative of direct views experienced by the local community and tourists visiting Iona. The existing views available from this location are enclosed in character being cosntrained by the higher ground on the island that forms a rugged horizon. The immediate foreground is comprised of open water extending to the eastern shoreline of Iona that appears well settled from this distance with numerous prominent buildings visible across the full width of the view nestled below the rugged and rocky hills beyond. The harbour and slipway at Baile Mòr is clearly visible in the centre of the view.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are the local community, tourist and recreational receptors. The view is representative of views from panoramic views within recognised designations including the the APQ and while not located in a specific designation the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the direct visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre of the view and prominent due to the close proximity of the viewpoint. Vessels transporting rock will be a large but transitory feature in views during construction and read with other vessels using the harbour and Sound of Iona coming and going. The direct visibility available from this location will result in the majority of construction activities being visible from ground/sea level up and at close distance but these activities will be read with the close proximity background of buildings and settled appearance of this side of the island that will lessen the prominence of activities. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will be visible as new feature on the Iona coastline but read as part of the settled rocky coastline and at the location of the existing harbour. The existing harbour is already a large landscape feature itself within this view and the rock used to construct the new breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed, tideline etc increasingly read more as a part of the eastern Iona coastline. The view to the existing slipway will be lost from this angle to ferry approach along with the ground level view of some buildings at Baile Mòr but overall, no significant views are lost. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels the proposed breakwater will be less visible in the view. At nighttime the warning light on the breakwater will be noticeable and read with the existing lights at the harbour slipway and properties at Baile Mòr in the background. The magnitude of visual change during construction is judged to be large. The magnitude of visual change during operation will be medium.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a major to substantial and significant temporary, adverse visual effect during the construction phase due to the existing urban/harbour context of the view.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a moderate to major and not significant visual effect due to the existing urban/harbour context of the view.

Table 15-14 Viewpoint 7; Port nam Mairtir (Martyrs Bay - Roadside)

Viewpoint 7 – Port nam Mairtir (Martyrs Bay - Roadside)			
Grid Ref	128462, 723830	**Existing Viewpoint Location**	Figure 15.3
Direction of View	60^0	**Approx Distance to Proposed Development**	175 m

Description of existing view and potential receptors	This viewpoint is located at the roadside immediately adjacent to Martyr's Bay which is circa.175m southwest of the Proposed Development. The existing view at this location is lowlying but just above the shoreline on the eastern Iona coast offering views towards the harbour. The existing slipway is visible in the centre of view along with vehicles and streetlights. The proximity to the shoreline offers largely uninterrupted views Ross of Mull and distant mountains and hills. If the viewer turned their head to the right Fionnphort would be visible in the distance on the opposite side of the Sound of Iona. There are a number of modern buidings clearly visible within this view that dominate the foreground along with vehicles. The buildings to the left of the view obscure visibility of the coastline of Mull and sea beyond the Sound of Iona. The existing ferry when crossing the Sound will be clearly visible within this view. This viewpoint is representative of views for the local community and recreational/tourist users exploring the island.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are local community and recreational/tourist receptors. The view is representative of views from a recognised stopping place and within a Conservation Area/APQ, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre and left of the view. Some activities will be screened by the existing buildings at Baile Mòr and by the breakwater itself as it increases in size. Vessels transporting rock will be a large but transitory feature in views during construction depending on the haulage route. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater that will appear as a new feature on the Iona coastline occupying a large portion of the overall view due to the proximity of the viewpoint. The new breakwater will be read with and in the context of prominent urban built form and vehicle movements at Baile Mòr in the foreground. A portion of the visible sea is lost in the view along with the part of the shore of the western coastline of the Ross of Mull but the profile of the rugged topography on Ross of Mull and view to distant hills and mountains remains. Similarly if the viewer turns their head to the right the view to Fionnphort also remains viisble. The existing harbour is already a landscape feature itself within this view and the rock used to construct the new breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed, tideline etc. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels there will be a smaller proportion of the proposed breakwater visible. At nighttime the warning light on the breakwater will be noticeable and associated with properties at Baile Mòr and the existing lights at the harbour slipway. The magnitude of visual change during construction is judged to be large. The magnitude of visual change during operation will be large.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a major to substantial and not significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a Major to substantial and significant visual effect due to the proximity of the view.

Table 15-15 Viewpoint 8; Port nam Mairtir (Martyrs Bay - Beach)

Viewpoint 8 – Port nam Mairtir (Martyrs Bay - Beach)			
Grid Ref	128488, 723840	**Existing Viewpoint Location**	Figure 15.3
Direction of View	60^0	**Approx Distance to Proposed Development**	150 m

Description of existing view and potential receptors	This viewpoint is located on the beach at Martyr's Bay which is circa.150m southwest of the Proposed Development. The existing view at this location is lowlying and below the high tide mark on the eastern Iona coast offering views towards the harbour. The existing slipway is visible in the centre left of view along with streetlights and upper parts of vehicles parked at the slipway. The shoreline view offers largely uninterrupted views Ross of Mull and distant mountains and hills. If the viewer turned their head to the right Fionnphort would be visible in the distance on the opposite side of the Sound of Iona. There are a number of modern buidings prominent in the left of the view. The buildings to the left of the view along with the harbour slipway obscure visibility of the northeastern Iona coastline. The existing ferry when crossing the Sound will be clearly visible within this view. This viewpoint is representative of views for the local community and recreational/tourist users exploring the island.
Sensitivity	Receptors at this location are judged to be of a high susceptibility as they are local community and recreational/tourist receptors. The view is representative of views from a recognised stopping place and within a Conservation Area/APQ, the value of the view is judged to be high. Overall the sensitivity of the view is judged to be high.
Magnitude of Change	During the construction phase the main source of effect from this viewpoint will be the visibility of machinery and activities associated with the construction of the breakwater that will be located in the centre and left of the view. Some activities will be screened by the existing buildings at Baile Mòr and by the breakwater itself as it increases in size. Vessels transporting rock will be a large but transitory feature in views during construction depending on the haulage route. During the operational phase the main source of visual effect from this viewpoint will be the new breakwater itself that will appear as a new feature on the Iona coastline occupying a large portion of the overall view due to the proximity of the viewpoint. The new breakwater will be read with and in the context of prominent urban built form and vehicle movements at Baile Mòr in the left foreground of the view. A portion of the visible sea is lost in the view along with part of the shore and sklyine of the western coastline of the Ross of Mull and some views to distant hills and mountains. If the viewer turns their head to the right the view to Fionnphort will remains viisble. The existing harbour is already a partially visible landscape feature itself within this view and the rock used to construct the new breakwater will through time reflect the adjacent rocky shoreline through growth of seaweed, tideline etc. The photomontage illustrates visibility of the breakwater at a lower tide level. With higher tide levels there will be a smaller proportion of the proposed breakwater visible. At nighttime the warning light on the breakwater will be noticeable and associated with properties at Baile Mòr and the existing lights at the harbour slipway. The magnitude of visual change during construction is judged to be large. The magnitude of visual change during operation will be large.
Significance of Visual Effect during Construction Phase	Taking account of the temporary duration of the effects and the high sensitivity of the viewpoint the Proposed Development would result in a major to substantial and not significant temporary, adverse visual effect during the construction phase.
Significance of Visual Effect during Operational Phase	Operational effects will occur long-term but will gradually decrease as the Proposed Development becomes an established feature within the overall view in the context of the existing active harbour. Taking into account the high sensitivity of the viewpoint the Proposed Development will result in a major to substantial and significant visual effect due to the proximity of the view.

15.6 Mitigation Measures

15.6.1 Aims and Objectives

No specific landscape mitigation measures have been proposed as part of the Proposed Development. The design of the Proposed Development has "built-in" mitigation through steps such as optimising the new breakwater height to maintain as low a height as possible and the use of natural rock to form the breakwater. The minimal lighting required for safety has been provided.

15.6.2 Monitoring and Maintenance

No monitoring and maintenance measures are proposed in relation to landscape and visual effects.

15.7 Potential Cumulative Impacts

A review of planning applications associated with other Proposed Developments has been undertaken to determine the likelihood for potential significant cumulative landscape and visual effects, taking consideration of the following criteria:

- Type and extent of identified proposal;
- The distance between the identified proposal and the Proposed Development;
- Likely visual influence of the identified proposal;
- Potential inter-visibility between the identified proposal and the Proposed Development;
- Potential for cumulative landscape effects on the physical fabric of the landscape or its scenic qualities; and
- The potential for combined, successive and sequential visual effects in the context of the Proposed Development.

There are two proposed projects in the vicinity of the Proposed Development. These are listed below and fully detailed in EIAR Chapter 21:

- The Fionnphort Breakwater and Overnight Berthing Project; and
- BT Cable installation – Iona to Fionnphort

Fionnphort Breakwater and Overnight Berthing Project

The proposed Fionnphort Breakwater and Overnight Berth Project consists of the construction of a new rock armour breakwater, overnight berthing facilities and associated dredging. The proposed project is located c1.3km to the east of Iona, across the Sound. There is potential that this proposed project may be constructed in parallel with the construction phase of Proposed Development at Iona. Due to the separation distance of the two proposed projects and their location within existing harbours and settled areas while it will be possible to view both projects under construction within one combined view and sequentially the magnitude of impact will be small due to distance and immediate urban context at the two project sites. It is predicted that when the

proposed Fionnphort Breakwater and Overnight Berth Project is cumulatively assessed with the Proposed Development that a minor to moderate and not significant cumulative effect will occur.

Cable installation – Iona to Fionnphort

The proposed locations for cabling works are located approximately 900m to the south of the site boundary of the Proposed Development. The proposed cable lengths are 2.6km. Burial of the cable is required (where sediments allow) to protect the optical fibre transmission path over the entire service life of the system and prevent interaction with the seabed and other sea users. Offshore the target burial depth will be to 1m below the seabed. From a landscape and visual perspective, the cable once installed will not be visible with no change in landscape and visual resource. It is predicted that when the proposed cabling once installed is cumulatively assessed with the Proposed Development that no significant cumulative effect will occur.

15.8 Conclusions and Summary of Effects

The Proposed Development is located within the extensive Island Mixed Farmland LCT 49 and Deposition Coasts of Islands CCT 12 for which moderate to major localised and direct long-term effects are considered to be significant for localised coastal fringe areas at Sound of Iona, reducing to minor to moderate and not significant with increasing distance from the coastal fringe of these LCT and CCT.

As part of this LVIA a local Sound of Iona Coastal Character Area has been described for which moderate to major localised and direct long-term effects are considered to be significant for localised areas at Iona, reducing to minor to moderate and not significant with increasing distance from the Iona harbour area.

The Proposed Development site is not located within a National Scenic Area. The Proposed Development is located within an Area of Panoramic Quality and a Local Landscape Area with moderate to major localised effects reducing to minor to moderate and not significant effects with increasing distance are predicted. The Proposed Development is also located within Baile Mòr Conservation Area with moderate to major effects predicted.

Views from a total of eight viewpoints have been assessed, for both construction and operational phases of the Proposed Development. Localised moderate to major visual effects are predicted to be experienced during the operational phase of the Proposed Development for portions of the overall view available in close proximity to the Proposed Development site. With longer distance the effects from viewpoints decrease to a level that results in no significant effects.

The assessment has also considered potential impacts on a number of Core Paths within the study area and has found that significant visual effects are predicted to be experienced by receptors on two Core Paths ID C044 the North Beach Walk on Iona and ID C483 the Ballie Mòr to Culbuirg dunes walk on Iona. A further Core Path ID C484 - Culbuirg Dunes to Port na Curaich will have no significant effects.

The assessment has considered cumulative effects, arising from the addition of the Proposed Development in combination with other proposed and potential developments within proximity. Predicted cumulative effects have been assessed as not significant.

16 CULTURAL HERITAGE

16.1 Introduction

This chapter considers the potential effects of the Proposed Development, during both its construction and operational phases, upon the historic environment. The assessment considers effects on World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes, Inventory Battlefields, Historic Marine Protected Areas, Protected Military Remains and non-designated archaeological sites and historic assets. The chapter is supported by a Cultural Heritage Baseline (see Volume III, Appendix 16.1) and Archaeological Assessment of Hydrographic Data (see Volume III, Appendix 16.2) and should be read in conjunction with these. In addition, the assessment is supported by visualisations and baseline photography contained in Chapter 15: Landscape and Visual Assessment.

16.2 Assessment Methodology

16.2.1 Planning Policy Context

Relevant planning policy is provided in the following documents, discussed in greater depth in Appendix 16.1:

- Marine Policy Statement 2011;
- Scotland's National Marine Plan 2015;
- The National Planning Framework (NPF) for Scotland (Scottish Government, 2014a);
- Draft National Planning Framework 4 (Scottish Government, 2022);
- Scottish Planning Policy (SPP) paragraphs 135-151 (Scottish Government, 2014b); and
- Planning Advice Note PAN 2/2011: Planning and Archaeology (Scottish Government, 2011).

16.2.2 Relevant Guidance

The assessment, including baseline studies, has been undertaken in accordance with relevant guidance comprising:

- Standard and Guidance for Historic Environment Desk-Based Assessment (CifA, 2020);
- Environmental Impact Assessment (EIA) Handbook (Historic Environment Scotland (HES) & NatureScot, 2018);
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, 2021); and
- Managing Change in the Historic Environment: Setting (HES, 2016).

In keeping with Managing Change in the Historic Environment: Setting (ibid, 8), a staged approach has been adopted in respect of effects relating to setting:

- *Stage 1: identify the historic assets that might be affected by the Proposed Development*
- *Stage 2: define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced*
- *Stage 3: evaluate the potential impact of the proposed changes on the setting, and the extent to which any negative impacts can be mitigated."*

Stage 1 has been informed by site visits and forms part of the baseline study (Appendix 16.1). Stage 2 is presented in full in Appendix 16.1 and summarised here as relevant. Stage 3 is presented in this chapter.

In keeping with the EIA Handbook (HES & NatureScot, 2018), magnitude of impact has been determined in terms of the change in the affected assets' cultural significance.

16.2.3 Study Areas

In order to characterise the archaeological potential of the Proposed Development site, data have been gathered for the Proposed Development site and the surrounding 500 m (Figure 16-1). A 500 m study area was considered appropriate as records relating to features and finds beyond 500 m are unlikely to have any direct bearing upon the current assessment in respect of physical effects and, given the scale of the Proposed Development, it is unlikely to result in change in the setting of assets beyond 500 m.

The above study area is as set out in the Scoping Report. No requests for alternative study areas to be applied were received from consultees.

16.2.4 Baseline Methodology

A Cultural Heritage Baseline Assessment has been prepared for the Proposed Development site and is provided in Appendix 16.1. This draws upon the following sources:

- HES datasets and Statements of Significance;
- West of Scotland Archaeology Service (WoSAS) Historic Environment Record (HER);
- maps and charts held by the National Library of Scotland;
- UKHO data on wrecks and obstructions;
- Existing project bathymetry data;
- Site investigation data;
- satellite imagery of the site;
- grey literature; and
- Archaeological Assessment of Hydrographic Data (Appendix 16.2).

The desk-based research was augmented with a site visit which was undertaken in September 2021.

16.2.5 Consultation

Table 16-1 Consultation Responses Relevant to this Chapter

Date	Consultee and Issues Raised	How/Where Addressed
16th September 2021	**HES** Advised that cultural heritage should be scoped into the EIAR. Noted that: *'a desk-based assessment will be undertaken to inform the development of mitigation measures, and that the latter may entail a watching brief or the establishment of a protocol for archaeological discoveries for the construction phase. We are content with this proposed mitigation regarding direct impacts by the Proposed Development.'* Noted potential for adverse impacts upon the setting of several Scheduled Monuments, including St Mary's Abbey (SM12968), during the operation of the Proposed Development, stating: *'the development site lies between two small bays that played an important role in the way that pilgrims visited the monastic complex from the medieval period onwards, and the height of the breakwater may impede early views of the abbey for travellers landing at the Bay of Martyrs. We therefore advise that visualisations produced in support of the application should include views looking towards St Mary's Abbey from the waters just off Bay of Martyrs.'*	Baseline studies have been completed and these have concluded that the potential for hitherto unrecorded archaeology to be present is low. A protocol for the reporting of archaeological discoveries has been prepared (Appendix 16.2) The operational effects upon Scheduled Monuments have been assessed and visualisations have been prepared illustrating the predicted view from various points around the Proposed Development site, including from the vicinity of the abbey (VP04), the waters off the Bay of Martyrs (VP06) and across the Bay of Martyrs (VP07). These are presented in Appendix 15.1: Photomontages.

16.2.6 Assessment Criteria and Assignment of Significance

This assessment has been undertaken with reference to current guidance, which advises that an assessment should consider change in terms of cultural significance. The criteria used within this assessment are set out below (Table 16-2 to Table 16-4). Assessment is a matter for professional judgement, but the following guidelines are provided to assist consistency and transparency. All effects at 'moderate' or above levels have been considered significant in the context of the EIA Regulations.

Table 16-2 Sensitivity Criteria

Sensitivity	Criteria
High	Assets valued at an international or national level, e.g., World Heritage Sites, Scheduled Monuments, Category A Listed Buildings, Inventory Gardens And Designed Landscapes, Inventory Battlefields, Historic Marine Protected Areas, some Conservation Areas and non-designated assets that meet the relevant criteria for designation in the opinion of the assessor.
Medium	Assets valued at a regional level, e.g., Category B listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor.
Low	Assets valued at a local level, e.g., Category C listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor.

Table 16-3 Magnitude Criteria

Magnitude	Criteria
Major	Changes to the fabric or setting of a heritage asset resulting in the complete or near complete loss of its cultural significance, such that it may no longer be considered a heritage asset. (Adverse).
	Preservation of the asset in situ where it would be completely or almost completely lost in the do-nothing scenario or removal of elements of the setting that prevent the appreciation of the asset's cultural significance. (Beneficial).
Moderate	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is substantially altered. (Adverse).
	Changes to key elements of the asset's fabric or setting that result in its cultural significance being preserved, where they would otherwise be lost, or restored. (Beneficial).
Minor	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is slightly altered (Adverse).
	Changes that result in elements of the asset's fabric or setting that detract slightly from its cultural significance being removed (Beneficial).
Negligible	Changes to the fabric or setting of an asset that result in a barely perceptible change in its cultural significance.
Neutral/ No chage	Changes to fabric or setting that leave cultural significance unchanged.

Table 16-4 Matrix for Determination of Significant Effects

		Magnitude of change			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	**Major**	**Major/ Moderate**	**Moderate**	Slight
	Medium	**Major/ Moderate**	**Moderate**	**Moderate**/ Minor	Minor
	Low	**Moderate**	**Moderate**/ Minor	Minor	Minor/ Negligible

Significant impacts are in **bold and underlined**

16.3 Baseline Scenario

The following section presents a brief summary of the results of the baseline study (see Volume III, Appendix 16.1) as relevant to the subsequent impact assessment.

16.3.1 Designated Heritage Assets

The Proposed Development site lies within the Iona Conservation Area (Figure 16-1).

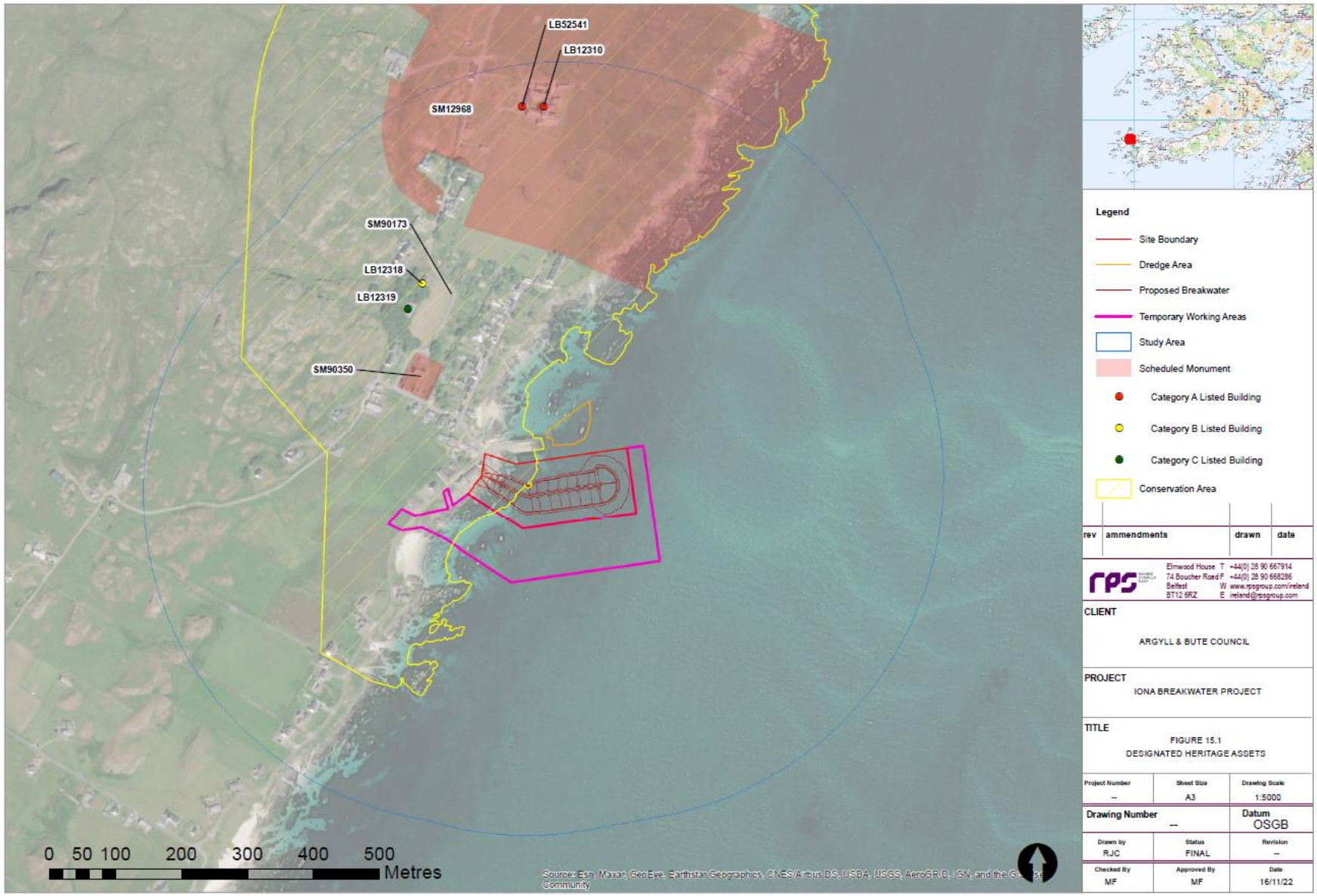


Figure 16-1 Designated Heritage Assets within a 500m buffer (illustrated by blue line polygon) of the Proposed Development site

There are three Scheduled Monuments in the 500 m study area (Figure 16-1):

- Iona Nunnery (SM90350) – 150 m to the north-west of the proposed breakwater;
- MacLean's Cross (SM90173) – 280 m to the north-west of the proposed breakwater;
- St Mary's Abbey, Iona, monastic settlement (SM12968) – 280m to the north of the proposed breakwater.

There are four Listed Buildings in the 50 0m study area (Figure 16-1):

- Iona Abbey (LB12310 – Category A) – 560 m to the north of the proposed breakwater;
- Iona Kirk (LB12318 – Category B) – 300 m to the north-west of the proposed breakwater;
- Iona Manse (LB12319 – Category C) – 280 m to the north-west of the proposed breakwater; and
- Replica of St John's Cross (LB52541 – Category A) – 550 m to the north of the proposed breakwater.

There are no Inventory Gardens and Designed Landscapes, Inventory Battlefields, Historic Marine Protected Areas or Protected Military Remains in the study area.

16.3.2 Non-Designated Heritage Assets and Archaeological Potential

The HER holds no entries regarding non-designated heritage assets within the Proposed Development site. However, a geophysical survey (Rose 2016) has recorded anomalies that extend into the Proposed Development site (Figure 16-2, inset). These have been interpreted as a revetting wall and a possible ditch surrounding a mound known as An Eala, that lies immediately to the south-east of the proposed temporary construction compound. The mound was the site of a cemetery thought to date to the Early Medieval period that was excavated in the 1960s (WoSAS 235). The indicative line of the Street of the Dead intersects with the compound area's western corner, but no anomalies that might relate to this have been recorded and on physical trace has been recorded in the area by intrusive works. It is considered that there is high potential for Early Medieval and Medieval features associated with An Eala to be present. Such remains are likely to be of local or regional importance owing to their potential yield archaeological data relating to Early Medieval or later funerary practices; the importance of the An Eala site as a whole is limited by the disturbance associated with the 1960s excavation. If it were not for this previous disturbance the mound might be considered of national importance. The potential for unrelated or extensive features of archaeological interest to be present here is low given the results of the previous geophysical survey.

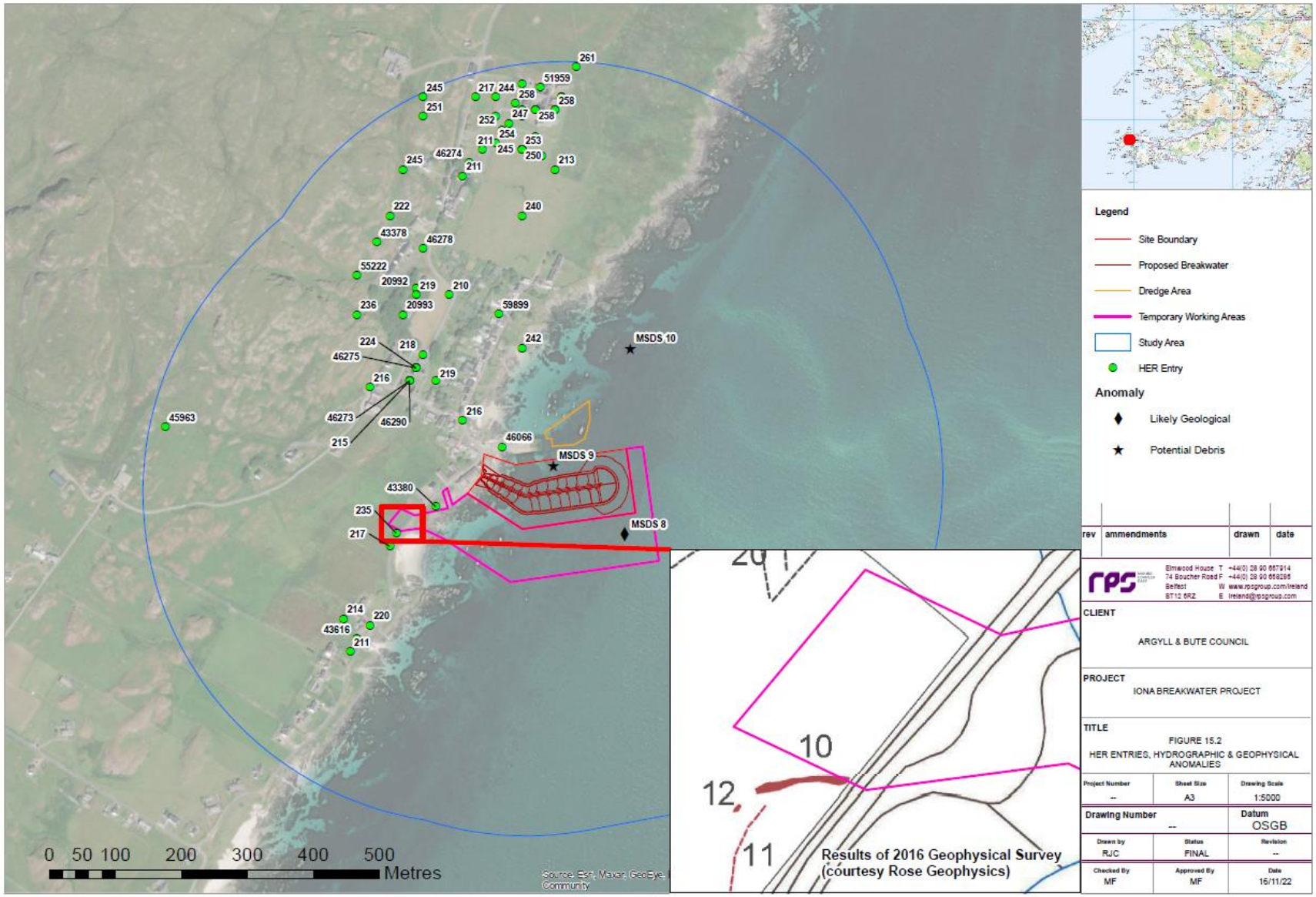


Figure 16-2 HER entries and hydrographic anomalies within a 500m buffer (illustrated by blue polygon) of the Proposed Development site

The review of bathymetric data has identified no anomalies within the construction footprint of the Proposed Development (refer to Volume III, Appendix 16.2 for detailed report). One anomaly is however close (Figure 16-2, MSDS9). This is considered most likely to be debris and unlikely to represent a heritage asset. If hitherto unrecorded marine heritage assets were present, it is most likely that they would be of local importance and low sensitivity, as they are most likely to survive in a fragmentary state owing to the relatively high energy environment and the rocky seabed. Their cultural significance would reside entirely in their archaeological interest and hence fabric.

