SEDIMENT CONTAMINANT CONCENTRATIONS IN MILFORD HAVEN WATERWAY: DATA CONVERSION AND TIMELINE

Report to Milford Haven Waterway Environmental Surveillance Group

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NON-TECHNICAL SUMMARY

The Milford Haven Waterway (MHW) has been the subject of surveys to determine concentrations of sediment contaminants for over 40 years. Laboratory analytical methods have changed in this time, making it difficult to compare current sediment contaminant concentrations in the MHW with those recorded in the past. This project inter-calibrated past and present methods for total hydrocarbon concentration (THC) and trace metals by subjecting paired sediment samples to old and new laboratory methods. The converted older data created a reliable baseline for future comparison, and also a timeline for contaminant input. This improves our understanding of the effects of oil spills, other contaminant inputs, and marine engineering works in the MHW.

Long-term trends in sediment contaminants since the late 18th century showed that THC decreased after both World Wars, and again after peak oil output in 1974. High THC also occurred mainly on the waterway's shorelines after some, but not all, oil spills. There were five significant increases and five significant decreases in mean THC in the MHW since the late 1970s, which suggested broadly stable THC in sediments. Some recent increases in THC seemed to be anomalous in the absence of recent large oil spills, and in light of improvements in effluent quality and of generally reduced economic activity since the 2008 financial crisis. This anomaly has arisen from disturbance and redistribution of historically-contaminated sediment during several years of dredging and construction, peaking in 2006.

The mean trace metals concentrations showed 22 significant increases and 27 significant decreases in the same period. Unlike the above fluctuations in THC which cancelled each other out, many trace metal trends noticeably decreased. This was also observed spatially, for example the decrease in lead concentrations through time in the innermost reaches of the waterway. Closure of sewage outfalls or investment in effluent treatment, reduction in lead domestic plumbing, and elimination of tetraethyl lead in petrol were all factors. Other trace metals showed similar concentrations since the late 18th century except after major dredging and engineering works, such as those peaking in 2006.

The chronology of contaminants in the waterway back to the 18th century was enabled by the sampling of deep sediment cores in the 1980s. These cores were dated using radionuclide decay rates, and allowed contaminant timelines to be traced back over centuries. They also provided the only previous data on rare earth elements (REE) in the waterway's sediments. REE are emerging contaminants from waste streams of electronics and renewables industries that have recently become established in the catchment. Two REE concentrations decreased, but overall there were no major changes in REE over 30 years.

Data must inspire confidence among the end users. Therefore for the Milford Haven Waterway Environmental Surveillance Group to construct an accurate timeline of sediment contaminant history in the MHW, it was necessary to undertake this data conversion exercise. Ultimately, this allowed for a more meaningful interpretation of contaminant trends to date, and in the future, which in turn will strengthen the rationale for decision making.

Key messages and recommendations:

- The usefulness of deep core-profiling for establishing contaminant timelines was confirmed, and should be repeated to include additional contaminants not previously analysed in the waterway, e.g. persistent pesticides, fire retardants and explosives.
- Monitoring data collected over long periods are potentially of great value in understanding estuarine processes, and thus in sustaining environmental quality in the waterway. This current study has addressed the inevitable generic issue of evolving laboratory methods over long term surveillance periods. These long term programmes must facilitate comparability of results over time, and it is therefore essential that before a newly accredited or revised method be adopted, an inter-calibration exercise is carried out. This had not been consistently undertaken by those commissioning monitoring studies over the years when methods changed.
- The value of monitoring can also only be fully realised when data is archived properly. Archiving of results needs to embed additional information on field and laboratory methods, as well as other relevant information such as context, contraints etc. Commissioning bodies in the future need to ensure that sufficient documentation is irrevocably embedded with tables of results. Otherwise, constraints and specific methods employed will be forgotten long after the original purpose of the project has been served.
- Awareness of field and laboratory methods is particularly important when datasets are used to develop baselines, trends or undertake Environmental Impact Assessment predictions. This report found that unreliable past data was still being used because issues surrounding the laboratory method used were not understood / recorded. Laboratory or method accreditation does not remove the need for vigilence.