Summary:

In the documents found on this page of the CRESP website, the reader will find an extensive discussion of how CRESP II plans to implement its Amchitka Scientific Assessment Plan (June 24, 2003) with a series of activities that begin in the field (June 12 – August 8, 2004) and, with data analysis and synthesis, are planned to be completed by April 15, 2005. When completed in the Spring of 2005, this work is intended to help determine: 1) whether there is any current threat to human health and the environment from radionuclide release into the Island's sea waters from nuclear tests shots at Amchitka; and 2) a baseline of biological and other data that should aid in the development of a long-term stewardship plan (likely including subsequent monitoring against the baseline) – a plan now scheduled for completion during FY2005. Unless unexpected obstacles are encountered, the current effort is intended to be standalone and to have tested a series of hypotheses that address these two elements (current risk and future stewardship). Through economies and coordination described below, it is anticipated that the work being done in this 2004-5 effort by CRESP will have addressed nearly half of the full original assessment plan agenda, although the resources available to support this effort are about 30% ($3.3M) of the estimated cost of the full plan.

Amchitka is an Alaskan island in the western part of the Aleutian chain. The nuclear tests shots conducted by the United States government that have led to this review were conducted in the late 1960's and early 1970's.

To understand the full scope and purpose of this current assessment effort, one needs to have reviewed the complete Amchitka Independent Assessment Plan (hereinafter, the Plan) found on this web page. That document describes at some length why this assessment program is being undertaken and the scientific elements that would be involved in a complete assessment. Also discussed there is the forecast that funding to support the complete Plan might not be available, particularly at the outset of the implementation of the research. Hence the Plan specified the activities that need, at a minimum, to be covered in the event that only partial funding is available when the first major research efforts are undertaken. The implementation program described here is intended to address the key elements of scientific and risk uncertainty described in the Plan as specified for initial funding provided by DOE (Nevada). Also found there are the letters of approval for the Plan from four specific involved and interested parties (the State of Alaska, the DOE, A/PIA and USFWS). Although emphasizing different aspects of the Plan and indicating differing views about the importance of undertaking the complete Plan, these letters collectively do constitute the endorsement of the CRESP-developed Plan required by the document that first "authorized" this program, that is, a Letter of Intent signed for the DOE and the State of Alaska in the summer of 2002.

The documents found in the subsequent sections of this website page describe the basic elements of the expedition that are planned to take a total of 21 researchers to the Amchitka region in the summer of 2004. They include:

- the basic hypotheses we are testing and the implementation plans we will be pursuing,

- the Health and Safety Plans that will cover the several different types of activities we will undertake.

- a depiction of the data management program CRESP has established and the ways in which the documentation developed by the several research teams carrying out the assessment will dovetail with that data management program to provide a robust Quality Assurance and Quality Control check on what we do with the data generated by the different expedition elements; and

- an introduction to the evolving methodology that will govern the radionuclide analysis of samples obtained from Amchitka and Kiska (reference site).

It is useful, then, to summarize briefly what CRESP researchers will be doing in 8 weeks of expedition as it gathers diverse types of data and samples and to relate them to the ways this web site page is organized:

1. Section 1 of this summary (replicated as Section 1 of this Amchitka page on the CRESP website) describes how CRESP plans to collect diverse types of data between mid-June and the first week of August in three separate expedition elements.
2. Section 2 describes briefly how we are moving forward to define precisely how we will process and analyze data from those 3 basic expedition elements and what we can currently say about how we anticipate synthesizing those data sources. It also describes the data management program being implemented by CRESP, one that is designed to achieve effective QA/QC of all data analyzed in this project; and.
3. Section 3 briefly describes the component part of the Health and Safety Plans that are tied to and integrated with the several field activities discussed in Section 1

