

Marine Aquaculture Site **Port na Mine** **Etive 3**

Annex 3. Assessment of Equilibrium Concentration Enhancement

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This assessment of Equilibrium Concentration Enhancement (ECE) has been prepared to support Dawnfresh Farming Ltd.'s proposed biomass changes to Etive 3 (Port na Mine) in Loch Etive.

There are currently four licenced finfish farms in Loch Etive (table 1) farming a permitted maximum stocked biomass (MSB) of 3,753.7 tonnes. The proposal seeks to increase Etive 3's MSB from 458.4 tonnes to 700 tonnes. If the proposal is successful farming permissions for Etive 2, which currently has a licenced MSB of 250 tonnes, will be surrendered and the farm removed. This will result in a net reduction of 8.4 tonnes biomass farmed in Loch Etive.

Loch Etive is a Category 3 loch in the Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters⁽¹⁾. Derivation of categories 1 – 3 for locational guidance is based on the sum of two indices: nutrient enhancement (derived from predicted ECE for nitrogen) and benthic impact (derived from the percentage area of the sea-bed predicted to be 'degraded' by organic deposition).

A nutrient enhancement model, as described by Gillibrand *et al.* 2002², was employed to predict ECE for nitrogen. Model parameters and results are shown in table 3. Current and proposed MSBs have a predicted ECE of 0.5 $\mu\text{mol N l}^{-1}$, and so there will be no change to the nutrient enhancement index for Loch Etive (table 4) as a result of the proposal.

Table 1: CAR licenced seawater finfish farms within Loch Etive

| Farm no. | Farm name | Operator | Active licence no. |
|----------|-------------------------|-----------------------|--------------------|
| 1 | Etive 2 (Inverawe) | Dawnfresh Farming Ltd | CAR/L/1022266 |
| 2 | Etive 3 (Port na Mine) | | CAR/L/1010366 |
| 3 | Etive 4 (Airds Point) | | CAR/L/1018068 |
| 4 | Etive 6 (Sailean Ruadh) | | CAR/L/1042067 |

Table 2: Maximum stocked biomass permitted at each farm in Loch Etive (current and proposed).

| Farm no. | Farm name | Current | Proposed |
|--------------|-------------------------|----------------|----------------|
| 1 | Etive 2 (Inverawe) | 250 | 0 |
| 2 | Etive 3 (Port na Mine) | 458.4 | 700 |
| 3 | Etive 4 (Airds Point) | 1,545.3 | 1,545.3 |
| 4 | Etive 6 (Sailean Ruadh) | 1,500 | 1,500 |
| Total | | 3,753.7 | 3,745.3 |

Note: The proposal results in a total reduction of 8.4 tonnes biomass farmed in Loch Etive.

Table 3: Nutrient enhancement model parameters and predicted ECE values.

| Parameter | Current | Proposed |
|-------------------------------|---------------------|----------|
| MSB (tonnes) | 3,753.7 | 3,745.3 |
| S (kg N/T/year) | 48.2 ² | |
| Q (M m ³ /year) | 24,913 ¹ | |
| ECE (µg N l ⁻¹) | 7.3 | 7.2 |
| ECE (µmol N l ⁻¹) | 0.5 | 0.5 |

Note: Gillibrand *et al.* (2002)² and assumes a feed wastage of 5%, digestibility of 90% and mean feed nitrogen content of 7.2% (wet weight).

Table 4: Index of nutrient enhancement from predicted levels of ECE for nitrogen (after Gillibrand *et al.* 2002²).

| Predicted ECE for nitrogenous nutrients arising from finfish farming (µmol N l ⁻¹) | Nutrient enhancement index |
|--|----------------------------|
| > 10 | 5 |
| 3 – 10 | 4 |
| 1 – 3 | 3 |
| 0.3 – 1 | 2 |
| < 0.3 | 1 |
| 0 | 0 |

References

- (1) Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. Marine Scotland Science. March 2024 (last updated April 2024).
- (2) Gillibrand P A, Gubbins M J, Greathead C and Davies I M. 2002. Scottish Executive locational guidelines for fish farming: predicted levels of nutrient enhancement and benthic impact. *Scottish Fisheries Research Report 63/2002*. Aberdeen: Fisheries Research Services. 52 pp.