

# Aquaculture Modelling Screening & Risk Identification Report:

Report date: June, 2025

# TARENISH (TARE1)

# 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://www.sepa.org.uk/regulations/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 pen finfish farm called Tarenish (TARE1). The proposed MPFF is at: 084690, 843903 (Easting, Northing). Pre-application advice has been requested early in the process and consequently the proposal is still in development and subject to change, however the maximum proposed weight of fish to be farmed is 1500t.

This pre-application replaces a previous proposal for a site named Loch Carnan (LCAR1) at location 084708, 843928 (Easting, Northing), where the proposed biomass was 1467t. The new site is proposed to be offset by inactivation of existing pen-groups within Loch Carnan comprising: Sandavaig CAR/L/102967, South Ford CAR/L/1002966, Inner Loch Carnan CAR/L/1003904, and Holmar CAR/L/1088167, with a combined biomass of 1983.5 tonnes.

As the location of this proposal and the previous proposal for Loch Carnan (LCAR1) are very similar, with similar biomass, the screening results previously produced for Loch Carnan (LCAR1) are deemed suitably representative of this proposal, and have been reproduced in this report.

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

* It is possible that discharges from Tarenish (TARE1) will be able to comply with the relevant aspects of the SEPA Aquaculture Regulatory Framework.
* Features at risk, identified at this stage, do not appear to influence the feasibility of the proposed site with respect to the regulatory framework.
* Tarenish (TARE1) is suitable to progress to the next stage of the pre-application process outlined on the SEPA website.
* Contextual site information suggests Tarenish (TARE1) may be able to comply with mixing zone standards. NewDepomod modelling should be undertaken for the proposed site. It is strongly recommended that default NewDepomod modelling is undertaken prior to any marine modelling, to ensure the proposed biomass can be supported.
* Sea lice screening has shown that TARE1 leads to a very small increase in influence in on the same WSPZs as LCAR1. The sea lice permitting approach taken for LCAR1 should be applied to TARE1. No further modelling work is required, at this time.

## 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

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## SEPA: 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://www.sepa.org.uk/regulations/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.

A summary of the modelling methods employed during screening modelling can be found alongside this document on the SEPA website.

## SEPA: Screening modelling

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

The East Coast Lewis and Harris model used for screening modelling has a relatively low resolution in this area.

