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September 24, 2001

Chief, Rules and Directives Branch
Mail Stop T6-D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

REFERENCE: Request for Comments on a Proposed Revision of the Office of State and Tribal Programs (STP) Procedure SA-900: *Termination of Uranium Milling Licenses in Agreement States* [66 Fed. Reg. 44389 (August 23, 2001)]

Dear Sir:

The Nuclear Energy Institute (NEI)[1] on behalf of its industry members is submitting the attached comments on a proposed draft revision of STP Procedure SA-900. SECY-99-025 (dated January 25, 1999) identified the need to update the Commission's guidance on how the NRC should make concurrence determinations

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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Add = K. Hsueh (KPH)

on license termination proposals received from Agreement States. The original guidance did not, for example, address termination of *in-situ* uranium licenses and did not clearly specify the level of detailed information that should be provided by an Agreement State in support of a license termination proposal.

NEI concurs with the NRC's identification of certain deficiencies in Procedure SA-900 and we support the Commission's decision to establish a Working Group of NRC staff and Agreement State representatives to spearhead revision of this guidance.

While certain changes incorporated in the August 2001 draft revision of the procedure do address deficiencies in the original guidance, NEI has identified four areas in which further revision should be considered:

- **Two-Step Review Process**: The guidance would formalize Agreement State-NRC consultations on the content of the Completion Review Report (CRR) by requiring pre-submission and approval of a draft CRR before the Agreement State could formally request concurrence on termination of a uranium recovery license. This new requirement is not needed, will be burdensome and costly to Agreement States and will appreciably delay the license termination process. Neither the Agreement States nor licensees should have to bear the significant, added costs that this additional paperwork would entail. The existing process, whereby the Agreement State consults with the NRC on a proposed license termination, but does not submit a draft CRR for pre-approval, has worked well and should not be modified. Cooperation and consultations between the two parties should be encouraged, but the added burden and delay of preparing and submitting a draft CRR for comment and consensus appears unnecessary.

  The CRR is essentially what is referred to as a Safety Evaluation Report (SER). SERs present the results of NRC staff evaluations of documents submitted generally in support of licensing actions. An SER typically contains a description of the review, including aspects that required special emphasis, matters that were modified by the applicant during the review, matters that will be resolved in the future, aspects where the applicant's proposal deviate from the criteria in a Standard Review Plan

(or other guidance document), and the bases for any deviations from the SRP or exemptions from applicable regulations or requirements. NEI would recommend use of the term "SER" rather than "CRR" in Procedure SA-900 to maintain consistency in Commission nomenclature for licensing action reviews.

- **Sample Completion Review Reports**: The draft revision of Procedure SA-900 includes example CRRs for both conventional and *in-situ* uranium recovery licenses. While the inclusion of specific content guidance is commendable, the sample CRRs for a conventional milling license (Appendix B) and an *in-situ* license (Appendix C) are poorly drafted, disjointed and incomplete. Appendix B is not a good example of what a CRR should contain or of how the information should be presented. Both example CRRs are based on actual CRRs from which specific names and data, but not detailed licensee-specific information, have simply been deleted. Time constraints may have forced the Working Group to simply "white-out" parts of existing CRRs, but the result is a mish-mash of inconsistent, confusing and unhelpful information. The CRR examples must be redone in a logical and helpful manner. Appendices B and C would be considerably more useful were they to enumerate those technical issues that should be addressed in the CRR in order to meet federal decommissioning and reclamation standards and requirements. Agreement State personnel will be better served by consulting actual CRRs from terminated licenses rather than attempting to decipher heavily edited, whiteout and disjointed CRRs as currently presented in Appendices B and C.

- **Procedure Structure**: The draft revision of Procedure SA-900 now includes some general guidance on issues that should be reviewed in the CRR. This is an improvement. However, specific federal requirements (such as those of 10 CFR 40, Appendix A criteria) are lacking, as are acceptance criteria for information provided in the Agreement State's proposal. The usefulness of the guidance could be significantly improved were it to be restructured along the lines of a typical '*Standard Review Plan*' in which the regulatory bases, areas of review and acceptance criteria are clearly and explicitly stated. There are several instances in which the draft revision of Procedure SA-900 addresses activities to be performed solely

by the Agreement State (e.g. Step #2 of the termination process). How the Agreement State assesses and judges the adequacy of licensee information is a state prerogative and need not be addressed in Procedure SA-900. The procedure's presecriptiveness in "dictating" how an Agreement State should conduct its analyses should be removed. Considerable redundancy remains in the draft revision (e.g. multiple citations of regulatory bases, personnel assignments and responsibilities, etc.) that should be consolidated and deleted for clarity.

