

CHARGE TO THE SAB POLYCHLORINATED BIPHENYLS – ARTIFICIAL REEF RISK ASSESSMENT CONSULTATIVE PANEL (PCB-ARRA PANEL)

Background

The U.S. Navy and the State of Florida are planning to deploy the ex-Oriskany, a World War II era aircraft carrier, as an artificial reef in the Gulf of Mexico. In accordance with the Toxic Substances Control Act (TSCA) and its Federal PCB regulations (40 CFR part 761), the U.S. Navy has applied for and must obtain a risk-based PCB disposal approval prior to sinking the vessel with non-liquid PCBs onboard. The EPA may approve such an application if it finds the disposal action will not pose an unreasonable risk of injury to human health or the environment. To evaluate the potential transfer of non-liquid PCBs to the marine environment and the subsequent risk that they might pose to human and ecological receptors using the artificial reef, the Navy performed leaching studies of different on-board PCB containing materials followed by fate and transport modeling of the leaching results to evaluate how released chemicals might behave in the near-reef marine environment. The U.S. Navy has also developed a fate and transport model known as the Prospective Risk Assessment Model (PRAM), and a time dynamic model (TDM). EPA Region 4 has requested that the SAB conduct a consultation followed by an advisory on the U.S. Navy's assessment of potential human health and environmental risks from PCBs released from the ex-Oriskany following deployment as an artificial reef.

Purpose of the Consultation

This SAB consultation represents a preliminary evaluation of several documents. The Consultation is intended to allow the SAB to provide initial advice regarding the draft risk assessment and to comment on the overall readiness for a subsequent advisory review. The documents being provided for this SAB consultation focus on several different areas, including a study of leaching capability of PCBs from ship materials to the marine environment, fate and transport modeling, and human and ecological risk characterizations. A listing of documents for the SAB consultation is followed by the overall and document specific charge questions

Description of Technical Documents for This Consultation

1. **Prospective Risk Assessment Model (PRAM) Documentation Version 1.4, May 2005 (Draft Final).** The PRAM is the main fate and transport/bioaccumulation model used to evaluate the redistribution of PCBs from the ship into the marine environment and biota. The technical documentation for the model contains a discussion of PRAM's underlying conceptual model for the ship-reef ecosystem and Zone of Influence (ZOI), computational algorithms for the fate, transport, and bioaccumulation of PCBs, and the parameters used to simulate the aforementioned processes for the proposed reefing of the ex-Oriskany. This document also discusses the strengths and weaknesses of the PRAM modeling framework as well as model sensitivities and uncertainties.

2. **Time Dynamic Model (TDM) Documentation, May 2005 (Draft Final).** A review of the leach rate study of non-liquid PCB materials indicates that there should be a fairly quick release of relatively high concentrations of PCBs from the ship to seawater soon after sinking. This elevated release rate is expected to taper off over time and eventually reach a quasi-steady state. In an attempt to understand this initial "pulse" of PCBs to the marine environment, a separate fate and transport evaluation (described in this document) was developed to augment the steady-state oriented PRAM outputs. [Note that pulse modeling studies only focus on the abiotic compartments of water, sediments, dissolved organic material (DOM) and total suspended solids (TSS).]
3. **Investigation of Polychlorinated Biphenyl Release-Rates from Selected Shipboard Solid Material Under Laboratory-Simulated Shallow Ocean (Artificial Reef) Environments, June 2005 (Draft Final).** Solid materials containing high levels of PCBs were targeted and collected from a variety of decommissioned Navy vessels to represent the highest range of PCBs that could potentially be found on board ships to be used as artificial reefs. An analysis of PCB leaching in sea water (25E C) over time was then performed. Additional experiments at lower temperatures (4E C) expected at greater ocean depths complimented this study. The leach rate study provided key input data for subsequent fate and transport modeling (using the PRAM and TDM).
4. **Ex-ORISKANY Artificial Reef Project Human Health Risk Assessment, June 2005 (Draft Final).** This document will provide the overall description of the analysis of potential risks to people who will use the artificial reef, primarily for recreational purposes (e.g., sport fishing). The document will include discussions of the background and purpose of the assessment, the exposure assessment approach, toxicity considerations, and risk characterization, including uncertainties associated with the assessment. (Note that while this document discusses the use of the PRAM for exposure assessment purposes, a complete discussion of the technical details of the PRAM model are provided in the document noted in number 1 above.)
5. **Ex-ORISKANY Artificial Reef Project Ecological Risk Assessment, June 2005, (Draft Final).** This document provides the overall analysis of potential toxicological risks to the marine organisms that are expected to establish themselves upon or otherwise use the new artificial reef. The document includes discussions of the background and purpose of the assessment, the characterization of exposure, the characterization of ecological effects, and the risk characterization, including uncertainties associated with the assessment.

