AQUATIC POLLUTION GROUP

Project: Marine dispersion of landfill leachate discharges.
Client: Rhodia UK Ltd

The Challenge

A chemical plant had ceased production and effluent discharges had been reduced to those associated with landfill leachate. The client required a water resources consent to discharge this leachate via their existing sea outfall. To satisfy EA requirements, initial dilutions were to be calculated and dispersion modelling of a pulsed landfill effluent discharge, that could vary in volume and occur during any tidal state, was to be performed.

Coastal environment of sea outfall

MIKE21 2D advection dispersion model bathymetry

Whitehaven Harbour to north of the EA EQS location for discharges

The Solution

The discharge consent application was based on a review of previous modelling and monitoring work and an assessment of the proposed new discharge regime using both ELSID and MIKE21 models

Modelling and Monitoring Review

The review of previous work had the following objectives:

- Extraction of appropriate landfill effluent monitoring data for metals
- Assessment and conversion/scaling of the proposed discharge in order to define the potential impacts along the coast.
- An initial assessment of the potential ecological impact of the proposed metal discharges upon foreshore communities and local SSSI's.

Initial Dilution Modelling

Monte Carlo simulations were also performed using the EA's preferred analytical model ELSID to predict the 95th percentile dilution factors for a range of effluent discharge scenarios.

MIKE21 Dispersion Modelling

A MIKE21 50 m numerical grid model for the simulation of water levels and flows in coastal waters was developed for the client by Westlakes Scientific Consulting Ltd and was used for modelling the dispersion of a pulse discharge over a range of tidal and wind scenarios. Results were analysed to obtain the worst case environmental dilutions

A conservative approach to calculating far-field effluent concentrations was developed based on combining ELSID initial dilution factors with the MIKE21 environmental dilution factors.

The Benefits

- The project provided a conservative method for the client to calculate effluent concentrations at EQS points and SSSI sites.
- Application of this method to the worst case discharge scenario predicted a range of environmental concentrations that were below the Environmental Assessment Level (EAL) for the metals of interest.