

CRESP Peer Review Committee Review:

- **Biomonitoring for Ecosystem and Human Health Protection at Amchitka Island (January 13, 2006, version)**
- **Addendum: Additional Radiological Data for Bioindicator Selection (January 11, 2006 version)**

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Introduction

This is a review of the following two draft reports of the Consortium for Risk Evaluation with Stakeholder Participation (CRESP): 1) *Biomonitoring for Ecosystem and Human Health Protection at Amchitka Island (January 13, 2006, version)* and 2) *Addendum: Additional Radiological Data for Bioindicator Selection (January 11, 2006 version)*. The review was carried out, at CRESP's request, by members of the CRESP Peer Review Committee (Table 1).

The plan for biomonitoring was called for in a June 2002 Letter of Intent between the U.S. Department of Energy and the State of Alaska Department of Environmental Conservation, which stipulated that: 1) an independent scientific organization (CRESP) was to assess the potential risks to the local marine environment and food chain posed by the seepage of radionuclides from three underground shot cavities resulting from nuclear bomb tests conducted at Amchitka in 1965, 1969, and 1971, and 2) the assessment was to serve as the basis for a long-term stewardship plan to deal with the radioactive wastes remaining in the shot cavities, some of which can be projected to remain there indefinitely.

The intended assessment was completed by CRESP in 2005, and its findings were reported in *Amchitka Independent Science Assessment: Biological and Geophysical Aspects of Potential Radionuclide Exposure in the Amchitka Marine Environment*. Subsequently, to aid in the selection of bioindicators and to provide further clarification of observed differences in radionuclide levels between specimens collected at Amchitka and those at Kiska, the reference island, CRESP performed additional analyses, which form the basis of the aforementioned *Addendum*. Also, based on the results of the analyses presented in the *Amchitka Independent Science Assessment* and in the succeeding *Addendum*, CRESP formulated the plan for the biomonitoring called for in the long-term stewardship of Amchitka, which is presented in *Biomonitoring for Ecosystem and Human Health Protection at Amchitka Island*.

In the remarks that follow, each of the two aforementioned reports is reviewed in succession, beginning with the latter.

Biomonitoring for Ecosystem and Human Health Protection at Amchitka Island

General Comments

This is a well organized and well written 49-page report, which explains clearly and in detail why, what, where, when, and how bio-indicator species are to be selected and analyzed for biomonitoring purposes in the projected long-term stewardship of Amchitka Island. The proposed plans for sampling and analysis are well conceived and flow logically from the findings presented in CRESA's earlier reports, cited above (i.e., the *Amchitka Independent Science Assessment* and its *Addendum*). Given that regular monitoring of biota in the vicinity of the three underground nuclear test shots on Amchitka is judged to be the most sensitive (and cost-effective) method of detecting releases of radionuclides from these shots, the proposed selection of species of biota to be sampled appears to be based on a sound monitoring strategy, particularly since the sampling is to include special measurement campaigns immediately following any substantial geophysical events (earthquakes; volcanic eruptions) in the region.

The measurements by CRESA staff of the current (very low) levels of radionuclides in the species sampled provide a valuable benchmark against which to compare future observations.

Also included in the report, and well conceived in their rationale and scope, are recommendations for the purpose of ensuring that the different stakeholders are adequately involved in the various aspects of the plan.

Specific Comments

Page 1, line 1: the *Abstract* should preferably begin with "A Letter of Intent..." rather than with the word "Following."

Page 1, 1st paragraph, line 8: "food" should be replaced by "foods."

Page 1, last line: "airport creek" should be replaced by "Airport Creek".

Page 2: a glossary should be added in view of the many technical terms and acronyms that are employed throughout the report.

Page 4: the inclusion of a small map of Amchitka, indicating the location of the test shots, would be helpful in the Introduction.

Page 5, *Common Principles*, 1st paragraph, line 3: "requires a continued commitment" should be replaced by "will require the long-term commitment of stakeholders and funds needed..."

Page 5, *Common Principles*, 2nd paragraph: addition of the following sentences would amplify and strengthen this paragraph. "There are many benefits to involving stakeholders in the process. Participation makes the process more democratic, lends legitimacy to the process, educates and empowers the affected parties and generally leads to decisions that are more accepted by stakeholders. Stakeholder

