

- Have due regard for the health safety and welfare of its employees and users of, or visitors to, the Airport.

- As a self regulating authority The Committee license the Airport in accordance with international civil aviation convention. This requires compliance with various United Kingdom (UK) Civil Aviation Publications (CAP). In particular there is a requirement to maintain active training of the Airport Rescue and Fire Service (ARFS) in the use of fire fighting techniques and all media which it is likely to deploy in the course of its work, this includes fire fighting foams. In addition to this training demand there is a requirement under CAP for the fire fighting equipment to be regularly calibrated and tested using the media which would be deployed in a 'live fire' situation.

3 EFFLUENT CREATED

The proposed redevelopment and remediation of the FTG would create two effluents.

- Firstly an effluent from pumping contaminated groundwater from the aquifer beneath the FTG. (This would attenuate the pollution in the aquifer and help mitigate the effect on the Private Water Supplies “downstream” of the FTG)

- Secondly effluent would be created from Fire Training (a requirement of an operational Airport).

A Fate and Behaviour study has been undertaken to look at the effects of discharging these two effluents to the foul sewer and subsequently to Bellozanne STW and the outfall in St Aubins Bay.

4 STUDY METHODOLOGY

The fate and Behaviour of the two effluents in Bellozanne STW is of prime importance to the study. To this end a mathematical model of Bellozanne STW has been constructed. The basis of this model is an internationally accepted software package developed in conjunction with the United States of America Environmental Protection Agency (USEPA) called 'Water9'.

Water9 requires the input of standard data for each chemical (A list of chemicals was gathered from records of analysis undertaken at the FTG and knowledge of the foam

(FFFP) to be used in future training). For a significant number of the chemicals involved the required data was unavailable from current literature sources, i.e. data that had been measured and published. For a remaining number of materials (approximately 30) no such data exists for a variety of reasons. In order to fulfil the data needs of the Water9 model each of these remaining chemicals had to be modelled at the molecular level to provide an estimate of the missing information.

This additional modelling was carried out using another suite of model programmes developed by the USEPA's Office of Pollution Prevention Toxics and Syracuse Research Corporation (SRC). The model suite is designated 'EPI'.

Certain aspects of the work could not be reliably modelled. For this reason samples of the contaminated groundwater and FFFP foam were subjected to treatment and nitrification inhibition testing by Alcontrol Laboratories (owned by Yorkshire Water). Evaluation of residues present after the treatment process was also carried out by M-Scan Ltd in order to assist in providing commentary on any degradation mechanisms that may be taking place, particularly for the currently used FFFP foam.

This mathematical modelling approach has achieved the following:-

- The toxicology of the fluorosurfactant components for agricultural land and receiving waters has been predicted and compared to reference substances (benzene and toluene) which have commonly understood effects. This has enabled the determination of a range of practical attenuation times and has been used to inform the design process for the construction of an attenuation tank at the airport.
- An assessment of the overall BOD and COD load impact on the works at Bellozanne STW.
- Identify threshold concentrations at Bellozanne STW for FFFP that would minimise the risk of a permanent foaming state at the works inlet during discharge from the FTG.

The Draft Report used flow parameters based on population equivalents for the Bellozanne works (Measured flows at Bellozanne STW have now been obtained and will be used in the Final Report). Moreover, the models and calculations can be readily adjusted to accommodate actual information at any time.

5 SUMMARY CONCLUSIONS FROM THE FATE & BEHAVIOUR STUDY

1. Fluorosurfactant compounds associated with AFFF fire fighting foams at the Airport will pass through the treatment facility at Bellozanne without alteration.
2. The relative dilution at the sewage works at times of dry weather flow will render the concentration of AFFF components (from the contaminated groundwater) exiting the plant below the current limit of detection of the analytical methods employed.
3. The contaminated groundwater from the airport does not appear to affect the respiration rate of activated sludge or its ability to produce a nitrified effluent within the scope of the test.
4. There was no detectable background of AFFF residues of fluorosurfactants present in the effluent from Bellozane when measured during the period 27 May 2002 to 30 May 2002.
5. The determined, and modelled, toxicity of AFFF and FFFP fluorosurfactant components indicates that there is a sufficient margin of safety between the lowest concentration predicted to be repellent to crustacean and the value determined as the maxima in the final effluent.

This indicates that no measurable harm is likely to be experienced by crustacean in the vicinity of the outfall in St Aubins Bay

6. It is likely that localised changes in salinity associated with the discharge of effluent from Bellozane sewage treatment works will be a stronger repellent to crustacean in the inter tidal zone than any impact related to AFFF residues derived from groundwater pumped from the airport. Other undetermined constituents of the effluent are likely to be as equally repellent to such fauna.

The modelled bioconcentration factors for AFFF fluorosurfactant components have been determined to be significant for those identified as PFHpS and PFOS when compared to the reference compounds benzene and toluene.

Note *Baseline bioconcentration factors for benzene and toluene were chosen as illustrative because they are ubiquitous emissions to the environment from internal combustion engines and petrol storage. It was intended that the relative bioconcentration*

factors could be viewed against that for those substances to allow judgement to be made about relative accumulation risk.

For the avoidance of doubt: PFHpS has a greater bioconcentration factor than water, but is less than benzene or toluene; whereas PFOS is greater than either of these two substances.

7. The bioconcentration factors modelled for PFHpS and PFOS suggest that long term monitoring of shellfish for the cumulative burden of these compounds is prudent in order to establish any real risks of assimilation of these substances into the human food chain in St Aubins Bay.

At present it is not thought that significant accumulation is likely over the life span of the commonly harvested shellfish species.

8. Foam persistence testing and modelled concentrations have indicated that there is not likely to be any persistent foaming at the Bellozane inlet attributable to Airport Fire Training Ground effluent.
9. The partially and fully oxidised degradation components of the FFFP have been shown to exist in the activated sludge effluent. It is therefore likely that these substances will pass into St Aubins Bay and continue to degrade resulting in a persistent compound 'TDFOS'.

The compound TDFOS has been assessed for its bioaccumulation potential using techniques described above and has been found not to be greater than theoretically determined for water.

10. A significant number of chemicals in the contaminated groundwater beneath the FTG have been shown, through mathematical modelling, to pass through the treatment stages at Bellozanne. The majority of these chemicals are also found in other locations such as runoff from car parks and vehicle maintenance areas.
11. There is apparently no significant absorption of the fluorosurfactant components of AFFF or FFFP wastes into the primary or activated sludge at Bellozanne. Therefore any impact on agricultural land is likely to be immeasurable.
12. There is no forecast marine ecotoxicological response for any component of FFFP at concentrations likely to occur in the effluent from Bellozanne.

13. The exit concentrations of FFFP components in the Bellozane effluent are forecast to fall below any predicted threshold toxicity values derived via the modelling process.