# Scottish Sanitary Survey Project

# Restricted Sanitary Survey Report

## Loch Feochan North: Glen Feochan

## AB 491

## February 2010

Cefas

Food Standards Agency
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Buidheann Inbhe-Bìdhe

# Report Distribution – Loch Feochan North

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* Distribution of both draft and final reports to relevant agency personnel is undertaken by FSAS.

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# 1. Area Overview

Loch Feochan is located on the west coastline of Scotland, 5 km south of Oban, on the southwest coast of Scotland (see Figure 1.1). The Loch Feochan North production area encompasses the intertidal area at the head of the loch only and is 0.7 km wide and 0.66 km in length. The area is very sheltered from the open sea and has two rivers discharging into it, the River Nell which drains from Loch Nell and the Feochan Bheag. A restricted sanitary survey at Loch Feochan North was undertaken in response to receipt of an application to classify the area for commercial harvest of common cockles within the intertidal zone.

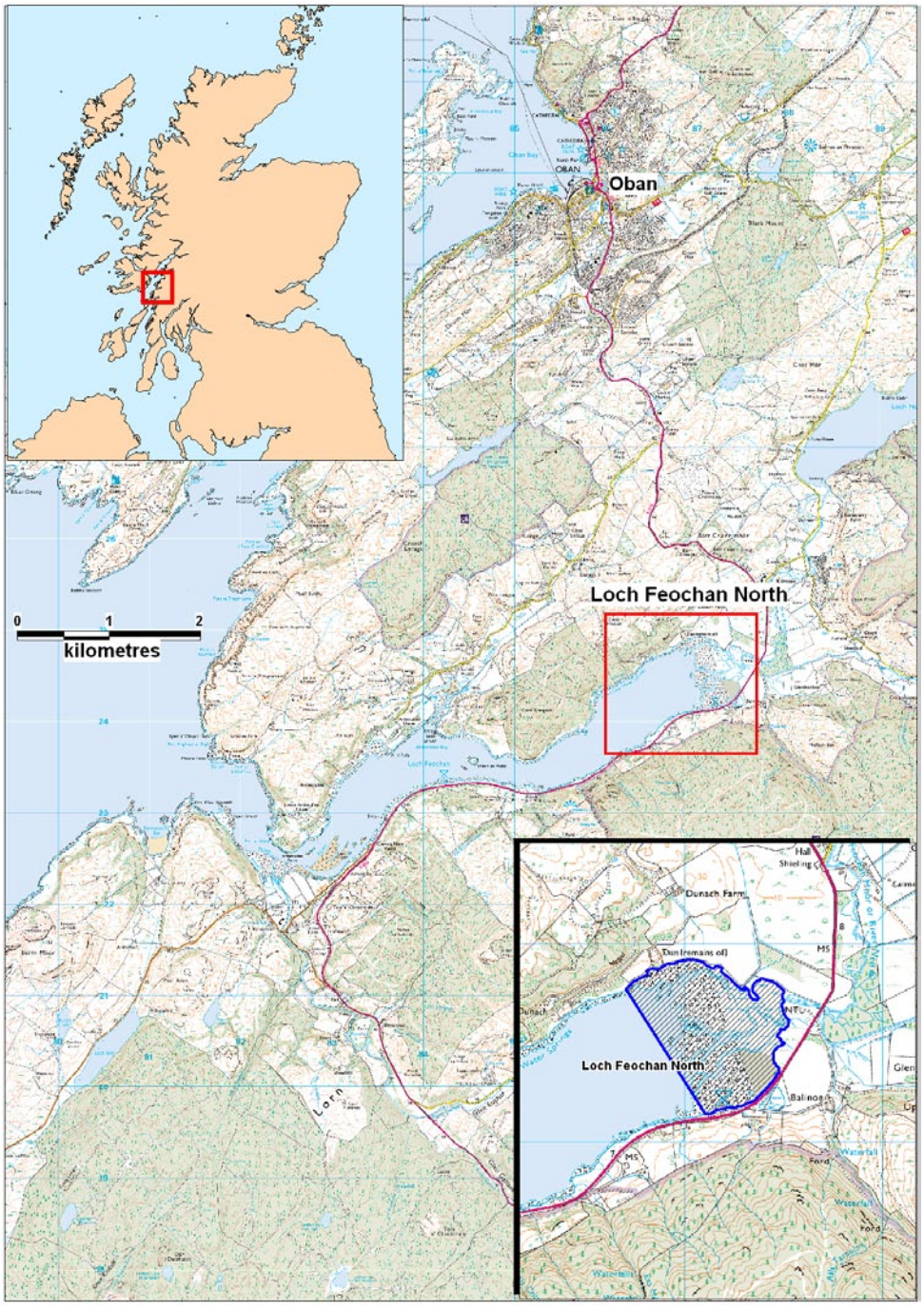


Figure 1.1 Location of Loch Feochan North

## 1.1 Land Cover

The land cover on the surrounding coastline of the production area is varied. The western shoreline is predominantly coniferous woodland. LandCover 2000 data indicates that there are large areas of improved grassland at the north end of the production area surrounding the River Nell. The western shoreline is covered in a band of neutral grassland next to the shoreline and then more coniferous woodland inland.

Faecal coliform contributions from improved grassland have been shown to be approximately 8.3 x $10^8$ cfu $km^{-2}$ $hr^{-1}$ (Kay et al, 2008). The contribution to the contamination in shellfish from all land cover types would be expected to increase significantly after marked rainfall events. This increase would be highest, at more than 100-fold, for improved grassland. Areas of improved grassland near the fishery would be expected to contribute the most to contamination levels carried in surface runoff to the western end of the common cockle bed.

## 1.2 Human Population

Figure 1.2 shows the three census output areas that are directly adjacent to Loch Feochan plus a further area that falls within the catchment area of the river feeding into the head of the loch. The total population for the four census areas was 565 at the 2001 census. Dwellings are mostly scattered. The settlement of Kilmore and the nearby estate of Barran is located north of the production area on the banks of the River Nell. The largest concentration of dwellings in the area, the Barran estate, has 36 houses according to the Kilmore Community Council. The area also has a marina and a mix of B&B and self catering accomodation for visitors and so would be expected to have a higher human population in summer.

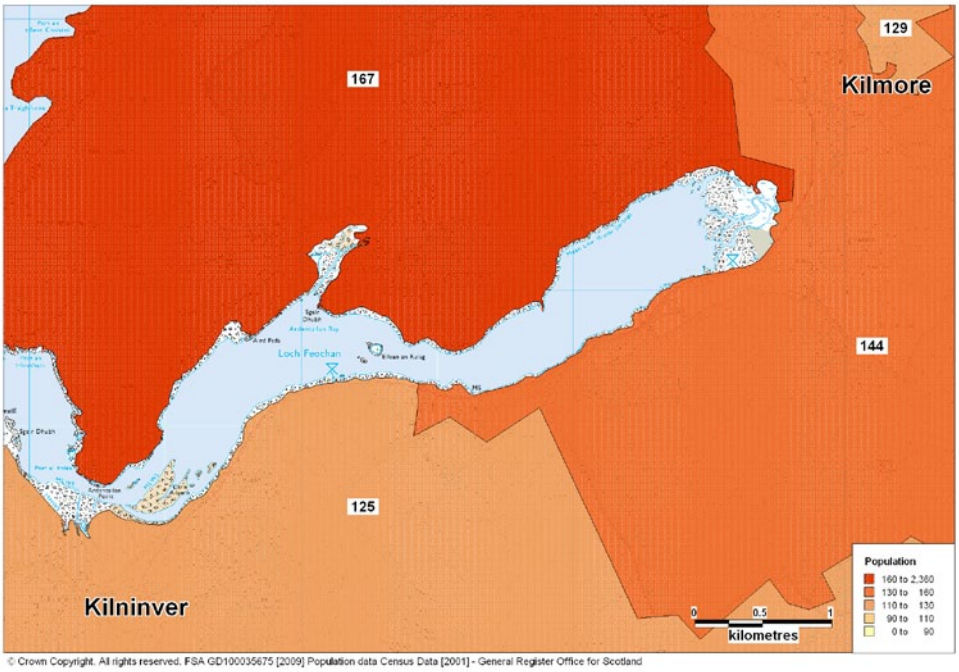


Figure 1.2 Human population surrounding Glen Feochan

# 2. Fishery

The Loch Feochan North production area (SIN AB 491 908 04) consists of a single site, Glen Feochan Cockles, which is a wild common cockle (*Cerastoderma edule*) fishery. The fast track classification production area boundaries as identified by the Food Standards Agency on 3rd April 2009 are given as the area bounded by lines drawn between NM 8670 2480 and NM 8710 2410 extending to MHWS.

There is currently no representative monitoring point (RMP) assigned to this area. The common cockle bed at Glen Feochan does lie within a designated shellfish growing water (SGW). The SGW at Loch Feochan is an area inshore of a line drawn between NM 852 236 and NM 852 234 extending to MLWS. The designated shellfish waters monitoring point is located at NM 87036 24233.

The cockle bed lies within the production area, although the exact boundaries are not known. The harvester outlined the area desired for classification and it is presumed that this encompasses the entire cockle bed. The cockles are harvested by hand raking and is planned to take place throughout the year.

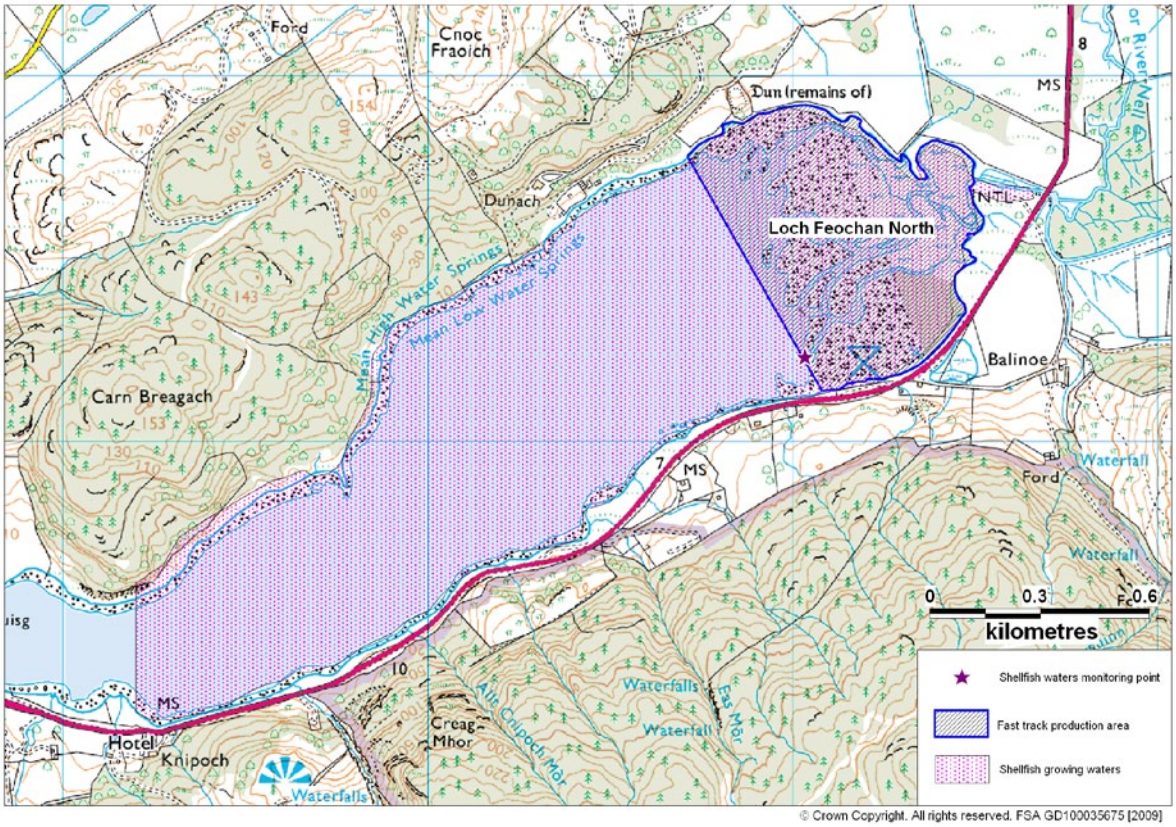


Figure 2.1 Loch Feochan North fishery

# 3. Sewage Discharges

Two discharge consents were issued by the Scottish Environment Protection Agency (SEPA) for the area adjacent to Loch Feochan North. These are listed in Table 3.1 and mapped in Figure 3.1.

