

# Aquaculture Modelling Screening and Risk Identification Report:

Report date: September 2025

# SANDA ISLAND (SNDA1)

# CAR/L/5011040

# VERSION 1

## Scope of report

As part of the SEPA Aquaculture Regulatory Framework it is recommended that a proposed application for a marine finfish aquaculture site should undergo a Screening Modelling and Risk Identification process. SEPA carries out this work and this is described on the SEPA aquaculture website [**Pre-application section**](https://beta.sepa.scot/topics/water/aquaculture/pre-application/)**.**

This report presents information arising from that process. Screening modelling methods are outlined and maps and tables describing the modelled impacts are shown. Risks arising from consideration of the model output are listed. Conclusions and recommendations are made regarding the proposed site.

## Executive summary

SEPA has received a proposal for a new marine finfish aquaculture site called Sanda Island (SNDA1). In the proposal two possible 6 x 120m pen locations were given. Location option 1: 174370E, 605710N (Easting, Northing). Location option 2: 174208.5E, 605872.5N (Easting, Northing). The maximum proposed weight of fish to be farmed is 3500t.

Following screening modelling and risk identification we have concluded the following:

* It is possible that discharges from Sanda Island (SNDA1) will be able to comply with the relevant aspects of the SEPA Aquaculture Regulatory Framework.
* Due to the size of this proposed marine pen fish farm and the identified risks, marine modelling for baths is required for this site.
* Standard default NewDepomod must be undertaken prior to any marine modelling to demonstrate the proposed biomass can be supported. Solids impacts will be addressed with NewDepomod.
* The proximity to locational guidelines waterbodies has been assessed and not considered a risk, however the open water ECE calculation will still be required.
* Sea lice screening has shown a very small effect on the exposure risk. No criteria for further work have been triggered. The outcome of current screening is that this site will not require a lice permit condition. No further modelling work is required, at this time.
* Sanda Island (SNDA1) is suitable to progress to the next stage of the pre-application process outlined on the SEPA website.

## List of abbreviations

SEPA Scottish Environment Protection Agency

MPFF Marine Pen Fish Farm

CTG Consenting Task Group

AMZ Allowable Mixing Zone

PMF Priority Marine Feature

EIA Environmental Impact Assessment

HRA Habitats Regulations Appraisals

SAC Special Area of Conservation

SPA Special Protected Area

SSSI Site of Special Scientific Interest

MPA Marine Protected Area

AZA Azamethiphos

Contents

[Aquaculture Modelling Screening and Risk Identification Report: 1](#_Toc204779253)

[SANDA ISLAND (SNDA1) 1](#_Toc204779254)

[CAR/L/5011040 1](#_Toc204779255)

[VERSION 1 1](#_Toc204779256)

[Scope of report 2](#_Toc204779257)

[Executive summary 3](#_Toc204779258)

[List of abbreviations 4](#_Toc204779259)

[List of figures 6](#_Toc204779260)

[List of tables 7](#_Toc204779261)

[Introduction 8](#_Toc204779262)

[Screening modelling 9](#_Toc204779263)

[Risk identification 17](#_Toc204779264)

[Conclusions 25](#_Toc204779265)

## List of figures

[Figure 1. Firth of Clyde (FOC) model grid 9](#_Toc204857228)

[Figure 2: Modelled average water speed (metres per second – m/s) in the sea loch around the proposed site (Sanda Island (SNDA1)). 11](#_Toc204857229)

[Figure 3: Modelled average sediment intensity over one month for the proposed site only (Sanda Island (SNDA1)). 13](#_Toc204857230)

[Figure 4: Modelled average sediment intensity over one month for the proposed site (Sanda Island (SNDA1)) and other relevant sites. 14](#_Toc204857231)

[Figure 5: Modelled average Azamethiphos concentration over four days from neap tide release for the proposed site only (Sanda Island (SNDA1). 16](#_Toc204857232)

[Figure 6: Map of sensitive features 18](#_Toc204857233)

