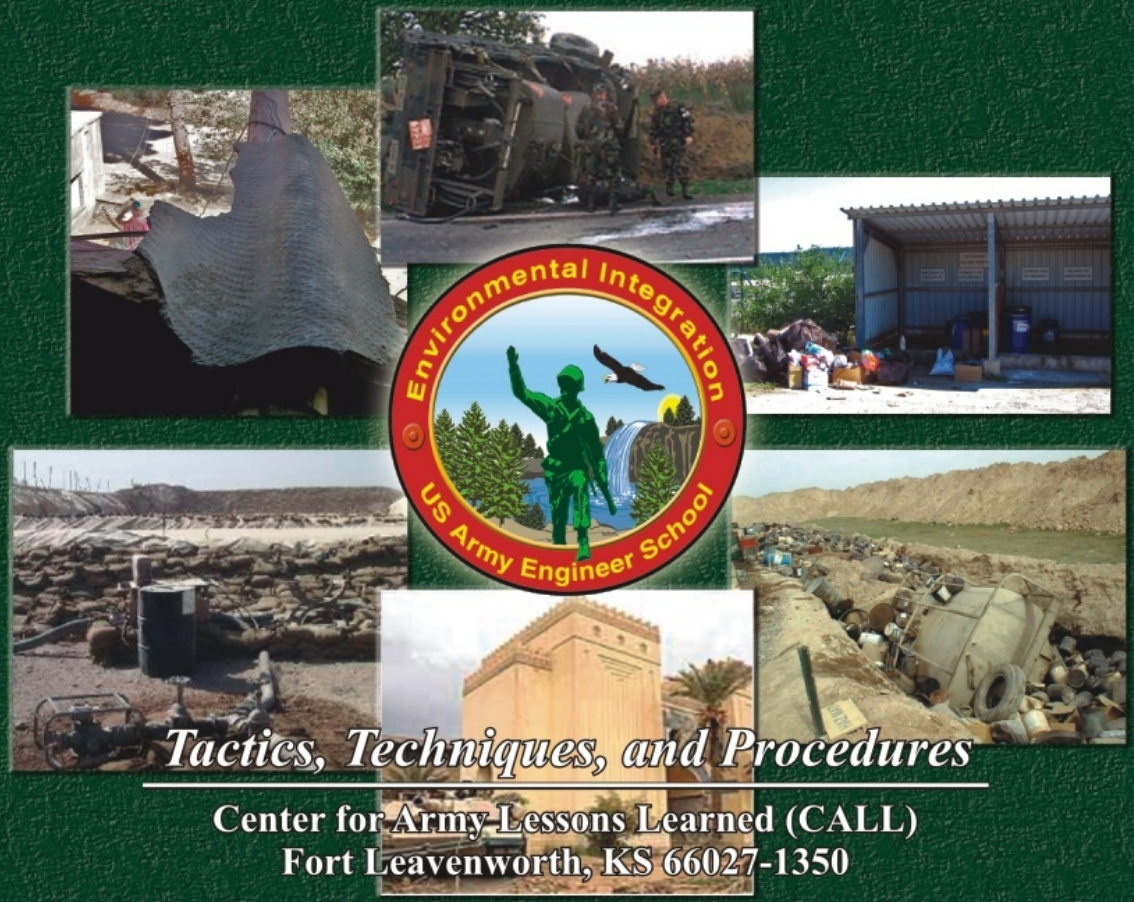
NEWSLETTER

No. 04-19 November 04

Environmental Considerations During Military Operations



Tactics, Techniques, and Procedures

Center for Army Lessons Learned (CALL)
Fort Leavenworth, KS 66027-1350

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Foreword

ENVIRONMENTAL HAZARD: All activities that may pollute, create negative noise related effects, degrade archaeological/cultural resources, or negatively affect threatened or endangered species habitats; also included are environmental health-related hazards.

— **FM 3-100.4, *Environmental Considerations in Military Operations***

This newsletter strives to reinforce environmental lessons learned and provide tactics, techniques, and procedures (TTP) that will prevent environmental-related hazards. Leaders cannot afford to overlook the inherent danger that environmental hazards pose to their Soldiers or the natural environment. By overlooking environmental hazards, commanders may adversely affect the health of their Soldiers and mission accomplishment, in addition to causing significant harm to the environment.

In August 1999, the Center for Army Lessons Learned (CALL) published **CALL Newsletter No. 99-9, *Integrating Military Environmental Protection***. The newsletter emphasized the importance of protecting the environment. It described actual environmental situations that Army personnel have encountered and the ways in which they reacted to those situations. Many of the scenarios in the newsletter depicted Army personnel making poor decisions – resulting in either environmental or environmental-health risks. By publishing these lessons learned, CALL attempted to inform commanders of these hazards made during home base operations, training, and deployments.

Unfortunately, several issues highlighted in that newsletter continue to occur. The problems range from commanders arriving at combat training centers (CTCs) without a working spill plan to failing to conduct environmental baseline surveys to neglecting spill mitigation or reporting.

Take the time to review the lessons learned in this publication and incorporate the TTP into your operations. Contact your chain of command and environmental support staff for additional information.

Lawrence H Saul

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ENVIRONMENTAL CONSIDERATIONS DURING MILITARY OPERATIONS

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The Secretary of the Army has determined that the publication of this periodical is necessary in the transaction of the public business as required by law of the Department. Use of funds for printing this publication has been approved by Commander, U.S. Army Training and Doctrine Command, 1985, IAW AR 25-30.

Section I: Introduction

Environmental Considerations -- The spectrum of environmental media, resources, or programs that may impact on, or are affected by, the planning and execution of military operations. Factors may include, but are not limited to, environmental compliance, pollution prevention, conservation, protection of historical and cultural sites, and protection of flora and fauna.

— **JP 1-02, *Department of Defense Dictionary of Military and Associated Terms***

This newsletter does not strive to make readers environmental experts. However, it does emphasize the importance of incorporating environmental considerations throughout the military decision-making process (MDMP). Through a variety of environmental lessons learned, this newsletter provides tactics, techniques, and procedures in an effort to reduce overall environmental risk.

Section II of the newsletter deals with environmental considerations at home station. Military units integrate environmental considerations throughout their daily activities and during training because environmental laws and regulations mandate it. Environmental sustainability and good environmental practices begin in garrison. By taking care of the environment, installations maintain good neighbor relationships with local communities and continue to provide Soldiers with realistic training areas for future use. Additionally, environmental stewardship promotes force health protection.

Section III presents situations from each of the combat training centers (CTCs) and provides lessons for units to understand the environmental challenges of planning and conducting training. The integration of environmental considerations into training is very similar to the integration of safety and force protection issues. Training is key to accomplishing the mission. Understanding environmental aspects of the training mission can help mitigate the risk environmental conditions pose to Soldiers and mission success.

Section IV covers environmental considerations during operational deployments. Environmental considerations have several implications for military operations that affect all levels of war. Once units leave the home station area and begin training or mobilization operations, their focus shifts to accomplishing their combat mission and, consequently, environmental awareness tends to decrease. This decline may cost the commander much needed time, personnel, and other resources. Integrating environmental considerations early in the MDMP for both training and mobilization operations will help ensure that we continue to fight as we train.

