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## Planning For Tomorrow.....

### Radionuclide Soil Action Levels at Rocky Flats

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#### Background

Rocky Flats operated from 1952 - 1992 as a manufacturing facility for the production of component parts for nuclear weapons, including plutonium pits, the fissionable core of such weapons. Since cessation of production activities, the site has been involved in waste management and environmental remediation activities. One of the primary challenges facing site officials and residents from surrounding communities is determination of the amount of radionuclides, such as plutonium, that may legally remain in the soil following remediation. These levels are known as "radionuclide soil action levels" (RSALs) because remediation action is triggered when the amount of radioactive material in the soil exceeds the established levels.

Using a computer-modeling program known as RESRAD (Residual Radiation) that was developed at Argonne National Laboratory, interim radionuclide soil action levels were incorporated into the Rocky Flats Cleanup Agreement (RFCA) on October 18, 1996. The RFCA serves as the legally binding agreement for site remediation between the Department of Energy and its regulators -- the Environmental Protection Agency and the Colorado Department of Public Health and Environment. Intended to be protective of people using the site after closure, the RSALs set the upper limits for the radionuclides (primarily plutonium and americium) allowed in the soil at Rocky Flats after remediation. The RSALs are measured in picocuries (a measure of radiation) per gram of soil.

Almost immediately after the RSALs were established, members of the community became concerned. Not only were the numbers much higher than anticipated, but upon further investigation the levels were found to be higher than levels established for remediation at sites elsewhere, as shown below:

After looking at the above numbers, it became apparent that more information was needed to better understand the criteria used for the soil action levels. As a result, several entities, including the Rocky Flats Citizens Advisory Board, the cities of Westminster and Broomfield, public interest groups, and Congressman David Skaggs called for an independent assessment of the RSALs as well as the process used to establish those levels. The end result of ensuing discussions was an unprecedented agreement by the Department of Energy to fund a community-directed, independent scientific assessment of the RSALs for Rocky Flats. To provide oversight of the study, a panel of thirteen community representatives was formed, known officially as the Radionuclide Soil Action Levels Oversight Panel (RSALOP).

After drafting and issuing a formal Request for Proposals, the Panel selected Risk Assessment Corporation (RAC) to conduct the assessment. RAC has previous experience with the Rocky Flats site studying the potential health effects caused by site emissions during production years. In addition, RAC has more than twenty years experience working on dose reconstruction, environmental dosimetry, chemical risk analysis and related disciplines. RAC has assembled a team of technical experts, each with a particular area of expertise necessary to complete the RSAL assessment. Work began in October 1998 and is scheduled for completion in November 1999.

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## **PROJECT SUMMARY**

Several project tasks have been defined for the contractor. The first of these is to research RSALs used at other plutonium-contaminated sites around the world. Second, RAC is tasked with exploring existing computer models that could be used to determine RSALs and recommending the one best suited for use at Rocky Flats. Third, RAC will investigate and then recommend pertinent inputs and assumptions for use in computer calculations. Fourth, with the preceding information, RAC's major task will be to conduct an independent calculation of the RSALs for Rocky Flats, which can then be compared with the originally recommended RSALs. The final two tasks involve recommending appropriate soil sampling procedures to determine the amount of contamination in soil both before and after remediation activity. Finally, RAC will analyze results from the ongoing Actinide Migration Studies to determine whether any findings from these studies are applicable to the soil action levels.

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## **PUBLIC INVOLVEMENT**

Although public involvement began when community representatives approached the Department of Energy with concerns that resulted in formation of the RSALOP, the Panel has developed a public involvement and information strategy to ensure ongoing communication. Monthly working meetings of the Panel are open to the public and are conducted the second Thursday of each month from 4-7 p.m. at the Broomfield City

Center, One Descombes Dr., Broomfield, CO. In addition, three public information workshop/meetings will be scheduled during the project. With some up-front planning, a member of the Panel can provide briefings to community groups or interested parties. For a project status update, information packet, or further information on meeting times and locations, please contact either Carla Sanda, Advanced Integrated Management Services, Inc., at (303) 277-0753 or Ken Korkia, Rocky Flats Citizens Advisory Board, at (303) 420-7855.

