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Chemical Stockpile Disposal Program: Review and Comment on the Phase I Environmental Report for the Umatilla Depot Activity, Hermiston, Oregon

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ABSTRACT

As part of the Chemical Stockpile Disposal Program mandated by Public Law 99-145 (Department of Defense Authorization Act), an independent review is presented of the U.S. Army phase I environmental report for the disposal program at the Umatilla Depot Activity (UMDA) in Hermiston, Oregon. The phase I report addressed new and additional concerns not incorporated in the final programmatic environmental impact statement (FPEIS). Those concerns were addressed by examining site-specific data for the Umatilla Depot Activity and by recommending the scope and content of a more detailed site-specific study. This independent review evaluates whether the new site-specific data presented in the phase I report would alter the decision in favor of on-site disposal that was reached in the FPEIS, and whether the recommendations for the scope and content of the site-specific study are adequate. Based on the methods and assumptions presented in the FPEIS, the inclusion of more detailed site-specific data in the phase I report does not change the decision reached in the FPEIS (which favored on-site disposal at UMDA). It is recommended that alternative assumptions about meteorological conditions be considered and that site-specific data on water, ecological, socioeconomic, and cultural resources; seismicity; and emergency planning and preparedness be considered explicitly in the site-specific EIS decision-making process.

1 INTRODUCTION

The U.S. Army is implementing a strategy for compliance with Title 14, Part B, Section 1412, of Public Law 99-145 (Department of Defense Authorization Act), which requires destruction of all lethal unitary chemical agents and munitions. As part of this strategy, the U.S. Army developed a two-tiered approach for compliance with the National Environmental Policy Act of 1969 (NEPA). The first part of this approach involved preparing a final programmatic environmental impact statement (FPEIS) (U.S. Army 1988a) to compare alternative strategies on a national scale. The analysis considered disposal technologies and locations. The second part of the two-tiered approach is now in progress and involves preparing site-specific environmental impact

statements (EISs) to assess the effects at each location from implementing the disposal technology selected in the FPEIS, that is, on-site incineration.

Because of comments received during the NEPA review of the FPEIS, the U.S. Army decided to conduct the site-specific NEPA impact analysis in two phases (U.S. Army 1988b). In phase I, site-specific data relevant to on-site disposal were to be further reviewed and analyzed for each installation. In phase II, the site-specific effects of constructing, operating, and decommissioning the incineration facility at each disposal location are to be considered.

The U.S. Army has prepared the phase I report for the Umatilla Depot Activity (UMDA) in Hermiston, Oregon (U.S. Army 1990). The report contains information on human health and safety, environmental resources, and emergency response that is specific to the area around UMDA. The stated objectives of that report are to determine (1) whether new data presented in the phase I report would result in the rejection of on-site disposal at UMDA as the environmentally preferred alternative (using the same methods and data-analysis tools as used for the FPEIS) and (2) whether the new data indicate the presence of significant environmental resources that could be affected by the implementation of on-site disposal at UMDA.

The U.S. Army decided that the phase I report for UMDA should be independently reviewed. This document presents the results of that review, which was conducted by research staff members at Argonne National Laboratory for the U.S. Army, Office of the Assistant Secretary, Installations, Logistics, and Environment. The Assistant Secretary requested that the reviewers determine the adequacy of the phase I report, whether new data should be evaluated, and whether evaluation of new data would change the environmentally preferred alternative selected in the FPEIS. Previous reviews, also conducted by Argonne National Laboratory staff, evaluated the phase I environmental reports prepared for the Tooele Army Depot (Krummel et al. 1988) and the Anniston Army Depot (Krummel et al. 1989).

Figure 1 shows the approach used to compare the site-specific data and results presented in the FPEIS with the new information generated for the phase I report. If differences were found in comparing phase I data with the data presented in the FPEIS, these differences were examined for significance. If significant differences were found, the selection of this specific disposal site as an alternative was to be reassessed. If the differences were found to be insignificant, that conclusion was to be reported in the site-specific EIS.

The phase I environmental report contains detailed, site-specific information for a circular area within a 100-km radius of UMDA. Two types of data are presented: (1) data to support the decision analysis presented in the FPEIS (Figure 1) and (2) environmental resource data required for preparation of the site-specific EIS in phase II. The phase I report does not incorporate any new modeling analyses or probabilistic accident scenarios; these analyses and scenarios are carried through unchanged from the FPEIS.