No evidence of deposits of potential palaeoenvironmental interest has been recorded by the site investigation works.

16.3.3 Future Baseline Conditions

Baseline conditions in respect of relevant heritage assets are considered to be stable and unlikely to change substantively either as a result of ongoing activities or as a result of future climate change.

16.4 Embedded Mitigation Measures

No specific cultural heritage mitigation measures are embedded in the design of the Proposed Development. The design of the Proposed Development has “built-in” mitigation through steps such as optimising the new breakwater height to maintain as low a height as possible and the use of natural rock to form the breakwater. The minimal lighting required for safety has been provided.

The construction area will be surrounded by Heras fencing that will prevent accidental damage to heritage assets or ground disturbance outwith the limits of the works area.

The above have been factored into the assessment of effects.

16.5 Description of Likely Significant Effects

16.5.1 Assessment of Construction Effects

Potential impacts upon previously recorded archaeology are limited to the temporary construction compound. Here the stripping of topsoil for the compound may result in the disturbance of features associated with An Eala, in particular a revetting wall and possible ditch. The disturbance would be highly localised, affecting only a small proportion of the features’ total length; the greater part will be preserved in situ. It is concluded that this would represent an impact of minor magnitude. Assuming the features are of regional importance, this would represent a permanent adverse effect of **moderate** significance. This would be significant in the terms of the EIA Regulations.

There is low potential for hitherto unrecorded marine archaeology to lie within the construction footprint of the Proposed Development. If present, such assets would be removed or disturbed resulting in the loss of their archaeological value and hence cultural significance. This would represent an impact of Major magnitude. Assuming that they were of low sensitivity, this would represent a permanent adverse effect of **moderate** significance. This would be significant in the terms of the EIA Regulations.

Construction phase effects relating to setting have been scoped out; as these are temporary they have no lasting impact upon cultural significance and therefore have no potential to be significant.

16.5.2 Assessment of Operational Effects

As detailed in the Heritage Baseline Assessment, the operational phase of the Proposed Development will affect the following designated heritage assets:

- Iona Nunnery (SM90350) – 150m to the north-west of the proposed breakwater;
- MacLean's Cross (SM90173) – 280m to the north-west of the proposed breakwater;
- St Mary's Abbey, Iona, monastic settlement (SM12968 & LB12310) – 280m to the north of the proposed breakwater; and
- Replica of St John's Cross (LB52541 – Category A) – 550m to the north of the proposed breakwater.

This will occur as a result of visual change in their setting or, in the case of the Conservation Area, change within it affecting its appearance, character and visual change in its setting. A key aspect of the cultural significance of the abbey, nunnery and crosses is that they are not isolated features but part of a group that were at least in part intended to be experienced sequentially whilst moving from the pilgrims' landing point to the abbey. Consequently, for the purposes of this assessment, setting has been drawn widely and has not been defined entirely on the basis of intervisibility. Clearly, the above assets will not always be experienced in this sequence, but as features on an historic route this sequence is the focus of the assessment.

In all instances, there is no potential for the operational phase to affect the archaeological or architectural interest as these relate to the assets' fabric and short-range views will be unaffected. This is not repeated for each asset.

Whilst this assessment includes reference to viewpoints considered in the Landscape and Visual Impact Assessment (Chapter 15), the two assessments use different criteria and the nature of the impacts being considered are not the same. Consequently, it should be accepted that different conclusions may be reached. Furthermore, it should be noted that whilst the assets considered in the following sections are tourist attractions 'tourism and leisure factors… do not form part of an assessment of setting impacts' (HES 2016, 9). The receptors considered here are the cultural heritage assets themselves, any impact that the Proposed Development may have upon tourism is outside the remit of the cultural heritage assessment.

16.5.2.1 Iona Nunnery (SM90350)

Iona Nunnery is located approximately 150m to the north-west of the proposed breakwater. As a Scheduled Monument, the nunnery is of national importance, but with the abbey and crosses it forms a group of international importance. It is of high sensitivity.

Owing to trees and vegetation along the eastern boundary of the scheduled area, the Proposed Development will, at most, be glimpsed from the immediate environs of the nunnery. It will be partially visible from the road immediately to the south. It will appear in combination with the ruins of the nunnery from the sea, but these views do not contribute substantively to its significance; the nunnery although visible in these views is lost to the eye amongst the surrounding buildings (LVIA VP06). The Proposed Development will affect the experience of the approach to the nunnery as visitors will disembark next to the breakwater before walking the short distance

to the nunnery. By dint of its scale and contrasting appearance with the existing built form and surrounding landscape, the breakwater is likely to be experienced as incongruous and intrusive and hence detracting from the overall aesthetic and, for some visitors, spiritual experience of visiting the nunnery as part of an extensive ecclesiastical site and as part of the pilgrims' walk to the abbey. This will represent an adverse impact. As the Proposed Development will be experienced at some remove from the nunnery and because the nunnery itself is experienced in a somewhat detached manner owing to its being enclosed, it is considered the impact will be of minor magnitude. The effect is considered to be of moderate significance. This is significant in the terms of the EIA Regulations.

16.5.2.2 MacLean's Cross (SM90173)

MacLean's Cross is located 280m to the north-west of the proposed breakwater. As a Scheduled Monument, the cross is of national importance, but with the abbey, nunnery and other cross it forms a group of international importance. It is of high sensitivity.

Owing to the built form and trees, the Proposed Development will not be visible from the cross or in combination with it. The Proposed Development will affect the experience of the approach to the cross as visitors will disembark next to the breakwater before walking through the village to the cross, which they will pass on their way to the abbey. There is no intervisibility between the cross and the Proposed Development and several minutes will pass between seeing the Proposed Development and arriving at the cross. Nevertheless, the Proposed Development is likely to be experienced as intrusive and incongruous and hence detracting from the overall aesthetic and, for some visitors, spiritual experience of visiting the cross as part of an extensive ecclesiastical site and as part of the pilgrims' walk to the abbey. As the Proposed Development will be experienced somewhat separately from the cross, it is considered that this will represent an adverse impact of minor magnitude. The effect is considered to be of moderate significance. This is significant in the terms of the EIA Regulations.

16.5.2.3 St Mary's Abbey, Iona, monastic settlement (SM12968 & LB12310)

St Mary's Abbey is located 280m to the north of the proposed breakwater. The scheduled area is extensive, with the abbey itself lying in its western part. As a Scheduled Monument and Category A Listed Building, the abbey is of national importance, but with the nunnery and crosses it forms a group of international importance. It is of high sensitivity.

There will be no intervisibility between the abbey itself and the Proposed Development, but from the eastern part of the scheduled area the breakwater will be visible (VP04). It is likely to be experienced as intrusive in these views detracting from the aesthetic experience of the abbey in a landscape that is almost entirely natural and which may be regarded as almost unchanged since Columban times.

The breakwater will be seen in combination with the abbey when approaching the island on the ferry (VP06). In these views the abbey is the single largest building, seen standing to the north of the village against the craggy backdrop of Dun I. Although not appearing directly in front of the abbey, the breakwater, by dint of its scale, proximity to the viewer and unnatural appearance, is likely to distract from the abbey and hence detract from its aesthetic appreciation.

On arrival to the island the Proposed Development is likely to be experienced as intrusive and incongruous and hence detracting from the overall aesthetic and, for some visitors, spiritual experience of visiting the abbey.

The Proposed Development will be prominent in views from Martyrs Bay and in these it will appear in combination with the upper parts of the abbey, which are visible above buildings on the southern edge of Baile Mòr. These views contribute to the cultural significance of the abbey owing to the historic relationship between the abbey and the bay. The view makes no contribution to the aesthetic appreciation of the abbey or its spiritual value; the buildings on the southern fringe of the village are appreciably modern and not in keeping with the earlier buildings in their style, materials and appearance and the abbey is somewhat lost behind them. The breakwater will be prominent in views from the bay, but this will represent a neutral change as it will not interfere with the appreciation of the historic relationship between the bay and the abbey.

Because the Proposed Development will be experienced at some remove from the abbey, it is concluded that this will represent an adverse impact of minor magnitude and an effect of moderate significance. This is significant in the terms of the EIA Regulations.

16.5.2.4 Replica of St John's Cross (LB52541 – Category A)

The replica of St John's Cross is located 550m to the north of the proposed breakwater. As a Category A Listed Building it is considered to be of high sensitivity, but as part of a group with the abbey, nunnery and other cross it forms a group of international importance. It is of high sensitivity.

The Proposed Development will not be visible from the cross and its immediate environs. The Proposed Development will affect the experience of the approach to the cross as visitors will disembark next to the breakwater before walking through the village to the cross, which stands next to the abbey. There is no intervisibility between the cross and the Proposed Development and several minutes will pass between seeing the Proposed Development and arriving at the cross. Nevertheless, the Proposed Development is likely to be experienced as intrusive and incongruous and hence detracting from the overall aesthetic and, for some visitors, spiritual experience of visiting the cross as part of an extensive ecclesiastical site and as part of the pilgrims' walk to the abbey. As the Proposed Development will be experienced somewhat separately from the cross, it is considered that this will represent an adverse impact of minor magnitude. The effect is considered to be of localised moderate significance. This is significant in the terms of the EIA Regulations.

16.5.2.5 Iona Conservation Area

The slipway lies within the Iona Conservation Area. The Conservation Area is considered to be regional importance and medium sensitivity.

The Proposed Development will be highly visible from the ferry during the approach to the island (VP06). Owing to it appearing out of scale with the existing built form in these views, it is likely to be experienced as intrusive and prominent. It will partially obscure several of the cottages in the vicinity of the jetty from view.

From the jetty and immediate environs, the breakwater will curtail views to the south and to some extent the east. These open views make an important contribution to the aesthetic experience of the Conservation Area. The breakwater is likely to be experienced as dominating from this area owing to its height and massing and intrusive and incongruous owing to its contrast with the small, largely 19th century buildings.

From the area to the north of the jetty (VP03), it will likewise affect southward views. From the beach these will be obscured completely whilst from the gardens and rear of the properties here it will appear as prominent in the middle distance; the sea will largely be obscured but the hills beyond will be visible above it. The breakwater's unnatural appearance will detract from the aesthetic experience of these views and will again contrast with the existing built form.

Similarly, the breakwater will be visible from the Conservation Area from the eastern fringe of the scheduled area (VP04). It will be prominent in these views and will appear incongruous in relation to the 19th century buildings and ruins visible in the foreground.

The breakwater will be visible from much of the open southern parts of the Conservation Area (VP02, 07 & 08). As discussed in relation to the abbey (above), the buildings at the southern fringe of the village are mostly modern and do not contribute to the aesthetic value of the village. From the higher parts of the Conservation Area, the breakwater will be seen between the buildings and will not detract greatly from the character of these views. However, the breakwater will dominate Martyrs Bay and detract from the aesthetic experience of these views and reducing their wild, undeveloped character.

The Proposed Development will have an adverse impact upon the character and appearance of the Conservation Area. Whilst the affected views are important to the cultural significance of the Conservation Area the impact is relatively localised, and therefore considered to be of moderate magnitude. This will constitute an effect of moderate significance. This is significant in the terms of the EIA Regulations.

16.6 Mitigation Measures

A reporting protocol has been developed to allow for the reporting and thereby appropriate recovery and recording of any cultural material encountered during the construction phase below the high-water mark (see Volume III, Appendix 16.2).

Potential construction impacts above the high-water mark can be avoided by relocating the compound or be mitigated through a programme of archaeological works. A programme of archaeological work would offset the physical loss or disturbance of features affected by allowing for them to be recorded appropriately, with reporting to an appropriate level. Such works must be undertaken in line with a Written Scheme of Investigation (WSI) agreed with WoSAS and approved by the Local Planning Authority.

16.7 Potential Cumulative Effects

A review of planning applications associated with other Proposed Developments has been undertaken to determine the likelihood for potential significant cumulative cultural heritage effects, taking consideration of the following criteria:

- Type and extent of identified proposal;
- The distance between the identified proposal and the Proposed Development;
- Likely visual influence of the identified proposal;
- Potential inter-visibility between the identified proposal and the Proposed Development;
- Potential for cumulative cultural heritage effects on the physical fabric of the landscape or its scenic qualities; and

- The potential for combined, successive and sequential visual effects in the context of the Proposed Development.

There are two proposed projects in the vicinity of the Proposed Development. These are listed below and fully detailed in EIAR Chapter 21:

- The Fionnphort Breakwater and Overnight Berthing Project
- Cable installation – Iona to Fionnphort

Fionnphort Breakwater and Overnight Berthing Project

The proposed Fionnphort Breakwater and Overnight Berth Project consists of the construction of a new rock armour breakwater, overnight berthing facilities and associated dredging. The proposed project is located c1.3km to the east of Iona, across the Sound.

Given the distance of the proposed project from the Proposed Development, there is no potential for cumulative effects relating to the physical fabric of cultural heritage assets.

Given the distance between the proposed project and the heritage assets on Iona, it is considered that Fionnphort and the proposed project does not form a part of their setting. There is therefore no potential for cumulative effects relating to setting.

Cable installation – Iona to Fionnphort

The proposed locations for cabling works are located approximately 900 m to the south of the site boundary of the Proposed Development. Given its distance from the Proposed Development, there is no potential for cumulative effects relating to the physical fabric of heritage assets. The proposed cable will not be visible and there is therefore no potential for cumulative effects relating to setting.

16.8 Residual Effects

16.8.1 Construction Phase

There is potential to avoid the risk of physical loss or disturbance of archaeology above the high-water mark through the relocation of the temporary construction compound. If this is not possible, a programme of archaeological works would offset the physical loss or disturbance of archaeology above the high-water mark by allowing the recovery of archaeological data and reporting to an appropriate level. This would reduce the level of loss but would not completely offset it. It is considered that the resultant residual effect would be of minor significance. This is not significant in the terms of the EIA Regulations.

The reporting protocol will allow the appropriate recovery and recording of any archaeological assets encountered during construction. This will allow their archaeological interest to be realised and prevent their physical loss. Some damage and hence loss of archaeological interest may still occur, but it is considered that with mitigation in place the impact would be of minor magnitude at worse. Assuming that if hitherto unrecorded assets were present, they would be of low sensitivity, this would represent an adverse effect of **minor** significance. This is not significant in the terms of the EIA Regulations.

16.8.1 Operational Phase

No mitigation is possible in respect of the identified operational phase effects. Consequently, the identified effects, which are of moderate significance, will not be reduced or offset and will remain significant in the terms of the EIA Regulations.

16.9 Conclusions and Summary of Effects

The Proposed Development lies in an area that has seen intensive activity from at least the Early Medieval period and probably earlier. The Early Medieval and Medieval activity has largely related to the importance of the island as a place of pilgrimage and near the Project Site are St Mary's Abbey, a Category A Listed Building and Scheduled Monument, Iona nunnery and MacLeans Cross, both Scheduled Monuments, and the Category A-listed Replica of St John's Cross.

Whilst intervisibility between these and the Proposed Development will be limited, it is considered that the appearance of the Proposed Development at the point of arrival on the island will detract from the experience of these assets, in particular their aesthetic and spiritual value. It is considered that the Proposed Development will have adverse effects of moderate significance on these assets. This is significant in the terms of the EIA Regulations.

The Proposed Development site lies at the fringe of the Baile Mòr Conservation Area and will be visible from a number of locations within it. This will have a localised impact upon its character and appearance and the contribution of the Conservation Area's setting. It is considered that the Proposed Development will have an adverse effect of moderate significance on the Conservation Area. This is significant in the terms of the EIA Regulations.

No heritage assets are recorded within the Proposed Development site below the high-water mark and given the results of the examination of bathymetry data and other data sources, it is considered that there is low potential for hitherto unrecorded heritage assets. This potential will be addressed through the implementation of a reporting protocol that will allow for the reporting and recording of any material of archaeological interest encountered.

A previous geophysical survey has identified features associated with an Early Medieval or Medieval cemetery that extend into the temporary construction compound area. These and any associated features present may be disturbed by construction works. This will be mitigated through a programme of archaeological works that will allow for appropriate recording. This will be secured by a planning condition.

Following implementation of the proposed mitigation in respect of physical construction effects, all potential effects will be of minor significance. This is not significant in the terms of the EIA Regulations.

17 WASTE

17.1 Introduction

This chapter assesses the waste management aspect of the Proposed Development.

Regulation 6(2) of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 sets out the minimum information that is required in an Environmental Impact Assessment Report (EIAR). Regulation 6(2)(f) states than an EIAR must include at least:

> *"...any other information specified in Schedule 4 relevant to the specific characteristics of the works or of the types of works in question and to the environmental features likely to be significantly affected."*

Under Paragraph 5 of Schedule 4 of the Regulations, applicants are required to include in the Environmental Impact Assessment, *"A description of the likely significant effects of the works on the environment resulting from, inter alia: (c)…the disposal and recovery of waste."*

Effects from the forecast waste generation from the construction and operational phases of the Proposed Development have been assessed in the context of the effects on regional waste management treatment and landfill infrastructure capacity, legislation, policy and strategy targets. Mitigation measures are proposed to reduce the impact of waste generated by the Proposed Development.

17.1.1 Waste

Waste is defined as '*"any substance or object which the holder discards or intends or is required to discard"* under the Waste Framework Directive (European Directive 2006/12/EC as amended by Directive 2008/98/EC).

Once a substance has become waste it will remain waste until it has been fully recovered and no longer poses a potential risk to the environment or human health. From that moment onwards, the material ceases to be waste, and it is no longer subject to the same legislative controls.

This applies to waste used as aggregate or construction material in civil engineering applications. Waste recovery can be achieved when such waste is incorporated into a road, building or other infrastructure works, or in the case of inert waste, after processing if such a process is conducted following the criteria specified in the relevant quality protocols.

The principal objective of sustainable resource and waste management is to use material resources more efficiently, where the value of products, materials and resources are maintained in the economy for as long as possible and the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy as set out in Scotland's Circular economy policy 'Making Things Last' (2016) (see Figure 17-1).

Figure 17-1 Circular Economy

The Waste (Scotland) Regulations 2011 and the Waste Management Licensing (Scotland) Regulations 2011 place a duty on all persons who produce, keep or manage waste to take all reasonable steps to apply the waste hierarchy (Figure 17-2). Therefore, where residual waste is generated, there is a requirement to deal with it in a way that follows the waste hierarchy and actively contribute to the development of sustainable waste management in Scotland and the ambition of a zero-waste society.

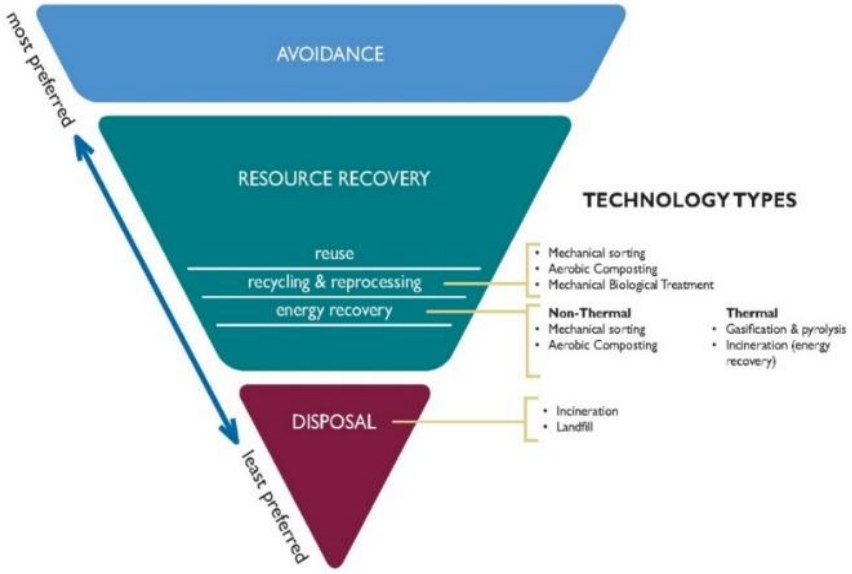


Figure 17-2 Waste Management Hierarchy[31]

17.2 Assessment Methodology

17.2.1 Assessment

A quantitative assessment of the potential effects in relation to waste will be undertaken. The assessment will comprise the following stages:

[31] The 'waste hierarchy' ranks waste management options according to what is best for the environment. It applies the following as a priority order in waste prevention and management policy— (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery (for example energy recovery); and (e) disposal.

- A review of applicable legislation and policy;
- A review of the Proposed Development design, undertaken in consultation with the project design team to estimate the waste generation during the various phases of construction;
- Determination of waste arisings from the development once operational;
- Consideration of potential interactions between proposals and the current site conditions;
- Identification of possible impacts;
- Assessment of impacts;
- Identification of measures and solutions to avoid, reduce or remedy potential impacts; and,
- Assessment of residual impacts, taking account of mitigation measures.

An assessment will be made of the potential environmental effects that are associated with the production, movement, transport, processing, and disposal of arisings from site during the construction and operational phase of the Proposed Development.

17.2.2 Assessment Criteria

The Institute of Environmental Management and Assessment (IEMA) published guidance in March 2020 which sets out criteria for determining the value (sensitivity) of material resources and waste (including waste infrastructure).

The determination of significance, in most cases, will be the product of professional judgement of the Waste Topic Lead and EIA Co-ordinator, with specific regard to the sensitivity or importance (value) of receptors and the magnitude of impact on these receptors; and the extent to which primary, secondary and tertiary measures are expected to minimise impacts and effects. Table 17-1 shows the importance/ sensitivity matrix used for this assessment.

Table 17-1 Importance or Sensitivity Matrix Definitions[32]

Importance / Sensitivity of Resource or Receptor				
Across construction and or/operation phases, the baseline/future baseline (i.e., without development) or regional inert and non-hazardous landfill void capacity is expected to…				
Negligible	**Low**	**Medium**	**High**	**Very High**
Remain unchanged or is expected to increase through a committed change in capacity.	Reduce minimally: by <1% as a result of wastes forecast.	Reduce noticeably: by 1-5% as a result of wastes forecast.	Reduce considerably: by 6-10% as a result of wastes forecast.	Reduce very considerably (by >10%); end during construction or operations; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.

17.2.3 Assignment of Magnitude

Where the construction phase is being assessed, the magnitude of impact is considered from the point at which the site access is gained, through site remediation, enabling works, and construction, to development commissioning.

Where the operational phase is being assessed, the magnitude of impact is assessed over the course of any one full and justifiably representative year within the first three years of commissioning. Table 17-2 shows definitions of magnitude of impacts used for this assessment.

Table 17-2 Magnitude of Impacts Definitions

Assessment of Magnitude				
Inert and Non-Hazardous Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce regional landfill void capacity baseline by <1%	Waste generated by development will reduce regional landfill void capacity baseline by 1-5%	Waste generated by the development will reduce regional landfill void capacity baseline by 6-10%.	Waste generated by the development will reduce landfill void capacity baseline by >10%.
Hazardous Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce national landfill void capacity baseline by <0.1%	Waste generated by development will reduce national landfill void capacity baseline by <0.1-0.5%	Waste generated by the development will reduce national landfill void capacity baseline by >0.5-1%	Waste generated by the development will reduce national landfill void capacity baseline by >1%.

[32] Assessing sensitivity of waste (Section 10.2.2) IEMA Guide to Materials and Waste Environmental Impact Assessment, March 2020.

17.2.4 Significance of Effects

The assessment of significance will be based on the matrix outlined in Table 17-3.

Table 17-3 Assessment of Significance Matrix[33]

		Magnitude of Impacts				
		No Change	Negligible	Minor	Moderate	Major
Sensitivity (or value) of receptor	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

17.2.1 Determining whether an effect is significant

Once the sensitivity of the receptor and the magnitude of impacts have been determined, Table 17-4 illustrates how it may be determined whether environmental effects are potentially significant.

Where a threshold is 'slight to moderate', i.e., transcends the significant effect / not significant effect boundary, professional judgement is used in combination with documented justification, to determine a final outcome. The cautious significance boundary applied responds to the need for developers and EIA practitioners to – in unison – continue to take an increasing responsibility for managing materials and wastes sustainably, with a view to incentivising sustainable resource management and (ultimately) a circular economy.

Table 17-4 Overall Significance of Effect[34]

Effect	Waste
Neutral	Not significant
Slight	
Moderate	Significant
Large	
Very Large	

17.3 Review of Legislation & Policy

A comprehensive legislative review has been undertaken as part of this assessment. This includes a review of applicable waste and environmental European Directives, National Regulations, National Policies and Strategies.

[33] IEMA Guide to Materials and Waste Environmental Impact Assessment, March 2020.

[34] IEMA Guide to Materials and Waste Environmental Impact Assessment, March 2020.

17.3.1 National and European Legislation

National and European Legislation of relevance includes:

- The Environmental Protection (Duty of Care) (Scotland) Regulations 2014.
- The Waste (Scotland) Regulations 2012.
- The Waste (Scotland) Regulations 2011.
- The Waste (Scotland) Regulations 2005.
- The Waste Management Licensing (Scotland) Regulations 2011.
- The Waste Batteries (Scotland) Regulations 2009.
- The Criteria and Procedures for The Acceptance of Waste at Landfills (Scotland) Direction 2005.
- The Criteria and Procedures for the Acceptance of Waste at Landfills (Mercury) (Scotland) Direction 2013.
- Environment Act 1995.
- Environmental Protection Act 1990.
- Environment Protection (Waste Recycling Payments) (Scotland) Regulations 2000.
- The Landfill (Scotland) Regulations 2003.
- The Landfill (Scotland) Amendment Regulations 2003.
- The Landfill (Scotland) Amendment Regulations 2013.
- The Special Waste Regulations 1996.
- The Controlled Waste Regulations 1992.
- The Special Waste Amendment (Scotland) Regulations 2004.
- The Special Waste Amendment (Scotland) Amendment Regulations 2004.
- Pollution Prevention and Control Act 1999.
- The Pollution Prevention and Control (Scotland) Regulations 2012.
- Waste and Emissions Trading Act 2003.
- The Landfill Allowances Scheme (Scotland) Regulations 2005.
- The Producer Responsibility Obligations (Packaging Waste) Regulations 2007.
- The End-of-Life Vehicles (Storage and Treatment) (Scotland) Regulations 2003.
- The Litter (Fixed Penalties) (Scotland) Order 2013.
- The Litter (Fixed Penalty Notices) (Scotland) Order 2014.

- The Controlled Waste (Fixed Penalty Notices) (Scotland) Order 2014.
- European Communities (Waste Directive) Regulations, 2011.
- Industrial Emissions Directive (2010/75/EU).
- Waste Framework Directive (2008/98/EC).