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

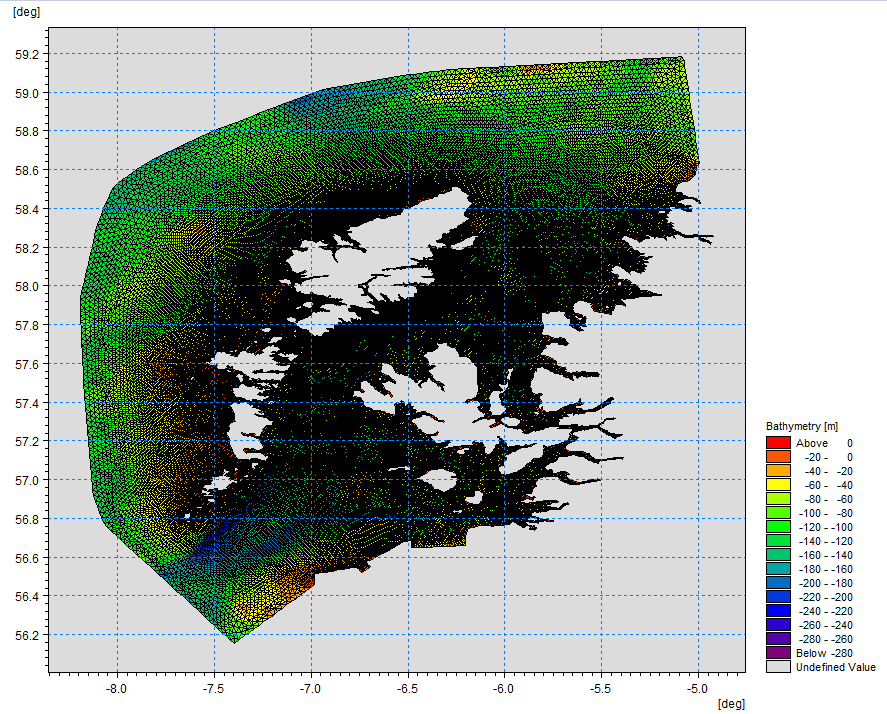


Figure 1. East Coast Lewis and Harris model grid

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

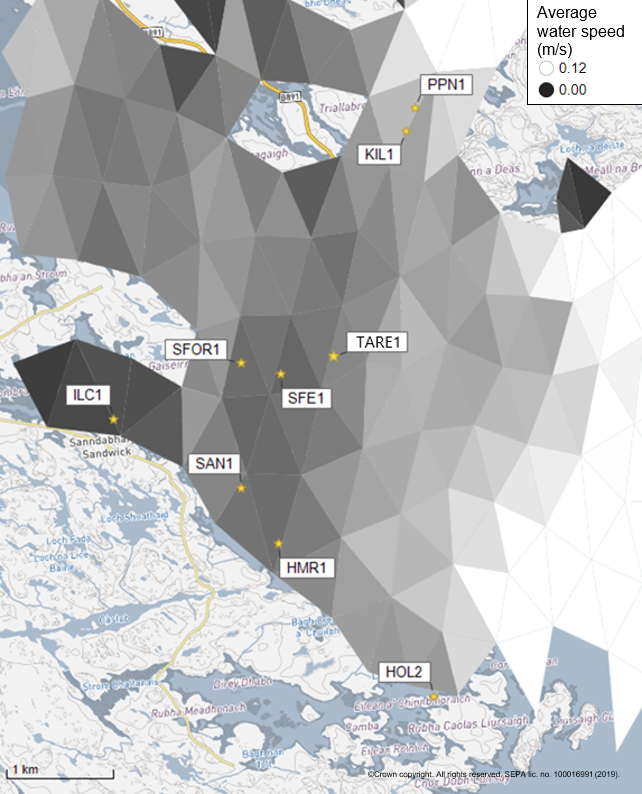


Figure 2: Modelled average water speed (metres per second – m/s) in the sea area around the proposed site (Tarenish (TARE1)).

### 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 1 g/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.

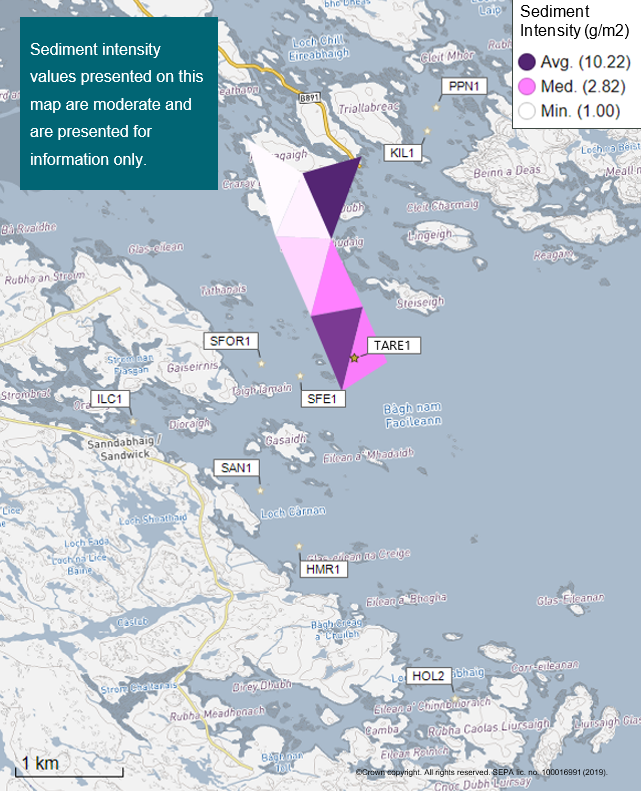


Figure 3: Modelled average sediment intensity over one month for the proposed site only (Tarenish (TARE1)).



