EXECUTIVE SUMMARY

Defra project WD0811 identified 24 catchments potentially at risk of ptaquiloside (PTA) contamination of raw water. Modelling predicted maximum PTA concentrations in surface water in the order of 10 µg/L, which compared well to literature data on groundwater concentrations. However, there were several uncertainties in the model, particularly the quantity of ptaquiloside released into the environment, and a study was required to characterise better the risk that ptaquiloside may pose to drinking water.

Eight monitoring sites (2 x private and 2 x public in both England and Wales) were identified that were deemed to be high risk based on bracken coverage and proximity of the abstraction point to bracken, though it was not possible to identify any catchment with the extreme characteristics used in the modelling in the previous project. Samples of the raw and treated water (or kitchen supply where there was no treatment) were taken on a monthly basis. The sites included 3 reservoirs and a river (public water supplies) and 4 springs (private supplies), one of which was influenced by surface runoff. In addition to the monthly sampling, samples were taken from one of the feeder streams of a reservoir during 3 rain events.

Samples were analysed for ptaquiloside (PTA) and its degradation product, pterosin B (PTB). The analytical lower limit of quantification of 0.05 µg/L.

No PTA or PTB was detected in the public water supplies.

No PTA or PTB was detected in the private water supplies.

Ptaquiloside was detected in the feeder stream to one of the reservoirs, with concentrations ranging from < 0.05 µg/L to 0.35 µg/L. The first rain event of 14 August 2014 recorded the highest ptaquiloside concentrations with an average of 0.18 µg/L after a total 6.0 mm of rain. There were no positive detections of PTA on 01 September 2014 following 0.6 mm of rainfall. On 23rd September, there was a total of 4.6 mm of rain. Three out of 5 samples gave positive results (> 0.05 µg/L) with a mean concentration of 0.08 µg ptaquiloside/L for the positive results and an overall maximum of 0.11 µg/L. Including all the samples for this rain event to calculate the mean gave an average concentration of 0.05 µg/L. This feeder stream was not representative of the water quality in the reservoir as a whole.

The model originally developed under project WD0811 was amended to match the catchment characteristics of the monitoring site with the feeder stream that was also sampled. The soil type was changed to Belmont. The quantity of ptaquiloside entering the soil remained unchanged, as additional work carried out whilst this study was ongoing demonstrated that the quantity of PTA in throughflow was similar to that in washoff assumed in the original model. However, the quantity of PTA released can be used to reflect lower bracken coverage within the catchment (as the model assumed 100%), and a lower loading/bracken coverage was included for comparative purposes. The model results compared well to the measured concentrations in the feeder stream. It should be noted however that the model predicts concentrations for percolate which is assumed to enter surface water and there is no dilution in the stream.

The presence of PTA and PTB in the small feeder stream but the absence in the raw water of the reservoir illustrates that in-stream dynamics and/or storage conditions may be important but there has been no research on this in relation to ptaquiloside. Dilution could also explain the absence of PTA/PTB detections in raw water for public supplies.

Due to the absence of any positive detections of PTA or PTB at the 8 monitoring sites it was not possible to comment on the role of factors such as pH, water treatment processes, bracken coverage on the fate of PTA and PTB in the environment. It was noted that the springs of the private water supplies were all small and similar in magnitude to the feeder stream of the reservoir where PTA was detected. The absence of PTA and PTB in the private water supplies indicates that either exposure is different at the springs, or perhaps the storage of water in the field affects PTA concentrations.