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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)

) Docket No. 40-8838-MLA

) U.S. ARMY)

) ASLBP No. 00-776-04-MLA

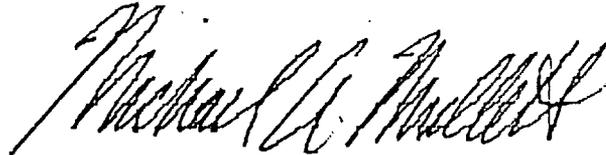
) (Jefferson Proving Ground Site))

) December 7, 2007

**PROPOSED
FINDINGS OF FACT, CONCLUSIONS OF LAW, AND INITIAL DECISION
OF INTERVENOR SAVE THE VALLEY, INC.**

Pursuant to the Board's Scheduling Order of

Respectfully submitted,



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TEMPLATE = SELV-037

SELV-02

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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FINDINGS OF FACT, CONCLUSIONS OF LAW, AND INITIAL DECISION
(Conditionally Approving License Amendment)

This proceeding involves a challenge by Intervenor Save the Valley, Inc. (STV), to Amendment No. 13 to the materials license (SUB-1435) issued to the Licensee Department of the Army for the depleted uranium (DU) munitions test site at the Jefferson Proving Ground (JPG) near Madison, Indiana. *See* Staff Exhibit 13. The license amendment would provide an alternate schedule (i.e., a five-year additional period) for the submittal of a decommissioning plan for that site. The decommissioning plan is required because there is currently amassed on the JPG site approximately 70,000 kilograms of expended DU munitions. The alternate schedule has been requested so that the Army may conduct additional site characterization activities as described in a Field Sampling Plan (FSP) and subsequent addenda preparatory to submittal of its decommissioning plan in 2011. *See* Staff Exhibits 14-18. STV has challenged the adequacy of the FSP as supplemented in multiple respects.

This proceeding is subject to the informal hearing procedures set forth in Subpart L of the Commission's Rules of Practice, 10 C.F.R. § 2.1201 et seq. In accordance with the provisions of that subpart, STV, the Army and the Staff presented testimony, exhibits and oral argument at a hearing

conducted on October 22, 2007, in Madison, Indiana. On the basis of a full consideration of the content of the testimony, exhibits and arguments of the parties, and for the reasons set forth below, the Board has determined that several of the challenges to the license amendment in question have been shown to be meritorious. However, none of the meritorious challenges warrant denial of the license amendment because they may be addressed through conditions. Accordingly, the license amendment is approved subject to the conditions described below.

I. BACKGROUND

The present proceeding has a long history, much of which has been recounted in considerable detail in LBP-05-9, 61 NRC 218, 218-21 (2005), and therefore need not be repeated in its entirety here. The following summary should suffice.

Between 1984 and 1994, the Army conducted, under the auspices of its NRC materials license, accuracy testing of depleted uranium (DU) tank penetration rounds at its JPG site. Five years after testing ceased, in December 1999, the Army submitted to the NRC Staff its first of several license amendment applications for decommissioning the JPG site. The Staff accepted the license amendment application for full technical review and published a notice of opportunity to request a hearing in the Federal Register. 64 Fed. Reg. 70,294 (Dec. 16, 1999). STV filed a petition to intervene and request for hearing, which was subsequently granted in LBP-00-9, 51 NRC 159 (2000) (2000 proceeding) by a Presiding Officer. At the Army's request, the proceeding was suspended pending further interaction with the Staff regarding the submitted decommissioning plan.

In June 2001, the Army submitted a new plan, referred to as the final decommissioning/ license termination plan (LTP). The Staff considered the LTP to supersede the 1999 plan. It refused, however, to accept the plan for full technical review until certain perceived deficiencies were

corrected. Once those deficiencies had been resolved, the Staff informed the Army that site-specific sampling and modeling would need to be performed as an incident of the technical review. The Army declined to undertake those activities, asserting that they were too dangerous because of the presence on site of unexploded ordinance (UXO). As a result, in mid-2003 the Army withdrew the LTP.

Subsequent to its withdrawal of the LTP, the Army submitted to the Staff a new (third) proposal for a five-year, possession only license amendment (POLA), which would be renewable until such time as it became possible to perform the required site characterization safely. In October 2003, the Staff published in the Federal Register a notice of opportunity to request a hearing on the POLA proposal. See 68 Fed. Reg. 61,471 (Oct. 28, 2003). Two months later, the 2000 proceeding was dismissed, without prejudice to an endeavor by STV to seek its reinstatement should the decommissioning of the JPG site once again receive active NRC consideration at the Army's behest. LBP-03-28, 58 NRC 437 (2003). The following month, STV's request for a hearing on the POLA proposal was granted, along with its unopposed motion to hold further proceedings in abeyance pending the completion of the Staff's technical review of the proposal. LBP-04-1, 59 NRC 27 (2004).

Over the course of the next fourteen months, the Presiding Officer issued three separate unpublished orders (June 1, 2004, October 4, 2004, and March 3, 2005) in which he called upon the Staff to provide progress reports on its technical review of the POLA proposal. In response to the March 2005 request for a status report, the Staff stated that it was not clear "how the Licensee intends to proceed" and added that, pending such clarification from the Army, the Staff could not provide an estimated issuance date for the Safety Evaluation Report and Environmental Assessment. LBP-05-9, 61 NRC at 221 (citation omitted). It was by reason of this last communication from the

Staff that, on March 31, 2005, the Presiding Officer sent a memorandum to the Commission expressing his concern regarding the then-current state of affairs. LBP-05-9, 61 NRC 218 (2005).

On June 20, 2005, the Commission issued CLI-05-13, 61 NRC 356 (2005), in which it directed the Army to provide a report to the Commission by July 11, 2005, "detailing its past and planned efforts to gather the information necessary for the Staff to complete its technical and environmental reviews." *Id.* at 357. In the same order, the Commission ordered the Staff to furnish, by July 20, 2005, a report "regarding the steps it plans to take to complete its reviews in light of the information provided by the Licensee." *Id.* In the course of the order, the Commission referenced a May 25, 2005, submission by the Army to the Staff, which the Staff had taken to constitute a new license amendment request superseding the POLA proposal.

Pursuant to the Commission's order, on July 7, 2005, the Army reported that it was abandoning the POLA proposal, and had instead submitted on May 25, 2005, a request for "NRC approval of an alternate schedule for submittal of a decommissioning plan . . . and one 5 year period for the execution of appropriate site characterization, with the Army presenting the NRC a definitive license termination plan at the end of that period." *See* LBP-05-25, 62 NRC 435, 438 (2005) (citation omitted). The Staff's report, filed on July 20, 2005, informed the Commission that, on June 16, it had told the Army that it was discontinuing review of the 2003 POLA proposal in view of the submission of the "superceding [sic] license amendment for an alternate schedule." *Id.* (citation omitted). The Staff further noted that, on June 27, it had published in the Federal Register a notice of opportunity to request a hearing on the Army's May 25 request for an alternate schedule for submittal of a decommissioning plan. *See* 70 Fed. Reg. 36,964 (June 27, 2005).

After apprising the Commission of its new proposal for decommissioning the JPG site, on

July 10, 2005, the Army filed a motion with the Presiding Officer seeking to dismiss the then-pending POLA proceeding on the ground of mootness. The Army noted that it no longer was seeking a five-year renewable possession only license for the JPG site, but instead now desired Commission approval of an alternate schedule for the submittal of a decommissioning plan. On September 12, the Presiding Officer issued an order, which for the reasons stated therein, (1) *sua sponte* reinstated the conditionally dismissed prior proceeding concerning the decommissioning of the JPG site; (2) referred the reinstatement to the Commission for its consideration; and (3) held the motion to dismiss the POLA proceeding in abeyance to await the outcome of the referral. LBP-05-25, 62 NRC at 435.

On October 26, 2005, the Commission affirmed the Presiding Officer's decision to reinstate the earlier proceeding, and ordered that Petitioner's standing "shall be considered already established." CLI-05-23, 62 NRC 546, 550 (2005). The Commission also instructed that the remainder of the adjudication be conducted by a three-member Licensing Board under the Rules of Practice revised in 2004. In this connection, the Commission indicated that any future hearings in this proceeding were to be conducted under the informal hearing procedures of the now-revised Subpart L. CLI-05-23, 62 NRC at 548-50 (discussing how the changes to Subpart L would impact STV in any future hearings).

On November 23, 2005, STV filed a petition to intervene and request for hearing in response to the Staff's June 27, 2005 Federal Register notice providing an opportunity to seek a hearing on the Army's May 25, 2005 request for an alternate schedule under which to submit its decommissioning plan for the JPG site. LBP-06-6, 63 NRC 167, 170 (2006). The petition to intervene advanced six contentions – each supported by a number of bases – concerned with the following aspects of the Army's alternate schedule proposal: (1) the Environmental Radiation Monitoring Plan (ERMP)

previously submitted by the Army in connection with its since-withdrawn 2003 application for a possession-only license (POL); (2) the Field Sampling Plan (FSP); (3) the Health and Safety Plan (HASP); and (4) the Army's timeliness and financial assurance commitments. *Id.* at 172-76. STV's filing was accompanied by an unopposed motion to the effect that, should its request be granted, a hearing in the matter be deferred to await the NRC Staff's completion of its technical review of the alternate schedule proposal.

The Army filed a response to STV's petition to intervene and asserted that none of the stated contentions is admissible. *Id.* at 176-79. The NRC Staff also filed a response, in which it maintained that one of STV's stated contentions, as supplemented by three bases, was admissible and, therefore, the hearing request should be granted. *Id.* at 179-81.

On February 2, 2006, we issued LBP-06-06, granting both the hearing request and the motion to defer a hearing. On the former score, we found that, as supported by at least one of the bases assigned for it, Contention B-1 satisfied the admissibility requirements imposed by 10 C.F.R. § 2.309(f)(1). *Id.* at 183-85. That contention asserted (*id.* at 183):

As filed, the FSP is not properly designed to obtain all the verifiable data required for reliable dose modeling and accurate assessment of the effects on exposure pathways of meteorological, geological, hydrological, animal, and human features specific to the JPG site and its surrounding area.

The specific basis to which the Board pointed in admitting Contention B-1 – basis (a) – stated:

The EI geophysical study which will follow the fracture analysis study, as described in section 6.1 of the FSP, is supposed to find all significant karst features and location of the water table. From these studies, 10 to 20 pairs of monitoring wells are proposed to attempt to tie into "conduits" of ground water flow. This study may help to site monitoring wells, but stream gauging studies should be an early and integral part of the search for likely conduits. The stream reaches of strong gain would be a very strong direct indicator of the discharge points of ground water "conduits." EI is an indirect technique and can miss conduits or identify features that are not conduits. The FSP alludes to doing stream gauging

in its discussion of well location criteria, but the time table shown indicates stream studies will follow the ground water studies by a year.

Id. at 183.

Having found acceptable one of STV's contentions along with a supporting basis, the Board deemed it unnecessary to pass at that time on the adequacy of either the other bases assigned for Contention B-1 or the five additional contentions and their assigned bases. Rather, given our decision to grant STV's motion to defer the hearing, it seemed that resolving the disagreement among the parties on the remaining contentions could readily abide the event of the NRC Staff's completion of its technical review of the alternate schedule proposal. In that connection, we indicated that STV would then be given a reasonable opportunity to review the documents associated with the technical review and to make changes, if so advised, in what it had presented in the hearing request. *Id.* at 185-86.

On March 15, the NRC Staff published in the Federal Register notice of its completion of the Environmental Assessment (EA) prepared in support of the Army's proposed license amendment. 71 Fed. Reg. 13,435 (Mar. 15, 2006). The EA concluded that a "Finding of No Significant Impact" (FONSI) was appropriate, with the result that an Environmental Impact Statement (EIS) would not be prepared.

More specifically, the NRC Staff concluded that the Army's proposed activities associated with site characterization "should not produce significant radiological or nonradiological impacts to the environment, workers or members of the public," and any radiation exposure to workers or the public would be within the limits of 10 C.F.R. Part 20. EA at 2-3. Although acknowledging that the presence of unexploded ordnance (UXO) on the JPG site "could potentially have nonradiological environmental impacts," the Staff did not anticipate it being a source of "significant environmental impact," given the Army's assurance that precautions would be taken to mitigate the risks from UXO

in its planning and implementation of site characterization activities. *Id.* at 3. The Staff considered a "no-action alternative" to the Army's proposal – i.e. denial of the alternate schedule request. It concluded that, while the environmental impacts would be slightly less, "without the requested time to conduct additional site characterization, . . . the [Army] would not have information adequate to produce a viable [decommissioning plan and, therefore,] the no-action alternative would not serve the objective of effective decommissioning." *Id.* at 3-4.

On April 27, 2006, the NRC Staff notified the Board that it had issued the following materials license amendment (License Amendment Number 13):

The Army shall submit a decommissioning plan for NRC review and approval under an alternate schedule identified in its May 25, 2005, Field Sampling Plan, its responses to action items from a September 8, 2005, public meeting by letter dated October 26, 2005, its Field Sampling Plan addendum dated November 2005, and its responses to NRC's request for additional information by letter dated February 9, 2006, by the end of 2011 or earlier. The Army will also submit an Environmental Report using the guidance in NUREG-1748 for NRC to use in preparing an Environmental Impact Statement.

The amendment was accompanied by issuance of the Staff's Safety Evaluation Report (SER). As reflected therein, in performing its safety evaluation of the Army's alternate schedule proposal, the Staff reviewed the proposed FSP to determine whether it satisfied the three criteria governing the grant of an alternate schedule request (10 C.F.R. § 40.42(g)(2)):

The Commission may approve an alternate schedule for submittal of a decommissioning plan required pursuant to paragraph (d) of this section if the Commission determines that the alternative schedule is [(1)] necessary to the effective conduct of decommissioning operations and [(2)] presents no undue risk from radiation to the public health and safety and [(3)] is otherwise in the public interest.

More particularly, the NRC Staff examined the Army's proposed site characterization activities – groundwater and surface water monitoring; biota, soil, and sediment sampling; determination of distribution coefficients, penetrator corrosion and dissolution rate – and found that

each of the planned approaches was adequate. SER at 4-8. It concluded that "there is reasonable assurance that the health and safety of the public will not be endangered by the proposed site characterization activities and alternate schedule for submittal of a [decommissioning plan]," that "such activities will be conducted in compliance with NRC regulations," and finally, that "it is in the public interest to take the additional time to adequately address monitoring deficiencies and allow for more specific information to be gathered from the site." *Id.* at 8-9.

In light of the NRC Staff's completion of its technical review, on May 1, 2006, the Board issued an order restoring this proceeding to fully active status. In that order, the Board established a schedule allowing STV to amend, to withdraw, and/or to supplement its original petition to intervene. It cautioned the STV that any attempt to add bases to existing contentions or to advance new contentions must be entirely based upon information contained in the EA or SER and the information must not have been previously available. In addition, STV was instructed to make clear to the Board and the other parties precisely what contentions and what supporting bases it sought to be included in an evidentiary hearing. The Army and the Staff were likewise instructed that any response filed was to be strictly confined to the content of the request for leave to amend and/or to supplement the original petition to intervene. It was made clear that any further augmentation on either party's part with regard to admissibility of contentions or adequacy of supporting bases not sought to be amended or supplemented would not be accepted. May 1 Order at 4.