Figure 1 depicts the relationship between the different operational phases and the level of environmental consideration most units demonstrate. Normally, consideration for environmental aspects of the mission is greatest during training as Soldiers operate from garrison or one of the CTCs. When the operating tempo (OPTEMPO) increases as units begin preparation for deployment, the emphasis on environmental considerations decreases. Conversely, as the OPTEMPO decreases during the post-employment phase, consideration for the environment rises. This trend is consistent during both low- and high-intensity conflicts (LIC and HIC). However, there is a noted difference during the employment phase of operations, as HICs are

inherently more dangerous than LICs. HICs require Soldiers to act more rapidly, shifting their emphasis from environmental considerations to force protection. A combatant commander once stated: "Environmental considerations will always be subordinate to force protection."

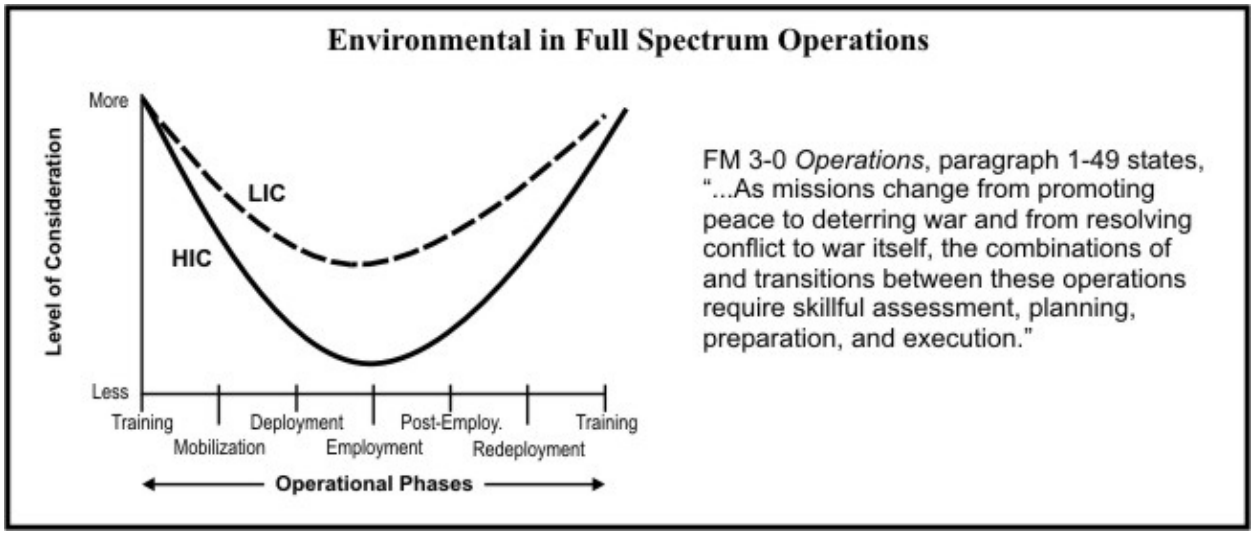

Figure 1. Levels of Environmental Consideration

This newsletters can be used as a tool to teach, coach, and mentor leaders by providing the basic knowledge necessary to conduct safe operations. As leaders establish and implement their plans, they must realize that they must not ignore the natural or physical environment in which their units operate. Leaders are encouraged to take the time to read and learn from the mistakes of others so they do not repeat them. A lesson is not truly learned unless we understand the underlying issues and apply the concepts.

Section II: Home Station Environmental Considerations

"Base operations (BASOPS) are critical to the success of the unit in its day-to-day operations and especially in support of training on, or in the proximity of, the installation. Whenever possible, leaders must actively seek and use installation expertise and assistance. Although the chain-of-command and unit staffs also provide support in an installation setting, the garrison staff is specifically designed to provide the required expertise to support units."

— **FM 3-100.4, *Environmental Considerations in Military Operations***

Military units integrate environmental considerations throughout training because environmental laws and regulations mandate it. Accordingly, failure to incorporate environmental considerations can:

- Endanger personnel health and safety.
- Affect mission accomplishment.
- Result in citations by federal and state regulating agencies.
- Result in civil and/or military penalties against individual offenders.
- Cause destruction to environmentally sensitive areas, to include cultural and historical sites.
- Damage habitats of protected and/or endangered species.

Proactive environmental stewardship involves everyone from the unit leader down to the individual Soldier. Environmental sustainability and good environmental practices begin in garrison. By taking care of the environment, installations maintain good neighbor relationships with local communities and continue to provide Soldiers with realistic training areas for future use. Additionally, environmental stewardship promotes force health protection.

Each installation has its own environmental management office that provides guidance and assistance on environmental issues. This resource is available to all leaders and is invaluable when establishing or reviewing a unit environmental program.

ISSUE:

Troop Self-Help Projects Result in State Environmental Fines (Asbestos/Lead-Based Paint)

DISCUSSION:

State environmental regulatory departments closely scrutinize demolition projects of older structures on installations. Many of these structures have asbestos-containing materials (ACM) and lead-based paint, both known health hazards. Installations are required to notify the state prior to beginning demolition or renovation projects. All ACM and lead-based paint must be removed by trained personnel. Several installations received notices of violation (NOV) for failure to comply with this requirement. The state issued NOVs to units disturbing ACM and lead-based paint during self-help projects. State regulators also issued an NOV for Soldiers discarding ACM items into trash containers.

Commanders and installation environmental offices must be proactive in promoting asbestos and lead-based paint awareness, not only to tenant units, but also those units training or conducting mobilization operations on the installation.

TECHNIQUES AND PROCEDURES:

1. Unit leaders must:

- Contact supporting environmental management offices or the Directorate of Public Works (DPW) for all self-help projects.
- Comply with installation-specific regulations and approved self-help project plans to prevent disturbing, mishandling, and/or improper disposal of ACM and lead-based paint.
- Attend asbestos and lead-based paint awareness classes conducted by the environmental office or DPW.
- Supervise Soldiers conducting self-help projects. Ensure Soldiers comply with guidance in the self-help project work plan.

2. For more information on asbestos and lead-based paint, view the Army Environmental Center website at **http://aec.army.mil/usaec/compliance-p2/toxics00.html.**

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ISSUE:

Rear Detachment Personnel Unprepared to Comply with Environmental Requirements

DISCUSSION:

Many deploying units fail to realize the importance of maintaining environmentally-trained personnel as part of their rear detachment. The rear detachment is responsible for the continued maintenance of existing facilities and hazardous material (HM) storage areas and complying with installation and state environmental requirements. Failure to maintain trained personnel increases environmental/safety risks and decreases the ability to meet regulatory requirements.

TECHNIQUES AND PROCEDURES:

1. Deploying unit commanders must ensure that stay-back personnel have the necessary training, facility access, and equipment to carry on the unit's rear detachment mission.

2. Develop an environmental standing operating procedures (SOP) that encompasses rear detachment responsibilities and procedures to include:

- Training rear detachment personnel to assume environmental-related duties.
- Ensuring the rear detachment has a trained environmental compliance officer (ECO).
- Conducting an inventory and walk-through inspections of facilities/supplies between the deploying unit commander and the rear detachment officer-in-charge (OIC). Note all environmental-related issues.
- Ensuring adequate spill kits are available for rear detachment use.
- Ensuring rear detachment personnel have access to HM lockers, connexes, or petroleum, oils, and lubricants (POL) storage bins.

ISSUE:

Hazardous Material Control Centers (HMCCs) Save Unit Resources

DISCUSSION:

Units routinely purchase hazardous materials in greater quantities than needed and then pay to dispose of the excess portions as hazardous waste (HW). The HMCC allows units to turn in their unused hazardous materials (HM), saving units the cost of disposal. Other units may require these items and can obtain them free of charge from the HMCC.

