



June 2021

Clarification of the National Assessment Guidelines for Dredging 2009

Decision tree and explanatory note for assessment of tributyltin (TBT) in dredge spoil

Introduction

[The National Assessment Guidelines for Dredging 2009](#) (NAGD) set out a framework for the environmental impact assessment and permitting of the ocean disposal of dredged material under the *Environmental Protection (Sea Dumping Act) 1981*.

The NAGD seeks to provide clear, consistent standards and criteria for assessment of dredged material. This helps facilitate better decision-making by regulators through improving the quality of information on which assessments are based. In order to provide up to date guidance on emerging science of contaminants, clarifications to the NAGD can be periodically published.

Clarified NAGD TBT assessment process

Tributyltin (TBT) is largely present in anti-fouling paint flakes and as such, its distribution in marine sediments is likely to be concentrated or localised. Due to the nature and distribution of TBT, the NAGD refers to a number of exceptions when assessing TBT. Procedures for assessing TBT including these exceptions are summarised in the below explanatory note and decision tree at Figure 1 available on page 2 of this document. This decision tree is to be referred to in place of Figure 3 of the NAGD (page 12) when assessing TBT. Page number, table and figures refer to the NAGD except where noted otherwise.

PHASE I – Evaluation of existing information

Phase I involves reviewing existing information on the material proposed for sea disposal, to determine which contaminants need investigation and to assess whether the existing information sufficiently characterises the sediments without further testing. Further detail is provided in the NAGD Section 4.2.1 and Appendix A.

PHASE II – Sampling and analysis requirements

If TBT is identified as possibly being at elevated levels in the sediments of the dredge area, the following processes apply.

Having a sufficient number of samples and sample density is a critical component of site characterisation. Where the TBT data from a dredging area is highly variable, it may be necessary to

collect more sediment samples, or a significantly higher number of replicates, than the minimum numbers specified in the NAGD (page 33 and Table 6). TBT variability will often be known from previous sampling. The number of samples required to adequately characterise an area can be determined, if there is existing data on TBT, by power analysis (pages 38 and 60). Where previous TBT data is lacking, it is prudent to collect more samples or replicates, otherwise, if high variability is found, it may be necessary to resample to obtain sufficient data for the assessment. If in doubt, refer to the determining authority (DA) for approval.

Where an outlier is reassessed and subsequently discarded, the process is to be documented and justified to the DA. See also the procedures for dealing with outliers (page 35).

Screening level assessment

Compare the 95% upper confidence limit (UCL) of total organic carbon (TOC) normalised sediment data to the screening level (SL) in Table 2 (9 µg Sn/kg). TBT is normalised to 1% TOC over the TOC range 0.2% to 10% (equates to multiplication factors of 5 times to 0.1 times, respectively) by dividing the TBT value by the % TOC value. Outside this range, use the end value which applies (e.g. for less than 0.2% TOC, use 5 times the TBT value measured).

If the 95% UCL exceeds SL, the spoil is potentially contaminated and requires further assessment. Generally, there should be a minimum of 10 samples for accurate calculation of the 95% UCL although it can be calculated with fewer (USEPA, 2015). If a 95% UCL cannot be determined or, in a small data set the calculated 95% UCL is greater than the highest analysis value, use the maximum value in the data set (USEPA 2015, Section 1.10, pp 56-57).

Hot spot assessment

Reference pages 20 and 44-45. A hot spot is a cluster of 2 or more samples exceeding the SL. If a hot spot is present, can it be selectively dredged? If it can, assess as a separate dredge spoil unit.

Comparison of Data to Ambient Baseline Concentration

Compare TBT data to ambient background concentration at a reference area near disposal site.

A reference area is an area with similar sediment grainsize and oceanographic characteristics as the disposal site, and nearby, but outside the area whose sediment chemistry could be affected by disposal at the site (page 38, 76, 80). Refer to the Screening Level assessment (above) for the minimum sample numbers for calculation of the 95% UCL. The spoil data (95% UCL) is compared to the 80th percentile for reference site sediments (page 38).

PHASE III – Elutriate and bioavailability testing

Compare TBT elutriate data to marine water quality guideline value (WQ GV) after 4-hour dilution (dilution calculation methods, pages 39-40).