Pursuant to our May 1 Order, on May 31, 2006, STV timely filed a motion for leave to withdraw, to amend, and/or to supplement contentions contained in its November 23, 2005 hearing request. In a separate document, it set forth the nine contentions and supporting bases it would have included in the evidentiary hearing. Although amending selected bases for Contention B-1 and adding

three new contentions, STV remained steadfast in its belief that the Army's May 25 alternate schedule proposal contained "serious and glaring deficiencies which, if not corrected" will prevent the Army from conducting a proper site characterization pursuant to 10 C.F.R. § 40.42(g)(2). STV Final Contentions at 3. With respect to its three new contentions, STV maintained that being based on either the Staff's SER or the EA, neither of which was available at the time it filed its initial contention, each contention complied with the Board's May 1 Order. In its contentions addressing the SER, STV asserted the Staff's review was inadequate because it "does not sufficiently address or resolve relevant significant deficiencies" in the Army's FSP or that plan's interrelationship with the HASP. STV Motion to Amend at 3. As for the Staff's EA, STV insisted that its "reasoning and assumptions . . . are faulty in significant respects." *Id.*

On June 19, 2006, the Army timely submitted its response to STV's Motion to Amend, in which it conceded that STV's Motion to supplement Contention B-1, bases (m) and (q), should be granted, but nonetheless maintained that all of STV's remaining requests to supplement, to clarify, or to add new contentions should be denied. It is the Army's position that the remaining supplemented and/or clarified bases and the three new contentions do not meet the requirements under 10 C.F.R. § 2.309(f)(2) for submission of new or amended contentions, nor do they satisfy the contention admissibility requirements imposed by 10 C.F.R. § 2.309(f)(1).

On June 20, 2006, the NRC Staff timely submitted its response to STV's Motion to Amend. It urged the Board to deny STV's request to clarify and to supplement selected bases assigned in support of Contention B-1, as well as to deny its request to admit two new contentions. It is the Staff's position that Contention E-1 and E-2 should not be admitted for the reason that they constitute impermissible attacks on the SER. With respect to STV's new Contention F-1, the Staff asserted that

it should be rejected for failing to raise a genuine dispute of law or fact with the Staff's FONSI determination.

On June 30, 2006, STV timely submitted its reply to the Army and the NRC Staff's filings. In it, STV maintained that, contrary to the assertions of the Army and the Staff, its requests to supplement, to clarify, and to add new contentions complied with the Board's May 1 Order, as well as with the applicable Commission regulations governing submission of amended or new contentions. In addition, it asserted that its new bases and contentions satisfied the contention admissibility requirements imposed by 10 C.F.R. § 2.309(f)(1).

After receipt of all the parties' pleadings, this Board convened a prehearing conference on July 19, 2006, in Madison, Indiana. Its purpose was to address those matters pertaining to the scope of the forthcoming evidentiary hearing that were left open in LBP-06-06. In the course of the conference, it became evident that the details of the Army's site characterization plans remained in a state of flux and, thus, it would be fruitful for the Army and STV to consult regarding the issues of concern to STV. Accordingly, the Board concluded, with the agreement of all parties, that no useful purpose would be served by proceeding to hold an evidentiary hearing in advance of such consultation.

Giving effect to this conclusion, the Board provided the Army and STV an opportunity to bring together their technical consultants to explore the accommodation of the STV's concerns and to discuss future procedures for updating and revising the Army's site characterization plans. The parties were directed to submit to the Board a joint status report on their progress, which they did on September 29. The report detailed the negotiations to date, which included four meetings between the Army and the STV and two additional meetings between their counsel (in all of which meetings

the NRC Staff and/or its counsel were also participants). Although no agreement had been reached on any of the matters of concern to the STV, the parties requested time for additional negotiations. The Board granted the request and directed that a second status report be submitted no later than November 9, 2006.

The second status report was timely submitted. It indicated that, after two teleconferences, the Army and STV "were unable to reach agreement on any issues" and "have no plans for future meetings and collaboration regarding development of the site characterization." As a result, "[a]ll matters remain unresolved and the parties' respective positions remain unchanged."

Given this apparent impasse in negotiations, the Board deemed it necessary to move forward with the evidentiary hearing in this proceeding and turned to consider the admissibility of STV's contentions not addressed in LBP-06-06, *supra*. To that end, on December 20, 2006, we issued a memorandum and order determining the scope of the evidentiary hearing. LBP-06-27, 64 NRC 438 (2006). In that decision, we concluded that, given the Army is here seeking simply a five-year period in which to characterize the JPG site – with the expectation that at the end of such time it would submit to the NRC Staff a viable decommissioning plan – the scope of this proceeding is limited to passing upon the acceptability of the Licensee's proposal for characterizing the JPG site as set forth in its FSP and subsequent addenda. For that reason, we rejected STV's remaining contentions – five of which were submitted with its initial petition to intervene and two of which were newly proposed – because none of them was similarly addressed, like Contention B-1, to the adequacy of the Licensee's site characterization activities. *Id.* at 448-58.

Were the Board to determine that the Licensee's FSP was not acceptable, it perforce would follow that at least one of the requirements for the grant of an alternate schedule for the submission of

a decommissioning plan have not been met. Among other things, 10 C.F.R. § 40.42(g)(2) specifies that the alternate schedule must be "necessary to the effective conduct of decommissioning operations." As applied to this case, the clear contemplation of this very specific regulatory criterion is that, at the end of the day, the proposed FSP – central to the granted alternative schedule – will bring about a satisfactory decommissioning plan. Any doubt that the NRC Staff viewed the FSP in this light in approving the alternate schedule would appear to be dispelled by the observation in its SER:

In summary, the activities described by the Army in its FSP and addendum as supplemented in its follow-up responses, should provide adequate site characterization information such that the Army could submit an acceptable [decommissioning plan] within 5 years and are therefore necessary for the effective conduct of decommissioning operations.

SER at 8.

Subsequent to issuing LBP-06-27, on January 19, 2007, Intervenor submitted a motion to admit for hearing an additional contention, denominated Contention B-2. According to Intervenor, the impetus for the new contention was the Licensee's submission to the NRC Staff of addenda to the FSP, and the disclosure of several documents that contain data collected thus far in its implementation of the FSP. None of these items, STV asserted, was available at the time it submitted its post-NRC Staff technical review contentions. Shortly thereafter, on January 24, the Board convened a telephonic pre-hearing conference with the parties to discuss matters pertaining to scheduling future milestones in this proceeding. As a result of discussions during that pre-hearing conference, on February 23, STV submitted an amended motion, setting forth its proposed new Contention B-2. On March 15, the Army and the NRC Staff each timely submitted answers to STV's amended motion.

Intervenor's Contention B-2 asserted that "[t]he Army's implementation of the [FSP] is

inadequate to achieve its objective of appropriate characterization of the [JPG DU] Site." STV Amended Motion at 1. According to Intervenor, "[t]hus far, FSP implementation has been inadequate . . . in crucial respects," for achieving its objective "of appropriately characterizing the JPG DU site for decommissioning." *Id.* at 2. More specifically, based upon the Licensee's addenda to its FSP and its release of data collected in the course of site characterization, Intervenor maintains that the Licensee's implementation of each of the following aspects of the FSP is "inadequate to serve [their] intended purpose": (a) fracture trace analysis; (b) electrical imaging survey; © soil verification survey; (d) well location selection methodology for ground water conduit and overburden characterization; (e) stream and cave gauging program; (f) field collection and analytical methods to document and evaluate data yielded by FSP implementation; and (g) initial deer tissue sampling study. *Id.* at 2-46.

Each of these seven bases appeared to raise a challenge to either (1) the manner in which the Licensee is implementing its FSP such that the Army is not complying with the terms of its granted license amendment or (2) the adequacy of the Army's proposed site characterization activities for achieving its intended objective, i.e., submission of a suitable decommissioning plan to the NRC in 2011. The Licensee and the NRC Staff insisted, *inter alia*, that because it was singularly addressed to implementation of the FSP rather than the adequacy of the FSP as approved by the Staff in April 2006, Contention B-2 is beyond the scope of this proceeding (10 C.F.R. § 2.309(f)(1)(iii)). *See* NRC Staff Response at 9-27; Army Response at 6-24.

On May 1, 2007, the Board ruled that, to the extent Intervenor's Contention B-2 was addressed to the Licensee's conduct in implementing its FSP, it was inadmissible. To the extent it was, instead, a challenge to the adequacy of the FSP as submitted in May 2005, approved by the NRC

Staff in April 2006, and subsequently supplemented, the challenge was deemed subsumed within the context of previously admitted Contention B-1. *See* LBP-07-07, 65 NRC 507, 513 (2007).

Having previously admitted STV's fundamental challenge as to whether what the Army proposed to do by way of site characterization is, in fact, adequate to accomplish the granted amendment's objective, or whether it must be otherwise modified or conditioned by the Board, we ruled that STV could attempt to demonstrate through expert testimony at the evidentiary hearing that what the FSP currently calls for is not sufficient to achieve that objective and that additional sampling procedures should be required by the Board. *Id.*

The Board explained that what cannot be entertained in this proceeding are claims that the Army is not carrying out the express terms of the license amendment that was approved by the NRC Staff. The failure of a licensee to fulfill responsibilities associated with a license amendment issued by the Staff gives rise to an enforcement issue that does not come within the purview of a license amendment adjudication. Rather, in such circumstances, the available remedy is the filing of a petition with the appropriate division director pursuant to 10 C.F.R. § 2.206, calling attention to the asserted failure of the licensee to meet its license obligations and requesting the taking of appropriate remedial action. *Id.* at 513-514.

On May 15, 2007, the Board issued its scheduling order in preparation for the evidentiary hearing on STV's admitted Contention B-1. Pursuant to that order and approved extensions of time:

- STV prefiled its initial statement of position, testimony and exhibits on July 13 and 20, 2007;
- The Army and the Staff filed their initial statement of position, testimony and exhibits

on August 27, 2007;

- STV prefiled its response and rebuttal testimony and exhibits on September 18, 2007;
- The Army and the Staff filed their replies and sur-rebuttal testimony and exhibits on October 2, 2007; and
- STV prefiled its reply and sur-rebuttal testimony on October 9, 2007.

The hearing in this matter was convened in City Hall in Madison, Indiana on October 22, 2007. At the outset of the hearing, the Board Chair explained the purpose of the hearing in these terms:

Broadly speaking the purpose of the characterization is to determine the current safety and environmental significance, if any, of the radioactivity associated with the depleted uranium munitions still on site. What brings us here today is a challenge to the adequacy of the Army's field sampling plan to accomplish its intended objective. That challenge has been mounted by a local organization, Save the Valley. Asserting that the field sampling plan satisfies all requirements imposed by NRC regulations, and will accomplish its intended purpose, both the Army and the Commission's technical staff oppose Save the Valley's challenge to the field sampling plan.

In accordance with NRC hearing procedures, each of the three parties to this proceeding has already submitted in writing the testimony of the witnesses in support of its position on the adequacy of the field sampling plan. The principal purpose of this hearing is to enable the members of the board to ask such questions of those witnesses as might be suggested by their written prefiled testimony.

October 22, 2007 Hearing Transcript ("Transcript"), at 78-79.

Prior to the receipt of evidence and the questioning of witnesses, the Board held oral argument by counsel pursuant to its Memorandum and Order of October 11, 2007, on the following legal issues:

- I. What are the legal requirements governing the grant of this alternative schedule application?

2. What are the legal requirements governing the acceptability of a site characterization submitted in support of a decommissioning plan?

Transcript, at 82-128.

Thereafter, the Board admitted into evidence the prefiled testimony and exhibits of the following witnesses for each of the parties:

STV – Diane Henshel, Ph.D., Charles Norris, LPG, and James Pastorick;

Army – Harold W. Anagnostopoulos, Joseph N. Skibinski, Michael L. Barta, Todd D. Eaby, and Stephen M. Snyder;

Staff – Dale Condra, Adam Schwartzman, Tom McLaughlin, Ph.D., Jon Peckenpaugh, and Christianne Ridge, Ph.D.

Transcript, at 128-132.

Pursuant to the Board's order of October 11, 2007, the witnesses were then questioned by the members of the Board on the following three topics in the order listed:

1. Biota and Air Sampling: Dr. Henshel (STV), Mr. Condra (Staff), Mr. Schwartzman (Staff), Dr. McLaughlin (Staff), Mr. Barta (Army), Mr. Anagnostopoulos (Army), Mr. Skibinski (Army). Transcript, at 134-221.

2. Karst Geology (Well Locations, FTA Study, EI Study, UXO Issues): Mr. Norris (STV), Mr. Pastorick (STV), Mr. Peckenpaugh (Staff), Mr. Eaby (Army), Mr. Snyder (Army). Transcript, at 221-282.

3. Soil, Water, and Sediment Sampling and Sample Analysis Methods: Mr. Norris (STV), Mr. Condra (Staff), Dr. Ridge (Staff), Mr. Anagnostopoulos (Army), Mr. Eaby (Army), Mr. Snyder (Army). Transcript, at 282-310.

Following the hearing, all parties submitted their proposed findings of fact, conclusions of law, and initial decisions on December 7, 2007, and their replies on December 19, 2007.

II. GOVERNING LAW

The Army has requested Commission approval for an alternate schedule for submittal of a decommissioning plan for the JPG DU site pursuant to 10 C.F.R. § 40.42(g)(2). This regulation provides:

The Commission may approve an alternate schedule for submittal of a decommissioning plan required pursuant to paragraph (d) of this section if the Commission determines that the alternative schedule is necessary to the effective conduct of decommissioning operations and presents no undue risk from radiation to the public health and safety and is otherwise in the public interest.

Thus, in order to approve the Army's request, the Commission must reach three conclusions regarding the alternate schedule, namely that it (1) is "necessary to the effective conduct of decommissioning operations," (2) "presents no undue risk from radiation to the public health and safety," and (3) "is otherwise in the public interest." STV Contention B-1 – the only contention which has been admitted in this matter – challenges in a number of specific respects the ability of the Army's FSP to achieve its intended purpose, i.e. the adequate characterization of the JPG DU site within the five-year period contemplated by the alternate schedule. According to STV, Commission approval of the alternate schedule without conditions requiring modifications of the FSP to correct its deficiencies would be inconsistent with both "the effective conduct of decommissioning operations" and "the public interest." *See Hearing Transcript*, at 99-127.

No case has been cited by the parties where the Commission has previously interpreted or applied 10 C.F.R. 40.42(g)(2) to the review of an alternate schedule request, nor are we aware of any. Thus, the interpretation and application of this regulation is a matter of first impression.

Accordingly, we must construe and apply this regulation “in a manner that is in accord with public health and safety and general administrative law principles.” *Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2)*, CLI-99-10, 28 N.R.C. 573, 596 (1988). In particular, the starting point in interpreting any regulation is giving effect to the language and structure of the provision itself. *See, e.g., Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1)*, ALAB-900, 28 NRC 275, 288, *review declined*, CLI-88-11, 28 NRC 603 (1988). In undertaking this task, we must bear in mind the elementary canon of construction that the regulation should be interpreted so as not to render any part inoperative; the whole of the regulation must be given effect. *See, e.g., Mountain States Tel. & Tel. Co. v. Pueblo of Santa Ana*, 472 U.S. 237, 249-50 (1985). Further, “[a]lthough administrative history and other available guidance may be consulted for background information and the resolution of ambiguities in a regulation’s language, its interpretation may not conflict with the plain meaning of the wording used in that regulation.” *Shoreham*, ALAB-900, 28 NRC at 288.

A. Legal Standard for “Adequate” Site Characterization

Within the plain meaning of the regulation, adequate site characterization is clearly “necessary for effective decommissioning operations.” 10 C.F.R. § 40.42(g)(2) is a subsection of 10 C.F.R. § 40.42 and must be interpreted and applied in the context of that entire regulation. Subsection 40.42(g)(2) makes express reference to the subsequent submittal of a decommissioning plan as required by subsection 40.42(d). The requisite elements of a decommissioning plan required by subsection 40.42(d) are, in turn, described in subsection 40.42(g)(4). Of particular relevance here, subsection 40.42(g)(4) expressly provides that “[t]he proposed decommissioning plan for the site . . . must include: (I) A description of the conditions of the site . . . sufficient to evaluate the acceptability

of the plan.” Thus, to be adequate for purposes of “effective decommissioning operations,” a site characterization plan must result in “a description of the conditions of the site sufficient to evaluate the acceptability of the [site decommissioning] plan.”

