AECOM

Jersey Airport FTG

Water quality monitoring of private water supplies

BRIEFING NOTE

Sampling of private water supply wells and boreholes and of groundwater monitoring boreholes in the St Ouen's Bay area to the west of the airport has been carried out since 2004, following the completion of the new fire training ground (FTG) at the airport. Sampling is undertaken to assess the presence and concentrations of components of fire fighting foams, which historically have been used at the airport. Elevated concentrations of certain components, in particular perfluorooctane sulphonate (PFOS) and perfluorooctanoic acid (PFOA), pose a potential risk to human health.

Both PFOS and PFOA are very soluble and highly stable chemicals with a negligible to low volatility and are resistant to most conventional water treatment processes. As a result, these chemicals are very persistent in soils and water.

Prior to the commissioning of the new FTG, sampling of private water supply wells and boreholes and groundwater monitoring boreholes around the FTG was carried out at variable frequencies to collect a comprehensive database of the groundwater quality in the St Ouen's Bay area. Subsequently, regular sampling has been undertaken in eight 'indicator' boreholes, which include two private water supplies. Sampling of other private water supplies has been undertaken at a lower frequency. Many of the private sources have been sampled annually.

Analysis of the water samples for fluorinated compounds has been undertaken by M-Scan for a number of years and continued following the acquisition of M-Scan by SGS in 2010. Sampling has been carried out in accordance with the laboratory requirements, using for a number of years sample bottles provided by the laboratory. At the request of the laboratory and to create efficiencies, sample bottles are now sourced directly from the supplier cutting out intermediary handling by the laboratory. The type and bottle order reference have been confirmed by SGS M-Scan. All samples are labelled uniquely with the location and the time and date of sampling and stored in a refrigerator prior to being transported to the laboratory for analysis using cool boxes and ice packs.

Analysis is conducted using LC-ESI-MS (liquid chromatography electrospray ionisation mass spectrometry) and analytes are quantified against analytical standards for the fluorinated compounds. The methodology and the use of standards, sample containers and processes, were set up a number of years ago. The analytical procedures undergo re-evaluation periodically to ensure that they reflect current best practice.

As PFOS is very stable and resistant to degradation, it is considered unlikely that any losses would occur in sampling or transit. Sample storage and internal procedures are in place at the laboratory as a precautionary measure to mitigate any risk of loss by these means.

PFOS, the principal contaminant of concern, has been reported above the DWI maximum admissible concentration (MAC) of 1µg/l. Several private borehole supplies regularly have reported PFOS levels significantly above the MAC. Equally a number of private supplies have reported concentrations below the MAC, with many samples showing PFOS below the laboratory limit of detection of 0.01µg/l.

The DWI maximum admissible concentration (MAC) for PFOA is 5µg/l. Other than in the scavenge boreholes at the FTG, PFOA concentrations generally are significantly lower than the MAC.

Based on the results of the groundwater analyses, it has been possible to identify the extent of the plume of contaminated groundwater. It is concluded that the main plume of contaminated groundwater is relatively well-constrained in a zone running westerly and west south westerly from the fire training ground. The southern boundary of the plume approximates the southern boundary of Simon's Sand Pit. The northern boundary runs to the south of Les Meilles Golf Club House. PFOS concentrations above the MAC generally have not been recorded for sample locations outside of the plume.

It is considered that the extent of the contaminant plume has been stable for several years. Other than a gradual reduction in PFOS levels as the residual source of contamination progressively is depleted and as scavenge pumping from the FTG continues, provided that there is no significant disturbance in the groundwater conditions in the area, it is considered that the boundary of the contaminant plume will remain similar. As a result, it is considered that regular sampling of those private supplies which are outside of the contamination plume and which have never recorded PFOS since 2004, or earlier, can be discontinued.

Prior to the completion of the new FTG in 2004, the surface of the fire training area was conducive to infiltration of rainfall, which provided recharge to the underlying groundwater in the Jersey Shale Formation. The groundwater level in the Jersey Shale below the FTG is deep at approximately 28m below ground level. As a result, it was considered that there was a reservoir of PFOS and other firefighting foam components in the thick unsaturated zone beneath the FTG (the source). Infiltration through the old FTG mobilised these contaminants and continually flushed contaminants into the groundwater, which migrated off-site to the west. As a result, concentrations of PFOS and PFOA in the groundwater beneath and down hydraulic gradient of the FTG varied in response to rainfall events. This was apparent from the significant fluctuations recorded in the PFOS concentration in boreholes in the vicinity of the FTG.

Since the completion of the new FTG in 2004, the surface of the area has been sealed to minimise infiltration to the underlying groundwater. This has caused a significant reduction in the mobilisation of contaminants in the unsaturated zone and a marked reduction in the fluctuations in PFOS concentrations reported from samples taken down hydraulic gradient. Analysis of groundwater samples from monitoring boreholes and private water supply sources down hydraulic gradient of the FTG shows that prior to the completion of the FTG in 2004, the PFOS concentration varied significantly and that since 2004, the variability in the PFOS concentration is much less. There also is evidence of a general trend of falling PFOS concentrations in the groundwater since 2004, although current (2016) concentrations in many locations remain above the DWI MAC.

The analytical results also show that since 2004, there is no obvious seasonal variability in the PFOS concentrations. Samples have been collected at different periods during each year and there is no apparent relationship between the reported concentrations and the time of sampling. Seasonal variations in contaminant concentrations would be anticipated where the contaminant source is present at a shallow depth and hence where recharge rapidly could mobilise the contaminants. As the contaminant source at the FTG not only is at depth but also has been isolated from rainfall recharge, the reduction in the fluctuation of PFOS levels is consistent with the changed conditions on the FTG.

Reference: 60031084/M10587
Date: 31 January 2017