Simply put, the expedition itself (Section 1) can itself be divided into three major pieces: Section 1A, the one that takes place from June 12 to June 22, where the entire focus will be on gathering additional data -- physical data – that will serve primarily to guide and best target the biological sampling work that will occur in the second phase of the expedition. Importantly, that physical data work will also give us additional assurance about the safety of the sampling process itself, an assurance that is especially important since this initial stand alone effort will not evolve over several field seasons but will seek to compress biological sampling activities into a single field season. That second phase (Section 1B) involves sampling the biota from key areas around Amchitka and a reference site (Kiska) – a phase that will take place from June 27 to July 18 (possibly

extended to July 21, depending on weather and sampling success). The third element or phase is field work that will take place simultaneously with the biological sampling time frame and be conducted from the 2004 version of the biennial NOAA fishing trawl that will be occurring in the western Aleutians this summer and on which CRESP will have a researcher taking some specific parallel samples.

Section 1A: Gathering the Physical Data

Preparatory to the expedition's beginning, CRESP researcher, Mark Johnson (Professor in the Institute of Marine Sciences at University of Alaska, Fairbanks) has been engaged for several months in reviewing and digitalizing both earlier bathymetric data (beginning with USGS data from the 1940's) and data recently generated by satellite and other means to synthesize the information available about the subsurface marine environment at Amchitka and to develop GPS coordinates for it. Johnson has focused specifically on the areas that represent the transects into sea the from the on-island sites of the 3 major underground nuclear tests conducted at Amchitka.[1] During the ten days from June 12 to June 22, Johnson will be seeking to confirm the accuracy and current status of the bathymetric results of this data mining, assure its GPS positioning and then, because he will be able to get concurrent bathymetric images, be able to deploy instrumentation for conductivity, depth and temperature profiles (CDT profiles) to test whether there are salinity differences (the saltwater/freshwater differences) where the bathymetric images suggest formations that indicate possible freshwater outfalls or seeps. It is anticipated that by carrying out both methods concurrently, we will gain radically improved guidance for pinpointing the focus and priorities of the biological sampling effort that will follow it.[2] Additional to the work done offshore at the transects from the test sites, we will be using rapidly evolving magnetotelluric techniques to analyze the on-island subsurface structure and, we hope, identify more precisely the depth and possible locations of the subsurface freshwater/saltwater interface and direction/location of the groundwater flow. Again, attention to GPS positioning should allow effective coordination/confirmation of the evolving bathymetric and CDT findings. In addition to the contribution these two efforts will make for focusing the biological sampling activities, and helping identify where safety concerns or risks might need to be more closely monitored/addressed during the conduct of that biological sampling activity, these two coordinated first field efforts should also help address a major goal, especially of DOE, articulated in the Letter of Intent (discussed above), i.e. "DOE's support of this assessment will be focused on model verification and reduction of risk uncertainty during this phase of the assessment".(LOI, p.2, this web page). In CRESP's judgment, the ability to coordinate these two physical testing methodologies constitute the best possible way of verifying the models contained in the DRI "Modeling Groundwater Flow and Transport of Radionuclides at Amchitka

[1] The information resulting from that effort will be made available to the biological sampling team prior to the expedition.

[2] During this same 10-day period, CRESP will conduct a limited collection of both water and sediment samples at locations that may be indicated by the bathymetric evaluations and of CTD profiles. Determination about whether and if so these samples should be analyzed has not been made – and will probably be delayed until an evaluation of the total sample and data collection achieved by the expedition has been made and the final analytic methods definition and prioritization is achieved in August, 2004.

Island's Underground Nuclear tests: Milrow, Long Shot and Cannikin" (DOE/NV11508-51).

Section 1B: Sampling of Biota at Amchitka and a reference site (Kiska)

A major purpose of the Amchitka Research Project is to determine if algae, invertebrates, fish, and predatory birds – all of which form part of the Aleut food web and are relevant to commercial fisheries in the region – are currently accumulating radionuclides that could now have been released from underground nuclear tests that were performed at the site between 1965 and 1971 – and, if so, do the radiation levels found present an increased human or ecological health risk. An additional purpose is to provide a sampling basis and data set from which future ecosystem monitoring programs can evolve.