Other guidelines from Scottish Natural Heritage such as 'A handbook on Environmental Impact Assessment' (2013) have been referred to also in the preparation of this EIA Waste chapter.

Specifically in relation to the waste management requirements at port and harbour facilities the following were also considered:

- EU Directive 2000/59/EC on port reception facilities for ship generated wastes and cargo residues.
- Directive 2002/84/EC amending the Directives on maritime safety and the prevention of pollution from ships.
- Commission Directive 2007/71/EC of 13 December 2007 amending Annex II of Directive 2000/59/EC of the European Parliament and the Council on port reception facilities for ship-generated waste and cargo residues.
- Commission Directive (EU) 2015/2087 amending Annex II to Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues.
- Directive 2005/35/EC on ship-source pollution and on the introduction of penalties for infringements.
- Directive 2009/123/EC amending Directive 2005/35/EC on ship-source pollution and on the introduction of penalties for infringements.
- MARPOL 73/78, International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978.
- A guide to good practice – IMO Consolidated Guidance for port Reception Facility Providers and Users.
- The Merchant Shipping and Fishing Vessels (Port Waste Reception Facilities) Regulations 2003, as amended (SI No. 1809).

17.3.2 National and Regional Waste Policies and Strategies

The statutory basis for waste management policy in Scotland comes from the revised Waste Framework Directive (2008/98/EC) (rWFD). The main impact on waste management in Scotland arising from the revised WFD was the transposition and implementation of a new waste hierarchy and its application as a priority order in waste prevention, waste management licensing and waste policy.

- **The Zero Waste Plan**, launched in June 2010, set out actions to deliver important changes to how Scotland treats and manages waste. The Plan is an economic strategy and a resource strategy - not simply a waste strategy. It aims to maximise the value of all the material resources

we use in our economy, helping to create new business opportunities as well as savings to existing businesses and local authorities in how they manage waste. To support this aim, the Pan includes ambitious recycling targets, including a 70% recycling rate for household and all other waste streams by 2025. Bills and legislation, such as the Waste (Scotland) Regulations 2012 and the single Use Carrier Bags Charge (Scotland) Regulations 2014 set in place statutory measures to support delivery of the Zero Waste Plan including:

- prevention;
- preparing for re-use;
- recycling;
- other recovery, e.g., energy recovery; and
- landfill diversion targets

In Scotland, the Scottish Government is responsible for the regulatory and legislative framework and for providing policy advice and guidance. The Scottish Environment Protection Agency can take enforcement action on large scale and hazardous fly-tipping and Local Authorities will investigate small scale incidents. Local Authorities and the Police can issue fixed penalty notices to offenders, they can also report incidents directly to the Procurator Fiscal for further action if the fine isn't paid.

- In addition to the Waste (Scotland) Regulations 2012 the Scottish Government launched a consultation, **'Safeguarding Scotland's Resources - A Programme for the Efficient Use of our Materials**', which acts as Scotland's Waste Prevention Programme, and sought views on a range of proposals to reduce waste and promote resource efficiency. This proposed an overall target of a 5% reduction in all waste by 2015, and a longer term vision of a 15% reduction in all waste by 2025.
- The **Environment Strategy for Scotland: Vision and Outcomes (2020)** provides an overarching framework for Scotland's existing environmental strategies and plans, including the Climate Change Plan, which will be reviewed over time to consider developments in international targets and policies. The Strategy outlines Scotland's long-term ambitions and priorities for action. The Strategy aims to deliver six shared outcomes which include 'We use and re-use resources wisely and have ended the throw-away culture' and 'Our thriving, sustainable economy conserves and grows our natural assets' which both support the transition to a circular economy.
- The **Circular Economy Bill** (in development) will establish a legislative framework to support the transition to a zero waste and circular economy. The Bill involves new enforcement powers for the offence of littering from vehicles, proposals to strengthen household recycling collections, tackle reliance on single-use items and set statutory targets in relation to circular economy. A consultation on proposals for a Circular Economy Bill took place between 30th May 2022 and 22nd August 2022.

- **Extended Producer Responsibility (EPR)** requires producers to bear responsibility for the environmental impacts of products they place on the market and provides an incentive to reduce these impacts. EPR focuses on the consideration of the whole lifecycle of a product or building by influencing design, maximising product lifespan through reuse, repair and durability and recyclability of products when they reach the end of their lives. 'Making Things Last – a Circular Economy Strategy for Scotland' was published in 2016 which aims to take a more comprehensive approach to EPR by encouraging reuse, repair and remanufacture as well as addressing the costs of recycling and disposal. Schemes such as UK Packaging EPR scheme, review of Waste Electrical and Electronic Equipment, Batteries and End of Life Vehicles Regulations, an EPR scheme for mattresses and a Deposit Return Scheme (DRS) for single-use containers are being considered or implemented.
- The **Deposit and Return Scheme Regulations (DRS) 2020** set out the legal requirements for drinks producers and retailers as part of a DRS which will be introduced in Scotland on 16th August 2023. DRS requires consumers to pay a deposit of 20p when they purchase a drink in a single-use container made of PET, steel, aluminium or glass who will then receive the deposit back when they return the empty single-use container to a return point. Under The Deposit and Return Scheme for Scotland Regulations (2020) retailers are required to operate a return point where sales of scheme products are made, deliver back deposits for the packaging and store the packaging for collection by/on behalf of producers.

17.3.3 Waste Management Plan

There is no specific Waste Management Plan in place for Iona Ferry Terminal. Iona Ferry Terminal is operated by Caledonian MacBrayne (CalMac) Ferries Ltd. who have an Environmental Strategy for 2021-2023 which outlines the company's aims and actions to minimise their impact on the marine and terrestrial environments in which they operate. The Strategy outlines four core priorities which align with Scotland's Environment Strategy, Scottish Government National Outcomes and the UN Sustainable Development Goals. One of the core priorities is *"we generate minimal waste and sustainably use materials".*

The CalMac Ferries Ltd. Environmental Strategy aims to achieve the Scottish Government recycling and landfill targets by 2025 of:

- Reducing total waste arisings by 15% against 2011 levels;
- Reducing food waste by 33% against 2013 levels;
- Recycling 70% of remaining waste; and
- Sending no more than 5% of remaining waste to landfill.

The Environmental Strategy aims to achieve this by applying the waste hierarchy and prioritising waste prevention. CalMac Ferries Ltd. will replace paper-based processes and communications with electronic, reduce plastic packaging sold through their retail outlets and implement a DRS. They aim to

minimise food waste by better understanding the source of their food waste using technology. CalMac Ferries Ltd. set out to measure total waste arisings including food waste, the amount of material recycled and that sent to landfill on a monthly basis. The amount of packaging that is sold and returned as part of a DRS will be measured.

17.4 Baseline Scenario

17.4.1 Characteristics of Current Wastes

The Iona Ferry Terminal consists of a pier and a slipway. The source of current waste arisings is from the operation of the passenger ferry service from Fionnphort. Current wastes arising at the site are a typical mix of recyclable and residual material, accompanied by mixed litter generated from passenger footfall. Iona Port is operated by CalMac Ferries Ltd. who provide recycling facilities at all their port locations for customers to recycle on the go. All waste generated and/or received at Iona Ferry Terminal is currently managed and disposed by local authorities or licenced waste contractors. The management/ disposal route is at the discretion of the approved contractor.

17.4.2 Waste Management Infrastructure

The Scottish Environment Protection Agency (SEPA) 'Scottish waste sites and capacity tool' provides data about licensed and permitted waste management sites holding a Waste Management Licence (WML) or Pollution Prevention Control (PPC) permit issued by SEPA. It also provides the site's annual capacity, which is the tonnage of waste a regulated site is licensed or permitted to handle in a given year and the remaining capacity for landfills.

Table 17-5 lists information on operational landfill sites in the vicinity of the development. This landfill site and capacity data is for reporting years 2014-2020 and was last updated in April 2022.

Table 17-6 lists information on waste management sites in the vicinity of the development. This waste management site and capacity data is for reporting years 2014-2020 and was last updated in April 2022.

Table 17-5 Capacity of Currently Authorised Landfills

Permit or Licence Number	Operator Organisation	Type of Site	Annual Capacity on Permit (tonnes)	Total Capacity of Permit (tonnes)	Remaining Capacity as at 31/12/2020	Estimated date for ceasing infill as at 31/12/2020 (tonnes)
11/12/2006	WILLIAM THOMPSON & SON LIMITED	Inert	240,000	2,400,000	250,000	01/10/2044
17/04/2012	W H MALCOLM LIMITED	Inert	500,000	7,200,000		
23/12/2019	CEMEX UK MATERIALS LIMITED	Inert	14,500	1,040,000		
30/03/2007	J & M MURDOCH & SON LIMITED	Non-Hazardous	90,000	552,750	277,500	25/01/2021
08/09/2004	BARR ENVIRONMENTAL LIMITED	Non-Hazardous	250,000	4,760,000	2,185,813	01/08/2022
20/02/2007	ARGYLL & BUTE COUNCIL	Non-Hazardous	1,000	27,000	12,829	01/12/2025
29/03/2007	SHANKS ARGYLL & BUTE LIMITED	Non-Hazardous	20,515	398,000	46,089	01/07/2026
30/03/2007	SHANKS ARGYLL & BUTE LIMITED	Non-Hazardous	36,500	720,000	151,600	01/12/2028
26/01/2011	BAE SYSTEMS PROPERTIES LIMITED	Non-Hazardous	100,000		73,920	01/12/2034
01/07/2005	LOCHIEL LOGISTICS LIMITED	Non-Hazardous	24,000	590,000	427,950	01/06/2040
10/10/2008	ARGYLL & BUTE COUNCIL	Non-Hazardous	8,230	90,000	21,000	01/12/2063
31/07/2009	ARGYLL & BUTE COUNCIL	Non-Hazardous	9,815	90,000	65,451	01/12/2063
29/03/2006	SMITH SKIP LIMITED	Non-Hazardous	75,000	750,000		

Table 17-6 Capacity of Waste Management Sites

Permit of Licence No	Operator Organisation	Site Activity	Licensed Waste Type	Waste Inputs to Site	Waste Treated / Recovered on Site	Waste Outputs from Site
PPC/A/1000116	STRAID FARM LIMITED	Landfill	Household / Commercial / Industrial / Special asbestos / Inert	74,967.78		
PPC/A/1038061	WH MALCOLM LIMITED	Landfill	Inert	9,865.49		
PPC/A/1004280	SHANKS ARGYLL & BUTE LIMITED	Landfill / Transfer station / Composting	Household / Commercial / Industrial / Inert	15,051.41	5,393.76	1,591.08
PPC/A/1004281	SHANKS ARGYLL & BUTE LIMITED	Landfill / Civic amenity / Transfer station / Composting	Household / Commercial / Industrial / Inert	21,596.60	4,798.14	1,366.57
PPC/A/1025163	ARGYLL & BUTE COUNCIL	Landfill / Civic amenity / Transfer station	Household / Commercial / Industrial / Inert	4,423.70	186.72	875.34
PPC/A/1008888	ARGYLL & BUTE COUNCIL	Landfill / Civic amenity / Transfer station	Household / Commercial / Industrial / Inert	569.02		543.82
PPC/A/1022141	ARGYLL & BUTE COUNCIL	Landfill / Civic amenity / Transfer station	Household / Commercial / Industrial / Inert	2,382.93	326	974.22
PPC/N/0050031	LOCHIEL LOGISTICS LIMITED	Landfill / Transfer station / Composting / Other treatment	Household / Commercial / Industrial / Special asbestos	20,368.58	12,820.52	3,054.80
PPC/W/0020026	BARR ENVIRONMENTAL LIMITED	Landfill / Transfer station / Composting	Household / Commercial / Industrial / Special asbestos / Inert	145,934.58	93,038.68	28,955.20
PPC/W/0020019	BARR ENVIRONMENTAL LIMITED	Landfill / Civic amenity / Composting	Household / Commercial / Industrial / Special asbestos	160,567.72	119,837.26	39,007.40
WML/W/0020038	GLASGOW CITY COUNCIL	Civic amenity / Transfer station	Household / Commercial / Industrial / Other special	21,167.02		28,062.15
WML/W/0020108	GLASGOW CITY COUNCIL	Civic amenity / Transfer station	Household	98,995.10		101,825.96
WML/W/0020036	GLASGOW CITY COUNCIL	Civic amenity / Transfer station	Household	67,058.27		69,978.73
WML/L/1084290	NORTH AYRSHIRE COUNCIL	Civic amenity	Household / Commercial / Industrial / Other special / Inert	1,870.71		1,870.71
WML/W/0022016	INVERCLYDE COUNCIL	Civic amenity / Transfer station	Household / Commercial / Industrial	32,207.63		40,203.91
WML/W/0020042	SHANKS ARGYLL & BUTE LIMITED	Civic amenity / Transfer station	Household / Commercial / Special asbestos / Inert	4,811.91		4,829.97

Permit of Licence No	Operator Organisation	Site Activity	Licensed Waste Type	Waste Inputs to Site	Waste Treated / Recovered on Site	Waste Outputs from Site
WML/W/0020056	NORTH AYRSHIRE COUNCIL	Transfer station / Other treatment	Household / Commercial	55,202.38		54,649.42
WML/L/1019190	KEENAN (RECYCLING) LIMITED	Transfer station / Composting	Household / Industrial	226.69		174.78
WML/N/0220307	OBAN SKIP HIRE LIMITED	Metal recycler / Transfer station	Household / Commercial / Industrial / Other special / Inert	2,332.51	1,671.66	1,399.95
WML/N/0220307	OBAN SKIP HIRE LIMITED	Metal recycler / Transfer station	Household / Commercial / Industrial / Other special / Inert	2,332.51	1,671.66	1,399.95
WML/N/0220313	OBAN SKIP HIRE LIMITED	Metal recycler / Transfer station	Household / Commercial / Industrial / Other special / Inert	214.69		194.58
PPC/A/1123280	JOHN R ADAM & SONS LIMITED	Metal recycler	Commercial	159,953.00	13,145.00	165,621.00
WML/L/1018833	EMR LIMITED	Metal recycler	Industrial	157,292.11	41,232.67	91,155.66
WML/L/1178417	DALES MARINE SERVICES (GREENOCK) LIMITED	Metal recycler	Industrial		271.76	662.4
WML/W/0220288	RESTRUCTA LIMITED	Other treatment	Household / Commercial	2,742.50	1,789.98	2,306.61
WML/L/1083066	WEEE SOLUTIONS LIMITED	Other treatment	Household / Commercial / Other special	3,518.67	2,527.72	2,884.92
WML/L/1159194	AYR ENVIRONMENTAL SERVICES OPERATIONS LIMITED	Other treatment	Industrial	1,136,002.00	897,188.00	26,467.00
PPC/A/1017440	SLG TECHNOLOGY LIMITED	Incineration	Industrial	2,470.00		
PPC/A/1110002	VIRIDOR (GLASGOW) LIMITED	Incineration / Other treatment	Household / Commercial / Industrial	166,233.39	123,094.33	56,436.94
WML/L/1099346	DOOCEY RECYCLING LIMITED	Other treatment	Commercial			10,401.16

17.5 Description of Likely Significant Effects

The predicted waste management impacts of the Proposed Development are assessed in accordance with Table 17-4. Potential effects of the Proposed Development associated with waste generation and management is considered for two distinct phases:

a) Construction Phase; and

b) Operational Phase.

17.5.1 Assessment of Construction Effects

Prior to the breakwater construction, dredging of approximately 1,225 m^3 of overburden material to -3.0m CD is required in a dredge pocket located to the northeast of the existing Iona slipway to accommodate the new navigation channel. Dredging will be undertaken using a backhoe dredger and the material will be deposited under a Marine Licence at a licenced offshore deposit site. The potential location for sea disposal is illustrated in Figure 3-8.

Existing private moorings and buoys from within the site boundary, working areas and dredging areas will be removed or relocated to a temporary location nearby.

A rock armour breakwater structure will be constructed 70 m to the south of the existing slipway. The construction of the breakwater will involve the installation of a geotextile membrane, c.149,812 tonnes of clean quarried rock, likely sourced from Glensanda Quarry. The breakwater toe will be reinstated to existing seabed level with site won seabed material. Surplus seabed material will be disposed of in accordance with the Marine Dredging Licence.

There is the potential for quantities of materials to be deposited in landfill sites rather than being reused or recycled unless site waste management plans are implemented and adhered to. The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in environmental impacts/ pollution. Therefore, it is essential that all waste materials are dealt with in accordance with regional policies, national legislation, and that site management procedures are in place to ensure the appropriate management of waste segregation, storage, handling, and transportation.

Typical waste materials arise from site management practices during the construction phase, for example, excess materials and packaging, over-ordering materials, off-cuts, damaged materials and poor storage during the construction phase. Typically, construction waste is ‘cleaner’ than demolition waste. Packaging waste can make up a significant part of this waste stream. In terms of waste arising from the site welfare facilities and site compound, general office waste such as paper, packaging and canteen waste will be collected in covered skips/large bins for disposal by a licensed waste contractor. Sewage from the temporary site toilets will be emptied under contract for disposal at an appropriate facility.

A number of different waste types are expected to be generated on site and are detailed in Table 17-7.

Table 17-7 Waste streams generated and associated management options and strategy

Work Stream	Waste	Waste Type	Waste Management Option	Waste Management Strategy
Dredging	Gravel & larger pockets of course material	Non-hazardous	Reuse on-site	Where feasible these dredged materials will be reused on-site.
	Sandy gravel and clay sediments	Non-hazardous	Disposal at offshore site	The majority of the dredged material will be disposed of at an authorised offshore disposal site. The proposed location (Figure 3-8) is situated in Portnahaven at the following central coordinate: 115785E, 647334N
	Drill cuttings	Non-hazardous	Disposal at offshore site	Drill cutting waste is likely to be generated during the dredging phase, however oil based drilling muds will not be used.
	Various waste oils & lubricants	Special	Treatment as Special waste Residual waste to Special waste facility	All Special waste must be source segregated before treatment and / or disposal and then independently moved to a secure collection point. It will then be collected by a specialist contractor and transferred
Construction	Concrete	Inert	Re-use on site Return to supplier Recycle on site Recover off-site Residual waste to landfill	Concrete will be batched on site. Care will be taken to ensure waste is minimised during this process. Investigations will be undertaken to identify if any excess concrete can be re-used in new batches. Awareness will be raised about the importance of effective handling. If additional concrete has to be delivered to the site a take-back scheme will be established for excess concrete with suppliers. Investigations will also be undertaken to determine whether concrete can be crushed on-site for use as aggregate of fill material where it is not possible to re-use it in its current form. Where this is not feasible the concrete waste shall be recovered off site
	Other inert	Inert	Recovered off-site where feasible Residual waste to landfill	All inert waste shall be segregated for off-site recycling or recovery.
	Metals	Non-hazardous	Recycle off-site	All metals shall be segregated for off-site recycling
	Plastics	Non-hazardous	Recycle off-site	Plastics shall be segregated for off-site recycling
	Paper & cardboard	Non-hazardous	Recycle off-site	Paper and cardboard shall be segregated for off-site recycling
	Timber	Non-hazardous	Recycle off-site	Storage pallets shall be returned where possible Wood waste will be segregated into a separate container so that off-site recycling can occur
	Glass	Non-hazardous	Recycle off-site	Glass will be segregated into a separate container so that off-site recycling can occur

Work Stream	Waste	Waste Type	Waste Management Option	Waste Management Strategy
	Mixed waste	Non-hazardous	Materials Recovery Facility (MRF)	Residual waste must be placed into a skip labelled mixed waste. Investigations shall be undertaken to identify potential recovery options for all waste.
	Paint tins	Special	Treatment as Special waste Recovery where feasible Residual waste to Special waste disposal facility	Empty paint tins arisings on site will be segregated in stockpiles on site away from all water courses and water bodies. All Special Waste must be source segregated before treatment and/or disposal and then independently moved to a secure collection point. It will then be collected by a specialist contractor and transferred for suitable treatment and/or disposal.
	Various waste oils & lubricants	Special	Treatment as Special Waste Residual waste to Special Waste Disposal Facility	All Special Waste must be source segregated before treatment and/or disposal and then independently moved to a secure collection point. It will then be collected by a specialist contractor and transferred for suitable treatment and/or disposal. Special waste shall be recycled where possible.

In terms of the overall impact (Table 17-3) of the construction phase of the Proposed Development, there is the potential to have a **Neutral or Slight** effect due to the increase in waste being generated and the potential for this waste to be sent to landfill over a short-term duration, however the intention will be to achieve a high rate of diversion from landfill through reuse, recycling and recovery throughout the construction phase.

17.5.2 Assessment of Operational Effects

Maintenance dredging will be required. However, the frequency of maintenance dredging will be established as part of the construction contract following the construction of the breakwater. Dredging material will be disposed of an authorised offshore disposal site (Figure 3-8) in accordance with the Marine Licence.

It is anticipated that the rock armour will adjust for a period of time which will be monitored for 104 weeks, and any movements will be recorded. After this, the breakwater will be inspected as part of the seabed bathymetric surveys regime and maintenance works will be undertaken as required.

The pier is used by CalMac Ferries Ltd. who operate a passenger ferry service with occasional vehicles being transported between the island of Mull and Iona. Crab/fishing vessel operators, leisure boat operators and private boat owners also use the facilities at the pier. The Proposed Development would support a slight increase in tourism using the ferry service and fishing/commercial vessels using the berthing opportunities which would result in a slight increase in litter and waste generation.

Waste management at the port is currently operated to best practice guidance and is managed and disposed by local authorities or licenced waste contractors. It is imperative that CalMac Ferries Ltd. Environmental Strategy and relevant policies and procedures are followed and that any additional waste that may arise are considered.

In terms of the overall impact (Table 17-3) of the operational phase on waste management, there is the potential to have a **Neutral or Slight** effect from a slight increase in waste sent to landfill associated with increased footfall from tourists using the ferry service and fishing and commercial vessels using the berthing facilities.

17.6 Mitigation Measures

In order to mitigate against the potential impacts that the Proposed Development could have on the production of waste during each phase, mitigation measures will be put in place to ensure that all waste is dealt with in a sustainable and legislatively compliant manner. These measures are set out below for the various phases of the development.

17.6.1 Construction Phase Mitigation Measures

17.6.1.1 Duty of Care

Contractors working on site during the works will have a duty of care and be responsible for the collection, control and disposal of all wastes generated by their works. Argyll & Bute Council and their

appointed contractor will ensure that all waste materials leaving the site will be transported via road by a registered and licensed carrier and arrive at a licensed / permitted site. Waste will only be disposed or recovered through licenced operators and in accordance with national waste legislation.

17.6.1.2 Site Waste Management Plan (SWMP)

Construction waste will be managed as part of a SWMP, prepared and implemented by the appointed contractor for the duration of the construction works. The SWMP will contain procedures for the management of waste and assist with providing a complete audit trail. The SWMP will be a live document and will be subject to revision throughout the course of the construction phase.

The SWMP will:

- Include specific details on the projected waste types and subsequent management;
- Identify and capture the decisions made in the design process to reduce waste generation;
- Identify the methodologies for waste management at each stage of the project;
- Identify how the waste will be dealt with (i.e., disposal, re-use on/off site etc.); and
- Identify potential end markets e.g., reuse, recycling facilities, waste treatment facilities and disposal sites.

The SWMP will specify procedures for:

- On-site segregation of waste at source where practical;
- On-site segregation of waste materials into appropriate categories;
- On-site segregation of non-hazardous waste materials into appropriate categories such as:
    - Metals;
    - Timber.
- On-site segregation of any hazardous waste materials into appropriate categories such as:
    - Any contaminated soils;
    - Waste oil and fuels;
    - Paints, glues, adhesives and other known hazardous substances.

The SWMP will additionally specify:

- Measures to ensure monitoring and updating of records under Duty of Care requirements;
- Measures to avoid over-ordering and generation of surplus waste materials;
- Measures to ensure appropriate staff training and levels of awareness in relation to waste management;
- Measures and procedures to monitor waste flows on site;

- Steps to be taken with materials suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- Implement a 'just in time' materials delivery systems to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project.

All waste leaving the site will be recycled, recovered or reused where possible, with the exception of those waste streams for which appropriate facilities are currently not available.

Waste streams will be collected by an appropriately licensed and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licensed facilities.

17.6.1.3 Construction Environmental Management Plan (CEMP)

An oCEMP is included in Appendix 20.1. A CEMP will be prepared which should contain measures and procedures for the management of construction waste. Contractors will be contractually obligated to comply with the requirements of the CEMP and it should be adhered to by all parties with any involvement in construction, including main contractors, sub-contractors and visitors to the site.

The CEMP will address specific waste management requirements:

- Identifying how the waste will be dealt with (i.e., disposal, re-use on/off site etc.).
- All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams for which appropriate facilities are currently not available.
- On-site segregation of non-hazardous waste materials into appropriate categories
- Control measures and attention to materials quantity requirements to avoid over-ordering and generation of waste materials.
- Implement a 'just in time' materials delivery systems to avoid materials being stockpiled, which increases the risk of the damage and disposal as waste.
- All waste materials will be stored in skips or other suitable receptacles in designated storage areas within NIE compounds. The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project.
- Ensure appropriate staff training and levels of awareness in relation to waste management.
- Waste streams will be collected by an appropriately licensed and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licensed facilities.
- Monitoring and updating of records under Duty of Care requirements.

- Sewage effluent from the temporary site compound will be removed using a vacuum tanker by a suitable licensed waste contractor.

17.6.1.4 Construction Phase Monitoring

Records will be kept for each waste material which leaves the site, whether for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the waste arising on site during the construction phase. The following should be recorded:

- Waste taken off-site for reuse;
- Waste taken off-site for recovery;
- Waste taken off-site for recycling; and
- Waste taken off-site for disposal.

For each movement of waste off-site a signed waste collection docket will be obtained from the waste contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

If waste movements are not accounted for, the reasons for this shall be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

The contractor will be responsible for conducting an audit of the waste practices at the site during the construction phase of the development.

Upon completion of the construction phase a final report will be prepared summarising the outcomes of waste management processes adopted and the total recycling/ reuse/ recovery figures for the development.

17.6.2 Operational Phase Mitigation Measures

17.6.2.1 CalMac Ferries Ltd. Environmental Strategy

There is no specific Waste Management Plan in place for Iona Ferry Terminal. Waste management at Iona Ferry Terminal should continue to be managed in line with CalMac Ferries Ltd. Environmental Strategy for 2021-2023 with one of its core priorities being *"we generate minimal waste and sustainably use materials".* CalMac Ferries Ltd. should continue to review and implement any required changes in the waste management to avoid and minimise the potential effects of passenger and ship generated wastes once the Proposed Development is operational. They should continue to encourage the responsible management of waste, including minimisation and recycling, at the point of generation on ships, reception in ports, transportation and disposal, and ensure that employees and users dispose of wastes responsibly in facilities provided.

17.7 Potential Cumulative Effects

A review of planning applications associated with other Proposed Developments has been undertaken to determine the likelihood for potential significant cumulative effects on waste, taking consideration of the following criteria:

- Type and extent of identified proposal;
- The distance between the identified proposal and the Proposed Development;
- Likely visual influence of the identified proposal;
- Potential inter-visibility between the identified proposal and the Proposed Development;
- Potential for cumulative cultural heritage effects on the physical fabric of the landscape or its scenic qualities and
- The potential for combined, successive and sequential visual effects in the context of the Proposed Development.

With regards to the potential for cumulative effects associated with waste, the proposed Fionnphort Breakwater and Overnight Berthing Project has been considered.

The source of current waste arisings associated with the Proposed Development is from the operation of the passenger ferry service from Fionnphort (the location of the proposed Fionnphort Breakwater and Overnight Berthing Project). Waste facilities are provided by CalMac Ferries Ltd. who provide recycling facilities at all their port locations for customers to recycle on the go. All waste generated and/or received at both the Iona Ferry Terminal and Fionnphort Ferry Terminal is currently managed and disposed by local authorities or licenced waste contractors. The management/ disposal route is at the discretion of the approved contractor.

