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**The following comments were originally presented to the  
Baseline/Human Health Subcommittee in September of 1997**

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**M MAG: Baseline Subcommittee**

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*Prepared by Dorothy Colagiovanni, Sandra Jaquith, and Rick Warner  
September 4, 1997*

***Bin items to consider***

**1) Baseline Health Assessments**

Based on our chronic exposure summary information, it is apparent that information is lacking for community background levels for cadmium, chlordane, DDE/DDT and there is minimal data for lead. We assert that it is crucial to obtain information on community background tissue burdens of the accumulating chemicals in order to adequately assess public health. Without these data, we have no way of knowing what impact the remediation might have on surrounding communities. We recommend collecting blood and urine samples from the target population for establishing body burden concentrations of these chemicals. In addition, a health survey is recommended to determine community concerns and identification of key areas where individuals have disease prevalence. The issue of chemical sensitivity has been brought up at MMAG and SSAB meetings and is relevant to this discussion of health impacts.

**2) Target Population**

Is it better to be inclusive than exclusive?

Although limiting the target population might result in the inability to reach statistical significance with sampling size, it is our recommendation that having a population that resides closest to the Arsenal would have the greatest exposure potential. We still see some utility in evaluating existing odor complaint data from Basin F remediation to determine wind patterns and help determine the target group.

**3) What about non-COC chemicals that we are concerned about?**

There are several chemicals that are not on the COC list that have potential human health

impacts. These include, but are not limited to, DIMP and the dioxins. Recent analysis of RMA wildlife indicate the presence of dioxins, potentially due to RMA activities. We are concerned

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about airborne transport of these harmful chemicals off-post. We are also concerned that individuals using groundwater for irrigation and bathing purposes are continually exposed to DIMP. We would like to have some dialogue about these non-COC compounds. It has come to our attention that the APA group is addressing this topic and we would like information regarding their conclusions. In addition, we have not discussed the topic of chemical mixtures. This is a crucial topic for RMA.

**4) Definitions of length of exposure**

acute/subchronic/persistent/chronic

This topic greatly impacts both the fence-line criteria standards, as well as the decision tree development. We would like to see more clear and concise language as to definitions of these terms.

**5) What about keeping visitors out of RMA during high profile remediation efforts?**

We have repeatedly asked for review of visitor status during remediation efforts. We would like to have a meaningful dialogue on this topic. In addition, we would like to know how RMA volunteers are being defined and if any monitoring of them will occur.

**6) Other routes of exposure?**

Vegetable uptake  
groundwater

## **RMA Medical Monitoring Advisory Group Bin Report Update - August 21, 1998**

This report addresses comments made in the document "Bin items to consider" prepared by Dorothy Colagiovanni, Sandra Jaquith, and Rick Warner (first presented to the Baseline/Human Health Subcommittee in September of 1997).

### **I. *Baseline Health Assessment***

Much of the Baseline/Human Health Monitoring Subcommittee's discussions focused on biomonitoring of chemicals in the human body. This perspective significantly broadened over time and the subcommittee ultimately considered a greater variety of approaches to the human health evaluation. This report explains the subcommittee's analysis.

- C     Biomonitoring for chemicals in human tissues is a tool with limited application. Only those chemicals with a prolonged residency in the body and for which effective measurement techniques exist, have potential as indicators of exposure.
  
- C     An analysis of the lower limits of detection and background concentrations for bioaccumulative chemicals of concern demonstrated that environmental monitoring is a more sensitive means of detecting potential exposure. Contaminant concentrations can be measured with lower limits of detection in air than in blood and that environmental concentrations (exposure concentrations) would need to be well above the respective detection limit in order for resulting blood levels to exceed the population background range. While small increases in the air/exposure concentration may be reflected in small increases in blood levels, this rise may not be observable in the exposed population. We have also concluded that urine will be a less effective medium for monitoring than blood and that the general relationship for air/urine is the same as air/blood.
  
- C     A review of statistical considerations indicates that very large population sample sizes may be required to measure significant differences in contaminant concentrations in biological tissues of the magnitude likely to result from environmental exposures.
  
- C     Because (1) human body levels of chemicals may vary over time, (2) individuals within a population migrate, and (3) the characteristics of individuals which may influence the levels of these chemicals changes (occupation, age, diet, hobbies, etc), a "baseline" measurement is potentially unstable.

The above observations indicate that a one-time community-wide baseline biomonitoring effort, and one which will only address a limited number of chemicals, and one which may have only a short temporal application, is likely to be very restricted in its application. In lieu of baseline biomonitoring, the subcommittee is proceeded as follows:

- C The subcommittee believes that the environmental monitoring plan must be adequate to ensure that the greater margin of protectiveness that environmental monitoring offers is used to our advantage.
  