This interpretation of the regulation is not only required by its plain meaning but is also consistent with the prior rulings of the Board and the previously stated positions of both the Army and the Staff.

STV Contention B-1 reads, "As filed, the FSP is not properly designed to obtain all of the verifiable data required for reliable dose modeling and accurate assessment of the effects on exposure pathways of meteorological, geological, hydrological, animal, and human features specific to the JPG site and its surrounding area." STV Petition at 17. In admitting STV's Contention B-1 and granting the associated request for hearing in this proceeding, the Board stated:

Whether the FSP is "properly designed" to assess accurately "the effects on exposure pathways . . . specific to the JPG site and its surrounding area," STV Petition at 17, is relevant to the effectiveness of the Licensee's decommissioning operations. If the methods proposed in the FSP do not actually provide for the accurate identification of all potential water conduits, including any significant karst features, the Licensee will be unable to conduct effectively decommissioning operations. In that regard, if, during the five-year period proposed in the current request, the Licensee fails to identify all potential water conduits, there will be an "undue risk" of radiation exposure to the public. Any unidentified water conduits could provide a pathway for radiation release to the area surrounding the JPG site. Clearly, preventing such an occurrence is "otherwise in the public interest." Thus, Contention B-1 and its supporting basis (a) are within the scope of this proceeding.

The fourth requirement, 10 C.F.R. § 2.309(f)(1)(iv), provides that the "issue raised in the contention is material to the findings the NRC must make." In connection with its determination as to whether the Licensee should be granted an alternate schedule (to allow five additional years to submit its decommissioning plan), the Staff presumably will have to consider whether the Licensee's FSP enables the latter to locate accurately all available pathways for radiation exposure. The adequacy of the FSP during this five-year proposed period goes to the heart of what is necessary for the effective conduct of decommissioning operations, and whether there is a potential undue risk to the public from radiation exposure.

LBP-06-06, at 23.

Subsequently, the Board admitted an additional basis for Contention B-1. In so doing, the Board stated:

A portion of Contention A-1 appears . . . to be concerned with site characterization and, therefore, is subsumed under Contention B-1 – namely, the claim that the "aquifer underlying the JPG site is not sufficiently characterized to demonstrate its extent and gradient." STV Final Contentions at 6. Without proper characterization of the aquifers, the Licensee will have insufficient knowledge of the direction and gradient of potential contaminants traveling through the aquifers in the area. This presents a significant problem in that all parties acknowledge the possible existence of individuals near the JPG site who use private wells for drinking water. See *id.*; NRC Staff Response at 16; Army Response at 6. Given this fact, proper aquifer characterization is "necessary to the effective conduct of decommissioning operations." 10 C.F.R. § 40.42(g)(2). Thus, while the challenge to the ERMP is inadmissible, a specific and adequately supported challenge to the characterization of the aquifer is admitted for litigation in the context of Contention B-1.

LBP-06-27, 64 NRC 438, 449-450 (2006).

Most recently, the Board ruled that STV's proffered Contention B-2, to the extent that it was admissible, had been subsumed within previously admitted Contention B-1. In this ruling, the Board stated:

Were the Board to determine that the Licensee's FSP was not acceptable, it perforce would follow that at least one of the requirements for the grant of an alternate schedule for the submission of a decommissioning plan have not been met. Among other things, 10 C.F.R. § 40.42(g)(2) specifies that the alternate schedule must be "necessary to the effective conduct of decommissioning operations." As applied to this case, the clear contemplation of this very specific regulatory criterion is that, at the end of the day, the proposed FSP – central to the granted alternative schedule – will bring about a satisfactory decommissioning plan.

LBP-07-07, 65 NRC 507, 510 (2007).

The Board also previously found that, in explaining why the FSP had been worth the long wait preceding its submission and justified a further five-year delay in the submittal of a JPG DU site decommissioning plan, the Army expressly represented to the Commission that it was seeking "NRC

approval of an alternate schedule for submittal of a decommissioning plan . . . and one 5 year period for the execution of appropriate site characterization, with the Army presenting the NRC a definitive license termination plan at the end of that period.” See LBP-05-25, 62 NRC 435, 438 (2005) (quoting July 8, 2005 Army Response to Commission Order of June 20, 2005, at 10). The Board has also concluded:

Any doubt that the NRC Staff viewed the FSP in this same light in approving the alternate schedule would appear to be dispelled by the observation in its SER:

In summary, the activities described by the Army in its FSP and addendum as supplemented in its follow-up responses, should provide adequate site characterization information such that the Army could submit an acceptable [decommissioning plan] within 5 years and are therefore necessary for the effective conduct of decommissioning operations.

Id. (quoting SER at 8).

Thus, we conclude that the legal standard for the Board to evaluate the adequacy of the FSP is whether it will result in a description of the conditions of the JPG DU site sufficient to evaluate the acceptability of the Army’s decommissioning plan for the site.

B. Legal Requirements for Site-Specific Information Provided by the FSP for JPG DU Site Characterization To Be Sufficient to Evaluate the JPG DU Site Decommissioning Plan.

There can be no doubt that there is a profound difference in view between STV on one hand and the Army and the Staff on the other with respect to the requirements the FSP must meet in order to achieve its intended purpose in relation to eventual decommissioning of the JPG DU site.

Specifically, the Staff and/or the Army differ with STV with respect to three key issues regarding the formulation of an adequate FSP:

1. Whether the FSP must be designed to provide the site-specific information required to permit the Army’s Decommissioning Plan to meet the legal standards of 10 C.F.R. § 20.1403?

2. Whether the FSP must be designed to provide the site-specific information required to permit the Environmental Report accompanying the Army's Decommissioning Plan to meet the legal standards of 10 CAR §§ 51.45, 50 & 102-103?

3. If the FSP must be designed to provide the information required for the Army's Decommissioning Plan to meet the legal standards of 10 CAR § 20.1403 and the accompanying Environmental Report to meet the legal standards of 10 CAR §§ 51.45, 50 & 102-103, what site-specific information must the Army collect, analyze and present in the FSP to meet those standards?

1. 10 CAR § 20.1403

STV believes that the FSP must provide the information required in order for the Army's Decommissioning Plan to meet the legal standards of 10 CAR § 20.1403. *See* STV Initial Statement of Position, at 3-4; STV Reply, at 5-7, 8-10, 12. The Army agrees. *See* Army Statement of Initial Position, at 4. However, the Staff disagrees, stating that the requirements of 10 CAR § 20.1403 are "not applicable" to the present proceeding. *See* Staff Statement of Initial Position, at 5 note 2.

The Army has made it clear that it intends to submit a Decommissioning Plan for the JPG DU site to support license termination under restricted conditions and the FSP is expressly premised on that stated intent. *See* FSP, at § 4-1. 10 CAR § 20.1403 expressly provides that "[a] site will be considered acceptable for license termination under restricted conditions only if it meets the requirements of that section of the Commission's regulations. Moreover, NUREG 1757 Vol. 2, Rev. 1, § 5.2 expressly states:

NRC staff should review the information provided in the DP pertaining to the licensee's assessment of the potential doses resulting from exposure to residual radioactivity remaining at the end of the decommissioning process. The findings and conclusions of the review under this section should be used to evaluate the DP's compliance with 10 CAR 20.1403.

Accordingly, it is manifest that, to be adequate, the FSP must include the tests and provide the information necessary for the Army to develop a restricted release decommissioning plan for the JPG DU site which meets the requirements of 10 CAR § 20.1403. Thus, the basic purpose of the Army's FSP is to develop the site-specific parameters for the JPG conceptual site model ("CSM") that are required to predict with reasonable assurance the Total Effective Dose Equivalent ("TEDE") from residual radioactivity distinguishable from background to the average member of the critical group, both with and without the institutional controls for license termination under restricted conditions proposed by the Army pursuant to 10 CAR 20.1403. *See* FSP § 4-1.

Specifically, the FSP must include the tests and provide the information necessary for a JPG DU site decommissioning plan to meet requirements which include the following:

(a) The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of § 20.1402 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are ALARA. Determination of the levels which are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal;

(b) The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE [Total Estimated Dose Equivalent] from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) per year;

....

(e) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either--

(1) 100 mrem (1 mSv) per year; or

(2) 500 mrem (5 mSv) per year provided the licensee--

(I) Demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of paragraph (e)(1) of this section are not

technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;

(ii) Makes provisions for durable institutional controls;

(iii) Provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site, both to carry out periodic rechecks of the site no less frequently than every 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of § 20.1403(b) and to assume and carry out responsibilities for any necessary control and maintenance of those controls. Acceptable financial assurance mechanisms are those in paragraph © of this section.

10 C.F.R. § 20.1403; *see also* FSP § 4-1. In addition, the FSP must be conducted with recognition that, “[w]hen calculating TEDE to the average member of the critical group the licensee shall determine the peak annual TEDE dose expected within the first 1000 years after decommissioning.” *See* 10 CAR § 20.1401(d).

2. 10 CAR §§ 51.45 and 51.50

STV believes that the FSP must provide the information required in order for the Environmental Report accompanying the Army’s Decommissioning Plan to meet the legal standards of 10 C.F.R. §§ 51.45 and 51.50. *See* STV Reply, at 7-8, 10-12. The Army and the Staff both disagree, stating that such requirements do not apply to the FSP. *See* Army Hearing Ex. 3, Skibinski Surrebuttal Testimony, at 3; Staff Surreply, at 10.

Pursuant to 10 CAR § 51.50, the Army will be required to submit an Environmental Report on its proposal to decommission the JPG DU site for restricted release. Because the JPG DU site will be proposed for restricted release, it will be a Group 6 site. As a result, the independent analysis to be performed by the Commission Staff will be an Environmental Impact Statement (EIS). *See* NUREG-1757, Vol. 1, Rev. 2, Table 15.3.

Thus, the Army will be required be required to prepare and submit an Environmental Report

which will provide sufficient information to the Staff to prepare the EIS. This requirement is expressly recognized in License Amendment No. 13:

The Army shall submit a decommissioning plan for NRC review and approval under an alternate schedule identified in its May 25, 2005, Field Sampling Plan, its responses to action items from a September 8, 2005, public meeting by letter dated October 26, 2005, its Field Sampling Plan addendum dated November 2005, and its responses to NRC's request for additional information by letter dated February 9, 2006, by the end of 2011 or earlier. **The Army will also submit an Environmental Report using the guidance in NUREG-1748 for NRC to use in preparing an Environmental Impact Statement.**

See Staff Exhibit 13 (emphasis added).

This Report must provide sufficient information and analysis regarding the environmental impacts of the proposal “to aid the Commission in its development of an independent analysis.” *See* 10 CAR § 51.45©. “The analyses for environmental reports shall, to the fullest extent practicable, quantify the various factors considered. To the extent that there are important qualitative considerations or factors that cannot be quantified, those considerations or factors shall be discussed in qualitative terms.” *See id.*

3. Site-Specific Information Required

To satisfy the legal requirements of 10 CAR § 20.1403 and §§ 51.45 and 51.50, NRC guidance specifies the site-specific information which the FSP must provide.

a. To Satisfy 10 CAR § 20.1403

To qualify the JPG DU site for restricted release, the Army will have to show that it “has residual radiological contamination present in building surfaces, soils, and possibly the ground water.” *See* NUREG-1757, Vol 1, Rev. 2, § 7.8. The Army will also need to demonstrate that “proposed residual radioactivity at the facility is in excess of the levels specified in NRC criteria for unrestricted use but within the levels specified for restricted use (10 CAR 20.1403) by applying site-specific

criteria in a comprehensive dose analysis.” *See id.* As a Group 6 site, the JPG site will “require extensive NRC review” individualized on “a case-by-case basis.” *See id.*

To satisfy the requirements of 10 C.F.R. § 20.1403, the Army must submit information for the site – at a minimum – regarding

the source term, exposure scenario(s), conceptual model(s), numerical analyses (e.g., hand calculations or computer models), and uncertainty have been included. NRC staff should review the abstraction and assumptions regarding the source term, the conceptual model of the site or building as appropriate, the exposure scenario(s), the mathematical method employed, and the parameters used in the analysis and their uncertainty.

See NUREG-1757, Vol. 2, Rev. 1, § 5.3. More specifically, the Commission has described the required information as follows:

- the source term information including nuclides of interest, the configuration of the source, the areal variability of the source, and so forth;
- a description of the compliance scenarios (for institutional controls both in place and not in place) including a description of the critical group;
- a description of any other reasonably foreseeable or less likely but plausible scenarios considered;
- a description of the conceptual model of the site including the source term, physical features important to modeling the transport pathways, and the critical group;
- the identification, description and justification of the mathematical model used (e.g., hand calculations, DandD v2.1, RESRAD v6.1);
- a description of the parameters used in the analysis;
- a discussion about the effect of uncertainty on the results; and
- input and output files or printouts, if a computer program was used.

See id.

Based on this information,

NRC staff should determine the acceptability of the licensee's projections of radiological impacts on the average member of the critical group during the compliance period from residual radioactivity. The information in the DP is acceptable if it is sufficient to ensure a defensible assessment of the possible future impacts from the residual radioactivity. The licensee's assessment can be either realistic or prudently conservative. The information should allow an independent NRC staff evaluation of the assumptions used (e.g., source term configuration, applicable transport pathways) and possible doses to the average member of the critical group.

See id.

The Army's projections of compliance with the regulatory criteria for restricted release will be acceptable only if NRC staff has reasonable assurance of all the following:

1. The licensee has adequately characterized and applied its source term.
2. The licensee has analyzed the appropriate scenario(s) and that the exposure group(s) adequately represents a critical group.
3. The mathematical method and parameters used are appropriate for the scenario and parameter uncertainty has been adequately addressed.
4. For deterministic analyses, the peak annual dose to the average member of the critical group is in compliance with the 10 CFR 20.1403(b) or 20.1403(e) dose criteria, as appropriate.
5. For probabilistic analyses, the "peak of the mean" dose distribution to the average member of the critical group for the appropriate exposure scenario(s) for the option is in compliance with the 10 CFR 20.1403(b) or 20.1403(e) dose criteria, as appropriate.
6. Either one of the following:
 - a. The licensee has committed to using a specific scenario, model and set of parameters with the final survey results to show final compliance with the dose limit.
 - b. The licensee has committed to using radionuclide-specific DCGLs and should ensure that the total dose from all radionuclides will meet the requirements of Subpart E by using the sum of fractions.

See id.

b. To Satisfy 10 CFR §§ 51.45 and 51.50

In order to permit the Staff to prepare an EIS for the proposed restricted release of the JPG DU Site, the Army will be required to provide information on the following characteristics of the site in its Environmental Report: Land use; Transportation; Geology and soils; Water resources; Ecology; Meteorology, climatology, and air quality; Noise; Historical and cultural resources; Visual/scenic resources; Socioeconomic; Environmental justice; Public and occupational health; and Waste management. *See* NUREG-1748, § 6.3. The Report must also assess the impacts of the Army's decommissioning proposal (as well as reasonable alternatives) on each of these characteristics. *See* NUREG-1748, § 6.4. In making this assessment, the Report must consider direct, indirect, and cumulative impacts, described in NUREG-1748 as follows:

Direct and Indirect Impacts (Sec. 4.2.5.1)

Direct impacts, or effects, are caused by the action and occur at the same time and place. Indirect impacts, or effects, are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. A detailed definition is provided in 40 CFR 1508.8 and describes the following areas of impact: ecological; aesthetic; historical; cultural; economic; social; and health. Both radiological and nonradiological impacts should be discussed. A section on radiological dose impacts should always be provided, including both direct and indirect radiation dose impacts to humans and environmental pathways. Both geographic and temporal boundaries for each resource should be identified to assist with the discussion of cumulative impact analysis findings discussed below. The EIS author should focus on resource areas where there are impacts. The impacts should be assessed over the expected lifetime of the action (e.g., expected duration of the site) and beyond. Although impacts may exist, they may not be significant. Also, an impact which is not significant does not equate to "no impact." Describe the assessment of impacts from all resources, even those for which an impact was not found.