Table 3.1 SEPA discharge consents

| Ref No. | NGR of discharge | Discharge type | Discharges to | PE | Discharge Vol $m^3$ per day |
|---|---|---|---|---|---|
| CAR/R/1015842 | NM 8714 2577 | Continuous | Land | 8 | - |
| CAR/L/1000611 | NM 8820 2580 | Continuous & treated | River Nell | 120 | 25 |

The discharge covered by the consent reference number CAR/L/1000611 discharges to the River Nell and thus will contribute to the loading of this river as it impacts at the eastern end of the production area.

A community septic tank and sewage discharge was identified by Scottish Water for the area north of Loch Feochan North. This is detailed in Table 3.2 and mapped in Figure 3.1.

Table 3.2 Discharge identified by Scottish Water

| Consent No. | Discharge Name | NGR of discharge | Discharge Type | Level of Treatment | Consented/ design PE | Consented flow $m^3$/day |
|---|---|---|---|---|---|---|
| CAR/L/1000611 | Kilmore CSO | NM 8826 2569 | Intermittent | 6mm screening | 120 | Overflow operates at 1/ls |
| CAR/L/1000611 | Kilmore STW | NM 8826 2569 | Continuous | Secondary | 120 | 25 |

No sanitary or microbiological data were available for these discharges.

Several suspected outfall pipes were also observed during the shoreline survey and these are listed in Table 3.3. Their locations have been included in the mapped discharges in Figure 3.1. Further details can be found in the shoreline survey report in the appendix.

Table 3.3 Observations of potential sewage discharges

| No. | Date | NGR | Description of potential sewage discharge |
|---|---|---|---|
| 1 | 11/06/2009 | NM 86939 24100 | 15cm plastic pipe, no flow. |
| 2 | 11/06/2009 | NM 86993 24108 | 60cm culvert. 15cm plastic pipe, end submerged. |
| 3 | 11/06/2009 | NM 87388 24191 | 78cm iron culvert. |
| 4 | 11/06/2009 | NM 87165 24860 | Two plastic pipes - 10cm and 6cm. |
| 5 | 11/06/2009 | NM 87133 24875 | 8cm plastic pipe. |
| 6 | 11/06/2009 | NM 87114 24889 | 30cm clay pipe. |
| 7 | 11/06/2009 | NM 86466 24672 | 10cm cast iron pipe. |
| 8 | 11/06/2009 | NM 86342 24566 | 20cm cast iron pipe, broken. |

In addition, SEPA report that there are two untreated leachate streams discharging from the Moleigh Landfill Site to Moleigh Burn, which falls within the Loch Feochan catchment area approximately 2.2km northwest of the loch. This landfill site accepts household, commercial and industrial wastes, including sewage sludge and so could potentially lead to contamination within

the catchment area, though it is unclear what impact this would have at the fishery as the burn does not appear to run directly to the loch.

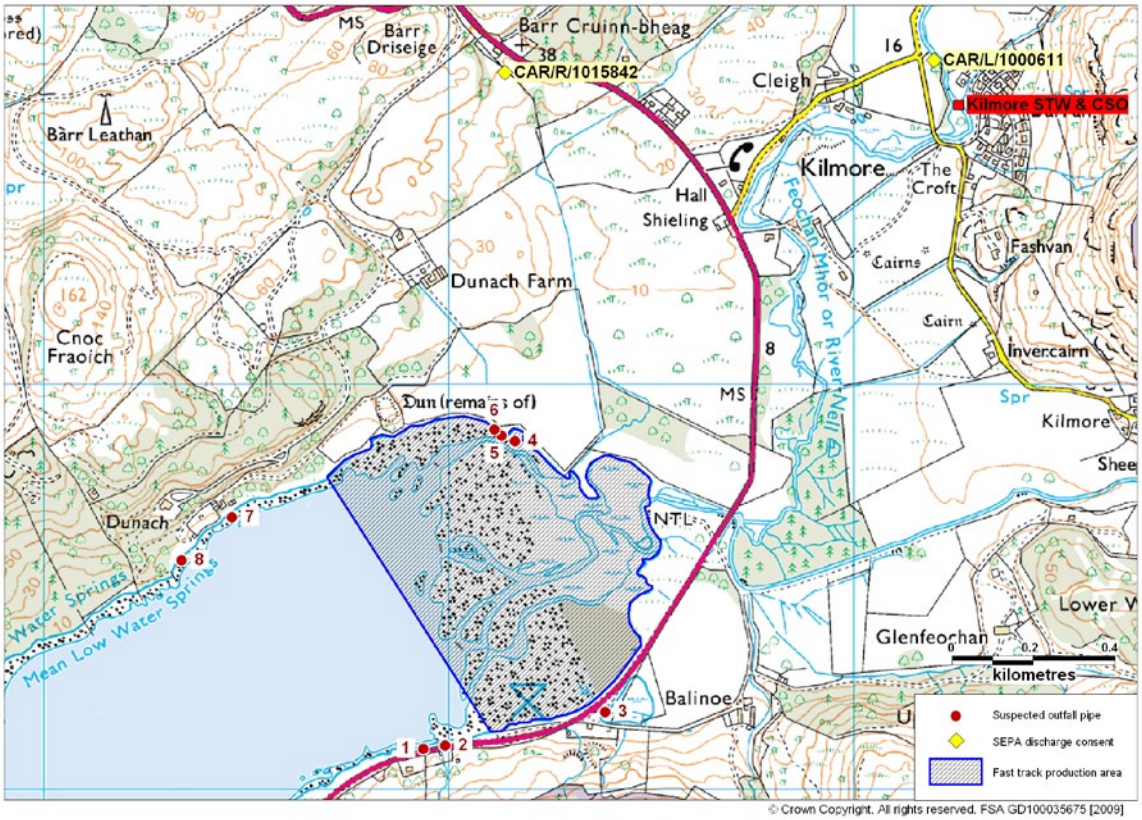


Figure 3.1 Sewage discharges at Loch Feochan North

# 4. Animals

## 4.1 Livestock

The only significant source of information concerning livestock numbers in the area surrounding Loch Feochan North was available from the shoreline survey. The shoreline survey only relates to the time of the site visits on the 11th June 2009.

During the shoreline survey, six sheep were observed on the shoreline at the northern end of the Loch Feochan North production area (see Figure 4.1). No other livestock was observed at the time of the shoreline survey.

SEPA report a total of 13 known farms engaged in cattle or sheep production operating within the catchment draining to Loch Feochan, indicating that the livestock population within the catchment is likely to be significantly higher than observed during the survey.

## 4.2 Wildlife

Seabirds such as gulls will always be present on and around the loch but in the absence of specific nesting or roosting sites their distribution is likely to be even over time and as such would not materially affect the spatial assessment of microbiological quality. During the shoreline survey eight geese were observed at the northern end of the Loch Feochan North production area (see Figure 4.1).

No other wildlife was observed at the time of the shoreline survey. However, it is likely that other animals including seals, otters and deer may be present in the area. However, the distribution and numbers of these species is unknown.

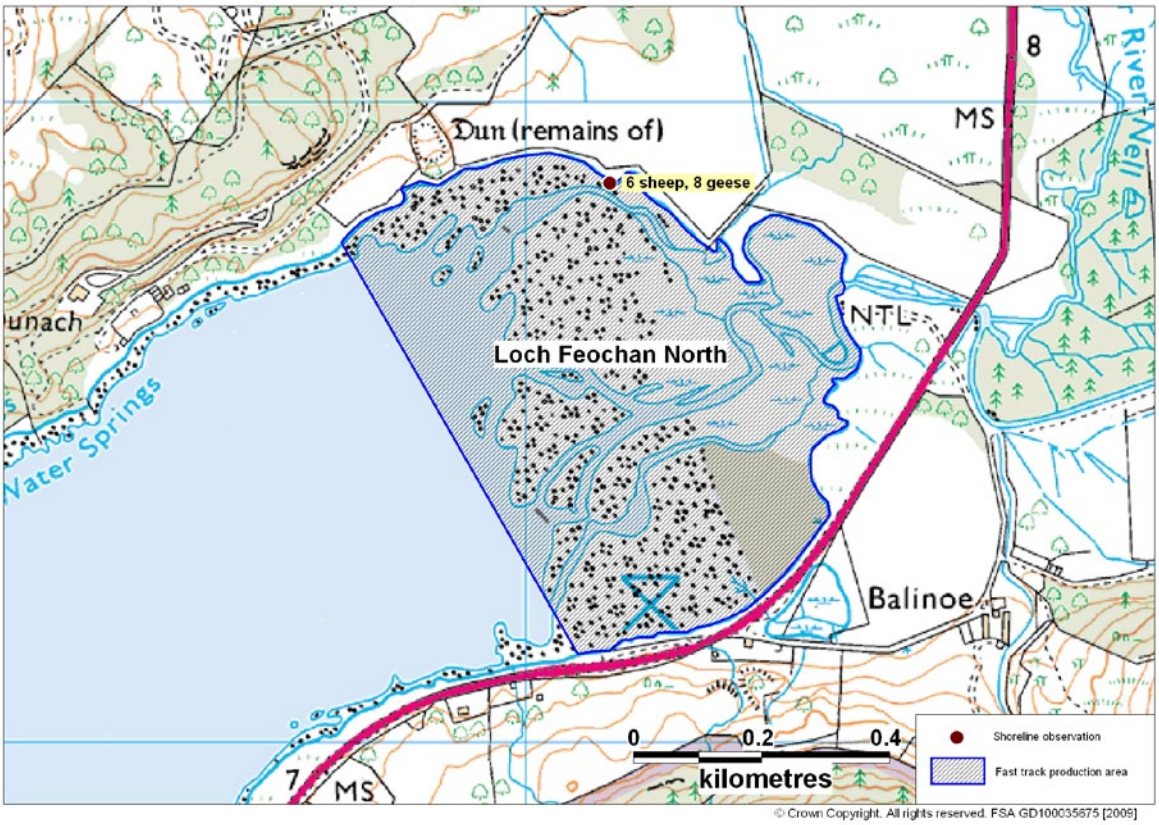


Figure 4.1 Livestock and wildlife observations at Loch Feochan North

# 5. Rainfall

The nearest weather station is located at Blaran, approximately 7 km to the south of Loch Feochan. Daily rainfall values were purchased from the Meteorological Office for the period 1/1/2003 to 31/12/2008 inclusive, although there were no records for 88 days during this period. Due to the proximity of the weather station to Loch Feochan, rainfall recorded here is likely to be similar to that experienced on the loch and the surrounding land.

