Fethard-On-Sea Sewerage Scheme
Marine Outfall Dispersion Study
Addendum Report
for Revised Outfall Location

Client: Byrne Lobby PHMcCarthy

14th September 2016

1. INTRODUCTION

Hydro Environmental Ltd. was requested by Byrne Looby and Co. to rerun the Fethard-On-Sea Water Quality Model for a revised outfall location near Ingard hole located 172m from the Shoreline and extending out a further 75m as a manifold diffuser with 16 vertical risers. The start and end coordimates for the manifold diffuser are E280247, N104326 and E280321, N104319 respectively.

Figure 1 Location of Outfall 9

2. FAECAL COLIFORM DISPERSION SIMULATION

The dispersion simulation used the previously developed 2-dimensional depth averaged finite difference hydrodynamic and dispersion model. This model has a reasonably good grid resolution of 10m which is sufficient to model the proposed diffuser length using seven consecutive grid squares at the outfall location. The simulations investigated faecal coliforms under mean dry weather flow conditions (1DWF) of 8.5l/s. A storm flow condition was also simulated which is the equivalent of 3 DWF (25.5l/s) to test the suitability of the site under extreme conditions.

To date eight different outfall locations have been investigated and this current assessment represents a refinement in respect to the proposed outfall location and the inclusion of a 16 riser diffuser manifold discharge, with risers at 5m intervals. The diffuser will make a significant difference in averaging out and reducing locally the nearfield maximum concentrations. However, in the far field the diffuser is unlikely to make much difference as the load and its timing remain unchanged.

The faecal coliform loading was specified as a continuous discharge after one tidal cycle of the hydrodynamic model had been run, which ensured that the hydrodynamic cold start effects had dissipated. The model simulations were performed a over a repeating spring and neap tidal cycles using a time step of 3 seconds. The duration of the simulation was sufficiently long enough to allow steady state conditions to be attained. This ensured that the maximum level of faecal coliforms, which would be reached throughout the water body would be observed. In terms of the class B shellfish water off and to the north of Ingard Point

In order to analyse the model results, snapshots of the faecal coliform plumes within the study area were output by the model at four different stages of the tide, namely, high water, mid-ebb, low water and mid-flood, for the critical spring tide condition which advects the effluent plume northwards into the shellfish waters. The neap tide flows are not of sufficient magnitudes as to reach the shellfish waters with sufficient concentration. The spring tide solute plumes are illustrated in Figures 2 to 5 for the dry weather flow condition

Table 1 summarises the maximum predicted concentrations of the effluent at the four principal stages of a spring tidal cycles and the tidal mean, median and maximum concentrations at the outfall site.

Table 1 Computed faecal coliform depth-averaged concentrations at Outfall site 9 (diffuser manifoild modelled 16riser at 5m centres) at the principal stages of a spring tidal cycle.

Tidal stage	FC conc. [number/100 ml] 1 DWF	FC conc. [number/100 ml] 3DWF
Mid ebb	2470	7410
Low water	1262	3787
Mid flood	621	1864
High water	1218	3653
Mean	1407	4222
Median	1259	3778
Maximum	3225	9674

3. DISCUSSION

Impact on designated Shellfish Waters

Under the Live Bivalve Molluscs (Production Areas) Designation 2006 Bannow Bay North from Ingard point to Clammers Point is designated as a Class B shellfish production Area.

The Shellfish waters EU directive 91/492/EEC " laying down the health conditions for the production and placing on the market of live bivalve molluscs" gives faecal coliform limits based on the shellfish flesh and intravalvular liquid rather than the water column (see Table 2 below). This leads to difficulty in assessing compliance based on predicted/measured water quality. Using the US Food and Drug Administration National Shellfish Sanitation Program Standards (1995), which relate to the water column of the production area as an equivalent to the 91/492/EEC Standards, a direct comparison with the Water column measurement/predictions can be made. This standard categorises two production waters, approved and restricted, these are equivalent to the A and B shellfish waters described in 91/492/EEC.