- C The subcommittee prepared recommended guidelines which will facilitate selection of appropriate public health actions (see *Guidelines for Public Health Responses to RMA Related Exposure and Observations of Health Concerns Among Communities and Visitors*). These guidelines support the *Remediation Monitoring - Medical Referral & Biomonitoring Decision Tree* which established a process for determining the adequacy of exposure prevention and for determining when the RMA Medical Monitoring Program should consider implementing public health actions. The selection of the appropriate action will be based on a systematic evaluation of the available data.

## **II. *Selection of Target Populations***

The identity of appropriate target populations has been addressed for those recommendations currently approved by the MMAG. The work of the subcommittees has made it clear that no one definition of target population is applicable under all circumstances. Rather, selection of populations should be based on the goals of inclusivity and the needs of each specific recommendation.

### **A. Baseline/Human Health Monitoring**

***Birth Defects and Cancer Surveillance*** - Selection of the target population was based on the desire to focus on that population most proximal to the RMA, yet be inclusive enough to satisfy the statistical tools being used to analyze birth defect and cancer incidence. This selection process required a balance between maximizing statistical power, and dilution of any potential association between the air exposure pathway and health outcomes. The political and natural boundaries selected to satisfy this need, moving clockwise from the north, are: 128th Ave, Gun Club Road, I-70, I-270 and the South Platte River.

*Medical Referral System* - Anyone with a health concern which he or she believes is associated with the remediation of the RMA may access the Medical Referral System.

*Health Professional Education* - The Health Professional Education Program has variable levels of educational effort. The effort level is related to the professional's proximity to the RMA, his or her patient's residence, and interest.

- C An initial mailing will target and advise health professionals of the RMA Medical Monitoring Program, the availability of the Rocky Mountain Poison and Drug Center for consultation, and the availability of relevant materials. This initial mailing will be sent to professionals practicing within the Denver Metro Area, including Brighton and Boulder. This broad mailing will include a returnable questionnaire which will help to identify those with patients living in communities surrounding the RMA or with a general interest.
  
- C Professionals practicing and, or, with patients living in the communities surrounding the RMA, those with a general interest, or those associated with HMOs, hospitals, community health clinics or with local health agencies will be the target of a greater educational effort. This greater effort will include more detailed materials etc.
  
- C The types of health professionals targeted for all levels of education include, but are not limited to medical doctors, osteopaths, physician assistants, school nurses, school risk managers, county nurses, interns, public health officials, chiropractors and acupuncturists.

**B. Environmental Monitoring**

*Environmental Monitoring Community Outreach* - The Environmental Monitoring Subcommittee has adopted political and natural boundaries for application to the Environmental Monitoring Community Outreach recommendation. Moving clockwise from the north, they are: 128th Ave, Gun Club Road, I-70, I-270 and the South Platte River (similar to Birth Defects Surveillance recommendation). This could be expanded to include local public health authorities and appropriate community organizations in a broader geographic area.

**C. Public Involvement and Education**

*Public Involvement and Education* - The PIE Subcommittee has adopted the following political and natural boundaries for application to recommendations are development. Moving clockwise from the north, they are: 136th Ave, Buckley Road, I-70, I-270 and the South Platte River.

**III. *Non-Chemicals of Concern***

The On-Post Record of Decision (ROD) states that “The primary goals of the Medical Monitoring Program are to monitor any off-post impact on human health due to the remediation and provide mechanisms for evaluation of human health on an individual and community basis until such time as the soil remedy is complete.” DIMP was not identified as a COC during the RI/FS process and since it is primarily found in ground water, it has no impact on the estimation of potential health risks related to the soil remediation program.

The ROD also identifies a process for evaluation of additional COCs. It states that “Although it is believed that these COCs are inclusive of the contaminants representing the greatest potential for risk, there are other contaminants that exist that may in the future become a concern (e.g., dioxin). In such an instance, an evaluation of the contaminant with respect to the remedy selected, designed, or implemented will be performed to ensure that the remedy remains protective of human health and the environment. Dioxin also was not identified as a COC during the RI/FS. The Parties are continuing to discuss this issue and obtain additional data upon which to base a decision but the time line for that decision has not been set. The decision to add dioxin to the COC list or not is up to the RMA Committee. If dioxin is eventually added to the COC list, the air monitoring will be modified to measure this chemical. However, even if dioxin were added to the list, no off-post impacts are expected because dioxin is tightly-bound to soils and construction dust particles typically do not travel very far, especially under controlled conditions.