HMCCs use the Hazardous Substance Management System (HSMS) to track each hazardous product from initial unit purchase to its use or turn-in. Using this process, one brigade-sized unit saved over $13,000 in a single year. In Europe, the Army saved over $338,000 in HW disposal costs and another $58,000 in purchase costs using the HMCC.

TECHNIQUES AND PROCEDURES:

1. In-processing procedures must include information on HMCC operations and related HM/HW programs.

2. Leaders must enforce proper handling and turn-in of unused HM and proper HW disposal procedures.

3. For more information concerning HMCCs and the HSMS program, visit the United States Army Environmental Center at **http://aec.army.mil/usaec/compliance-p2/index.html.**

ISSUE:

Improper Hazardous Waste (HW) Collection, Storage, Transporting, and Disposal Cost Unit Training Dollars

DISCUSSION:

Satellite accumulation points (SAPs) are temporary storage facilities for hazardous waste. The Resource Conservation and Recovery Act (RCRA) is one of the primary laws governing SAP operations. Federal law requires all users of hazardous materials (HM) and generators of HW to track all of their HM and HW from acquisition until disposal, more commonly referred to as "cradle to grave." SAPs are established to collect limited amounts of HW generated by a unit over a short period of time and play a role in the HM/HW management process.

Difficulties occur when units establish and fail to properly manage SAPs. Mismanagement creates scrutiny by federal/state regulators, often resulting in monetary fines to the unit. Problems arise from unlabeled containers, unknown substances in containers, and cross contamination of HW products. Unknown HM/HW must be tested to determine the substances, costing the unit money. Army installations collectively paid out over two million dollars as a result of the mismanagement and improper hazardous waste disposal over the course of one fiscal year. Typically, the unit responsible for the violation pays the fine, normally out of its training budget. Additionally, cross-contamination may create an increased risk of volatile reactions, thereby endangering Soldiers' health and safety.

TECHNIQUES AND PROCEDURES:

Units must:

- Identify and train personnel on proper HW management procedures. (Installations as well as private industry offer a variety of courses relating to SAPs. Contact your installation environmental office for more information.)
- Establish satellite accumulation point standing operating procedures (SOPs).
- Ensure unit personnel receive proper training. (See your unit environmental compliance officer [ECO] for assistance.)
- Ensure SAP managers are actively supervising their areas of responsibility and enforcing proper SAP procedures and practices. (SAP managers should conduct regular spot inspections.)
- Ensure ECOs conduct formal inspections of unit SAPs.

ISSUE:

Fuel Leaks from Storage Tank Threatening Drinking Water Source

DISCUSSION:

The heating systems for barracks at various overseas installations have their fuel supply located in an above ground storage tank (AST). At one installation, the AST was located 200 meters from a creek, and a buried fuel line supplying this tank was leaking and threatened the installation drinking water supply. The AST was located in the unit's company area. However, the unit did not routinely inspect this infrastructure, believing it was the installation's responsibility.

The unit could have detected the leak by observing the stains on the ground and the smell of fuel oil. Based upon these indicators, the unit should have reported the situation to the facility engineers. Because the unit failed to report the situation in a timely manner, the facility engineers were forced to install an expensive extraction fuel/water separator to recover over 700 gallons of fuel oil.

TECHNIQUES AND PROCEDURES:

1. Commanders must conduct risk assessments for items containing hazardous materials located within their unit areas, even though the equipment is maintained by other agencies.

2. Units should include an inspection procedure in their environmental SOP for all ASTs. Appoint and train a unit environmental compliance officer to conduct weekly environmental inspections of unit areas.

3. Contact your installation's Environmental Office for more information and assistance.

ISSUE:

Antifreeze Recycling Conserves Resources and Saves Money

DISCUSSION:

Army hazardous waste minimization (HAZMIN) policy mandates that all Army installations, including Army National Guard units, must reduce the quantity and toxicity of hazardous waste generated by antifreeze products. Recycling antifreeze conserves natural resources, reduces the cost of purchasing new antifreeze, and reduces the cost and problems associated with the storage and disposal of used antifreeze. The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) tested five antifreeze-recycling units and have determined that two are acceptable for DoD use. The Coolant Purification System (CPS) manufactured by KFM (formerly BG Products, Inc.) and the BE series Engine Coolant Recyclers manufactured by Finish-Thompson Inc. (FTI) are TARDEC-certified recycling units currently in use throughout the Army.

Recycling the same antifreeze can be performed countless times. The process separates glycol from the water while changing the color and the alkali levels. As part of the final process, color must be added and the alkali levels adjusted by adding phosphoric acid or potassium hydroxide.

Organizations that generate used antifreeze that are not currently recycling antifreeze can choose between three options:

- Purchase a TARDEC-certified recycling machine and perform on-site recycling.
- Contract a TARDEC-certified recycler to perform on-site recycling.
- Send antifreeze out to a TARDEC-certified recycler.

(**NOTE:** Determining which option to choose will be based upon the amount of used antifreeze generated, the initial cost of the machine, and the operation- and maintenance-associated costs.)

TECHNIQUES AND PROCEDURES:

1. Contact TARDEC for the technical report titled ***Antifreeze Recycling Field Demonstration,*** dated March 1998, number 13749. (**NOTE:** An updated *Antifreeze Recycling Users Guide* will be published in the future. For more information concerning recycling antifreeze, contact the Directorate of Environmental Integration [DEI], U.S. Army Engineer School [USAES], atsedei@wood.army.mil.)

2. Additional TTP not contained in the technical report include the following:

- Train all personnel that add used antifreeze to the collection container to minimize potential contamination.
- Properly label all containers to ensure that used antifreeze (not yet recycled) and recycled antifreeze is separated.
- Ensure any oil contaminating the used antifreeze is not processed. (**NOTE:** Oil is naturally lighter than antifreeze and will settle at the top.)
- Ensure sediment settled at the bottom of the barrel is not processed. (**NOTE #1:** The oil and sediment-containing mixture at the bottom of the barrel may be disposed of at the used oil satellite accumulation point. **NOTE #2:** Allowing oil and sediment to enter the antifreeze recycler will clog the filters.)
- Maintain positive control of the collection site to avoid potential misuse.

Section III: Environmental Considerations During Training

"It is essential to include environmental considerations early and throughout the training cycle. The integration of environmental considerations is an easy fit that causes no functional change in battle-focused training. Like safety, it is another important consideration to apply during training planning and execution."

— **FM 3-100.4, *Environmental Considerations in Military Operations***

The integration of environmental considerations into training is very similar to the integration of safety and force protection issues. Training is the key to accomplishing the mission. Environmental considerations should meld into the planning and implementation of the training process. The discussion of battle-focused training highlights the integration of environmental consideration throughout the training cycle, as specified in **FM 7-1 (25-101), *Battle Focused Training.***

In addition to general environmental awareness training, specialized training is required based on certain duties and responsibilities. Some of this specialized environmental training and much of the awareness training can be addressed through integrated instruction or supplemental material as part of ongoing unit training programs.

While at their home stations and combat training centers (CTCs), Soldiers must learn to integrate environmental considerations into their training to:

- Effectively prepare for issues they may see in future operations and deployments.
- Preserve military training areas and ensure they can continue to receive realistic training.
- Help to preserve the training lands for future use.

This section provides lessons for units to understand the environmental challenges of planning and conducting training.