This assesses potential impacts on water column organisms during disposal. Test results are normally compared to the relevant ANZECC/ARMCANZ (2000a, b) marine WQ GV (called trigger value in that document) for 95% protection (0.006 µg Sn/L), or subsequent updates to these values (ANZG, 2018). Except where the water body has been zoned to have a higher (or lower) level of protection, in which case the relevant ANZECC/ ARMCANZ (2000a, b) trigger values, or subsequent updates to these values, are to be used (Section 4.2.3, page 14). ANZG, 2018, recommends that, for bioaccumulating contaminants (such as TBT) the next most protective DGV should be used (e.g. 99% species protection rather than 95%, if the water body is zoned 95%).

Bioavailability and toxicity assessment

Bioavailability and toxicity are assessed by comparing TBT pore water data to relevant marine WQ GV – without dilution. This test assesses potential impacts on benthic organisms exposed to sediment pore water after disposal. Toxicity testing does not apply to TBT because standard tests are unresponsive except at high levels (page 43), however the marine WQ GVs are based on chronic toxicity and, if exceeded, indicate that TBT is bioavailable and likely to be toxic.

Test results are normally compared to the relevant ANZECC/ARMCANZ (2000a, b) marine water quality trigger values for 95% protection (0.006 µg Sn/L), or subsequent updates to these values. Except where the water body has been zoned to have a higher (or lower) level of protection, in which case the relevant ANZECC/ ARMCANZ (2000a, b) trigger values, or subsequent updates to these values, are to be used. ANZG, 2018, recommends that, for bioaccumulating contaminants (such as TBT) the next most protective DGV should be used (e.g., 99% species protection rather than 95%, if the water body is zoned 95%).

If pore water cannot be obtained, which needs to be established to the satisfaction of the DA, elutriate data can be used to **estimate** pore water concentrations. If the TBT data is above the GV without dilution, the spoil is unacceptable for sea disposal. For marine areas zoned for a high level of ecological protection, any significant toxicity may render the sediments unacceptable for ocean disposal in that area (Section 4.2.4, page 14).

If the TBT data for pore water or elutriate water is below the relevant marine WQ GV, but the sediment TBT level (95% UCL) exceeds the sediment quality guidelines (SQG)-High value of 70 µg Sn/kg in Table 4, bioaccumulation testing is required in PHASE IV. Organisms can also be exposed to contaminants by contact with or consumption of the sediment, or by consuming other organisms, and bioaccumulation may be of concern even where toxicity has not been identified.

PHASE IV – Assess TBT bioaccumulation

Reference:

- Section 4.2.4, page 14
- Appendix A, pages 43, 44-46
- Appendix D, pages 62-63
- [Simpson et al., 2013](#).

Where bioaccumulation is rated as very significant or significant (columns 2 and 3 of Table 3, respectively) **in any of the tests on any of the samples**, if the proponent wishes to dispose of this material at sea they would need to check existing data to see if a hot spot can be identified. If not, carry out step-out sampling (i.e. collect two or more samples stepped out at appropriate distances from the sample or samples in which bioaccumulation has been identified, in order to determine the extent of the contamination).

These samples would be tested for chemistry as per NAGD PHASE II (page 13) and bioaccumulation as per PHASE IV (page 14). Then:

- If any hot spots are identified, sediments within them are unacceptable for sea disposal.
- If no hot spot is found, and bioaccumulation only occurs in one sample, the spoil is acceptable.

- If bioaccumulation is identified at scattered locations throughout the dredge area that do not constitute hot spots, with the agreement of the DA a Weight-of-Evidence (WOE) assessment may be carried out.