High rainfall and storm events are commonly associated with increased faecal contamination of coastal waters through surface water run-off from land where livestock or other animals are present, and through sewer and wastewater treatment plant overflows (Mallin et al. 2001, Lee and Morgan 2003).

The influence of rainfall on microbiological quality will depend on factors such as local geology, topography, land use and sewerage infrastructure.

## 5.1 Rainfall at Blaran

Total annual rainfall and mean monthly rainfall were calculated, and are presented in Figures 5.1 and 5.2. The monthly mean for July and August was calculated by dividing the total monthly rainfall by the number of years for which records were provided.

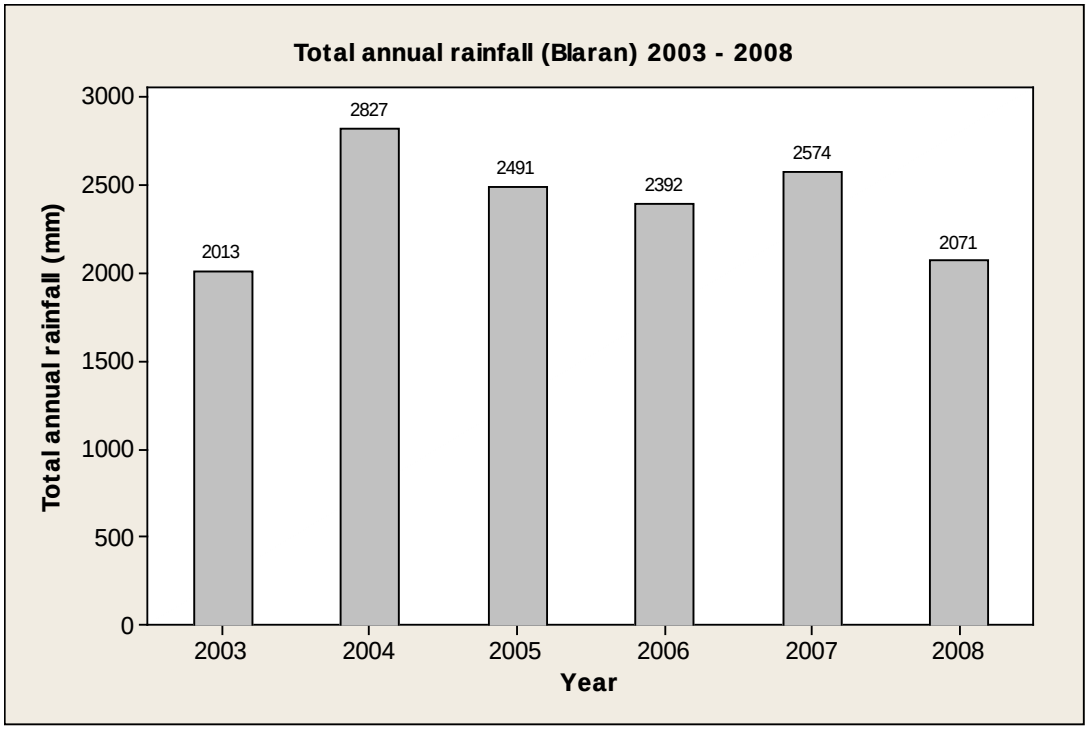


Figure 5.1 Total annual rainfall at Blaran 2003 – 2008 (* Rainfall data was not available for the whole of July and August 2008)

Total annual rainfall was considerably lower in 2003 than in the following five years.

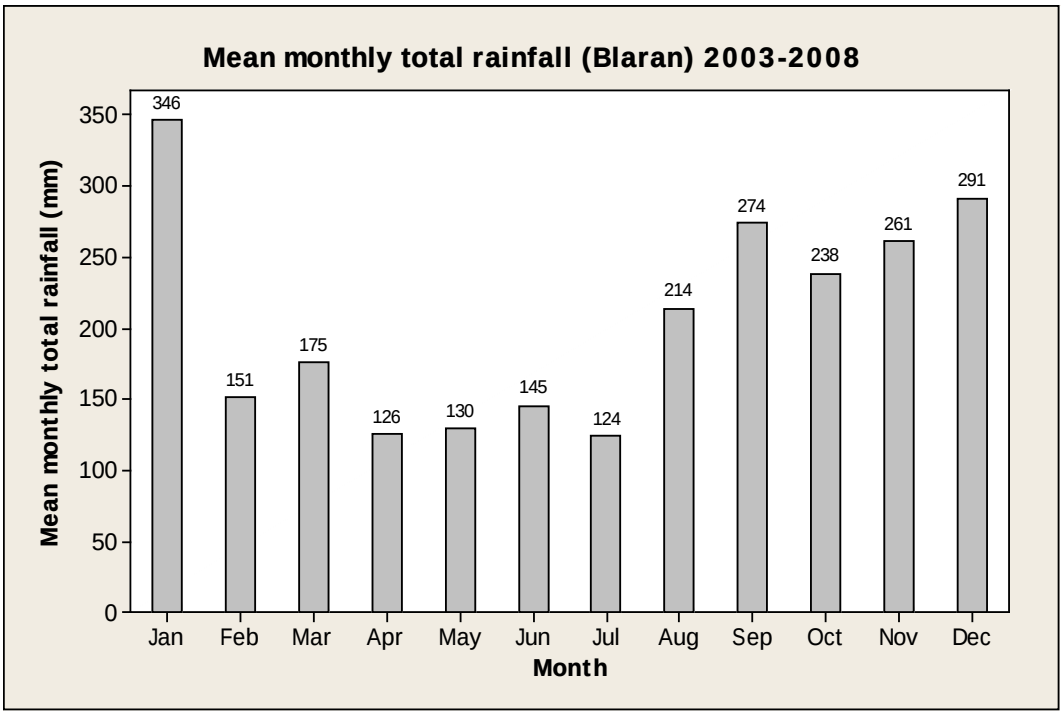


Figure 5.2 Mean total monthly rainfall at Blaran 2003 – 2008

Mean rainfall varies markedly between months. The wettest months were August to January. The largest increases in rainfall over the previous months occurred in August and January.

Periods of increased rainfall are generally associated with higher levels of contaminated surface water runoff. Marked changes in the level of rainfall may also cause significant wash off of accumulated material. This effect would be likely to be most significant in August but may possibly also occur in January.

Faecal contaminants from other sources may be independent of rainfall and so episodes of contamination may occur outside identified periods of higher rainfall, for example when livestock are present on the shoreline.

# 6. River Flow

There is no river gauging station in the vicinity of Loch Feochan. A total of seven fresh water inputs were observed discharging into the Loch Feochan North production area. The details of these streams are listed in Table 6.1 and mapped in Figure 6.1.

Table 6.1 River flow and loadings – Loch Feochan North

| No | Grid Ref | Description | Width (m) | Depth (m) | Measured Flow (m/s) | Flow in $m^3$/day | *E. coli* (cfu/ 100 ml) | Loading (*E. coli* per day) |
|---|---|---|---|---|---|---|---|---|
| 1 | NM 86463 23776 | Stream | 0.55 | 0.04 | 0.195 | 370.7 | <100 | ^ |
| 2 | NM 86584 23882 | Stream | 0.29 | 0.03 | 0.293 | 220.2 | <100 | ^ |
| 3 | NM 86993 24108 | Culvert | 0.10 | 0.01 | 0.495 | 3 | <100 | ^ |
| 4 | NM 87388 24191 | Culvert | 0.25 | 0.02 | 0.262 | 47 | <100 | ^ |
| 5 | NM 87280 24760 | Stream | 0.65 | 0.04 | 0.364 | 817.7 | 6500 | $5.3 \times 10^9$ |
| 6 | NM 86823 24863 | Stream | * | * | * | * | <100 | ^ |
| 7 | NM 87616 24679 | River Nell | 8.0 | 0.15 | 0.298 | 30900 | <100 | ^ |

* Not enough flow to measure and calculate loadings

^ Water samples with an *E. coli* result of <100 are not suitable for calculating *E. coli* loading per day

The only freshwater input with a high enough *E. coli* concentration to determine a loading was located on the north east side of the production area. The calculated loading for this stream was high considering the weather had been dry prior to the shoreline survey. Although the *E. coli* concentration in the River Nell was low at the time of the visit, given that the flow is large it is likely that this contributes significantly to the *E. coli* input at the eastern end of the area. It is also likely that the loadings of all the freshwater sources will increase following rainfall.

Calculated loadings are based on the flows and dimensions recorded during the shoreline survey and do not necessarily reflect those that would apply under different conditions.

Where the bacterial loading is labelled as on the map, the scientific notation is written in digital format, as this is the only format recognised by the mapping software. So, where normal scientific notation for 1000 is $1 \times 10^3$, in this case it would be written as 1E+3.