ISSUE:

Joint Readiness Training Center (JRTC) Integrated Environmental Considerations into the Tactical Scenario

DISCUSSION:

JRTC takes a proactive approach towards environmental considerations by writing scenarios with socio-economic implications rather than treating "no-dig" areas as administrative restrictions. For example, units are advised that the local population has reservations about American forces being in the area. Units are also informed that there is a power line that provides electrical power to the local town buried somewhere in the area and if severed would adversely affect their ability to accomplish the mission. To create defensive positions and avoid digging in this area, units constructed berms by hauling soil from less sensitive areas.

This JRTC scenario forces units to consider the long-term effects of their actions. Units that do not consider socio-economic and environmental impacts may affect the mission end state.

TECHNIQUES AND PROCEDURES:

Commanders must:

- Integrate environmental considerations into the mission analysis phase of the military decision-making process (MDMP). (During mission analysis, the commander and his staff conduct a risk assessment, which includes identifying all environmental-related hazards.)
- Develop innovative solutions to limit training distracters that may be the result of environmental considerations (i.e., making environmental considerations part of the tactical scenario.)
- Utilize the unit environmental compliance officer (ECO) throughout the planning process.

ISSUE:

Lack of a Spill Response Plan Increases Unit Training Costs at Combat Training Centers (CTCs)

DISCUSSION:

CTCs direct units to have a spill response plan and conduct spill training prior to their arrival. Units that fail to meet this requirement must allocate limited preparation time, which could be spent preparing for their CTC rotation. These units are less prepared to respond to spills due to their lack of training and rehearsals.

The CTCs require the unit to bear all the costs for spill cleanup and contaminated soil disposal (usually charged by the pound). Untrained spill teams increase the units' clean-up costs due to slower response times and improper clean-up procedures resulting in larger spill plumes or unnecessary excavation of non-contaminated soil.

TECHNIQUES AND PROCEDURES:

1. Unit leaders must:

- Coordinate all environmental concerns with the CTC.
- Develop a working spill plan. (For a sample Spill Response Plan, see Appendix B.)
- Train and rehearse spill response teams.

2. For additional information on spill response training products, visit the Directorate of Environmental Integration (DEI), U.S. Army Engineer School (USAES) at **http://www.wood.army.mil/dei/t_products.htm.**

ISSUE:

Environmental Clean-up Team (ECT) Spill Requirements at the National Training Center (NTC)

DISCUSSION:

The NTC requires rotating units to designate an ECT to respond to and clean up their unit's spills. ECT personnel are not participants in the exercise and are authorized uninhibited response to spills throughout the maneuver area. Rotating units often task the ECT to assist in digging fighting positions and defensive obstacles — what commanders believe are mission priorities. As a result, the observer/controllers (O/Cs) now consider the ECT as active participants in the battle and do not release them until the battle is over. This impedes the ECT from performing its primary mission — responding to spills.

The longer it takes for the ECT to respond to a spill, the greater the soil contamination, manpower requirements, and unit disposal costs. Rotating units are charged six cents a pound for the disposal of contaminated soil. The average cost for a unit's environmental cleanup is $40,000 per rotation; however, because of delayed spill response some units have paid up to $90,000. Spill cleanup and disposal can have a significant effect on the unit's training budget and the desert environment.

TECHNIQUES AND PROCEDURES:

Commanders must:

- Understand the ECT's mission and assign its priorities accordingly.
- Comply with **FORSCOM Regulation 350-50-1, *Training at the National Training Center,*** which states: *The unit ECT will have the capability to respond to spills; communicate with the Division Tactical Operations Center (DTOC), Range Control, Rotational Emergency Operations Center (EOC), and the DPW Environmental Division; and dispose of spills in compliance with NTC Regulation 200-3. The ECT will clean up all rotational spills, including clearing the Rotational Unit Field Maintenance Area (RUFMA), following regeneration. The ECT will be controlled by an OIC (recommended O3) and an NCOIC. ECT personnel will be provided training by the NTC Environmental staff upon arrival at the NTC. The ECT will be split into two teams, with one team operating from the Divisional Support Area (DSA) and one team operating from the Brigade Support Area (BSA).*
- Coordinate with the NTC Directorate of Public Works prior to deployment on additional environmental requirements: 760-380-4501 (DSN 470-4501).
- Develop spill response plans and train the ECT prior to arrival. (For a sample Spill Response Plan, see Appendix B.)

ISSUE:

Unit Poor Housekeeping Procedures Increase Safety and Environmental Risk

DISCUSSION:

U.S. forces redeploying to home station from the Combat Maneuver Training Center (CMTC), Hohenfels, Germany, process through designated hazardous waste (HW) accumulation points at the training center. Some redeploying units disregard established turn-in procedures and use the satellite accumulation points as a site for their trash as well as their HW. Units also fail to properly dispose of their HW, overfilling barrels and secondary containment devices. Poor housekeeping procedures result in an increased safety and environmental risk. Unit leaders fail to properly supervise the operation. Additionally, contractors maintaining the hazardous site refuse to clean up units' trash and hazardous waste, resulting in units sending Soldiers back to the CMTC to conduct clean-up operations.

Mixing wastes causes an increased cost of maintaining the accumulation point. Extra funds allocated for the operation and maintenance of the site results in reduced funds available for troop facility maintenance. Mixing wastes and poor housekeeping result in risks to the safety and health of the Soldiers who process through this installation.

TECHNIQUES AND PROCEDURES:

1. Leaders must:

- Know the regulations and procedures for dealing with HW. Unit leadership must supervise and enforce policies for processing through the HW accumulation point.
- Appoint and train an environmental compliance officer.
- Train Soldiers within the unit on HM/HW handling and procedures.
- Ensure the unit properly clears their operational areas prior to departing the training center.

2. CMTC personnel must:

- Monitor unit operations to ensure compliance with CMTC policies and procedures.
- Clear all units prior to departure.

ISSUE:

Maneuver Damage Angers Korean Civilians

DISCUSSION:

The convoy routes that U.S. Army units take to and from their field training exercise (FTX) locations in Korea include travel through civilian population areas. During a field training exercise, wet and muddy field conditions caused vehicles to deposit large amounts of soil on the roadways. This resulted in hazardous driving conditions, which angered the local population.

The unit's maneuver damage control plan included procedures to use water trucks to wash the mud from the roadway. However, due to freezing temperatures, the team chose not to use the water trucks. This decision was not coordinated with the local authorities, who then falsely believed the Americans were indifferent to the situation. The local populace responded by organizing roadblocks with tractors and wagons that halted the movement of Army vehicles. The incident reinforced the perception of the "ugly American."

TECHNIQUES AND PROCEDURES:

Units must:

- Include maneuver damage control in unit SOPs.
- Address maneuver damage in the operations order.
- Identify all hazards associated with each FTX task (i.e., maneuver damage as a result of convoy operations).
- Coordinate with civilian authorities on convoy movement.
- Conduct a route recon to identify hazards.
- Select alternate routes around populated areas and civilian traffic patterns.
- Clean mud from vehicles prior to re-deploying.
- Employ a maneuver control damage team with proper equipment.
- Supervise and evaluate the maneuver damage control mission.

Section IV: Environmental Considerations During Operational Deployments

"The Army faces a unique set of challenges as it adapts to a world that has changed more broadly and fundamentally than any time since the end of WW II. The Army must continue to adapt to ensure success in a rapidly changing strategic environment. Now more than ever, it serves as a strategic Army, a land force on which the United States and its allies rely to meet global challenges."

