National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Sandia Field Office
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Albuquerque, NM 87185

JAN 3 1 2014

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. John E. Kieling
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Bldg. 1
Santa Fe, NM 87505

Subject: Extension Request for the Burn Site Groundwater Corrective Measures Evaluation Report, Sandia National Laboratories, EPA ID #NM5890110518

Dear Mr. Kieling:

The Department of Energy/National Nuclear Security Administration (DOE/NNSA) and Sandia Corporation (Sandia) are requesting an extension of time to submit the Burn Site Groundwater Corrective Measures Evaluation (CME) Report.

The Department of Energy/Environment Management (DOE/EM) conducts a formal process for reviewing corrective action decision documents that establish key requirements directly impacting future scope and projected cost of a cleanup. This process is referred to as the Internal Remedy Review (IRR) Process, typically involving review of the CME Report by subject matter experts at DOE/Environmental Management (EM) headquarters and/or other locations, with support from Field Office personnel. DOE/EM has conducted an Internal IRR of the Burn Site Groundwater CME Report and current conceptual model (CCM). The results of the IRR are provided in a memorandum dated October 30, 2013, and titled *Internal Remedy Review of the Bum Site Groundwater Area of Concern, Sandia National Laboratories, Albuquerque, New Mexico* (enclosed). In summary, based on stable isotope chemistry and the hydrogeologic conditions at the site, the IRR recommends a weight-of-evidence approach to evaluate two scenarios: the CCM in which nitrates present in groundwater originate from Burn Site operations, and a conceptual model in which the nitrates in groundwater may be of an origin not associated with DOE operations at the site. This approach would likely require a two-year extension for submittal of the Burn Site Groundwater CME Report and CCM from the current due date of March 31, 2014, to March 31, 2016, during which information necessary to evaluate the scenarios would be identified, collected, and analyzed. The weight-of-evidence process, as proposed, would be similar to that described in the attached DOE/Environmental Protection Agency publication *Expediting Cleanup Through a Core Team Approach.*

If you have any questions, please contact John Weckerle of my staff at (505) 845-6026.

Sincerely,

Geoffrey L. Beausoleil
Manager

2 Enclosures
See Page 2

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OCT 30 2013

MEMORANDUM FOR GEOFFREY L BEAUSOLEIL
MANAGER
NATIONAL NUCLEAR SECURITY ADMINISTRATION
SANDIA FIELD OFFICE

FROM: STEVEN C. GOLIAN
CHAIR
OFFICE OF ENVIRONMENTAL MANAGEMENT
INTERNAL REMEDY REVIEWS

SUBJECT: Internal Remedy Review of the Burn Site Groundwater Area of Concern, Sandia National Laboratories, Albuquerque, New Mexico

This memorandum formally transmits the internal remedy review (IRR) team's comments and recommendations on the Department of Energy's (DOE) cleanup plans for the Burn Site Groundwater (BSG) Area of Concern (AOC), Sandia National Laboratories, in Albuquerque, New Mexico. The review team's comments and recommendations are based on a review of the October 2013 draft *Corrective Measures Evaluation Report for Burn Site Groundwater at Sandia National Laboratories, New Mexico*, supporting documentation, and discussions with Sandia Field Office and Sandia National Laboratories (Sandia) personnel.

The BSG AOC is one of three groundwater AOCs located at Sandia National Laboratories. The Burn Site, which is located in a remote area in the eastern portion of Kirtland Air Force Base, has been used for over 45 years to conduct open-air detonations of high explosives (HE) and burn tests involving jet fuels. A total of 16 solid waste management units (SWMU) have been identified, all of which have been characterized and associated contamination (soils and debris) removed under previous actions. Ongoing analyses and assessments are underway to address contamination (principally nitrates) in groundwater, which are believed to have possibly resulted from prior operations, including waste water discharges at various SWMUs within the Burn Site. An estimated 480,000 gallons of waste water was discharged to the alluvium via unlined pits/impoundments from 1969 to 1988, with approximately 64 percent of those discharges occurring between 1984 and 1987.[1] The nitrate plume (as designated by concentrations above the 10mg/L drinking water standard for NO_2-N) is estimated to be approximately 70 acres in size, with the highest concentrations in the 30 to 35mg/L

[1] Site personnel have been unable to locate any analytical data from that time frame to indicate the level of nitrate that may have been present in the discharges.

level.[2] Although per chlorate and jet fuel constituents are also present in ground water, they are below levels of concern. Three alternatives are being evaluated in the Corrective Measures Evaluation (CME) report (monitored natural attenuation, in-situ bioremediation, and pump and treat).