Study objectives included determining a) the biota most important to assess, b) sampling locations that increased the possibility of identifying biota from the marine ecosystem that would have the greatest potential for exposure to Amchitka-related radionuclide emissions (if emissions currently exist) and also comprise an important part of the Aleut diet (or part of the commercial fishery catch), c) the radionuclides most likely to appear and to bioconcentrate in biological specimens and are most relevant to human and ecological health and d) the analytic limits of detection necessary to achieve a quantitative assessment of human and ecological health risks – and to particularly assess risks to Aleut subsistence consumers.

The involvement of the Aleut/Pribilof Islanders and other stakeholders early in the planning phase of the study helped to assure that the bioindicators selected would be directly relevant to their diets and to their concerns. The targeted biota of interest include 1) sedentary and sessile organisms, 2) rockfish, 3) Atka Mackerel, 4) eagles and predatory birds, and 5) a range of key dietary and subsistence foods. Furthermore, samples were designed to adequately characterize uptake and distribution through major food chains (such as invertebrates to small fish to Halibut and eventually to humans; or small fish to larger fish to seabirds and eagles). The decision logic for field sampling took into consideration logistical and safety constraints, seasonality and life-cycle stages of biota, relative abundance, and their relevance to the Aleut and commercial seafood-based diets. Representatives of each trophic level are included in the sampling scheme and include kelp, ulva, chiton, sea urchin, blue mussel and crab through large fish (Atka Mackerel, Halibut, Dolly Varden) through birds of prey (mostly egg samples).

Ocean sampling location is expected to be influenced by the findings of Phase I research on Amchitka freshwater seeps to the ocean floor. Highest priority will be given to Cannikan and Long Shot sites, followed by Milrow – and also including Kiska/Buldir (comparison sites with comparable marine plants and animals, approximately 50 miles to the west of Amchitka).

The biological sampling component of the Amchitka Research Project systematically collects samples, processes them on the boat, identifies, tags, and transports specimens to Rutgers for homogenization and compositing. Specimens are then transported primarily

to Vanderbilt and INEEL and another confirmatory lab still to be chosen for radionuclide analysis. Data analysis, synthesis and interpretation will be an overall CRESP effort that incorporates the physical, radiological and biological data.

This phase of the research is under the guidance of Drs. Joanna Burger (Rutgers University) and Steven Jewett (University of Alaska, Fairbanks). A specimen collection support team includes Drs. Michael Gochfeld (Robert Wood Johnson Medical School, UMDNJ) and Conrad Volz (University of Pittsburgh), Aleutian/Pribolof Island Association representative (Bob Patrick) with two Aleut hunters/fishers, as well as three divers from the University of Alaska, Fairbanks, accompanying Dr. Jewett. Biological sampling is expected to be conducted between June 27 and the 18th of July (perhaps a few days later, depending upon weather conditions). Land sampling will include collection of eggs and/or chicks, rats (part of the eagle food supply), and plants. All biological sampling will be conducted with appropriate state and federal permits and approved university protocols.

CRESP has also arranged to have a researcher Jim Weston (Rutgers University) participating on the full expedition of a NOAA trawling boat that this year, and every two years, moves through the western Aleutians assessing the vitality of the marine environment there and taking samples by design from the NOAA catch. Since that boat will be trawling past Amchitka within a week of the time we are completing our much broader sampling effort (described in Section 1B), we hope to achieve some data comparability between the two efforts. And that data might be used by the Department or whomever as an especially efficient and cost-effective part of a stewardship plan's monitoring program in subsequent years since this NOAA trawling exercise has been occurring and will continue for the foreseeable future – every two years. This separate effort will, then, make a material contribution to accomplishing the seven objectives described in 1B (above). This represents, then, a two-pronged approach to replicating the process by which the marine catch for human consumption is obtained: 1) A research vessel that will incorporate traditional sampling and collection methods as well as Aleut hunting and fishing methods and 2) A NOAA trawl that is fishing according to normal commercial fishery practices. Because we will be able to obtain samples from that trawl that include benthic organisms, using this approach will allow us to obtain and make available for analysis organisms that both represent not only the marine and the Aleut subsistence food web but the commercial fishery take as well. This represents an efficient (likely unique) approach for collecting samples in terms of both methodology and the diversity of ways the marine environment functions and is used.