Figure 4: Modelled average sediment intensity over one month for the proposed site (Tarenish (TARE1)) 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 10 ng/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 40 ng/l. This must be met 72 hours after the material has been discharged. The estimate of influence detailed here is precautionary.

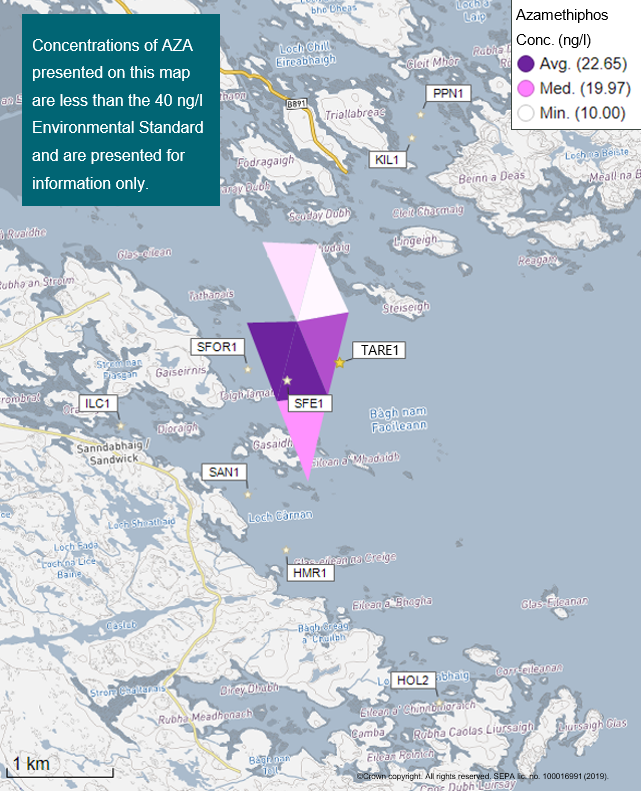


Figure 5: Modelled average Azamethiphos concentration over four days from neap tide release for the proposed site only (Tarenish (TARE1)).

## SEPA: 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, and it is determined that no further investigation with marine modelling will be required

Table 1: Table of identified features of interest

|  | **Feature Name** | **Feature Type** | **Location (Easting, Northing)** | **Brief Reason for Identification** |
| --- | --- | --- | --- | --- |
|  | None | None | None | None |

### Additional comments on sediment influence

Screening modelling predicts relatively low sediment influence from Tarenish (TARE1). The site is not near any identified sensitive features, however there a number of neighbouring farms, with potential for interaction. The relatively low biomass of these other farms means the risk from solids is considered to be low. However, should this farm require an increased bath medicine amount above that allowed through BathAuto, marine modelling will be required.

The relatively low flow speeds in this area, mean this site is more likely to struggle with having high enough dispersion to meet mixing zone criteria. Given it is a new site, default NewDepomod will be required. It is highly recommended that NewDepomod modelling is undertaken prior to proceeding further with this application.

### 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. Cumulative modelling of baths is not required.

### Nutrient influence

The proposed Tarenish Marine Fish Farm will not fall within an enclosed water body as defined by the Scottish Sea Loch Catalogue, but does fall within 2 km of Loch Carnon, a Category 2 listed site. Currently, there are five licenced sites – Inner Loch Carnan (CAR/L/1003904 – Maximum biomass 410T), Sandavaig (CAR/L/1002967 - 500T), Holmar (CAR/L/1088167 - 473.5T), South Ford (CAR/L/1002966 - 600T) and South Ford East (CAR/L/1088166 - 800T) – with just Inner Loch Carnan within the Category 2 area. The proposal outlines a plan to relinquish four of the five existing licences – Inner Loch Carnan, Sandavaig, Holmar and South Ford, and develop a new site – Tarenish (1500T). This sees a planned overall decrease in total biomass from 2783.5T to 2300T (Tarenish and South Ford East) and a general shift of farming operations away from Loch Carnon into more open water. Therefore, as the proposal represents an overall reduction in biomass in the vicinity, the proximity to locational guidelines waterbodies has been assessed and not considered a risk. However, the standard open water ECE calculation will still be required to ensure nutrient enhancement levels from this new farm are acceptable. South Ford East and Tarenish fall within 2 km of each other, so their combined impact needs to be considered.