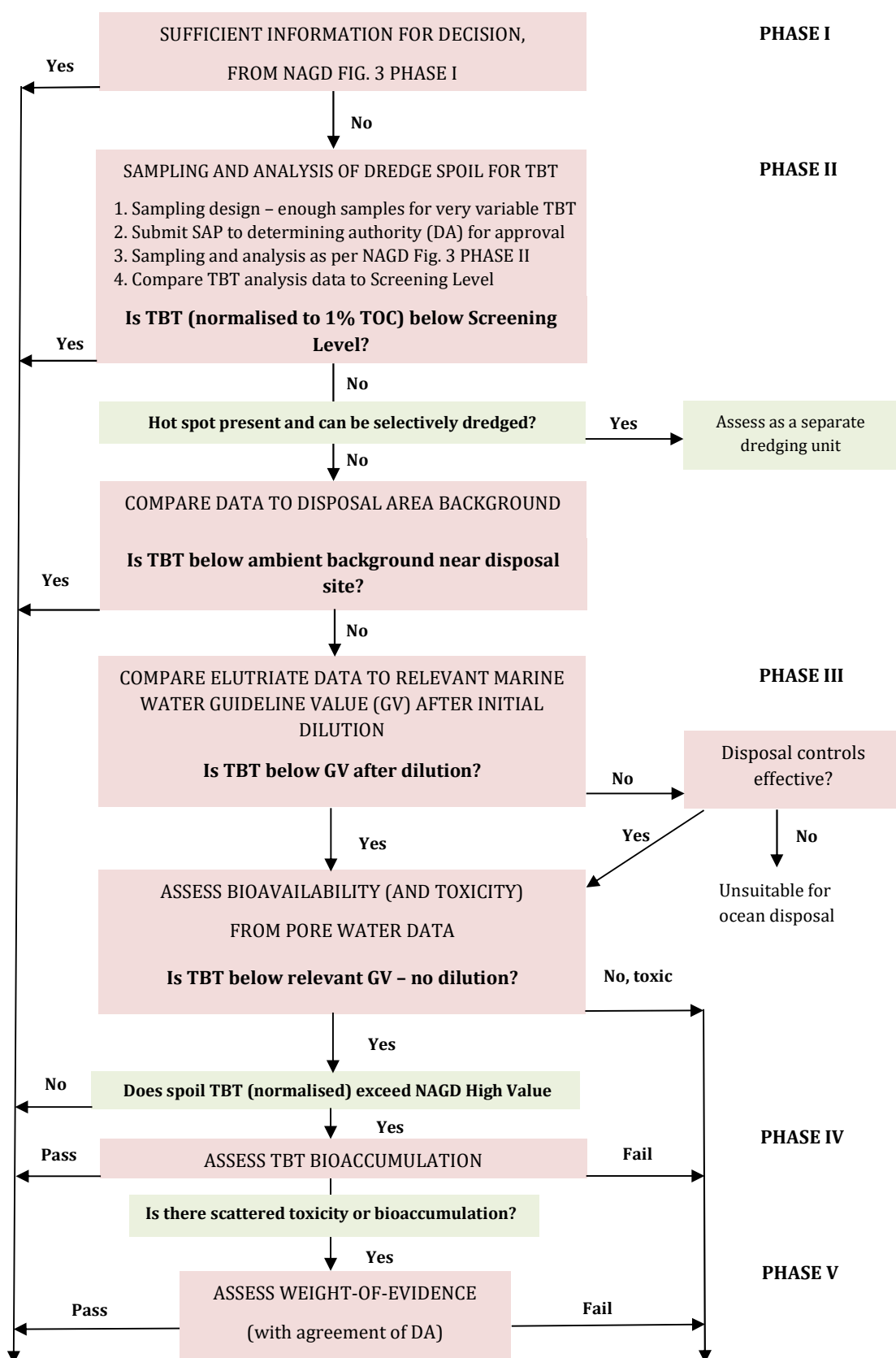
PHASE V – Assess Weight-of-Evidence

Reference:

- Section 4.2.4, page 15
- Appendix A, page 48
- Table 3, page 46

More detailed WOE procedures, and examples, are set out in [Simpson et al., 2013](#). If the WOE is passed the spoil is acceptable for sea disposal. If the WOE is failed, the spoil is unacceptable for unconfined ocean disposal.

Figure 1. Clarification of the National Assessment Guidelines for Dredging 2009 (NAGD) decision tree for assessment of tributyltin (TBT) in dredge spoil



TBT content of spoil suitable for unconfined ocean disposal. Evaluate impacts etc.

TBT content of spoil not suitable for unconfined ocean disposal. Investigate treatment, confined disposal options or on-land disposal.

References

ANZECC, ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1: The Guidelines. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT, October 2000.

ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Department of the Environment, Water, Heritage and the Arts, (2009) [National Assessment Guidelines for Dredging](#). Commonwealth of Australia, Canberra, 2009.

Simpson, SL, Batley, GE and Chariton, AA 2013. [Revision of the ANZECC/ARMCANZ 2000 Sediment Quality Guidelines](#). CSIRO Land and Water Science Report 08/07. Prepared for the Department of Sustainability, Environment, Water, Population and Communities.

USEPA 2015. ProUCL Version 5.1, User Guide. US Environmental Protection Agency, EPA/600/R-07/041, October 2015.

Further information

Email: seadumping@awe.gov.au

Web: <http://www.environment.gov.au/marine/publications/national-assessment-guidelines-dredging-2009>

© Commonwealth of Australia 2021

This work is copyright. It may be reproduced in whole or in part subject to the inclusion of an acknowledgement of the source and no commercial usage or sale.