[Figure 7: Map of the average modelled lice concentration over the simulated April and May period (in lice/m2) within the top two meters of the sea area. SNDA1 site location shown as a blue circle. Fish tracks are shown as green lines with the WSPZs, which are highlighted by a white boundary. 21](#_Toc204857234)

## **List of tables**

[Table 1: Table of identified features of interest 17](#_Toc204779227)

[Table 2: Table of farms which should be included in any cumulative modelling. 19](#_Toc204779228)

[Table 3: Influence of modelled sea lice from SNDA1 on exposure in the relevant affected WSPZs. 23](#_Toc204779229)

[Table 4: Location of SNDA1 within the assessment matrix framework of WSPZ capacity and site contribution (Presented for information only). 24](#_Toc204779230)

## Introduction

Screening Modelling and Risk Identification are important steps in the SEPA regulatory framework for marine pen fish farms. SEPA carries out this work and this is described on the SEPA aquaculture website [**Pre-application section**](https://beta.sepa.scot/topics/water/aquaculture/pre-application/).

This section presents screening output for the proposed site with comments. Risks identified from the screening output are detailed. Conclusions and recommendations about the suitability of the proposed site are then made.

## Screening modelling

#### Accuracy of model in the area surrounding the proposal

The Firth of Clyde model used for screening modelling has a moderate resolution in this area.

Comparison against observational current meter data indicates that the model provides a reasonable performance of the physical processes in the vicinity of the proposed site.

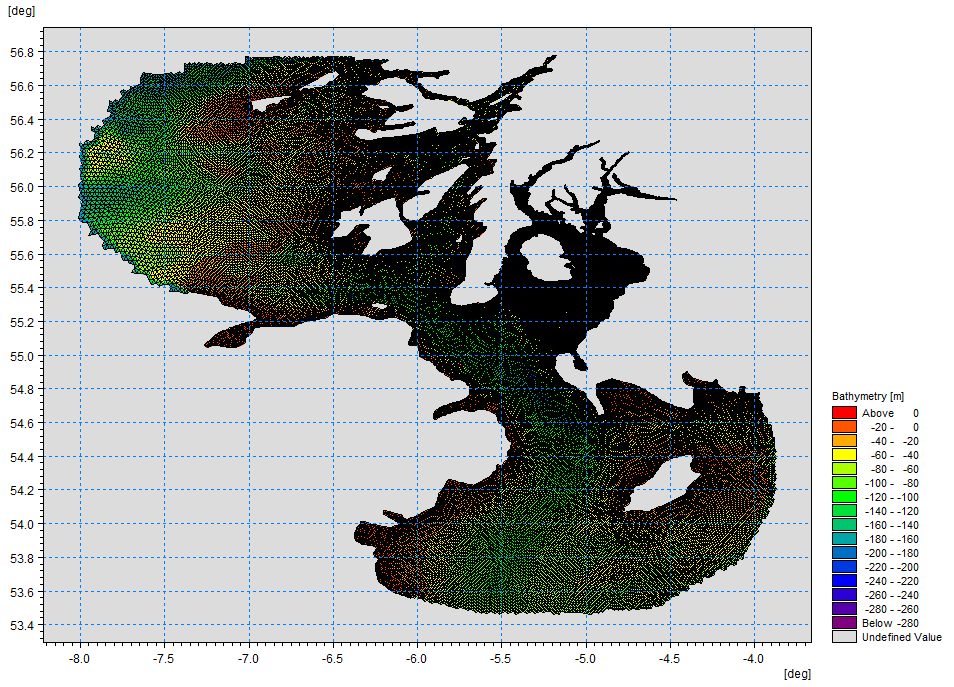


Figure 1. Firth of Clyde (FOC) model grid

### Dispersion and erosion capacity maps

Modelled water movement in a sea area can be used to show the capacity of the water to move and disperse discharged substances. It is also possible to show the capacity available to erode substances from the seabed. This information is a useful guide to the potential size of a marine pen fish farm at a particular location.