FIGURE 1 Phase I Concept and the Approach Used in this Review to Compare the FPEIS and Phase I Environmental Report (Boxes labeled *Review* are germane to this review report.) (Source: Adapted from U.S. Army 1988c)

2 APPROACH

This review compares the site-specific data used in the FPEIS with the data presented in the phase I report (Figure 1). The comparison involves reviewing the data for completeness and adequacy to support modeling and computation of risk measures. This phase I review explicitly follows the decision methodology developed in the FPEIS. Krummel et al. (1988, 1989) provide information on application of the FPEIS methodology to decisions of adequacy and completeness and describe the types of data explicitly considered. (Data adequacy applies to the phase I information in terms of choosing the most appropriate parameters and variables in the modeling analyses, as well as incorporating all potential receptors in analyzing potential effects of on-site incineration of chemical agents at UMDA. In this case, the receptors are the people located around UMDA. The modeling analyses depend on the phase I information to evaluate site-specific dose levels that could be experienced by the population located around UMDA.) This review considers neither the U.S. Army Record of Decision (Federal Register 1988) nor the probabilistic accident analyses completed for the FPEIS to determine the chemical agent source terms.

This review also examines the information presented in the phase I report that will be used for the phase II site-specific EIS. Specifically, the review addresses the adequacy of the data to support a site-specific impact analysis. Although these data were not used in the FPEIS decision process, the information will be used both to define baseline environmental conditions at UMDA and to conduct impact analyses for the site-specific EIS. In addition, recommendations are provided, where appropriate, on the types of information and analyses that should be included in the site-specific EIS.

Section 3 of this review examines the data explicitly used in the FPEIS methodology to make decisions related to disposal options. These data areas include meteorology, population, seismicity, and emergency planning. Section 4 of this review examines data that will be used in the site-specific EIS, but that were not explicitly included in the FPEIS decision methodology. These data areas include water, ecological, social, economic, and cultural resources. Section 4 also contains recommendations for site-specific data and analysis requirements for meteorology, population, and emergency planning.

3 DATA THAT APPLY TO THE FPEIS DECISION

3.1 METEOROLOGY AND ATMOSPHERIC DISPERSION

The site is located about 10 km south of the Columbia River. The surrounding terrain is gently rolling. Tall grass and sagebrush cover the depot, and irrigated cropland and orchards cover the surrounding area. The Columbia River valley influences the local atmospheric circulation. The Pacific Basin is not as prone to pooling of cold air as is the Great Basin of Utah. Average summer mixing heights vary from 200 m in the morning to 2,100 m in the afternoon.

The Umatilla risk assessments required the use of dispersion modeling predictions. The D2PC model was used for the two sets of meteorological scenarios developed in the FPEIS -- *conservative-most-likely* and *worst-case* scenarios. Conservative-most-likely conditions were chosen as class D atmospheric stability and 3 m/s wind speed (denoted by the designation D,3); worst-case conditions were selected to be class E stability and 1 m/s (E,1). The D,3 scenario assumes a frequently occurring meteorological condition that results in relatively large agent doses as compared with other frequently occurring conditions. The E,1 scenario is intended to represent a credible condition that results in near-maximum doses. Predictions based on these two meteorological scenarios were used to estimate how the population would be affected by the five measures of risk used in the FPEIS (U.S. Army 1988a).

Evaluation of other possible relevant data for use in the phase I report revealed that (1) all surface and tower meteorological parameters measured on a regular basis in the vicinity of the proposed Chemical Stockpile Disposal Program site at UMDA were identified in the phase I report, and (2) no comprehensive dispersion studies have been carried out in the vicinity of the site that could be used to develop insight into flow patterns for potential accident releases.

The two sources of meteorological data were those collected at UMDA and those collected at the Portland General Electric Co. (PGEC) Plant 6.5 km south of UMDA. The phase I document did not use the wind data from the meteorological tower at UMDA because the data were not in ready-to-access form and because no stability data were available. However, the UMDA data could have been compared with the PGEC data if the considerable work necessary to process the UMDA data had been done. In that way, wind roses for both the UMDA and PGEC sites could have been compared, at least qualitatively, even though the measurement periods did not overlap. The importance of studying this one point of data is lessened considerably because there is variable terrain and, consequently, a single point of meteorological data has limited value.