To assist in this consultation of the aforementioned documents, three additional documents are enclosed that may provide helpful insights into what is known about PCB migration from ships into the open ocean and their potential to bioaccumulate in fish. We are not asking for review of the supplemental background documents (they are provided for informational purposes only).

Supplemental Background Document

A Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls from Sunken Vessels Used As Artificial Reefs (Food Chain Scenario) Final Report (March 2004). In August 1988, South Carolina reefed a cargo vessel, the ex-Vermillion in the open ocean (approximately 30 nautical miles southeast of Georgetown, SC). While a thorough inventory of non-liquid PCBs for this ship was not developed at the time, an estimate of such materials was subsequently made. In an attempt to understand the potential for non-liquid PCBs to accumulate in reef fish, the South Carolina Department of Natural Resources (SCDNR) in 1998, collected fish and invertebrates from artificial reefs and naturally occurring "hard bottom" reef sites. In 2001, another sampling effort by the Navy and SCNDR included sea bass (*Centropristis striata*), vermillion snapper (*Rhomboplites aurorubens*) and white grunt (*Haemulon plumieri*) samples. The results of these investigations provide insight into the potential impact of a non-liquid PCB-laden ship carcass on near-reef fish tissue PCB levels.

The Ecological Risk of Using Former Navy Vessels to Construct Artificial Reefs: An Initial and Advanced Screening Level Ecorisk Assessment, Final Report (May 2005). This document presents the results of an initial and advanced screening-level ecorisk assessment that was conducted on data from artificial reefs located off the coast of South Carolina to assess the potential toxicological risks from sunken Navy vessels. The problem formulation, conceptual model, and exposure pathways for the risk assessment are described, the methods, benchmarks, and decision criteria for the ecorisk screening are detailed, and the results are presented and discussed.

Polychlorinated biphenyls (PCBs) Source Term Estimates for ex-ORISKANY (CV 34) Rev 4. (Dec. 2004). PCB containing materials were identified aboard Oriskany through the Navy's routine sampling protocol for inactive vessels. Materials/components found to contain PCBs at some concentration include paints, rubber products, electrical cable insulation, bulkhead insulation, ventilation gaskets, and lubricants. This document quantifies the amount of these PCB-containing materials aboard the Oriskany and provides mean and upper limit estimates of the amount of PCBs that could potentially be released to the marine environment if left aboard (the PCB source term).

General Charge Instructions

The charge questions for this consultation are focused on the five primary documents described above. Please comment on the adequacy and readiness of the aforementioned draft documents for further scientific review.

- Do the documents provide adequate descriptions of study design, methods, conclusions, limitations and uncertainties?
- Are there major omissions?
- Are the draft reports sufficient for peer review?