- **Risk-Informed, Performance-Based Regulation**: The draft revision of Procedure SA-900 does not address how the NRC's risk-informed, performance-based regulatory approach should be incorporated into the concurrence process. Nowhere does the guidance address, for example, how to evaluate the risk significance and potential impacts on human health and safety and the environment of the inability (whether technical or economic) to meet every detail of a 10 CFR 40 Appendix A decommissioning criterion. Guidance on how the NRC should act in such cases (e.g. authorize or delay termination, etc.) would be helpful.

The Working Group has made many improvements to Procedure SA-900 and the usefulness of the guidance has been significantly improved. However, NEI believes the draft revision could be further improved were some specific guidance included to explain how concurrence to an Agreement State application for license termination should be assessed and granted. To be really useful the procedure should not just state what information should be summarized in the CRR, but also guide the NRC reviewer in how to judge the acceptability and completeness of the CRR content. Appendices B and C require complete revision to make them useful to an NRC reviewer. Finally, the significant commitment of NRC, Agreement State and licensee resources that will be required to pre-approve a CRR is unnecessarily burdensome and will not enhance protection of human health and safety or the environment. The NRC should take full advantage of the opportunity to revise Procedure SA-900 to address previous deficiencies, but also to incorporate truly helpful and risk-informed, performance-based guidance structured in a user-friendly manner.

The Attachment to this letter expands upon each of NEI's four concerns noted above and presents some detailed comments on the procedure and its appendices. As

noted earlier, however, NEI recommends a significant restructuring of Procedure SA-900 along the lines of a traditional NRC *Standard Review Plan*.

NEI looks forward to working with the NRC's Working Group and other interested stakeholders in advancing the revision of this important Commission guidance document. If you have any questions concerning the attachments please contact either Clifton Farrell (202-739-8098; cwf@nei.org) or me.

Sincerely,

Felix M. Killar, Jr.

Attachment

DETAILED COMMENTS ON THE AUGUST 2001 DRAFT REVISION OF PROCEDURE SA-900
'Termination of Uranium Milling Licenses in Agreement States'

GENERAL CONCERNS

(a) Two Step Review Process

The draft revision proposes that an Agreement State formally submit a draft Completion Review Report (CRR) for NRC review and comment before the final CRR could be accepted. This process would replace the informal consultations that now take place between the NRC and Agreement State staff as the latter prepares the CRR. Judging by the envisioned complexity of the draft CRR review process (see the example chronology in Appendix D), this exercise will entail large commitments of NRC and Agreement State personnel resources and a lot of time exchanging letters and processing what amounts to multiple '*Requests for Additional Information*'. Who will bear the costs for this multi-month exercise? How will this pre-review process expedite the termination of licenses? Does this new bureaucratic requirement enhance human health and safety and protection of the environment?

SECY-99-025 and Procedure SA-900 both state that the NRC is to make its concurrence determination based on the Agreement State's reviews and acceptance of the documentation submitted by the licensee. Both documents clearly state that the NRC will not conduct independent detailed technical reviews of the Agreement State documentation. In other words, the NRC's role is one of checking to ensure the completeness of the licensee's compliance with its approved Decommissioning Plan, 10 CFR 40 Appendix A requirements, Agreement State regulations and any specific license conditions or exclusions. Presumably, if the NRC's periodic Integrated Materials Performance Evaluation program (IMPEP) reviews confirm that an Agreement State's uranium recovery regulatory program is technically sound and in concurrence with federal requirements, the NRC should accept the validity of the Agreement State's license termination assessments and CRR proposals. If an Agreement State attests to the completeness and satisfactory execution of a licensee's approved

Decommissioning Plan, the amount of information included in the CRR should be relatively limited. There should be no need for submission and pre-approval of a draft CRR. If the chronology of events for submittal and approval of a draft CRR is typical of that laid out in Appendix D (Pages D-3 to D-5), at least six to twelve months should be expected to complete approval of the draft CRR. The required expenditure of NRC, Agreement State and licensee resources can also be expected to be sizeable. Expenditure of these resources will neither enhance protection of human health and safety nor protection of the environment. The existing system, whereby the NRC staff and Agreement State staff informally discuss preparation and submission of the CRR, works well. In view of the way in which the NRC is to assess and grant concurrence as presented in Procedure SA-900, burdening the process with an added pre-approval step cannot be justified. This is an unnecessarily costly and time-consuming bureaucratic step that is unwarranted.

The CRR is essentially what is referred to as a Safety Evaluation Report (SER). SERs present the results of NRC staff evaluations of documents submitted generally in support of licensing actions. An SER typically contains a description of the review, including aspects that required special emphasis, matters that were modified by the applicant during the review, matters that will be resolved in the future, aspects where the applicant's proposal deviate from the criteria in a Standard Review Plan (or other guidance document), and the bases for any deviations from the SRP or exemptions from applicable regulations or requirements. NEI would recommend use of the term "SER" rather than "CRR" in Procedure SA-900 to maintain consistency in Commission nomenclature for licensing action reviews.

