

CHAPTER 10

TIER IV EVALUATIONS

10.1 OVERVIEW

A Tier IV evaluation is a special, non-routine evaluation that requires coordination between the RMT and the dredging proponent to determine the specific testing required. As part of this on-going process, the RMT will continually review new tests and evaluation procedures that have been peer reviewed and are deemed ready for use in the regulatory evaluation of dredged material. The RMT will subsequently make recommendations about their potential implementation and use. Tier II and III evaluations of dredged material may result in a requirement to conduct Tier IV evaluations.

Three circumstances are expected to trigger Tier IV evaluations: (1) the results of Tier III bioaccumulation tests (tissue analysis) are indeterminate, (2) the sediments/tissues contain chemicals for which threshold values have not been established or (3) for which the routine Tier III biological tests are inappropriate. If Tier IV testing or evaluations are determined necessary by the RMT, specific tests or evaluations and interpretive criteria will be specified by the RMT in coordination with the applicant. Alternative analyses which may be conducted in this tier may include any or all of the following.

10.2 STEADY STATE BIOACCUMULATION TEST

In a Tier IV evaluation, bioaccumulation testing may be necessary to determine the steady state concentrations of contaminants in organisms exposed to the dredged material when compared with organisms exposed to the reference material. Testing may be done in the lab, or in rare cases, in the field. Testing options may also include time-sequenced laboratory exposures in excess of the standard 28 days in order to reach a steady state concentration. Tier IV evaluations of data collected will follow the interpretation guidance specified in Section 9-4 (also see Appendix D of the Inland Testing Manual).

10.2.1 Time-Sequenced Laboratory Testing. This test is designed to detect differences, if any, between steady-state bioaccumulation in organisms exposed to the dredged sediments and steady-state bioaccumulation in organisms exposed to the reference sediments. If organisms are exposed to biologically available contaminants under constant conditions for a sufficient period of time, bioaccumulation will eventually reach a steady-state in which maximum

bioaccumulation has occurred, and the net exchange of contaminant between the sediment and organism is zero.

The necessary species, apparatus and test conditions for laboratory testing are the same as those utilized for the Tier III bioaccumulation test. Tissue sub-samples taken from separate containers during the exposure period provide the basis for determining the rate of uptake and elimination (depuration) of contaminants. From these rate data, the steady state concentrations of contaminants in the tissues can be calculated, even though the steady state may not have been reached during the actual exposure. For the purposes of conducting this test, steady state is defined as "the concentration of contaminant that would occur in tissue after constant exposure conditions have been achieved."

An initial time-zero sample is collected for each species for tissue analysis. Additional tissue samples are then collected from each of the five replicate reference and dredged-material exposure chambers at intervals of 2, 4, 7, 10, 18, and 28 days. Alternative time intervals may be proposed by the agencies. It is critical that sufficient tissue is available to allow the interval body burden analyses at the specified detection limits for the chemical(s) of concern.

10.2.2 Field Assessment of Steady State Bioaccumulation. Measuring concentrations in field-collected organisms may be considered as an alternative to laboratory exposures. A field sampling program designed to compare dredging and reference tissue levels of the same species allows a direct comparison of steady state contaminant tissue levels, to the above referenced database. This may be difficult to accomplish, because the same species in similar size ranges must be available for collection from both the dredging site and a suitable reference area to enable a statistical comparison of the tissue levels between the two areas.

The assessment involves measurements of tissue concentrations from individuals of the same species collected within the boundaries of the dredging site and a suitable reference site. Collecting sufficient numbers of individuals of the same relative size ranges and biomass of the same species to enable tissue analyses at the reference and dredging site can make this type of assessment problematic. A determination is made based on a statistical comparison on the magnitude of contaminant tissue levels in organisms collected within the boundaries of the reference site, compared with organisms living within the area to be dredged.

A field assessment should only be allowed where the quality of the sediment to be dredged can be shown not to have degraded or become more contaminated since the last dredging and disposal operation.

10.3 HUMAN HEALTH/ECOLOGICAL RISK ASSESSMENT

When deemed appropriate by the RMT, a human health and/or ecological risk assessment may be required to evaluate a particular chemical of concern, such as dioxin, mercury, PCBs, etc. National guidance on chemicals such as dioxin is subject to rapid changes as new information becomes available. Project specific risks to human health or ecological health should be evaluated using the best available current technical information and risk assessment models. A risk assessment must be developed on a case specific basis and be formulated with all interested parties participating. If a risk assessment is the method of choice for a Tier IV evaluation, either as a stand alone or in concert with tissue analysis, it must be accomplished with the RMT and all parties actively participating.