CalMac Ferries Ltd. have in place, an Environmental Strategy for 2021-2023 which outlines the company's aims and actions to minimise their impact on the marine and terrestrial environments in which they operate. The Strategy outlines four core priorities which align with Scotland's Environment Strategy, Scottish Government National Outcomes and the UN Sustainable Development Goals. One of the core priorities is *"we generate minimal waste and sustainably use materials".* Waste management at the port is currently operated to best practice guidance and is managed and disposed by local authorities or licenced waste contractors. It is imperative that CalMac Ferries Ltd. Environmental Strategy and relevant policies and procedures are followed and that any additional waste that may arise are considered. Through continued adherence to this Environmental Strategy and relevant policies and procedures, there is not likely to be cumulative effects associated with waste arising from the Proposed Development with the proposed Fionnphort Breakwater and Overnight Berthing Project.

17.8 Residual Effects

17.8.1 Construction Phase Residual Impact

A carefully planned approach to waste management and adherence to a SWMP and CEMP during the construction phase will ensure that the waste effects on the environmental will be short term, imperceptible, and will not be significant. There is available capacity within the existing waste management infrastructure in the region to manage municipal and construction related waste from the Proposed Development works. Therefore, the impact of the construction phase in relation to waste management is predicted to be Neutral or Slight with the residual effect outcome being **Not Significant**. This is summarised in Table 17-8.

17.8.2 Operational Phase Residual Impact

From a waste management point of view, waste arisings at the site will return to the baseline situation as it is anticipated that due to recycling and reuse policies, procedures and CalMac Ferries Ltd. Environmental Strategy, waste will continue to be managed as per legal requirements. While there may be a minor increase in waste arisings, they are capable of being managed under the existing waste management arrangements. The impact of the operational phase in relation to waste management is predicted to be Neutral or Slight with the residual effect outcome being **Not Significant**. This is summarised in Table 17-8.

Table 17-8 Summary of Impacts

Phase	Receptor	Sensitivity of Receptor	Assessment of Magnitude	Predicted Effect	Adverse/ Beneficial	Permanent/ Temporary	Mitigation Measures	Residual Effect
Construction Phase	Landfill Void Space Capacity	Low	Negligible	Neutral or Slight	Adverse	Temporary	1.6.1	**Not Significant**
Operational Phase	Landfill Void Space Capacity	Low	Negligible	Neutral or Slight	Adverse	Permanent	1.6.2	**Not Significant**

By implementing the mitigation measures set out in this chapter and by managing wastes in accordance with the waste management hierarchy and best practice guidance, and the CEMP and SWMP, wastes generated during the distinct phases of the Proposed Development will have no adverse effect on waste management in the area.

17.9 Conclusions and Summary of Effects

The source of current waste arisings at the Proposed Development site is from the operation of the passenger ferry service from Fionnphort. Current wastes arising at the site are a typical mix of recyclable and residual material, accompanied by mixed litter generated from passenger footfall. Iona Port is operated by CalMac Ferries Ltd. who provide recycling facilities at all their port locations for customers

to recycle on the go. All waste generated and/or received at Iona Ferry Terminal is currently managed and disposed by local authorities or licenced waste contractors. The management/ disposal route is at the discretion of the approved contractor.

During the construction phase of the Proposed Development, typical waste materials which may arise from site management practices may include, excess materials and packaging, over-ordering materials, off-cuts, damaged materials and poor storage during the construction phase. Typically, construction waste is 'cleaner' than demolition waste. Packaging waste can make up a significant part of this waste stream. In terms of waste arising from the site welfare facilities and site compound, general office waste such as paper, packaging and canteen waste will be collected in covered skips/large bins for disposal by a licensed waste contractor. Sewage from the temporary site toilets will be emptied under contract for disposal at an appropriate facility.

In terms of the overall impact of the construction phase of the Proposed Development, there is the potential to have a Neutral or Slight effect due to the increase in waste being generated and the potential for this waste to be sent to landfill over a short-term duration, however the intention will be to achieve a high rate of diversion from landfill through reuse, recycling and recovery throughout the construction phase.

During the operational phase, the pier will continue to be used by CalMac Ferries Ltd. who operate a passenger ferry service with occasional vehicles being transported between the island of Mull and Iona. Crab/fishing vessel operators, leisure boat operators and private boat owners also use the facilities at the pier. The Proposed Development may support a slight increase in tourism using the ferry service and fishing/commercial vessels using the berthing opportunities which may result in a slight increase in litter and waste generation.

Waste management at the port is currently operated to best practice guidance and is managed and disposed by local authorities or licenced waste contractors. It is imperative that CalMac Ferries Ltd. Environmental Strategy and relevant policies and procedures are followed and that any additional waste that may arise are considered.

In terms of the overall impact of the operational phase on waste management, there is the potential to have a Neutral or Slight effect from a slight increase in waste sent to landfill associated with increased footfall from tourists using the ferry service and fishing and commercial vessels using the berthing facilities.

It is concluded that the significance of the Proposed Development in relation to waste management is – **Not Significant**.

18 GREENHOUSE GAS ASSESSMENT

18.1 Introduction

This chapter of the EIAR presents the Greenhouse Gas (GHG) Assessment for the Proposed Development. It provides quantitative and qualitative estimates of likely GHG emissions associated with the pre-construction, construction, operation and decommissioning phases of the Proposed Development.

This GHG Assessment is based on a Life Cycle Assessment ("LCA") approach and references the IEMA Environmental Impact Assessment Guide "Assessing Greenhouse Gas Emissions and Evaluating Their Significance" ("IEMA GHG Guidance"). As all GHG emissions are contributing to a global accumulation, the global climate is the ultimate receptor, and the impacts of climate change will impact all aspects of the Environmental Impact Assessment (EIA) directive (2011/92/EU as amended by 2014/52/EU). Although GHG emissions to the atmosphere are localised, the impacts are transboundary, meaning no matter where the emissions are released, the social, economic and environmental impacts will be felt on a global scale. GHG emissions associated with an infrastructure project (in this case a ferry and associated structures) can originate from the combustion of fossil fuels on-site for operating machinery, the manufacture and transport of materials and changes in land-use.

Throughout this assessment, the term carbon is referred to. This is used as shorthand for the carbon dioxide equivalent of all GHGs and is quantified as 'tonnes of carbon dioxide equivalent' (tCO_2e). Reporting emissions as CO_2e allows for the emissions of the six key GHG: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) to be expressed in terms of their equivalent global warming potential in mass of CO_2. This assessment will consider the whole life carbon of the Proposed Development scheme which encompasses capital and operational whole life carbon. Capital carbon refers to the GHG emissions associated with the construction of an asset and is more widely used within the infrastructure sector, having been previously referred to as embedded carbon. Operational carbon refers to the emissions associated with the operation and maintenance of the infrastructure.

This chapter should be read in conjunction with Volume III, Appendix 18.1 Scottish Greenhouse Gas Statistics 2021. This appendix summarises the results of the Scottish Greenhouse Gas Inventory for 1990-2021 which is compiled in line with international guidance from the Intergovernmental Panel on Climate Change (IPCC). The data is reported by source sector, such as energy supply, and greenhouse gas, such as carbon dioxide.

18.2 Legislation

18.2.1 Climate Change (Emissions Reduction Targets) (Scotland) Act 2019

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 amends the Climate Change (Scotland) Act 2009 and places the monitoring framework on a statutory footing, requiring individual sector by sector monitoring reports to be laid before the Scottish Parliament annually. Future reporting will occur under the requirements of the amended Climate Change (Scotland) Act.

Net-zero Emissions Target

The Scottish Ministers must ensure that the net Scottish emissions account for the net-zero emissions target year is at least 100% lower than the baseline (the target is known as the “net-zero emissions target”). The “net-zero emissions target year” is 2045. This act is in line with the principles set out in article 3 of the United Nations Framework Convention on Climate Change, contributing appropriately to the holding of the increase in global average temperature to well below 2°C above pre-industrial levels, and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

Interim Targets

The Scottish Ministers must ensure that the net Scottish emissions account for the year:

- 2020 is at least 56% lower than the baseline.
- 2030 is at least 75% lower than the baseline.
- 2040 is at least 90% lower than the baseline.

These reductions are relative to 1990 levels of carbon dioxide, methane and nitrous oxide and 1995 levels of hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.

Annual Targets

Table 18-1 below details the annual targets starting from 2020 and ending in 2045.

Table 18-1 Annual targets from 2020 to a net zero 2045

Year	Percentage reduction from the 1990/1995 baseline
2020 (interim target)	56%
2025	65.5%
2030 (interim target)	75%
2035	82.5%
2040 (interim target)	90%
2045	100% (net zero emission)

Reporting and Planning Duties

An annual target report sets out whether each annual emissions reduction target has been met. The latest report for the 2020 target year was published in June 2022.

The report must state:

- The emissions reduction target for the target year.
- Whether the emissions reduction target for the target year has been met.
- The percentage by which the net Scottish emissions account for the target year is lower than the baseline.

- The amount by which the net Scottish emissions account for the target year is lower or higher than the emissions reduction target for that year.
- The cumulative amount by which the net Scottish emissions accounts are lower or higher than the corresponding emissions reduction targets, calculated by adding each amount by which an account is lower or higher than the corresponding target for each year in the period beginning with 2018 and ending with the target year.

Climate Change Plan

The Scottish ministers must lay out a plan before the Scottish parliament.

This plan includes the sectors:

- Energy supply.
- Transport (including international aviation and shipping).
- Business and industrial process.
- Residential and public (in relation to buildings in those sectors).
- Waste management.
- Land use, land use change and forestry.
- Agriculture

Just Transition

The just transition principles are the importance of taking action to reduce net Scottish emissions of greenhouse gases in a way which:

- Supports environmentally and socially sustainable jobs.
- Supports low carbon investment and infrastructure.
- Develops and maintains social consensus through engagement with workers, trade unions, communities, non-governmental organisations, representatives of the interests of business and industry and such other persons as the Scottish Ministers consider appropriate.
- Creates decent, fair and high-value work in a way which does not negatively affect the current workforce and overall economy.
- Contributes to resource efficient and sustainable economic approaches which help to address inequality and poverty.

Appendix 18.1 Scottish Greenhouse Gas Statistics 2021 summarises the results of the Scottish Greenhouse Gas Inventory for 1990-2021 which is compiled in line with international guidance from the Intergovernmental Panel on Climate Change (IPCC). The data is reported by source sector, such as energy supply, and greenhouse gas, such as carbon dioxide.

18.3 Assessment Methodology

18.3.1 Introduction

'Climate' is generally understood to mean the weather conditions prevailing over a long period of time and climate change refers to changes in recorded long term climate trends. As a topic for the assessment within EIA, climate change is relatively new. Guidance is evolving and there is no prescribed way in which climate change should be incorporated into an ES/EIAR, however, some guidance has been prepared by IEMA, discussed further below, which sets out the two main approaches that can be taken to determine a project's climate change impact.

These involve identifying:

- The vulnerability of the Proposed Development to climate change; and
- The direct and indirect influence on the Proposed Development on climate change.

The vulnerability of the Development to climate change considers effects on the Development as a receptor (this is referred to in IEMA Guidance as Climate Change Resilience and Adaptation). A high-level climate change risk and resilience assessment has been undertaken to identify the potential risks of climate change on the Development and to high design measures to increase its resilience and adaptation to climate hazards, such as extreme hot and cold weather, intense rainfall, high winds and storm events.

Direct and indirect effects consider effects on environmental receptors as a result of the Proposed Development. Direct and indirect emissions can be defined as follows:

- Direct GHG emissions are emissions from sources that are owned or controlled by the operator. Examples include vehicular emissions, plant use (such as generators) and independent onsite energy generation (oil, gas and diesel);
- Indirect GHG emissions are emissions that are a consequence of the construction of operational activities of the Development but are a result of procurement and / or activities controlled by another entity. Examples include energy generation and the manufacture of materials (known as 'embodied' carbon).

18.3.2 IEMA guidance, Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance

IEMA guidance, Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance states that *"in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their occurrence by taking mitigating action".* As a result, we do not intend to assign a significance threshold to the Proposed Development.

The guidance has been prepared by IEMA with the intention of assisting EIA practitioners to make informed choices relating to GHG emission treatment within an EIA, *"The aim of this guidance is to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and non- statutory Environmental Impact Assessment (EIA)."*

It provides options for the treatment of GHG emissions within each stage of the assessment process by highlighting key issues. The effects of GHG emissions are included in the decision-making process as each project will influence climate change relative to the GHG emissions produced. The UK have GHG reduction targets, therefore it is important to limit the amount of GHG emissions from each project (including this project) to stay within this target. Early stakeholder engagement maximises the mitigation measures put in place from project inception, through each stage of the process. This is underpinned by four key principles:

- Early, effective and ongoing interaction;
- Appropriate stakeholder engagement;
- Consenting risk is managed; and
- A clear narrative.

Due cognisance has been taken of this guidance in this Proposed Development and has been employed through the assessment presented here.

18.3.3 Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

The Guide to Climate Change Resilience and Adaptation (June 2020) provides an updated framework for the effective consideration of climate change resilience and adaption in the EIA process). This document is a revision of the 2015 IEMA guidance on Climate Change Resilience and Adaption in EIA and reflects lessons learnt from emerging practice.

A step by step method presented within this guidance is set out below and has been given due cognizant within this Chapter:

- Step 0 – Building climate resilience into the project by considering incorporating resilience during the designs stage and by identifying appropriate mitigation measures;
- Step 1 – Scoping for the EIA; e.g. identify the climate change projections for use in the assessment and identify key climatic variables relevant to the project;
- Step 2 – Defining the future (climate) baseline; define future conditions using selected climate change projections (i.e. increase in rainfall, increase in mean summer temperature and wind strength);
- Step 3 – Identifying and determining sensitivity of receptors;
- Step 4 – Reviewing and determining magnitude of the effect; consider probability and consequence to determine the magnitude of the effect;
- Step 5 – Determination of significance;
- Step 6 – Developing additional adaptation / EIA mitigation measures;
- Step 7 (Development permitted) – Monitoring and adaptive management by implementing mitigation measures.

EIA Reports produced in line with this guidance are to be proportionate in their approach and not include superfluous assessment that does not address likely material issues.

In lieu of a prescribed methodology, IEMA guidance on Climate Change Resilience and Adaptation (2020) has been prepared to assist practitioners with the effective consideration *"of both climate change resilience and adaptation in the EIA process"*.

The guidance stresses that climate change should be an integrated consideration within the EIA, by undertaking an assessment that is *"proportional to the evidence base available to support any assessment"* and focusses on impacts *"specific to project".*

18.3.4 GHG Emissions Assessment Methodology

There are different assessment methods for measuring and quantifying GHG emissions. Two key examples include:

- PAS 2080:2016[35] Carbon management in infrastructure which has been developed to enable a consistent approach to the managed reduction of GHG emissions associated with economic infrastructure by construction industry stakeholders including clients, designers, constructors and material suppliers.
- BS EN 15978:2011[36] Sustainability of construction works, Assessment of environmental performance of buildings, Calculation method which has been developed by CEN to enable a consistent approach to the environmental assessment of buildings including GHG emissions.

18.3.4.1 GHG Assessment and Proportionality

Projects vary by size and type, resulting in varying GHG emissions. An effective scoping exercise will ensure that a balance is struck between the amount of GHG emissions from the project to the effort committed to the GHG assessment. For example, the GHG assessment can show if the majority of the impacts occur during the construction phase and there are negligible impacts during the operational phase.

A qualitative GHG assessment can be carried out if it is justified and agreed with the stakeholders during the scoping stage. They are also acceptable where data is unavailable or where mitigation methods are agreed upon early.

18.3.4.2 Define Goal and Scope

The goal and scope of the assessment should include a range of different aspects:

- The goal of the GHG emissions calculation.
- Description of the system (i.e., built environment asset / development etc.) that is the subject of the assessment.
- The function of the system (i.e., its performance characteristics).

[35] PAS 2080:2016 Carbon Management in Infrastructure, The British Standards Institution (BSI)

[36] BS EN 15978:2011. Sustainability of construction works. Assessment of environmental performance of buildings.

- The system boundary to be applied.
- Allocation procedures (where used) for apportioning GHG emissions.
- The calculation methodology to be applied.
- How GHG emissions information will be interpreted and used in decision-making including how it should be used to inform.
- Mitigation response.
- Significance of impact of emissions.
- Communicating and reporting GHG emission impact within EIA.
- Data quality requirements.
- Assumptions, limitations and constraints.

The study review process, ensuring it is appropriate and proportionate to the intended use of the study.

18.3.4.3 Scoping the Boundaries of the GHG Emissions Assessment

Topics which will be included or excluded need to be identified. The scoping exercise of the GHG emissions assessment will consider aspects such as which life cycles to include, whether there should be a focus on assets construction or operation, if there are specific elements of the supply chain that must be included, and what an appropriate boundary condition or cut off point might be to excluding aspects from the assessment. The following sections provide a summary of scope and scale of assessment and guidance. Section 18.4.5 sets out the key assessment criteria for this project.

18.3.4.4 Study Boundaries

EIAs should apply system boundaries, use data that is consistent with and report using the modular approach. GHG emissions assessments typically cover all the life cycles to determine which need included. Projects will vary in size and hence so will the scale of GHG assessments in the spirit of delivering proportionate EIAs.

18.4 Inclusions

The study system boundary should reflect the system under study including its physical scope and life cycle stages relevant to the goal and scope of the assessment.

18.4.1.1 Cut off Rules (Exclusions)

Any activities that do not significantly impact the result of the quantification can be excluded. The input or output flows per module would be expected to be a maximum of 5% energy usage and mass. All inputs and outputs to a process for which data are available should be included.

18.4.1.2 Study Period

A reference study period shall be chosen as the basis for the GHG emissions assessment, and this should be based on the expected service life of the construction asset.

18.4.1.3 Calculation Data

To undertake a calculated GHG emissions assessment for an EIA it will be necessary to gather data on the activities occurring and the GHG emissions factors for these activities, for the system under study.

18.4.1.4 Study System Activity Data

Activity data includes information about the size, magnitude and physical nature of the system under study. It can take different forms and consists of information covering materials quantity, energy and water demand, waste generation, transportation distances and modes, and works techniques/technologies.

18.4.1.5 GHG Emissions Factors

GHG emission factors are a value for 'GHG emissions per unit of activity'. Examples of this are:

- *HGV: 0.13 kg CO_2e / t.km*
- *UK electricity grid: 0.41 kg CO_2e / kWh*
- *Concrete: X kg CO_2e / tonne*

GHG emissions factors vary in their scope and coverage and will be representative of a single, or multiple processes/activities, and can incorporate multiple life cycles. Care needs to be taken when selecting the correct factors for the system under study. It is often necessary to apply multiple GHG factors for the same activity if the assessment is being completed over a long time period, for example if the GHG emissions are expected to change.

18.4.1.6 Data Quality

To satisfy the goal and scope of the EIA, the data needs to be of appropriate quality by defining:

- Age.
- Geography.
- Technology mix represented by data.
- Methodology applied to gather or calculate the data.
- Competency of entity that developed the data.

18.4.1.7 Types of Data

Data types will vary depending on the project type and how detailed it is. In most cases, EIAs are based on design-stage information, hence activity data specific to the project should in theory be available from the engineering and design teams. If this is not available, an alternative would be to use generic or public information that is best representative of the project.

18.4.1.8 GHG Emissions Calculation Method

A measured or calculated, or a combination of these two methods are used to quantify the GHG emissions for a project. In almost all cases a calculated approach will be used because an EIA is completed in advance of supply chain mobilisation and associated construction works.

The structure of a quantification calculation for determining the GHG emissions associated with the construction works should be as follows:

GHG emission factor × Activity data = GHG emission or removal

Calculations may be taken at different scales reflecting specific activities, components or elements of construction. As a result, individual calculations should be completed to form a GHG emissions inventory for the quantification.

18.4.1.9 Study Uncertainty

Uncertainty should be considered and if it significantly affects the outcome of the study, additional steps should be used to reduce it and provide more confidence in results.

Uncertainty can be considered by:

- Testing upper and lower limits.
- Testing for different inclusions and exclusions.
- Modify study period.

If the scale of uncertainty provides findings are likely to change any decision based on the data, it should be appropriately reduced.

18.4.2 Sources of Information

A review was undertaken of the literature and data relevant to this assessment, relating to climate change and carbon and this was used to provide an overview of the future environment.

18.4.3 Site-Specific Surveys

No site-specific surveys have been undertaken to inform the climate change and carbon assessment.

18.4.4 Defining Magnitude and Sensitivity

Institute of Environmental Management and Assessment (IEMA, 2022) guidance states that; *"The crux of significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050."*

In the deficiency of sector-based, or local emissions budgets, the UK Carbon Budgets can be used to contextualise the level of significance. As per IEMA (2022) guidance, all GHG emissions are classed as having the potential to be significant as all emissions contribute to climate change. In establishing the scope and boundary of emission assessment, it is standard accounting practice to exclude minor sources as these are not

material. Inventories that exclude these minor sources are still considered complete for verification purposes. This exclusion of emission sources that are less than 1% of a given emissions inventory is based on a 'de minimis' (relatively minimal) contribution (BSI, 2019).

On this basis, where emissions from the Proposed Development are greater than 1% of the relevant annual UK Carbon Budgets the impact of the Proposed Development on the climate is considered to be major. This is summarised in Table 18-2 and

Table 18-3.

There is currently no published standard definition for receptor sensitivity of GHG emissions. The global climate has been identified as the receptor for the assessment. The sensitivity of the climate to GHG emissions is considered to be 'high' (IEMA, 2022). The rationale supporting this includes:

- Any additional GHG impacts could compromise the UK's ability to reduce its GHG emissions and therefore the ability to meet its future carbon budgets; and
- The importance of meeting the Paris Agreement goal of limiting global average temperature increase to well below 2°C above pre-industrial levels. Additionally, a recent report by the Intergovernmental Panel on Climate Change highlighted the importance of limiting global warming below 1.5°C (IPCC, 2021).

Table 18-2 Magnitude Criteria for Impact Assessment

Magnitude	Magnitude Criteria Description
Beneficial Reduction	Estimated emissions equate to a reduction of >0.1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise
Negligible Change	Estimated emissions ± 0.1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise
Small Increase	Estimated emissions equate to between 0.1 and 1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise
Large Increase	Estimated emissions equate to >1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise

Table 18-3 Consequence Matrix for Impact Assessment

Magnitude of Emissions	Magnitude Criteria Description
Beneficial Reduction	Beneficial
Negligible Change	Minor Beneficial/Adverse
Small Increase	Moderate Adverse
Large Increase	Major Adverse

18.4.5 Climate Change Resilience

The identification and assessment of climate change resilience within EIA is an area of emerging practice. There is no single prescribed format for undertaking such assessments; therefore, the approach adopted to undertaking and reporting the assessment has drawn on good practice from other similar developments and studies.

The types of receptors considered vulnerable to climate change are:

- construction phase receptors (i.e., workforce, plant and machinery);
- the development's assets and their operation, maintenance and refurbishment (i.e., hardstand, structures and drainage, etc.); and,
- end-users (i.e., members of public and commercial operators etc.).

The 120-year design life of the Proposed Development includes its construction and operational phases. As the construction phase would be much shorter in duration than the operational phase, future climate change is less relevant to the assessment of construction impacts and effects. Accordingly, the construction assessment has followed a descriptive based approach. For the operational assessment, the likelihood and consequence of impacts and effects on receptors has been assessed based on a future time frame of operation.

Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 18-4 Measure of Likelihood for Climate Change Resilience Assessment.

Table 18-4 Measure of Likelihood for Climate Change Resilience Assessment (Source: DMRB)

Likelihood Category	Description (probability and frequency of occurrence)
Very High	The event[37] occurs multiple times during the lifetime of the project e.g. approximately annually, typically 120 events.
High	The event occurs several times during the lifetime of the project e.g. approximately once every five years, typically 20 events.
Medium	The event occurs limited times during the lifetime of the project e.g. approximately once every 15 years, typically 8 events.
Low	The event occurs during the lifetime of the project (once in 120 years).
Very low	The event may occur once during the lifetime of the project.

The consequence of an impact has been measured using the criteria detailed in Table 18-5 Measure of Consequence for Climate Change Resilience Assessment.

Table 18-5 Measure of Consequence for Climate Change Resilience Assessment (Source: DMRB)

Consequence of Impact	Description
Very Large Adverse	National level disruption lasting more than 1 week.
Large Adverse	National level disruption lasting more than one day but less than 1 week.
Moderate Adverse	Regional level disruption lasting more than one day but less than 1 week.
Minor Adverse	National level disruption lasting less than 1 day.
Negligible	Isolated disruption lasting less than 1 day.

The identification of likely significant effects on receptors has been undertaken using professional judgement by combining the measure of likelihood with the predicted consequence of impact, as shown in Table 18-6 'Significance Criteria for Climate Change Resilience Assessment'.

[37] * The event is defined as the climate event and the hazard occurring in combination.

Table 18-6 Significance Criteria for Climate Change Resilience Assessment

Consequence of Impact	Measure of Likelihood				
	Very Low	Low	Medium	High	Very High
Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Minor	Not Significant	Not Significant	Not Significant	Significant	Significant
Moderate	Not Significant	Not Significant	Significant	Significant	Significant
Large	Not Significant	Significant	Significant	Significant	Significant
Very Large	Not Significant	Significant	Significant	Significant	Significant

The assessment also identifies and accounts for existing climate change resilience measures either already in place or in development for infrastructure and assets, for example, mitigation measures for potential flooding impacts.

18.4.6 Assessment Criteria and Assessment of Significance

18.4.6.1 Assessment of GHG Emissions

The main emissions sources of the Proposed Development that have been considered are:

- As with the majority of large civil engineering projects potential emissions to air are inevitable during the construction phase, arising from construction activities, transport of materials and the use of plant and equipment.
- other inputs, primarily electricity and heat load; and,
- The decommissioning of the Proposed Development. The decommissioning phase is not considered relevant due to the long design life of the assets and given that emissions with the end of the life of this type of asset are relatively small and therefore unlikely to be significant.

18.4.6.2 Assessment of Climate Risks

The assessment assumes the Development will be fully operational from 2025. In considering future climate change scenarios, managing climate change resilience and adaption, the IEMA guidance (2020) recommends the use of the UK Climate Projections (UKCP) Website (Met Office, 2018). The latest UKCP is UKCP18 which provides updated observations and climate change projections out to 2100 in the UK. Therefore, this assessment assumes projections for the 2100 as the most far-reaching projection and is considered to be appropriate for the design life of the Development.

18.4.6.3 Sensitive Receptors

Following identification of the future climate scenarios, the project receptors within the study area which are vulnerable to climate change may be identified as below:

- the construction process (e.g., workforce, plant, machinery etc);
- the assets and their operation, maintenance and refurbishment (e.g., structures, breakwater, utilities, etc); and,
- end-users (e.g., members of public, commercial operators etc).

18.4.7 Employed Assessment

Due to the level of uncertainty within the final Proposed Development design, the carbon assessment will provide an approximate range, rather than a definitive total, for the total carbon dioxide equivalent (CO_2e) emissions inventory. Conservative assumptions have been used to reflect a high emissions, 'realistic worst case scenario' when calculating the emissions.

The assessment boundaries define the scope of the inventory. The assessment boundary comprises the boundary (see Figure 3-5) of the Proposed Development and all components contained therein, including offshore activities. Emissions associated with activities during pre-construction (surveys), construction (embodied carbon, transportation of components to the Proposed Development and installation of components), operation and maintenance and decommissioning are included, to ensure all activities are captured in the carbon assessment.

Due to the stage of development of the industry and the availability of validated embodied carbon data, assumptions are developed for the source location of the components which form the Proposed Development and the materials constituting these components.

