R6 Response to Explo Open Burn/Open Detonation Comments
September 22, 2014

Comments on Feb 13, 2014 Draft 7003 Order for Camp Minden, LA

Comments on the Work Plan requirement to include on-site open burning/open detonation (OB/OD), para 73:

Para 73 says "The M6 Propellant Work Plan shall include an on-site open burning/open detonation remedy."

Because alternatives to open burning are available, we should not require, or even encourage, OB in this case. The RCRA and Superfund experiences, and DOD research, show that open burning/open detonation (OB/OD) is a relatively uncontrolled, dirty, polluting technology that should therefore be reserved for situations when there are no practical alternatives or for time-critical explosives safety emergencies, and with the understanding that there will be an extensive and costly clean-up/remedial action needed at closure, which is especially true in this case when considering the volume to be treated at Camp Minden and the presence of DNT. If, on the other hand, there is a known category D M6 propellant (i.e., a time-critical situation) and the alternatives are not yet as readily available, open burning may make sense.

RESPONSE:

Following the explosion at Camp Minden in October 2012, the discovery of the illegally and dangerously stored explosives was made in November 2012. At that time, EPA Region 6 began researching and identifying technologies and equipment to address the situation. The 16 months that have passed since then due to administrative and enforcement activities have resulted in limiting the options and made time an increasingly important factor. Even now, if the action was approved immediately, crews would have a difficult time completing the removal action (by OBOD or any means) in the remaining time before the M6 stability starts to fail. Feed rates and production rates for other technologies cannot meet the time constraint IF the equipment was even available.

EPA Region 6 and ORD met with several companies with "alternative technologies" for burning the M6 in a rotary kiln, turning the M6 into fertilizer, or neutralizing the explosive components of the M6. The technologies were not pursued due to the exponential increase in cost and time required to perform the removal, the production of ash, residue or liquids (potentially wastes) that still require disposal, and the unavailability of the technology at this time. Rotary kiln technology either cannot accommodate the required process rate to meet the schedule dictated by safety (15 M lbs. of M6 in less than 12 months), the equipment is not available (needs to be built or DoD/Army denied availability), and poses significant safety risks for M6 propellant burning requiring Quantitive Distance/Minimum Safe Distance that is unavailable at Camp Minden.

M6 is a smokeless powder. The combustion products are vapors; H_20, CO_2, CO, N_2 with traces of NO_x and H_2. Much of the concern about OBOD is from material that will result in residue contaminates. Such explosives as fireworks contain a considerable amount of heavy metals for effect and color. Black powder is known for its abundant smoke plumes and up to 55% solid residuals.

The connotation of OBOD is not quite the appropriate description for the destruction by burning method. Recent depictions in presentations and discussion portray the process as simply spreading the explosive onto the barren ground and blowing it up. In fact, no contact with soil will be made

other than potential spills. The method that EPA has selected utilizes burn trays that are raised above the ground. The burn trays will be placed on impermeable materials, loaded with minimal depth of M6 to prevent a load that would result in detonation, and are designed to restrict/eliminate "pop outs" of the M6 pellets while burning. The destruction process is a burn or deflagration and not an explosion. The ash will be contained within the burn trays and will be collected and disposed of in a separate waste stream. Any "clean up" post burn would be minimal to nonexistent due to engineering controls throughout the process.

The other waste streams are expected to be the ash residue, the pad material, and the trays. The Administrative Order on Consent requires representative sampling and profiling for disposal. The analytes for the sampling are to include the combustion products and partial combustion products. The analytes consider those included in an EPA study and an Environment Canada study on the M6 propellant. The EPA study included the burning of the dunnage bags that have been eliminated from the Explo stockpile. Soil sampling will include those analytes as well. Air sampling will include the gaseous components as well.

EPA's log-standing position under RCRA and the CAA is that OB/OD is appropriate for the demilitarization of explosives wastes only in situations where there are no alternatives. OB/OD is not necessarily cheaper and more expedient than other options, and will result in an environmental mess that someone will need to clean up. Although cheaper initially, the full life cycle costs and environmental consequences of open burning can be significant.
Alternatives do exist (I previously provided a list to Region 6). Probably the most attractive in terms of mobilization, through-put, and environmental protection is transportable rotary kiln incineration (mobile treatment units). Hundreds of thousands of tons of explosives-contaminated soils have been treated by this method, including DNT-contaminated soils at multiple Army Ammunition Plants (AAPs) and Depots. Further, the Army currently treats excess propellants at AAPs with Explosive Waste Incinerators at about 8 or 9 facilities. These facilities have high throughput (tons/hr treatment rates), with controlled feed rates, temperature, and residence times. If more through-put is needed, multiple units can be deployed.