### Sea Lice Screening

Sea lice screening was carried out using our standard method with the translated Scottish Shelf ECLH (East Coast Lewis & Harris) 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 – TARE1

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, the highest modelled influence occurs in the Loch Stocinis / Loch Fleòideabhagh / Loch Fhionnsabhaigh WSPZ.  This does not mean the actual modelled exposure will be high.

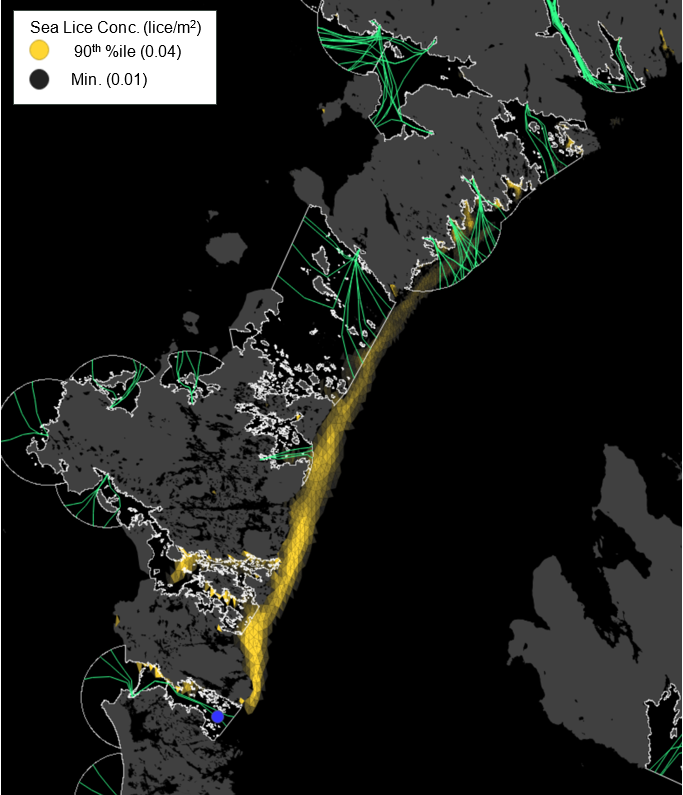


Figure : Map of the average modelled lice concentration over the simulated April and May period (in lice/m2) within the top two meters of the sea area. TARE1 site location shown as a blue circle. Fish tracks are shown as green lines with the WSPZs, which are highlighted by a white boundary.

### Modelled Sea Lice Concentrations – Single Site Influence on Exposure – TARE1

Table 2 shows information relating to the influence of modelled lice concentrations, from TARE1 alone, on fish track exposure levels within the relevant WSPZs.

Table : Influence of modelled sea lice from TARE1 on exposure in the relevant affected WSPZs.

| **Wild Salmon Protection Zone (WSPZ)** | **95th %ile of Fish Track Exposure (lice/m2 days)** | **% of Exposure Threshold (0.7 lice/m2 days)** |
| --- | --- | --- |
| Loch Stocinis / Loch Fleòideabhagh / Loch Fhionnsabhaigh | 0.02 | 2.75 |
| Loch Maddy | 0.02 | 2.26 |
| Loch Tarbert (Harris) | 0.01 | 1.49 |
| Sound of Harris | 0.01 | 1.47 |

#### WSPZ Influence

Four WSPZs are subject to a negligible influence.  Nine other WSPZs are influenced but to a level which is extremely low. Exclusion of these from the table brings focus on the areas of highest influence. However, these influences are included in the combined exposure analysis below.

#### 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 TARE1 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 it is Loch Stocinis / Loch Fleòideabhagh / Loch Fhionnsabhaigh. Table 3 shows that TARE1 lies within cell B1 (Negligible, Large).