18.4.7.1 Emission scenarios associated with the Proposed Development.

Estimates (both qualitative and quantitative) were made of the following:

- Pre-construction emissions from vessels;
- Construction phase – including trips by vessel to the dredge deposit locations (please refer to Chapter 3, Figure 3-8 for location);
- Operations and maintenance – trips from the ferry and any estimated ferry maintenance;
- Decommissioning: emissions from vessels removing and transporting components to shore, following the operational period of the Proposed Development.

The following categories of emissions were excluded from the emissions inventory due to the complexity of estimation and the availability of data given the level of maturity of the industry. These emissions are likely to represent a very small part of the total emissions for this assessment, and therefore are likely to have a low potential to alter the outcome or value of the assessment:

- Emissions from manufacturing process of geotextile, site welfare fatalities, Heras fencing, safety buoys etc.
- Onshore transportation[38] (if any); and;
- Office activity and worker travel.

Emissions associated with activity beyond the return of components to shore for decommissioning at the end of the lifecycle of the Proposed Development are outwith the assessment boundary, however, it is considered that a high percentage of the material may be recycled.

[38] Transport of Material to site: Materials are expected to be transported to site by barge and installed from a barge. Transport by road will be minimal – there is no estimated impact on the road transport network.

18.5 Baseline Scenario

18.5.1 Scottish Greenhouse Gas Statistics 2021

18.5.1.1 Source Emissions

A measure of the actual emissions or removals in Scotland including international aviation and shipping. This measure can be used for UK and international comparisons. This is included to enable an assessment to be made in regard to the significance of the Proposed Development when considered on a national scale. There was 41.6 MtCO2e in 2020, down 49.2% from 1990 and down 2.4% from 2020.

18.5.1.2 Emissions for Reporting Against Targets

The Committee for Climate Change (CCC) recommended a new method of reporting emissions for the purposes of monitoring performance against targets for the June 2020, and future, publications. This is known as the GHG Account.

On this adjusted basis, the GHG account reduced by 49.9% between the baseline period and 2021.

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 specifies a target reduction of 51.0% reduction over the same period. Therefore, the interim target for 2021 has not been met.

18.5.2 The Greenhouse Gas Inventory

The Scottish Greenhouse Gas Emissions (2022) publication uses the results of the Scottish Greenhouse Gas Inventory for 1990-2021 which is compiled in line with international guidance from the IPCC. The data is reported by source sector, such as energy supply, and greenhouse gas, such as carbon dioxide.

“Scottish Greenhouse Gas Emissions 2021” includes data on two categorisations of greenhouse gas emissions.

- Estimated net source emissions. These are sometimes referred to as "territorial" emissions, as they are produced within a country's territory or economic sphere.
- GHG account. These are net source emissions which have been adjusted to remove the effect of successive revisions to the data over time. Section C contains results using this approach.

The publication does not include any information on consumption-based emission estimates, which refers to GHG emissions associated with the spending of Scottish residents on goods and services wherever in the world these emissions arise together with emissions directly generated by Scottish households, through private heating and motoring.

Table 18-4 below shows how to use the different categorisations of statistics on greenhouse gas emissions.

Table 18-4 Guidance on the use of Estimated Source Emissions and GHG Account (Source: Scottish Greenhouse Gas Emissions 2021)

	Estimated Source Emissions	GHG Account
Use for reporting progress against Scotland’s Climate Change Targets	×	✓
Can be compared with EU countries	✓	×

	Estimated Source Emissions	GHG Account
Can be compared with UK	✓	×
Includes International Aviation and Shipping	✓	✓
Includes North Sea Oil & Gas	×	×
Data on individual GHG	✓	×
Data on sectoral emissions	✓	×
Base Year	1990	Baseline Period (Variable)

18.5.2.1 Categories

For the purpose of reporting, GHG emissions are allocated into the following sections:

- Energy Supply: Emissions from fuel combustion for electricity and other energy production sources, and fugitive emissions from fuels (such as from mining or onshore oil and gas extraction activities). North Sea oil & gas emissions are not allocated to Scotland[40].
- Business: Emissions from fuel combustion and product use in industrial and commercial sectors, and F gas emissions from refrigeration and air conditioning in all sectors. Includes industrial off-road machinery.
- Industrial Processes: Emissions resulting from industrial processes, except for those associated with fuel combustion which are included in the Business sector.
- Transport (excluding International Aviation and Shipping): Emissions from domestic aviation, road transport, railways, domestic navigation, fishing and aircraft support vehicles.
- International Aviation and Shipping: This category is called "Exports" in some inventories. Includes emissions from international aviation and shipping.
- Public: Emissions from combustion of fuel in public sector buildings.
- Residential: Emissions from fuel combustion for heating/cooling and garden machinery and fluorinated gases released from aerosols/metered dose inhalers.
- Agriculture: Emissions from livestock, agricultural soils (excluding carbon stock changes which are included in the LULUCF sector), stationary combustion sources and off-road machinery.
- Waste Management: Emissions from waste disposed of to landfill sites, waste incineration, and the treatment of wastewater.
- Land Use, Land Use Change and Forestry (LULUCF) – Emissions/removals of CO_2 from changes in the carbon stock in forestland, cropland, grassland, wetlands, settlements and harvested wood products, and of other greenhouse gases from drainage (excl. croplands and intensive grasslands) and rewetting of soils, nitrogen mineralisation associated with loss and gain of soil organic matter, and fires. Because the impact of biomass harvest on carbon stocks in ecosystems is included in this sector, any emissions of CO_2 from

[40] Emissions of GHGs from offshore oil and gas exploration and production are classified within the Greenhouse Gas Inventory as "Unallocated" emissions and not attributed to any of the devolved administrations.

burning biomass (regardless of the country of origin) are excluded from other sectors to avoid double counting them.

18.5.3 Results – Net Sources of Scottish Greenhouse Gas Emissions

In 2021, Domestic transport (excluding International Aviation and Shipping) (10.9 $MtCO_2e$) was the largest source of net emissions, followed by Business (7.7 $MtCO_2e$), Agriculture (7.8 $MtCO_2e$), Residential (6.3 $MtCO_2e$) and Energy Supply (4.9 $MtCO_2e$).

Table 18-5 Scottish Greenhouse Gas Emissions by National Communications Category 2020 (Values in $MtCO_2e$)

NC Category	Carbon Dioxide	Methane	Nitrous Oxides	Fluorinated Gases	Total
Agriculture	1.2	4.6	2.0	0.0	7.8
Business	6.8	0.0	0.1	0.8	7.7
Energy Supply	4.4	0.4	0.0	0.0	4.9
Industrial Processes	0.4	0.0	0.0	0.0	0.4
International Aviation and Shipping	0.7	0.0	0.0	0.0	0.7
Land Use, Land Use Change and Forestry	-4.0	3.7	0.7	0.0	0.4
Public	0.9	0.0	0.0	0.0	0.9
Residential	6.1	0.1	0.0	0.1	6.3
Domestic Transport	10.8	0.0	0.1	0.0	10.9
Waste Management	0.0	1.4	0.1	0.0	1.5
Grand Total	27.5	10.2	3.0	0.9	41.6

18.5.3.1 Main Points

Carbon dioxide was the main greenhouse gas emitted or removed in most sectors, with the exceptions of the Agriculture and Waste Management sectors.

Methane was the main net gas emitted in the agriculture (4.6 MtCO2e), followed by nitrous oxide (2.0 MtCO2e) and carbon dioxide (1.2 MtCO2e).

Almost all emissions in the Waste Management sector were emitted in the form of methane (1.2 $MtCO_2e$).

All sectors exhibit a general downwards trend between 1990 and 2021:

- Energy Supply emissions have seen the largest decrease in GHG emissions (-16.8 MtCO2e, a reduction of 77.6%) followed by LULUCF (-5.7 MtCO2e, a reduction of 94.1%), Waste Management (- 5.0 MtCO2e, a reduction of 76.2 per cent), and Business (-4.2 MtCO2e, a reduction of 35.3 per cent). This is as a result of the change in electricity supply sector, with renewables on the increase, and fossil fuels and nuclear energy decreasing.
- Overall, the gigawatt-hours of electricity generated in Scotland decreased by 7.0 per cent between 2020 and 2021. Renewables were the single largest source of electricity generated in Scotland in 2021 at 57.0

per cent, followed by nuclear generation at 29.8 per cent with fossil fuel generation making up only 10.9 per cent of total electricity generation.

Full details of the Scottish Greenhouse Gas Statistics 2021 are detailed in Appendix 18.1.

18.5.4 Emissions in Dredging

The international emission legislation for the shipping industry has become increasingly stringent in recent years and will become even more stringent in future years. Increasing environmental awareness and social challenges like air quality, climate change and energy scarcity have resulted in the latest emission legislation as set forth in the IMO (International Maritime Organization). The emissions of a dredger are not only defined by the dredging installation, local circumstances and the crew, but also by the legislation itself. Legislation to restrict environmental impacts, such as turbidity and noise, is likely to influence efficiency and emissions. The vessel that will be employed for the construction phase dredging phase is a backhoe dredger. Full details will be presented by the appointed contactor and the dredging vessel will adhere to all relevant legislation with regards to emissions that are applicable at the time of operation.

18.6 Description of Likely Significant Effects

18.6.1 Emissions Inventory

The emissions inventory for the Proposed Development is divided into three phases:

- Development and emissions associated with pre-construction and construction vessels;
- Construction CO_2e - the emissions from construction vessels;
- Operational CO_2e - the emissions from vessels associated with operation and maintenance;
- Decommissioning CO_2e - the emissions from vessels associated with the removal of components, following the operational period of the Offshore Development.

The entire construction (including pre-construction) phase is 52 weeks. An outline method statement is provided in Section 3.3 of the Project Description, a summary is presented below.

18.6.2 Carbon Assessment

18.6.2.1 Pre-construction Phase

The main aspects of the pre-construction phase are likely to be:

1. Undertaking of site dilapidation survey and level surveys as required to show the condition of the surrounding area and roads prior to the start of the works.
2. Site welfare facilities, site compound and storage areas established within the area. The site boundaries on land around the site compound and storage areas shall be defined with Heras fencing. Working area over water shall be marked with indicative safety buoys deployed at approx. 10m centres to delineate.

Dredging Works:

1. Mobilisation of dredging plant to site.

2. Pre-dredge bathymetric survey.
3. Removal/relocation of existing private moorings and buoys from within the site boundary, working areas and dredging area and subsequent installation of the mooring at temporary locations nearby.
4. Dredge pocket to the northeast of the existing Iona slipway.
5. Post-dredge bathymetric survey.

18.6.2.2 Construction Phase

The main aspects of the construction phase are likely to be:

1. Mobilisation of plant and operations team to site.
2. Rock armour and materials for breakwater delivered to site by barge.
3. Formation of breakwater footprint.
4. Installation of secondary rock and primary rock to existing seabed level.
5. Installation of inner core & primary rock armour.
6. Disposal of surplus seabed material in accordance with Marine Dredging Licence.
7. Installation of rock armour along shore between existing slipway and south end of existing restaurant.

18.6.2.3 Operational Phase

The design life of the structure is 120 years in accordance with the UK National Annex to BS EN 1990:2002, Category 5. The total emissions from the vessels were divided by the operational lifetime of the Proposed Development of 30 years to calculate emissions per year. This is a conservative assumption as vessels are likely to become more efficient over the next 30 years.

18.6.2.4 Maintenance Phase

Maintenance dredging will be required after construction is completed. The frequency of maintenance dredging will be established as part of the construction contract following the construction of the breakwater. Maintenance of the breakwater will be required as rock armour will move/adjust for a period of time.

Defect period is expected to be 104 weeks during which the breakwater will be monitored, and any movement recorded and reported. After this, the breakwaters will be inspected as part of the seabed bathymetric surveys regime. Mains Electric is known to be present well to the north of the site and the proposed works will have no interference with these services.

18.6.2.5 Decommissioning Phase

Decommissioning considers the decommissioning and removal (for re-use, recycling, incineration with energy recovery, or disposal at a licensed site) of the infrastructure to the shore at the end of the Proposed Development's lifetime.

It is likely that the breakwater would be removed in reverse order to its installation. With an anticipated 120 year life span it could be assumed that any emission at this stage would be negligible due to advance in technology and use of clean engines.

As the Proposed Development's anticipated lifetime is up to 120 years from full commissioning, there may have been advances in technological capabilities for decommissioning and/or changes to legislation by this time, therefore decommissioning best practice and legislation will be applied at that time of the Proposed Development's decommissioning. Under international standards such as those published by the IMO, there is the potential to consider leaving components in situ, however it is understood that this would require a robust and compelling justification to be presented to Marine Scotland in order to be granted approval for partial removal of the Proposed Development.

18.6.3 Calculations and Emission Estimates

There is predicted to be a Negligible Change in emissions from the project throughout the phases of the scheme. Estimated emissions + 0.1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise. Table 18-6 details the estimates, carbon emission estimates and magnitudes.

Table 18-6 Scottish Greenhouse Gas Emissions by Gas by National Communications Category 2020. Values in $MtCO_2e$

Materials	Units	Approximate Estimate	Estimated Quantity + ~10% Contingency for Worst Case	tCO_2e	Magnitude of Emissions (Please refer to Table 18-2)
Permanent Construction Concrete	Tonnes	682	750	**Less than 0.1%**	**Negligible Change** - Estimated emissions + 0.1% of total emissions across the relevant five-year UK Carbon Budget period in which they arise
Dredging[41] – Prior to Construction (1 week)	M^3	1,225	1450	**Less than 0.1%**	
Dredging Trips (45 exposed sea journeys) by vessel to dredge deposit location (the closest open dredge deposit site is MA035 Portnahaven)[42] Estimated dredge tonnage is 2,550.	km	160 round trip (45 exposed sea journeys)	160 round trip (45 exposed sea journeys) + 10%	**Less than 0.1%**	
Rock Armour[43] Transport (50 Vessels[44] Movements)	Tonnes	149812	164793.20	**Less than 0.1%**	

[41] Self-contained self-propelled vessel with an excavator mounted on its bow

[42] The closest Open Dredge Deposit site is MA035 Portnahaven, just off the coast of the Isle of Islay, an approximate 80Km distance away from Iona, and 160Km round trip (45 exposed sea journeys)

[43] Glensanda Quarry (Aggregate Industries) in Oban has been identified as a quarry which will be capable of producing rock armour material to a grading sufficient for the application at Iona. The quarry is equipped with marine loading facilities. The actual source of rock will be determined by the successful Contractor following the tender stage of the project.

[44] While this will be contractor specific, we anticipate a typical vessel type for rock armour delivery could be similar to 4 no. Flat Top Barge – Mormaen 15 | Keynvor MorLift Ltd

Materials	Units	Approximate Estimate	Estimated Quantity + ~10% Contingency for Worst Case	tCO_2e	Magnitude of Emissions (Please refer to Table 18-2)
Rock Armour Core	Kg	3000	3300	**Less than 0.1%**	
Rock Armour – 2 no. layers on top of core	Kg	6000	6600	**Less than 0.1%**	

The licence authorises the use of the undernoted construction materials[45] required in connection with the licensed activity, subject to the indicative amounts as specified below:

Material to be used in permanent construction;

- Concrete – 682 tonnes
- Rock Armour Core – 3000kg
- Rock Armour (on top of Rock Armour Core) – 6000kg

It is important to note that the vessel movements associated with the pre-dredging activities, construction dredging, and rock armour placement are temporary and any emissions associated with those activities are also temporary.

18.6.3.1 Open Dredge Deposit Site

Transportation distance of dredge material is taken as a return journey to the nearest appropriate deposit site (160km) as identified by Marine Scotland. The closest Open Dredge Deposit site is MA035 Portnahaven, just off the coast of the Isle of Islay.

18.6.4 Climate Change Resilience – Construction Impacts

During the construction process, receptors may be vulnerable to a range of climate risks. These are addressed by the mitigation measures in Section 18.7. Potential impacts during the construction phase could include:

- Inaccessible construction site due to severe weather events (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and,
- Damage to construction materials, plant and equipment, including damage, material storage areas and worksites, for example from stormy weather.

It is considered reasonable that construction contractors would be able to adapt working methods if necessary. For example, warmer winter conditions may extend the time certain construction activities such as concrete pouring can be carried out, while a greater chance of summer heatwave conditions may require adaptations

[45] From Marine License

such as shading work areas or increased attention to construction dust control measures. Effects are considered to be negligible and not significant.

18.6.5 Climate Change Resilience – Operational Impacts

The Proposed Development also has the potential to be impacted upon by a changing climate and, in particular, more frequent severe weather events, in the medium to longer-term. These are addressed by the mitigation measures in Section 18.7. Potential impacts on the Proposed Development during the operational phase include:

- Material and asset deterioration due to high temperatures;
- Health and safety risks to ferry users;
- Damage to access roads from periods of heavy rainfall; and
- Flood risk (surface, groundwater, fluvial and snow/ice melt) on the road network and damage to drainage systems with the potential for increased runoff from adjacent land contributing to surface water flooding.

The potentially significant risks identified are those associated with flooding, summer heatwave or drought conditions, and extreme weather. Increased maximum temperatures or sustained heatwave conditions can affect the thermal comfort and hence cooling and shade requirements for operational staff. This can be addressed through working practices such as maintaining hydration and appropriate PPE if working in direct sun.

In conclusion, with the incorporated mitigation measures, no significant climate change risks to the Proposed Development are considered likely.

18.7 Mitigation Measures

18.7.1 General Potential Measures

Carbon mitigation can best be achieved by taking a planned and focused approach following the principles of a carbon management hierarchy. It is common to set out a graded structure of interventions with more favourable options presented over others. These structures typically start with avoiding or reducing emissions where practical, before suggesting offset or sequester strategies. BS EN 14064: 201218 on GHG quantification and reporting provides an example list of carbon mitigation interventions such as:

- Energy demand and use management.
- Energy efficiency.
- Technology or process improvements.
- GHG capture and storage in, typically, a GHG reservoir.
- Management of transport and travel demands.
- Fuel switching or substation.
- Afforestation.

The IEMA GHG hierarchy19 provides a similar structure to PAS 2080 set out as avoid, reduce, substitute and compensate. They are as follows:

1. Do not build: evaluate the basic need for the project and explore alternative approaches to achieve the desired outcome/s.
2. Build less: realise potential for re-using and/ or refurbishing existing assets to reduce the extent of new construction required.
3. Design clever: apply low carbon solutions (including technologies, materials and products) to minimise resource consumption during the construction, operation, user's use of the project, and at end-of-life.
4. Construct efficiently: use techniques (e.g., during construction and operation) that reduce resource consumption over the life cycle of the project.
5. Offset and sequester: as a complimentary strategy to the above, adopt off-site or on-site means to offset and/or sequester GHG emissions to compensate for GHG emissions arising from the project.

18.7.2 Project Specific

Embedded mitigation and management plans are proposed to form part of the design to reduce the potential impact of the Proposed Development. These are detailed in the following bullet points:

- Operational Environmental Management Plan (OEMP) - An OEMP will be developed to guide ongoing operations and maintenance activities during the life-cycle of the Project. The OEMP will also set out the procedures for managing and delivering the specific environmental commitments as per each technical chapter for each receptor over the operational period.
- Adherence with the International Convention for the Prevention of Pollution from Ships (MARPOL) - All vessels will adhere to MARPOL requirements. Accordance with this will help to ensure that the potential for release of pollutants is minimised during operations.
- Adherence with the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the 'BWM Convention').

18.7.3 Monitoring and Mitigation Requirements

There is no requirement for additional mitigation over and above the embedded mitigation, management plans and specific measures proposed for the Proposed Development.

18.7.4 Climate Change Resilience

With the design and mitigation measures proposed, the Development is considered to be resilient to projected climate change. The resilience of the Development to climate change impacts is qualitatively assessed, based on professional expertise and judgement.

18.7.5 Operation

No significant adverse effect on the development due to climate change during operation is predicted. No specific mitigation measures are therefore suggested.

18.7.6 Future Monitoring

As no significant effects have been identified for the climate assessment, no monitoring of significant effects is proposed.

18.8 Residual Impacts

The CEMP will outline how the effects of construction can be managed by good practice and environmental controls which are routinely and successfully applied on other similar development proposals. In most cases, residual effects during construction will be of a temporary nature however, given that the duration of construction could be up to 52 weeks, some effects could be regarded as being short term.

No significant residual effects have been identified in relation to climate change adaptation or emissions reduction.

18.9 Potential Cumulative Impacts

The cumulative impact of carbon emissions arising from global human activity is *High*. This is true to the nature of climate change as a global, cumulative problem. As committed developments have been assessed throughout this EIAR the potential inter-scheme cumulative effects during the operational phase of the development have already been considered.

It is assumed that all committed developments will be required to meet relevant standards for emissions reduction and to comply with related planning policy. On this basis, it is considered appropriate to assume that any applications that are consented include ‘reasonable’ measures to avoid, reduce and /or offset the generation of greenhouse gas emissions and therefore that no significant cumulative effects are anticipated.

18.10 Transboundary Impacts

Although GHG emissions to the atmosphere are localised, the impacts are transboundary, meaning no matter where the emissions are released, the social, economic and environmental impacts will be felt on a global scale.

18.11 Inter-related Impacts

Interrelated effects describe the potential interaction of multiple project impacts upon one receptor which may interact to create a more significant impact on a receptor than when considered in isolation. Interrelated effects may have a temporal or spatial element and may be short-term, temporary, or longer-term over the life-cycle of the Proposed Development. There are obvious interrelationships with the water environmental and coastal processes.

18.12 Conclusions

The assessment has been undertaken in accordance with published guidance on considering climate change in Environmental Impact Assessment and consequently reviews how climate change has been considered at all stages of project progression and assessment.

Construction and operation of the Development is likely to result in emissions of CO_2 from direct sources and indirect sources. It is not anticipated that the scale of projected climate change identified will fundamentally alter baseline conditions or the effects included in this EIAR. Overall, with the design and mitigation measures proposed, the development is considered to be resilient to projected climate change and similarly not add significantly to GHG emissions at a national level.

Construction and operation of the Development is likely to result in emissions of GHGs from direct sources and indirect sources. It is not anticipated that the scale of projected climate change identified will fundamentally alter baseline conditions or the effects included in this EIAR.

19 RISK OF MAJOR ACCIDENTS & DISASTERS

19.1 Introduction

This chapter of the EIAR describes the assessment undertaken of the potential risk of major accidents and disasters presented from the Proposed Development. The chapter aims to set out the methodology for the assessment of major accidents and disasters and the potential risks and likelihood of such events occurring during both the construction and operational phases. In addition to this, potential mitigation measures to reduce the risk of major accidents and disaster have also been explored, as well as the cumulative effects between the Proposed Development and other projects in the area, and residual effects that may still be experienced after mitigation measures have been applied.

19.2 Assessment Methodology

19.2.1 Guidance and Legislation

The assessment of Major Accidents & Disasters has been carried out with regard to the following guidance and legislation:

- Major Accidents and Disasters in EIA: A Primer (IEMA, 2020);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (SNH & HES, 2018); and
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017).

19.2.2 Study Area

The study area for the assessment of Major Accidents & Disasters covers the area in which works will be undertaken. This includes the Isle of Iona, including the settlement of Baile Mòr. The area also covers Fionnphort, the Ross of Mull, the Sound of Iona. However, it should be noted that the marine area that will be used as a dredge deposit location is not included in this study area. For the marine deposit areas please refer to Figure 3-8. Figure 19-1 shows the study area for the assessment of Major Accidents & Disasters.

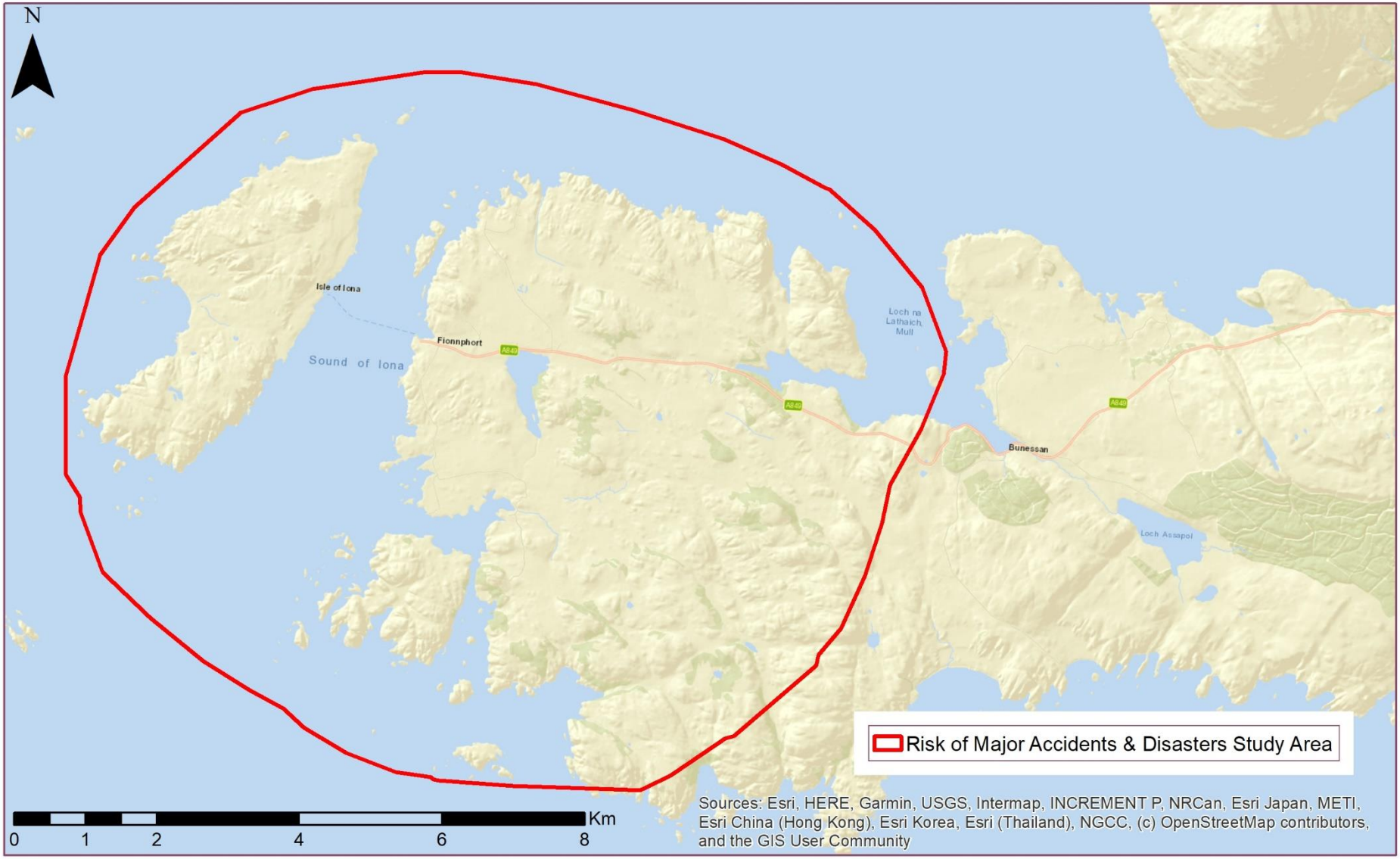


Figure 19-1 Risk of Major Accidents & Disasters Study Area

19.2.3 Desk Study

19.2.3.1 Receptor Identification

The receptors identified from the EIAR were taken forward for the assessment of Major Accidents & Disasters. They are:

- Navigation & Safety;
- Biodiversity (Terrestrial, Ornithology & Marine);
- Terrestrial Noise & Vibration;
- Water Quality;
- Flood Risk;
- Greenhouse Gases;
- Coastal Processes;
- Cultural Heritage;
- Landscape & Visual;
- Population & Human Health; and
- Waste.

Key receptors were further scrutinised through the examination of information presented in the EIAR, review of mapping and aerial photography, and identification of designated sites/ areas.