The Task 2 Working Group of the Air Pathway Analysis project conducted a soil emission flux testing project in the Fall of 1998. This activity focused on a representative sample of contaminated soils. Although the results are still preliminary, no additional site-wide COCs have been identified. However, they did identify 5 chemicals (hexachlorobutadiene, bicycloheptadiene, dichlorobenzene, hexachloroethene, and 1,3,5-cycloheptatriene) which might warrant inclusion into air pathway analyses at a few sites. If these chemicals continue to pass screening criteria, they will be evaluated in the

site-specific air pathway analyses, but their impact is generally expected to be minor relative to other chemicals already included as COCs, whether because of relatively low concentration or toxicity.

Regarding chemical mixtures, CDPHE is following the key literature in this area. In brief, this literature reveals a complex picture, one which includes many relevant variables. Limited studies demonstrate that combined exposures may result in modification of toxicity depending on the nature of the agent, exposure conditions, animal model used, endpoint-selection, etc. Generalizable characterization of interaction outcomes are not yet supported by current scientific understanding. More efficient study designs and more comprehensive dose-response evaluations are among the many challenges still facing the scientific community. Because of these significant limitations, designing focused elements of a medical monitoring program which address undefined health outcomes of potential exposures is highly problematic. However, the current MMAG recommendations are receptive to a broad range of health concerns.

#### **IV. *Definitions of Length of Exposure***

Acute, subchronic and chronic are terms used by toxicologists and physicians to characterize both the duration and intensity of exposure. These terms may be conceptual and or chemical-specific, and do not have one single definition. Acute implies that an exposure is short-term (e.g., 1 or 24 hours), infrequent and of relatively high intensity. Chronic is considered long-term (e.g., 1 year, equal to or greater than 7 years, a significant portion of a lifetime) and generally of low intensity. Subchronic generally refers an intermediate condition with a duration of perhaps 90 days.

The term “persistent” implies a continuous exposure.

For the purposes of the RMA air pathway analysis, acute and chronic fence line criteria are being developed from the best available toxicological data describing short-term, high intensity and long-term, low intensity exposure conditions. The fence line criteria are used to design emission controls into the soil remediation. The fence line criteria will also be compared to measured concentrations of COCs. A measured concentration of a COC will be considered excessive if its 24-hour time-weighted average concentration is above the respective acute or chronic fence line criteria.

A variety of factors determine when an exposure becomes medically significant. These factors are dose, or intensity (as determined by air concentration), exposure frequency and duration and the chemical-specific toxicity. The fence line criteria take these factors into consideration so as to identify conservative health-protective levels that are useful for

primary prevention of exposure and control of remedial activities. Because of the conservatism built into these values, they are not appropriate triggers, in and of themselves, for pursuing public health actions. Rather, they are starting points for the evaluation of exposure significance. An outline of the evaluative process used to determine the significance of an exposure, both acute and chronic, with respect to selection of appropriated public health response, has been presented in the MMAG recommendation *Guidelines for Public Health Responses to RMA Related Exposure and Observations of Health Concerns Among Communities and Visitors*.

## **V. *RMA Visitors***

The health and safety of visitors to RMA during remediation is under evaluation from several different perspectives. The USFWS has developed the *Visitor Access Policy* document, currently under review by CDPHE and EPA, which deals with the types of activities the FWS contemplates at RMA during remediation and how these activities will be managed under both routine and non-routine conditions. The Task 1 Toxicology Work Group, a collaboration of the RVO, State and EPA toxicologists, is developing acute reference air concentrations which are health-protective. These acute concentrations will be used for a number of purposes including identification of safe areas for visitor access. Visitors will not be in close proximity to active remediation sites; access will be canceled if modeled or measured air concentrations exceed risk-based criteria.

A risk handbook focused on soil is currently being prepared by the RVO that will assist the FWS in evaluation of visitor access to different areas of the RMA.

The FWS considers RMA volunteers as equivalent to workers and treats them accordingly. Volunteer are carefully screened and receive a job description and performance plan when the enter the program. They receive periodic performance evaluations and their hours worked are monitored. They receive training appropriate to their position, including OSHA training and medical surveillance if the equivalent regular FWS position would require it. For these reasons, the RVO will consider them as workers when evaluating acceptable air criteria.

## **VI. *Other Routes of Exposure***

During the RMA soil remediation, the air pathway has the greatest potential for impact on human health due to potentially harmful levels of airborne contaminants or enjoyment of personal property due to nuisance odors. For this reason, the MMAG recommendations have focused on this pathway as a source of potential exposure and public health impact.



If the soil remediation results in exposure through other pathways, these pathways should be addressed by the Program.

Regardless of the potential exposure pathway, any community member with a health concern may access the RMA Medical Monitoring Referral System. Additionally, the health surveillance systems initiated under the Program will be operative for the communities surrounding the RMA, and the *Remediation Monitoring - Medical Referral & Biomonitoring Decision Tree* and *Guidelines for Public Health Responses to RMA Related Exposure and Observations of Health Concerns Among Communities and Visitors* are applicable to any identified exposure or community health concern.