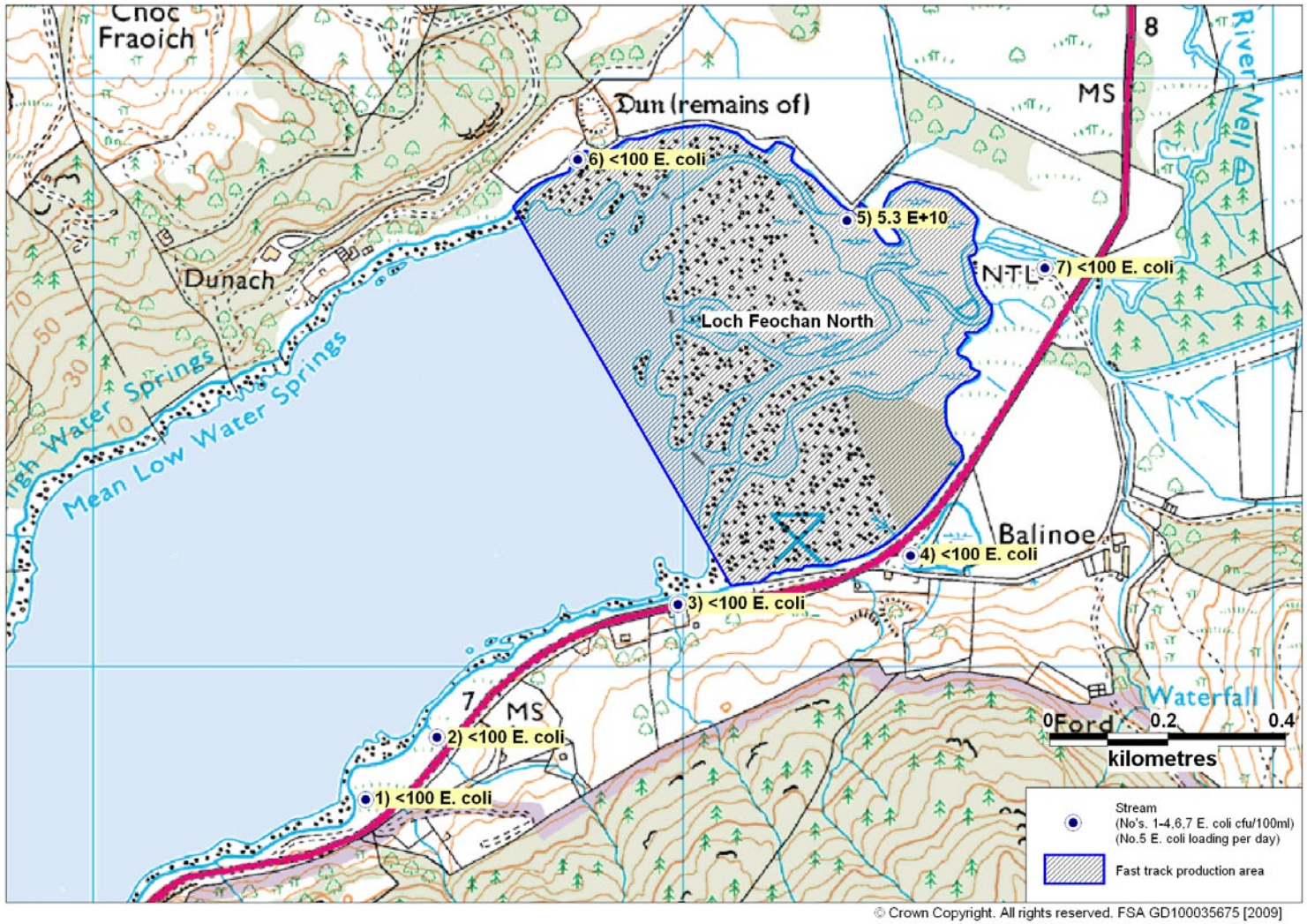



Figure 6.1. Location of river flows and loadings at Loch Feochan North

# 7. Historical *E. coli* Monitoring Data

Only two sample result were available via the monitoring program at the date of writing:

Table 7.1 Results from classification monitoring at Loch Feochan North

| Date | Production Area | Area Name | Species | GridRef | *E.coli* (MPN /100g) |
|---|---|---|---|---|---|
| 07/10/2009 | AB 491 908 04 | Loch Feochan North | Common cockle | NM 87157 24258 | 3500 |
| 02/11/2009 | AB 491 908 04 | Loch Feochan North | Common cockle | NM 87108 24200 | 790 |

Both results fell within the Class B range microbiological criteria (230 and ≤4600 *E. coli*/100g). It is not possible to assess seasonal or other variations in microbiological monitoring results at this point due to the limited data available.

The Loch Feochan shellfish growing water was monitored by SEPA from the 3rd quarter 2003 to the last quarter 2008 (Table 7.2). The shellfish water designation was rescinded by the Scottish Government in 2009. Under the Shellfish Growing Waters program, common mussels (*Mytilus* spp.) are monitored for faecal coliform (FC) levels. As both the shellfish and indicator species are different, the results in Table 7.1 cannot be compared directly with those in Table 7.2. Nevertheless, results gathered under the SGW monitoring program can give a general picture of contamination levels present in the loch.

Table 7.2 Shellfish Waters Directive shellfish monitoring results

| Collection Year/Quarter | Per 100 ml flesh and intervalvular fluid |
|---|---|
| 2003 Q3 | 1400 |
| 2003 Q4 | 70 |
| 2004 Q1 | 70 |
| 2004 Q2 | 160 |
| 2004 Q3 | 70 |
| 2004 Q4 | 310 |
| 2005 Q1 | 500 |
| 2005 Q2 | 110 |
| 2005 Q3 | 70 |
| 2005 Q4 | 100 |
| 2006 Q1 | 430 |
| 2006 Q2 | 1850 |
| 2006 Q3 | 255 |
| 2006 Q4 | 90 |
| 2007 Q1 | 310 |
| 2007 Q2 | 500 |
| 2007 Q3 | 6300 |
| 2007 Q4 | 34500 |
| 2008 Q1 | 500 |
| 2008 Q2 | 1100 |
| 2008 Q3 | 1700 |
| 2008 Q4 | 9100 |

A significant proportion (59%) of the Shellfish Waters Directive shellfish monitoring results were above the 300 faecal coliform per 100 ml limit given in that directive (which applies on a 75% basis). Assuming an approximate equivalence between faecal coliforms and *E. coli*, those results are also above the class A limit. The result for Q4 in 2007 was very high at 34,000 per 100 ml.