The current conceptual site model (CSM) reflects a presumption that the Burn Site constitutes the primary source of the nitrates in ground water, via the leaching of nitrate compounds (e.g., resulting from open-air detonations) from dust/fire suppression water applications, and waste water discharges.[3] However, elevated nitrate concentrations similar to the Burn Site area occurs in the distal portion of the plume, precluding any SWMUs as possible sources. Although initially these higher nitrate concentrations in the distal portion of the plume were believed to possibly be a higher concentration "slug" moving through the system, further evaluation of the historical operations and available information/data make such a possibility unlikely. The review team concluded that a more likely explanation was the observed nitrates in groundwater were predominately of natural origin, generated from formations within the Burn Site area, or possibly migrating into the area via existing fault lines. This conclusion is based on a number of factors, including:

- Analytical results indicate there are no HE residues in the Burn Site soils as would be expected if the nitrates originated from the detonation or burn activities. Similarly, there are no actionable levels of petroleum fuel in the soil. Since the source of nitrogen from pool fires (the single biggest source of water loss at the burn site) would have been nitrogenous constituents of the fuel itself, any residual nitrates derived from such activities in the soil would be expected to be present at much lower levels than other fuel constituents (e.g., substituted benzenes, naphthalene and other hydrocarbons in the diesel boiling range), but the opposite was found.
- The ammonia, nitrate, and nitrite present in the soils of the Burn Site could result from the mineralization of natural nitrogen in the soil (typically from vegetation) as many native soils in arid regions are high in ammonia. Furthermore, the team interpreted the stable isotopic data for nitrogen and oxygen as indicating the nitrates in the groundwater are likely of soil origin (vegetation or mineral sources), not synthetic chemicals.
- Both the phyllite and the carbon-rich shale (Sandia) formations in this area are possible sources of natural nitrate in groundwater and surface water. In fact, a portion of the nitrate plume occurs in the phyllite formation, and the remaining portion of the plume is down gradient of the phyllite and Sandia formations.

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[2] There is general agreement that additional data are needed to improve the defensibility of the potentiometric surface maps and plume geometries so these general plume characteristics are subject to change.

[3] The leaching of naturally occurring nitrate in the alluvium due to surface disturbances was also considered a possible source. Although approximately 60 acres were bladed, this disturbance occurred almost 50 years ago and it is unlikely residual effects would still be observed.

- The "contaminated aquifer" is positively pressured (as measured by the rise in water elevation in boreholes after water is first encountered), ranging from 9 to 154 feet (~19 to ~85 psi, including atmospheric resistance). Such pressures would be expected to prevent or minimize any infiltration or recharge from the Burn Site in essence serving to "confine" the aquifer.
- Nitrate levels in groundwater would be expected to co-vary with perchlorate (derived from incomplete combustion of explosive materials) if they were sourced from the same activities, but such covariance has only been observed in one location.
- Although the younger age of the affected groundwater (as determined from tritium/helium dating) and the positive pressure in the aquifer seem to suggest recharge from a higher elevation area, it is also possible that recharge resulted from waste water and dust suppression water (which is depleted of helium causing the groundwater to appear younger) entering along a fault running beneath the Burn Site. Alternatively, recharge could be occurring from younger-aged water (with higher nitrate levels) moving down the fault either from the north or south.[4] The latter could explain the elevated nitrate concentrations in the distal portion of the plume because a second fault also is present in that location.