Cumulative Impacts (Sec. 4.2.5.2)

Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

Examples of cumulative impacts that may be considered: Pollutant discharges into surface water; Deterioration of recreational uses from loading water bodies with discharges of sediment, nutrients, or thermal effluents; Reduction or contamination of ground water supplies; or Physically segmenting a community through incremental development.

c. NRC Record of Decision on JPG DU Site Decommissioning Plan

Ultimately, the information required for a JPG DU restricted release decommissioning plan to satisfy both 10 CFR § 20.1403 and 10 CFR §§ 51.45 and 51.50 will all be brought together in the NRC Record of Decision (ROD) required by 10 CFR §§ 51.102-103. The Final EIS, as well as the Safety Evaluation Report (SER), will form the basis for the NRC decision to approve or deny the Army's plan and associated license amendment or termination. To document the NRC's decision and the process which led up to it, the agency will prepare a concise public ROD that states: (i) what the decision is; (ii) all alternatives considered by the NRC and specifying the alternative(s) considered to be environmentally preferable; (iii) preferences among alternatives based on relevant factors; (iv) whether the NRC has taken all practicable measures within its jurisdiction to avoid or minimize environmental harm from the selected alternative and if not, explain why; and (v) summarize any license conditions or monitoring programs adopted as mitigation measures, if applicable.

Thus, the FSP must include the tests and provide the information regarding JPG DU site characterization ultimately necessary for inclusion in the Final EIS and SER which will provide the basis for the NRC's Record of Decision on the eventual license amendment or termination associated with restricted release of the site.

C. Timing of "Adequate" Site Characterization

Whatever the legal standard for "adequate" site characterization, the Board has also detected a difference among the parties as to the required timing for that state of affairs to be achieved. In

particular, STV has espoused the position that the FSP must be designed to achieve additional site characterization sufficient to support a restricted release decommissioning plan and environmental report within the five-year period of the alternate schedule. *See* Transcript, at 123. By contrast, the Army and the Staff have adopted the position that the FSP must be designed only to achieve additional site characterization that would be necessary but not sufficient to support the Army's decommissioning plan. *See* Transcript, at 91, 99.

All parties cite 10 C.F.R. §§ 40.42(g)(2) in support of their respective positions. In particular, the Army and the Staff argue that the first requirement of Subsection 40.42(g)(2) includes only the word "necessary" and not the phrase "necessary and sufficient" (i.e., "necessary to the effective conduct of decommissioning operations"). *See* Transcript, at 87-91, 95-99. By contrast, STV argues that the first requirement of Subsection 40.42(g)(2) relating to "effective decommissioning" must be read in conjunction with subsection 40.42(g)(4)(i) which does include the word "sufficient" (i.e., "sufficient to evaluate the acceptability of the [decommissioning] plan") and therefore renders superfluous the inclusion of the word "sufficient" in Subsection 40.42(g)(2). *See* Transcript, at 121-124. Alternatively, STV argues that, even if there are cases where a five-year alternate schedule could be approved for additional characterization less than that "sufficient to evaluate the acceptability" of the associated site decommissioning plan, this case is not one of them. In particular, STV points out that the license amendment issued by the Staff in conjunction with its approval of the alternate schedule calls for the submittal of the decommissioning plan and environmental report at the conclusion of the five-year deferral period rather than at some later time. Additionally, STV points out that decommissioning at the JPG DU site has already been delayed for thirteen years and a further five-year delay would not be "otherwise in the public interest" as required by the third requirement of

Subsection 40.42(g)(2) unless the site characterization achieved during the additional delay would be “sufficient to evaluate the acceptability” of the associated decommissioning plan. *See* Transcript, at 124-127.

The Commission has declined to adopt a “bright line” test for precisely how “complete” or “final” a site characterization must be at the time a decommissioning plan is filed. Instead, in *Yankee Atomic Elec. Co. (Yankee Nuclear Power Station)*, 61 NRC 365 (2005), the Commission adopted a “site-specific” approach to the issue which allowed licensees to conduct ongoing monitoring, confirmatory investigations, and required surveys (e.g., the final site survey) to provide additional data during the decommissioning process itself but required:

At a minimum, the site characterization and remediation plans must provide sufficient information to allow the NRC to determine the extent and range of expected radioactive contamination, to determine whether estimates for remaining decommissioning costs are reasonable, to determine the likely schedule for remaining activities, and to support the final site survey to verify compliance with Part 20 release limits - the ultimate goal of the decommissioning process. With respect to an adequate site characterization, it seems reasonable to interpret the regulation as requiring LTP submissions to contain the type of information discussed in the NUREG-1700 acceptance criteria, including a reasonably bounded discussion of future activities to refine site characterization information.

Id. at 377.

Given the circumstances of this case, the Board concludes that the STV interpretation is the one consistent with the plain meaning of both the regulation and the license amendment in question here. In particular, we note that Subsection 40.42(g)(2) is an integral part of a larger rule that the Commission adopted for the purpose of achieving “timely” decommissioning of sites such as JPG. In that context, the Board believes that the public interest does require that the FSP provide for completion of all site characterization activities required to provide the information necessary for approval of the Army’s restricted release decommissioning plan by the time that plan is submitted in

accordance with the License Amendment No. 13. We also note that, in requesting and issuing the license amendment authorizing the alternate schedule at issue here, both the Army and the Staff expressly contemplated that all site characterization activities necessary for approval of an Army decommissioning plan to be submitted not later than 2011 would be completed within an intervening deferral period not exceeding five years. *See* LBP-05-25, 62 NRC 435, 438 (2005).

D. Purpose of Evidentiary Proceeding

In LBP-07-07, the Board defined the purpose of the recently completed evidentiary hearing on previously admitted STV Contention B-1 as follows:

This Board has admitted Intervenor's fundamental challenge as to whether what the Licensee informed the NRC Staff it proposed to do by way of site characterization is, in fact, adequate to accomplish the granted amendment's objective, or whether it must be otherwise modified or conditioned by the Board. See 10 C.F.R. § 40.42(g)(2). It is thus open to Intervenor to assert and to attempt to demonstrate through expert testimony at the evidentiary hearing that what the FSP currently calls for is not sufficient to achieve that objective and that additional sampling procedures should be required by the Board. Intervenor's Contention B-I alleges precisely that, which is the reason the Board deemed it admissible. LBP-06-27, 64 NRC at 447-48.

To the extent... that Intervenor's Contention B-2 seeks to assert that the Licensee's implementation of the FSP demonstrates that the FSP - as proposed - is inadequate to achieve its stated purpose of developing a decommissioning plan, such a challenge is subsumed in previously admitted Contention B-1. That being so, the information (including data) cited in support of inadmissible Contention B-2 may be relied upon by Intervenor in the evidentiary hearing to be held on already-admitted Contention B-I - which, once again, challenges the adequacy of the FSP to accomplish its intended site characterization purpose.

What will be open for consideration at the evidentiary hearing, under the aegis of previously admitted Contention B-1, is whether the approved FSP is adequate to accomplish its intended objective. In this regard, Intervenor will be entitled to put forth in its written presentations any then-existing data or information that it might deem to demonstrate a need for undertakings above and beyond those required (or reasonably contemplated) by the approved FSP.

LBP-07-7, 65 NRC 507, 514 (2007).

III. FINDINGS OF FACT

There are a number of factual issues among the parties regarding the activities and results required for “adequate” characterization of the JPG DU site. The Board makes the following findings to resolve these issues.

A. Hydrogeologic Sampling Relating to Karst Terrain

There are three principal factual issues among the parties relating to the hydrogeologic sampling of the karst terrain at the JPG site. These are (1) need for and timing of a seepage run study; (2) additional measures necessary to characterize the karst terrain; and (3) needed modifications to and timing of sampling measures for significant karst features. Each is discussed below.

(1) Need for and Timing of Seepage Run Study

a. Relevant FSP Provisions

The FSP postulates flows from the groundwater aquifer system to the surface water system (NRC Staff Exhibit 14, at 6-9). The FSP postulates stream flows to contain both groundwater flow and flow that directly results from precipitation (*id.*). The FSP as amended provides for the continuous measurement of stream stage (water height) at multiple locations and periodic stage measurements at a single location (NRC Staff Exhibit 17, at 2-1 and 2-2). From the stream stages, stream discharge rates will be calculated (NRC Staff Exhibit 17, at 5-1). From temporal patterns of stream discharges, the FSP postulates distinguishing between groundwater discharge as baseflow into the stream and precipitation-related discharge (*id.*).

Streams, at JPG not only gain water from groundwater that discharges to them, they also lose

water to groundwater where streams provide recharge to the groundwater system (NRC Staff Exhibit 19, at 2-17). The head (water elevation) data from some environmental monitoring wells support the interpretation that Big Creek loses water to the groundwater system (STV Exhibit 1, Norris pre-filed rebuttal as 30). The FSP is silent with respect to characterization of the flow of water from streams into the karst groundwater system, the locations where such losses occur, the rates, at which the losses occur, and the ultimate fate of the lost water. The FSP is silent on how such transfers points can be located and how the transfers can be measured. The FSP is silent as to the identification of localized stream/conduit interconnections as a means to identify which karst conduit features are demonstrably significant to the hydrogeology of the DU impact area and potentially significant to the transport of uranium within and from that area.

b. STV Position

Streams that intersect significant karst conduit features often have reaches which show measurable increases or decreases in stream flow (seepage gains or losses) depending upon whether the conduit discharges to the stream or recharges from the stream (STV Exhibit 1, Norris pre-filed direct, at 29). These reaches are most discernible and the measurement of the gain to or loss from the stream is most reliable during periods of low stream flow, when the gains or losses are larger relative to stream flow (Transcript, at 243, 262). It is not necessary to be at the absolute minimum stream flow to perform a seepage run (Transcript, at 262). Mapping the locations and nature of the seepage (gain or loss) requires multiple contemporaneous flow measurements along the length of a stream, rather than continuous measurements at individual points (Army Exhibit 5, Snyder pre-filed testimony, at 36 and 37).

Performing such a seepage run allows three fundamental elements of site characterization for a

karst area to be identified. First, the locations of seepage changes to stream flow denote points where karst conduits intersect the stream bed, *i.e.*, known points on individual conduits can be used to help map the entire conduit system (STV Exhibit 1, Norris pre-filed direct as 35, 67). Second, the conduits that are identified in a seepage run are inherently significant karst features because they are ones that are by observation known to connect the groundwater and surface water systems and to convey enough water to impact contaminant transport in and from the area (STV Exhibit 1, Norris pre-filed rebuttal, at 25), irrespective of whether the source of that contamination is recharge from the stream or recharge from other areas (Transcript, at 265-266). Third, the seepage points represent ideal monitoring or testing locations for procedures such as tracer studies to identify the source areas of stream gains or the discharge points of stream losses, which is fundamental to characterizing transport through the karst system (Transcript, at 262-263).

With respect to the design of an efficient characterization program for this site, seepage runs of streams crossing the DU impact area provide detail on the baseflow budget of the streams, allowing better placement of continuous stream gauging locations that are to be used for baseflow separation (STV Exhibit 1, Norris pre-filed rebuttal, at 33; STV Exhibit 1, Norris pre-filed surrebuttal, at 19). They allow optimization of the selection of locations for characterization wells by ranking potential locations with independent hydrologic data reflecting their significance as active conduits (STV Exhibit 1, Norris pre-filed direct, at 67). Because of the multiple uses of identified points and quantities of seepage exchange between streams crossing the DU impact area and the significant karst conduits, seepage runs ideally would be run before the selection of characterization wells and continuous stream gauging locations, but in any case as soon as possible in a characterization program (Transcript, at 234; STV Exhibit 1, Norris pre-filed direct, at 67-68; (STV

Exhibit 1, Norris pre-filed rebuttal, at 33).

c. Army Position

The Army, as cited above, acknowledges and understands the methodologies and uses of seepage runs. The Army also describes experience in performing seepage runs (Army Exhibit 5, at 36-37). The Army is satisfied that its method of selecting locations for characterization wells is adequate without the need to prioritize potential locations based upon identified hydraulic connections to streams crossing the site (Army Exhibit 5, at 7). The Army maintains its surface water gauging stations are adequate for purposes of baseflow separation without knowing the locations or magnitudes of stream losses relative to the locations being gauged (Army Exhibit 5, at 42).

Although the Army position is consistently against the need for a seepage run, the FSP contains no program for a seepage run, and there are no addenda that have added a seepage run program, the Army stated at the hearings that identifying losing reaches of streams was part of their characterization program (Transcript, at 263). The Army maintains that if it is subsequently shown to be necessary to map a conduit associated with a losing reach of a stream, that mapping could be performed at that later time (Transcript, at 263-264). The criterion for necessity in this case is that the conduit from a losing reach of the stream could be mapped if it were established, during the remaining life of the 5-year characterization period, that the water being lost from the stream were contaminated with depleted uranium (Transcript, at 264-265).

d. Staff Position

The Staff position with respect to the need for seepage runs has changed with time (Transcript, at 242). The Staff agrees with the Army that, at this point, seepage runs are not necessary (NRC Staff Exhibit 7, at 4), but it is not clear what criterion or criteria the Staff would use

to determine a necessity for later runs. One argument advanced by the Staff in discounting the need for a seepage run has to do with timing. As presented, the position of the Staff is that, having delayed performing a seepage run until a full year of data has been collected to determine what constitutes low-flow, there may no longer be time to incorporate such a study in the FSP (Transcript, at 242).

e. Board Finding

All parties agree there are or may be losing reaches of site streams, reaches where the streams recharge groundwater rather than receive discharge from groundwater. Historical documents for the JPG expressly reference the losing reaches for site streams. The importance of losing stream reaches to characterizing the hydrogeology of the site and reliably modeling it is fundamental, perhaps critical. At a minimum, the losing reaches are points of transfer of potentially contaminated surface water into the karst groundwater system. But, more importantly, they confirm a flow path from a site stream into the groundwater to an unknown discharge point, perhaps in the same stream valley downstream of monitoring or perhaps to a different valley entirely. Any DU in that conduit pathway, whether from the losing stream or from other recharge to the conduit, is flowing potentially undetected and unmonitored under the current characterization program.

The FSP does not include the seepage runs necessary to identify the losing reaches. There are no scheduled addenda that would add such seepage runs. In the absence of any identified program that is designed to map streams to locate gaining and losing reaches of the site streams, the Army's testimony at the hearings that identifying such losing reaches is part of the characterization program of the FSP is not credible.

Further, the Army's position that it is necessary to map the conduit(s) responsible for a losing reach of a stream only if the stream water is presently contaminated with DU is untenable. Inherent in

the Army's criterion of necessity are the flawed assumptions that the characterization obtained from seepage runs is not needed to understand the site hydrogeology, that the only source of contamination to a conduit receiving water from a stream is the stream, and that contamination in the stream will never be greater than contamination detected during the 5-year characterization period. None of these assumptions is supported by general hydrogeological principles or specific evidence cited in the record before us.

The position of the Staff that delayed timing of seepage run studies renders them less necessary is also untenable. Never performing necessary characterization studies is an unacceptable alternative to performing them later than would have been preferable.