19.2.3.2 Hazard Identification

Various sources identified in the chapters of the EIAR were examined to identify the hazards that should be assessed. The identified hazards were grouped into high-level 'Risk Events' to ensure the assessment remained proportionate.

To consistently present the analysed information on potential hazards, a 'Hazard Identification Record' was created. The hazard identification record sets out the results of the review process undertaken, recording consultations with other EIA topics as an evidence trail, and providing any other comments that will assist in demonstrating how an outcome was reached. This helps provide the evidence base for the assessment and can be found in Volume III, Appendix 19.1.

19.2.3.3 Identifying the Reasonable Worst-Case Impact

It was important to identify the reasonable worst-case environmental impact for each of the grouped Risk Events. This was achieved through a qualitative assessment of the information presented in the EIAR, professional judgement and consultation with other EIA chapter authors.

19.2.3.4 Selecting Grouped Risk Events for Further Assessment

Grouped Risk Events were screened out of the assessment if they met the following criteria:

- There is no source-pathway-receptor linkage;
- The receptor is not within scope;
- The consequence does not meet the criteria of a significant environmental effect; or
- The consequence and likelihood of the risk is high to the extent that it is considered unacceptable (and therefore has been designed-out or managed/ mitigated)

All other grouped Risk Events were taken forward for further consideration.

19.2.3.5 Likelihood of a Risk Event Occurring

The possibility of the reasonable worst-case environmental impact occurring was evaluated considering:

- The likelihood of the measures already embedded into the design and best practice; and
- The likelihood that an environmental receptor is affected by the reasonable worst-case grouped Risk Event following primary and tertiary mitigation.

This highlighted any Risk Events where embedded, primary and tertiary mitigation measures (Section 19.5) would not provide sufficient mitigation to reduce the risk to an acceptable level. These identified Risk Events would likely require secondary mitigation measures.

19.2.3.6 Mitigation

For Risk Events where secondary mitigation was deemed to be necessary, the relevant chapter authors were consulted in order to develop mitigation measures to manage the risk to an acceptable level. It was important that secondary mitigation measures developed would bring the risk to below the significance criteria for a major accident or disaster.

Risk management options for Major Accidents & Disasters were identified within the broad categories shown in Table 19-1.

Table 19-1 Types of mitigation for Major Accidents & Disasters

Mitigation	Description
Eliminate	Adopt alternative processes to eliminate the source of the hazard or remove the receptor.
Reduce	Adapt proposed processes such that either the likelihood or the impact of the Risk Event can be reduced.
Isolate	Use physical measures to ensure that the Risk Event can be isolated from its pathway.
Control	Ensure that the appropriate control measures are in place so that a Risk Event can be managed appropriately.
Exploit	A risk may be exploited if it presents potential benefits or new opportunities (e.g. moving an asset related to the development further from a potential source of a hazard)

19.3 Baseline Scenario

This section outlines the current environmental conditions in the absence of the Proposed Development from the perspective of Major Accidents & Disasters. For this baseline scenario assessment, each of the receptors identified in Section 19.2.3.1 were examined individually to identify the key hazards that may exist in the study area.

19.3.1 Navigation & Safety

There are a number of different types of vessels that regularly travel through the Sound of Iona. These include the passenger ferry service that navigates between Fionnphort and Baile Mòr, fishing vessels, recreational vessels and tour boats. This means that there is a relatively high density of vessels navigating within the Sound of Iona.

There were a number of incidents recorded by the RNLI and MAIB between 2010 and 2019, meaning that a significant risk for navigational accidents within the Sound of Iona currently exists. For more detailed information on these incidents and on vessel density please see Chapter 6.

19.3.2 Biodiversity

In terms of terrestrial biodiversity, there are seven designated sites within 20 km of the Proposed Development, with the closest site Southeast Iona Local Nature Conservation Site (LNCS) approximately 1.4 km from the site. Due to the distance of these sites, there is not likely to be any indirect impacts relating to noise disturbance from ferry activities. It is possible that the shoreline near the ferry terminal at Baile Mòr may be used by otters, however, due to the disturbances caused by ferry terminal operations, it is unlikely that areas nearby the slipway are used as refugia by otters. It was established that the Proposed Development site offers negligible potential for foraging, commuting and roosting bat species, with terrestrial habitats to the west offering moderate potential for roosting bats and low potential for foraging and commuting. The Proposed Development site offers no suitable habitat for reptiles. Habitats to the west have been assessed as having the potential to support common lizard and slow worms.

In terms of ornithology, three international sites with seabirds or migratory waterbirds as qualifying interest features within 30 km of the Proposed Development were identified. A fourth SPA, Cnuic agus Cladach Mhuile, was located within the 30 km search radius, designated for its breeding population of golden eagles.

A total of 16 bird species were recorded during the surveys undertaken between April and August 2021. All of these species recorded are common and widespread and regularly occur in the coastal waters of west Scotland either throughout the year, or during the breeding or non-breeding season. All species were recorded in very low or low numbers compared to their national breeding and wintering populations, revealing the site to be of local importance for these species.

In terms of marine biodiversity, the existing Iona slipway is located within both the Inner Hebrides and the Minches SAC and the Sea of the Hebrides MPA. This means that the existing risk of a major pollution event from ferry or other vessel operations has the potential to directly impact upon these sites and the species/ habitats listed under these designations.

For further information on the baseline scenario for Terrestrial Biodiversity, Marine Biodiversity and Ornithology please see Chapter 7 to Chapter 9, respectively.

19.3.3 Terrestrial Noise & Vibration

Currently, it is not expected that terrestrial noise and vibration presents any risk of major accidents and/or disasters to the surrounding environment of the Iona ferry terminal. A baseline noise monitoring survey consisting of attended and unattended noise measurements has been conducted within the vicinity of the Proposed Development site. Assessment of noise impacts associated with the construction, operation and decommission phases has been undertaken. Where potential impacts have been identified, appropriate mitigation measures have been proposed.

For further information on the baseline scenario for Terrestrial Noise & Vibration please see Chapter 10.

19.3.4 Water Quality

The Iona ferry terminal is located within the Sound of Iona which has a high overall WFD status. Furthermore, the connected waterbodies of West and South Mull also have a high overall status. There are designated sites within these waterbodies, in particular the Sea of the Hebrides MPA, the Inner Hebrides and the Minches SAC and the Cnuic agus Cladach Mhuile SPA. This means that any major pollution incident from vessel operations within the Sound of Iona has the potential to negatively impact on the WFD status of the waterbodies and therefore impact upon designated sites. However, it is unlikely that a major pollution incident will happen with the current baseline conditions, particularly with relevant pollution, prevention and control mitigation measures in place.

For further information on the baseline scenario for Water Quality please see Chapter 11.

19.3.5 Flood Risk

The Proposed Development site is currently at risk of coastal flooding, and this will still be the case with the Proposed Development. As the site is already operating for the same use there will be no new receptors introduced into the flood hazard area and therefore there is no increase to the overall flood risk which might

contribute to a major accident and/ or disaster. Whilst the physical infrastructure of the Proposed Development will not be adversely impacted by flooding, mitigation measures are required for the users of the Proposed Development. Tidal warning will be the key mitigation measure for the operation of the site.

For further information on the baseline scenario for Flood Risk please see Chapter 12.

19.3.6 Coastal Processes

The Sound of Iona is relatively shallow with sandbanks in the vicinity of the ferry crossing between Fionnphort and Baile Mòr. There is also sediment action on the west and relatively large tidal currents experienced at the centre of the Sound of Iona. The predominant direction of high energy waves is from the southwest, attributed to large Atlantic swells entering the Sound, but smaller storms are also possible from the north and east. All these factors make channel navigation difficult for vessels within the Sound and increase the risk of collisions between vessels and the potential for running aground. However, it must be noted that the Proposed Development, with the relevant mitigations in place (i.e., those identified under Navigation & Safety), is anticipated to decrease the risk of any major accident and/ or disaster to both slipway users and ferry users.

For further information on the baseline scenario for Coastal Processes please see Chapter 13.

19.3.7 Population & Human Health

With regards to population and human health, there is potential for a major accident with regards to other sea users (such as kayakers) being pushed out to sea, causing an allision with other vessels. This has been assessed in Chapter 6 (Navigation & Safety), Section 6.4.1.10 and Section 6.4.2.2.

For further information on the baseline scenario for population & human health please see Chapter 14.

19.3.8 Landscape & Visual

Views from a total of eight viewpoints have been assessed for landscape and visual impacts from the Proposed Development. Localised moderate to major visual effects are predicted to be experienced during the operational phase of the Proposed Development for portions of the overall view available in close proximity to the Proposed Development site. With longer distance the effects from viewpoints decrease to a level that results in no significant effects. With regard to Major Accidents & Disasters, there is not expected to be any risk of major accidents and/or disasters relating to landscape and visual receptors during baseline operations of the ferry terminal.

For further information on the baseline scenario for landscape & visual please see Chapter 15.

19.3.9 Cultural Heritage

There are three scheduled monuments and four listed buildings within 500 m of the Proposed Development site There are also a number of non-designated sites within 500 m of the Proposed Development site. However, none of these are within the site boundary. Although adverse effects of moderate significance have been identified on the Cultural Heritage assets and setting of the Proposed Development site, the risk of Major Accidents & Disasters relating to cultural heritage receptors is considered to be low during the baseline scenario.

For further information on the baseline scenario for Cultural Heritage please see Chapter 16.

19.3.10 Waste

Currently it is not expected that operations and infrastructure present any risk of major accidents and/or disasters related to waste in the vicinity of the Iona ferry terminal. This is because the only current waste at the site is produced from the operation of the passenger ferry service from Fionnphort. The current waste is mainly made up of a typical mix of recyclable and residual material along with litter generated from passengers.

For further information on the baseline scenario for waste please see Chapter 17.

19.3.11 Greenhouse Gases

In Scotland, there have been significant reductions in greenhouse gas emissions between 1990 and 2020. Despite these reductions, domestic transport is the largest source of net emissions in Scotland. As a ferry service currently runs between the Iona and Fionnphort ferry terminals, operations currently contribute to greenhouse gas emissions in the domestic transport category however, any contributions from this small-scale operation are negligible when considered in nation-wide terms. Therefore, it is concluded that there is currently no specific risk of any major greenhouse gas related risks of major accidents and / or disasters in the area. It is important to note that any greenhouse gas emissions at the Iona ferry terminal will, in some way, exacerbate global climate change, thus contributing to global disasters (e.g., droughts, flooding etc.).

For further information on the baseline scenario for GHGs please see Chapter 18.

19.4 Description of Likely Significant Effects

This section first sets out the various grouped Risk Events that could lead to a potential major accident and/or disaster during the construction and operational phases of the Proposed Development. In addition, this section outlines the reasonable worst-case scenario for each of the identified grouped Risk Events and the likelihood of each grouped Risk Event occurring. Volume III, Appendix 19.1 shows the Hazard Identification Record.

19.4.1 Grouped Risk Events

Six grouped Risk Events were identified for both the construction and operational phases of the Proposed Development. The grouped Risk Events are as follows:

- Major boat / construction vessel collision / allision (either with existing infrastructure, new infrastructure, other vessels or running aground);
- Accident to the general public on or near the shoreline (e.g., people swimming etc.);
- Man overboard during construction;
- Major pollution or sedimentation event affecting nearby designated sites / areas;
- Major coastal flood event during construction of the Breakwater; and
- Scour of the toe of the breakwater leading to movement and/or damage that could cause a health & safety risk (e.g., vessel allision, risk to maintenance workers).

Major boat / construction vessel collision / allision (either with existing infrastructure, new infrastructure, other vessels or running aground)

The first grouped Risk Event identified was the risk of major boat or construction vessel collisions / allisions. Collisions are most likely during the construction phase due to increased construction vessel activity but may also occur following the completion of the breakwater. Collisions could occur between construction vessels, between construction vessels and ferry services and/or between construction vessels and recreational watersport vessels in the vicinity of the works. Allisions could occur between construction vessels and the shoreline (i.e., running aground) as well as contact with the existing slipway and new breakwater. Contact between ferry services and the new breakwater is also possible. The reasonable worst-case scenario identified for each of these potential events is the death and/or injury to a member of the public or a construction worker.

Accident to the general public on or near the shoreline (e.g., people swimming etc.)

Another grouped Risk Event is the possibility of an accident involving the general public on or near the shoreline the construction phase. Members of the public may be at risk of injury arising from activities in the site compound on the shoreline. An additional risk to the public is from construction vessel activities when swimming or undertaking other recreational activities (e.g., kayaking, sailing etc.) in the Sound of Iona. Individuals may also be at risk of falling into water from the shoreline if any material changes have occurred during construction. The reasonable worst-case scenario identified for this potential event is the death and/or injury to a member of the public.

Man overboard during construction

Another grouped Risk Event is the possibility of man overboard during the construction phase. Individuals falling into water from a construction vessel is possible and may cause significant harm to individuals and disrupt construction activities. The reasonable worst-case scenario identified for this potential event is the death and/or injury to a member of the public or a construction worker.

Major pollution or sedimentation event affecting nearby designated sites / areas

A major pollution or sedimentation event affecting nearby designated sites/ areas has also been identified as a grouped Risk Event. The works will take place within the Inner Hebrides and the Minches SAC as well as the Sea of the Hebrides MPA designated sites. The Inner Hebrides and the Minches SAC is designated for harbour porpoise and is considered to be one of the best supporting habitats for this species in the UK. The Sea of the Hebrides MPA is designated for supporting a range of marine species including basking shark and minke whale. Therefore, any major pollution or sedimentation event would likely have a direct impact on the species and habitats listed under these designations. A major pollution or sedimentation event also has the potential to impact upon a number of onshore designated sites within 30 km of the works including:

- Cnuic agus Cladach Mhuile SPA;
- Staffa SSSI;
- Treshnish Isles SPA and SSSI;
- Coll and Tiree SPA;
- North Colonsay and Western Cliffs SPA and SSSI;

- West Colonsay Seabird Cliffs SSSI; and
- Sleibhtean agus Cladach Thiriodh SPA.

While the potential to affect these sites exists, it is unlikely that there will be any major impacts following a major pollution or sedimentation event. The reasonable worst-case scenario identified for potential event is a severe long-term or permanent detrimental impact on sites and qualifying species / features.

Major coastal flood event during construction of the Breakwater

Another grouped Risk Event identified is the potential for a major coastal flood event to occur during the construction of the Breakwater. Without adequate planning, a high tide event could cause significant damage and disruption to construction activities on the Iona Breakwater and lead to a potentially serious situation. The reasonable worst-case scenario identified for this potential event is the death and/or injury to a construction worker.

Scour of the toe of the breakwater leading to movement and/or damage that could cause a health & safety risk (e.g., vessel allision, risk to maintenance workers)

The final grouped Risk Event is erosion and/or scour to the breakwater causing the structure to shift or become damaged over time. This could lead to a potential hazard as movement of heavy rocks and other construction materials could hamper vessel passage, causing a potential allision. Maintenance staff may also be at risk if they are required to walk along the breakwater as material may have moved or become loose over time due to coastal processes. The reasonable worst-case scenario identified for this potential event is the death and/or injury to a maintenance worker, vessel operator or a member of the public.

19.4.2 Significance of Effects

When determining the significance of effects for each of the grouped Risk Events, it was important to take the following into account:

- Sensitivity of the receptors
  - Vulnerability of the receptor
  - Recoverability of the receptor
  - Value / importance of the receptor
- Magnitude of effects
  - Geographic extent of effects
  - Duration of effects
  - Frequency of effects
  - Severity of effects
  - Reversibility of effects

Table 19-2 illustrates the matrix for categorisation of significance of impacts.

Table 19-2 General categorisation of the scale of significance

		Magnitude of change			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	Major	Major/ Moderate	Moderate	Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible

Note: Significant impacts are in dark shading

It is expected that most of the reasonable worst-case scenarios for the grouped Risk Events described in Section 19.4.1 would have a major significance were they to occur during construction or operation of the Proposed Development. Table 19-3 shows the sensitivity, magnitude and significance of each of the grouped Risk Events occurring and provides a reasoning for each categorisation.

Table 19-3 Sensitivity, Magnitude and Significance of Impacts

Grouped Risk Event	Sensitivity of Receptors	Reasoning / Rationale	Magnitude of Impact	Comments	Significance of Effect
Major boat/construction vessel collision / allision (either with existing infrastructure, new infrastructure, other vessels or running aground)	High	Death/injury of member of public or construction worker is high sensitivity due to the value/importance of the receptor being high and the fact that there is no recoverability of that receptor after the event occurs	Major	not reversible, long term, low frequency (likely), small extent (geographically), large extent (socially/personally)	Major
Accident to the general public on or near the shoreline (e.g., people swimming etc.)	High	Death/injury of member of public is high sensitivity due to the value/importance of the receptor being high and the fact that there is no recoverability of that receptor after the event occurs	Major	not reversible, long term, low frequency (likely), small extent (geographically), large extent (socially/personally)	Major
Man overboard during construction	High	Death/injury of a construction worker is high sensitivity due to the value/importance of the receptor being high and the fact that there is no recoverability of that receptor after the event occurs	Major	not reversible, long term, low frequency (likely), small extent (geographically), large extent (socially/personally)	Major
Major pollution or sedimentation event affecting nearby designated sites / areas	Medium	Impacts to designated sites and species is medium sensitivity due to the value/importance of the receptor being high. It is likely that the receptor will recover over time	Moderate	Large extent, potential long-term duration, low frequency, reversible	Major/Moderate
Major coastal flood event during construction of the Breakwater	Medium	While the value/importance is high and the recoverability of the receptor is not possible, death/injury of a construction worker is set as a medium sensitivity due to the vulnerability of the receptor	Major	not reversible, long term, low frequency (likely), small extent (geographically), large extent (socially/personally)	Major

Grouped Risk Event	Sensitivity of Receptors	Reasoning / Rationale	Magnitude of Impact	Comments	Significance of Effect
		being low as there is not a significant risk of a coastal flood event occurring during construction			
Scour of the toe of the breakwater leading to movement and/or damage that could cause a health & safety risk (e.g., vessel allision, risk to maintenance workers)	High	Death/injury of a construction worker is high sensitivity due to the value/importance of the receptor being high and the fact that there is no recoverability of that receptor after the event occurs	Major	not reversible, long term, low frequency (likely), small extent (geographically), large extent (socially/personally)	Major

19.4.3 Likelihood of Effects

It is expected that most of the grouped Risk Events will have a relatively low likelihood of occurring during construction and operation of the Proposed Development, particularly where mitigation measures are applied.

The risk of major accidents and/or disasters occurring relating to vessel collisions, accidents to the general public and man overboard are all considered unlikely during the construction and operation phases. This is because it is assumed that mitigation measures in place will be adequate to avoid such incidents.

The risk of a major pollution or sedimentation event is more likely to occur, due to the dredging activities and disposal at sea of dredged materials. Dredging activities could have a direct impact on designated sites in the vicinity of the site. Disposal of dredged material is unlikely to have any direct impacts on designated sites, however there may be indirect impacts in the short-term near the disposal area. The nearest designated site is the Oa SSSI on the coast of Islay (approximately 20km from Portnahaven), which is of special importance for its breeding chough *Pyrrhocorax pyrrhocorax*. However, suitable mitigation measures and plans will reduce the potential for these impacts.

Finally, the risk of a major coastal flooding event leading to a major accident and/or disaster is expected to be low. The Proposed Development site is currently at risk of coastal flooding, however, as the site is already operating for the same use there will be no new receptors introduced into the flood hazard area and therefore there is no increase to the overall flood risk which might contribute to a major accident and/ or disaster. Whilst the physical infrastructure of the Proposed Development will not be adversely impacted by flooding, mitigation measures are required for the users of the Proposed Development. Tidal warning will be the key mitigation measure for the operation of the site. The Floodline Warning Service and the Scottish Flood Forecast can be used. If an extreme event is forecast, any sailings from the ferry terminal are likely to be cancelled. The entire area is at risk of coastal flooding so it is likely to be closed and evacuated, which will ensure people are not at risk in the area.

19.5 Mitigation Measures

This section describes the various mitigation measures that may be applied in order to manage the risk of major accidents and/or disasters to a manageable level. The types of mitigation include:

- Primary mitigation – modifications to the location or design of the Breakwater made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
- Secondary mitigation – actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the EIAR.
- Tertiary mitigation – actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative

requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.

The mitigation measures that have been proposed in the following sub-sections are those specified within the specialist topic chapters.

19.5.1 Primary Mitigation Measures

In order to reduce the risk of major accidents and/or disasters as listed in Section 19.4, the following primary mitigation measures are recommended:

- Lighting at the end of the Breakwater – to avoid contact between vessels and the breakwater during the operation phase.
- Scour protection – to reduce scour around the toe of the breakwater and avoid damage and movement of rock armour.
- Type and sources of construction materials – constructing the breakwater from clean quarried local rock should help reduce the risk of pollution during construction phase and reduce transport distances.
- Utilities infrastructure – avoidance of sewer, telecommunications, gas and electricity infrastructure during construction is key as well as incorporating any existing infrastructure into the project design to avoid any unnecessary risks.
- Safety fencing – to keep the general public away from construction areas or areas of potential danger.

19.5.2 Secondary Mitigation Measures

A number of secondary mitigation measures have also been recommended to reduce the risk of major accidents and/or disasters. This type of mitigation includes other practical measures that may be implemented in addition to the primary mitigation measures discussed in the previous section. These include:

- Safety Boat – to help avoid collisions between vessels and contact with the shoreline or infrastructure during the construction phase.
- Navigational Aids – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase.
- Safety lighting – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase.
- AIS coverage – to help avoid collisions between vessels during the construction phase.
- Weather forecasts and operational weather limits – to avoid hazardous conditions during construction.

- Updating ALRS and signalling directions – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase.
- Pollution response equipment – to help quickly respond to a major pollution event during the construction phase.
- SEPA's Floodline Warning Service – to be aware and plan for coastal flood events during the construction phase. This service also includes information on tidal extremes and may also be useful during the operation phase.
- Ecological Clerk of Works (ECoW) – appointed to monitor the works in respect to biodiversity and species in the area.
- Correct and secure storage of fuels, oils and chemicals – must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity.

19.5.3 Tertiary Mitigation Measures

In addition to primary and secondary mitigation measures, tertiary mitigation is also recommended. These measures include legislative plans and processes and are not strictly practical measures.

- Marine Liaison Officer – to provide a point of contact for the marine works providing safety information to vessels in the area during the construction phase.
- Notices to mariners – to provide details of construction activities.
- Passage and operational planning – to provide details of altered routes during the construction and operation phase and scheduling construction activities to reduce disruption.
- Communicating with stakeholders – to inform locals of movement of buoyed areas during the construction phase.
- Navigation safety management process – to help manage vessel movements during the construction phase.
- Construction Environmental Management Plan (CEMP) (including pollution prevention measures).
- Operational Environmental Management Plan (OEMP) – to guide ongoing operations and maintenance activities during the life cycle of the Project. The OEMP will also set out the procedures for managing and delivering the specific environmental commitments as per each technical chapter for each receptor over the operational period.
- Environmental Management Plan (EMP)
- Ensure waste arisings from the construction phase (especially with sediment disposal) are dealt with in a sustainable and legislatively compliant manner

- Oil Spill Contingency Plan – to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. Effective planning will ensure that the necessary actions are taken in a structured, logical and timely manner.
- The safe operation of refuelling activities shall be in accordance with PPG 7 “Safe Storage – The safe operation of refuelling facilities” (Environment Agency, 2011b).
- Adherence with the International Convention for the Prevention of Pollution from Ships (MARPOL) – to help to ensure that the potential for release of pollutants is minimised during operations.
- Site Waste Management Plan (SWMP) – will contain procedures for the management of waste and assist with providing a complete audit trail. The SWMP will be a live document and will be subject to revision throughout the course of the construction phase.
- Construction Phase Monitoring – records will be kept for each waste material which leaves the site, whether for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the waste arising on site during the construction phase.

19.6 Potential Cumulative Effects

This section considers the cumulative effects on receptors that may arise when the Proposed Development is considered together with other proposed and ongoing developments in the area. These combined effects may increase the risk of major accidents and/or disasters occurring during and after construction. The relevant projects identified in the area are:

- The Fionnphort Breakwater and Overnight Berthing Project; and
- British Telecom (BT) Cable installation – Iona to Fionnphort.

Further details of these projects can be found in Chapter 21 of the EIAR.

19.6.1 Fionnphort Breakwater and Overnight Berthing Project

The Fionnphort Breakwater and Overnight Berthing Project is being developed alongside the Proposed Development. Therefore, it is likely that cumulative effects may be experienced when constructing the two projects. The Fionnphort Overnight Berthing Project is likely to have many of the same risks of major accidents and disasters as the Proposed Development. This means that the Risk Events described in this chapter may be exacerbated, depending on whether works are being carried out at the same time. However, there is potential that these can be mitigated through adherence to the mitigation measures proposed within the specialist topic chapters.

19.6.2 Cable Installation – Iona to Fionnphort

BTs installation of superfast broadband cables for the Ross of Mull and Iona is likely to get underway during the first half of 2023. While the cabling will be installed around 900 m south of the proposed Iona Breakwater, there is still likely to be some cumulative effects if the two projects are undertaken at the same time.

The most likely cumulative effect is the risk of collisions between construction vessels. This is possible due to increased vessel traffic in the Sound of Iona during the construction phase. The same logic applies to the risk of accidents to the general public and the risk of a man overboard.

The potential for a major pollution / sedimentation event is also another effect that may be pronounced by the two projects being undertaken at the same time. Due to both projects requiring dredging activities, it is more likely for a major sedimentation event to occur. Furthermore, due to increased vessel activity in the Sound of Iona during the construction phase there is an increased likelihood of a pollution event occurring.

However, there is potential that these can be mitigated through adherence to the mitigation measures proposed within the specialist topic chapters.

19.7 Residual Effects

Following the implementation of mitigation measures, residual effects are likely to be reduced. This means that each of the grouped Risk Events will have a minor chance of occurring during construction and operation of the Proposed Development. However, there will always be some level of risk of a major accident and/or disaster occurring even with all suitable mitigation measures in place.

19.8 Conclusions and Summary of Effects

The assessment of major accidents and disasters for the Proposed Development has found that there are a number of potential Risk Events during construction and operation including vessel collisions, man overboard, pollution/ sedimentation events and risks to the general public. These Risk Events could have potential for negative impacts on a number of receptors including biodiversity, water quality, coastal processes and population and human health.

A wide variety of mitigation measures have been identified to reduce the likelihood of Risk Events. These measures are designed to significantly reduce the potential for major accidents and disasters relating to the project. Despite mitigation measures, a (low level) risk of a major accident or disaster occurring will remain. However, it is determined that this risk is not likely to be significant in EIA terms.

There is potential for cumulative effects between the Proposed Development and the proposed Fionnphort Breakwater and Overnight Berthing Project and proposed British Telecom (BT) Cable installation between Iona and Fionnphort. Where these projects occur concurrently, this presents a cumulative risk for major accidents and disasters. However, through adherence to the mitigation measures proposed within the specialist topic chapters, it is determined that the likelihood of an event occurring would be low.

20 SUMMARY OF MITIGATION MEASURES

20.1 Mitigation Measures Arising from the Proposed Development

This EIAR assesses the likely significant impacts arising from the Proposed Development. Where required, mitigation measures are identified and described within individual topic chapters. These are measures which could avoid, prevent, reduce and, where possible, offset likely significant adverse effects upon the environment.

Table 20-1 summarises the mitigation measures and monitoring recommended within the EIAR.