RESPONSE:

While there are technologies that exist and there is some equipment, it is not available to be used at Camp Minden. The kilns at Army depots exist for long term use, making the investment into a treatment system feasible. At Army depots, the Army has complete control of the property, constant security, no travel costs, and the large investment of the treatment units can be distributed over many years. The Army also has a great advantage of an actual and credible stability monitoring program that allows several years in advance to schedule the destruction of M6 propellant. Many of the Army's on-depot disposal systems are in the pilot stage. One reason that the Army contracted with Explo Systems for disposal of the M6 is that the volume of M6 exceeded the capacity of the Army's disposal systems.

EPA has no evidence that rotary kilns are available for use at Camp Minden and the statement "that multiple units can be deployed" is not valid. EPA and EPA's clean up contractors searched for availability of equipment as well as technologies. The Army has denied the use of any existing kilns at Camp Minden for M6 burning, the money required to invest in building an onsite kiln, and the time required to build the kiln is unavailable considering the immediate need of this removal action and the volume of the material. Burning M6 propellant by rotary kiln cannot meet required disposal rate to

meet the schedule dictated by safety (15 M lbs. of M6 in less than 12 months). Multiple kilns would be necessary, requiring large Quantitative Distance/minimum safe distance exclusion zones not available at Camp Minden due to existing operations and infrastructure.

A number of other technologies exist…many of which the Army (and Navy) have previously tested and proven (thermal treatment without flame, chemical treatment, conversion to fertilizer, reuse, etc.) Perhaps a combination of a number of these could/should be used/demonstrated to achieve the desired through-put. [See, for example: "Alternatives to Open Burning/Open Detonation of Energetic Materials: A Summary of Current Technologies," US Army Corps of Engineers, August 1998; "Development of US-ROK Joint Munitions Demilitarization Facility Concept and Demilitarization of Propellants," US Army Joint Munitions Command, Defense Ammunition Center, 10 May 2007.]

RESPONSE:

Due to the urgency of eliminating the risk of the 15 million pounds of M6 in less than 12 months, disposal treatment and reuse options are limited. However, Region 6 investigated several options prior to selecting destruction by burning. Below is a summary of our investigations into these other options.

Region 6 Superfund briefed Regional Senior Management in February 2013 and January 2014 on the alternate technologies evaluated by Superfund and ORD. Management's decision was to pursue destruction by burning with careful and thorough consideration and evaluations of multiple factors (safety, time required, cost, overall efficiency, legitimacy, and proven technology). Due to the time constraints at the site (15M lbs. of M6 in less than 12 months), additional evaluation of other technologies is not prudent. While other technologies are proven, there are no commercial facilities available at this time; or the time to build, test, and permit such facilities is prohibitive due to safety, schedule, and cost constraints.

One technology that EPA R6 Superfund and ORD evaluated involved breaking M6 down into a high nitrogen fertilizer (the Actodemil process). The Army has a pilot plant of this technology in operation. The through put of that pilot plant translates to more than 34 years to complete the Actomil process on 15 M pounds of M6. That deployment at McAlester of the pilot was a $6,000,000 investment to build the pilot system, in addition to the operational costs. To scale up and build a facility to meet the time restrains would require orders of magnitude higher funds than that to conduct the open burning. The process would produce high nitrogen fertilizers that encourage rapid plant growth. Contrary to the claim by Actodemil, the use of the fertilizer on roadsides and medians is not a welcome thing by highway departments. They don't want accelerated growth on areas that they have to bush hog and maintain. The end results of the process for EPA is the storage, use, or disposal of 7,000,000 gallons of nitrogen rich liquid waste.

A modified rotary kiln option was presented to the LA National Guard and witnessed by EPA. The presenter is in the asphalt business (Madden Contracting) and uses rotary kilns used to make asphalt. Madden claims they have the capability to use the rotary kilns, while partnering with another firm, to destroy the M6. However, he does not currently have a rotary kiln for that use and has not conducted M6 disposal by rotary kiln. Madden has no permits to operate in Louisiana, no test results on the performance, and lacks the understanding of the control of the M6 feed into the kiln to control rapid gas production/detonation or destruction of the kiln by excessive heat production. Madden's disposal rate is considerably longer than OBOD even though the thermodynamic aspects of the process (listed

above) are ignored. Kiln or open burning results in the same combustion products, although open burning can produce more NOx, etc. as incomplete combustion products.

The option to include M6 in Asphalt is not practical and would result in increasing the decay of the asphalt due to the decomposition products of the M6.