Marine pen fish farms using open-net pens will benefit from operating in locations where there are strong, repeating, water currents to erode and disperse waste.

Locations with average water flow speeds of greater than, or equal to, 0.12 metres per second (0.23 knots) are for screening purposes, considered generally suitable for larger farms.

A map of modelled average water flow speed for the area surrounding the proposed site is shown in Figure 2. The average water flow speed in each cell of the model grid has been assigned a shade. The darker the shading, the slower the average current speed and the lower the capacity for dispersion.

Licenced aquaculture farms in the vicinity of the proposed site are shown and discharges of material from these sites have been included in the screening modelling.

#### Modelled flow properties

Based on the maps of the modelled water flow properties we can make the following observations about the proposed site location:

* It lies in a high dispersion area.
* It lies in an area where water flow has a high capacity to erode material on the seabed.

Figure 2: Modelled average water speed (metres per second – m/s) in the sea loch around the proposed site (Sanda Island (SNDA1)).



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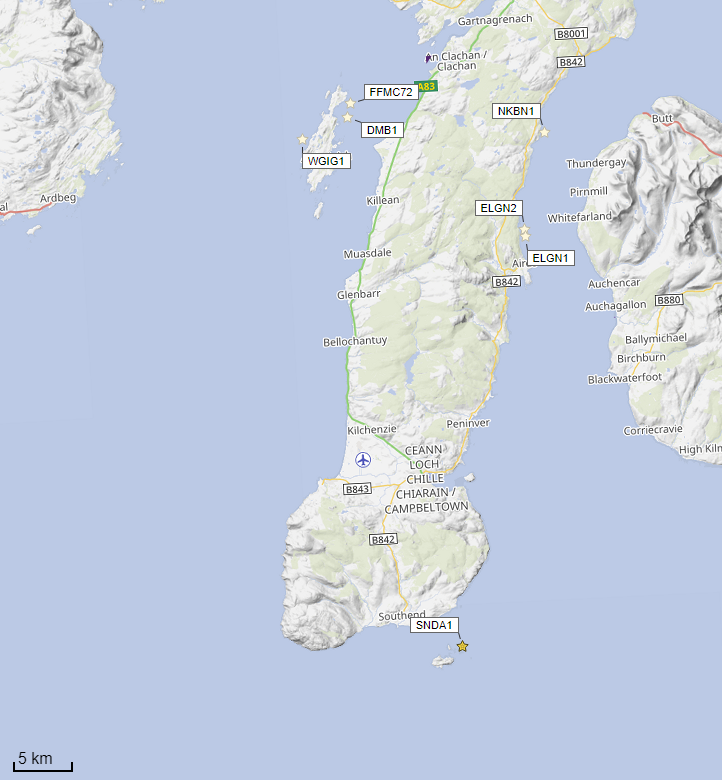
Average water speed (m/s)

### Sediment influence maps and analysis

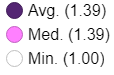
Modelled particles in a sea area can be analysed for each modelled grid cell and presented to show the potential influence of discharged sediment on the surrounding sea area.

Values less than 1g/m2 have been excluded from the map and subsequent calculations. These low concentration cells are produced by the particle tracking approach but they are not considered to be representative of the main influence of a discharge.

Figures 3 and 4 show maps of the modelled average sediment intensity over one month (time average). Grid cells within the model that are influence by modelled sediment are shaded according to the intensity of the influence in grams per square metre (g/m2). Cells which are shaded purple are similar to the average and those shaded pink are similar to the median (middle value in the range) intensity value shown on the map.



Sediment Intensity (g/m2)



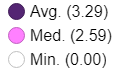
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Sediment intensity values presented on this map are negligible and are presented for information only.

Figure 3: Modelled average sediment intensity over one month for the proposed site only (Sanda Island (SNDA1)).



Sediment Intensity (g/m2)



Sediment intensity values presented on this map are low and are presented for information only.