Table 20-1 Summary of proposed mitigation measures per individual topic chapter

Potential Effects	Summary of Proposed Mitigation
CHAPTER 6: Navigation & Safety	
Ferry or tour boat allision (heavy contact) with the Proposed Development Dredger flooding whilst engaged in operations Dredge/construction plant impact with the Proposed Development during construction phase Recreational or fishing vessel allision with the Proposed Development Dredge/construction plant collision with recreational/fishing vessel Tug and tow collision with recreational/fishing vessel Tug and tow collision with ferry/tour boat Accident spill during marine works Heavy lift failure, or failure of lifting gear Small non-powered craft displaced by the Proposed Development: Ferry or tour boat allision with the breakwater: Small non-powered craft displaced by the breakwater	• Marine liaison officer – the marine liaison officer provides a point of contact for the marine works, will provide safety information to vessels navigating in the area and coordinate with local authorities during emergency situations. This is just to provide a central point of contact. • AIS coverage – all dredge/construction vessels, including barges to carry AIS (A or B (see Volume III, Appendix 6.1, Section 2.1 for definitions of AIS signals)). • Notices to mariners – issued by Argyll & Bute Council containing details about the construction works. These should be issued prior to any works (or any related activities such as diving or towage movements). • Availability of pollution response equipment – pollution response equipment should be available and carried by the contractors for use at Iona. The equipment should be appropriate for the type and scale of pollution that may occur. • Weather forecasting – a weather forecasting service should be regularly monitored to indicate any periods of upcoming adverse weather conditions. Appropriate actions should then be taken to mitigate any potential situations that may arise. These actions should be documented in the safety management system, detailing the specific weather conditions that will necessitate action(s). • Operational weather limits – including maximum wave and wind limits for construction activities should be detailed in the contractors 'Risk Assessment Method Statement'. • Promulgation of information – information on the Proposed Development and upcoming operations with associated vessel movements should be provided to local stakeholders. A website page (potentially on the Council's website) for the project, providing information and a method to contact the project would allow any vessels in the area to obtain information. • Aids to navigation, provision and maintenance of – aids to navigation should be provided after consultation and approval of the NLB. Marine works to be illuminated at night. The aids to navigation must be maintained to provide the availability of the aids to navigation required by the NLB with any out of service periods reported via the Local Aids to Navigation (LATON) system. • Safety boat – the safety boat should be appropriate for the wind and wave conditions in the area. It should be available on site and manned during construction operations in order to provide quick assistance if any incident was to occur. • Passage planning – CalMac should update their passage plan, both during the works and on completion of the works to recognise the altered route. • Operational planning – capital dredging should be scheduled, as far as possible, to avoid disruption to ferry operations.

Potential Effects	Summary of Proposed Mitigation
	• Review of available powers – Argyll & Bute Council should review their powers in relation to operating the port facility at Iona to determine whether further powers are required to ensure navigational safety. • Update ALRS volume 6 and Sailing Directions – updates to include new structures after completion of the marine works. • Shore side facility maintenance programme – to schedule the maintenance of the site, including the AtoN. • Communications – stakeholders should be informed of the need to move buoyed areas prior to construction and advised of other suitable locations. • Safety - Lighting - it is important that any marine works at night or at times of reduced visibility are sufficiently illuminated in accordance with the Health and Safety Executive (HSE) Approved Code of Practice (ACOP) 'Safety in Docks' (HSE, 2014). The guidance on illumination levels is drawn from the 'Safety and Health in Ports' code of practice published by the International Labour Organization; this states that: "On access routes for people, plant and vehicles and in lorry parks and similar areas, the minimum level of illumination should not be less than 10 lux. In operational areas where people and vehicles or plant work together, the minimum level of illumination should not be less than 50 lux". (ILA, 2016). This level of illumination must be balanced alongside the requirements provided in the British Standard Institute (BSI) publication 'Design of Road Lighting' BS5489.
CHAPTER 7: Terrestrial Biodiversity	
Temporary disturbance/ loss of habitat arising from activities within the terrestrial area of the Temporary Work Area (namely the establishment of a work compound and storage of rock)	• Production of an Otter Species Protection Plan (see Volume III, Appendix 7.2) and adherence to all recommendations made within. • Production of a Construction and Environmental Management Plan (CEMP). • An Ecological Clerk of Works (ECoW) will be appointed to monitor the works in respect to otter activity. • No additional mitigation measures are required for the operational phase of the Proposed Development. The Environmental Management Plan (EMP) will manage the risks of all operational activities, facilities and cargo handled by the port and will include best practice measures to control pollution following standard guidelines such as the Environment Agency Pollution Prevention Guidelines. This will be considered sufficient to limit any potential impacts relating to pollution events.
Temporary disturbance/loss of habitat due to airborne noise and visual disturbance from construction activities	
Permanent loss of habitat arising from reclamation of seabed during the construction of a new rock armour breakwater to the south of the existing slipway	
Temporary effects on prey species due to underwater noise arising from construction activities (notably dredging and vessel noise), increased suspended sediment concentrations and sediment deposition.	
Long term increase in disturbance to habitat arising from increased levels of marine activity due to improved ferry services	
Long term increase in disturbance of habitat due to airborne noise and visual disturbance associated with the increase in terrestrial activity	

Potential Effects	Summary of Proposed Mitigation
Long term effects on prey species due to noise arising from vessels and potential for pollution events linked with increased levels of marine activity.	
CHAPTER 8: Marine Biodiversity	
Temporary disturbance/ loss of habitat arising from capital and maintenance dredging activity Increased suspended sediment concentrations and sediment deposition Resuspension of contaminated sediments Temporary disturbance/loss of habitat arising from the displacement/compaction of the seabed by anchors and jack-up barge spud legs Permanent habitat loss arising from placement of material on the seabed for the breakwater Underwater noise Disturbance and collision risk to marine mammals from increased vessel traffic during construction Changes in the hydrodynamic regime due to the presence of the breakwater	• Production of a CEMP - Control of pollution during construction will be set out in a CEMP. This will include best practice measures to prevent accidental spillage of chemicals during construction activities. • Production of an EMP - The EMP will manage the risks of all operational activities, facilities and cargo handled by the port and will include best practice measures to control pollution following standard guidelines such as the Environment Agency Pollution Prevention Guidelines. • Production of an Invasive and Non-Native Species (INNS) Management Plan - A document detailing how the risk of potential introduction and spread of INNS should be produced. The plan will outline measures to ensure vessels comply with the International Maritime Organization (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted if a high alert species is recorded. • Plant, equipment and material (where required) will follow the 'check, clean, dry method'. • The presence of sensitive features onboard the ship's navigation systems will aid the vessel master in placing either anchor or jack-up legs to avoid these sensitive features. • Production of a Seagrass Compensation and Monitoring Plan - to ensure that seagrass habitat is not permanently lost, compensation will be undertaken to ensure that the habitat is restored. An assessment has already been undertaken in the form of the intertidal and subtidal survey, with the extent of biotopes derived. This data will be used to inform the 'Seagrass Compensation and Monitoring Plan'.
CHAPTER 9: Ornithology	
Temporary disturbance/loss of habitat arising from activities within the terrestrial area of the Temporary Work Area (namely the establishment of a work compound and storage of rock) Temporary disturbance/loss of habitat due to airborne noise and visual disturbance from construction activities Permanent loss of habitat arising from reclamation of seabed during the construction of a new rock armour breakwater to the south of the existing slipway	• The most highly sensitive IOF are non-breeding populations and therefore measures to reduce disturbance around the nearshore area shall be undertaken as far as is practical during the period between September and April. • Methods to attenuate noise will be utilised, notably the use of sound walls and any modification of drilling rigs that would reduce noise levels. • Works undertaken in the vicinity of roosting birds or near occupied nests of sensitive species will be supervised by a suitably qualified and experienced Ecological Clerk of Works (ECoW) to determine if additional measures may be required.

Potential Effects	Summary of Proposed Mitigation
Temporary effects on prey species due to underwater noise arising from construction activities (notably dredging and vessel noise), increased suspended sediment concentrations and sediment deposition.	• Near-shore vessel-based activities should aim to reduce disturbance to foraging seabirds and waterfowl, particularly if works coincide with the winter period when divers, grebes and sea duck may be present.
Long term increase in disturbance to habitat arising from increased levels of marine activity due to improved ferry services	
Long term increase in disturbance of habitat due to airborne noise and visual disturbance associated with the increase in terrestrial activity	
Long term effects on prey species due to noise arising from vessels and potential for pollution events linked with potential increased levels of marine activity.	
CHAPTER 10: Terrestrial Noise & Vibration	
Worst case construction noise predictions exceed the 65 dB BS 5228 noise limit at a number of construction noise receptors during day-time hours.	• Mitigation in the form of timely and effective stakeholder consultation should be undertaken. This would ensure that residents are kept informed of on-going and future operations. For example, local residents would be informed by letter drop of proposed works, particularly where these are due to occur outside standard working hours. The letter would include details of proposed cause, start dates and duration of works to be carried out. • In order to minimise the likelihood of complaints, Argyll & Bute Council and affected residents should be kept informed of the works to be carried out and of any proposals for work outside normal hours. All complaints will be recorded by the appointed contractor. The appointed contractor will investigate the circumstances and ensure the necessary corrective measures are taken. • Night-time construction noise impact indicates that there is the potential for significant impact without mitigations. Screening at source of potentially affected receptors would ensure that the BS 5228 noise limit is achieved reducing impact to temporary minor adverse. • Construction mitigation measures will be put in place to ensure construction noise levels are attenuated and reduced where necessary. • Best practice measures will be employed to ensure that construction phase noise levels are reduced to the lowest possible levels. • BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures will be applied by the contractor where
Worst case construction noise predictions exceed the 45 dB BS 5228 noise limit at a number of construction noise receptors during night-time hours.	
Unmitigated construction noise daytime predictions in excess of 65 dB would be deemed to have a temporary moderate impact at four receptors of medium sensitivity, and temporary moderate / major impact at one receptor of high sensitivity	
Worst case construction noise predictions exceed the 45 dB night-time BS 5228 noise limit for all construction noise receptors during night-time hours. Unmitigated construction noise night-time predictions in excess of 45 dB would be deemed to be temporary moderate / major adverse impact at all medium and high sensitivity receptors	

Potential Effects	Summary of Proposed Mitigation
	appropriate during the construction phase of the Proposed Development. Construction best practice measures which will be implemented included below: ○ Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order ○ Careful selection of quiet plant and machinery to undertake the required work where available ○ Machines in intermittent use will be shut down in the intervening periods between work ○ Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, temporary construction barriers or enclosures will be utilised around noisy plant and equipment ○ Handling of all materials will take place in a manner which minimises noise emissions ○ Audible warning systems will be switched to the minimum setting required by the Health & Safety Executive • Although recognised that the choice of dredgers is likely to be determined by the engineering requirements and the suitability of available equipment, dredging activities should be planned where possible to reduce the overall source noise level during the works – e.g., limiting night-time works directly adjacent to noise-sensitive properties etc. • Any dredger used for the works will be expected to be fitted with effective engine exhaust silencers, and there will be a requirement placed on the chosen dredger operator to ensure that all engine silencers are effective and reducing engine exhaust noise levels to the lowest reasonably practicable level. • Screening shall be provided nearest to those properties most likely to experience high noise levels from dredging, particularly during more sensitive night-time periods.
CHAPTER 11: Water Quality	
There is the potential for increased suspended sediment during the construction works of the breakwater and the dredging process	• SEPAs standing advice for “Construction Activities – Pollution Prevention” should be used. • Mitigation measures required to reduce the potential impacts from noise have been identified and included and the impacts of dredging and suspended solids on general marine life. These measures follow the Joint Nature Conservation Committee recommendations and guidance for minimising risk to marine wildlife (JNCC, 2010). • No losses of concrete (cement) to the waters will be permitted during the works.
Any sediment plumes generated during disposal are expected to be limited but may result in a temporary increase in turbidity	
The presence of physical alterations within a waterbody has the potential to impact on the hydromorphology of the waterbody	

Potential Effects	Summary of Proposed Mitigation
Dredging activities associated with the Proposed Development are likely to produce noise which is likely to disturb species in the area resulting in temporary, localised impact. There is potential for accidental oil/ fuel spillages on site due to increased vessel presence and associated fuel storage	• Fuel, oil and chemical storage must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. GPP2 shall be implemented to ensure safe storage of oils and chemicals. • The safe operation of refuelling activities shall be in accordance with PPG 7 "Safe Storage – The safe operation of refuelling facilities" (Environment Agency, 2011b). • With regard to potential oil spills during construction, an emergency spill kit and oil spill containment equipment will be located at strategic locations adjacent to the works. • An Oil Spill Contingency Plan which must be adhered to by all staff including those employed to carry out works. Its primary purpose is to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. Effective planning will ensure that the necessary actions are taken in a structured, logical and timely manner. • Given that there will be berthing of oil, gas and renewables supply vessels and associated refuelling, a full retention oil separator is recommended to mitigate for the potential impacts of fuel/ oil spillage or leakage. This is recommended to be maintained in accordance with the manufacturer's instructions by experienced personnel. • SEPA's Standing Advice for Construction activities – pollution prevention has been consulted and will be adhered to. • The contractors Environmental Clerk of Works will be required to monitor mitigation measures and auditing of the contractor's environmental controls will be undertaken by the client's representative. • A 'Seagrass Compensation and Monitoring Plan' has been proposed to counter the direct habitat loss predicted to occur as a result of the Proposed Development. This will ensure that the loss of existing seagrass habitat is compensated ensuring no net loss of habitat.
CHAPTER 12: Flood Risk	
The existing slipway and pier are currently at risk of coastal flooding, and this will still be the case with the Proposed Development Minor local changes to the currents are expected around the breakwater such as an increase in the current velocity around the structure	• Contractor to sign up to SEPA's Floodline flood warning service in order to get notified when the area is at risk of flooding. • Use the Scottish Flood Forecast by the Scottish Flood Forecasting Service (SFFS), which provides 3-day flood forecasts and is updated daily. • Tidal warning will be the key mitigation measure for the operation of the site. The Floodline Warning Service and the Scottish Flood Forecast as described above can be used.
CHAPTER 13: Coastal Processes	
Scour around the toe of the breakwater Sediment build-up to the northern side of the breakwater (infilling the dredged pocket)	• Scour protection is proposed as part of the operational phase of the Proposed Development to mitigate the impact of scour around the toe of the breakwater during periods of maximum flood velocity which would be expected during a 1 in 1 year 240° storm event during the flood tide.

Potential Effects	Summary of Proposed Mitigation
	• Maintenance dredging would be required after construction is completed. The frequency of maintenance dredging would be established as part of the construction contract following the construction of the breakwater.
CHAPTER 14: Population & Human Health	
Construction noise is predicted to be within limits set to be protective of health and the environment in most cases. However, when considering a worst-case scenario, Chapter 10 identifies that there is potential for construction noise to exceed limits (both daytime and night-time) at a small number of individual receptors that are located closest to the construction activities, with the receptors most likely to be impacted being non-residential.	• Mitigations measures related to noise impacts are included in Chapter 10. • A CEMP will be produced as part of application process. The CEMP will outline how the effects of construction can be managed by good practice and environmental controls which are routinely and successfully applied on other similar development proposals. • The CEMP should also set out a clear plan for managing access to the Sound of Iona during construction. This would include designating safe alternative transport routes and appropriately communicating these to local populations (including through the use of Gaelic materials). • The CEMP should also set out a plan for engagement with the local population. This could include information on timings updates, affects to any services/deliveries/access and a complaints procedure. Engagement should be culturally appropriate, including provision of non-technical information and communication in Gaelic. • Opportunities to include the local population in construction of the Proposed Development can be beneficial for health. Actions to ensure positive outcomes include providing opportunities for training and upskilling as well as prioritisation of hiring for local populations.
Disruption or disturbance to recreation could affect the vulnerable sub-population (dependents with children or people with existing poor physical or mental health)	
There is the potential for construction to affect sea users including sea kayakers and sail boats which are used for leisure boating and recreation in the Sound of Iona. This effect would possibly occur during dredging or when there is other disruption in the construction area. This change would mostly affect residents in the local community	
CHAPTER 15: Landscape & Visual	
No specific landscape mitigation measures have been proposed as part of the Proposed Development. The design of the Proposed Development has “built-in” mitigation through steps such as optimising the new breakwater height to maintain as low a height as possible and the use of natural rock to form the breakwater. The minimal lighting required for safety has been provided.	
CHAPTER 16: Cultural Heritage	
Stripping of topsoil for the compound may result in the disturbance of features associated with An Eala, in particular a revetting wall and possible ditch.	• A reporting protocol has been developed to allow for the reporting and thereby appropriate recovery and recording of any cultural material encountered during the construction phase below the high-water mark. • Potential construction impacts above the high-water mark can be avoided by relocating the compound or be mitigated through a programme of archaeological works.
The change in setting of heritage assets including Iona Nunnery, MacLean’s Cross, St Mary’s Abbey and Replica of St John’s Cross	
Change of appearance / character of Iona Conservation Area	

Potential Effects	Summary of Proposed Mitigation
	• A programme of archaeological work would offset the physical loss or disturbance of features affected by allowing for them to be recorded appropriately, with reporting to an appropriate level. • Works must be undertaken in line with a Written Scheme of Investigation (WSI) agreed with WoSAS and approved by the Local Planning Authority.
CHAPTER 17: Waste	
There is the potential for quantities of materials to be deposited in landfill sites	• Argyll & Bute Council and their appointed contractor will ensure that all waste materials leaving the site will be transported via road by a registered and licensed carrier and arrive at a licensed / permitted site. Waste will only be disposed or recovered through licenced operators and in accordance with national waste legislation. • Site Waste Management Plan (SWMP). • Construction Environmental Management Plan (CEMP). • Construction Phase Monitoring.
The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in environmental impacts/ pollution	
Excess materials and packaging, over-ordering materials, off-cuts, damaged materials and poor storage during the construction phase	
The Proposed Development would support a slight increase in tourism using the ferry service and fishing/commercial vessels using the berthing opportunities which would result in a slight increase in litter and waste generation	
CHAPTER 18: Greenhouse Gas Assessment	
Potential impacts during the construction phase could include: • Inaccessible construction site due to severe weather events (flooding, snow and ice, storms) restricting working hours and delaying construction; • Health and safety risks to the workforce during severe weather events; • Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and • Damage to construction materials, plant and equipment, including damage, material storage areas and worksites, for example from stormy weather.	• Operational Environmental Management Plan (OEMP) - An OEMP will be developed to guide ongoing operations and maintenance activities during the life-cycle of the Project. The OEMP will also set out the procedures for managing and delivering the specific environmental commitments as per each technical chapter for each receptor over the operational period. • Adherence with the International Convention for the Prevention of Pollution from Ships (MARPOL) - All vessels will adhere to MARPOL requirements. Accordance with this will help to ensure that the potential for release of pollutants is minimised during operations. • Adherence with the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the 'BWM Convention').

Potential Effects	Summary of Proposed Mitigation
Potential impacts on the Proposed Development during the operational phase include: • Material and asset deterioration due to high temperatures; • Health and safety risks to ferry users; • Damage to access roads from periods of heavy rainfall; and • Flood risk (surface, groundwater, fluvial and snow/ice melt) on the road network and damage to drainage systems with the potential for increased runoff from adjacent land contributing to surface water flooding.	
CHAPTER 19: Risk of Major Accidents & Disasters	
Major boat/construction vessel collision/allision (either with existing infrastructure, new infrastructure, other vessels or running aground)	• Lighting at the end of the Breakwater – to avoid contact between vessels and the breakwater during the operation phase. • Scour protection – to reduce scour around the toe of the breakwater and avoid damage and movement of rock armour. • Type and sources of construction materials – constructing the breakwater from clean quarried local rock should help reduce the risk of pollution during construction phase and reduce transport distances • Utilities infrastructure – avoidance of sewer, telecommunications, gas and electricity infrastructure during construction is key as well as incorporating any existing infrastructure into the project design to avoid any unnecessary risks. • Safety fencing – to keep the general public away from construction areas or areas of potential danger. • Safety Boat – to help avoid collisions between vessels and contact with the shoreline or infrastructure during the construction phase. • Navigational Aids – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase. • Safety lighting – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase. • AIS coverage – to help avoid collisions between vessels during the construction phase. • Weather forecasts and operational weather limits – to avoid hazardous conditions during construction. • Updating ALRS and signalling directions – to help avoid collisions between vessels and contact with the shoreline or infrastructure during both the construction and operation phase. • Pollution response equipment – to help quickly respond to a major pollution event during the construction phase.
Accident to the general public on or near the shoreline	
Man overboard during construction	
Major pollution or sedimentation event affecting nearby designated sites	
Scour of the toe of the breakwater leading to movement and/or damage that could cause a health & safety risk	

Potential Effects	Summary of Proposed Mitigation
	• SEPA's Floodline Warning Service – to be aware and plan for coastal flood events during the construction phase. This service also includes information on tidal extremes and may also be useful during the operation phase. • Ecological Clerk of Works (ECoW) – appointed to monitor the works in respect to biodiversity and species in the area. • Correct and secure storage of fuels, oils and chemicals – must be sited on an impervious base within a bund and secured. The base a.nd bund walls must be impermeable to the material stored and of adequate capacity • Marine Liaison Officer – to provide a point of contact for the marine works providing safety information to vessels in the area during the construction phase. • Notices to mariners – to provide details of construction activities. • Passage and operational planning – to provide details of altered routes during the construction and operation phase and scheduling construction activities to reduce disruption. • Communicating with stakeholders – to inform locals of movement of buoyed areas during the construction phase. • Navigation safety management process – to help manage vessel movements during the construction phase. • Construction Environmental Management Plan (CEMP). • Operational Environmental Management Plan (OEMP). • Environmental Management Plan (EMP). • Ensure waste arisings from the construction phase (especially with sediment disposal) are dealt with in a sustainable and legislatively compliant manner. • Oil Spill Contingency Plan – to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. • The safe operation of refuelling activities shall be in accordance with PPG 7 "Safe Storage". • Adherence with the International Convention for the Prevention of Pollution from Ships (MARPOL) – to help to ensure that the potential for release of pollutants is minimised during operations. • Site Waste Management Plan (SWMP). • Construction Phase Monitoring.

21 CUMULATIVE EFFECTS & ENVIRONMENTAL INTERACTIONS

21.1 Introduction

This chapter presents a summary of the assessment of cumulative effects which may arise from adjacent or nearby developments together with those predicted for the Proposed Development as well as the environmental interactions which have been examined within the individual technical assessment chapters (Chapters 6 –19).

21.1.1 Cumulative Effects

Cumulative effects address long-term changes that may result from the construction and operation of the Proposed Development in combination with other developments in the area.

Cumulative assessment is undertaken to ensure that the combined effects of the Proposed Development and other influences are assessed together, and not as individual aspects of the environmental assessment.

Cumulative effects are defined as changes to the environment that are caused by an action in combination with other actions, arising from:

- the interaction between existing and/or approved Projects in the same area; as required by Schedule 4 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- the interaction between the various impacts within a single Project.

The EU Guidance on the preparation of the Environmental Impact Assessment Report guidance states that it is important to consider effects, not in isolation, but cumulatively, as this may show that individually analysed impacts can become significant when they are added together, or with, other effects.

The coexistence of impacts may increase or decrease their combined impact. Impacts that are considered to be not significant, when assessed individually, may become significant when combined with other impacts.

Cumulative effects can occur at different temporal and spatial scales. The spatial scale can be local, regional or global, while the frequency or temporal scale includes past, present and future impacts on a specific environment or region.

The methodology for selecting the relevant Projects to be considered in-combination with the Proposed Development is presented in Section 21.2.

The experts leading each of the technical assessments (as presented in Chapters 6 –19), have defined significance thresholds and criteria for the cumulative effects assessment, using professional judgement and consideration of the relevant standards and guidelines via a collaborative approach,

involving all the interested parties in the process of data collection and analysis, to determine whether in-combination effects give rise to additional levels of significance.

21.2 Assessment Methodology

The following guidelines and publications were considered when determining the other projects to be considered for their potential to generate cumulative effects with the Proposed Development.

- European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts (1999);
- European Commission (EC) Guidance on the preparation of the Environmental Impact Assessment Report (2017);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland (SNH (now NatureScot) & HES, 2018);
- Scottish Planning Series Planning Circular: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- UK Planning Inspectorate (PINS) Advice Note 17: Cumulative effects assessment relevant to national significant infrastructure projects. Version 2, 2019.

The first step in determining cumulative effects comprised the identification of a list of other projects which may have the potential to overlap with the proposed redevelopment based on available information.

Other projects and plans that have been considered as part of this cumulative assessment have been identified through a desk study involving general internet searches and in particular, scrutiny of consenting authority websites.

The different developments considered as part of this cumulative assessment are those in close proximity to the Proposed Development and with the potential to interact with it. Those other projects whose impacts could foreseeably overlap with the construction or operation of the proposed redevelopment or where construction impacts may be consecutive but cumulative, were considered. The resulting selected developments comprise of:

- Projects in the area that are listed on the local planning authority website or Marine Scotland website;
- Projects at construction stage in the area;
- Projects that are at an advanced stage of planning; and
- Other Projects which have the potential to result in a cumulative impact.

The cut-off date for sourcing information on the other projects considered was 14th September 2022.

There are two proposed projects in the vicinity of the Proposed Development. These are listed below and summarised in the following sections:

- The Fionnphort Breakwater and Overnight Berthing Project; and
- British Telecom (BT) Cable installation – Iona to Fionnphort

21.2.1.1 Fionnphort Breakwater and Overnight Berthing Project

The proposed Fionnphort Breakwater and Overnight Berth Project consists of the construction of a new rock armour breakwater, overnight berthing facilities and associated dredging. The Proposed Development is located c1.3 km to the east of Iona, across the Sound (Figure 21-1).

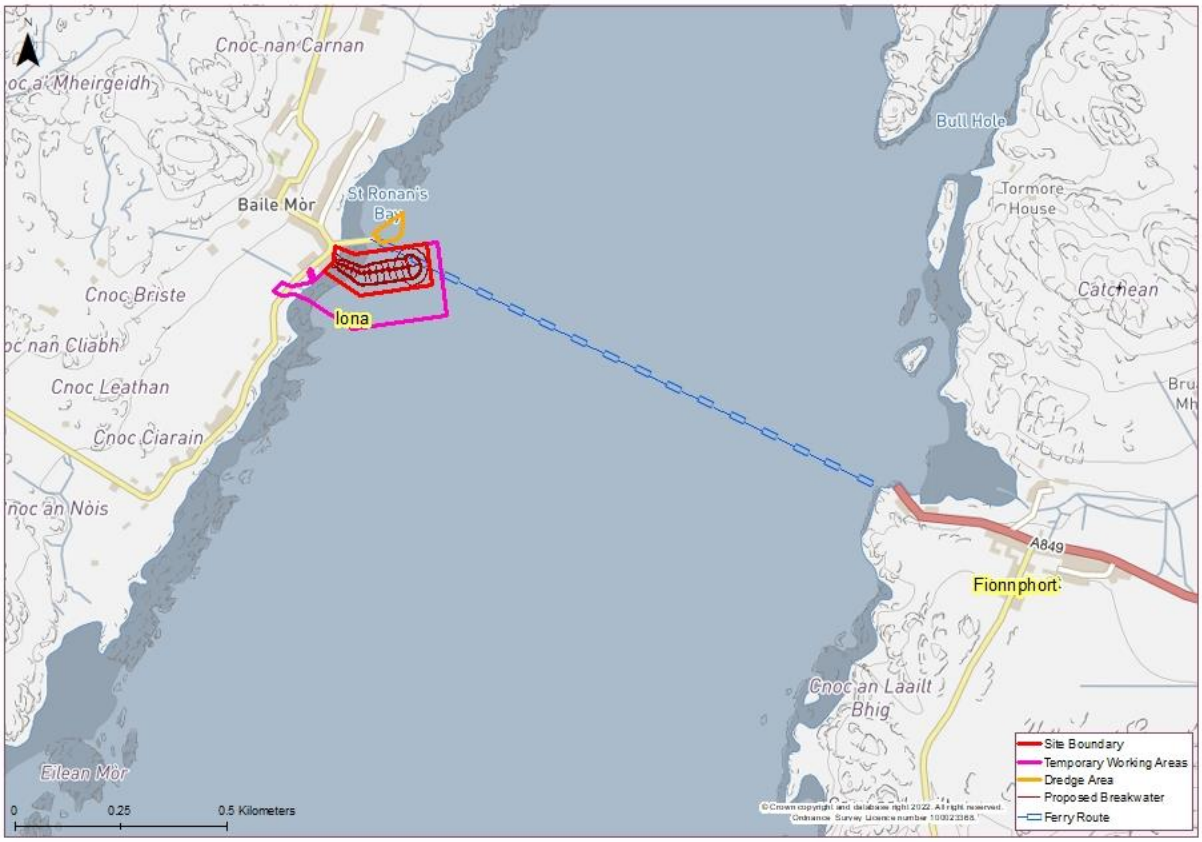


Figure 21-1 Location of proposed Fionnphort Project in relation to the Proposed Development

It is anticipated that the duration of the construction phase will be 52 weeks. This Proposed Development is in the final stages of design and so there is potential that this proposed project may be constructed in parallel with the construction phase of proposed Breakwater Project at Iona. The proposed Fionnphort development is likely to require some form of maintenance, such as maintenance dredging or maintenance of the breakwater and/ or berthing facility.