The Board finds that identifying the locations of gaining and losing reaches of streams crossing the DU impact area is fundamentally necessary for characterization of the site. The necessity of integrating those reaches with the karst flow system(s) is not a function of current DU contamination in the stream; it is a function of the need to know how and where groundwater and surface water flow within the DU impact area and where groundwater from the DU impact area discharges. There is agreement that seepage runs are capable of providing this information. Therefore, Board approval of the requested alternate schedule is subject to the condition that seepage run studies will be performed and the results of those studies will be integrated into the groundwater characterization of the site.

Substantial amounts of gauging data have been collected from locations that were not selected using criteria incorporating the results of seepage runs. Interpreting this data would appear to be complicated and subject to alternative approaches. The Board finds it to be beneficial that as many parties as are interested be allowed to review that data. Accordingly, our approval of the alternate

schedule is conditioned on the requirement that the Army make available to both NRC Staff and STV the actual staging data, in electronic format.

(2) Needed Additional Measures to Identify Significant Karst Features;

a. Relevant FSP Provisions

Vertical fractures that are visible on aerial photographs (fracture traces) are features likely to develop karst system conduits (NRC Staff Exhibit 14, at 5-1). A Fracture Trace Analysis (FTA) was planned in the FSP to identify linear fracture traces that are visible on vintage aerial photographs (*id.*). Fracture traces were mapped across the DU impact area and adjacent areas of JPG (NRC Staff Exhibit 26, at 4-3).

Fracture-controlled conduits that contain groundwater will be characterized by low-resistivity anomalies as compared to non-fractured rock (NRC Staff Exhibit 14, at 6-4). An electrical imaging survey (EI survey) was planned in the FSP to identify those fracture traces with associated low resistivity-anomalies where the EI survey crossed the fracture traces (NRC Staff Exhibit 14, at 6-1 and 6-2). The EI survey was performed solely along roads around the perimeter of, or that crossed, the DU impact area. (NRC Staff Exhibit 26, at 4-5).

Locations of characterization well pairs for the karst conduit system were planned in the FSP to be selected based on the coincidence of a mapped linear trace from the FTA and low-resistivity(ies) on the EI survey (NRC Staff Exhibit 14, at 6-2). The FSP is silent on mapping the fracture-controlled conduits beyond the intersection locations. The FSP is silent on using characterization wells to monitor karst conduits other than fracture-controlled conduits that are identified with the FTA/EI survey methodology.

In the implementation of the FSP, the selection of the locations of the characterization well

pairs was consistent with the FSP criterion of the coincidence of mapped linear traces from the FTA and low-resistivity(ies) on the EI survey (NRC Staff Exhibit 26, at 6-1). Characterization wells for the fracture-controlled karst conduits are all located along the DU impact area roads (NRC Staff Exhibit 26, at 6-5), a consequence of limiting the EI survey to DU impact area roads (*id.*).

b. STV Position

Karst features, including groundwater conduits, can develop along fractures that penetrate the surface of the ground as a result of the dissolution of carbonate rock by infiltrating surface water and precipitation (NRC Staff Exhibit 14, at 5-1; STV Exhibit 1, Norris pre-filed direct at 6). Such conduits can be called fracture-controlled conduits (Transcript, at 267). Karst features, including groundwater conduits, can also develop independently of fractures that penetrate the surface of the ground, through the dissolution of carbonate rock by geochemical processes such as mixing of groundwater along its path of flow (STV Exhibit 1, Norris pre-filed direct, at 6). Characterization of the DU impact area and surrounding areas requires the characterization of all karst features, not just those that are fault controlled (Transcript, at 251-252).

Karst features known to exist under the DU impact area and in surrounding areas include caves and sinkholes (Transcript, at 223, 229-231, 252, 253, 258, 269, *et al.*). Some of these caves have entrances along Big Creek and Middle Fork Creek within and outside the DU impact area (Army Exhibit 5-A; STV Exhibit 1, Norris pre-filed direct, at 37). Some of these caves have other entrances away from the streams of the DU impact area, at sinkholes that have formed at the surface of the ground (NRC Staff, Exhibit 11; STV Exhibit 1, Norris pre-filed direct, at 6, 36). Some caves with entrances to streams in the DU impact area are big enough and drained well enough to allow human entry and many have been mapped by 3rd parties unrelated to Army characterization of the site

(Transcript, at 223; STV Exhibit 1, Norris pre-filed direct, at 36, 66). The extent of the mapping of caves in the DU impact area does not represent the extent of the caves, it represents only the extent to which there is continuous, drained passage that allows a person to move through the cave; the caves extend beyond the point of mapping (Transcript, at 223 and 24).

The known and mapped caves within the DU impact area do not occur where fracture traces have been mapped (STV Exhibit 1, Norris pre-filed direct, at 36, 37, 66; Army Exhibit 5-A). Some mapped sinkholes that are known to be entrances to caves within the DU impact area do not occur where fracture traces have been mapped (STV Exhibit 1, Norris pre-filed direct, at 6, 36, 37). The known and mapped karst groundwater conduits in the DU impact area, *i.e.*, the caves large enough for human entry, are not associated with the traces mapped by the FTA, and did not, therefore, form by the surface processes active in the formation of the fracture-controlled conduits that are targeted in the FSP program (Transcript, at 258).

In addition to the caves found within the Silurian strata in the DU impact area, caves are found at the top of the Silurian strata west of the JPG, exposed to local streams, and at the bottom of the Silurian strata east of the JPG, exposed to streams in the Indian-Kentuck drainage basin (Transcript, at 259; STV Exhibit 1, Norris pre-filed rebuttal, at 31). Other, non-fracture-controlled karst features, similar to the known and mapped caves, may exist away from the streams that cross the DU impact area and may exist at greater depths than the known caves and stream elevations (Transcript, at 258-259, 253-255). Because the selection of a location for a characterization well requires **both** a resistivity anomaly **and** a mapped fracture trace from the FTA, the FSP well location selection program is blind to all cave-type karst features that formed in a manner similar to the known and mapped caves – including but not limited to those numerous cave-type features previously

mapped by third parties (Transcript, at 258-259, 276).

In order to characterize the DU impact area, all types of karst features that may be found on the site, not just non-fracture-controlled karst features, must be characterized (Transcript, at 275-276). To do so requires alternative methodologies to the combined FTA and EI survey used in the FSP program to select locations for the characterization wells, since this methodology is known incapable of finding known caves (Transcript, at 276-279). Locating fracture-controlled and cave-type karst groundwater conduits at a particular location must be supplemented by mapping the karst groundwater conduits that are *significant* to the site (STV Exhibit 1, Norris pre-filed direct, at 8).

Surface drainage systems exist both east and west of the DU impact area at elevations below surface drainage on the site and, therefore, capable of receiving discharge from conduits underlying the site (STV Exhibit 1, Norris pre-filed rebuttal, at 31; Army Exhibit 5A). Mapping the direction and extent of significant karst conduits under JPG to their point(s) of discharge is needed to ensure contaminant discharge locations are being monitored and are modeled for exposure scenarios (STV Exhibit 1, Norris pre-filed direct, at 8-9). Below-surface cave systems have been found in the same strata in similar geologic setting (STV Exhibit 1, Norris pre-filed rebuttal, at 28-29). These karst features have been successfully mapped using a combination of electrical resistivity surveying and reflection seismic surveying when both surveying techniques are performed in a grid system over the area of interest; a system that could be used at JPG. (Transcript, at 276).

c. Army Position

The methodology of identifying coincident occurrence of fracture traces and low-resistivity anomalies on an EI survey is effective at locating groundwater conduits, based upon use of the methodology on other projects (Army Exhibit 5, at 24-25). The low-resistivity anomalies observed in

the EI survey data predominantly represents water-saturated clay deposits in the fracture traces (Army Exhibit 5, at 31). Although clay minerals contribute to the low-resistivity anomaly that is observed, the clay-containing fracture trace will also contain groundwater conduit zones, within which characterization wells can be completed (Army Exhibit 5, at 32).

Open caves exist on the DU impact area and elsewhere on the JPG above and in the immediate vicinity of streams that cross the site (Army Exhibit 5, at 41). Multiple positions are stated with respect to cave development other than those along streams that have been entered and mapped. One position is that the known or similar caves will not exist away from or below existing stream levels (*id.*). Another position is that the known caves may extend further away from the streams and into the site than they are currently mapped and similar caves may occur elsewhere on the site and at depths below the existing stream levels (Transcript, at 253-255).

It is not necessary to map fracture-controlled karst groundwater conduits or provide multi-point control in a conduit (Army Exhibit 5, at 45-46). It is only necessary to establish a perimeter of wells in representative fracture-controlled conduits around the DU impact area to establish whether there is migration of DU from the impact area (*id.*).

d. Staff Position

The FTA/EI survey combination will be capable of finding karst groundwater conduits (NRC Staff Exhibit 7, at 4) There is no need for an alternative or supplemental program to explore for other conduits and the FTA/EI survey methodology will be used for future well locations (NRC Staff Exhibit 7, at 5) There is not evidence of non-fracture-controlled karst features (NRC Staff Exhibit 2, at 19) other than the known caves along site streams NRC Staff Exhibit 11, at 1). The possibility (likelihood) of uncharacterized karst conduit systems below local stream bases is speculative or

hypothetical (NRC Staff Exhibit 2, at 21). Were such conduits to exist, they would not discharge into drainages to the east of the JPG (Transcript, at 271-272). Since the caves along the site streams are known, some of them are being monitored, and the known caves are above the stream local stream base, it is only necessary to further investigate fracture-controlled karst features and not seek the cave-type karst conduits which cannot be seen by the FTA/EI survey methodology ((NRC Staff Exhibit 7, at 4-5).

If the FSP characterization program produces evidence of non-fracture-controlled karst features such as cave-type conduits, the FSP can be amended to characterize them if it is necessary to do so (NRC Staff Exhibit 2, at 18). The Staff is silent on what types of data from what FSP programs would establish the necessity, when such data would be collected and analyzed, or what the criteria for necessity would be.

Mapping of the karst conduit system beyond the road-limited FTA/EI survey approach is unnecessary (*id.*). Such mapping would be also be dangerous because of the unexploded ordinance (*id.*). Attempting to map karst conduit systems would be futile; karst systems are simply too complex to map all the conduit pathways (NRC Staff Exhibit 2, at 5-6).

e. Board Finding

The parties seem to agree that fracture-controlled karst conduits are a component of the hydrogeology of the DU impact area. The parties similarly seem to agree to a large extent that the methodology of the FSP to identify likely locations for this type of conduit is reasonable. Therefore, the Board finds that the combination of the FTA and the EI survey is a necessary part of the bedrock characterization program for the DU impact area.

The parties seem to agree that the known and mapped cave systems that occur near the site

stream drainages are different and distinct from fracture-controlled karst conduits that may develop. No party disputes the STV observation that these karst features are not identifiable with the FSP program of FTA and EI survey. Each party holds a distinctly different position with respect to the significance and potential importance of non-fracture-controlled, and particularly cave-type, karst features. The STV opinion, based upon its expert's experience and interpretation of regional and area data, is that alternative karst conduit systems are likely and that the identification and characterization of such non-fracture-controlled conduit systems are fundamentally necessary to the characterization of site hydrogeology. The Army opinion is that such non-fracture-controlled conduit systems may exist in areas away from the site streams, and they may exist at varying depths below the areas away from the streams. However, if they do exist, they will likely be intersected by fracture-controlled conduits and characterizing the fracture-controlled conduits will be sufficient to assess the impact of any other conduit systems. Further, if data collected establish it is necessary to independently characterize other conduit systems, the FSP can be amended at some future date to do that. The NRC staff position is that non-fracture-controlled conduit systems almost certain do not exist. Were they found to exist by the FSP characterization program and it were necessary to characterize them, the FSP could be so modified at that time.

The Board finds the STV opinion that there exist multiple significant types of karst features persuasive. The known and mapped conduits at the site, conduits that demonstrably affect the site hydrogeology, are non-fracture-controlled conduits. The fracture-controlled conduits identified in the FSP program, while expected by all parties, are still speculative. Since the former karst conduits are not visible in the FSP program, the FSP program is not capable of resolving the differences of opinion among the parties as to the significance of the cave-type or other non-fracture-controlled karst

conduit away from the site streams. The Board also finds the STV approach to the uncertainties of multiple karst systems reasonable. STV believes that, since there are probably at least two karst systems active - the fracture-controlled system believed present and the cave-type system known to be present - it is necessary to seek out and characterize each type of karst system in order to characterize the hydrogeology of the bedrock. The alternative approach, advocated by the Army and the NRC Staff, that if and when evidence of non-fractured controlled conduits is found by data from wells exploring fracture-controlled conduits, the FSP can then be modified is faulty on two levels. First, without a plan and pre-identified criteria that would constitute evidence of other karst systems, it requires a high degree of serendipity and a willingness to consider and accept data that may be indicative of a second or third conduit system. Second, the 5-year expansion period is already two-years gone. Without deliberately looking for such additional conduit systems, it is questionable that, were they stumbled upon, they could be characterized in a manner and on a time frame that would fit within the remaining 3 years.

The parties disagree on the need for mapping conduits. The Army position is that a perimeter fence of representative fracture-controlled conduits is sufficient to establish control of existing migration of DU from the DU impact area. The STV position is that without knowing the from-and-to of significant karst conduits, regardless of the conduit type, one cannot be sure of something as basic as where to monitor or where to model impacts. The NRC Staff position appears to be that mapping is futile because of the inherent complexity of attempting to map all conduits, regardless of their significance. The STV position is the most persuasive. It recognizes the need to understand the site hydrogeology with respect to decommissioning objectives without becoming lost in the minutia of characterizing everything. The alternative, one-point control on individual, if representative,

conduits, is like trying to understand an urban traffic pattern by looking at individual interchanges without benefit of knowing the how the highways connect them.

The Board finds that a characterization program that focuses solely on identifying a single type of karst system using a methodology that is blind to another system that is known to exist is incapable of achieving a level of characterization that is necessary for the purposes of this extension. The Board finds that the FSP must be modified to include methodologies sufficient to identify all known and reasonably anticipated karst conduit systems, and that those karst systems be evaluated in a manner that allows them to be mapped from the DU impact area to their locations of discharge.

(3) Needed Modifications to and Timing of Sampling Measures for Significant Karst Features.

a. Relevant FSP Provisions

The FSP provides that specific conduit zones completed in the characterization wells will be selected based upon the drilling characteristics during borehole advancement and the visual examination and description of soils and rocks brought to the surface during drilling (NRC Staff Exhibit 14, at 6-4). Other than the visual examination and description of soils and rocks brought to the surface during drilling, the FSP provides for no quantitative evaluation of the physical properties of the rock layers drilled through or the zone completed (NRC Staff Exhibit 14, at 6-12, 6-16, and 6-21).

The FSP provides that there will be no measurement of individual characterization wells for permeability (NRC Staff Exhibit 14, at 6-16). The FSP provides that there is no aquifer testing planned to evaluate the karst conduit aquifer system(s) (NRC Staff Exhibit 14, at 6-21).

The FSP provides that a subset of the characterization wells may be used for evaluation and

sampling as part of further characterization (NRC Staff Exhibit 14, at 6-5). The FSP is silent with respect to the specific criteria and thresholds upon the selections will be made. The FSP provides that any characterization well so selected for staging will have stage data collected continuously for a minimum of one (*id.*). The FSP provides that sampling of any selected characterization well will be performed quarterly for a minimum of one year (*id.*). The FSP describes only field sampling and no discussion of laboratory analytical parameters or methods for this groundwater monitoring (NRC Staff Exhibit 14, at 6-1 to 6-24).