— FM 3-0, *Army Operations*

This section provides lessons learned dealing with environmental considerations during operational deployments. Environmental considerations have several implications for military operations that affect all levels of war. As commanders analyze the risks associated with an operation, they may deem environmental considerations as a higher or lower priority than other concerns (e.g., tactical considerations and force protection). When environmental considerations impact Soldier health and safety or mission end state, it will always be high on the commander's priority list.

Commanders must identify environmental considerations early and continue throughout the MDMP because deployed settings do not maintain the same infrastructure and lack the support that units find at their home station. The more procedural continuity commanders can integrate into deployment, the better. For example, commanders involved in base camp operations must ensure they take the necessary precautions and conduct an environmental baseline survey (EBS) prior to occupying the site. Their actions will help prevent many of the adverse effects the environment can have on force health protection and base camp planning.

ISSUE:

Used Oil-Fuel Blenders Reduce Unit Fuel Purchase and Waste Oil Disposal Costs (Operation Joint Guard)

DISCUSSION:

Prior to May 2002, all used oil products were transported from the Balkans to Germany for disposal, requiring a large logistical support structure. In an effort to reduce the logistics tail, the U.S. Army implemented an oil recycling process that blended used oil with fuel for use in military vehicles.

The fuel-oil blending process has completely eliminated used oil from the waste stream and resulted in fuel cost savings. The blended fuel project consisted of three blender units and extra filters costing $9,000. On average, the task force generated ten barrels of waste oil per week. The figures below illustrate that a return on investment occurred in three months.

Simplified cost avoidance using fuel-oil blenders:

$0.50 cost per gallon of disposal
$1.00 per gallon fuel value
$1.50 per gallon direct cost avoidance

One drum w/50 gallons @ $1.50 per gallon = $75
Ten drums = 500 gallons @ $1.50 per gallon = $750 per week
Cost of the drums to haul the waste = $65 per drum

Aside from the cost savings related to waste oil disposal and fuel purchases, there was an additional benefit in the reduction of manpower involved with the waste oil disposal process. Prior to the use of fuel-oil blenders, the Balkans disposal process required handling the waste oil eight separate times by several different individuals. The fuel-oil blending cycle is a one-person, three-step process conducted in the local maintenance shop.

TECHNIQUES AND PROCEDURES:

For more information concerning blended fuel usage, contact the Directorate of Environmental Integration (DEI), U.S. Army Engineer School (USAES), atsedei@wood.army.mil; or the Deputy Chief of Staff Engineer (DCSENG)/18th Eng BDE, U.S. Army Europe (USAREUR).

ISSUE:

Improper Disposal of Hazardous Waste Affects Soldier Health and Welfare (Operation Iraqi Freedom)

DISCUSSION:

U.S. forces occupying a non-forward base camp in Iraq failed to properly dispose of their hazardous waste (HW). Insecticides, used vehicle batteries, petroleum, oils, and lubricants (POL), and other HW were dumped in the same area as solid waste. Additionally, fuel and gray water trucks parked nearby and leaked their contents into the dump. The unit did not implement spill containment or clean-up procedures to prevent the hazardous fluids from potentially entering the water table. Soldiers jokingly referred to fuel spills as "replenishing the oil wells." These wastes also posed an environmental health hazard to Soldiers occupying the camp. Mixing wastes increased the likelihood of spontaneous combustion. Additionally, enemy fire hitting this area increased the risk of producing toxic and noxious vapors against which the Soldier's protective gear would be ineffective.

TECHNIQUES AND PROCEDURES:

Commanders must:

- Include environmental management practices during operational deployments.
- Apply the laws, regulations, and other guidance documents pertaining to the disposal of solid and hazardous waste (to include host nation laws).
- Establish local environmental and waste management policies and procedures.
- Utilize the deployed base camp Directorate of Public Works (DPW) or unit environmental compliance officer (ECO) to report environmental and waste management issues.
- Train personnel within the unit on HM/HW handling and procedures.
- Ensure tenant units have access to sufficient quantities of proper HW storage containers.
- Establish HW collection points and solid waste disposal procedures.

ISSUE:

Environmental Baseline Survey Prevents Soldiers' Exposure to Toxic Substances (Operation Enduring Freedom)

DISCUSSION:

U.S. and coalition forces occupied former Soviet bases during Operation Enduring Freedom, where they discovered a stockpile of leaking electrical transformers. The commander's risk assessment determined that due to their age, these transformers potentially contained polychlorinated biphenyls (PCBs), a known carcinogen. Subsequently, commanders determined that the risk to Soldiers, cost of cleanup, and the value of the real estate parcel to mission needs did not warrant immediate removal of the transformers. However, as a risk mitigation procedure, the site was effectively marked and posted as a hazardous area and recorded on the environmental baseline survey (EBS) document.

This unit employed proper risk assessment procedures, as learned through training scenarios, during its real-world mission. The commander protected his Soldiers from an environmental hazard and helped safeguard their health, well-being, and the mission by taking the necessary precautions.

TECHNIQUES AND PROCEDURES:

To help safeguard the health and well-being of their Soldiers, leaders must:

- Ensure completion of an EBS prior to occupying base camps or existing facilities. Appendix B, **FM 3-100.4, *Environmental Considerations in Military Operations,*** contains information on conducting an EBS and initial site survey.
- Conduct a risk assessment to include environmental-related risks prior to and during operations. Chapter 2, FM 3-100.4, contains further information on conducting an environmental risk assessment.

ISSUE:

Soldiers Attempt Improper Waste Disposal (Operation Enduring Freedom)

DISCUSSION:

Soldiers selected a building for occupation and discovered several drums containing unidentified liquids. The Soldiers did not know to report this find, nor did they request assistance from their command to have the barrels tested to determine if their contents were hazardous. Instead, the Soldiers used a bucket loader to dig a large hole and bury the drums. Upon observing their actions, a member of their higher headquarters stopped the Soldiers and informed them of the proper disposal procedures.

These Soldiers did not take environmental considerations or consequences into account – failing to realize the environmental and health impacts of their actions. If any of the buried drums had developed a leak, it would only be a matter of time before both the soil and ground water became contaminated, having an adverse effect on Soldier and civilian population health and safety.

TECHNIQUES AND PROCEDURES:

1. Unit commanders must incorporate environmental awareness into deployment briefings. The briefing should include information from **Training Circular (TC) 3-34.489,** ***The Soldier and the Environment,*** which contains basic environmental awareness, and the following Soldier environmental responsibilities:

- Comply with environmental policies, operations orders (OPORDs), unit standing operating procedures (SOPs), Army regulations (ARs), and environmental laws and guidelines.
- Prevent environmental damage and pollution by making sound decisions that will not harm the environment.
- Advise the chain of command when unit actions do not comply with environmental guidelines.
- Support the Army recycling program.
- Report hazardous material (HM) and hazardous waste (HW) spills immediately.
- Make sound environmental decisions in the absence of a supervisor or proper guidance.

2. Each unit must develop an SOP/field SOP (FSOP) that addresses environmental issues such as HM/HW. For more information concerning integrating environmental concerns into a unit SOP, see Appendix B, **FM 3-100.4,** ***Environmental Considerations in Military Operations.***

ISSUE:

Soldiers Develop Respiratory Illness after Occupying Former Soviet Structure (Operation Enduring Freedom)

DISCUSSION:

During Operation Enduring Freedom, a U.S. military unit occupied a former Soviet-hardened aircraft hanger. The hanger was almost fully enclosed and provided limited ventilation. The unit constructed a two-story wooden structure inside the hanger, with the top floor used as the living area and the bottom floor as the office space. The unit heated the structure with electric space heaters.