Analyses of the samples, performed under strict quality control and with duplicate readings, will be undertaken first as a screening survey of composite samples – with an attempt to identify for radionuclides of greatest concern to human and ecological health. A logic tree has been developed that optimizes the ability to identify the greatest human and ecological health risks, while at the same time minimizing the degree of sampling and analyses needed to arrive at decisions. More details of this process will be provided on the web in a future communication.

Section 2: Radionuclide Analysis of Samples Obtained from Amchitka and a reference site (Kiska) and Data Management

Radionuclide Analysis

Before turning to how we will analyze these samples and other expedition data and then manage the data they generate, it is important to describe more specifically how we understand those activities to help address the two issues defined earlier through the four major questions the expedition will address:

1. Are the foods safe to eat with respect to radionuclides?
2. Within the context of available data from eco-receptors, is there any indication that biota are at risk from radionuclides?
3. Can the data from the study be used to determine which species are the best bioindicators to be used to design future monitoring, and
4. If the full range of physical and biological data obtained from the expedition that indicates radionuclides above background, can we attribute increased levels of radionuclides to a particular source?

Our results represent only one point in time.[3] Within a context of multiple species, multiple locations within Amchitka transects and the reference site, and multiple radionuclides, some of the possible outcomes from this single expedition are given below:

1. Results are indistinguishable for all radionuclides in comparison to other Amchitka sampling locations, off-site reference site(s) or relevant literature values.
2. Some radionuclides exhibit elevated levels near Amchitka but are below thresholds of concern to human health and the ecosystem and the source of elevated levels is unknown.
3. Some radionuclides exhibit lower levels near Amchitka but are below thresholds of concern to human health and the ecosystem, and the reasons for the decreased levels are unknown.
4. Some radionuclides exhibit elevated levels near Amchitka and are above thresholds of concern for ecosystem impacts but below thresholds of concern for human health, and the source of elevated levels is unknown.
5. Some radionuclides exhibit elevated levels near Amchitka and are above thresholds of concern for ecosystem and human health, but the source of elevated levels is unknown.
6. Some radionuclides exhibit levels above thresholds of concern for ecosystem impacts and human health, but results are indistinguishable amongst the Amchitka sites and the reference site(s).

[3] Only a long-term bio-monitoring plan would provide needed information over time.

7. Any of cases 1-5 above, but the isotopic signature suggest Amchitka as the source.
8. Any of cases 1-6 above, but the isotopic signatures suggest a source other than Amchitka test shots.
9. Any of cases 1-6 above, but the isotopic signatures suggest both Amchitka test shots and other sources of radionuclides are contributing to the risk.

In order to be able to help evaluate any of these possible outcomes, there must be a rigorous examination of the data generated. What does CRESP now know about how it will be analyzing the biological and other samples it will take during the expedition? Has it begun - and what does it plan additionally to do – in order rigorously to define analytic practices and chain of custody procedures, be processing and then analyzing these samples in order finally to be able to test for these possible outcomes.?