Document-Specific Charge Questions

Prospective Risk Assessment Model (PRAM) Documentation Version 1.4, May 2005 (Draft Final)

- Please provide specific recommendations regarding the sufficiency of PRAM's documentation.
- Are the data used to calibrate the PRAM appropriate
- Please comment on the soundness of PRAM's approach, assumptions, equations, and calculations in predicting direct PCB exposure, uptake, and food web transfers (including bioaccumulation algorithm).
- The choice of ZOI is paramount to accuracy of PRAM's modeled predictions. Please provide recommendations regarding its definition, basis, dimensions, and overall scientific soundness.
- Please provide recommendations regarding the accuracy of the PRAM's PCB congener forecasts in water and fish.
- Please make recommendation regarding sufficiency of the ship's interior flow rate assumptions. Also comment on the potential usefulness of considering catastrophic weather effects on both interior and exterior flow rates.
- Please provide specific opinion regarding PRAM's transferability to other naval reefing applications including scenarios that include multiple ships reefed in close proximity.
- Lastly, provide comments on the sufficiency of the ex-Vermillion fish tissue study in calibrating and validating the PRAM.

Time Dynamic Model (TDM) Documentation, May 2005 (Draft Final)

- Please provide recommendations as to the TDM's applicability in ship reefing (i.e., is its short term fate and transport algorithm accurate and applicable).

- Please offer recommendation on the appropriateness of TDM's fate and transport outputs for input in PRAM's exposure algorithm and the resulting comparability of the short- versus long-term exposure results.
- Please comment on the sufficiency of the documentation describing the TDM approach, limitations, and uncertainties?
- Please comment on the soundness of the assumed pycnocline to bound the volume into which PCBs are initially distributed.
- Please make recommendations regarding the accuracy, and/or reasonableness, of TDM's approach, assumptions, inputs, equations, and calculations in regards to the overall prediction of direct PCB exposure to humans and marine organisms.
- Please provide specific opinion regarding TDM's transferability to other naval reefing applications including scenarios that include multiple ships reefed in close proximity.

Investigation of Polychlorinated Biphenyl Release-Rates from Selected Shipboard Solid Material Under Laboratory-Simulated Shallow Ocean (Artificial Reef) Environments, June 2005 (Draft Final)

- Please provide comments as to whether biodegradation or encrustation processes should have been considered in the study.
- Please provide comments as to the adequacy of the study to support the fate and transport models (PRAM and TDM).
- Please comment on whether the nonliquid-PCB materials selected for evaluation were sufficiently representative of PCB materials on the ex-Oriskany and other vessels to provide a basis for evaluating ship sinkings.

Ex-ORISKANY Artificial Reef Project Human Health Risk Assessment, June 2005 (Draft Final)

- Please provide specific recommendations on the completeness of the exposure scenarios with regard to selecting the maximally exposed receptor and the length of the chronic exposure duration (i.e., should the initial 2-year pulse PCB release period be considered in chronic exposures).
- Please provide specific recommendations regarding the exposure parameter selection for the diver scenario and whether its qualitative assessment is sufficient.

- Please provide recommendations regarding the accuracy of the PRAM's PCB congener forecasts in water and fish.
- Please comment on the selected risk assessment parameters used in the study including toxicity values and risk calculations. Are quantitative risk considerations missing (e.g., dioxin-like PCB risks)?

Ex-ORISKANY Artificial Reef Project Ecological Risk Assessment, June 2005, (Draft Final)

- Please comment on whether the selected ecological communities and trophic relationships are inclusive and representative of reefing sites. Please also comment on whether the assessment endpoints and conceptual model are acceptable.
- Please comment on whether sufficient toxicological benchmarks are used to be confident that risks to Threatened and Endangered species and other species of critical concern are adequately considered.
- Please comment on the soundness and inclusiveness of the selected assumptions, the inherent uncertainties, and the overall limitations of the ecological risk assessment. Are additional data analyses or risk characterizations warranted to support the conclusions about ecological risks?
- Please specifically identify fundamental analytical flaws and/or key data gaps that might negate or restrict the use of this Ecological Assessment in supporting risk-based reefing (ex-Oriskany as well as other vessel reefing).
- Please comment on the need for acute ecological health concerns given the results of the TDM and reef species colonization timing and uncertainty.