Within a few weeks, most of the Soldiers living and working in this structure developed short-term respiratory illnesses. An investigation revealed that use of space heaters caused the aircraft oil, lubricants, and cleaning substances embedded in the joints and cracks of the concrete hanger to vaporize and form noxious vapors. The structure's poor ventilation caused the vapors to accumulate. The Soldiers were subject to these harmful vapors on a daily basis – ultimately leading to their respiratory illnesses.

This situation could have been prevented by performing an initial environmental baseline survey (EBS). An EBS serves as a tool to assist commanders and camp planners in designating which facility or parcel of land is acceptable for military use. An EBS is typically performed by or with support from installations, corps, divisions, or higher HQs. However, individual units must be prepared to perform an initial EBS.

The EBS documents a proposed site's existing environmental conditions and the likelihood of past or ongoing activities that pose environmental, safety, or health risks. These risks could include air, soil, ground water, and surface water contamination by harmful substances to include petroleum, oils, and lubricants (POLs).

TECHNIQUES AND PROCEDURES:

1. Commanders must ensure that an initial EBS is conducted prior to occupying any structure or base camp. Soldier health, safety, and environmental impacts must be considered when surveying a proposed site.

2. For more information on conducting an EBS, see Appendix B, **FM 3-100.4, *Environmental Considerations in Military Operations.***

3. Include environmental-related issues in the unit's risk management plan. See Appendix G, **FM 3-100.4, *Environmental Considerations in Military Operations.***

(**NOTE:** Units should use structures for only their original intended purpose to avoid situations such as the one above.)

ISSUE:

Unreported Fuel Spill Affects Base Camp Expansion (Operation Iraqi Freedom)

DISCUSSION:

A 300-gallon fuel tanker overturned at a U.S. forces base camp. A supervisor coordinated for a unit to clean up the spill site and haul the contaminated soil to a temporary storage location. Due to mission priorities, a senior supervisor countermanded the clean-up. The spill was never officially reported, and the site was not properly marked.

Base camp planners were not aware of the spill and planned to construct troop sleeping areas over the spill site. As the first tents went up, the original supervisor notified base camp officials, leaving the camp planners with two options: remediate the site or re-site the troop sleeping areas. Either option would cost the unit additional time and resources.

During the time of inaction, the size of the plume increased and required a more costly remediation effort. Furthermore, Soldiers unaware of the spill might have used dirt from the spill site to fill sandbags and HESCO bastions placed around their living facilities. In addition to safety and remediation cost concerns, a spill of this magnitude could seep into the ground and contaminate the local water supply. This can have long-term effects on friendly forces and civilian populations.

TECHNIQUES AND PROCEDURES:

1. Ensure all Soldiers are trained to comply with spill response procedures as outlined in **GTA 05-08-17, *The Environment and Deployment, Tactical Risks and Spill Procedures*** (**http://www.adtdl.army.mil/cgi-bin/atdl.dll/ gta/05-08-017/ 0508017_top.htm**).

2. Incorporate all spill procedures into unit SOPs. An example of a unit environmental SOP can be found in Appendix C, **FM 3-100.4, *Environmental Considerations in Military Operations.***

3. Ensure the unit has proper equipment on site to respond to spills.

4. Report all spills using the electronic spill report message format found in **FM 101-5-2, *U.S. Army Reports and Message Formats.***

5. Mark the site in such a manner that units moving through the area are aware of the spill and avoid the site.

ISSUE:

Hardpan Soil Disturbance Creates Safety and Health Issues for Soldiers (Operation Iraqi Freedom)

DISCUSSION:

During Operation Iraqi Freedom, units using heavy construction equipment leveled large desert tracts to construct troop bed-down facilities and motor parks. In doing so, they removed the top layer of hardpan soil that acts as a crust and minimizes sand movement. Consequently, the movement of construction and military vehicles created large volumes of airborne sand and dust particles.

The heavy volumes of sand and dust created limited visibility, Soldier breathing problems, and vehicle maintenance issues. Considering the terrain during mission analysis would have identified these issues and allowed the command to implement controls to mitigate the risk or redesign the base camp plan.

TECHNIQUES AND PROCEDURES:

1. Conduct a risk assessment to identify all hazards associated with the mission during the mission analysis step of the military decision-making process (MDMP). This risk assessment includes all safety, property, and environmental-related hazards.

2. Ensure that commanders and staff understand the associated environmental hazards in order to quantify risks, detect problem areas, and prevent any harmful consequences.

3. To mitigate the overall risk, the unit could have employed one or more of the following controls:

- Spray water on the disturbed area.
- Apply a chemical dust suppressant on the disturbed area.
- Erect physical barriers (e.g., fences, berms).
- Phase the construction to limit the amount of disturbed area.
- Limit construction during high winds.
- Locate new construction downwind of existing facilities.

4. For more information on conducting an environmental-related risk assessment, see Chapter 2, **FM 3-100.4,** ***Environmental Considerations in Military Operations;*** and **GTA 5-8-2,** ***Environmental Risk Assessment.***

(**NOTE:** United States Army Corps of Engineers Water Experiment Station Vicksburg is currently working dust suppression initiatives. For more information contact USAES Directorate of Environmental Integration at atsedei@wood.army.mil.)

ISSUE:

Lack of Contract Oversight Results in Improper Dumping of Hazardous Waste (GWOT)

DISCUSSION:

During operations in support of the war on terrorism, the United States hired a local national contractor to haul waste oil from U.S. forces' positions. The contractor dumped the oil in a local landfill and sold the barrels. Lack of direct oversight of the contractor resulted in a claim by the host nation for clean-up compensation of $1.25M.

The U.S. Government should have hired a reputable contractor to dispose of the waste oil IAW applicable disposal standards, usually host nation or U.S. standards. Contracting representatives and contracting officers in theater must ensure contractors are supervised for compliance of the contract terms.

Units must remain aware of contractor personnel working in their area. If they see contractors performing illegal, improper, or unethical actions, they should inform their command and the local contracting agency.

TECHNIQUES AND PROCEDURES:

1. The contracting officer should include the proper procedures for waste removal into the contract statement of work.

2. The contracting officer's representatives, occasionally the unit receiving the services, must ensure proper execution of the contract statement of work.

3. Unit leaders must remain cognizant of contractors working in their area and report all incidents that create potential safety, health, or environmental risk.

ISSUE:

Field Expedient Satellite Accumulation Points (SAPs) Pose Environmental and Safety Risks (Operation Iraqi Freedom)

DISCUSSION:

The Defense Reutilization Marketing Service Forward Support Team Europe established two main hazardous waste (HW) accumulation points and nine feeder sites in Iraq for storing large volumes of waste oil generated in-country. Mission, enemy, time, terrain, troops, civilians (METT-TC) dictated that the inherent risks of convoy operations in the hostile environment was high, requiring commanders to reduce the frequency of HW convoys or discontinue transport altogether. Commanders were forced to set up their own HW accumulation points inside their base camps.

Problems associated with these areas include:

- HWs were not segregated.
- No secondary containment was used.
- Leaders did not provide proper supervision on the sites.
- Sites were situated too close to camp perimeters, creating a force protection issue: sites were a potential target for hand grenades and improvised explosive devices (IEDs).

These actions put the health and safety of Soldiers at risk.

(**NOTE:** Soldiers' protective equipment will not prevent death or injury caused by toxic fumes and vapors emitting from mixtures of HW or from HW fires.)