Based on the above factors, the review team believes an alternative CSM (nitrates are of natural origin, possibly migrating in along faults from other areas) needs to be further evaluated in order to: 1) confirm whether the nitrate plume is the result of DOE's Burn Site related activities, thereby confirming DOE's liability/responsibility for implementing remedial measures; and 2) ensure the "problem" is sufficiently understood to support the selection of a remedy if necessary. Given there are two potentially viable CSMs to explain the origin of the nitrate plume, the team is recommending a weight-of-evidence approach, whereby selected characteristics or conditions that are expected under each of the scenarios are compared against collected information/data to determine (using agreed to decision logic) which scenario is more likely.[5] Once this weight-of-evidence analysis is complete, which the team recommends be done in a joint scoping session(s) with the New Mexico Environment Department (NMED), a decision can be made to proceed with completion of the CME (including the identification of any further data needs to support alternative evaluations) and selection of a remedy, or to conclude no further action is warranted and seek regulatory closure for this AOC.

[**NOTE**: Based on the interactions with the IRR Team, the site has decided to delay the CME report in order to allow more time to further evaluate source and plume

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[4] Previous studies at a number of locations in the general proximity of the Burn Site found elevated nitrate levels equal to or greater than those noted at this site.

[5] The review team provided site personnel with an example of some of the parameters that could be used to build a weight-of-evidence case. The review team also cautioned the site not to stray from the stated purpose of further analyses (to test /confirm whether DOE's activities is the source of the nitrate), by attempting also to identify the specific off-site source(s) that could be feeding the plume.

characteristics; a decision which the review team supports. With the delay of the BSG CME report, the site will be expediting the ongoing work at the Technical Area-V (TA-V) groundwater AOC in exchange for regulator concurrence in delaying the BSG CME report. The review team has therefore agreed to conduct an IRR on the CME report for the TA-V groundwater AOC as well. If it is determined that the nitrates in groundwater at the BSG AOC are due to past DOE activities and a remedial response is required, then the IRR will re-review the CME report for the BSG AOC. This re-review of the BSG CME report will be based on the updated CSM.]

Since the preponderance of the team's time/focus was on discerning the viability of an alternate CSM, and the team's agreement to re-review the CME should remedial measures be required at the Burn Site, only cursory input on the alternatives being considered is provided at this time. The team noted the inherent challenges to pump-and-treat effectiveness posed by the fractured flow conditions, and the potential impediments to in-situ treatment posed by aquifer continuity and porosity characteristics. Based on these potential implementation challenges to effective treatment, and the relatively low levels of nitrate involved, the site's remoteness (7 miles to nearest receptor), and the high reliability of institutional controls to prevent access to groundwater on the Kirtland Air Force base, the team's preliminary conclusion is that a monitored natural attenuation strategy will likely constitute the most appropriate path forward. However, a final conclusion can not be reached until the uncertainties within the current CSM are addressed.

In summary, the review team recommends an alternative CSM, one based on the nitrates being of natural origin, possibly migrating into the area along existing fault lines, be evaluated against the current CSM using a weight-of-evidence approach. Should it be determined the nitrates in groundwater are due to past DOE activities and implementing remedial measures become necessary, the team will re-review the CME report and provide a set of final recommendations on the remedial alternatives being considered.

The team thanks Mr. Joe Estrada and Mr. John Weckerle for their assistance with this review. Should you or your staff have any questions or wish to discuss the team's comments, please contact me, at (301) 903-7791.

cc: J. Todd, DOE/NNSA/SFO
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DOE/EPA's Principles of Environmental Restoration

Expediting Cleanup through a Core Team Approach

This guide is primarily intended for personnel with line management responsibility for Department of Energy (DOE) environmental restoration (ER) projects conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). It describes how a core team approach, when integrated with the other three DOE/EPA "Principles of Environmental Restoration," will streamline the remedy selection process and enhance cleanup decisions.

What is a core team approach?