The effort will involve the processing of samples primarily at Rutgers University and Vanderbilt University, with the primary analytic efforts taking place at INEEL and then subject to confirmatory processes to assure the accuracy of those analytic efforts at Vanderbilt University and another confirmatory lab still to be determined (likely, the EPA laboratory at Las Vegas). This phase of the research is under the guidance of David Kosson, Vanderbilt University with Michael Stabin, also of Vanderbilt University. Methods, now actively being developed to dovetail with the sampling plan, will not be used until late August (after the completion of the field work) but they are already mature and are likely to further evolve. In draft form, this is what we plan to do:

Initially, one composite sample (reflecting multiple individual organisms of the same species from the same general location) from each Amchitka and Kiska sampling location will be analyzed for specific radionuclide isotopes as a screening survey. This screening survey will be limited to a maximum of 25 species for analysis. The results of this screening survey will then be used to select one species from each trophic level for more extensive analysis of multiple composite samples. More than one species may be selected from a single trophic level for species that serve as primary food sources. Considerations in the selection of the species for more extensive analysis will include identification of the species that is estimated to present the greatest human health risk (considering measured radionuclide levels, isotope-specific risk factors and consumption rates) and the ability to measure isotopes indicative of the source of the radionuclides present. Although a greater number of biological samples are being obtained during the field expedition, the current program is limited in total to the analysis of approximately 600 samples for ^{137}Cs, ^{152}Eu, ^{60}Co (gamma emitters), ^{90}Sr and 200 samples for other isotopes. Samples not analyzed are being retained for future analysis if such analysis is warranted based on findings under the current program and sufficient resources are available. A detailed logic for the selection of specific species for analysis is included in the Appendix to discussion in Section 2.

Isotopes of interest for analysis in this study are ^{137}Cs, ^{152}Eu, ^{60}Co (gamma emitters), $^{238, 239, 240, 241}$Pu, $^{234, 235, 236, 238}$U, ^{241}Am (alpha emitters), and ^{90}Sr, ^{3}H, ^{99}Tc, ^{129}I (beta

emitters). ^{137}Cs and ^{90}Sr are considered the isotopes most likely to accumulate in muscle (soft tissue) and cause human health risks through consumption. Other isotopes accumulate preferentially in either skeletal material (bones or exoskeletans) or specific organs, with a lesser distribution in muscle. Thus, for programmatic efficiency, analysis for specific isotopes will focus on sample types (soft tissue or skeletal material) most likely to contain the greatest amounts of the specific isotopes and to cause human health risk. Detection limits for analyses will be below levels necessary to detect human health risks based on conservative estimates of lifetime consumption and risk thresholds. More limited analysis will be used to ascertain the distribution of specific isotopes amongst the sample types for a given biota. Ratios of isotopes of Pu (indicative of nuclear detonations) and U (indicative of nuclear reactor releases and enrichment processes) will be used to the extent possible to identify whether Amchitka test shots are the likely source of measured radionuclides in samples. Analysis procedures appropriate for each isotope in each specific analytical matrix will be validated prior to actual sample analysis.

Data Management and QA/QC

The Data Management (**DM**) component of the Amchitka project will develop a geo-referenced database, in order to serve the following objectives:

- Compilation and synthesis of information from the sampling campaign and laboratory analyses of the samples;
- Tracking of specimens from point of collection to laboratory analysis;
- Quantitative analysis of information collected by the project and communication of the findings of the project; and
- Continued monitoring and improvement of data quality

The DM team, directed by Vikram Vyas, Ph.D. (UMDNJ) will work with scientists conducting the sampling and analysis campaigns to build a system for assembling, synthesizing, and analyzing the information generated through this project. The primary requirement in initiating data management activities is a protocol for standardizing activities related to data reporting, processing and archival; the issues related to these steps are discussed in subsequent sections.

