APPENDIX G

Executive Summary, Addendum 2: Screening Health Risk Assessment, Burn Pit Exposures, Balad Air Base, Iraq

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EXECUTIVE SUMMARY
ADDENDUM 2
SCREENING HEALTH RISK ASSESSMENT
BURN PIT EXPOSURES
BALAD AIR BASE, IRAQ
USACHPPM REPORT NO. 47-MA-08PV-08/
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1. PURPOSE. This report documents the results of ambient air sampling conducted at Balad Air Base, Iraq (now known as Joint Base Balad, Iraq; the current name is used throughout this addendum) by on-site military environmental health personnel in Fall 2007 as a follow-up to ambient air sampling conducted in January through April 2007. The ambient air sampling was intended to collect multiple classes of pollutants expected to be emitted by the Air Base municipal waste open burn pit, which operated 24 hours (hrs) per day, 7 days per week. Although burn pit emissions were noted as the primary concern amongst site personnel, other air pollution sources including flight operations, vehicular emissions, generators, and off-site sources were present and likely contributing to the pollutant levels found during this sampling effort. The results of the ambient air sampling provide the foundation for a screening health risk assessment (HRA) of military personnel located at the site and likely exposed to these pollutants. The ambient air sampling relied upon for this assessment was performed 18 October 2007 through 25 November 2007, after two on-site incinerators had begun operation and waste segregation practices had commenced. Additional air sampling will be conducted to increase knowledge of airborne contaminants and their potential health risk to deployed personnel.

2. CONCLUSIONS.

a. The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and the U.S. Air Force School of Aerospace Medicine (USAFSAM) have jointly developed a screening HRA documenting the current understanding of the health risk from exposure to the ambient air at Joint Base Balad, Iraq. Though it is primarily focusing on burn pit operations and changes since the installation and operation of 2 incinerators, many sources as discussed above were contributors to ambient air. The two primary methods used to assess risk were the military occupational and environmental health (OEH) risk estimate and the Screening HRA.

b. Using Composite Risk Management (CRM) risk estimate methodology to complete the OEH risk estimate, findings indicate that measured chemical exposure levels are not routinely above deployment military exposure guidelines (MEGs) for exposures up to 1 year. The MEGs, as published in USACHPPM Technical Guide (TG) 230, (*Chemical Exposure Guidelines for Deployed Military Personnel*), represent chemical concentrations above which certain types of health effects may begin to occur in individuals within an exposed population after a continuous, single exposure of specified duration. The MEGs are not designed for determining casualty estimates but are instead used as preventive guidelines. The OEH risk estimate for exposure to

all substances sampled for in the ambient air (except particulate matter with aerodynamic diameters of 10 micrometers or less (PM_{10})) at Joint Base Balad indicates long-term adverse health effects are unlikely. The PM_{10} was excluded because it is being addressed in other studies.

c. In addition, a screening human HRA was performed under guidance outlined by the U.S. Environmental Protection Agency (U.S. EPA). Cancer (carcinogenic) and non-cancer (or non-carcinogenic, which means any health effect other than cancer) risk estimates were developed. This methodology and its resulting estimates do not indicate an absolute measure of an individual's probability of an adverse health effect. Instead, the results indicate the likelihood that such outcomes (longer term/delayed cancer or non-cancer health effects) might occur under very specific exposure conditions. The results from this sampling effort indicate an "acceptable" health risk for cancer long-term health effects. For non-cancer health effects the hazard index exceeded 1.0 due to a combination of respiratory irritants. A hazard index greater than 1.0 indicates there is a potential for non-cancer health effects under the specific exposure conditions chosen. It does not indicate that a health effect will occur; however, the safety margin for protection is being breached so further evaluation is necessary.

d. Similar results were obtained from the previous sampling effort, conducted from January through April 2007. The initial and recalculated OEH risk estimates for exposure to all substances sampled for in the ambient air, excluding PM_{10}, indicated long-term adverse health effects were unlikely. Using U.S. EPA methodology the cancer risk for all receptors was within or below the U.S. EPA's acceptable cancer risk range. For non-cancer health effects the hazard index was initially calculated to be less than 1.0 as reported in the initial Screening Health Risk Assessment. These calculations did not incorporate estimated values for chemicals detected at levels less than the laboratory reporting limit. This was discovered during analysis of the Fall 2007 sampling data. The hazard index was recalculated for the January through April 2007 results to include the estimated values. The recalculated hazard index slightly exceeded the protective level of 1.0 due to a combination of respiratory irritants. This indicated the safety margin for protection is being breached and there is potential for non-cancer health effects under the specific exposure conditions chosen. However, it does not indicate that long-term health effects will occur.