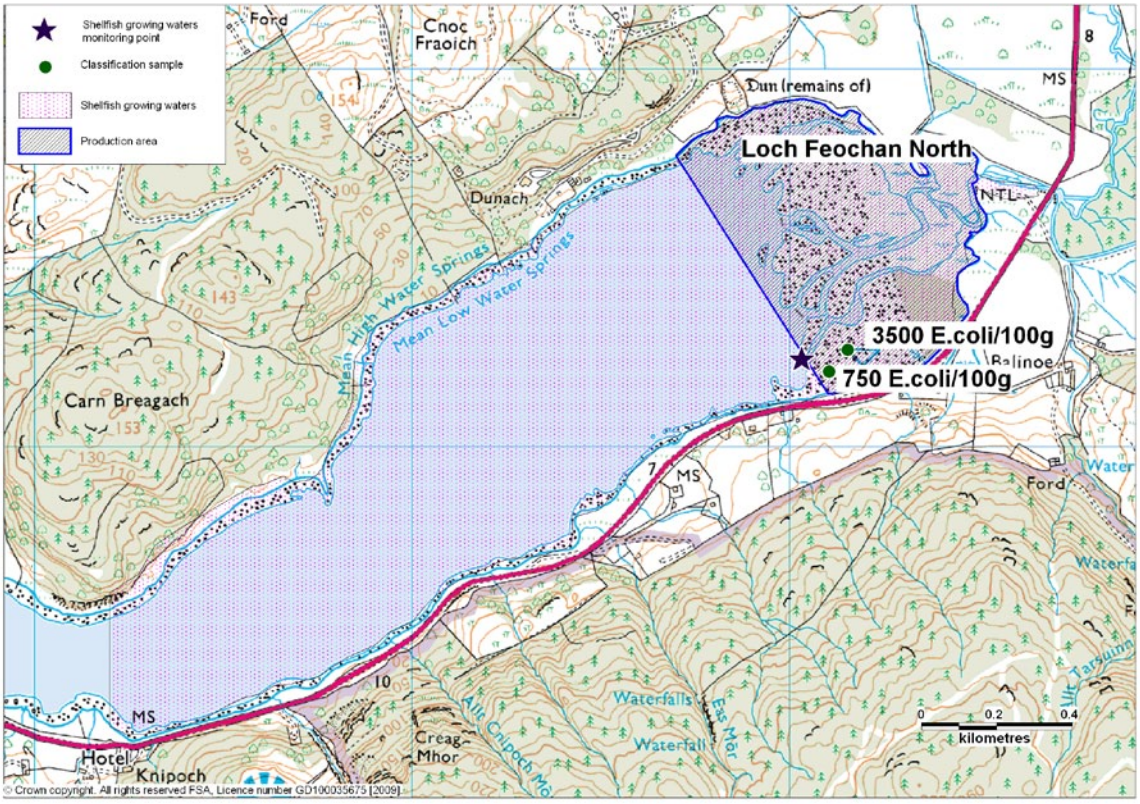


Figure 7.1 Historical monitoring points at Loch Feochan

# 8. Bathymetry & Hydrodynamics

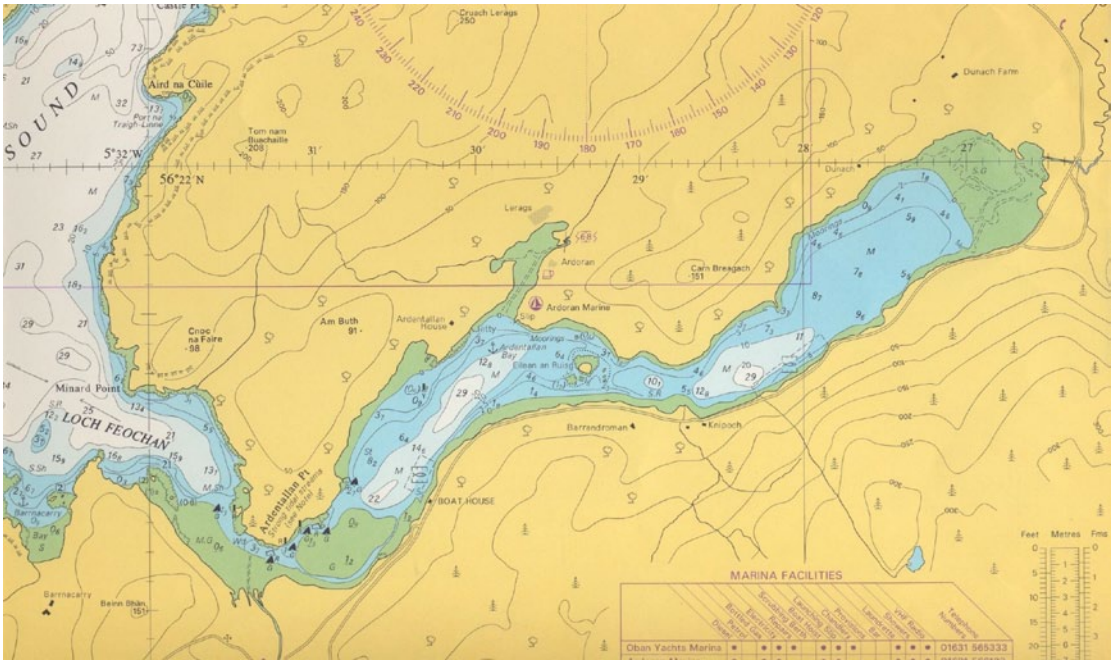


Figure 8.1 Loch Feochan bathymetry

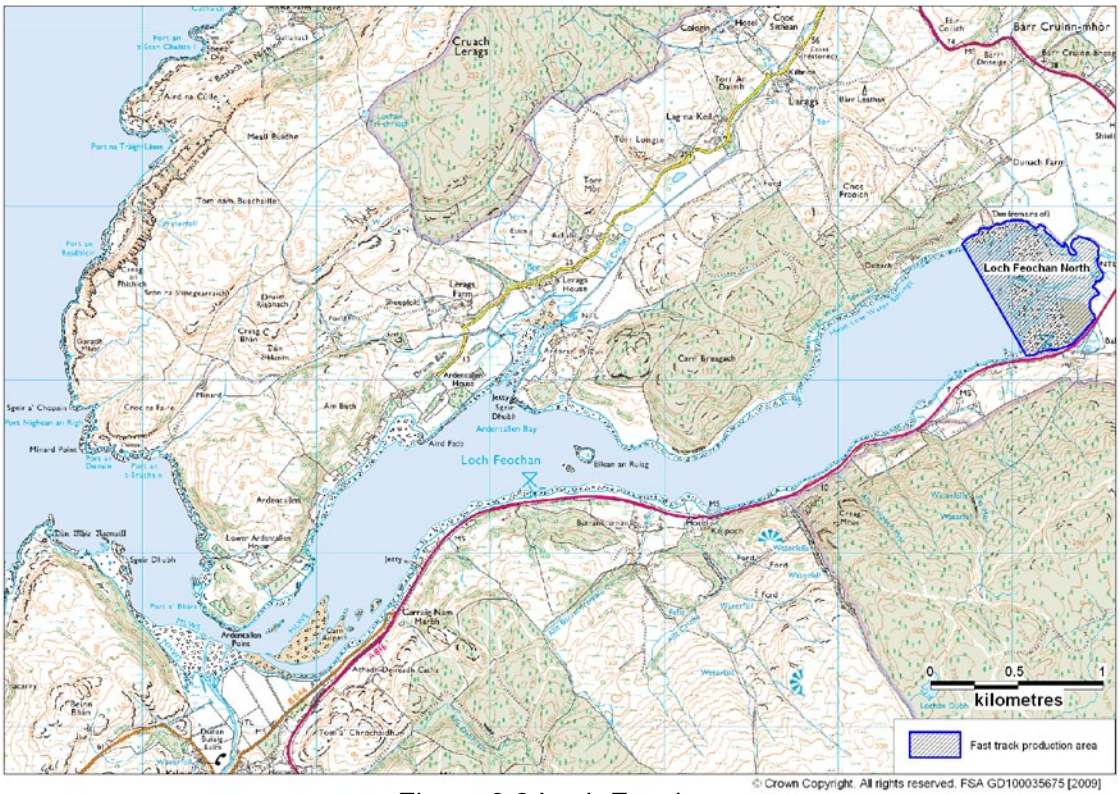


Figure 8.2 Loch Feochan

The bathymetry chart above (Figure 8.1) shows that the Loch Feochan production area is a shallow drying area. South of the production area the depth of the loch increases. Over the loch as a whole, there are two deep areas separated by a shallower area, with a further shallow drying area near the mouth.

### 8.1 Tidal curve and description

The two tidal curves below are for the port of Oban, the nearest standard harmonic port– they have been output from UKHO TotalTide. The first is for seven days beginning 00.00 GMT on 2nd June 2009. The second is for seven days beginning 00.00 GMT on 9th June 2009. Together they show the predicted tidal heights over high/low water for a full neap/spring tidal cycle.

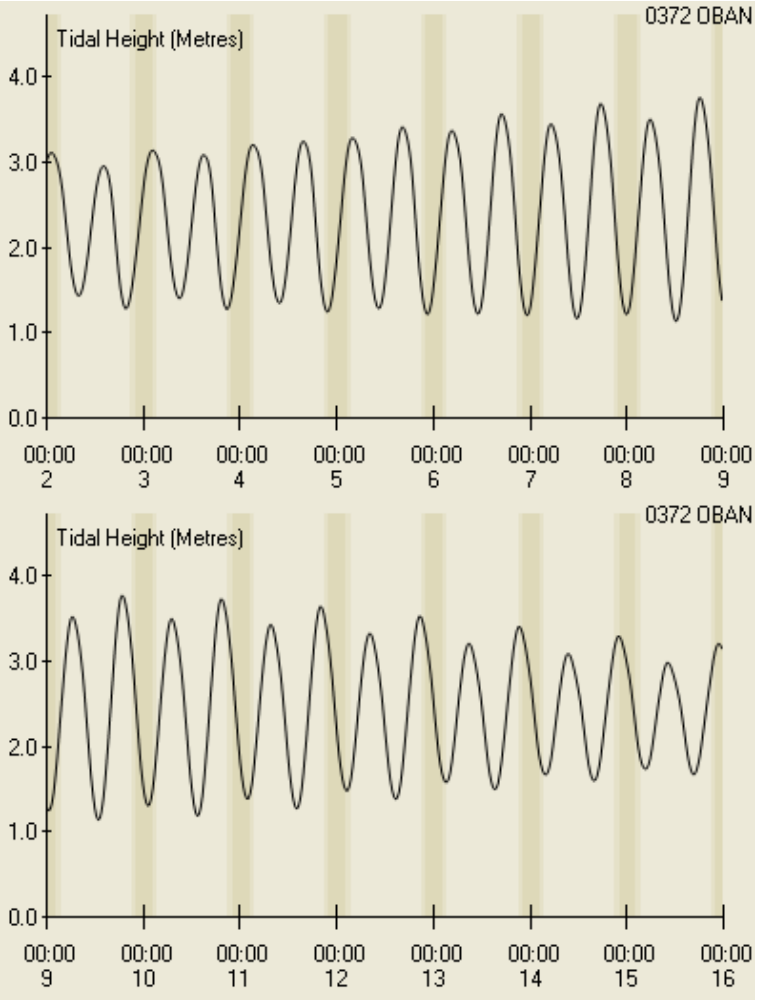




Figure 8.3 Tidal curves for Oban

The following is the UKHO summary description for Oban:

The tide type is Semi-Diurnal.

| | |
|---|---|
| MHWS | 4.0 m |
| MHWN | 2.9 m |
| MLWN | 1.8 m |
| MLWS | 0.7 m |

Predicted heights are in metres above chart datum. The tidal range at spring tide is therefore approximately 3.3 m and at neap tide 1.1 m.

## 8.2 Currents

The Imray chart for the Loch Feochan entrance contains a note to the effect that tidal streams reach up to 5 knots (Anon, 2004). These will be greatest at times of spring tides. The tidal streams will also be faster in narrow shallow areas than in the two wider depths within the lochs.

## 8.3 Conclusions regarding effect on impacting sources

Contamination from the eastern end of the loch will be taken over the production area on the ebbing tide. There is the possibility that contaminants may not be completely flushed and may be brought back over the production area, in a more dilute state, on the next flooding tide.

# 9. Shoreline Survey Overview

A restricted shoreline survey of the Loch Feochan North shoreline was undertaken by staff from Argyll and Bute Council on the 11th June 2009.

Sub-surface sea water samples were taken at two points within the Loch Feochan North production area. The sample taken from the north-western side of the shellfish bed had a result of 2 *E. coli* cfu/100 ml and the sample taken from the south-western side had a result of 50 *E. coli* cfu/100 ml.

Fresh water samples were taken all along the coastline of the Glen Feochan shellfish bed area at any streams or burns flowing at the time of the shoreline survey. Six of the seven samples had results of <100 *E. coli* cfu/100ml and as a result it was not possible to calculate a *E. coli* loading per day for these freshwater inputs. The remaining stream at the northern end of Loch Feochan, west of the River Nell had a higher result of 6500 *E. coli* cfu/100 ml and an *E. coli* loading of $5.3 \times 10^9$.

During the shoreline survey eight outfall pipes were observed. Four of these outfall pipes discharged directly into the Loch Feochan North production area. The remaining four were located two on either side of the loch just south past the border of the production area boundary. There are also two SEPA discharge consents within the catchment area of the production area however due to being inland these were not observed at the time of the shoreline survey.

At the time of the shoreline survey approximately 6 sheep were present on the northern end of the shellfish bed. A flock of 8 geese were also spotted at the same location.

Common cockle samples were collected from two points within the production area. The first sample was collected from the north-western side and returned a result of 310 *E. coli* MPN/100 g. The second sample was collected from the south-western side of the production area and returned a higher result than the previous of 1300 *E. coli* MPN/100 g.

A map is provided in Figure 9.1 that shows the relative locations of the most significant findings of the shoreline survey. Where the bacterial concentration is labelled, the scientific notation is written in digital format, as this is the only format recognised by the mapping software. So, where normal scientific notation for 1000 is $1 \times 10^3$, in this case it would be written as 1E+3.

In summary, identified sources of potentially significant contamination are:

- Contaminated freshwater streams in the area
- Sewage outfall pipes discharging into the loch
- Sewage discharge into the River Nell
- Livestock grazing on the shoreline