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## Introducing the RSALOP Team...

### Panel Co-Chairs

**Mary Harlow** serves as the Rocky Flats Coordinator for the City of Westminster, acts as the City liaison to other City, County, State, and Federal organizations relative to Rocky Flats activities, and keeps the City Council and staff apprised of pertinent site issues. She represents the City staff on the Rocky Flats Coalition of Local Governments Board of Directors and is currently Secretary for the Rocky Flats Citizens Advisory Board. Additionally, she serves on the Board of Directors of the Energy Communities Alliance, a national organization of local communities that are located in the shadow of Department of Energy facilities. Ms. Harlow has a BS in Health Care Management, an AAS in Environmental Technology and an AS in Water/Wastewater Technology.

**Henry A. Stovall** earned a BS in Industrial Education and a BS in Physics. Prior to retirement, he was an Engineering Manager with 33 years experience in the engineering arena, including environmental health and safety engineering. Mr. Stovall serves as a member of the Rocky Flats Health Advisory Panel and has been actively involved in related Rocky Flats issues. As a twenty-nine year resident of Broomfield, Colorado, Mr. Stovall has been active in various community activities, including serving on the Broomfield City Council from 1977 - 1993 and again from 1995 - present.

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### Panel Members

**Tom Davidson** received his BS in Electronic Engineering and has thirty years of engineering experience, including 16 years in the nuclear field. He is a member of the Rocky Flats Citizens Advisory Board and has participated in numerous issues related to the cleanup and future use of the site. Mr. Davidson is also an active participant in the University of Colorado at Boulder Chancellor's Community Advisory Council. He currently serves as the Mayor of Louisville, Colorado and represents his community on the Panel.

**Joe Goldfield** earned his BS in Chemical Engineering and achieved professional affiliation with the American Academy of Environmental Engineers as a Diplomate. His professional

career with Manville Corporation spanned thirty-one years, of which 20 years was spent as manager of Environmental Engineering. He holds a Professional Engineers' license in New Jersey, Colorado, Massachusetts, and Mississippi and owns several patents on pollution control devices. Mr. Goldfield has been an active stakeholder in numerous issues at the Rocky Flats site.

**Dean Heil** is currently Assistant Professor of Soil Chemistry in the Department of Soil and Crop Sciences at Colorado State University. He completed his Ph.D. in Soil Science at the University of California at Berkeley. His past research includes remediation of Pb (lead) polluted soils.

**Robert Kanick** earned a BS in Nuclear Engineering with an emphasis in reactor/power operations. His experience as a reactor engineer and core designer has provided valuable experience ranging from the development and oversight of reactor testing and control of special nuclear materials, to the use and evaluation of computer modeling systems used for core design, safety and criticality analysis. As a member of the Rocky Flats Citizens Advisory Board, Mr. Kanick has been actively involved in numerous projects related to the cleanup and future use of the Rocky Flats site.

**Carol E. Lyons** serves as the Rocky Flats Coordinator for the City of Arvada, Colorado.

**Todd Margulies** earned his MS in Environmental Sciences/Geochemistry, as well as a Bachelor's in Geology. After spending more than ten years working for major environmental firms, he began work as an independent environmental consultant in 1991. He has dealt with numerous Rocky Flats issues and was a staff member of the Colorado Council on Rocky Flats. In addition, Mr. Margulies has conducted groundwater, surface water, soil, and sediment investigations at sites around the world to assess organic and inorganic contaminant transport and fate.

**LeRoy Moore, Ph.D.**, serves as a consultant to the Rocky Mountain Peace and Justice Center in Boulder, Colorado. Author of the Citizens Guide to Rocky Flats (1992), Dr. Moore is a member of the Rocky Flats Citizens Advisory Board. Involved with the Rocky Flats issue since 1979, he has played a key role in numerous projects, including the Rocky Flats Future Site Use Working Group. He co-chairs the recently created Rocky Flats Actinide Migration Studies Technical Review Group. He is currently working with a photographer on a book which will tell the Rocky Flats story in images and words of workers who made bombs inside the facility and activists who opposed such production from the outside.