As a general practice, SI reporting units will be used. However, it is possible that some parameters may have to be reported in non-SI units, and the data management team should be made aware of these exceptions. Further details of reporting units and consistency of units across data will be worked out as template files become available for the different components. In all cases, it is imperative that measured parameters be fully described and units explicitly stated for all data files. The reporting of spatial and time coordinates deserves a separate section because of the room for inconsistency in their reporting. Spatial coordinates will be measured by GPS systems of varying accuracy, and reporting the likely error in spatial measurement will be essential to prevent inconsistency between different components in the project. (

Section 3: Health and Safety Plan

Efforts only briefly substantively to summarize the health and safety plan (HASP) and the pre-planning for a multi-activity of an expedition of this sort would be misleading. It has been a long process. As research projects were considered and clearly defined, they were subjected to multiple tests to determine how the proposed activities could be conducted with the appropriate priority given to safety. We analyzed them to determine what are the full range of contingencies that need to be addressed and what would constitute appropriate safety redundancy consistent with cost effectiveness. All participants were invited into these discussions although they were final judgments were made by the Health and Safety officer for the full expedition, occupational doctor, Dr. Michael Gochfeld M.D., PhD, and project director, Daniel Volz, PhD, with key experience from years as CEO of a hazardous waste engineering firm. Throughout the development of the HASP and its review these two persons were aided by a second experienced occupational doctor and CRESP Deputy Executive Director, Barry Friedlander M.D, and health physicist, Michael Stabin, Ph.D. of Vanderbilt. We were enormously aided by the fact that DOE itself had conducted work on Amchitka Island and the health plan for that effort was enormously on point and useful. The Ocean Explorer, our expedition vessel, has well-developed – even elaborate - marine safety plans and deep experience in functioning in the Aleutians and personnel well trained in EMT and other skills. The diver team is directed by the UAf Dive Safety Director, Steven Jewitt, who also has broad diving experience at this island. Training for safe conduct of relevant activities has been carried out in relevant safety and health procedures courses. The HASP found in Section C on this website is the result of all these efforts.

Section 4: How is the expedition being managed logistically?

The entire expedition will take place on and from the Ocean Explorer, a vessel whose home port is Seattle. The ship is used not only for commercial fishing but frequently used by NOAA and others to support their ocean exploration efforts. (see Bathymetry discussion for dimensions). This summer of 2004, the CRESP expedition is sandwiched between two NOAA expeditions that are being carried out immediately before and after the CRESP work in late June and July. This is especially fortuitous since the Ocean Explorer, when it left its home port in Seattle in mid-May, was carrying with it for NOAA key oceanographic exploration equipment CRESP will also be using – a side-scan sonar and a CTD, both owned and operated by the Navy. CRESP has been able to arrange that, when the NOAA bathymetric work is complete on June 10, the Ocean Explorer with the Navy equipment and operators on board will steam directly from Dutch Harbor to Adak where CRESP researchers will board and proceed to Amchitka. The side-scan sonar and CTD work done by the Navy technicians will be under the direction of Dr. Johnson. The central purpose of that 10-day expedition will be to use the side-scan sonar to depict and characterize the sub-surface Amchitka massif and guide the deployment of the CTD into those portions of the sub-surface marine environment that are, based on visual inspection, most likely to identify areas where the CTD might detect salinity differences between the sea and any fresh water seeps emanating from Amchitka

ground water sources especially along the transects from the nuclear test sites. A modest number of samples of both water and the sediments contiguous to the marine sites so identified will be taken for possible analysis. In addition to the work being done in the marine environment itself, a second group of CRESP researchers, under the direction of Dr. Martyn Unsworth, will for that same ten-day period be conducting magnetotulleric and audio-magnetotulleric testing of the subsurface of the island, again along the cross island transects contiguous to the nuclear test sites. The purpose of this work will be the same – to characterize the Amchitka massif to seek to determine more about the post-shot underground environment and the depth and location of the most likely groundwater pathways from the island into the sea.

By working together both during the ten-day period and immediately after the expedition, it is anticipated that CRESP will have identified and developed GIS locational positioning of the areas in the sea where multi-trophic biological sampling would best detect the presence or accumulations of radionuclides in that marine environment if they are present and might be related to the test shots. The sampling program discussed in Section 2 will use that information to locate their sampling priorities.