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Figure 4: Modelled average sediment intensity over one month for the proposed site (Sanda Island (SNDA1)) and other relevant sites.

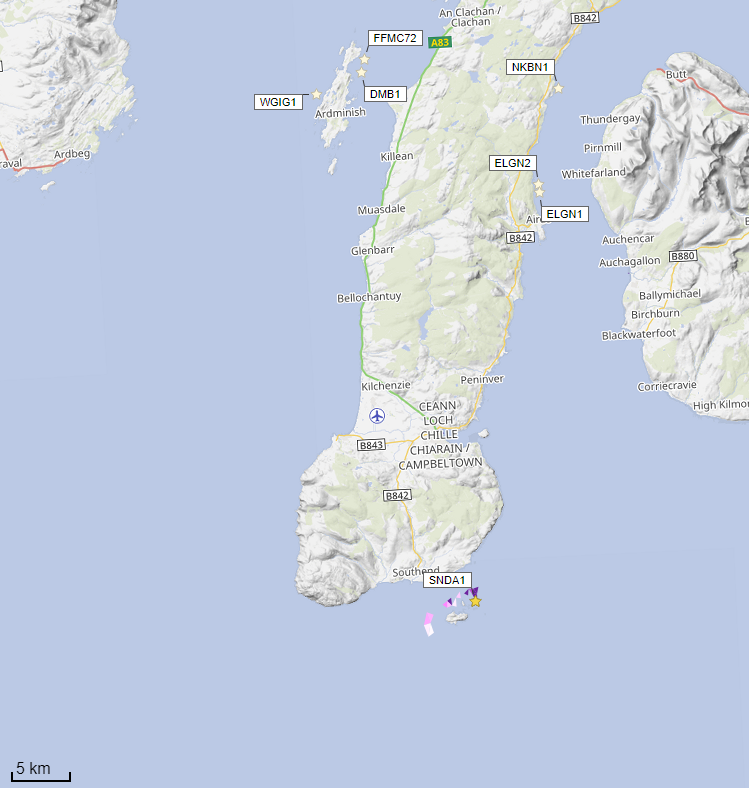
### Bath medicine influence maps and analysis

Modelled particles in a sea area can be analysed for each modelled grid cell and presented to show the potential influence of discharged bath medicine on the surrounding sea area. Results presented are for the Azamethiphos medicine.

Figure 5 shows a map of the modelled average AZA concentration over four days for the proposed site only. Grid cells within the model which experience an AZA influence are shaded according to the concentration of AZA in nanograms per litre (ng/l). Cells which are shaded purple are similar to the average and those shaded pink are similar to the median (middle value in the range) intensity value shown on the map.

Values less than 10ng/l have been excluded from the map. These low concentration cells are produced by the particle tracking approach but they are not considered to be representative of the main influence of a discharge.

Please note that the Environmental Standard for Azamethiphos with the lowest concentration is 40ng/l. This must be met 72 hours after the material has been discharged. The estimate of influence detailed here is precautionary.



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Azamethiphos Conc. (ng/l)

Concentrations of AZA presented on this map are less than the 40ng/l Environmental Standard and are presented for information only.

Figure 5: Modelled average Azamethiphos concentration over four days from neap tide release for the proposed site only (Sanda Island (SNDA1).

## Risk identification

The screening modelling output summarised in the screening modelling section is compared against available information on features of interest. Features which require attention are presented with any additional comments and will need to be considered during the pre-application phase.

### Features of interest which require attention

Sensitive features in the area have been assessed, those considered at risk and therefore requiring additional consideration, can be found in the table below.