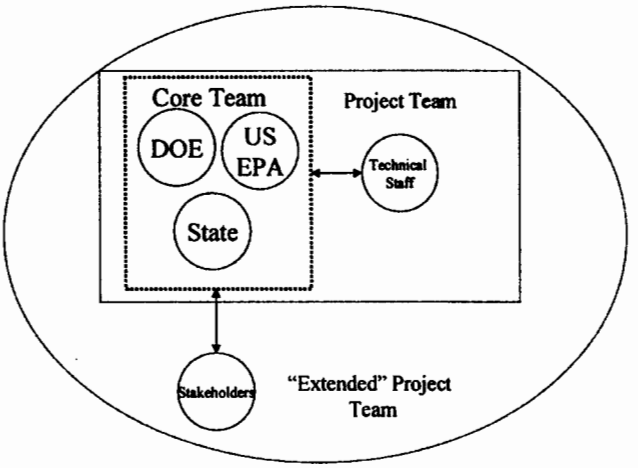
The "core team approach" is a formalized, consensus-based process in which those individuals with decision-making authority, including DOE, USEPA, and State remedial project managers, work together to reach agreement on key remediation decisions. Equally important, the core team works to ensure that all technical support staff and stakeholders are involved and communicating effectively throughout the decision-making process.

Working together as a team does not change the role or responsibilities of the agency representatives – e.g., participation of regulators on a core team in no way limits their discretion to use whatever enforcement authorities they may deem appropriate over the course of a project; similarly, DOE personnel maintain sole responsibility for managing a project's available resources. What the core team approach does is improve communication between all parties so that regulators can more effectively oversee and direct, as appropriate, remedial progress.

The core team and their technical staff (DOE's site contractors and the federal and state technical support personnel) comprise the ***project team***. Essential to the decision-making process, support personnel not only provide the information necessary for the core team to make technically defensible decisions (e.g., analysis of characterization data, technology evaluations), they also execute the work as directed by the core team.

Stakeholders include any member of the public or designated entity (e.g., site-specific advisory board) who has an interest in the cleanup project and wishes to participate in the remedy selection process. Although the various regulations governing cleanup explicitly require public participation at specific points in the decision-making process, the core team should solicit stakeholder input at <u>any</u> point in the process that they believe is appropriate. In this light, stakeholders may be viewed as an "extension" to the project team – i.e. that they also help to guide the work performed by identifying those uncertainties or concerns they want addressed as part of the remedy selection process. This relationship between the core team, project team, and stakeholders is illustrated in Figure 1.

Figure 1. The Core Team Approach



What makes the core team approach different?

Historically, many DOE project teams have established and implemented characterization strategies, identified a preferred cleanup alternative, and prepared supporting documentation without the full input of their regulators and other important stakeholders. As a result, meetings

between the DOE project team and the regulators too often have been used to discuss the adequacy of documents (e.g., remedial investigation reports, baseline risk assessments), rather than serving to build consensus on the appropriate scope and direction of the investigation and cleanup before documentation is prepared. As could be expected, the work performed has often been considered inadequate or misdirected, inevitably resulting in schedule delays, increased costs, and reduced confidence in the project's execution.

In contrast, the core team approach emphasizes clear communication "in person"before analyses are conducted, thus ensuring each member of the core team is provided an opportunity to express his or her views or concerns (e.g., perceptions of risk, questions regarding site uncertainties). As a result, misinterpretation or misunderstandings are minimized and important issues and concerns can be immediately resolved and addressed, leading to a better investigation strategy or remedial approach that is agreeable to all. In addition, the project team better understands the rationale behind the decisions due to their direct involvement in these decision-making meetings and, consequently, they can better execute the work. Finally, stakeholders concerns can be addressed more effectively because their thoughts and views are solicited before planning is complete and the work is performed.

Highlight 1. Core Team Decisions.

There are a number of decisions that must be made during the course of any remedial project that inherently are the responsibility of the core team. Six such decisions include:

1. Is there a problem requiring action?
2. What specifically is the problem requiring action?[1]
3. What are the appropriate actions to consider?[2]
4. What uncertainties must be reduced prior to selecting a remedy and what uncertainties can be managed during remedy implementation?[3]
5. What information will be used to demonstrate when the action is complete (i.e., response objectives have been achieved)?
6. What information will be used to trigger implementation of an alternative remedial action should the selected remedy fail to meet response objectives?

[1] See related fact sheet, *Expediting Cleanup through Problem Identification and Definition.*
[2] See related fact sheet, *Expediting Cleanup through Early Identification of Likely Response Actions.*
[3] See related fact sheet, *Uncertainty Management: Expediting Cleanup through Contingency Planning.*

What are the characteristics of an *effective* core team?