Table : Location of TARE1 within the assessment matrix framework of WSPZ capacity and site contribution.

| **Contribution to infective-stage sea lice exposure (% of exposure threshold)** | **Remaining available capacity in WSPZ** | | |
| --- | --- | --- | --- |
| **Large (1)** | **Intermediate (2)** | **Little or none (3)** |
| **Negligible (A) (<10)** | A1 **TARE1** | A2 | A3 |
| **Small (B) (10 to <20)** | B1 | B2 | B3 |
| **Moderate (C) (20 to <30)** | C1 | C2 | C3 |
| **Substantial (D) (>30)** | 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 TARE1 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 at the time of its submission. TARE1 mainly affects the Loch Stocinis / Loch Fleòideabhagh / Loch Fhionnsabhaigh WSPZ.  Its inclusion has reduced some of the remaining capacity in Loch Stocinis / Loch Fleòideabhagh / Loch Fhionnsabhaigh, but does not, on its own, cause the exposure threshold upper limit to be exceeded.  TARE1 has also reduced the screening capacity in a number of nearby WSPZs but to a very small degree.

### Conclusion of Sea Lice Screening

TARE1 is replacing LCAR1. The LCAR1 results have been scaled to the tonnage of the new site. TARE1 replaces LCAR1 in the original base screening matrix published in consultation documentation. The extra tonnage does not change the position of the new TARE1 site within the matrix.

The outcome of current screening is that current lice permitting approach taken for LCAR1 will need to be applied to TARE1. However, no further modelling work is required, at this time.

### Risks identified from contextual site data

Table 4: 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?** |
| --- | --- | --- | --- | --- |
| TARE1 | 84708, 843928 | 1500 | Proposed | N/A |
| HMR1 | 84060, 842230 | 473.5 | No record of use | N/A |
| HOL2 | 85400, 840700 | 311 | Fish last on site Jun 05 | N/A |
| ILC1 | 82600, 843500 | 410 | Fish last on site May 03 | N/A |
| KIL1 | 85547, 845966 | 450 | Fish last on site Jul 19 | N/A |
| PPN1 | 85645, 846176 | 654 | Fish last on site Jul 19 | N/A |
| SAN1 | 83740, 842770 | 500 | Fish last on site Mar 21 | N/A |
| SFE1 | 84193, 843798 | 800 | Fish last on site Sep 21 | N/A |
| SFOR1 | 83835, 843935 | 600 | Fish last on site Dec 17 | N/A |

## SEPA: Conclusions

### Conclusions

* According to screening modelling, the proposed site (Tarenish (TARE1)) is in an area of moderate dispersion and has a relatively low capacity for erosion of material on the seabed.
* The screening model provides a moderate performance in the vicinity of the site when compared to observational data.
* Solids modelling suggests that the relative influence of Tarenish (TARE1) is likely to be similar to other sites for a similar tonnage.
* The influence on the surrounding sea area from Tarenish (TARE1) is likely to be moderate.
* It is likely that discharges of bath medicines from Tarenish (TARE1) will be dispersed to moderate levels over a relatively small area.
* Tarenish (TARE1) is likely to result in an increase in the total influence of all sites modelled. This is likely to interact with other areas of influence generated by existing sites.

### 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 size of this proposed marine pen fish farm and lack of identified risks, marine modelling is not required for this site.
* However, should an insufficient bath medicine quantity be granted through BathAuto, then 2D marine modelling of baths will need to be undertaken. The size of the marine model should include all sites identified in this report. The resolution of the marine model should be relatively fine around the proposed site. Cumulative modelling of baths is not required.
* Flow speeds are slow at this location and standard default NewDepomod must be undertaken prior to any marine modelling to demonstrate the proposed biomass can be supported.
* The proximity to locational guidelines waterbodies has been assessed and not considered a risk, however the standard open water ECE calculation will still be required due to the relatively low dispersion nature of waters surrounding the site.
* Sea lice screening has shown that TARE1 leads to a very small increase in influence in on the same WSPZs as LCAR1. The sea lice permitting approach taken for LCAR1 should be applied to TARE1. No further modelling work is required, at this time.

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