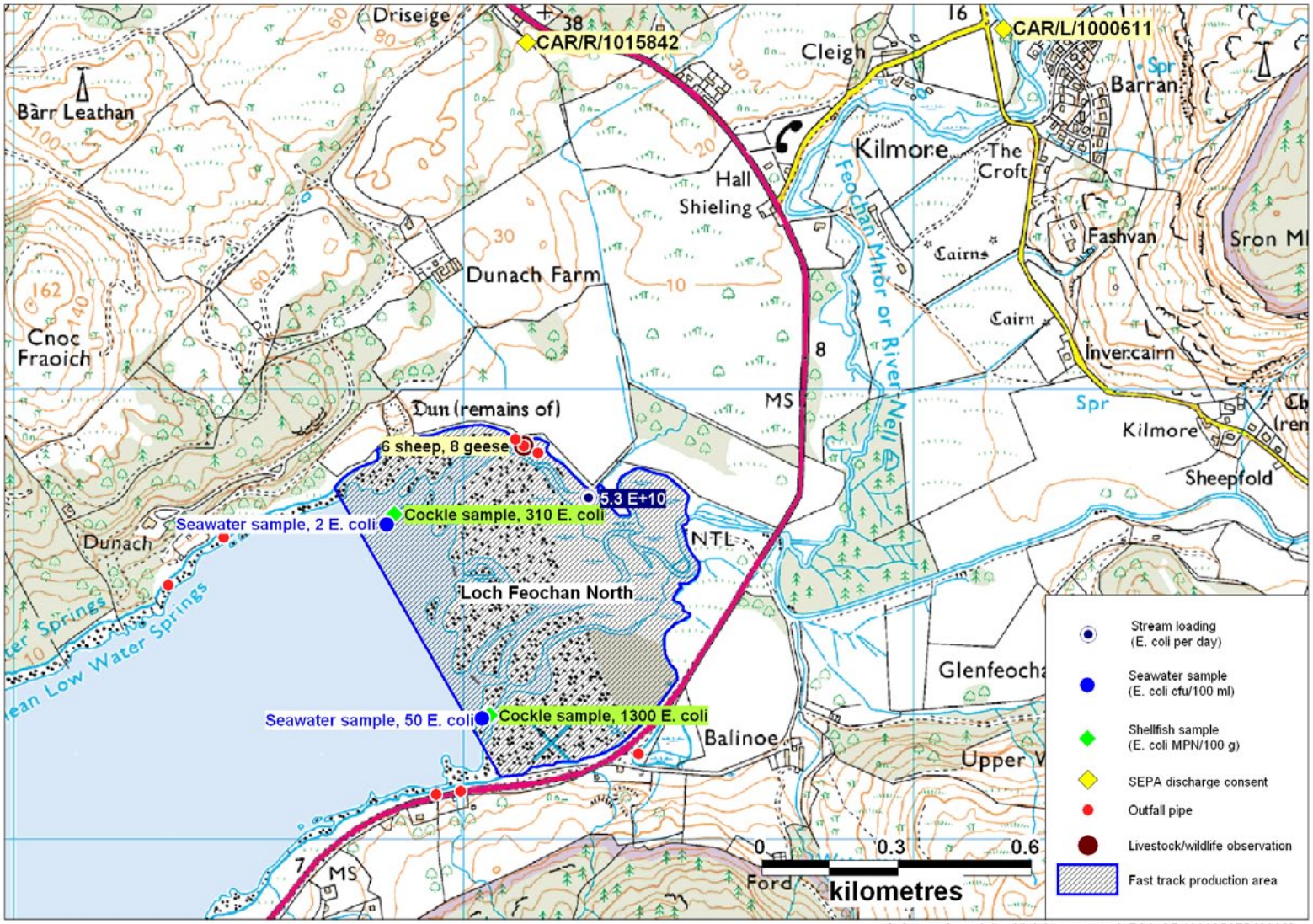



Figure 9.1 Summary of shoreline observations

# 10. Overall Assessment

### Fishery

The cockle bed is located at the head of Loch Feochan, within the boundaries of the Loch Feochan North production area. The exact boundaries of the shellfish bed are unknown.

### Human sewage inputs

Total human population in the area, based on 2001 census figures, was 565. The largest concentration of dwellings in the areas is located near Kilmore, north of the production area on the banks of the River Nell. There is one registered discharge consent for a population equivalent of 120 into the River Nell near this location and a second, much smaller one located slightly west of Kilmore which discharges to land. During the shoreline survey a total of eight outfall pipes were also observed around the shoreline of the loch, but it is not known how many of these were active. The main sources of human sewage pollution therefore discharge into the loch via the River Nell at the eastern end of the production area.

### Agricultural inputs

During the shoreline survey, a single group of six sheep were observed at the northern end of the shellfish bed. Due to the close proximity of the livestock to the shellfish bed, it is likely that this will have an affect on the faecal contamination of the sea water and shellfish.

### Wildlife inputs

During the shoreline survey eight geese were observed at the northern end of the shellfish bed. Seabirds including gulls will always be present along the coastline but in the absence of defined roosting or nesting areas their distribution is likely to be even over time and as such not materially affect placement of a monitoring point.

### Seasonal variation

The area around Oban is popular with tourists and therefore there is likely to be an increase in human population at Kilmore and elsewhere near Loch Feochan in the summer months.

Livestock numbers in the area as a whole are likely to be at their highest during the summer months when lambs are present. During the warmer months livestock may access streams to drink and cool off more frequently, leading to higher levels of faecal contamination in freshwater streams and the shellfish bed itself.

The historical data from the SEPA shellfish waters monitoring programme is limited and does not show any marked seasonal effects.

### Rivers and streams

A total of seven streams and burns were discharging into the northern end of Loch Feochan at the time of the shoreline survey. Six of the streams sampled had a result of <100 *E. coli* cfu/100ml. The remaining stream, at the northern end of the loch and west of the River Nell, had a result of 6500 *E. coli* cfu/100 ml with a calculated *E. coli* loading of $5.3 \times 10^9$. Overall it is expected that the freshwater inputs into the Loch Feochan North production area will have an effect on the bacterial contamination of shellfish and that the greatest impacts will be at the north-eastern end of the production area.

### Rainfall

Rainfall patterns at Blaran (the nearest rainfall station) show rainfall levels are higher between August and January than during the remainder of the year. An increase in rainfall, especially early in this period and after the dry summer months, may be expected to wash a flush of bacteria from the surrounding land into the production area. The impact of this is likely to be most acute nearest where the river and streams enter the loch.

### Analysis of results

Only two historical monitoring results were available for Loch Feochan North, both taken from the southeastern end of the bay and both above 230 *E. coli*/100 g. No further assessment was possible due to the limited dataset.

Sub-surface sea water samples were taken at two points within the Loch Feochan North production area. The sample taken from the northwestern side of the shellfish bed had a result of 2 *E. coli* cfu/100 ml and the sample taken from the southwestern side had a result of 50 *E. coli* cfu/100 ml.

From the eight outfall pipes observed during the shoreline survey, it was only possible to take water samples from two. Both of these samples returned results of <100 *E. coli* cfu/100 ml. The remaining freshwater samples were taken from streams and burns.

Cockle samples were collected at two points within the production area. The first sample with a result of 310 *E. coli* MPN/100 g was taken from the northwestern side of the production area and the second sample with a result of 1300 *E. coli* MPN/100 g was taken from the southwestern end of the production area, indicating higher levels of contamination toward the southern end of the production area.

### Movement of contaminants

Contaminants reaching the head of the loch either via rivers and streams or direct discharge/deposition will be taken over the shellfish bed by the ebbing tide.

## Overall conclusions

Potential sources of human and animal faecal contamination are principally located on the northern and eastern sides of the loch, including contamination transported by the River Nell and the streams. This contamination will be taken across the northern and central parts of the shellfish bed during the ebbing tide. It should be noted, however that at the time of the shoreline survey, the highest *E. coli* results in seawater and cockles were obtained from samples taken at the south western end of the production area. The monitoring undertaken by SEPA under the Shellfish Waters Directive shows that the area is subject to marked contamination, with faecal results in mussels up to 34500 faecal coliforms per 100 ml flesh and intervalvular fluid.

# 11. Recommendations

For the production area, in the absence of any specific information on the location and extent of the cockle bed, the limits should be as described for the fast track classification, adjusted to 10 m accuracy. The production area boundary is therefore the area bounded by lines drawn between NM 8670 2477 and NM 8710 2414 extending to MHWS.

A representative monitoring zone approach has been taken for this fishery following feedback regarding stock availability and site access issues. The use of bagged shellfish is not suitable in this instance. The use of a RMZ is only approved for wild harvest species.

It is recommended that samples be taken from within the area bounded by lines drawn between NM 8704 2470 and NM 8714 2470 and NM 8716 2425 and NM 8706 2425. This area was selected to take account of influences from contamination sources on the north and east sides of the production area and allow for sampling on the southern side of the bay when stocking or access issues warrant.

All samples must come from within the zone, and it is recommended that they be taken throughout as much of the area as possible in order to develop a picture of geographic variation in the bed. Monthly monitoring is recommended.

The RMZ should be reevaluated after sufficient monitoring data has been accumulated to determine whether establishment of an RMP is appropriate. An interim evaluation should take place after 12 months monitoring has been conducted.

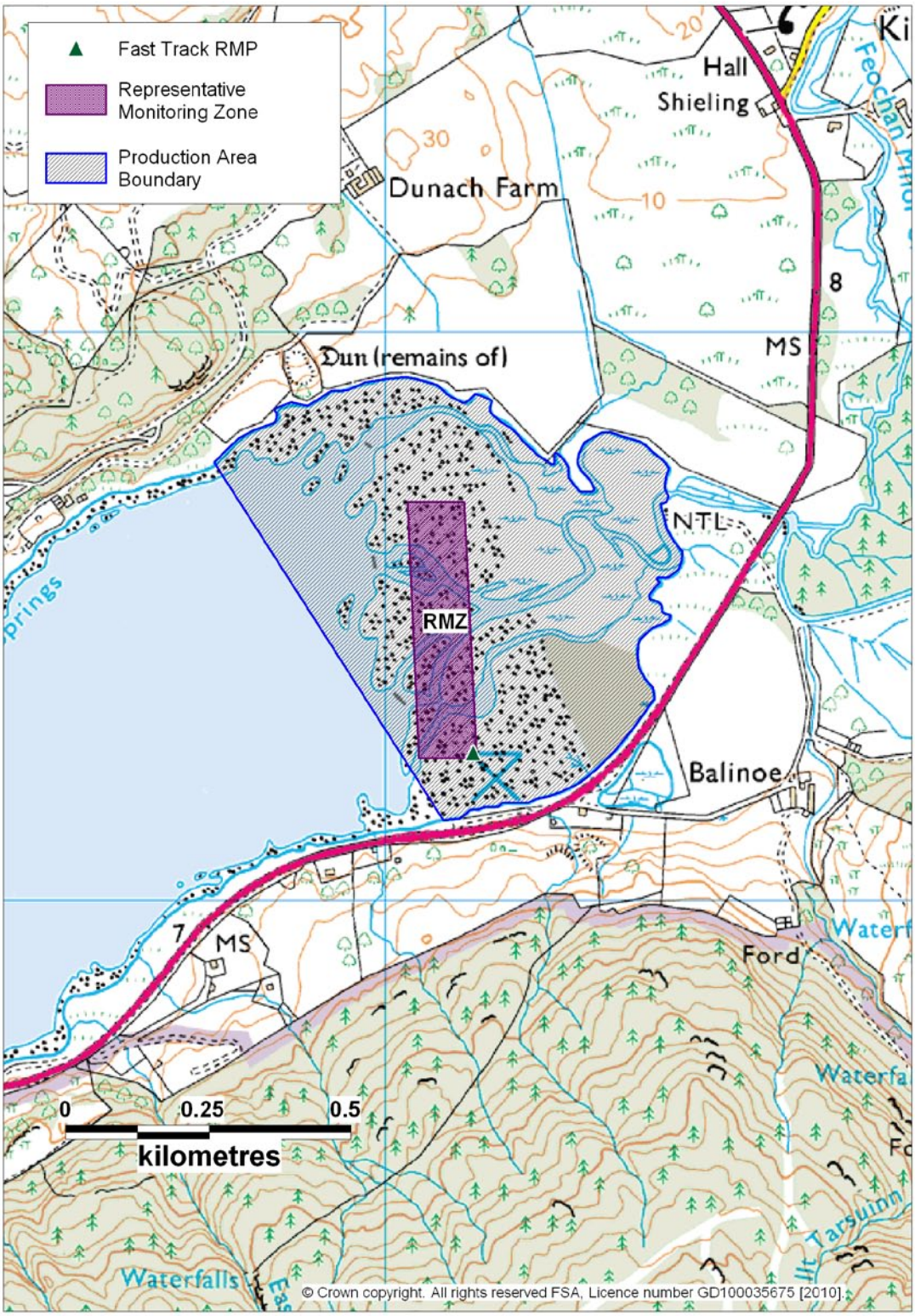


Figure 11.1 Recommendations for Loch Feochan North

# 12. References

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Mallin, M.A., Ensign, S.H., McIver, M.R., Shank, G.C., Fowler, P.K. (2001). Demographic, landscape, and meteorological factors controlling the microbial pollution of coastal waters. *Hydrobiologia* 460, 185-193.