Remanufacture of M6 into small arms ammunition has several hurdles. One is the unattractive rate of burn of the M6. It is slow compared to most military propellants and too slow to be of commercial use in small arms. Currently, the configuration of the M6 propellant at Camp Minden is small rods, about the diameter of a pencil about an inch long. Small arms propellants are shaped in discs and even smaller rods. While the chemical composition is important, the performance of the propellant is also a function of size, shape and homogeneity of the powder. It would be extremely expensive to build the facility to re-mill the M6 into a useful product for small arms. The resulting ammunition would be less effective than anything on the market.

Natural attenuation of the M6 is an option that involves spreading it out at a depth that would not cause it to explode, i.e. no confinement or compression. It could result in fires, would require exceptionally large areas of uninhabited/unused land, would require an undetermined period of time to degrade, and is not feasible.

Supercritical Water Oxidation (SCWO) is an enticing technology that applies to the destruction of the propellants. The Explo facility was participating in a pilot of a SCWO system. It uses water at above its critical point of about 705° F and 3206 PSIA. At that point, water becomes a very powerful oxidizer. The result is "waterburning", or thermal destruction. Unfortunately, there are no commercially available units at this time.

Note: **para 8** under "Findings of Fact" admits that "Burning and demolition activities were also performed to destroy explosives and explosive wastes…. The above activities resulted in soil and groundwater contamination. EPA placed LAAP on the National Priorities List in March 1989." Does EPA really want to continue those open burning activities that lead to the NPL listing, and significantly add to the contamination already there (or replace the contaminants already remediated)?

RESPONSE:

The LAAP was placed on the NPL because of groundwater contamination by the handling of TNT and red water wastes. The burning was not of M6 or any other smokeless powder. Red water was stored in ponds at several locations around LAAP. The groundwater at LAAP is still contaminated. As part of the remedy, institutional controls were implemented. One of the controls is the restriction that only other explosives companies are allowed to operate in certain areas. Because the ground is still contaminated or has unexploded ordinance, the institutional controls limits those companies that are familiar with those conditions to operate at the Site. The handling of red water wastes that lead to the ground water contamination is not the same material, not the some chemistry, not the same process, and not the same receptors.

Camp Minden has a designated and permitted burn area for the onsite disposal of the energetic material. LMD has coordinated with LDEQ on permitting for onsite burns. Pre-burn and post-burn sampling of the soil and assessment of the air during burning activities will be conducted for any potential contaminants present in the materials to be disposed of through onsite burning.

Comments on the OB/OD Work Plan, para 74:
Para 74. k. Given the extensive contamination that is expected from open burning, this subparagraph addressing closure requirements needs to be more specific, e.g., "the respondent shall include in the closure plan the need for taking discrete soil and ground water (and if present, surface water) samples to identify the contaminants of concern, their concentrations, and the geographical extent of contamination. The list of contaminants to be monitored must include DNT (dinitrotoluene)…M6 has 100,000 ppm DNT…and dioxin (a common contaminant at OB/OD sites). 2,4-Dinitrotoluene is a 40 CFR 261.24 Toxicity Characteristic contaminant, with a regulatory level of 0.13 mg/L (this was the quantitation limit at the time this regulation was issued, which was greater than the calculated regulatory level, so therefore the quantitation limit became the regulatory level). DNT has a NIOSH and OSHA time-weighted average (TWA) exposure limit of 1.5 mg/m3 [skin].
Question: If EPA issues an order that requires the use of a known polluting technology (open burning) that results in the need for remediation, doesn't this ultimately reflect back on EPA?

RESPONSE:

Where is the dioxin? How could dioxin be formed? There is no chlorine in the mix. M6 does not contain any chlorine.

M6 is a smokeless powder. It does contain DNT. However, the combustion products are vapors; H_20, CO_2, CO, N_2 with traces of NO_x and H_2. The presence of dioxin at other sites does not indicate that dioxin will be produced from chemicals that lack the chemical building blocks for that contaminant.

Open burning will not result in the need for additional remediation at Camp Minden. The E-Line area within Camp Minden is a designated burning area. The area will be cleared of vegetation. Impermeable pads will be constructed and metal trays will be fabricated specifically for burning of propellants and placed on the pads. The construction of the pads includes barriers that provide protection from contamination and will be removed at the end of use. Distances between trays, the quantity of propellant on each tray, ignition procedures, worker protection, public safety, and other aspects will all be according to the DoD 4145.26 Manual.