In reality, because the terrain is irregular, meteorological data collected from any single location (either from on-site or from the PGEC Plant) can not adequately characterize the entire flow in the Umatilla area. The terrain slopes down to the Columbia River, which is north of the site. Nighttime drainage can create plume motion downslope from the site, with some material possibly passing over the river to the state of Washington and some following the Columbia River Valley to the east. Because the site is so close to Washington, some plume dispersion in that state is likely. Plumes from

daytime releases would likely flow from west to east. The possibility of terrorism prevents ruling out any time of day for accidental releases of chemical agents.

The condition of F stability at nighttime during a release and its concomitant long residence times and meandering plume motion was not considered in the phase I report. The use of the straight-line Gaussian approach of the D2PC model does not account for the likely change in direction of the flow due to terrain differences. This change in direction can be important in evaluating impacts. In the phase I document, the "maximum number of fatalities" associated with a particular downwind direction was computed by rotating the predicted D2PC plume in increments of one compass degree around the point of release. Fatalities were then computed for each of these increments. The absolute largest number of fatalities among all 360 computations was identified in the FPEIS as the *maximum number of fatalities* associated with that particular downwind no-deaths distance category. In each of these 360 computations, the plume is assumed to travel in a straight-line path in the direction of a different degree of the compass. However, looking at the worst-case of the 360 computations does not necessarily provide a conservative prediction. Because of differences in terrain and the change of wind direction with time, plumes do not travel in a straight line. The wind blows in one direction for a few minutes, then turns to a different direction a few minutes later. Over long distances, considerable change in direction of the plumes can occur. The likely possibility in the Umatilla case is that the plume would change direction as it heads downslope towards the Columbia River, turning eastward and with some released material possibly crossing the river into Washington. Such a condition is not covered by any of the 360 computations made for the phase I document. Depending upon the location of the population, a strategically located zigzag plume could cause more fatalities than predicted by any of the 360 straight-line plume computations.

Within the framework of the U.S. Army methodology presented in the FPEIS, however, *conservative-most-likely* and *worst-case* combinations of wind speed and stability class had to be selected on the basis of straight-line Gaussian theory and the meteorological data given in the phase I report. After examining the meteorological data presented in the phase I report, the U.S. Army selected for analysis the stability/wind speed conditions of D,3 for the conservative-most-likely scenario and E,1 for the worst-case scenario. These choices were identical to those in the FPEIS, and the measures of risk did not need to be recalculated because of changes in meteorology. However, the choice of D,3 and E,1 conditions for analysis was subjective, and other meteorologists could reasonably choose and defend other stability class/wind speed combinations.

In the phase I report, one other meteorological condition relating to conservative-most-likely conditions was analyzed: D stability and 1 m/s wind speed (in addition to the subjective choices of D,3 and E,1 as described above). It was postulated that the D,1 alternative might lead to greater impacts for the conservative-most-likely condition because D stability plumes ought to spread over a larger area than E stability plumes. As it turned out, only the shading pattern for "expected plume area" for the on-site disposal alternative changed. It increased by one shading pattern in both of the two sets of pictograms (with the FPEIS and updated population estimates). No significant difference from the risks estimated in the FPEIS was found for that case.

Within the methodology used in the phase I document, all possible stability class/wind speed combinations should have been tested to determine which led to the greatest impacts. Recommendations concerning this matter are further discussed in Section 4.2.

3.2 POPULATION

In the FPEIS, the size of the residential (off-base) population near the UMDA installation was based on 1980 U.S. census data. In the phase I report, 1986 population estimates from the Census Bureau were used. The methods used to distribute the population in the FPEIS and the phase I report have been discussed and critiqued in previous reviews (Krummel et al. 1988, 1989). The data and methods used to identify the size and distribution of the off-base population in the affected area were both valid and appropriate.

As a result of differences in calculating the size and distribution of the population, it was estimated in the phase I report that 5,426 more people are located in the potentially impacted zone near the UMDA than was estimated in the FPEIS. Within specified distances from UMDA, the revised estimates resulted in a population increase of 327 persons at a 2-5 km radius, 4,969 at 5-10 km, and 5,048 at 35-50 km. Reductions in population occurred at distances of 0-2 km (-10 persons), 10-20 km (-3,664), 20-35 km (-468), and 50-100 km (-776).