# 13. List of Tables and Figures

# Appendices

1. **Summary Sampling Plan**
2. **Comparative Table of Boundaries and RMPs**
3. **Shoreline Survey Report**

# Sampling Plan for Loch Feochan North

| PRODUC-TION AREA | SITE NAME | SIN | SPECIES | TYPE OF FISH-ERY | NGR OF RMP | EAST | NORTH | TOLE R-ANCE (M) | DEPTH (M) | METHOD OF SAMPLING | FREQ OF SAMPLING | LOCAL AUTHORITY | AUTHORISED SAMPLER(S) | LOCAL AUTHORITY LIAISON OFFICER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loch Feochan North | Glen Feochan Cockles | AB 491 | Common cockles | Wild harvest | RMZ - area bounded by lines drawn between NM 8704 2470 and NM 8714 2470 and NM 8716 2425 and NM 8706 2425 | NA | NA | NA | NA | Hand raked | Monthly | Argyll and Bute Council | Christine McLachlan<br>William MacQuarrie<br>Ewan McDougall<br>Donald Campbell | Christine McLachlan |

# Comparative Table of Boundaries and RMPs – Loch Feochan North

| Production Area | Species | SIN | Existing Boundary | Existing RMP | New Boundary | New RMP | Comments |
|---|---|---|---|---|---|---|---|
| Loch Feochan North | Common cockles | AB 491 908 04 | Not yet a classified production area | Fast Track NM 87157 24258 | Area bounded by lines drawn between NM 8670 2477 to NM 8710 2414 extending to MHWS | RMZ - area bounded by lines drawn between NM 8704 2470 and NM 8714 2470 and NM 8716 2425 and NM 8706 2425 | Production area based on previous fast-track production area and RMZ until sufficient monitoring history to reevaluate |

# Shoreline Survey Report

# Loch Feochan North
# AB 491

## Restricted Sanitary Survey

Scottish Sanitary Survey Project

# Shoreline Survey Report

| | |
|---|---|
| Production area: | Loch Feochan North |
| Site name: | Glen Feochan |
| Species: | Common cockles (*Cerastoderma edule*) |
| Harvester: | Iain McIntyre |
| Local Authority: | Argyll & Bute Council |
| Status: | New site |
| | |
| Date Surveyed: | Thursday 11th June 2009 |
| Surveyed by: | Ewan McDougall, Donald Campbell |
| Existing RMP: | Not yet determined |
| Area Surveyed: | See Figure 1. |

## Weather observations

Thursday 11th June: Very dry and sunny, no significant rain for past 10 days. Wind NE, Force 3.

## Site Observations

### Fishery

The Glen Feochan site is harvested for Common cockles (*Cerastoderma edule*). The cockles are hand raked within the boundaries of the Loch Feochan North production area identified in Figure 1. The harvester plans to harvest the cockles all year round.

### Sewage/Faecal Sources

The area surveyed had the small settlement of Kilmore 1.1km inland of the northern end of the Loch Feochan North production area. There is a single SEPA discharge consent serving 25 people in Kilmore and another serving 8 people 0.8 km northwest of the production area. During the shoreline survey, three outfall pipes were observed on the eastern shoreline and five on the western shoreline.

### Seasonal Population

No caravans or campsites were observed during the shoreline survey in the surrounding area of Loch Feochan North.

### Boats/Shipping

During the shoreline survey two boats were observed moored near Dunach on the western shoreline of Loch Feochan.

## Land Use

The land either side of Loch Feochan is heavy coniferous woodland, with a small band of neutral grassland before this woodland on the eastern shoreline. North of Loch Feochan the land is composed of primarily improved grassland with a few patches of dwarf heath land and bracken.

## Wildlife/Birds

During the shoreline survey eight geese were observed at the far northern end of the Loch Feochan North production area. No other wildlife was observed in the area at the time of the shoreline survey.

Observations can be found in Table 1.

Figure 1. Shoreline observations

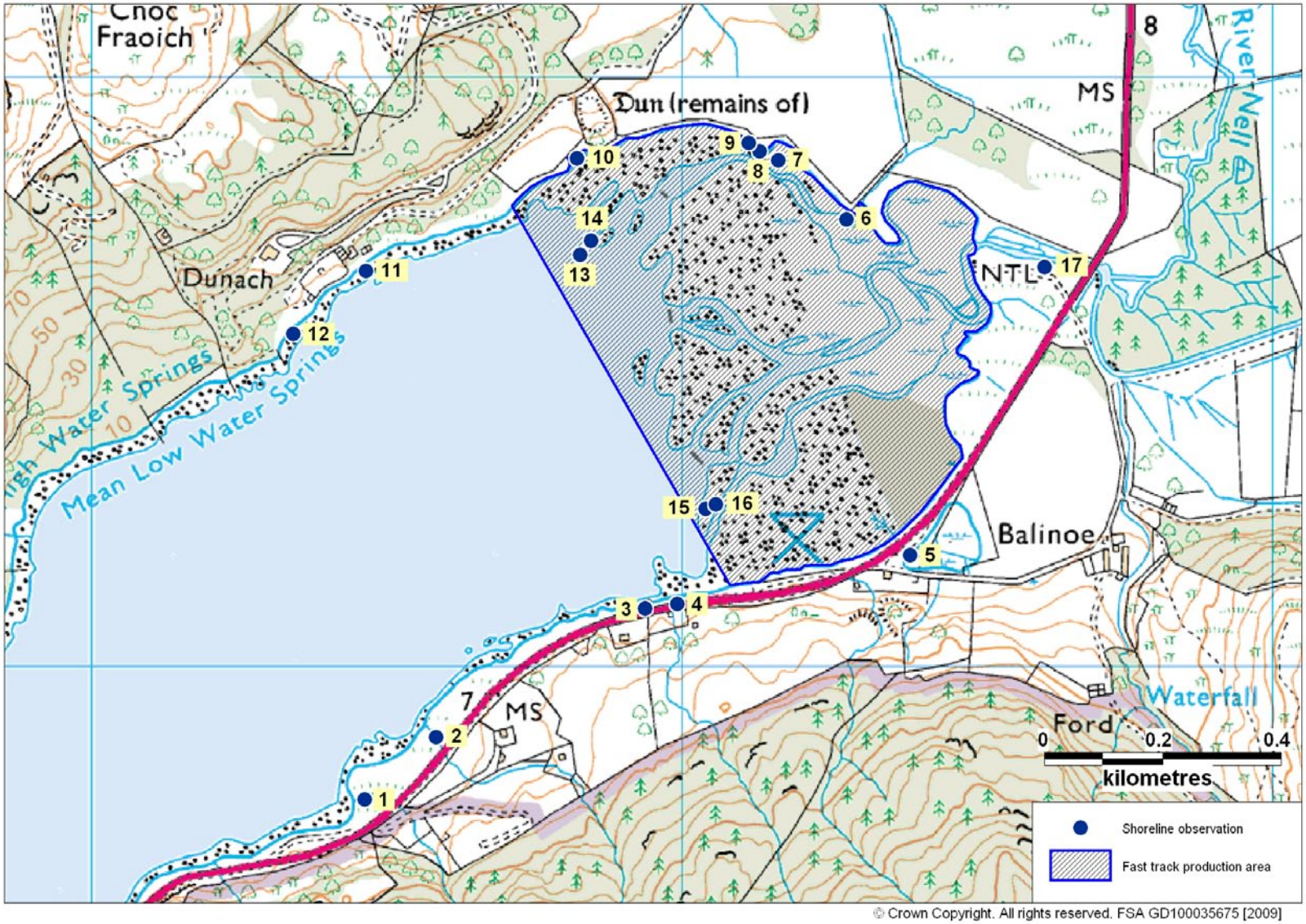


Table 1. Shoreline Observations

| No. | Date | Time | NGR | East | North | Associated photograph | Description |
|---|---|---|---|---|---|---|---|
| 1 | 11/06/2009 | 12:57 | NM 86463 23776 | 186463 | 723776 | Figure 4 | Survey start point. Small stream. Water sample LF FW 1. 55cm x 4cm x 0.195m/s |
| 2 | 11/06/2009 | 13:14 | NM 86584 23882 | 186584 | 723882 | Figure 5 | Small stream. Water sample LF FW 2. 29cm x 3cm x 0.293m/s. Two houses above road. |
| 3 | 11/06/2009 | 13:25 | NM 86939 24100 | 186939 | 724100 | | 15cm plastic pipe. No flow. Three houses above road. |
| 4 | 11/06/2009 | 13:28 | NM 86993 24108 | 186993 | 724108 | Figure 6 | 60cm culvert. Water sample LF FW 3. 10cm x 1cm x 0.495m/s. 15cm plastic pipe, end submerged. Near to houses seen at observation No.3. |
| 5 | 11/06/2009 | 13:41 | NM 87388 24191 | 187388 | 724191 | Figure 7 | 78cm iron culvert. Water sample LF FW 4. 25cm x 2cm x 0.262m/s. Iron ochre in pipe. |
| 6 | 11/06/2009 | 14:07 | NM 87280 24760 | 187280 | 724760 | Figure 8 | Stream. Water sample LF FW 5. 65cm x 4cm x 0.364m/s. |
| 7 | 11/06/2009 | 14:16 | NM 87165 24860 | 187165 | 724860 | | Two plastic pipes – 10cm and 6cm, recently cleared. Water sample LF FW 6. Flow insufficient to measure. |
| 8 | 11/06/2009 | 14:22 | NM 87133 24875 | 187133 | 724875 | | 8cm plastic pipe. Water sample LF FW 7. 6cm x 1cm x 1.395m/s. Farm buildings to North. 6 sheep. 8 wild geese. |
| 9 | 11/06/2009 | 14:29 | NM 87114 24889 | 187114 | 724889 | | 30cm clay pipe. Water sample LF FW 8. 40cm x 3cm x 0.171m/s. |
| 10 | 11/06/2009 | 14:39 | NM 86823 24863 | 186823 | 724863 | | Small stream. Water sample LF FW 9. Flow insufficient to measure. |
| 11 | 11/06/2009 | 14:47 | NM 86466 24672 | 186466 | 724672 | Figure 9 | 10cm cast iron pipe. Broken and blocked – no flow. Large house, cottage and walled garden adjacent. |
| 12 | 11/06/2009 | 14:53 | NM 86342 24566 | 186342 | 724566 | | 20cm cast iron pipe, broken. Water sample LF FW 10. Trickle - insufficient to measure. Two boats on moorings. |
| 13 | 11/06/2009 | 15:08 | NM 86829 24700 | 186829 | 724700 | | Sea water sample LF SW 1. Salinity 34 ppt. |
| 14 | 11/06/2009 | 15:11 | NM 86847 24724 | 186847 | 724724 | | Cockle sample LF SF 1. 30 cockles. |
| 15 | 11/06/2009 | 15:20 | NM 87041 24269 | 187041 | 724269 | | Sea water sample LF SW 2. Salinity 6 ppt. |
| 16 | 11/06/2009 | 15:29 | NM 87059 24277 | 187059 | 724277 | | Cockle sample LF SF 2. 30 cockles. |
| 17 | 11/06/2009 | 15:38 | NM 87616 24679 | 187616 | 724679 | Figure 10 | River Nell. Water sample LF FW 11. 8m x 15cm x 0.298m/s. End of survey. |

Photos referenced in the table can be found attached as Figures 4 – 10.