Para 74. l. "Air monitoring and waste sampling activities" should be changed to read: "Residue and soil sampling (and possibly surface water if present and ground water sampling) activities." Also add at end: "Sampling is to include DNT and dioxin. The monitoring plan is to include for each burn, the observation and recording of the extent of visible particulate/smoke plume and kick-out, to determine if changes are needed to the operating plan (under para 74 q (iv)), and to indicate the extent of soil sampling needed at closure (under para 74 k)."
Note: There are no EPA recognized protocols for air monitoring of open burning sites. Most of the methods tried (e.g., plane, helicopter, balloons, backstops, nets, and pans on the ground) have been demonstrated to be meaningless. The best surrogate for air monitoring is targeted soil sampling.

RESPONSE:

Air monitoring is conducted routinely at removal sites and at emergency responses. Monitors, as well as sample collectors are placed at the perimeters, downwind, in sensitive areas, etc. Air monitoring is as standard operationally as any procedure at the sites. Many decisions to make engineering changes, to call for evacuation, or to warrant soil sampling are routinely based on air monitoring results.

The EPA Air Monitoring Plan will include perimeter air monitoring. That will provide near real time information on particulates, volatiles, and even CO_2 concentration. This will facilitate making engineering control changes to limit the discharge. In addition to perimeter monitoring, an emphasis on downwind monitoring will be employed. Sensitive areas such as schools, shopping centers and other places where people tend to congregate outside will be monitored. Even though those places are well beyond any realistic expectation of contamination reaching them, monitoring will be conducted.

Likewise, samples of air will be collected and analyzed at a laboratory. The locations will be similar to those of the monitoring locations. Samples will also be collected by high-volume air samples which can collect particulates and organic compounds adsorbs onto media.

The basis for the air monitoring and air sampling protocols and design include the following EPA courses:

Air Monitoring for Hazardous Materials
Offered by Environmental Response Training Program (ERTP)
ERT - OSRTI

Air Monitoring for Emergency Response
Offered by Environmental Response Training Program (ERTP)
ERT - OSRTI

One example is the Vieques NPL site where open detonation of munitions were performed. The explosives involved there were formulations that contained mercury, lead, copper, magnesium, lithium, perchlorate, TNT, napalm, and RDX. In coordination with ERT, multiple air sampling events were conducted and no air impacts were observed.

"Waste sampling" seems not to be the term meant since we already know the ingredients of M6, and EPA has apparently decided NOT to do further sampling of the stabilizers to determine stability (if stabilizer sampling is desired, which it should be, it should be so specified instead of "waste sampling"). It seems "environmental sampling," not "waste sampling" is the term meant here.

RESPONSE:

Waste sampling is part of the requirement of disposal of other waste streams that will be generated at the Site. Supersacks, bags, boxes, cans, strapping, plastic wrap, and more will have to be disposed of offsite. There is also the waste stream of the generated ash and residue from the trays. The facility receiving those waste streams will insist on waste sampling in order to profile the waste to determine the concentration of the residual M6 components.

The idea of stability sampling remains an issue, in particular to those people who do not have the advantage of seeing the site and the conditions of the M6 storage. To reestablish the stability monitoring program; the time, personnel, and resources required to do it would require ¾ of the time it would require to complete the burning of the M6. It would include triple handling of the M6, require

additional magazines since the M6 cannot be restacked safely in the same positions, and still leave the task of disposal to be completed. The Lots of M6 propellant have been mixed into boxes, drums, and 880 lb. supersacks. The collection of a homogeneous or representative sample of M6 propellant from an 880 lb. is impossible. Without representative samples, the quality of the stability data is questionable at best. And the stability monitoring sampling does not reduce the cost, labor, or resources to dispose of the M6.

The Cardinal Rules of Explosive Safety are to handle the smallest volume of explosives, for the shortest period of time, by the fewest number of people. This reduces the risk of injury caused by an explosive incident significantly and is quoted and followed by DoD and all explosive workers. Stability monitoring at the Camp Minden site violates every rule of explosive safety by exposing more people than necessary to more explosives than necessary for a period of time that is unnecessary. The DoD rules that apply to the situation recognize that stability monitoring is no longer an option and prescribes the immediate destruction of the M6 as the appropriate remedy. Stability monitoring at this site will not provide quality data that increases safety or reduces the explosive risk at Camp Minden.

Para 74 q (iv). Since these are not specified elsewhere, and they are very important to this project, this section should be expanded to read as follows: "Provide any other limitations to protect personnel and nearby communities (such as weather, wind speed and direction, and inversions)…."

RESPONSE:

These are included in the DoD Manual 4145.26 and as part of the HASP.

Other Comments:
Para 71. To expect DOD to develop a Work Plan as specified, including an assessment of technical options, in **15 days** is unreasonable.

RESPONSE:

We disagree.

Para 75. There seems to be a problem with the use of the word : "open" in the phrase "each open shall address."
Para 88. Something seems to be missing in the phrase: "**'Day' or 'day'** shall mean a calendar day."