Although many DOE project teams have evolved in their approach to interacting with their regulators and stakeholders (e.g., by conducting joint scoping meetings, sharing draft documentation earlier), meetings often remain highly reactive as regulators "respond" to proposals (often for the first time in documents) rather than developing the proposals together. Meeting regularly to scope and direct projects does not necessarily mean a team is communicating well or effectively working together to move a project forward. Characteristics of a truly effective core team are outlined below.

1. There is ***clear recognition of the core team's decision-making responsibility*** by all parties involved. As signators to Federal Facility Agreements and the cleanup decisions generated thereby, the core team constitutes the decision-making authority for a project. After providing input on an issue, technical support personnel and other stakeholders allow the core team to fully weigh the information provided and develop their recommended course of action.

2. The ***core team clearly identifies which key decisions they will make*** and which decisions they intend to delegate to the technical support staff. (See Highlight 1.) Consequently, it is clear to all parties involved when an issue must be brought to the core team for resolution and when the project team has the authority to proceed.

3. The ***core team makes decisions based on consensus*** as each core team member has an "equal vote." Consensus means agreement on an option that each core team representative can accept, but not necessarily an agency's most preferred approach – i.e., a willingness to compromise is exhibited as necessary to keep projects moving and expedite cleanup.

4. ***There is no ambiguity in the core team's intent,*** minimizing the potential for misinterpretation by the technical staff. The core team clearly defines the scope and specifics of every decision, delineating where appropriate, the criteria or data required to demonstrate that a particular action is

warranted or that an objective has been met.

5. The ***core team representatives have sufficient decision-making authority*** so that agreements typically are not overturned by management. Furthermore, once the agencies have agreed to a decision, that decision is not revisited unless new data or information become available which draw into question the validity of key assumptions that were relied on in making the decision.

   [Note: Even when sufficiently empowered, core team representatives typically need formal management approval prior to finalizing significant decisions – e.g., decisions that hold substantive implications with respect to resources or stakeholder concerns. In such situations, the first order of business at the following core team meeting is to confirm whether management for all agencies supports their decision(s). If not, the core team must first resolve management concern(s) and again reach a mutually-agreeable solution before proceeding.]

6. ***Core team members and their technical staff attend all meetings.*** Because core team decisions are based on consensus, there is little, if any, value in holding a meeting if one of the core team representatives is absent since decisions can not be finalized. Relatedly, when decisions are being made which will affect work scope, the technical support staff who will be conducting the work, or providing the technical expertise to assist the core team in defining the scope, should be in attendance. Their direct involvement with a decision will help to ensure they fully understand the rationale underlying that decision, and thus are able to more efficiently implement it.

7. All ***core-team decisions, and the rationale underlying these decisions, are documented*** immediately following each meeting. Documenting core team decisions serves three primary purposes. First, it provides an additional opportunity to confirm the specifics of what was agreed to orally and further minimizes the potential for misinterpretation. Second, it will often serve as the basis for any required documents (e.g., Work Plans, RODs). Lastly, it provides the necessary background should any of the individuals participating on the core team change over the life of the project.

What are the benefits of a core team approach?

By working together in a cooperative manner and ensuring all decisions are clearly communicated to the project team and stakeholders, the core team achieves a number of benefits.

Improves project focus. Because the core team identifies information needs and investigative / analytical strategies together, the likelihood of collecting unnecessary data is minimized. Similarly, the probability that all information needs will be satisfied increases. As a result, the analyses are performed more effectively, targeting those uncertainties they were intended to address.

Streamlines documentation. Because project focus is improved and less work has to be performed, less documentation is required. Furthermore, the core team reaches consensus on what work is to be done before documentation is prepared. Therefore, generated reports serve to reflect and document decisions rather than simply constitute compilations of all available information.

Minimizes comment/review/revise process. Because there is less documentation to review, and what is generated reflects previous core team agreements, regulators can quickly confirm the adequacy of generated reports.

Minimizes rework/wasted effort. Because the core team jointly scopes and directs projects, and stakeholders provide input prior to decisions being finalized, there is less likelihood of encountering late-stage objections requiring additional work or changes in project direction.

All of these benefits culminate in more rapid attainment of the projects' ultimate objective -- expedited implementation of these remedial measures required to ensure the protection of human health and the environment.