An EIA and HRA will be undertaken as part of the marine licencing application for the proposed Fionnphort Breakwater and Overnight Berthing Project, nonetheless it is likely that there would be potential for in-combination effects.

Although there is no spatial overlap between the two projects, given the proposed duration of the construction phase (52 weeks each), there is potential that the construction phase of both projects may occur concurrently. This has potential for in-combination effects.

21.2.1.2 BT cable installation – Iona to Fionnphort

BT are installing and operating 16 new telecommunication cables to extend superfast broadband coverage in three geographical regions of Scotland: Orkney; Shetland Islands; and the Inner Hebrides. The project is currently underway with the Shetland Islands cabling started in June 2022. Operations are scheduled to progress from Shetland to Orkney, via Fair Isle, then down the West coast. The delivery schedule for the fibre network installation on the Ross of Mull and Iona, remains the first half of 2023. The locations provided with the Marine Licence for this application are shown in Figure 21-2.

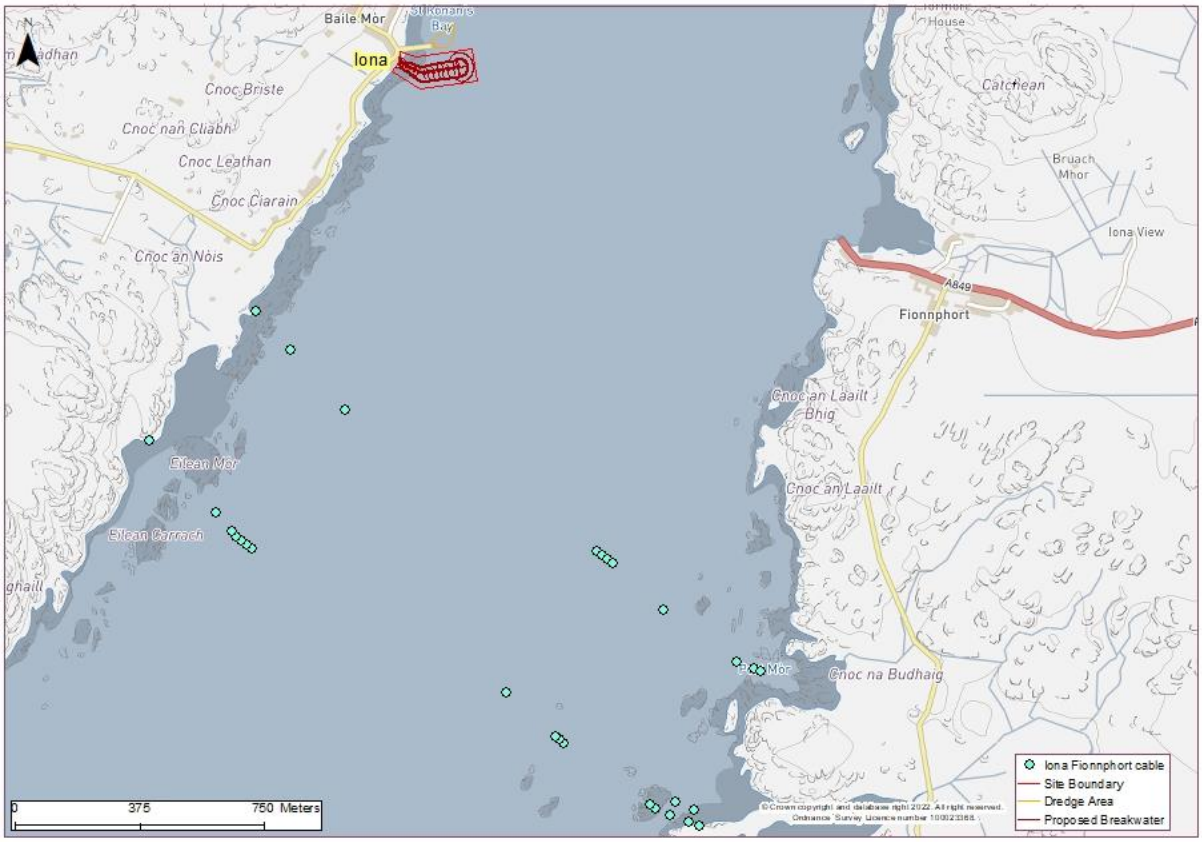


Figure 21-2 Proposed cabling location works in relation to the Proposed Development

The proposed locations for cabling works are located approximately 900 m to the south of the site boundary of the Proposed Development. The proposed cable lengths are 2.6 km. Burial of the cable is required (where sediments allow) to protect the optical fibre transmission path over the entire service life of the system and prevent interaction with the seabed and other sea users. Offshore the target burial

depth will be to 1m below the seabed. Depths are subject to survey and other potential constraints. The cable types to be used for the R100 project are armoured fibre optic cables, which are a resilient cable type suitable for installation within Scottish waters. The cable system will be unrepeatered (an 'unrepeatered system' is a cable system without optical amplifiers due to the short overall length). The cable itself is between 25mm (single armour) and up to 46mm (rock armour) in diameter, depending on the level of cable armouring required. The optical fibres are contained within a gel filled stainless steel tube. This is surrounded by a polyethylene insulation layer. The construction of this core provides protection against water penetration and hydrogen. The core is further protected by layers of steel wire and an outer polypropylene yarn.

An Environmental Appraisal Report (EAR) was submitted to Marine Scotland on behalf of BT in November 2021. The Cable corridor between Iona and Mull (Fionnphort) is known as route 2.15 and passes across the Sound of Iona, between the bay of Port Mòr, south of Fionnphort and the eastern side of Iona. Section 5.3.7 of this AER notes that no Annex I habitats or PMFs have been recorded within 1 km of the cable corridor.

Although there is no spatial overlap between the projects, there is potential that the construction phase of the Proposed Development may coincide with the construction cabling works during the first half of 2023. This has potential for in-combination effects.

21.3 Assessment of Likely Significant Effects

21.3.1 Environmental Interactions between the Proposed Development and other Projects

When determining the significance of the cumulative effects of the Proposed Development and other existing and/or approved projects, consideration was given to the following factors:

- The Spatial and Temporal interactions between the Project and other projects;
- Identification of potential of cumulative effects by environmental topics and establish if a potential linkage exists using the source-pathway-receptor model;
- The type and duration of the impact - will it be temporary or permanent;
- The value and resilience of the receptor affected; and
- Mitigation measures that will be employed and the likelihood of their success

Table 21-1 provides a description of potential interactions between the Proposed Development and the other listed projects in the area which are deemed likely to have cumulative effects.

Table 21-1 Potential interactions between the Proposed Development and the other projects

Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact
Navigation & Safety: There is no potential for cumulative impacts on navigational safety during the operational phase due to the implementation of adequate risk controls that are needed to ensure marine safety. There will be no significant cumulative impacts during the construction phase.	N/A
Terrestrial Biodiversity: No information on the potential impacts of this work on otters or habitats was available through the Marine Scotland website. There is the potential for cumulative impacts relating to disturbance for otters using the Iona coastline. Given the distance between the sites, the presence of alternative foraging and commuting habitats for otter to use along the coastline and inland and following implementation of the mitigation outlined in Section 7.5 and Appendix 7.2, it is considered that in-combination effects relating to otters would be of negligible magnitude and their effects as of minor significance. In terms of the EIA Regulations this is deemed a non-significant effect.	Non-significant
Marine Biodiversity: The proposed project to be undertaken at Fionnphort, is likely to have the potential for cumulative effects. The main effects that require consideration are those that were identified to have significant effects on benthic receptors. The key effect to be considered within the assessment is 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' during the construction phase on benthic receptors. As there is likely to be a significant effect on seagrass, an agreement will be sought between the Iona Proposed Development and the Fionnphort project on the compensation/ mitigation strategy of the seagrass.	Significant
Ornithology: Two projects have been identified in the vicinity of the Proposed Development. These are listed below: • The Fionnphort Breakwater and Overnight Berthing Project No assessment has been made in respect to this development as yet, but it is anticipated that the impacts would be of a similar nature to the Proposed Development. Due to the distance and separation of the two developments by the Sound of Iona, it is unlikely that any in-combination effects on IOFs would occur. • Cable installation – Iona to Fionnphort The project involves the installation of fibre optic cable and is proposed in the first half of 2023. No information on the potential impacts of this work on birds was available through the Marine Scotland website. Given the distance between the sites and the presence of alternative foraging habitats along the coastline and inland, it is considered that that any in-combination effects would be negligible.	Non-significant
Terrestrial Noise & Vibration: Assumed worst case scenario that construction impacts of the Proposed Development may overlap with the construction of the Fionnphort Breakwater and Overnight Berthing Project, or cable installation – Iona to Fionnphort. Any cumulative construction noise or vibration impact is	Non-significant

Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact
predicted to be of local spatial extent, temporary duration, and intermittent. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be low.	
Water Quality: The Proposed Development at Fionnphort which could potentially give rise to in-combination effects from a water quality perspective was included for further assessment. Based on the modelling undertaken in the Coastal Processes chapter and the outputs of the MImAS assessment of both projects on the Sound of Iona costal water body, the cumulative impacts of both projects are unlikely to have a significant impact on during the construction and operational phases of the Proposed Developments. The potential for cumulative effects has been identified in Chapter 8 (Marine Biodiversity), due to the permanent long-term habitat loss experienced as a result of the structures' footprints during the operational phases. As there is likely to be a significant effect on seagrass, an agreement will be sought between the Iona Proposed Development and the proposed Fionnphort Project on the compensation/ mitigation strategy of the seagrass to ensure that the ecological status of the water body is not affected.	Non-significant
Flood Risk: There will be no cumulative impact on coastal flood risk when the Proposed Development is considered together with other Proposed Developments in the area.	N/A
Coastal Processes: In line with the scoping response received from MSS, the cumulative effects of the Proposed Development along with other developments were considered quantitively in a numerical model. The potential development at Fionnphort would be most relevant as it most likely has the greatest possibility of creating in-combination effects upon the coastal processes within the Sound of Iona when the two developments are in operation. In circumstances where the mitigation measures are fully implemented during the construction and operational phases, the impact of the Proposed Development on the coastal processes within the Sound of Iona would consist of small-scale, low magnitude changes in the tidal regime, wave climate, littoral currents, and sedimentology. The Proposed Development is therefore not expected to have a significant effect on coastal processes or make a significant change to the existing morphology.	Non-significant
Population & Human Health: No additional cumulative population and health effects are anticipated during construction and operation of the Proposed Development.	N/A
Landscape & Visual: The proposed Fionnphort Breakwater and Overnight Berth Project consists of the construction of a new rock armour breakwater, overnight berthing facilities and associated dredging. The proposed project is located c1.3km to the east of Iona, across the Sound. There is potential that this proposed project may be constructed in parallel with the construction phase of Proposed Development at Iona. Due to the separation distance of the two proposed projects and their location within existing harbours and settled areas while it will be possible to view both projects under construction within one combined view and sequentially the magnitude of impact will be small due to distance and immediate urban context at the two project sites. It is predicted that	Non-significant

Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact
when the proposed Fionnphort Breakwater and Overnight Berth Project is cumulatively assessed with the Proposed Development that a minor to moderate and not significant cumulative effect will occur. The proposed locations for cabling works are located approximately 900m to the south of the site boundary of the Proposed Development. The proposed cable lengths are 2.6km. Burial of the cable is required (where sediments allow) to protect the optical fibre transmission path over the entire service life of the system and prevent interaction with the seabed and other sea users. Offshore the target burial depth will be to 1m below the seabed. From a landscape and visual perspective, the cable once installed will not be visible with no change in landscape and visual resource. It is predicted that when the proposed cabling once installed is cumulatively assessed with the Proposed Development that no significant cumulative effect will occur.	
Cultural Heritage: The proposed Fionnphort Breakwater and Overnight Berth Project consists of the construction of a new rock armour breakwater, overnight berthing facilities and associated dredging. The proposed project is located c1.3km to the east of Iona, across the Sound. Given the distance of the proposed project from the Proposed Development, there is no potential for cumulative effects relating to the physical fabric of cultural heritage assets. Given the distance between the proposed project and the heritage assets on Iona, it is considered that Fionnphort and the proposed project does not form a part of their setting. There is therefore no potential for cumulative effects relating to setting. The proposed locations for cabling works are located approximately 900m to the south of the site boundary of the Proposed Development. Given its distance from the Proposed Development, there is no potential for cumulative effects relating to the physical fabric of heritage assets. The proposed cable will not be visible and there is therefore no potential for cumulative effects relating to setting.	Non-significant
Waste: With regards to the potential for cumulative effects associated with waste, the proposed Fionnphort Breakwater and Overnight Berthing Project has been considered. The source of current waste arisings associated with the Proposed Development is from the operation of the passenger ferry service from Fionnphort (the location of the proposed Fionnphort Breakwater and Overnight Berthing Project). Waste facilities are provided by CalMac Ferries Ltd. who provide recycling facilities at all their port locations for customers to recycle on the go. All waste generated and/or received at both the Iona Ferry Terminal and Fionnphort Ferry Terminal is currently managed and disposed by local authorities or licenced waste contractors. The management/ disposal route is at the discretion of the approved contractor. CalMac Ferries Ltd. have in place, an Environmental Strategy for 2021-2023 which outlines the company's aims and actions to minimise their impact on the marine and terrestrial environments in which they operate. The Strategy outlines four core priorities which align with Scotland's Environment Strategy, Scottish Government National Outcomes and the UN Sustainable Development Goals. One of the core priorities is "we generate minimal waste and sustainably use materials". Waste management at the port is currently operated to best practice guidance	Non-significant

Potential Cumulative Effects on Environmental Factors	Overall Cumulative Impact
and is managed and disposed by local authorities or licenced waste contractors. It is imperative that CalMac Ferries Ltd. Environmental Strategy and relevant policies and procedures are followed and that any additional waste that may arise are considered. Through continued adherence to this Environmental Strategy and relevant policies and procedures, there is not likely to be cumulative effects associated with waste arising from the Proposed Development with the proposed Fionnphort Breakwater and Overnight Berthing Project.	
Greenhouse Gas Assessment: The cumulative impact of carbon emissions arising from global human activity is *High*. This is true to the nature of climate change as a global, cumulative problem. As committed developments have been assessed throughout this EIAR the potential inter-scheme cumulative effects during the operational phase of the development have already been considered. It is assumed that all committed developments will be required to meet relevant standards for emissions reduction and to comply with related planning policy. On this basis, it is considered appropriate to assume that any applications that are consented include 'reasonable' measures to avoid, reduce and /or offset the generation of greenhouse gas emissions and therefore that no significant cumulative effects are anticipated.	Non-significant
Risk of Major Accidents & Disasters: The Fionnphort Breakwater and Overnight Berthing Project is being developed alongside the Proposed Development. Therefore, it is likely that cumulative effects may be experienced when constructing the two projects. The Fionnphort Overnight Berthing Project is likely to have many of the same risks of major accidents and disasters as the Proposed Development. This means that the Risk Events described in this chapter may be exacerbated, depending on whether works are being carried out at the same time. However, there is potential that these can be mitigated through adherence to the mitigation measures proposed within specialist topic chapters. BTs installation of superfast broadband cables for the Ross of Mull and Iona is likely to get underway during the first half of 2023. While the cabling will be installed around 900m south of the proposed Iona Breakwater, there is still likely to be some cumulative effects if the two projects are undertaken at the same time. The most likely cumulative effect is the risk of collisions between construction vessels. This is possible due to increased vessel traffic in the Sound of Iona during the construction phase. The same logic applies to the risk of accidents to the general public and the risk of a man overboard. The potential for a major pollution / sedimentation event is also another effect that may be pronounced by the two projects being undertaken at the same time. Due to both projects requiring dredging activities, it is more likely for a major sedimentation event to occur. Furthermore, due to increased vessel activity in the Sound of Iona during the construction phase there is an increased likelihood of a pollution event occurring. However, there is potential that these can be mitigated through adherence to the mitigation measures proposed within the specialist topic chapters.	Non-significant

As identified in Table 21-1, the proposed project to be undertaken at Fionnphort, is likely to have the potential for cumulative effects with regards to 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' during the construction phase on benthic receptors.

At Iona, permanent long-term habitat loss will occur directly under the new breakwater structure (i.e., not including the temporary working area). The overall footprint of the breakwater is approximately 10,037 m^2, with approximately 149,812 tonnes of rock armour to be laid. The works will be carried out once but will remain in situ for up to 120 years for the design life and will be non-reversible.

At Fionnphort, permanent long-term habitat loss will occur directly under the new breakwater structure. The overall footprint of the breakwater is approximately 4,200 m^2 (this is based on the Fionnphort Scoping Report dated July 2021 and therefore may be subject to slight variation). The works will be carried out once but will remain in situ for up to 120 years for the design life and will be non-reversible.

The potentially combined permanent loss of habitat due to the breakwaters would be 7,000 m^2.

As such, a 'Seagrass Compensation and Monitoring Plan' has been proposed. Direct habitat loss is predicted to occur as a result of the Proposed Development, therefore to ensure that seagrass habitat is not permanently lost, compensation will be undertaken to ensure that the habitat is restored. An assessment has already been undertaken in the form of the intertidal and subtidal survey, with the extent of biotopes derived. This data will be used to inform the 'Seagrass Compensation and Monitoring Plan'.

As there is likely to be a significant effect on seagrass, an agreement will be sought between the Iona Proposed Development and the Fionnphort project on the compensation/ mitigation strategy of the seagrass. This approach should be agreed upon with Marine Scotland, its advisors, and in consultation with seagrass restoration projects, with reference to documents such as Seagrass restoration in Scotland - handbook and guidance (Kent *et al*., 2021) and Seagrass Restoration Handbook (Gamble *et al.*, 2021).

21.3.2 Environmental Interactions within the Proposed Development

This section of the EIAR determines the potential for environmental interactions within the Proposed Development, between specialist topic chapters.

Environmental factors are inter-related to some degree, and these interactions can exist on many levels. This section summarises the primary interactions between the environmental topics and provides a matrix to coherently display them.

Table 21-2 identifies the interacting topics which are then discussed further in the following sections.

Table 21-2 Proposed Development environmental interactions

	Navigation & Safety	Terrestrial Biodiversity	Marine Biodiversity	Ornithology	Terrestrial Noise & Vibration	Water Quality	Flood Risk	Coastal Processes	Population & Human Health	Landscape & Visual	Cultural Heritage	Waste	GHG Assessment	Risk of Major Accidents & Disasters
Navigation & Safety														
Terrestrial Biodiversity														
Marine Biodiversity														
Ornithology														
Terrestrial Noise & Vibration														
Water Quality														
Flood Risk														
Coastal Processes														
Population & Human Health														
Landscape & Visual														
Cultural Heritage														
Waste														
GHG Assessment														
Risk of Major Accidents & Disasters														

Navigation & Safety

During the construction phase of the Proposed Development there is potential for the interaction between Navigation & Safety with Marine Biodiversity, Population and Human Health and the Risk of Major Accidents and Disasters. These interactions and effects are fully assessed within Chapter 6, Section 6.4.1 and Chapter 19, Section 19.4.

Marine Biodiversity

During the construction phase of the Proposed Development there is potential for the interaction between Marine Biodiversity with Navigation & Safety, Water Quality, Coastal Processes and the Risk of Major Accidents and Disasters. These interactions and effects are fully assessed within Chapter 8, Section 8.7.2 and Chapter 19, Section 19.4.

Terrestrial Noise & Vibration

During the construction phase of the Proposed Development there is potential for the interaction between Terrestrial Noise & Vibration with Population & Human Health. These interactions and effects are fully assessed within Chapter 10, Section 10.4.2.

Water Quality

During the construction phase of the Proposed Development there is potential for the interaction between Water Quality with Coastal Processes, Marine Biodiversity and the Risk of Major Accidents and Disasters. These interactions and effects are fully assessed within Chapter 11, Section 11.3.1 and Chapter 19, Section 19.4.

Flood Risk

During the construction phase of the Proposed Development there is potential for the interaction between Flood Risk and the Risk of Major Accidents and Disasters. This interaction is fully assessed within Chapter 19, Section 19.4.

Coastal Processes

During the construction phase of the Proposed Development there is potential for the interaction between Coastal Processes with Marine Biodiversity and Water Quality. These interactions and effects are fully assessed within Chapter 13, Section 13.4.1.

Population & Human Health

During the construction phase of the Proposed Development there is potential for the interaction between Population & Human Health with Navigation & Safety and Terrestrial Noise and Vibration. These interactions and effects are fully assessed within Chapter 14, Section 14.4.1.

Landscape & Visual

The Proposed Development has the potential for interaction between Landscape & Visual effects with Cultural Heritage. These interactions and effects are fully assessed within Chapter 15, Section 15.5.

Cultural Heritage

The Proposed Development has the potential for interaction between Cultural Heritage and Landscape & Visual effects. These interactions and effects are fully assessed within Chapter 16, Section 16.5.

Risk of Major Accidents & Disasters

During the construction phase of the Proposed Development there is potential for the interaction between the Risk of Major Accidents & Disasters with Navigation & Safety, Marine Biodiversity, Water Quality and Flood Risk. These interactions and effects are fully assessed within Chapter 19, Section 19.4.

22 SUMMARY & CONCLUSIONS

The assessment presented within the EIAR has identified and documented impacts arising from the Proposed Development. These impacts have been assessed as to whether or not they are likely to result in significant effects. Where significant effects have been predicted, measures to avoid or mitigate these effects have been included so that, where possible, they are no longer significant.

The overall objective of the Proposed Development is to provide improved access facilities for the Iona ferry which operates across the Sound of Iona, between the two villages of Fionnphort and Iona. The Iona ferry, operated by CalMac, operates daily all year round. After traversing the Sound, the ferry holds its position at Iona using the weight of the ramp and the friction between the ramp and the slipway deck, however the slipway at Iona is currently very vulnerable to waves, particularly from the south, resulting in the ramp of the ferry rising and falling from the deck of the slipway. The instability of the ferry, as a result of swells, presents a risk to both ferry operators, passengers embarking and disembarking, vehicles and other slipway users.

During storm events or periods of intense wave action, the health and safety risk associated with the current berthing practice means that the ferry is not able to operate. Ferry users are therefore not able to access Iona, or in fact, may become trapped at Iona until the ferry is able to operate again. This presents issues such as lack of accommodation (visitor accommodation on Iona is limited to two hotels, a number of B&Bs, self-catering units, and a campsite), with tourists having to sleep in their vehicles[46] and subsequent reputational issues, with tourists unlikely to revisit after having a poor experience. In addition, there is no shelter or indoor waiting area for ferry passengers in times of unfavourable weather conditions. This often presents difficulties where the weather is either wet or windy.

The current berthing practice also has a negative impact on service provision to residents of Iona. These problems have had a direct impact on the lives of the people who live there. A day without a ferry operating, results in essential services to the island being affected – medical, educational, refuse collection, business delivery etc.

In addition to ferry operation, the Island and the Sound bring people visiting on holiday, including discernible increases in the total numbers of leisure yachts, which sail around Mull and Iona in the summer season berthing within the Sound as a safe overnight mooring. This is an opportunity for these visitors to eat locally as well as stock up on supplies.

The Proposed Development aims to address these issues by making the connection between the Isle of Mull and Iona safer, more efficient and more attractive to both ferry customers and leisure sailors. The Proposed Development is intended to make the ferry crossings more reliable and safer. It is not intended to increase the frequency of the ferry crossings and thereby no change in vessel traffic is expected as a result of the works.

[46] BBC News Article 2021 - https://www.bbc.co.uk/news/articles/ce9n25zeyx1o

With adherence to a CEMP and with implementation of the mitigation laid out in the EIAR, most negative effects from the Proposed Development will generally not be significant. However, some significant negative effects may potentially be experienced by a number of receptors.

Given the remote nature of Iona, the landscape and visual setting will potentially be significantly affected by the Proposed Development. Moderate to major localised and direct long-term effects have been identified for a number of landscape and visual receptors. These are generally localised to coastal fringe areas and in close proximity to the breakwater and reduce to minor to moderate, and not significant, with increased distance from the Proposed Development.

In addition, although there will be no direct physical effects on cultural heritage, significant effects have been identified on the character and appearance, and the aesthetic and spiritual value of several heritage receptors. The island is considered as a place of pilgrimage and it is considered that the appearance of the Proposed Development at the point of arrival on the island will detract from the experience of the pilgrimage assets, in particular, their aesthetic and spiritual value. The Proposed Development site also lies at the fringe of the Baile Mòr Conservation Area and will be visible from several locations within it. This will have a significant but localised impact upon its character and appearance and the contribution of the Conservation Area's setting.

It is not possible to mitigate against these visual effects and changes in aesthetic value. A range of alternative designs have been previously assessed, as discussed within this EIAR, however to date, no alternative design has been identified, which provides the required level of protection, without compensating on other health and safety aspects (i.e., reduced visibility of overtopping waves), whilst also being as small in crest height and width as practicable.

As well as the above effects on visual and aesthetic settings, the Proposed Development has been assessed with respect to effects on marine environmental receptors. The assessment determined that 'Permanent habitat loss for the benthic habitat 'Zostera marina/angustifolia beds on lower shore or infralittoral clean or muddy sand A5.5331' (seagrass), arising from the placement of material on the seabed for the breakwater' was deemed of moderate significant effect. Seagrass is also a biological element contributing to water body status, under the WFD. To address the moderate significant effect of the temporary and permanent habitat loss, a 'Seagrass Compensation and Monitoring Plan' has been proposed to reduce the impact of the Proposed Development on seagrass receptors.

However, it should also be noted that minor positive effects associated with benthic ecology and fish and shellfish are anticipated due to the breakwater creating a hard habitat for colonisation and refuge. With the exception of the loss in footprint of seagrass currently present, the remaining biological elements are deemed to be of low vulnerability, high recoverability and local to international importance. Therefore, the assessment determined the significance of effect on the biological elements, other than seagrass (angiosperms) as minor (positive) and not significant in EIA terms.

Following implementation of the mitigation and/or compensation measures proposed, all other environmental effects have been deemed as not significant.

In addition to the above, a HRA has been undertaken as part of development consent, to determine the potential for the Proposed Development to have a LSE on designated sites in the UK national network of sites ('European sites'). The potential for LSE could not be excluded at the screening stage for three European sites (Inner Hebrides and Minches SAC; Treshnish Isles SAC; and Eileanan agus Sgeiran Lios mor SAC.), without further evaluation, or the application of mitigation measures intended to reduce effects of the Proposed Development on the European sites concerned.

A subsequent assessment to inform a Stage 2 Appropriate Assessment of the implications of the Proposed Development on European sites allowed the introduction of measures intended to avoid or reduce the potential adverse effects of the Proposed Development on European sites. These measures ensure that the Proposed Development will not undermine the conservation objectives of the sites concerned, and as such will not adversely affect the integrity of any European site.

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