Anatomy of a Decision: Potential Outcomes from Changes in the Canadian Dredged Material Disposal at Sea Protocols

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Introduction/Background: Environment Canada (EC) regulates the disposal at sea (DaS) of dredged material (DM) in Canada using the legal authority of the Canadian Environmental Protection Act, 1999. Currently, the Tier 1 assessment involves the determination of both the geophysical properties of the dredged material (sediment) and the concentrations of four contaminants (Cd, Hg, PAH and PCB), as well as "other chemicals of interest" using analyte-specific lower action levels (LALs), specified in the regulations. Unlike dredged material disposal frameworks in many countries, CEPA does not apply chemical upper action levels (UALs) within their framework. As part of an ongoing review, Environment Canada's DaS Program has hosted a workshop in 2006. A number of recommendations were made concerning the development of sediment assessment tools, the interpretation of these tools, and the essential attributes of a comparative risk assessment process for dredged material management. Specific recommendations to improve chemical assessments included reviews of the following issues: a) Inclusion of a broader suite of metals in Tier 1 assessments, b) Expansion of the PAHs examined in Tier 1 from the 16 parent compounds, c) Examination of PCBs based upon individual congeners rather than aroclors, d) Inclusion of a broader range of organic compounds in Tier 1 assessments, and e) Inclusion of chemical UALs in the Tier 1 assessment. Additional bioassessments, and changes in the way biological LOEs were applied in decisions, were also recommended. Since the workshop, EC has sought advice externally and carried out work internally to address a range of issues in support of framework revisions; studies evaluated the scientific underpinnings of a number of assessment and decision tools, and reviewed international policy and practice on various aspects of the DM framework.

Approach: It was strongly recommended that any changes to the framework should be preceded by a field assessment that evaluated the potential responses of representative sediments from throughout Canada's coastal and marine areas to a range of decision approaches. Such a review would evaluate whether an expanded, and potentially more expensive, assessment approach would change regulatory outcomes; whether it would "capture" potentially contaminated sediments which were currently missed. However, field studies of sufficient size (and with sufficient analyses) to test the impacts of various assessment and decision approaches are expensive, and currently outside the program's budget. A more cost-effective approach would be to challenge Tier 1 approaches using a "data mining" strategy. Such an approach could identify sediment chemistry (and, ideally, co-located toxicity) datasets that are available, and subject them to a series of Tier 1 decision approaches to determine whether different approaches "classify" sediments differently in regulatory terms. Based on results, recommendations could be made about a Tier 1 approach. To this end, a North American database was built with 2196 records of marine and estuarine sediment chemistry and, where available, co-located biology.

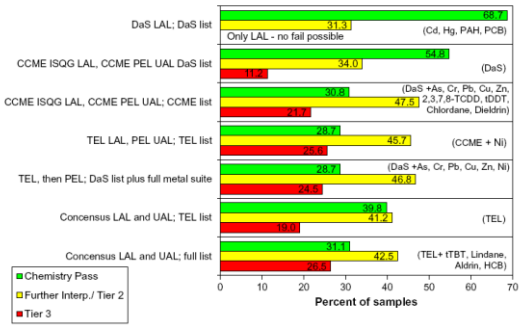

Fig. 1: Potential overall regulatory outcomes of a range of chemical test protocols that apply both LAL and UAL SQGs. The current DaS protocol is an LAL-only protocol, but is included for comparison. From [1].

Results/Lessons Learned: In this paper, we report on the development and application of the database to test the outcomes and implications of potential changes in the Canadian DM DaS chemical (Figure 1) and biological assessment protocols. Recommendations on changes to aspects of the DaS framework, and their implications for overall framework performance, as well as for the next steps, will be made.

References: [1]. Apitz and Agius (2013) *Marine Pollution Bulletin* **69:**76-90.