**Lisa Morgan Morzel** serves on the Boulder City Council, having been elected in 1995. As a council member, she represents Boulder on issues related to Rocky Flats, including the Rocky Flats Local Impacts Initiative and its successor group, the Rocky Flats Coalition of Local Governments. Dr. Morzel is a research geologist for the U.S. Geological Survey and holds a Ph.D. in Geology and Geophysics.

**Niels Schonbeck** is a professor in the Department of Chemistry at Metropolitan State College of Denver, Colorado, where he has taught since 1978. He has also been a visiting scientist at the National Center for Atmospheric Research in Boulder, Colorado. He earned his Ph.D. in Biological Chemistry and his BA in Chemistry. In 1987 he became involved in the health and safety issues of the Rocky Flats site and was appointed to the Rocky Flats Environmental Monitoring Council. Since then he has also served as a member of the Rocky Flats Health Advisory Panel.

**Joel Selbin** received his BS in Chemistry and his Ph.D. in Inorganic Chemistry. He joined the faculty at Louisiana State University (Baton Rouge) in 1957, where he served until 1991. During his 34 years at LSU, he directed the research of graduate and postdoctoral students, authored and collaborated on numerous books and articles, and obtained two U. S. patents. He has written, lectured, and debated widely on nuclear power and nuclear arms issues, as well as energy alternative issues, and has served as a technical consultant to numerous academic and governmental entities. Upon his retirement from LSU, Dr. Selbin relocated to Boulder, Colorado, where he taught for seven years at the University of Colorado in Denver. He now teaches at the University of Colorado-Boulder campus.

**Ken Starr** has more than 13 years' experience in the fields of civil and environmental engineering including numerous CERCLA/Superfund remediation and investigation tasks, environmental assessments, environmental, health and safety assessments, as well as health and safety training. He currently serves as the Director of the Environmental Compliance Division for the Jefferson County Department of Health and Environment. He holds an MS in Environmental Engineering, a BS in Agricultural/Civil Engineering, and is a Registered Professional Engineer for both the States of Colorado and Arizona.

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## Technical Support Contractor

Since its formation in 1977, Risk Assessment Corporation (RAC) has significantly contributed to the development and application of methods for estimating exposures from radionuclides and chemicals to the public and workers and quantifying the health risks and their uncertainties. RAC has also encouraged public participation in dose reconstruction studies and has developed innovations in the communication of exposure and risk information to the public. The following team of professionals, headed by RAC's president, Dr. John E. Till, has been assembled to conduct this study:

**John E. Till** holds a Ph.D. in Nuclear Engineering, an MS in Health Physics, and a BS in Engineering. In addition, he is a graduate of the U.S. Naval Academy and the U.S. Naval Nuclear Propulsion Program. Following his naval career, Dr. Till worked as a staff scientist at the Oak Ridge National Laboratory, and in 1977 formed Risk Assessment Corporation (RAC). Dr. Till's scientific achievements include more than 150 publications, including editing the first textbook on radiation dose analysis, Radiological Assessment, and other

documents that stress new approaches to apply and simplify risk analysis. Dr. Till's current work focuses on the assessment of risks from past releases of radionuclides and chemicals.

**George G. Killough** earned an MA degree in mathematics from the University of Tennessee at Knoxville and did further study under a grant from the National Aeronautics and Space Administration. His more than 30 years of professional experience include university teaching (mathematics and computer science) and serving as a member of the research staff at Oak Ridge National Laboratory, where he designed and implemented mathematical models and applied them to environmental problems. He developed internal dosimetry computer software, which was subsequently the basis for the Environmental Protection Agency's RADRISK program. Under sponsorship of the National Science Foundation and the Department of Energy, he constructed models of the global cycling of carbon and tritium, which were applied to estimating levels of carbon dioxide as a greenhouse gas and to predicting exposure of the world population to releases of  $^{14}\text{C}$  and  $^3\text{H}$  from nuclear fuel cycles. As a consultant to Risk Assessment Corporation, he participated in a dose reconstruction project for the Fernald nuclear facility, sponsored by the Centers for Disease Control and Prevention. For the Fernald study, he devised new methods for confirming estimates of airborne uranium releases from soil measurements and modeling the atmospheric diffusion of radon decay products using radon monitoring data. Mr. Killough is author or co-author of many refereed publications. In his current work, he makes innovative use of probabilistic methods and Monte Carlo bootstrap sampling to assess uncertainties in model predictions and to calibrate environmental models to site-specific data.

