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Impacts by point and diffuse micropollutant sources on the stream water quality at catchment scale

M.F Petersen, E. Eriksson, P.J. Binning, and P.L. Bjerg
Department of Environmental Engineering, Technical University of Denmark, Denmark (plbj@env.dtu.dk)

The water quality of surface waters is threatened by multiple anthropogenic pollutants and the large variety of pollutants challenges the monitoring and assessment of the water quality. The aim of this study was to characterize and quantify both point and diffuse sources of micropollutants impacting the water quality of a stream at catchment scale. Grindsted stream in western Jutland, Denmark was used as a study site. The stream passes both urban and agricultural areas and is impacted by severe groundwater contamination in Grindsted city. Along a 12 km reach of Grindsted stream, the potential pollution sources were identified including a pharmaceutical factory site with a contaminated old drainage ditch, two waste deposits, a wastewater treatment plant, overflow structures, fish farms, industrial discharges and diffuse agricultural and urban sources. Six water samples were collected along the stream and analyzed for general water quality parameters, inorganic constituents, pesticides, sulfonamides, chlorinated solvents, BTEXs, and paracetamol and ibuprofen. The latter two groups were not detected. The general water quality showed typical conditions for a stream in western Jutland. Minor impacts by releases of organic matter and nutrients were found after the fish farms and the waste water treatment plant. Nickel was found at concentrations 5.8 – 8.8 μg/l. Nine pesticides and metabolites of both agricultural and urban use were detected along the stream; among these were the two most frequently detected and some rarely detected pesticides in Danish water courses. The concentrations were generally consistent with other findings in Danish streams and in the range 0.01 – 0.09 μg/l; except for metribuzin-diketo that showed high concentrations up to 0.74 μg/l. The groundwater contamination at the pharmaceutical factory site, the drainage ditch and the waste deposits is similar in composition containing among others sulfonamides and chlorinated solvents (including vinyl chloride). Vinyl chloride concentrations surpassed Danish stream water quality criteria with a factor 10. The largest chemical impact occurs at the reach downstream Grindsted city revealing that the main contaminant groundwater discharge zones are found here. The contaminant plume from the factory site north of the stream is known to impact the stream whereas the impact by the old landfill south of the stream remains to be assessed. A conceptual model of the chemical impacts by the identified sources was made, and high impact was assigned to the contaminant plume from the factory site and to the diffuse sources of urban-use and agricultural pesticides. The next step will be a quantification of the sources, which will be presented at the conference.