The FSP provides that selective stream flow staging and selective cave discharge staging will be performed with that stage data converted to equivalent flow discharges (NRC Staff Exhibit 14, at 6-29 to 6-31). The FSP does not provide for measuring the elevation of any stream stage at any location. The FSP provides that the stream flow data will be used to identify the recharge rate of precipitation into the bedrock of the site by modeling the rate of baseflow into the streams (NRC Staff Exhibit 14, at 6-29). The FSP is silent with respect to the impact of stream losses to bedrock recharge on the methodologies to be used to model precipitation recharge based on the identification of baseflow.

b. STV Position

Visual examination of earth materials brought up by drilling does not provide the data that can be obtained by running down hole geophysical logs that measure rock properties or allow direct observation of the formations at the well bore (STV Exhibit 1, Norris pre-filed direct, at 45). The drilling procedures should be modified to allow logging of the boreholes before the wells are installed (*id.*).

Characterization of the hydrogeology of the soils and rocks beneath the site requires

measuring the hydraulic properties of the various materials, including conduits (STV Exhibit 1, Norris pre-filed direct, at 45-46). This is done with individual well testing and/or with pumping tests to evaluate inter-well connections and aquifer properties (*id.*). The site hydrogeology cannot be interpreted until such information is gathered, nor can inferences about needed additional testing or characterization be drawn (STV Exhibit 1, Norris pre-filed rebuttal, at 15). Characterization of the hydrogeology of the site requires measuring the hydraulic head of groundwater, since heads, not water levels, control groundwater flow (STV Exhibit 1, Norris pre-filed direct, at 46-47). These data should be collected from all wells, not a selected subset, to allow an understanding of the spatial variability in the site hydrogeology and avoid biased data collection (*id.*).

As with water levels in wells, water levels in streams need be converted to elevations to represent the head levels of the streams (Transcript, at 235-236). It is the head level of a stream, not the stage level, that controls the direction and magnitude of flow to and from the karst systems in the bedrock and the streams on site Transcript, at 235-237).

The timing for the collection of these data is important (Hearing Transcript, at 234-235). Groundwater patterns change over periods of an annual cycle or longer, and understanding these cycles requires data collected over long periods, the longer the better (Transcript, at 237-240). Failing to obtain the data on aquifer parameters as soon as possible correspondingly postpones any subsequent data collection that may be necessary (*id.*).

c. Army Position

Measurements of the hydraulic properties of the bedrock and karst conduits can be deferred until it is determined that it is necessary to measure them (Army Exhibit 10, at 4 and 5), as laid out in the responses to the RAI of January 2006. Measurements of water levels in wells and sampling of the

water from wells can be similarly deferred indefinitely until required to do so and the collection of this data is at least a year behind surface gauging data (NRC Staff Exhibit 2, at 7). The Army is silent with respect to when and with what data such necessity will be demonstrated or the criteria for such demonstration.

d. Staff Position

In January, 2006, the need for the prompt measurement of hydraulic properties at the characterization wells was explicitly stated as a means to generate additional phased site characterization; *i.e.*, under the phased approach, data could be collected early to provide the information upon which the need for subsequent characterization can be established (Army Exhibit 10, at 4). Specifically, the Basis for Question 2 of the RAI states,

The hydraulic properties of the water-bearing units are needed to understand the rate of groundwater flow and storage of groundwater. Both are important factors that impact the fate and potential transport of the depleted uranium at JPG. A phased approach for obtaining the hydraulic properties of the water-bearing units permits the Army to determine these parameters and to evaluate whether additional data should be obtained.

That perspective changed by August 2007, to a position that opposes measuring hydraulic property data until there is a demonstrated need that the data be collected (NRC Staff Exhibit 2, at 13; and NRC Staff Exhibit 7 as2). The NRC Staff is silent regarding what data will demonstrate such necessity or the criteria for such demonstration. The NRC staff is silent with respect to how the site hydrogeology can be deemed characterized without the collection of such data.

e. Board Finding

The Board finds there can be no issue regarding the need to characterize the hydrogeology of the site, including the hydraulic properties, surface- and groundwater heads, and water quality of the bedrock and conduits; it is an integral part of the purpose for which the 5-year extension was granted.

Since this data collection is a necessary part of the characterization, the Board conditions approval of the alternate schedule on a requirement that such measurements be made and data collected.

The Board finds no useful purpose for deferring the collection of these data once the wells and other measuring stations are available for data collection. When the basic hydrologic cycle is an annual cycle, and there is no assurance that the first 12-month cycle of data represents typical or average conditions, the STV position that both early data and long-term data are important has substantial merit, particularly since only 3 years of the 5-year extension remains. The prompt collection of these data are similarly fundamental to the performance of the FSP as an adaptable plan for characterization. Postponing necessary data collect beyond the first opportunity at which it can be collected reduces the possibility that information gleaned from that data can be used to modify the FSP to characterize unanticipated conditions. The Board will thus require as a condition of approval of the alternate schedule that characterization measurements begin as soon as possible at any one monitoring location, be made during each sampling period for all monitoring locations that are available, continue to be made for as long a period of time as possible. The Board will also require as a condition of approval of the alternate schedule that characterization data that are time-variable, such as but not limited to water elevations in wells, stream stage, and stream flow, to be continued until the completion of an acceptable decommissioning plan.

B. Detection and Measurement of DU Migrating in the Environment

There are two principal factual issues among the parties relating to the detection and measurement of DU migrating in the environment. These are (1) distinguishing depleted and natural uranium in environmental sampling of various media; and (2) limitations of AS methodology and the need for and nature of alternate methodology. Each is discussed below.

(1) Distinguishing Depleted and Natural Uranium in Environmental Sampling of Various Media;

a. Relevant FSP Provisions

The FSP provides a general description of sampling protocols as Appendix A to the FSP (NRC Staff Exhibit 14, at A.1-1 to A.15-1). However, the FSP does not provide the sampling and analysis procedures and data objectives for uranium sampling and analysis.

b. STV Position

The ability to distinguish between natural uranium and depleted uranium is important to understanding the existence and extent of DU migration from the areas of impact into adjacent areas, even though concentrations may be well below compliance levels for the existing permit (Transcript, at 309-310; STV Exhibit 1, Norris pre-filed direct, at 74-75). First, the dose modeling performed for the decommissioning plan projects from existing site conditions across a period of 1000 years (STV Exhibit 1, Norris pre-filed rebuttal, at 51). Documenting the onset of or existing migration from the points of impact, even when, at low concentrations, constrains the model inputs by providing a non-zero calibration point in near time, improving the reliability of the dose modeling over the 1000-year model life (STV Exhibit 1, Norris pre-filed direct, at 75). Second, the existence or absence of depleted uranium in environmental samples may impact the evolution of FSP through future modifications. For example, if DU is detected in sediments that are sampled along the streams under the present FSP programs, sediment sampling outside the JPG may be added to the FSP (Transcript, at 215). At an additional example, if depleted uranium is detected in surface water inside the DU impact area, the FSP may be modified to map conduits that are being recharged by stream flow to identify where such conduit discharges back to the surface (Transcript, at 264-265).

The adequacy of the uranium sampling and analysis plan under the FSP cannot be critiqued now because it does not yet exist (STV Exhibit 1, Norris pre-filed direct, at 69-70). However, Appendix A in the FSP is patterned after and very similar to the sampling and analysis procedures that are supposed to be used, at part of the environmental radiation monitoring (ERM) that is being performed semi-annually on the site (*id.*). The ERM protocols, while possibly adequate for purposes of compliance monitoring under the permit, are inadequate for the purposes distinguishing the proportions of natural- and depleted uranium at needed for site characterization (STV Exhibit 1, Norris pre-filed direct, at 74-75). The ERM protocols support only a depleted- versus natural uranium interpretation, with no attempt to establish proportions of the two uranium sources (*id.*). The ERM laboratory protocols are such that, at the low levels to total uranium in the environmental samples, unambiguous identification of depleted uranium in a sample cannot be made, and no attempt to identify the proportions of a mix of natural- and depleted uranium is attempted (STV Exhibit 1, Norris pre-filed direct, at 73-74). The methods that have been used in the ERM are inadequate to meet these needs, having resulted in data from which one cannot determine the proportion of depleted uranium (Transcript, at 301). Alternative methods to those of the ERM are required to provide a characterization of the proportions of natural- and depleted uranium in environmental samples with low total uranium concentrations (Transcript, at 304). Alternative methods to achieve this distinction have been used by the United Nations in the Bosnia and Herzegovina conflict (Transcript, at 305; STV Exhibit 1, Norris pre-filed rebuttal, at 43) and has identified the presence of depleted uranium in samples with U238/U234 ratios that would have been dismissed as not indicative of containing depleted uranium in the ERM program (STV Exhibit 1, Norris pre-filed rebuttal, at 43-44).

c. Army Position

The methods and protocols that have been used for the assessment of environmental uranium for various media are not capable of distinguishing the proportions of natural- and depleted uranium for most environmental samples (Transcript, at 299). This inability is not important because the concern with respect to characterization is levels, at which peak doses may exceed acceptable levels or performance standards are exceeded (Transcript, at 309).

d. Staff Position

Environmental samples are interpretable only as either natural uranium or depleted uranium (NRC Staff Exhibit 5, at 8). There are no known procedures for determining the proportions of natural and depleted uranium within an environmental sample (*id.*). The laboratory work done by the United Nations that reported the proportion of depleted uranium in samples is not analytical data; it is an interpretation of analytical data using bad science (NRC Staff Exhibit 10, at 6-7). The work by the United Nations is a non-standard approach using non-standard techniques that is not available routinely at commercial laboratories in the United States (Transcript, at 305). Ultimately, a sample can be called "natural" or "depleted" but cannot be apportioned between the two (Transcript, at 296-298).

e. Board Finding

The characterization program that is the purpose of the 5-year extension clearly has different objectives than the previous or existing environmental monitoring at the site. Were the objectives the same, the required data would already exist and there would be no need for the 5-year extension. Believable modeling for a period of 1000 years is inherently a challenge. There is no evidence in the record that today's concentrations of depleted uranium in environmental samples represent the worst-

case that will develop over the next 1000 years, so it is unrealistic to presume that low contemporary concentrations are indicative of no future problem. In the absence of data or demonstration to the contrary, and there is none, it is reasonable to view any contamination at this point as a precursor to a possibly larger problem at some point in the future and it is reasonable to expect any modeling of the future to be more accurate if it can predict the level of contemporary depleted uranium that has been quantified. The analytical methodologies to determine the proportion of total uranium that is depleted uranium are apparently non-routine and not available from commercial laboratories off their price sheets. The concept of permanently leaving in place tons of depleted uranium projectiles is also non-routine and pursuing custom laboratory services to ensure the safety of doing so is not onerous. The Board finds that reliably distinguishing natural uranium from depleted uranium in contemporary environmental samples is a necessary part of the site characterization for which the 5-year extension is being granted and conditions its approval of the alternate schedule on such services being included in the FSP as necessary to accomplish this result.

(2) Limitations of AS Methodology; and Need for and Nature of Alternate Methodology.

a. Relevant FSP Provisions

The FSP provides a general description of sampling protocols as Appendix A to the FSP (NRC Staff Exhibit 14, at A.1-1 to A.15-1). However, the FSP does not provide the sampling and analysis procedures and data objectives for uranium sampling and analysis.

b. STV Position

The adequacy of the uranium sampling and analysis plan under the FSP cannot be fully critiqued now because the plan does not yet exist in the necessary detail (STV Exhibit 1, Norris pre-

filed direct, at 69-70). However, Appendix A that is in the FSP is patterned after and very similar to the sampling and analysis procedures that are supposed to be used as part of the environmental radiation monitoring (ERM) that is being performed semi-annually on the site (*id.*). The ERM analyses rely on alpha spectroscopy (AS) to determine the isotopic distribution of uranium in the environmental samples (NRC Staff Exhibit 37, at 4-1). The sensitivity of the AS results is in part predetermined by the detection limits that are defined for the project (Army Exhibit 1, at 15). As implemented for the ERM program, the laboratory protocols are such that, at the low levels of total uranium in the environmental samples, unambiguous identification of depleted uranium in a sample cannot be made (STV Exhibit 1, Norris pre-filed direct, at 73-74). The primary reason for this inability is that the analyses protocols allow high error (uncertainty) as part of the AS analysis, relative to the low total uranium activities (Army Exhibit 1, at 20).

For example, the surface water sample SW-DU-002 taken at the western boundary of the JPG, where Big Creek leaves the JPG, was analyzed with a U238/U234 ratio of 3.75 in the spring sampling event for 2006 (NRC Staff Exhibit 37, at 4-1). The nominal value of the ratio for natural uranium is 1 (Transcript, at 296, 182) and the observed value of the ratio in most site groundwater and surface water samples is about 0.65 (Transcript, at 296-296). The departure of the sample ratio from the nominal value of natural uranium or site-specific empirical values of this magnitude is best interpreted as evidence of depleted uranium in surface water leaving the JPG site, regardless of the calculations of propagated error (STV Exhibit 1, Norris pre-filed surrebuttal, at 9). However, for this sample, the error from the individual analyses propagated to the ratio is +/- 3.7, negating for the Army and Staff any interpretation of depleted uranium in the sample (Army Exhibit 1, at 20; NRC Staff Exhibit 10, at 7).

The resolution of AS, at low total uranium concentrations can be improved by altering the laboratory procedures, *e.g.*, increasing the count time and increasing the mass of uranium being analyzed will reduce the minimal detectable concentration (MDC) (Staff Exhibit 40, at 5; Transcript, at 176-177), reducing the uncertainty associated with an analysis and the propagated error in the U238/U234 ratio (STV Exhibit 1, Norris pre-filed direct, at 73-74; Army Exhibit 1, at 17-20; NRC Staff Exhibit 5, at 8). Since the U238/U234 ratio of natural uranium in water is variable (Transcript, at 183-184) because of an increased relative solubility of U234 (Army Exhibit 1, at 25) and the U238/U234 ratio of mobilized depleted uranium can be altered by chemical fractionation from that of the source projectile (STV Exhibit 1, Norris pre-filed direct, at 78-79), the interpretation of even an improved AS analysis of an environmental sample may be ambiguous (Transcript, at 292, 302, and 305). The answer to the problem is to incorporate an analysis of U235 concentration obtained by ICPMS into the assessment process, as did the United Nations in their detailed evaluation of depleted uranium from the Bosnia and Herzegovina conflict (Transcript, at 304-305), thereby providing an independent means of differentiating natural and depleted uranium.

c. Army Position

AS is a standard methodology capable of identifying depleted uranium (NRC Staff Exhibit 10, at 5). Alternative methods to AS are not routinely offered by commercial laboratories in the United States (Transcript, at 305). Combined use of AS with ICPMS, as used by the United Nations, is not a service routinely offered by commercial labs and if it could be contracted, would be expensive (Transcript, at 302). While there may be some benefits to using ICPMS to analyze isotope mass ratios, there are also problems associated with those analyses (Army Exhibit 1, at 25-26). Because the levels of total uranium are so low in the environmental samples, the details of the uranium isotope

distributions are not important (Transcript, at 306,307).

d. Staff Position

The analytical methodology that is used in the ERM sampling and analysis is fully appropriate for the FSP site characterization program (NRC Staff Exhibit 5, at 6).

e. Board Finding

Low levels of total uranium in contemporary environmental samples are reassuring from a standpoint of compliance with the existing permit conditions. However, until this characterization program is completed and the modeling has been finalized three years hence, no inferences may be drawn between contemporary total uranium levels and their implications for peak dose calculations or chronic exposure in the future. Of immediate interest is whether there is depleted uranium from the DU impact area that is migrating, at detectable concentrations outside the DU impact area and of immediate concern is whether it is migrating at detectable concentrations outside the boundaries of JPG itself. Were such migration to be the case, it could reasonably provide a reality check against any model calculations, improving the long-range projections of the model, as suggested by STV. However, if such migration is already occurring outside the boundaries of institutional control, it presents serious questions about the entire concept of leaving the mass of DU penetrators in place to weather and disperse.