TECHNIQUES AND PROCEDURES:

1. Commanders must ensure personnel are trained in handling hazardous materials (HM) and HW prior to setting up a base camp hazardous waste accumulation point.

2. Leaders must familiarize themselves with the combatant commander's requirements for managing HW in theater and ensure the requirements are followed.

3. Trained personnel and leaders need to supervise site operations and their Soldiers to ensure proper handling and management of HW.

4. Units must consider the following when setting up their HW accumulation point:

- Identify the custodian for the HW accumulation point.
- Identify the types of HW materials present.
- Specify the authorized amounts of HW collected.
- Segregate the HW.
- Locate the HW accumulation point a safe distance from troop bedding/duty areas and perimeters (a minimum of 50 feet).
- Provide an adequate amount of storage and proper collection containers on hand.
- Provide electrical grounding for containers.
- Label the containers.
- Have material safety data sheets (MSDS) on hand for each item.
- Set up an emergency wash/decon site.
- Plan for adequate secondary containment.
- Plan for spills and have appropriate personal protection equipment (PPE) and spill kits readily available.
- Secure the hazardous accumulation site by fencing the area. (**NOTE:** The fence is the perimeter around the accumulation point and *not* the base camp perimeter.)
- Supervise all activities within the hazardous waste accumulation point.

See Appendix A for an example of how to set up a field expedient hazardous waste accumulation point.

ISSUE:

Aerial Bombardment of Industrial Complex Releases Toxic Cloud (Gulf War)

DISCUSSION:

During the first Gulf War, a U.S. unit came under fire from an Iraqi mechanized unit that took up a defensive position in a refinery/processing plant. The U.S. unit responded with artillery fire. The 155mm rounds hit and silenced the Iraqi unit; however, the resulting collateral damage caused the unintentional release of a toxic cloud of hydrochloric and sulfuric acids.

The cloud blew over a herd of camels and other livestock, causing their deaths. A post-operations investigation determined that the consequences would have been disastrous if friendly forces or non-combatants were downwind of the refinery. While chemical protective gear will protect soldiers from biological and chemical agents, they offer no protection against many toxic industrial chemicals (TICs)/toxic industrial materials (TIMs).

Depending on the type and quantity of TICs/TIMs, a deliberate release could present either a short- or long-term hazard at the release site and for those within the downwind chemical plume. They would disperse similarly as chemical warfare agents. The vapors tend to remain concentrated downwind from a release point and in natural low-lying areas such as valleys, ravines, or manmade underground structures.

TECHNIQUES AND PROCEDURES:

1. The commander and staff must conduct an intelligence preparation of the battlefield (IPB) during the mission analysis phase of the military decision-making process (MDMP). (The IPB defines the battlefield environment and considers all risks.)

2. Fire support officers must address the hazards associated with TICs/TIMs during their targeting procedures.

3. Units must address the hazards associated with TICs/TIMs in unit SOPs and operations orders.

Section V: Summary

The preceding lessons learned provide a glimpse into environmental challenges units have faced during home station operations, training, and recent operational deployments. Heeding these lessons learned can positively impact units in their daily operations by protecting Soldiers' health and the environment. Developing and implementing a plan to address environmental considerations during operations saves time, money, and resources. They can also impact the mission during operations.

It is essential to include environmental considerations early and throughout the planning cycle. The integration of environmental considerations is an easy fit and causes no functional change in the MDMP. Like safety, it is another consideration to apply during this process.

Unit leaders use risk assessment to estimate the impact of their unit activities on the natural environment and to identify environment-related safety issues for their Soldiers. Environment-related risk is part of the risk management process as detailed in **FM 100-14, *Risk Management.*** Knowledge of environmental factors is key to planning and decision-making.

Unit leaders should complete risk assessments before conducting training, operations, or logistical activities. Risk assessments assist leaders and their staffs in identifying potential environmental hazards, developing controls, making risk decisions, implementing those controls, and ensuring proper supervision and evaluation. Unit staffs consolidate environmental risks, as well as all other risk, into the overall unit risk management plan for an operation.

Section VI: References

CALL Newsletter No. 99-9, *Integrating Military Environmental Protection,* Aug 1999

Environmental Law for Department of Defense Installations Overseas, Fourth edition, May 1998

Environmental Performance Assessment System, Information and Environmental Reporting Division, U.S. Army Environmental Center, Aberdeen Proving Grounds, Maryland

FM3-100.4/MCRP 4-11B, *Environmental Considerations in Military Operations,* 11 May 2001

FORSCOM Reg 350-50-1, *Training at the National Training Center,* 1 July 2002

JP 4-04, *Joint Doctrine for Civil Engineering Support,* 26 September 1995

Overseas Environmental Baseline Guidance Document, May 2000

Other information gathered via ARCENT visits and lessons learned field surveys to various worldwide locations

Appendix A

Field Expedient Hazardous Waste Accumulation Point

Place site above ground 50 feet or more from any occupied structure.

STEP 1: Build Secondary Containment

1. Measure out area and dig shallow pit using dirt to fill sandbags for the berm (see Figure 1).
2. Allow room for forklift operation to remove/replace pallets/HW.
3. Line pit with rubberized tarp. Tarp will be held in place at the berm using sandbags.