- involvement can also assist in dealing with perceptions of risk and helping affected parties to understand the differences between different types and degrees of risk.”
- Page 5, *Common Principles*, 3rd paragraph, lines 3-5: after “Specificity” the existing statement should be replaced by the concept that is expressed in the last sentence of the paragraph.
- Page 5, *Common Principles*, 4th paragraph, line 1: “studies and report will allow” should be replaced by “data and analyses will help.”
- Page 5, *Common Principles*, 5th paragraph, line 1: “We note” should be replaced by “Our studies clearly indicate.”
- Page 5, *Common Principles*, 5th paragraph, line 5: the meaning of, and rationale for, “biomonitoring” should be spelled out for the uninitiated reader.
- Page 8, *DOE Surveillance and Monitoring Plans*, 2nd paragraph, line 2: “required” should be inserted after “biomonitoring is.”
- Page 11, *Table 1*: in this table and others, the title alone should appear above the table, and the explanatory information should be allocated to footnotes.
- Page 14 et seq., *Species to Monitor*: regular monitoring of selected species of biota in the vicinity of the three underground nuclear test shots in the Amchitka region is judged to be the most sensitive (and cost-effective) method of detecting releases of radionuclides from the shot cavities. To this end, the selection of biota presented in the report based on: (i) species that are important to the diet of the local population and to others who may eat fish caught in the region (i.e. fish that is sold for consumption elsewhere); and (ii) species that are particularly sensitive indicators of changes in radionuclides in the marine environment, appears to be a reliable monitoring strategy, particularly since the sampling is to include special measurement campaigns immediately following any substantial geophysical events (earthquakes; volcanic eruptions) in the region. The measurements by CRESA staff of the current (very low) levels of radionuclides in the species sampled provide a valuable benchmark against which to compare future observations.
- Page 24 et seq.: some discussion of the statistical methods used in the analyses would be helpful.
- Page 28, *Sampling Challenges for Regular Biomonitoring*, 5th bullet, “Glaucus-winged Gulls,” line 1: “by” should be replaced by “be”.
- Page 37 et seq., *Trigger: Responses to Specific Geologic Events*: absent any significant seismic or volcanic events 'in the region', changes in the cavity will probably occur very slowly; i.e., over hundreds of years. The 'chimneys' formed above the shot points -- extending essentially to the surface -- are unlikely to experience any additional collapses of rock, certainly not sufficient to affect the hydrological regime in the chimneys. The 'hydrological drive' due to the temperature increase of the water in the chimneys (produced by the shots) will continue to decline with time, albeit slowly. Thus, releases of radionuclides by this mechanism (i.e., assuming no increase over time of radionuclide concentration in the water in the chimney) should also decline.

With respect to the consequences of volcanic eruptions and seismic events

in the vicinity, these would probably need to be severe before they would result in significant changes in the releases. It would be possible to make some calculations in order to enable more quantitative statements [See below], but the associated uncertainties would be large. In any case, observation of radionuclide concentrations in the biota after such events would probably still be the most reliable indicator of immediate consequences.

As concerns the effects of seismic events (earthquakes) and volcanic eruptions, it is noteworthy that DOE's Office of Civilian Radioactive Waste Management (OCRWM) is in the process of preparing a Total System Performance Assessment (TSPA) for a potential repository at Yucca Mountain, Nevada. In this assessment, the consequences of high intensity ground motions (i.e. earthquake induced) and volcanic eruptions on the repository have been studied intensively as part of the TSPA. Numerical model analyses of damage to the rock in the region of the drifts, and the effect of eruptions through the repository (entraining radionuclides in the volcanic ash plume) have been developed. These could be used (with appropriate modification) to predict the immediate and long-term consequences on radionuclide doses in the Amchitka region. Officials associated with 'Amchitka Legacy' issues should be recommended to follow developments in the Yucca Mountain TSPA, especially the section on Disruptive Events. As noted above, it is obviously not possible to avoid uncertainties in such calculations and predictions, but they could help to provide estimates of the long-term risks from such events.

Page 41, *Conclusions*: the recommendations listed at the end need to be sharpened and spelled out more clearly.

Conclusion

This draft of *Biomonitoring for Ecosystem and Human Health Protection at Amchitka Island* represents a thorough and well-considered plan for future analyses of evidence for the dispersion of radionuclides from the underground test shots at Amchitka Island. The biomonitoring plan will provide a suitable database for responsible authorities to anticipate significant releases of radionuclides and, as needed, to provide protection against significant effects on human health and ecosystems.

Addendum. Additional Radiological Data for Bioindicator Selection

General Comments

This addendum to *Amchitka Independent Science Assessment: Biological and Geophysical Aspects of Potential Radionuclide Exposure in the Amchitka Marine Environment* provides the results of additional analyses of actinides and other radionuclides in several key species of marine organisms that will aid in the selection of bioindicators for monitoring and also help to clarify observed differences in radionuclide content between samples collected at Amchitka and those collected at Kiska, a reference island.

Specific Comments

Page 3, *Abstract*, 2nd paragraph, line 8: “,a reference island” should be inserted after “Amchitka.”

Conclusions

The additional analyses of cesium-137, cobalt-60, and iodine -129 in specimens of Atka, Mackerel, Rock Sole, Ocean Perch, and Rock Greenling, and the additional analyses of actinides in Rock Jingles, Blue Mussels, Horse Mussels, Ulva, and kelp, including Laminaria, were well conceived and have been useful in confirming the findings of the earlier study; namely, that: 1) the radionuclides in the foods tested are below published human health guidance levels, demonstrating the foods to be currently safe to eat; 2) the radionuclides found in the biota collected from Amchitka are not attributable to the Amchitka test shots but are more likely to have come from another source; and 3) a combination of sedentary and mobile organisms at different trophic levels should be included for continued sampling in the projected long-term biomonitoring program at Amchitka. The analyses in question were well conceived and well conducted, and the conclusions that emerge from them are of major importance.

Table 1. Members of the CRESA Peer Review Committee Who Participated in the Review of These Two Reports

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