e. This addendum is based on the results of an air sampling effort conducted by U.S. Air Force Bioenvironmental Engineering and U.S. Army preventive medicine personnel in October and November 2007. The air sampling study targeted expected emissions from the burn pit to include particulate matter, volatile organics, metals, polycyclic aromatic hydrocarbons, and polychlorinated dibenzo-p-dioxins/furans (hereafter called "dioxins" and "furans"). Sampling locations were selected to represent typical and maximum exposure levels for the general population serving at Joint Base Balad. The samples were also collected over multiple 24-hour periods to account for some of the operational and meteorological variability in exposure levels. A total of 107 samples were collected, resulting in 3079 individual analyte results. The 1-year MEGs were exceeded in 32 samples, to include 29 samples for particulate matter less than 10 microns in size (PM_{10}) and three samples for volatile organic compounds. Particulate matter levels were typical of what would be expected in the region and similar to background levels.

Testing results do not indicate that PM_{10} was significantly increased by burn pit operations. Particulate matter exposure in the U.S. Central Command (USCENTCOM) region has been previously identified as a potential health concern and is being addressed in other studies. Results from the particulate matter were not evaluated as part of this assessment

f. Despite the comprehensive sampling effort, there is significant uncertainty about actual exposure levels and the associated health risk estimates for those who currently are or have been assigned to Joint Base Balad. Therefore, the exposure scenario was performed using a worst-case scenario approach and most if not all individual exposures and resulting risks are expected to be less than predicted. Contaminant concentrations and related exposure levels are highly variable due to changing meteorological conditions (such as, wind direction and speed), differences in non-burn pit operations, differences in amount and type of material burned, as well as the temperature at which the material is burned. The risk assessment in this report conservatively assumed air sample results were representative of daily exposure, continuous and stable burn pit operations occurred, and that the base population and operations remained constant.

g. Continued work by preventive medicine personnel in the U.S. Air Force and U.S. Army will be aimed at protecting the health of all Service members and reducing the level of uncertainty in these estimates. Any significant refinement that improves the precision of the estimate will be shared with Joint Base Balad and USCENTCOM leadership as they are obtained.

3. RECOMMENDATIONS. The following recommendations should be considered in the development of an action plan to reduce future exposures to airborne pollutants at Joint Base Balad and at other locations in USCENTCOM area of responsibility. These include the following:

a. Continue to minimize the open burning of plastic materials and waste cooking grease through source reduction and recycling as well as incineration. The low-temperature burning of plastic materials and cooking grease, especially in the presence of metals that acts as catalysts, generates dioxins, furans, polycyclic aromatic hydrocarbons, and other organic chemicals of potential concern. These conditions typify open pit burning operations. Also, consider relocation of the burn pit to a predominantly downwind location.

b. Assess effectiveness of control measures. Assess air pollution levels as additional controls and countermeasures are implemented. Air sampling should be performed to ensure that recommended control measures for reducing exposure levels to personnel are working. Continue to seek improved monitoring and analytical procedures.

c. Refine the risk communication plan. A risk communication plan, to include both information products and open discussion opportunities, should be refined to reflect new and changing information on site conditions. Appropriate risk communication products, such as fact sheets for Service Members and commanders, should be disseminated to communicate the results of any HRAs and potential plans for determining the meaning of the results. While

information products can be helpful in increasing understanding, open discussion opportunities are proven to help minimize unnecessary concerns by outwardly reinforcing leadership focus on Force Health Protection; clarifying misinformation/ misperceptions; and by ensuring that decision makers remain cognizant of non-experts' interests, values, and concerns.

d. Conduct a policy review. Recommend Force Health Protection and Readiness, Joint Staff, and Under Secretary of Defense (Acquisition, Technology and Logistics) conduct a comprehensive policy review concerning proper use of burn pits and develop new policies to fill any gaps.

e. Implement administrative controls when practical to reduce exposures to the ambient air during periods of observed poorer air quality, such as during an inversion, dust storm, or large scale convoy operation. Controls could include moving indoors, using alternate outdoor locations for an activity, or altering the physical training schedule.

f. Submit this addendum to the Defense Health Board for an independent, third-party review. Ensure that the results of this review are communicated and used to further improve surveillance, risk assessment, and risk mitigation.