## Sampling

Water and shellfish samples were collected at sites marked on the map. Bacteriology results follow in Tables 2 and 3.

Seawater samples were tested for salinity using a hand held refractometer. These readings are recorded in Table 1 as salinity in parts per thousand (ppt).

Samples were also tested for salinity by the laboratory. These results are shown in Table 2, given in units of grams salt per litre of water. This is the same as ppt.

Table 2. Water Sample Results

| No. | Date | Sample | Grid Ref | Type | *E. coli* (cfu/100 ml) | Salinity (g/L) |
|---|---|---|---|---|---|---|
| 1 | 11/06/2009 | LFSW1 | NM 86829 24700 | Seawater | 2 | 35.1 |
| 2 | 11/06/2009 | LFSW2 | NM 87041 24269 | Seawater | 50 | 5.4 |
| 3 | 11/06/2009 | LFFW1 | NM 86463 23776 | Fresh water | <100 | - |
| 4 | 11/06/2009 | LFFW2 | NM 86584 23882 | Fresh water | <100 | - |
| 5 | 11/06/2009 | LFFW3 | NM 86993 24108 | Fresh water | <100 | - |
| 6 | 11/06/2009 | LLFW4 | NM 87388 24191 | Fresh water | <100 | - |
| 7 | 11/06/2009 | LFFW5 | NM 87280 24760 | Fresh water | 6500 | - |
| 8 | 11/06/2009 | LFFW6 | NM 87165 24860 | Fresh water | 100 | - |
| 9 | 11/06/2009 | LFFW7 | NM 87133 24875 | Fresh water | <100 | - |
| 10 | 11/06/2009 | LLFW8 | NM 87114 24889 | Fresh water | 100 | - |
| 11 | 11/06/2009 | LFFW9 | NM 86823 24863 | Fresh water | <100 | - |
| 12 | 11/06/2009 | LFFW10 | NM 86342 24566 | Fresh water | <100 | - |
| 13 | 11/06/2009 | LFFW11 | NM 87616 24679 | Fresh water | <100 | - |

Table 3. Shellfish Sample Results

| No. | Date | Sample | Grid Ref | Type | *E. coli* MPN/100 g |
|---|---|---|---|---|---|
| 1 | 11/06/2009 | LFSF1 | NM 86847 24724 | Common cockles | 310 |
| 2 | 11/06/2009 | LFSF2 | NM 87059 24277 | Common cockles | 1300 |

Figure 2. Water sample results

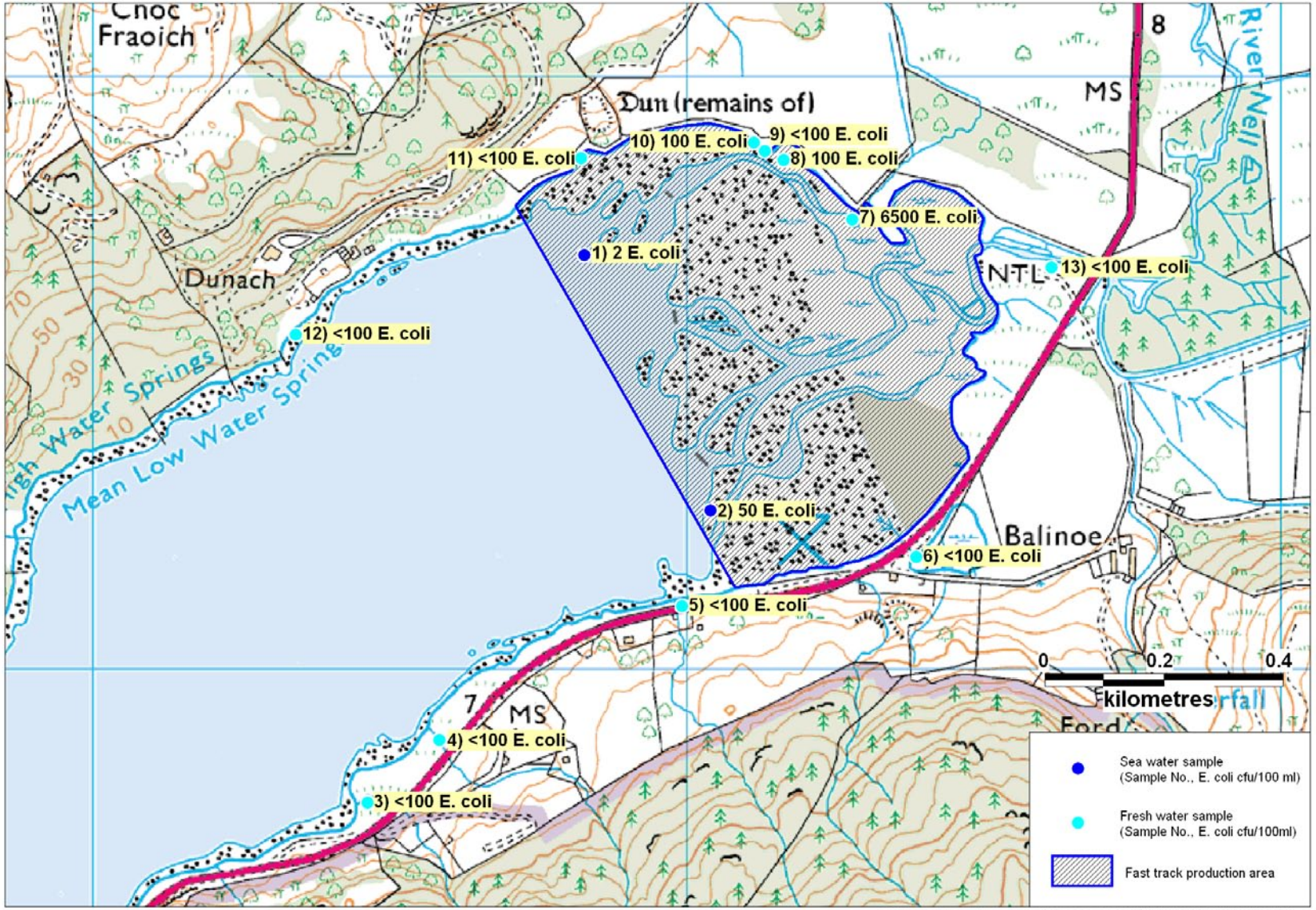
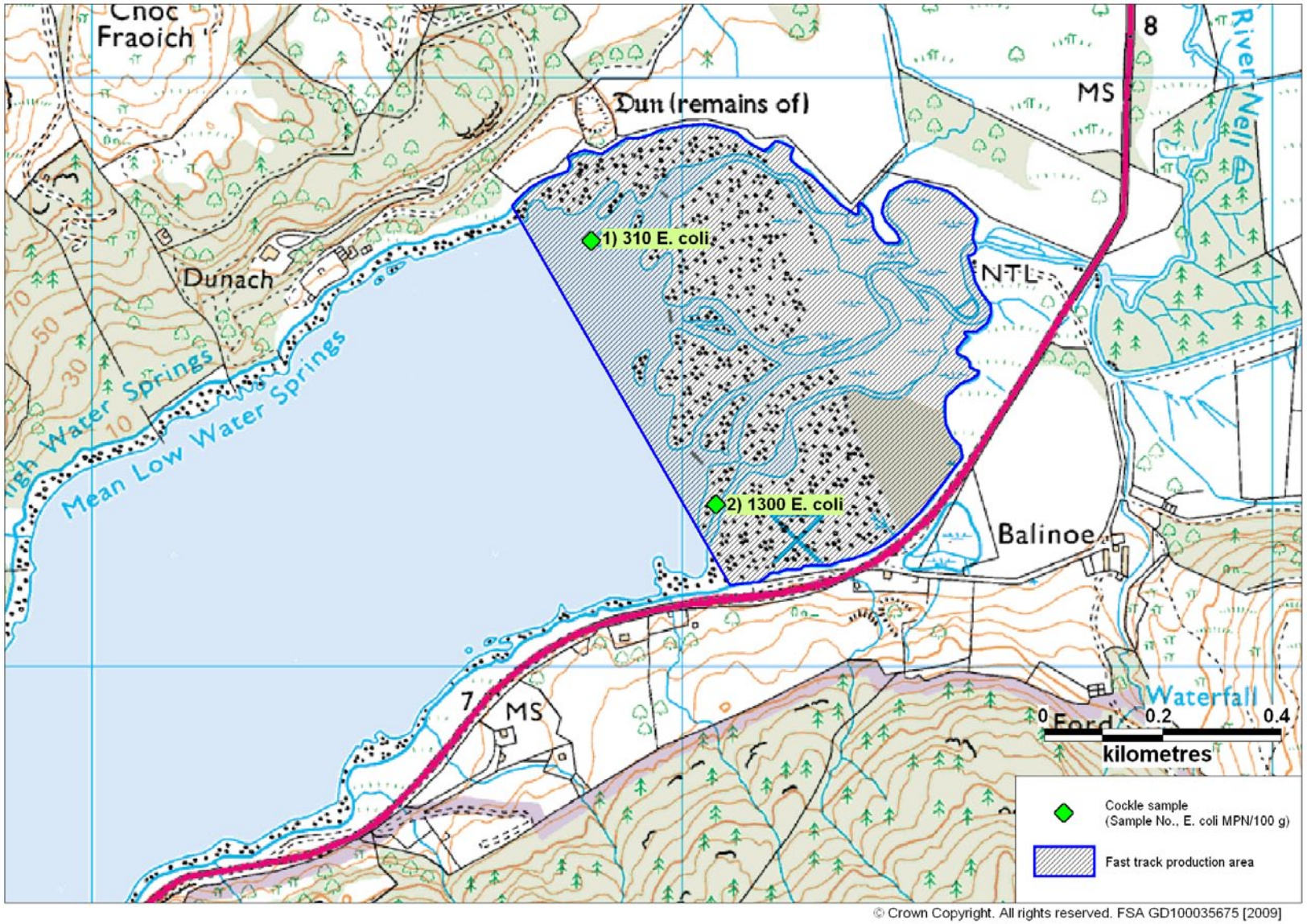


Figure 3. Shellfish sample results



# Photographs

Figure 4. Small stream, water sample 3

Figure 5. Small stream, water sample 4

Figure 6. 60cm culvert and plastic pipe leading down to sea, end submerged

Figure 7. 78cm iron culvert, water sample 6

Figure 8. Stream, water sample 7

Figure 9. 10cm cast iron pipe

Figure 10. River Nell, water sample 13