Table 1: Table of identified features of interest

|  | **Feature name** | **Feature type** | **Location (Easting, Northing)** | **Brief reason for identification** |
| --- | --- | --- | --- | --- |
| 1. | Kelp beds | PMF | |  |  | | --- | --- | | 174232 | 605284 | | 173354 | 605103 | | 173352 | 605104 | | 174232 | 605284 | | 174391 | 604811 | | 172277 | 603541 | | baths – prey supporting feature of Clyde Sea Sill MPA qualifying feature Black guillemot. |
| 2. | Pink sea fingers | PMF | |  |  | | --- | --- | | 174391 | 604811 | | baths |

### Map of proposed site Sanda Island and the identified sensitive features: pink sea fingers and kelp beds.

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Figure : Map of sensitive features

### Additional comments on bath influence

The conservative nature of the simple BathAuto model in areas of high current speeds, means quantities of bath medicines may be limited to impractical amounts for this site. Use of marine modelling of bath influence will enable more realistic bath medicine treatment quantities to be determined. Features identified as at risk within this area will need to be addressed in any marine modelling, however cumulative modelling of baths is not required. Dye/drogue calibration will not be required.

### Nutrient influence

The proximity to locational guidelines waterbodies has been assessed and not considered a risk, however the open water ECE calculation will still be required to ensure nutrient enhancement levels from this new farm are acceptable.

### Risks identified from contextual site data

Table 2: Table of farms which should be included in any cumulative modelling.

| **Site name** | **Location (Easting, Northing)** | **Biomass (Tonnes)** | **Last production cycle** | **Include in solids marine modelling?** |
| --- | --- | --- | --- | --- |
| SNDA1 | 174370, 605710 | 3500 | Proposed | No |
| ELGN1 | 181740, 640900 | 2500 | Currently stocked (since November 2023) | No |
| ELGN2 | 181745, 641590 | 2500 | Currently stocked (since September 2023) | No |
| NKBN1 | 183742, 649765 | 2475.54 | Currently stocked (since May 2024) | No |
| WGIG1 | 162876, 650259 | 3104 | Not currently stocked | No |
| DMB1 | 166865, 651950 | 2499 | Currently stocked (since February 2025) | No |
| FFMC72 | 167165, 653125 | 2500 | Fish last on site March 2023 | No |

### Sea Lice Screening

Sea lice screening was carried out using our standard method with the translated Scottish Shelf FOC (Firth of Clyde) sub area model.  This method is outlined in in Appendix 4 of the May 2023 second consultation document: [Managing interactions between sea lice from finfish farms and wild salmonids, Proposed new regulatory framework, May 2023.](https://consultation.sepa.org.uk/regulatory-services/detailed-proposals-for-protecting-wild-salmon/)

### Modelled Sea Lice concentration map – SNDA1

Figure 6 shows a map of the average modelled lice concentration over the simulated April and May period (in lice/m2) within the top two meters of the sea area. Model grid cells (triangles) are coloured according to the amount of sea lice particles within them.

#### Indicative influence

The map serves as an indicative influence under average tidal and weather conditions. The focus is on areas of potential high influence for further fish track analysis within WSPZs.