In order to assure the maximum coordination of these first phase efforts with the second, there will be - in a two day interim between the two phases - a focused review of what has been learned in Phase 1 and how it could affect biological sampling. That review will include key expedition participants and the CRESP PI, (Charles W. Powers, UMDNJ): the Amchitka project director (D. Daniel Volz, University of Pittsburgh), the biological expedition lead (Joanna Burger, Rutgers), the lead diver (Stephen Jewett) and the two lead "physical data" researchers (Mark Johnson and Martyn Unsworth). Perhaps as importantly, the use of the combination of these two sources of physical information about the marine environment should, if appropriately reviewed in this two-day discussion, improve the likelihood of pre-screening the areas where sampling will focus to determine whether those activities might pose any unanticipated safety risks to those taking the samples.

At the end of the expedition, frozen samples will be returned to New Jersey, stored at a secure cold storage warehouse and processed in preparation for the radionuclide analysis described above. It is anticipated that this processing will be iterative as the results of screening level analysis give rise to more specific preparation of samples for various levels of subsequent analysis.

Section 5: Relationship of the Planned Expedition to the Assessment Plan and its June 24, 2003 Priorities

On Page 74 of the Amchitka Independent Assessment Plan is found a summary budget for this project. Every research activity for which NNSA funding was to have been used is fully funded in the activities described with the following exceptions: the data recovery (primarily of bathymetric data) costs will have been reduced from the then estimated $150 K to about $90K, except that the data recovery work is now fully integrated with the new bathymthetric data being gathered in the summer of 2004. It would appear that

the radionuclide source term evaluation costs will be $25K rather than the previously estimated $100K in part because of work done on U and Pu ratios at Vanderbilt – but final determination of whether additional work on speciation to clarify the relationship of findings to the classified source term will needs to await early analytic results in the Fall of 2004.

Additionally, some management and expedition logistics costs were achieved well below estimates: We have been able to reduce the cost of the ship-time costs from the estimated $400K to about $300K. The CRESP management, peer review and data management costs will have been reduced from $495K to approximately $250K (even including the $28K cost of expedition-specific insurance to augment the existing CRESP specific E&O insurance). Part of these savings were achieved because CRESP was able to use earlier funds designated for Amchitka research and carried forward to its 3rd budget year to completely cover the estimated $150K in Assessment Plan development costs. These $150K, then, constitute a "contribution" by CRESP to augment the NNSA budget and have been applied to the CDT and MT work. The $41K in initial biological sampling projected for Summer 2003 in the original budget was rendered impossible by the time frame in which CRESP actually received initial Amchitka funding – late September, 2003. Finally, there was $200K left in the original budget to either address contingencies (estimated at 10%) or to fully fund tasks as needed or additional tasks. About $180K of that line defined as "available for redistribution or reallocation" is being maintained in order to deal with major contingencies, such as a possible need to extend the ship-time for biological sampling in the event of particularly bad weather and or to fund an evacuation of a sick or injured expedition participant in the event of such an emergency. Should that funding still be available, it would be devoted to additional analysis of samples (biological and possibly physical) to clarify unresolved issues in the late Fall or early Winter – in time to allow for the final report to be developed by April 15, 2005 and some resources to communicate the results of this work to stakeholders. .

It should be noted in closing that the actual coming together of the elements of the expedition just described was fortuitous – one might even say serendipitous. Although at many stages the expedition was a planning nightmare made more difficult by the fact that 1) initial funding was delayed, 2) CRESP itself was a contingency in the Fall of 2003, and then 3) assurance that the full funding for the project was not known until mid-May. Still, throughout the early Winter of 2003 and Spring of 2004 key pieces of the expedition began to fall (theoretically) into place. CRESP was able to achieve unanticipated economies due to the evolving (although also long-delayed) schedules of contiguous expeditions and then the availability of the equipment and personnel that, had CRESP been forced either to try to buy or lease them independently would have been totally beyond the reach of its limited budget. For example, in June, 2003, we had calculated the cost of doing the historical and current bathymetric evaluation alone by piecing together equipment, vessel costs, technical and academic personnel to be at $1150K. We will accomplish most of the same work for less than $210K through the process of linking NOAA's schedule with Navy personnel. (As noted above, we achieved more that 30% savings from the original data mining estimates by integrating that work with the bathymetric evaluation itself.) Because the Ocean Explorer's (OE) presence in