When these new population values were translated into revised fatality estimates, it was determined that under potential maximum worst-case meteorological conditions, fatalities would be greater at distances of 2-5 km from UMDA (+1), 5-10 km (+8), 10-20 km (+219), and 20-50 km (+445). Under the same meteorological conditions, fatalities would be lower at a distance of 50-100 km (-120). Under average conservative most-likely meteorological conditions, fatalities would be greater at distances of 10-20 km from UMDA (+15), and 20-50 km (+100).

Using the ranges of risk provided in Figure 10 of the phase I report (U.S. Army 1990, p. 3-20), the revised fatality estimates result in an overall reduction in the probability of one or more fatalities for the on-site disposal and national disposal alternatives. This occurs because of a reduction in the estimated number of off-site residents living within 0-2 km from UMDA (U.S. Army 1990, p. 3-21).

The method used to accept or reject the alternatives under consideration has been based on the subjectively determined, but operationally defined, term *significant differences*. The U.S. Army (1988a) has accepted as its interpretation of a conservative gauge of *significant differences* between alternatives a measure of risk that allows for a ten-fold range of error in either direction and that requires a two-order of magnitude (e.g., 100-fold) difference in risk for four measures of risk. A fifth measure of risk requires a difference of 4,001 to an unknown number of maximum fatalities to result in a *significant* change at the highest risk category (U.S. Army 1990, p. A-7).

It should be noted that to achieve a *significant difference* in risk (using the U.S. Army's definition of *significant*) in terms of maximum number of fatalities under worst-case conditions (for an accident with a toxic plume reaching 50-km), the number of

deaths would have to increase from 2,500 as estimated in the FPEIS, to greater than 10,000. To achieve a *significant difference* in terms of the maximum number of fatalities under worst-case condition for an accident with a toxic plume reaching 100 km, the number of deaths would have to change from 9,800 as estimated in the FPEIS to a number greater than 10,000. The actual number cannot be determined from the pictogram provided in Figure 10 from the phase I report. Nevertheless, the probability that the estimated number of fatalities could increase to levels that would be *significant* using the U.S. Army's definition are extremely small (Krummel et al. 1989, p. 10). The only demographic conditions under which differences of this magnitude could occur are (1) with the recalculation of risk using on-site and special populations in the fatality estimates, and (2) under conditions where residential development occurs rapidly within very narrow and short distances from the site.

3.3 SEISMICITY

A comment is made in the phase I report (p. 3-9), that a major earthquake in the western United States will produce surface ruptures of 1 or 2 m over 10,000 years. This implies that in all of the western United States, rupture is a slow and continuous process. It would be more accurate to state that accumulated strain over 10,000 years could result in episodic and instantaneous displacement along a major fault of 1 or 2 m. The statement should refer specifically to the Columbia Plateau and not the entire western United States.

Peak ground acceleration of 0.25 g and worst-case earthquake of bodywave magnitude (mb) = 5.6 are correct for the Columbia Plateau; however, the single reference (Jacobs Engineering Group and URS/John A. Blume and Associates 1987) to seismicity cited in the phase I report is inadequate for a critical review. Original sources from which seismicity was determined should be listed. Site characterization at the U.S. Department of Energy's Hanford Site has recently been updated and includes as-yet-unpublished seismicity data. This site is near the UMDA facility. The earthquake map on p. 3-9 of the phase I report would be altered somewhat, but peak ground acceleration and worst-case earthquakes would remain as stated in the Jacobs and Blume report.

3.4 EMERGENCY PLANNING AND PREPAREDNESS

In the FPEIS and the phase I report, the risk reductions associated with emergency planning and preparedness used to support the decision for on-site disposal were not measured and compared with off-site transportation risks (U.S. Army 1990, p. 2-3). No empirical evidence was presented to support the conclusion that emergency planning and preparedness would reduce the risk of an accident. It was noted in the phase I report that the risk measures for emergency response planning and preparedness were not necessary in this analysis. The phase I report also stated that no proven or acceptable method exists to quantify a potential reduction in impacts associated with emergency response planning and preparedness (U.S. Army 1990, p. A-7). These two statements are incompatible. Risk measures do not exist for emergency planning; therefore, these measures cannot be used in the FPEIS methodology.