Table 2 Shellfish Waters Classification **EC Shellfish Waters Classification**

	(91/492/EEC) F. Coliform	US Shellfish Waters Classification	US National Sanitation Program
A (direct consumption)	< 300 No/100g	Approved	G. Mean < 14 No. / 100ml & 90% < 43 No./100ml
B (Purification)	< 6,000 No/100g	Restricted	G. Mean < 88 No. / 100ml & 90% < 260 No./100ml
C (relaying)	< 60,000 No/100g	-	-

Based on the US Food and Drug Administration National Shellfish Sanitation Program water quality standards the revised Outfall with diffuser does not achieve Class A shellfish production standards within the designated Shellfish production area off Ingard Point. If secondary treated effluent quality was improved by a factor of 5 from 1 by 10^6 no./100ml to a final effluent concentration of 2 by 10^5 no./100ml Faecal coliforms then Class A production standard is likely to be achieved. Based on the predicted results the Class B shellfish production standards may be achieved for a proposed secondary treated effluent standard of 1 by 10^6 no./100ml.

14th September 2016

Anthony Cawley B.E. M.Eng.Sc C. Eng M.I.E.I
Consulting Hydrologist
Hydro Environmental Ltd.

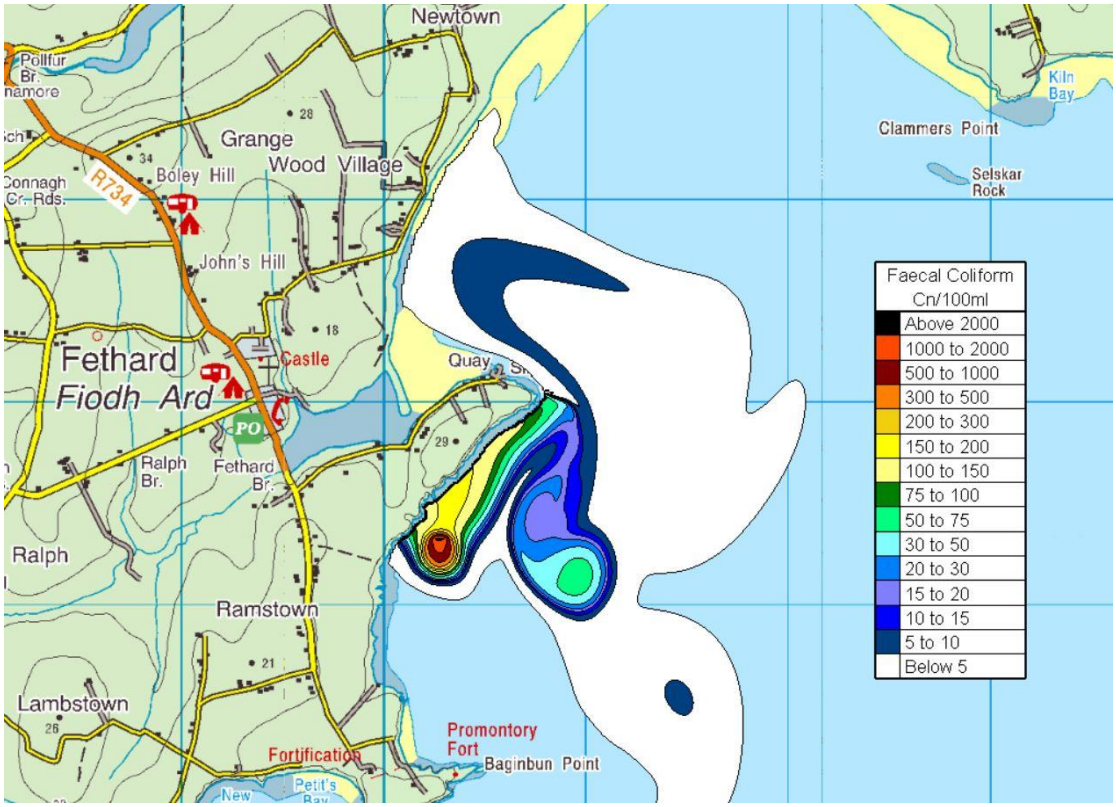

Figure 2 Outfall 9 1DWF Faecal Coliform Concentration Spring Tide at Mid-Ebb

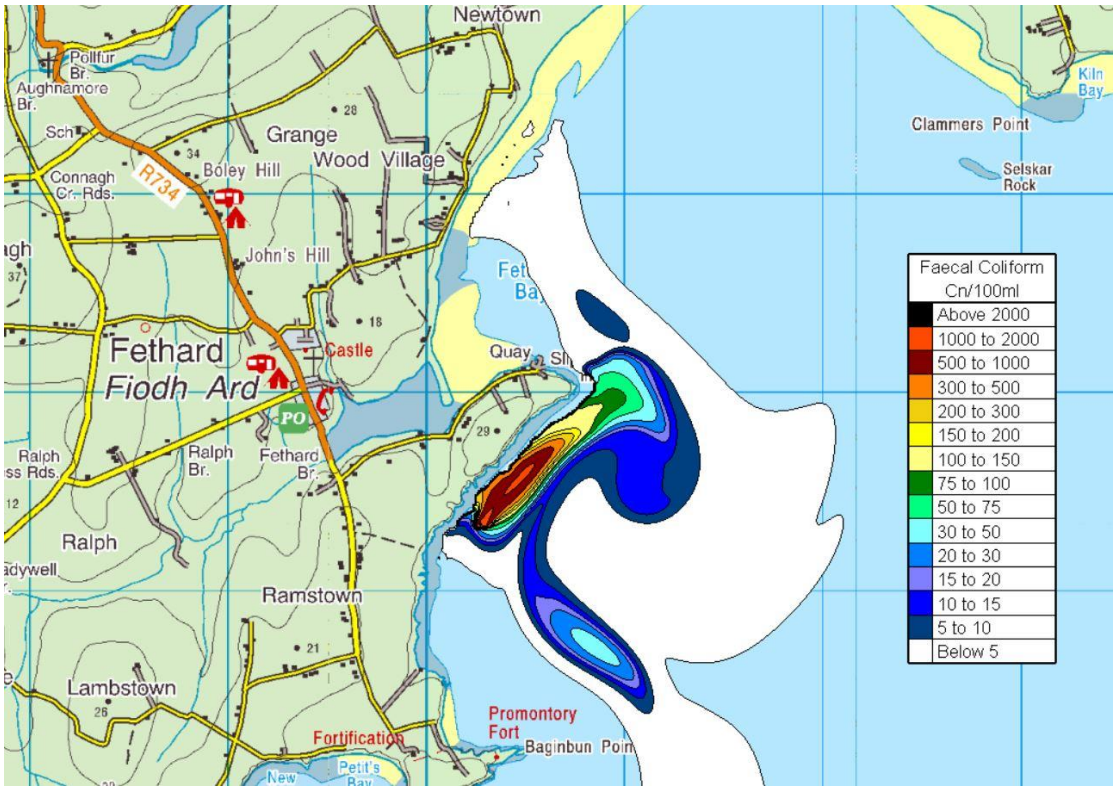

Figure 3 Outfall 9 1DWF Faecal Coliform Concentration Spring Tide at Low Water

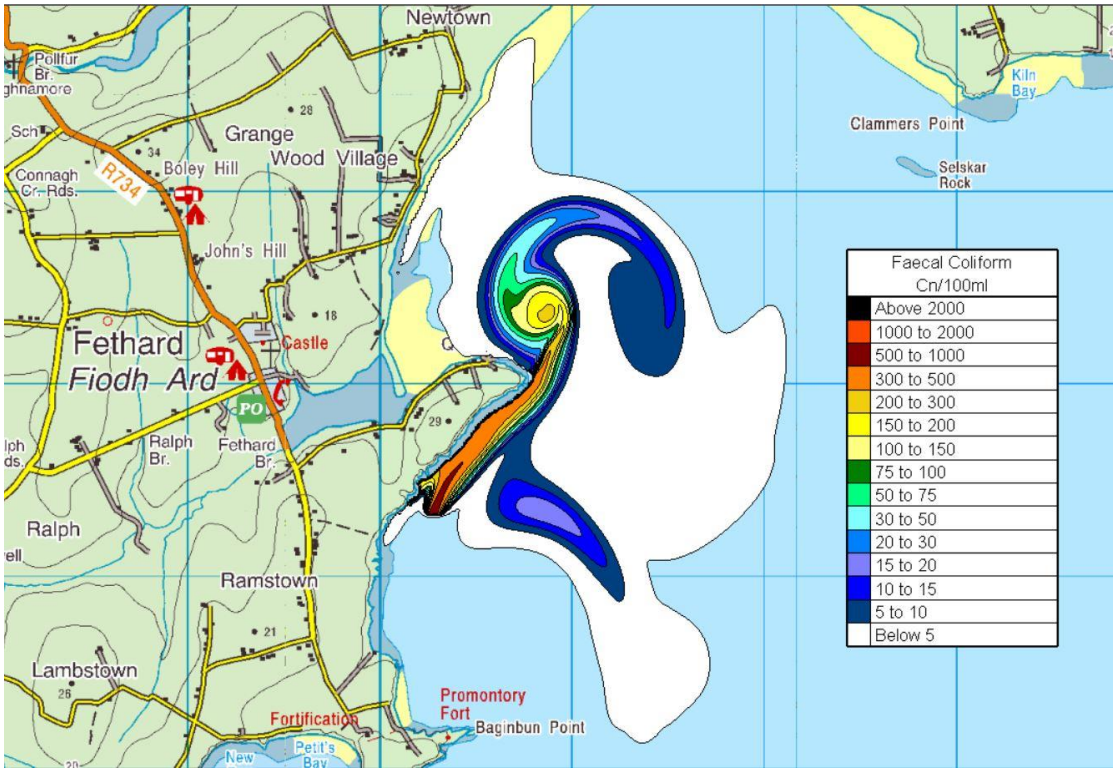

Figure 4 Outfall 9 1DWF Faecal Coliform Concentration Spring Tide at Mid-Flood

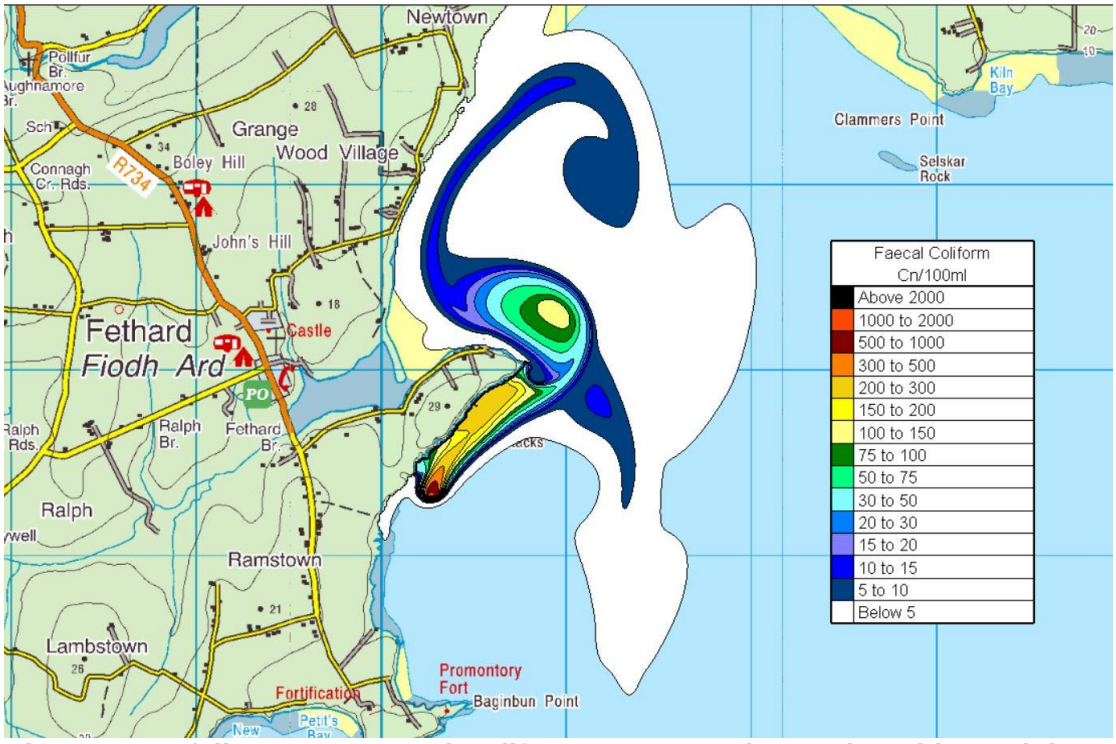

Figure 5 Outfall 9 1DWF Faecal Coliform Concentration Spring Tide at Highwater