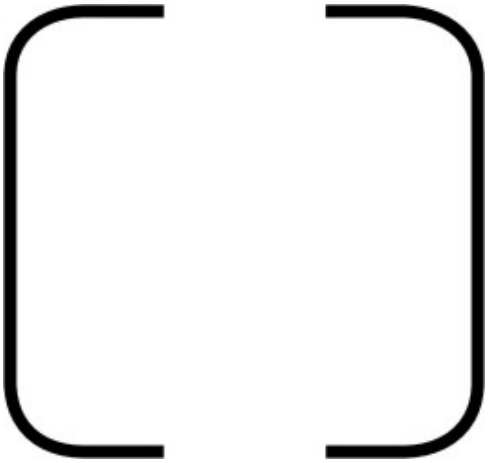

Figure 1

STEP 2: Set-up Segregated Areas

1. Determine segregated areas to collect HW (see Figure 2).

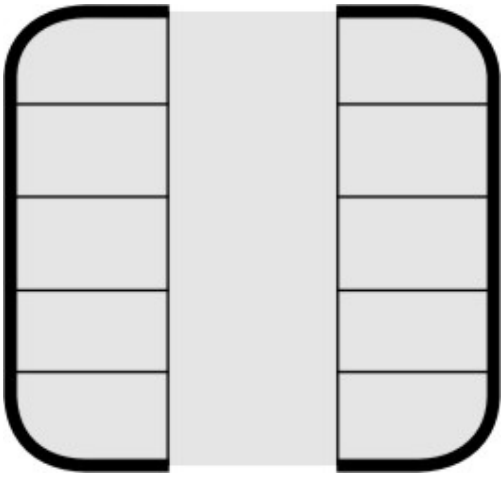

Figure 2

2. Place a set number of pallets needed for each segregated area (see Figure 3).

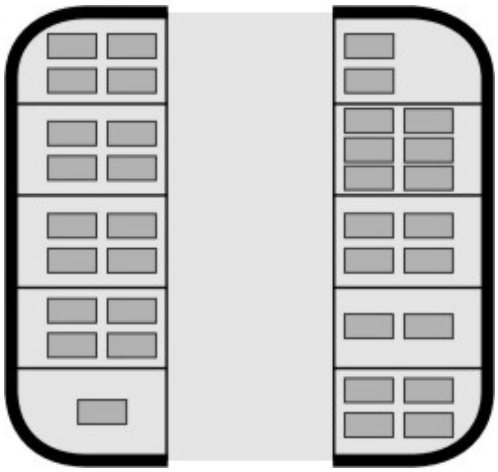

Figure 3

3. Place correct type and number of containers for type of HW on pallets (see Figure 4).

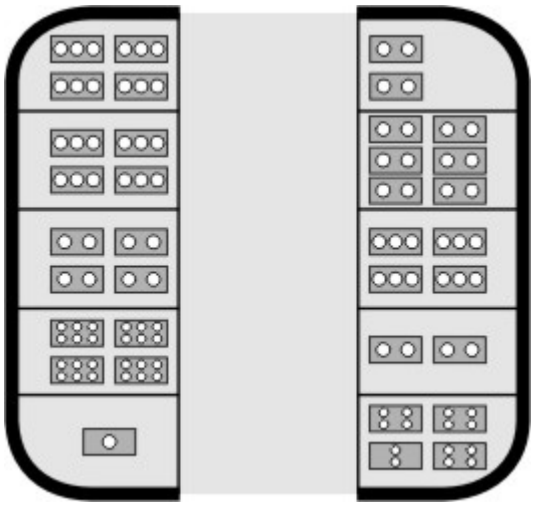

Figure 4

STEP 3: Labeling

1. Label each segregated area and container.
2. Erect signs at entrance to accumulation point.

Appendix B

Spill Response Plan

1. **Immediate Action.** A spill is defined as any quantity of petroleum product over five gallons (or according to local laws since some states are more stringent than five gallons) or any quantity of any other HW. Should a spill occur, immediate actions are as follows:

a. **Protect yourself and other personnel.**

(1) Evacuate area, if necessary, due to type of spill.

(2) Take personal precautions as detailed on MSDS for material spilled.

(3) Use proper PPE.

(4) Extinguish smoking materials and all sources of ignition.

(5) Turn off power if there is the possibility of fire.

(6) Ventilate area.

b. **Stop the flow** (do it **safely**).

(1) Shut off valves, turn drums upright, and other procedures that will stop the flow, if possible.

(2) Do not take unnecessary chances, but stop the flow if it is possible without injury or contamination.

(3) Shower and change clothes as soon as possible if HW contamination occurs.

c. **Contain the spill** (**quickly** and **safely**).

(1) Contain spill by throwing absorbent, floor sweep, or dirt on it.

(2) Make dams to keep spill from spreading further; do not let spill enter storm or sewer drains or other waterways.

(3) Divert the flow to prevent spill from entering any water source, including drains, if containment is not possible.

d. **Report the spill immediately.**

(1) Report spill to supervisor/superior.

(2) Sound alarm or give verbal warning.

(3) Have another person call the installation's fire department while you continue to assess size and severity of spill.

(4) Immediately report to unit ECO or installation's environmental office spills of any HM other than a petroleum product, regardless of quantity.

(5) Senior person in charge makes a copy of pertinent MSDS for emergency response personnel in the event of a reportable spill.

e. **Clean up the spill.**

(1) Scoop up contaminated material and put in a container. Mark container with "Hazardous Waste, Contaminated Absorbent (Dirt)" if spill occurred on concrete or asphalt and spill was cleaned up with absorbent or dirt.

(2) Check with unit supply sergeant or DRMO for proper disposal.

f. **Replace spill equipment.**

(1) Immediately after a spill is cleaned up, spill response team's noncommissioned officer in charge (NCOIC) will account for all tools and supplies. The NCOIC will order replacement consumables (sweeping compound and rags) from unit supply. He will also identify missing property and initiate appropriate action (statement of charges or report of survey) to maintain accountability.

(2) Spill response team's NCOIC will ensure that spill kit inventories are complete before resealing drums.

g. **Maintain POC list for assistance** (listed by office, name, telephone number, and building).

(1) Fire department.

(2) Installation EMO.

(3) Unit ECO.

2. **Response and Clean-Up Instructions.**

a. **Take immediate actions in paragraph 1 above.**

b. **Ensure that any PPE specified in MSDS is properly used.**

c. **Transfer fluid to a serviceable container if container is still leaking fluid.**

d. **Absorb remaining spilled liquid with absorbent material.** Use only amount necessary to absorb spill. If spill is too large, take remedial action while waiting for fire department.

e. **Clean up material with a non-sparking shovel or broom, and place residue in a serviceable container with a secure lid.**

f. **Label container.**

(1) Label container -- "**POL SPILL RESIDUE**" -- for fuel, oil, or hydraulic fluid spills.

(2) Label container -- "**(Name of Chemical) SPILL RESIDUE-FLAMMABLE**" -- for flammable liquid spills (including solvents, paints, paint thinners, and alcohol).

(3) Label container -- "**(Name of Acid) SPILL RESIDUE - ACID**" -- for acid spills.

g. **Store container in HW storage area while awaiting turn-in.**

h. **Turn in residue container to DRMO.**

Appendix C

Hazardous Material/Hazardous Waste Supplies

Containers (DOT or equivalent)

NSN	ITEM
8105-00-848-9631	Bag, polyolefin, 5 millimeters, 36 x 54 inch
8125-00-174-0852	Bottle, plastic, 1 gallon (polyethylene)
8125-00-731-6016	13 gallon
8125-00-888-7069	5 gallon
8110-00-254-5719	Drum, steel, 1 gallon*
8100-00-128-6819	1-gallon steel drum (17C)*
8110-00-254-5722	4-gallon steel drum*
8110-00-282-2520	5-gallon steel drum (17C)*
8110-00-254-5713	Drum, steel, 6 gallon (w/ring)*
8110-01-204-8967	Pail, shipping, steel, 5 gallon (DOT 17C)*
8110-00-519-5618	Drum, steel, 10 gallon (DOT 17C)*
8110-00-753-4643	19-gallon steel drum (17C)*
8110-00-366-6809	30-gallon steel drum (17C)*
8110-00-030-7779	30-gallon steel drum*
8110-00-030-7780	50-gallon steel drum (17C)*
8110-00-823-8121	55-gallon steel drum (17M)*
8110-00-030-9783	Drum, steel 55 gallon (bung & vent) (DOT 17E)*
8110-01-282-7615	Drum, polyethylene, 55 gallon*
8110-01-101-4055	85-gallon steel disposal drum (no lining)*
8110-01-101-4056	85-gallon steel recovery drum (epoxy phenolic lining)*
8110-01-101-4055	Drum, hazardous material*

* Refers to open top containers

For bung container, refer to federal logistics (FEDLOG) or contact the G-4.

Absorbent

NSN	ITEM
7930-00-269-1272	Clay, ground unit of issue (UI-bag)
1939-01-154-7001	Nonskid absorbent (UI-40 bag skid)
5640-00-801-4176	Insulation, thermal, vermiculite (UI-bag) (packing material)
4235-01-423-1466	4 each 1 cubic foot bag
4235-01-423-0711	1 each 1 cubic foot bag
4235-01-423-1463	30 each 18 x 18 inch pillows
4235-01-423-1467	20 each 2 inch x 10 foot sock
4235-01-423-1465	10 each 4 inch x 8 foot booms
4235-01-423-2787	10 inch x 10 foot booms

Spill Prevention

NSN	ITEM
8135-00-579-6491	Plastic sheet, clear
8135-00-579-6492	Plastic sheet, clear
4235-01-423-7214	Spill kit
4235-01-423-7221	Spill kit

Center for Army Lessons Learned

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