The phase I report stated (pp. 2-1, 2-5, A-7) that regional disposal of chemical agent stockpiles was considered and rejected, at the third tier of analysis (e.g., emergency planning and preparedness), because of the greater difficulty in providing adequate emergency response along transportation corridors vs. on the site. This conclusion was not based on a quantitative analysis of alternatives. In fact, no quantifiable basis exists for determining whether phase I report site-specific information on emergency planning and preparedness is sufficiently different from that considered in the FPEIS to alter the decision in favor of on-site disposal. A list of emergency response issues that have been addressed in documents supporting all of the phase I reports has been discussed by Krummel et al. (1989, pp. 11-13).

4 SITE-SPECIFIC EIS

4.1 METEOROLOGY

4.1.1 General

The meteorology and air quality section of the site-specific EIS should evaluate impacts of routine operation of the Chemical Stockpile Disposal Program (along with construction impacts), as well as impacts to human populations from the accident scenarios.

Relative to routine operation, on-site meteorological data should be used to evaluate compliance with air quality standards at the site boundary (see p. 3-4 of the phase I report). Finally, off-site air quality impacts and noise impacts from the construction of the facility should be evaluated.

4.1.2 D2PC Model and the Choice of Meteorological Conditions

The D2PC model was used in the FPEIS for dispersion analyses to evaluate the consequences of the various off-site transportation and on-site accident scenarios at all eight stockpile sites. The D2PC model actually is applicable only to dispersion in reasonably flat terrain under simple meteorological conditions. The errors that arise in application of the model to a specific site depend strongly on how the assumptions in that model match the actual conditions at the site being studied. The EIS for each depot is supposed to assess site-specific impacts of implementing the Chemical Stockpile Disposal Program at that site and to evaluate possible alternative locations for the incineration facility within the depot.

Because of the variable terrain present at UMDA, the D2PC model can be applied to the site only if knowledge of the flow patterns by time of day is available. Such information is available qualitatively. An experienced user of D2PC (with a meteorology background) armed with such information on time-of-day variations in wind and pollutant motion can use D2PC in an effective way for conditions at UMDA. A person with little meteorological experience or lack of knowledge of the possible plume motions would find it better to use a variable terrain flow and dispersion model such as the MACH series of codes developed by the U.S. Army Atmospheric Sciences Laboratory. It is recommended that the MACH codes (or a similar type of model, such as HOTMAC/RAPTAD) be run for selected nighttime (F stability) and daytime periods and that plume predictions (concentrations and locations) be compared with the phase I methodology (counting fatalities) using D2PC. If this exercise projects fewer fatalities using the variable terrain model, it should provide some confidence in the D2PC modeling results as they were developed for the phase I document. The question of zigzags in the plume direction possibly leading to additional fatalities unaccounted for in the phase I methodology using D2PC could then be evaluated.

The MACH codes are currently being considered for use in emergency response at the site. This seems to be advisable considering the complex patterns that flow and dispersion could take during an actual accident. However, it is our recommendation that the MACH models should also be used in the site-specific EIS to evaluate worst-case conditions (as described above) and to verify the results obtained with D2PC.

Another important issue for the site-specific EIS relates to the meteorological conditions selected for the dispersion analysis (Section 3.1). The D,3 and E,1 conditions selected for use in the FPEIS analysis appear to have been subjective choices, and it is not certain that they represent conservative conditions for purposes of this impact assessment. Table 1 of the phase I report presents the joint frequency distribution of stability and wind rose for the Portland General Electric Co. These data indicate frequencies of 1.1% for A stability, 9.2% for B stability, 10.3% for C stability, 52.6% for D stability, 10.7% for E stability, and 16.1% for F stability. Neither that table nor the accompanying text (U.S. Army 1990) provide any substantive support for the selections, leading to the conclusion that the choice of the D,3 and E,1 meteorological conditions were subjective. Other meteorologists could reasonably make other choices. It is recommended that the Army consider remodeling dispersion characteristics with other reasonable stability and wind speed combinations (such as D,5 and E,3 for conservative-most-likely and F,1 and F,3 for worst-case scenarios) and then compare projected doses to the population for these other combinations.