#### Exclusion of low concentrations

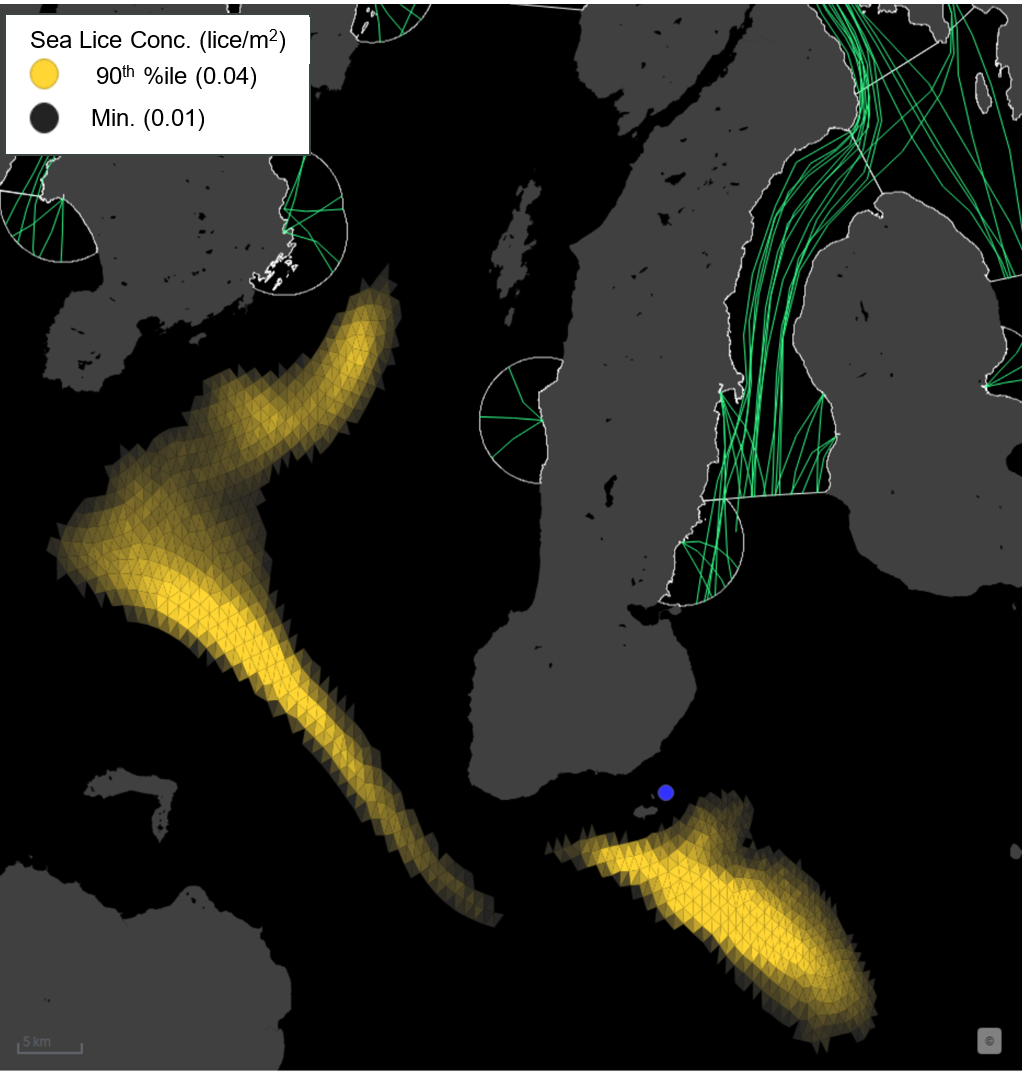
Any grid cells with concentrations below 0.01 lice/m² are not shown on the map. This exclusion helps focus on more influential concentrations on the fish track analysis and WSPZs. However, these concentrations are not excluded from fish track exposure analysis below.

#### Colour intensity, 90th percentile and median concentrations

The more intense the colour in the grid cells, the closer the concentration is to the 90th percentile of all concentrations within the model cells. This brings attention to areas of higher modelled influence.  The 90th percentile of sea lice concentrations is 0.04 lice/m², meaning that 90% of the concentrations are below this value.  The median concentration is 0.02 lice/m², suggesting that half of the values are below this number. At baseline (before the introduction of the proposed site), the average 90th percentile concentration across modelled sites was 0.04 lice/m².

#### Focus area

The fish track exposure assessment, on which the screening outcome is based, is on the zone where the influence is highest. In this case, no WSPZs are subject to influence from SNDA1.



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Figure : Map of the average modelled lice concentration over the simulated April and May period (in lice/m2) within the top two meters of the sea area. SNDA1 site location shown as a blue circle. Fish tracks are shown as green lines with the WSPZs, which are highlighted by a white boundary.

### Modelled Sea Lice Concentrations – Single Site Influence on Exposure – SNDA1

Table 3 shows information relating to the influence of modelled lice concentrations, from SNDA1 alone, on fish track exposure levels within the relevant WSPZs.