The Board finds it disturbing that an analysis of water leaving the JPG site boundary in Big Creek had a U238/U234 activity ratio that was from almost 4- to more than 5-fold that of natural uranium in site surface and groundwater. Regardless of error bars and statistical arguments, such a result must give pause. The Board conditions its approval of the alternate schedule with the requirement that the sampling and analysis addendum, when issued, will include analytical procedures

to establish the concentration of U235 as an independent check of AS methods used to compare concentrations of U234 and U238. The Board further requires that laboratory procedures for AS analyses be modified to improve the resolution of the technique to achieve a data quality objective of statistically confirming, at a 95% (one-tail) confidence level, whether depleted uranium is present in environmental samples with U238/U234 ratios of 3.0 or higher.

C. Unexploded Ordinance as Consideration in Hydrogeologic Site Characterization

As recounted in the procedural history of this matter recounted in Section I, supra, the Army has frequently cited the presence of unexploded ordinance (UXO) intermixed with expended DU munitions at the JPG site as an impediment to characterization of the site. Indeed, in 2003, the Army withdrew the License Termination Plan (LTP) it had submitted to the Commission for approval in 2001 rather than conduct certain site characterization activities requested by the Staff because the Army considered them to be too dangerous. In place of the withdrawn LTP, the Army submitted a proposal for a five year, possession only license amendment (POLA), which would be renewable until such time as it became possible to safely perform the required site characterization. In its current application for an alternate schedule, the Army has reconsidered and concluded that at least the characterization activities called for in the FSP and its addenda may, with the appropriate precautions, be performed safely. However, controversy has continued among the parties as to whether UXO has inappropriately and unnecessarily limited the nature and location of the hydrogeologic characterization activities included in the FSP.

1. UXO as an Impediment to Hydrogeologic Characterization Activities Proposed in the FSP.

a. Relevant FSP Provisions

In large part, the Army developed its Health and Safety Plan (HASP) for its site characterization activities to address the UXO risk. While the sufficiency of the HASP is not at issue in the current proceeding, there are numerous examples of UXO safety procedures being planned and implemented in the FSP, *e.g.*:

(1) Staff Exhibit 16, Final Field Sampling Plan Addendum 2, Depleted Uranium Impact Area Site Characterization Soil Verification, JPG, Madison, Indiana (July 2006), Section 2; and Health and Safety Plan, Section 2 and Appendix A - SAIC's EC&HS Procedure 120;

(2) Staff Exhibit 17, Final Field Sampling Addendum 3, Depleted Uranium Impact Area Site Characterization: Other Monitoring Equipment Installation, Other Monitoring (Precipitation, Cave, and Stream/Spring Gauges), and Electrical Imaging Survey, JPG, Madison, Indiana (July 2006), Sections 2, 3, and Appendix A - Work Instruction for the Installation of Other Monitoring Equipment, Sections 3.0, 4.1, 4.2, 4.3, and 4.4.

b. STV Position

STV has consistently advocated that the FSP should be designed to provide the best and most useful environmental data to support decommissioning of the JPG DU Area. According to STV, the FSP can and should be developed independently from concern for UXO because implementation of established U.S. Army Corps of Engineers procedures (contained in EP 75-1-2 – Unexploded Ordnance (UXO) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities) will allow the optimal FSP to be implemented. It is possible that some specific sampling locations may need to be modified based on field observations of UXO density, but those modifications should not affect the adequacy of the FSP in achieving its intended purpose.

(STV Exhibit 3, Pastorick Rebuttal Testimony, at 11-17, and Surrebuttal Testimony, at 1-3).

c. Army Position

In its prefiled testimony, the Army cited the UXO hazard as a significant consideration in the design of the FSP. (See, e.g., Army Exhibit 3, Skibinski Rebuttal Testimony, at 5; Exhibit 4, Eaby Rebuttal Testimony, at 24 and 29). At the hearing, the Army position on this issue was presented by Mr. Snyder. During questioning by Judges Abramson and Rosenthal, Mr. Snyder stated that the only effect UXO has had on the currently planned hydrogeologic activities is that UXO tends to slow the field work (Transcript, at 280-282).

d. Staff Position

Staff witness Peckenpaugh referenced the UXO hazard at the JPG site, but did not identify any specific respects in which it represented an impediment to the hydrogeologic characterization of the site. (Staff Exhibit 2, Peckenpaugh Rebuttal Testimony, at 18). However, at the hearing, beyond the observation in passing by Mr. Peckenpaugh that “UXO can have an impact on where you can do some of the field work” (Transcript at 247-248), the Staff offered no testimony on the UXO issue.

e. Board Finding

UXO is not an impediment to sampling measures proposed in the FSP and addenda. The presence of UXO in the JPG DU Area can be addressed by the planning and implementation of established safety procedures developed by the U.S. Army Corps of Engineers. Implementation of these procedures may slow the sampling process, but the UXO hazard does not prevent implementation of the FSP.

2. UXO as an Impediment to Additional Hydrogeologic Characterization Activities

Proposed by STV.

a. Relevant FSP Provisions

While the FSP contemplated that the plan was likely to change based on the inability to sample in certain locations due to UXO hazards, it could not and did not address the additional hydrogeologic characterization activities proposed by STV.

b. STV Position

STV's position is that UXO presents a hazard that is manageable through the implementation of the guidance in U.S. Army Corps of Engineers Document EP 75-1-2. Based on the presence of UXO it may be desirable to alter a specific sample location. But, this is a decision that should be based on a "cost to benefit" analysis as to whether or not the expense of removing UXO to allow the sample to be taken in the originally desired location is economically practical. This position was illustrated in the interaction at the hearing between Judges Abramson and Rosenthal and STV witness Pastorick on the UXO issue. (Transcript, at 281, Line 25 through 282, Line 8).

c. Army Position

The Army position, as stated by witness Snyder at the hearing, is somewhat inconclusive as to whether UXO is a factor that will prevent contractor personnel from implementing the additional hydrogeologic sampling procedures recommended by STV for characterizing the groundwater and karst features in the DU Area. In his testimony, Mr. Snyder does not commit fully to the proposition that it is possible to implement UXO procedures that would allow him to perform additional sampling in off road locations. However, this hesitancy on Mr. Snyder's part seemed to be more associated with the Army's view that the additional sampling proposed by STV was unnecessary rather than a belief that there was no way to perform it safely. See the interaction between Judge Rosenthal and Mr. Snyder recorded in the Transcript, at 280, Line 13 through 281, Line 7.

d. Staff Position

There was no staff testimony on this issue.

e. Board Finding

Based on the interaction between Judge Rosenthal and Mr. Snyder reported in the Transcript, Pages 280, Line 13 through 281, Line 7, it seems clear that UXO is not a significant limiting factor to the adequate characterization of the DU Area and that the Army is "able to do everything that they would be doing were there no UXO on site." The Board thus concludes that the UXO hazard does not require modification of the additional site characterization activities recommended by STV which we have incorporated in the conditions for our approval of the alternative schedule in Sections III A and B, *supra*.

D. Biota Sampling

1. Relevant FSP Provisions

There is only one defined element of biological characterization in the FSP, namely deer sampling. Depending on the "weight of the evidence" from the deer sampling and the planned abiotic sampling, the Army has the option to sample other biota. (FSP, at 6-25). However, based on the results of the deer sampling, the Army has elected not to perform additional biota sampling. (Staff Exhibit 33, at 5-1 to 5-2).

2. STV Position

More biota than just deer should have been sampled in the initial round of sampling. In order to evaluate and model fate and transport through a food web, representative species of at least several trophic levels in the food web need to be sampled. It is impossible to properly understand whether and how the animals and the plants at JPG are being exposed to and accumulating DU if there is

minimal to no data on most parts of the ecosystem. Virtually all standard risk modeling guidance requires that, for an open environmental exposure situation such as exists at JPG, there should be at least one airborne species (e.g. a bird or flying insect), one aquatic species (e.g., a crayfish), and one soil-based species (e.g., an earthworm or slug), in addition to a terrestrial species eaten by humans (e.g., squirrel or rabbit). (STV Exhibit 2, Henshel Direct Testimony, at 13).

Moreover, if only one species is to be sampled initially, the species sampled should not be deer, but one that is lower in the food chain and a better indicator of DU movement through the ecosystem (e.g., a small mammal such as squirrel or rabbit). (*Id.*)

Additionally, the deer sampling and analysis conducted by the Army is so grossly inadequate as to be essentially worthless. There are several glaring deficiencies in both the sampling methods used to obtain deer tissue and in the subsequent data collection, management, and interpretation techniques which were employed. Thus, the deer sampling results cannot be used to justify the Army's decision not to conduct additional biota sampling. (*Id.*, at 14-24).

Notably, all parties agree that the total uranium concentrations are relatively low in the few deer samples taken. The Army and staff interpret the isotope ratios measured by alpha spectroscopy in those samples in which uranium is detectable to mean that the only uranium present is natural uranium. Some of the sample results are at the detection limit of the methods used to analyze the samples and all are in general range of the absolute detection limit of alpha spectroscopy. (Transcript, at 155 lines 14 to 19 and 156, lines 8 through 14). When analyzing samples that are at or near the detection limit of the measurement technology, one cannot expect the results to be interpretable, but at best only indicative. Here, the deer tissue samples were analyzed using a technology which is not sensitive enough to resolve with analytical certainty whether uranium was present in all of the

samples, much less whether the uranium that was detected is depleted or natural. (Transcript, at 155 lines 10 to 19, at 143 lines 12 through 19, and at 156 line 22 to 159 line 2).

Additionally, STV raised issues regarding the size and categorization of the deer sample used by the Army. Specifically, STV witness Henshel testified that the sample was too small to generalize results to the entire JPG deer population. She also testified that the means used by the Army to separate “background” and “exposed” deer was simply not reliable. (STV Exhibit 2, Henshel Rebuttal Testimony, at 19, and Transcript, at 158 line 13 to 159 line 7).

3. Army Position

The FSP calls for deer to be the only species sampled in the initial round of sampling because deer is considered by the Army to be the most likely biota pathway for DU from JPG to reach humans, given available information about the various animals hunted at JPG and the amount of meat from these animals consumed by humans in the course of a year. (Army Exhibit 2, Barta Rebuttal Testimony, at 6).

Given the results of the deer sampling, there is no reason to sample other species of biota. The results do not show any detectable uptake of DU in the sampled deer from the DU impact area, nor any difference in the total uranium levels in those deer and those deer sampled from other areas. (*Id.*).

4. Staff Position

The Army’s decision to sample only deer initially is reasonable because deer is the species most likely to serve as the pathway to human exposure of any magnitude. The results of the deer sampling do not warrant any further sampling of biota. (Staff Exhibit 6, McLaughlin Surrebuttal Testimony, at 2).

5. Board Finding

With respect to dose modeling, humans are the only species of concern under Commission regulations. With respect to environmental impact assessment, however, other species are relevant to consider as well. Thus, the Board considers STV's position to be well-taken that sampling of biota in addition to deer should be conducted at JPG. Moreover, the Board is gravely concerned that the sampling and measurement issues raised by STV regarding the deer sampling results are not a sound basis for the Army's decision not to conduct additional biota sampling. Accordingly, the Board will condition its approval of the requested license amendment on the Army sampling either rabbit or squirrel as a terrestrial species, either crayfish or molluscs as an aquatic species, and turkey as a bird species.

E. Air Sampling

1. Relevant FSP Provisions

The FSP does not provide for any air sampling. Big Oaks National Wildlife Refuge (BONWR) is managed by the US Fish & Wildlife Service (USFWS). USFWS decided that doing controlled burns in the DU Impact Area would not increase human exposure significantly. The USFWS based their decision to burn over the DU Impact Area on a study by Williams et al. (1998) carried out at Aberdeen Proving Ground (APG), a similarly DU-contaminated base. ("Current available data suggests that levels of DU carried in smoke associated with burning natural vegetation is not significant. This is the only study we know of that looks at dispersion of DU in smoke in a setting similar to the conditions that are found on the refuge.") (Big Oaks National Wildlife Refuge Fire Management Plan, March 2001, p25). The FSP adopted this conclusion and reasoning. (FSP, at 4-1).

2. STV Position

There is a more recent study regarding the levels of DU carried in smoke associated with burning vegetation. This study was conducted at the Los Alamos National Laboratory (LANL). This study found that there were significant changes (14% increases on average) in airborne depleted uranium at the perimeter of the LANL property following a fire. See J.J. Whicker, et al., *From Dust to Dose: Effects of Forest Disturbance on Increased Inhalation Exposure*, Science of the Total Environment (2006) (Army Exhibit 1-I, at 7). While the absolute levels of airborne DU reported were not high enough to represent, by themselves, significant health risks to site workers or neighboring residents, the LANL study does show that the periodic controlled burns at JPG can create an airborne pathway for human exposure to DU. The magnitude of this exposure should be measured pursuant to the FSP so that cumulative effects over time on both site workers and neighboring residents may be reliably assessed. (STV Exhibit 2, Henshel Direct Testimony, at 25-27).

The concerns raised by STV derive essentially from two main points. First, there has been no baseline air measurements to compare against under the new controlled burn regime at JPG. The baseline air measurements for JPG cited by the Army are from the 1980s, and the air measurements related to burns specifically are from the Aberdeen Proving Ground, not JPG. (See Staff Exhibit 31, at 2 through 4). STV believes that there needs to be new baseline air measurements conducted during a controlled burn to confirm that the current mobilization of DU in smoke is relatively low, as suggested by the APG and LANL modeling. (See STV Exhibit 2, Henshel Direct Testimony, at 25-27; Henshel Rebuttal Testimony, at 21-22).

3. Army Position

The LANL study is more recent than the one relied upon in the FSP. However, it does not

provide a reason to conduct air sampling at JPG as part of the FSP. As STV concedes, the airborne levels of DU reflected in the LANL study did not pose a health risk to humans. There is no reason to believe that the airborne levels of DU at JPG as a result of the controlled burns would be any higher than those reported at LANL; to the contrary, comparing the two situations would indicate that the LANL levels would represent bounding estimates for JPG. So, the results of the LANL study support the conclusion that no site-specific sampling is required at JPG. (Army Exhibit 1, Anagnostopoulos Rebuttal Testimony, at 10).

4. Staff Position

The LANL study does not provide a basis to conduct air sampling at JPG as part of the FSP. The use of a bounding estimate using generic data should suffice for JPG site characterization purposes. (Staff Exhibit 4, Schwartzman Rebuttal Testimony, at 4-7).

5. Board Finding

The LANL study is more recent than the one relied upon in the FSP. And, it does suggest that the controlled burns conducted at JPG are likely to be a source of airborne DU. However, the Army is not required by NRC regulations or guidance to collect site-specific data for every potential source of DU. The available data suggest that the levels of airborne DU resulting from the controlled burns at DU will be episodic and minimal and that a conservative bounding estimate using generic data should suffice for JPG site characterization purposes.

F. Nature and Scope of Site Modeling

1. Relevant FSP Provisions

The FSP does not expressly address the computer model which the Army will use to make the radioactivity dose estimates necessary to support its JPG DU site decommissioning plan. However,

the assumption appears to be that the computer model to be used will be the standard RESRAD model. See Technical Memorandum included in Staff Exhibit 14.

2. STV Position

The FSP must achieve characterization of the JPG DU site adequate to support the fate and transport modeling required for purposes of the ultimate decommissioning of the site in accordance with NRC regulations, including preparation of the Environmental Report required to support the Environmental Impact Statement (EIS) to be developed by the NRC Staff. (STV Exhibit 2, Norris Rebuttal Testimony, at 7-8).