It is important to recognize that the meteorological scenarios selected are important only because they are needed to compute potential dosage values for the population near UMDA. Depending upon the relative location of the population with respect to UMDA, the largest dosage to the public may or may not result from the D,3 and E,1 conditions. All reasonable possibilities need to be checked, not just D,1, in addition to D,3 and E,1.

Only through a sensitivity analysis with respect to wind speed and stability class can the effect of the subjective choice of meteorological conditions be evaluated. These evaluations should be done in conjunction with the more important study of the effects of variable terrain on fatality projections, as described above. The impacts to on-site personnel should also be included in the dosage comparisons with the different stability class/wind speed combinations.

4.2 POPULATION

It is noted in the phase I report that on-post and special populations near UMDA will be considered when estimating potential fatalities for the site-specific EIS. The use of these more detailed data is both valid and appropriate. Also, it should be noted that in the phase I report, fatality estimates have been presented in each table in a cumulative format by distance from the proposed facility (although the tables are not labeled accordingly, and the distances considered are not comparable), while the population distributions are presented in an incremental format with totals at the bottom of the table. To reduce the likelihood of confusion, it is suggested that tables showing the estimated number of fatalities should be comparable in style and format to those showing the population distributions.

4.3 SOCIAL, ECONOMIC, AND CULTURAL RESOURCES

Unlike the method used to conduct the population analysis, systematic methods or models were not used in the FPEIS and phase I report to analyze data associated with social, economic, and cultural resources. For both the FPEIS and phase I report, data were collected on public services/infrastructure and economic resources for the counties within a selected radius of UMDA, but even if the data collected for the phase I report indicated that *significant differences* in impacts were expected as compared with those projected in the FPEIS, this would not alter the decision in favor of on-site disposal. This is because social, economic, and cultural resources were not explicitly used in the decision-making process. It is suggested that social, economic, and cultural issues should be included explicitly in the decision-making process for the site-specific EIS.

4.4 WATER RESOURCES

As the phase I report indicates, risks or impacts to surface water and groundwater resources were not considered in the FPEIS decision methodology. Therefore, it is not necessary to compare the data presented in the FPEIS and the phase I report. Rather, the phase I report presents site-specific information on surface water and groundwater that will be used in the EIS impact analysis for UMDA. The site-specific data will be used to quantify the baseline environment, to map water resources that occur within the region of influence described in the FPEIS (100 km), and to provide information on initial conditions for analysis of surface and groundwater flow dynamics. These studies will provide the information needed to judge the site-specific human health and aquatic ecosystem risks associated with on-site disposal at UMDA.

The surface water information presented in the phase I report provides sufficient site-specific data on the location of rivers, streams, and reservoirs within the region of influence. In addition, information presented on flow rates for the primary streams and rivers quantifies mean flow and average withdrawal rates. No new information exists or was developed for the phase I report relative to the presence of surface water that would affect the FPEIS decision for on-site disposal. Surface water information contained in Appendix C of the phase I report provides sufficient detail for the affected environment section of the site-specific EIS. Since there is no surface runoff connection between UMDA and permanent rivers, streams, or reservoirs, the phase I report is correct in stating that atmospheric deposition of contaminants is the only pathway available for potential surface water impacts.

Because the FPEIS decision methodology did not consider water resources, the impact analysis for the site-specific EIS will contribute important new information to the implementation of on-site disposal at UMDA. The Columbia River, and the rivers and streams that join the Columbia River in the vicinity of UMDA, are important regional sources of water. Because UMDA is only a few kilometers south of the Columbia River, the EIS should explicitly quantify potential deposition of chemical agent in the river. Deposition values should be derived from the accident data base developed for the FPEIS. This information should also be developed for the Umatilla River, Cold Springs Reservoir, MaKey Reservoir, and the irrigation canals that surround UMDA.

Groundwater information contained in Appendix C of the phase I report provides sufficient detail for the affected environment section of the site-specific EIS. The new information presented in the phase I report related to the confined basalt aquifer system that occurs beneath UMDA and the hydraulic connection of this aquifer with the unconfined surficial aquifer would not alter the decision for on-site disposal. The phase I report is correct in stating that groundwater can be directly impacted by spills. The very permeable soils on UMDA provide a pathway for movement of contaminants toward the groundwater.