Table : Influence of modelled sea lice from SNDA1 on exposure in the relevant affected WSPZs.

| **Wild Salmon Protection Zone (WSPZ)** | **95th percentile of Fish Track Exposure (lice/m2 days)** | **% of Exposure Threshold (0.7 lice/m2 days)** |
| --- | --- | --- |
| None | None | None |

#### WSPZ influence

No WSPZs are influenced.

#### Exposure threshold

The percentage of the exposure threshold is shown to illustrate the scale of a single site influence. The exposure influence of all sites is not simply the sum of the individual site percentages.  The overlapping influence of all sites on modelled screening exposure is shown below.

#### Assessment matrix

An assessment matrix is presented on page 57 of the SEPA December 2023 response to consultation feedback: Managing interactions between sea lice from finfish farms and wild salmonids, SEPA response to [consultation feedback](https://consultation.sepa.org.uk/regulatory-services/detailed-proposals-for-protecting-wild-salmon/), December 2023.

Using the fish track exposure method, we establish the location of SNDA1 within the assessment matrix framework of WSPZ screening capacity and site contribution.  To assess the capacity influence, we take the WSPZ which experiences the greatest influence, in this case no WSPZ is influenced. Table 4 shows that SNDA1 does not have a position within the screening matrix and is presented for information only.

Table : Location of SNDA1 within the assessment matrix framework of WSPZ capacity and site contribution (Presented for information only).

| **Contribution to infective-stage sea lice exposure** | **Remaining available capacity in WSPZ** | | |
| --- | --- | --- | --- |
| **Large (1)** | **Intermediate (2)** | **Little or none (3)** |
| **Negligible (A)** | A1 | A2 | A3 |
| **Small (B)** | B1 | B2 | B3 |
| **Moderate (C)** | C1 | C2 | C3 |
| **Substantial (D)** | D1 | D2 | D3 |
| **Table Cell Colour Key (Permit conditions controlling on farm sea lice levels (19th March to 31st May)** | | | |
| A1 to A3, B1 to B2, C1 | No sea lice limit conditions. | | |
| B3, C2, D1 | Sea lice limits proposed by the developer and used in the screening assessment. | | |
| C3, D2 | Sea lice limits derived from an appropriate modelling assessment demonstrating that the farm will not compromise achievement of the sea lice exposure threshold. | | |
| D3 | Sea lice limits derived from an appropriate modelling assessment demonstrating that the farm will not compromise achievement of the sea lice exposure threshold. | | |

### Combined influence of SNDA1 on all Wild Salmon Protection Zones

Using the fish track exposure method, we can calculate the latest combined influence of all sources on the exposure threshold within all WSPZs, including the proposed site at the time of its submission.  SNDA1 has reduced the screening capacity in a number of nearby WSPZs (Laggan Bay, Mull of Kintyre -West) but to an extremely small degree.

### Conclusion of Sea Lice Screening

The outcome of current screening is that this site will not require a lice permit condition. No further modelling work is required, at this time.

## Conclusions

### Conclusions

* According to screening modelling, the proposed site (Sanda Island (SNDA1)) is in an area of high dispersion and has a relatively high capacity for erosion of material on the seabed.
* The screening model provides a reasonable performance in the vicinity of the site when compared to observational data.
* Solids modelling suggests this farm is having minimal influence compared to the surrounding farms.

### Recommendations and further modelling

Following the engagement meeting(s), this report may be revised and this should allow the applicant to submit a method statement which address the issues raised in this document.

Due to the proposed tonnage and identified PMFs, detailed 2D marine modelling of baths is required. Identified features should be considered. Solids modelling is not required due to the dispersive nature of the site. Calibration with dye/drogues is not required.

* Standard default NewDepomod must be undertaken prior to any marine modelling to demonstrate the proposed biomass can be supported. Solids impacts will be addressed with NewDepomod.
* The proximity to locational guidelines waterbodies has been assessed and not considered a risk, however the open water ECE calculation will still be required.
* Sea lice screening has shown a very small effect on the exposure risk. No criteria for further work have been triggered. The outcome of current screening is that this site will not require a lice permit condition. No further modelling work is required, at this time.

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