**Kathleen R. Meyer** holds an MS degree in health physics and a Ph.D. in radiological health sciences. She has served as a research assistant at Oak Ridge National Laboratory where she assessed the radiation damage and subsequent recovery capabilities of normal tissue, both in cell culture and in animal models. Her career has also included independent work in radiological dose assessments, technical abstracting, and chemical and radiological risk evaluation for sites containing hazardous materials. Dr. Meyer has more than 20 years experience in the fields of biological research and teaching, radiation protection, and public communication.

**Arthur S. Rood** received his Bachelor's degree in geology and an MS in health physics. His experience includes environmental and laboratory measurements of uranium-related byproducts. He later joined a team of environmental scientists at the Idaho National Engineering and Environmental Laboratory and worked primarily in the field of environmental contaminant transport modeling and dose assessment. Mr. Rood has now formed his own corporation, and projects currently focus on the use of atmospheric dispersion models to study past releases of chemicals and radionuclides to support dose reconstruction studies at the Rocky Flats Plant and Savannah River Site. Mr. Rood also teaches an Environmental Modeling class for the University of Idaho.

**David J. Thorne** received his Bachelor's degree in geology and his MS degree in health physics. His career has included surveillance of the Fort St. Vrain Nuclear Power Station

and conducting studies on concentrations of 131I in dairy milk. He has also been involved in providing air quality modeling support, preparing radiological health risk assessments, conducting studies on groundwater transport of contaminants, and development of an atmospheric dispersion modeling study as well as computer models to simulate the transport of radionuclides. Mr. Thorne is currently using his extensive experience with computer systems, computer programming languages, and contaminant transport models to test computer models, assess residual contamination in buildings, model accidental releases, develop risk-based standards, and model potential groundwater impacts.

**Jill M. Weber** received her undergraduate degree in 1993 in physics with minors in chemistry and mathematics and her MS degree in radiological health sciences with a specialty in health physics. Ms. Weber joined RAC in 1995 and has been involved in a number of radiological dose reconstruction projects. Her research has included model development for releases of plutonium from the 903 Pad Area at Rocky Flats, a contaminated soil area that was exposed to high winds and resulted in significant releases. She also has experience in environmental monitoring, uncertainty estimation, and public communication.

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### **Administrative Support Contractor**

Advanced Integrated Management Services, Inc. (AIMSI) is a small, minority-owned, Tennessee corporation founded in 1994 with a staff of over 100 full- and part-time professionals. Headquartered in Oak Ridge, Tennessee, with field offices in Denver, Colorado, Nashville, Tennessee, and Paducah, Kentucky, AIMSI provides professional engineering, management, technical and administrative support services and has formed the following team to provide both day-to-day project administrative support and public involvement and information:

**Anna Corbett** has more than 15 years experience in technical support and customer service, including extensive support to programs in the nuclear and chemical waste environment. Her career with AIMSI has included support to Rocky Flats programs including the Mixed Waste Focus Area, Technology Management program, and the Rocky Flats Site Technology Coordination Group.

**Carla Sanda** brings more than 15 years of experience in developing and executing stakeholder involvement activities. Prior to joining AIMSI as a subcontractor on this project, Ms. Sanda was a member of the Community Relations group at Rocky Flats. She served as team lead for waste management stakeholder involvement; project manager for the Rocky Flats Western Governors' Association Demonstration of Innovative Technologies; program manager for the Federal Facility Compliance Act stakeholder involvement; and was a member of the team tasked with drafting our national public involvement policy.

**Project Information:**  
**AIMSI**  
**5460 Ward Road, Suite 370**  
**Arvada, CO 80002**  
**(303) 456-0884, Fax (303) 456-0858**

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The Rocky Flats Citizens Advisory Board is a community advisory group that provides recommendations on cleanup and waste management plans at Rocky Flats, a former nuclear weapons plant outside of Denver, Colorado.

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