It is recommended that the analysis of groundwater impacts for the site-specific EIS take advantage of work completed to date on the National Priorities List (NPL) hazardous waste site located at UMDA. With the NPL information, inferences can be drawn as to the potential impacts to groundwater resources. These inferences, combined with an explicit mapping of off-site groundwater resources and users of groundwater (e.g., irrigated cropland or municipal wells), should provide a thorough site-specific study of groundwater at UMDA.

4.5 ECOLOGICAL RESOURCES

In the FPEIS, explicitly protected ecological resources were listed as being at risk from accidental releases of agent; however, these resources were not used to quantify ecosystem risk. The atmospheric dispersion model was used to measure ecosystem risk by defining the expected plume area around the UMDA disposal location. Implicit in this calculation is the assumption that the greater the plume area, the larger the impact to the surrounding biota. The calculation and thus the subsequent index of risk did not change during the phase I analysis. Therefore, inclusion of all protected ecological resources in the phase I report is only necessary to support impact analyses in the site-specific EIS.

The phase I report identifies and maps the locations of all publicly owned land areas within 100 km of UMDA that contain natural ecological systems. In addition, all threatened and endangered species are identified for inclusion in the phase II studies. For major natural areas and important habitat for threatened and endangered species, that information adequately defines the baseline environment in the UMDA region. Impact analyses of these ecological resources conducted for the site-specific EIS would serve as an acceptable index of potential impacts to biological and ecological resources within the entire 100-km area surrounding UMDA.

No data on terrestrial biota at the UMDA installation properties are provided in the phase I report. These data are essential for completion of the site-specific EIS. For example, information on the locations of plant communities and animal habitats is needed to judge the impacts of road construction. It is recommended that ecological data from the installation be presented in the site-specific EIS and that this information be used in the impact analysis of disposal facility construction and operation.

4.6 EMERGENCY PLANNING AND PREPAREDNESS

For emergency planning, the U.S. Army is currently considering the use of a number of possible computer codes, including D2PC, the MACH codes, and HOTMAC/RAPTAD, in an emergency preparedness model for the site. In addition, it should be recognized that the individuals responsible for running the models in an emergency (daytime or nighttime) should have sufficient training and experience in meteorology to be able to properly use the models under a variety of conditions.

5 CONCLUSIONS

Applying only the decision methodology used by the U.S. Army in the FPEIS and phase I report, there are no *significant* differences between the information presented in the FPEIS and that presented in the phase I report for UMDA. The projected number of people exposed to accidental releases of chemical agent was found in the phase I report to be larger than the estimates contained in the FPEIS, and the number of expected fatalities under the worst-case conditions (50 km) increased by 670 from the FPEIS to the phase I report. The FPEIS methodology required an increase of 7,501 expected fatalities or a 100-fold increase in the other measures of risk to be considered *significant* enough to reject on-site disposal. Other than changes in estimates of the size and distribution of the human population, no other data were altered in the phase I report.

The phase I report adequately describes the current environmental conditions at the UMDA and the surrounding region. The information contained in the phase I report adequately addresses surface or groundwater attributes needed to analyze impacts to water users or aquatic biota. However, it is recommended that further information be collected for the site-specific EIS to map the location of surface water and groundwater withdrawals. It also is recommended that other likely meteorological conditions be evaluated with the D2PC dispersion model in the site-specific EIS to determine if these different conditions alter dispersion patterns. Furthermore, it is recommended that the MACH series of models (or similar codes) be used in the EIS to evaluate worst-case conditions and to verify the results obtained with the D2PC model.

Under the FPEIS and phase I process, only one proposed disposal location has been considered for the UMDA. Although this site location has been subjected to preliminary engineering analyses, the U.S. Army, in the site-specific EIS process, is committed to evaluating other on-site locations if environmental impacts at the initially proposed site are of a magnitude to warrant facility relocation. If other locations are considered in the EIS, the FPEIS risk measures will have to be recomputed to determine the magnitude of any changes. The determination of whether changes in the risk measures that result from these recomputations are significant will also be based on subjective criteria for significance that are formulated by the U.S. Army.

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