However, the FSP as it now exists functions to nominally meet a checklist of data collection objectives without acquiring the information that can test and refine the Conceptual Site Model (CSM), characterize the hydrogeology of the site, especially its karst terrain, and build the data set necessary to model all assessments necessary for decommissioning.

For example, information that is specified by NUREG-1757, Vol.1, Groundwater (Sec. 16.3.7), Rev. 2, for the site characterization in a decommissioning plan includes, among many other items, the following: groundwater flow directions and velocities; [d]escriptions of all aquifer tests should also be provided; and [p]hysical parameters such as storage coefficients, transmissivities, hydraulic conductivities, porosities, and intrinsic permeabilities. These are elements that can only be determined by physical measurements or computed from physical measurements that are made on a site-specific basis. (*Id.*, at 15).

These are not optional parameters for groundwater assessment of a decommissioning plan at a site with restricted release. They can only be optional or extraneous or unnecessary if the groundwater system is removed from consideration as a pathway for exposure, because if there is a

groundwater pathway, these parameters must be determined to characterize it. There is no question that a groundwater system exists under the site, there is agreement that it is a complex groundwater setting, and there is an acknowledged requirement that this complex setting must be characterized. Yet, the Army is proposing and the Staff is agreeing to defer the collection of the required data.

This agreed deferral appears to be premised on the expectation that some combination of bounding calculations will be used to remove the groundwater pathway from consideration. However, this seems to be a reversal of the position taken by SAIC in the Technical Memorandum submitted with the FSP (SAIC, 2004), wherein the previous bounding condition of zero for groundwater (ground water was not part of the exposure model) was addressed as the first of three issues of major concern. (*Id.*, at 15-16).

3. Army Position

The purpose of the FSP as amended is only to characterize the site sufficiently to provide the RAI-requested inputs for RESRAD modeling. There is no present requirement to characterize the site in a manner that is sufficiently complete and accurate for all purposes required for the restricted-release decommissioning plan, such as particularly the Environmental Report required to support the Environmental Impact Statement (EIS) to be developed by the NRC Staff. Instead, the Staff will determine at a later date the additional characterization beyond the FSP as amended that is necessary for the EIS or other requirements of decommissioning the JPG DU site. (Army Exhibit 3, Skibinski Rebuttal Testimony, at 4; Army Exhibit 4, Eaby Rebuttal Testimony, at 19).

To meet this limited purpose for the FSP, it may be possible, and is allowable, to “bound” the total effective dose equivalent (TEDE) at an acceptable exposure level and thereby negate the need to fully characterize the DU site. As a result, the RAI-requested inputs for the RESRAD model are all

the information that will be needed to compute Total Effective Dose Equivalents (TEDEs) with sufficient reliability for purposes of both restricted release decommissioning scenarios at the JPG DU site. (Army Exhibit 4, Eaby Rebuttal Testimony, at 28-29; Army Exhibit 5, Snyder Rebuttal Testimony, at 17).

4. Staff Position

The purpose of the FSP is to meet the requirements of the Commission regulation regarding an alternate schedule for submittal of a decommissioning plan. Basically, those requirements are flexible and to be determined in the sound discretion of the Staff. (Staff Exhibit 1, McLaughlin Rebuttal Testimony, at 4, 5; Staff Exhibit 2, Peckenpaugh Rebuttal Testimony, at 20).

While it may not be the only requirement, certainly the key requirement is developing the data required for RESRAD modeling of dose estimates for humans. In that context, full-blown fate and transport modeling using only site-specific data is not necessary. Instead, it is both feasible and permissible to use bounding conservative values for DU transport at the site. (Staff Exhibit 2, Peckenpaugh Rebuttal Testimony, at 13). To the extent that modeling in addition to RESRAD may be required for karst, it may be performed during the decommissioning process and has no relevance to evaluating the FSP at this time. (Staff Exhibit 7, Peckenpaugh Surrebuttal Testimony, at 3).

5. Board Finding

The purpose of the FSP cannot be limited to collecting data for a standard RESRAD model run. Nor can the data used in the dose modeling done for JPG be limited to bounding generic values derived from studies of other sites.

As Army witness Eaby discusses in his testimony (Army Exhibit 4, Eaby Rebuttal Testimony, at. 7), NUREG 1757, Volume 2, defines the JPG DU site to be a technically complex site, if only by

virtue of its karst setting. As such, it requires special characterization efforts. Among those extra efforts, NUREG 1757, Volume 2 states, "Technically complex sites may require more advanced ... assessment performance modeling and analysis approaches" While RESRAD is the standard assessment performance model for human radiological exposure, it is clear that RESRAD alone is not the appropriate modeling tool for the JPG DU site.

The Army's May 25, 2005 cover letter to Staff witness McLaughlin transmitting the FSP included a technical memorandum dated September 8, 2004 and entitled "Identification of Key Site-Specific Data to enhance the accuracy and reliability of RESRAD Modeling of the Depleted Uranium Impact Area, Jefferson Proving Ground, Indiana." See Staff Exhibit 14. The assessments performed by SAIC for that memorandum used RESRAD Version 6.22 and did include groundwater in the assessment. SAIC's report "identified three major areas of concern regarding the dose assessment process" that was part of the Army's 2002 decommissioning plan. One of those major areas of concern, the first area of concern listed by SAIC, was that groundwater contamination should be part of the RESRAD analyses. (STV Exhibit 1, Norris Rebuttal Testimony, at 17-18, quoting Staff Exhibit 14)

Furthermore, long before the September of 2004 Memorandum from SAIC, SAIC, the Army and the Staff were well aware of karst geology underlying the JPG DU area. On May 20, 2004, Staff witness McLaughlin issued an RAI to Army (NRC, 2004) regarding Army's 2003 proposed changes to the Environmental Radiation Monitoring Program (U.S. Army, 2003). In the Basis for Question 2 of the RAI, McLaughlin quotes heavily from the Army's plan, as follows:

In the ERMP, the Army states: "To assess the groundwater conditions in and surrounding the DU Impact Area, a number of groundwater monitoring wells were installed and sampled over a substantial period at

locations experts believed adequate for acquiring such information.” “No one can ensure that groundwater monitoring systems in karst environments will not involve a contaminant ‘end-running’ a network.” “It is well known that a complete deterministic description of the preferential pathways is not possible in karst/fractured environments.” “The site is located in karst topography; therefore, the complex physics of flow and transport in fractured media apply. In these systems, the flow patterns may or may not match the directions typically inferred from the slopes indicated on groundwater table maps. Therefore, locating monitoring wells directly downgradient of a source area is complicated. In addition, migration of uranium in the subsurface is a complex biogeochemical reactive process.”

Thus, it was known at least by 2003 to Army, its contractor SAIC, and the Staff that karst was a critical part of the JPG DU site hydrogeology. They also knew that RESRAD is incapable of realistically modeling karst hydrogeology. According to the RESRAD users manual, page 2-11, “The groundwater pathway models implemented in the RESRAD code apply only to situations for which the hydrological strata can reasonably be approximated by a sequence of uniform, horizontal strata.” If groundwater under and around the JPG DU site are part of the human radiological exposure assessment, the standard RESRAD model cannot be used as the only assessment tool. Indeed, even in 2004, SAIC was proposing to add a groundwater contamination module to the standard RESRAD model for the site.

Accordingly, the Board will condition its approval of the requested license amendment for the alternate schedule on the requirement that the Army propose and the Staff approve a modeling approach which is capable of assessing the fate and transport of DU groundwater contamination in the karst environment of the JPG site.

IV. CONCLUSIONS

The fundamental issue in this proceeding is what requirements must be met for the FSP, as

originally designed and subsequently modified, to be “adequate” for its intended purpose. As explained in the legal analysis in Section II, *supra*, the Board has concluded that to be “adequate” for its intended purpose, the FSP must include the tests and provide the information regarding JPG DU site characterization ultimately necessary for inclusion in the Final SER and EIS which will provide the basis for the NRC’s Record of Decision on the eventual license amendment or termination associated with restricted release of the site. As the factual findings in Section III, *supra*, make clear, the FSP as currently designed cannot meet that standard. Indeed, the FSP has not been designed to meet that standard. Instead, the Army originally designed the FSP as no more than its response to a 2004 Request for Additional Information (RAI) from the Staff to conduct those tests necessary to provide site-specific values for certain input parameters for a standard RESRAD model run which, in the Army’s judgment, could be conducted without undue UXO risk to Army and contractor personnel. It has then supplemented the original FSP with addenda in response to additional information requests from the Staff as the plan is implemented and test results become available indicating to the Staff a need for yet more information. For the Staff, the information which will ultimately be required for restricted release decommissioning is apparently “not applicable” for evaluating the “adequacy” of the FSP in this proceeding. Instead, the “applicable” standard for the Staff is whether the additional site characterization information provided by the FSP is sufficient, in the Staff’s judgment, to warrant a five year delay in the submission of the Army’s JPG DU site decommissioning plan.

In view of these circumstances, the Board concludes that the FSP as originally designed and subsequently modified does not meet two of the three requirements of 10 C.F.R. § 40.42(g)(2). First, the FSP does not include all of the tests and will not provide all of the information required to

evaluate the Army's restricted release decommissioning plan and thus "necessary for the effective conduct of decommissioning operations." Second, it is very unlikely that the FSP, absent this decision, will be further modified by the Army in the future to include all of the requisite tests and provide all of the requisite information and certain that the required modifications will not be made by 2011.

A. Modifications to FSP

Generally speaking, the required information which will not be provided at all, or not provided on a timely basis, by the FSP as currently designed, subsequently modified, and expected to evolve falls into two categories: (1) information necessary to meet the requirements of 10 C.F.R. § 20.1403 regarding radioactive doses resulting from restricted release; and (2) information necessary to meet the requirements of 10 CAR §§ 51.45 and 51.50 regarding the environmental impacts of restricted release. More specifically, the sampling methods and protocols of the FSP require modification as follows:

1. Hydrogeological Components

a. The sampling program should include an expanded network of characterization wells, to investigate the potential for and evidence of deeper karst elements that may channel water in directions other than toward the local, on-site streams or to discharge locations outside the current monitoring web; *i.e.*, currently unmonitored groundwater discharges. *See Finding III.A.2, supra.*

b. Prior to the installation of additional characterization wells, Big Creek, Middle Fork Creek and the unnamed tributary of Big Creek that enters the DU Impact area north of D Road should be surveyed with one or more seepage runs to identify those stream reaches with readily apparent flow increases or decreases, thereby identifying where active conduits intersect and interact with the

surface drainage system. *See* Finding III.A.1, *supra*.

c. Also prior to installation of any additional monitoring wells, remote-sensing and on-the-ground geophysical programs should be instituted that are designed to delineate in three dimensions major, open karst pathways that would dominate the groundwater flow system into and from the DU Impact area. These programs should be designed in a manner capable of identifying multiple monitoring sites within critical pathways. *See* Finding III.A.3, *supra*.

d. The sample collection locations, timings, and methods should be re-evaluated and re-designed as necessary to aggressively find migrating DU, in each medium and at times, at locations, and under conditions that are most likely to find it and that document variations in its concentrations and migration rates. *See* Finding III.B.1, *supra*.

e. The sample analysis protocols and methods to detect and measure DU in the samples should be improved, if only during the characterization period, by combining AS and ICP-MS methods and protocols. Characterization sampling serves different purposes and has different requirements than compliance monitoring, and the characterization program should reflect that. *See* Finding III. B.2, *supra*.

2. Biological Components

Biological sampling components for additional biota should be included in the FSP in addition to the Deer Sampling Program already completed. The Deer Sampling Program has not achieved its own limited purpose, but even if it had, it could not substitute for the other biological sampling required. *See* Finding III.D, *supra*.

3. Other Matters

a. The FSP data sets should be expanded to include appropriate inputs for a full capability

fate and transport model where those differ from what is needed for RESRAD alone, especially but not exclusively with respect to modeling groundwater transport in the karst terrain of JPG. *See* Findings III.A.3 and III.F, *supra*.

b. The results of all components of the FSP should be integrated into a comprehensive Conceptual Site Model (CSM) and specific sampling methods and protocols included in the FSP should be redesigned to document the existence and estimate the migration rates and concentrations in space and time of DU along all major exposure pathways. *See* Findings III.A.3 and III.F, *supra*.

B. Dynamic, Iterative Character of the FSP

As both the Army and the Staff see it, the FSP includes the ultimate "Catch-22": the FSP as currently defined cannot be inadequate for its ultimate purposes (whatever they may be) because, as a dynamic, iterative plan, it can always be amended by future addenda to provide for additional testing, modified sampling protocols, and revised data collection and evaluation procedures. The Board acknowledges what is both obvious and necessary, namely that the FSP is intended to be a dynamic, iterative plan that is subject to change later in its scheduled life as tests are conducted and data is collected and evaluated earlier in its five-year life. But, the Board does not agree that the dynamic, iterative character of the FSP means that its current design cannot be found inadequate for its ultimate purpose in this proceeding.

From the Board's perspective, the most critical evaluative consideration is whether the FSP as currently designed will include the tests and provide the information within its scheduled five-year life necessary to support an NRC Record of Decision on a restricted release decommissioning plan submitted in 2011. The Board simply does not believe that the Commission's License Termination Rule contemplates a decommissioning process for the JPG DU site which continues indefinitely. At

the hearing in this matter, it was the stated position of all parties that five years should be sufficient for the Army to characterize the JPG DU site adequately for purposes of the planned restricted release decommissioning. Accordingly, the Board concludes that the FSP should be designed to achieve that result in the remaining three years of the alternate schedule period.

C. Unexploded Ordnance Risk

As the Board sees it, the issue of unexploded ordinance risk came into this proceeding like a lion but leaves like a lamb. On the record before it, especially the answers to the Board's questions at the hearing, the Board concludes that the decisions on what sampling can or cannot be accomplished in the DU Area can and should be based on the information necessary for informed decommissioning decision-making and personnel safety should then be assured by collecting that information in accordance with the sound technical principles described in EP 75-1-2. If this is done, the Board is confident that all required site characterization activities may be performed without undue risk to Army or contractor personnel.

V. DECISION

Based on the foregoing discussion of this matter's Background, Governing Legal Principles, Findings, and Conclusions, the Board affirms issuance of License Amendment No. 13 and the associated alternate schedule for submittal of a JPG DU site decommissioning plan, subject to all required conditions and modifications to the FSP included in our Findings and Conclusions.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

| | | |
|---------------------------------|---|-------------------------|
| In the Matter of |) | Docket No. 40-8838-MLA |
| |) | |
| U.S. ARMY |) | ASLBP No. 00-776-04-MLA |
| |) | |
| (Jefferson Proving Ground Site) |) | December 7, 2007 |

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing Proposed Findings of Fact, Conclusions of Law, and Initial Decision of Intervenor Save the Valley, Inc., have been served this 7th day of December, 2007, upon the following persons by electronic mail and by U.S. Mail, first class postage prepaid.

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December 7, 2007

Secretary
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ATTN: Rulemakings and Adjudications Staff

Re: Proposed Findings of Fact, Conclusions of Law and Initial Decision of Save the Valley, Inc.

In the Matter of the U.S. Army (Jefferson Proving Ground Site), Docket No. 40-8838-MLA, ASLBP 00-776-04-MLA

Dear Secretary:

Enclosed please find for filing in the above-referenced docket the original and two conformed copies of the above-referenced filing, along with the related Certificate of Service.

Thank you for your assistance in this matter.

Respectfully submitted,



Michael A. Mullett
Attorney for Save the Valley, Inc.

cc: Service List – Docket No. 40-8838, ASLBP 00-776-04