the Aleutians – with the exploration equipment and Navy personnel – was being generated by the NOAA work, and because the CRESP effort could be slotted into the OE schedule, CRESP was able to negotiate far below-estimate vessel costs and at-cost Navy technician support (the use of Navy equipment was free– and the cost of its shipping back to Seattle were borne by others). Similarly, the cost of providing adequate insurance (not only for the general expedition but also charterer's and property insurance to cover any possibly damage to Navy equipment), were made possible at costs less than a quarter of what had originally been estimated due to the extraordinary efforts to piece together the existing CRESP E&O liability policies that protects CRESP researchers at its diverse universities with charterer's insurance and explicit expedition insurance for the potential radionuclide pollution issues that are excluded from all normal commercial insurance. Indeed, the costs of needed insurance are probably 8-10% of what they would have been if purchased independently, if the insurance had been available at all. This was accomplished by the deft work of the Risk Management team at Rutgers University. But the qualifications of our health and safety team and a perfect record for safety by CRESP in its 8 ½ years of existence also helped with the underwriters. By directly managing travel costs, not through the normal university travel procedures (and their inherent addition of indirect costs premiums that exceed 50%) but by the work of CRESP's imaginative travel agent and then the work of the project director in arranging all Adak lodging and food as a package, CRESP's travel and related costs for the expedition were probably halved. And because of the modest accommodations at Adak, significant savings were achieved over the projected costs (lodging, food and boat time) of operating from Dutch Harbor, the original start and finish place of the expedition. (And, because we will operate from Adak, the community closest to Amchitka will be involved in the launching of the expedition itself – stakeholder participation of the best sort). CRESP was even able to negotiate the waiving of indirect costs at one participating university. The Navy contract was negotiated directly and at cost – avoiding indirect costs of working the arrangement through a university. And, finally, because CRESP itself was able to contribute funds in the early development of the Science Plan and its 2004 planning by using funds earlier designated for but not spent for planned Amchitka research, it had discretionary funds it could contribute to pieces of the research plan that were of particular interest to it – and to augment funds designated for discretionary redistribution in the plan itself.

To be sure, pieces of this complicated puzzle did not actually fall into place until the very end – as, for example, working out the details of a "work for others" agreement with the Navy was actually accomplished on June 7, 2004 and the insurance piece was locked in place only on June 8!

Finally, although we are focusing on a single summer effort, we are trying to set in motion a data gathering process that can link to any process that follows it – whether in the execution of the "rest" of the science plan or in modest efforts to link to ongoing processes in the Aleutians that could be used for comparison to the baseline we will seek to provide to the parties. The primary reason for focusing on a single season of CRESP work at Amchitka was to be responsive, despite the late arrival of funding, to the goal of having the assessment work available for completion of a stewardship plan by the end of

FY2005. That firmness of that time table was affected also by the needs of DOE's Nevada office due to the fact that there is a legislatively defined transfer of Amchitka to another DOE PSO (currently designated as the Office of Legacy Management) in that same time frame – making clarity about Amchitka risks and the stewardship plan for it of great urgency. In the end, this single season focus has also forced us to clarify the sequence of our work consistent with the Assessment Plan of June 24, 2004 and played a large role in what we finally decided to do consistent with the Plan's mandate.

This summary is being written, of course, on the eve of the expedition. We will all be watching the western sky and testing the adequacy of our health and safety planning as we seek to bring home the needed information on time and within budget.

Charles W. Powers, CRESP II PI