(b) Sample CRRs (Appendices B and C)

Appendices B and C are edited versions of the CRRs prepared for Western Nuclear's Sherwood Uranium Project (Appendix B) and an unnamed Texas *in-situ* mining project (Appendix C). Unfortunately, the cursory manner in which sections of the respective CRRs have been excised from the original reports and pasted together is unsound and inconsistent and constitutes bad guidance. Both appendices provide

little guidance to the NRC staff in judging whether a CRR is complete and acceptable. Inclusion of alternate approaches for certain issues (e.g. geotechnical stability, radiation clean-up in Appendix B) is confusing and simply contrasts bad and good writing styles. Clearly, little thought or consideration was put into drafting these appendices and the resulting mish-mash of disconnected text, misplaced references, and superfluous information (e.g. documentation of the exchange of correspondence in §3.1 of Appendix B is totally irrelevant) necessitates a major revision of these appendices.

To be truly useful, and not simply a source of "boilerplate" text for inclusion in a CRR, each appendix should first clearly enumerate those federal and state standards, as well as any specific license or Decommissioning Plan conditions, that must be satisfied. The appendix should relate each standard or condition to the federal requirement (primarily 10 CFR 40, Appendix A) and the corresponding section of the CRR or supporting technical study. In other words, the appendices should provide a listing of the issues to be addressed in the CRR along with sub-issues or expected data or completed analyses. This would be far more useful to the NRC reviewer than having to read a doctored-up version of an actual CRR. As an example, for groundwater remediation at a conventional mill, topics for possible inclusion in a CRR may include the following. There should be no need to provide paragraphs of example text for each topic, but simply identification of topics for which the NRC seeks reasonable assurance that were properly addressed by the licensee and attested to by the Agreement State in the CRR.

Groundwater Remediation:

(i) groundwater characterization

- monitoring well locations (well design(s), spatial proximity to tailings impoundments, completion depths, aquifers sampled, etc.)
- water quality sampling program description (methodology, frequency, protocols, split samples, Agreement State sampling, etc.)
- analytical results (analytical laboratory, analytical

methods, quality assurance, temporal variation of water quality, agreement between licensee and Agreement State analytical results, etc.)
- applicable baseline water quality standards (EPA, state, or license-specific alternate concentration limits (ACLs), etc.)
- comparison of analytical results to applicable standards (temporal variation, analysis of licensee and Agreement State data, etc.)

(ii) definition of problem (if applicable)
- definition of parameters exceeding applicable standards (environmental significance and risk, evaluation of the need to proceed with groundwater remediation, etc.)
- definition of problem scope (aquifer hydrology characterization including horizontal and vertical hydraulic gradients, contaminant transport properties, extent of contamination, etc.)
- evaluation of remedial options (technical and economic feasibility, modeling of contaminant fate and dispersion, assessment of immediate and long-term environmental risk, etc.)

(iii) remedial action program (if applicable)
- implementation of remedial actions (program design, installation and construction, effectiveness monitoring parameters, etc.)
- post-closure monitoring (selection of indicator chemical parameters, monitoring well location, achievement of groundwater restoration quality, demonstration of water quality stability, etc.)
- impacts on Long-Term Surveillance Plan (LTSP) (including funding, etc.)

Keep in mind that every licensee and Agreement State will consult previously submitted and approved CRRs. There is no need to reproduce sections of such CRRs in the guidance appendices.

(c) Procedure Structure

The draft revision of Procedure SA-900 now states in very conceptual terms what information should be included in a CRR. SECY-99-025 identified a need for more specific guidance on the level of detailed information that should be in a CRR and specifically, which technical issues should be addressed. The draft revision has been modified and now lists six to seven topics for which information should be submitted. This is an improvement.

However, the draft revision lacks guidance on how the NRC reviewer should judge the adequacy and acceptability of information presented in the CRR. While Procedure SA-900 cannot address every possible approach for implementing an Agreement State approved Decommissioning Plan, the procedure must outline some high-level acceptance criteria for CRRs.

NEI recommends that Procedure SA-900 be restructured along the lines of an NRC '*Standard Review Plan (SRP)*'. An SRP outlines a uniform, consistent approach for guiding the review of submissions to the NRC. Adherence to the structure and format of an SRP would state the regulatory bases for the review and concurrence, clearly identify technical areas to be examined, provide acceptance criteria for the submitted information, and outline a common mechanism for conducting the concurrence review. While information pertaining to several of the aforementioned topics is present in the draft revision of the procedure, it is often needlessly repeated, unclear or simply lacking.

To facilitate a CRR review, NEI recommends that the procedure include a table of all federal decommissioning and restoration criteria that must be met with cross-references to Agreement State requirements and sections of the CRR. (Any licensee-specific conditions in the Decommissioning Plan would also require examination).

Steps 2 and 3 of the license termination process (pages A-2 and A-6) are superfluous to the procedure. These steps state how the Agreement State should conduct its own analysis and, as such, are not

appropriate for inclusion in Procedure SA-900. While the statements in these two steps are factually correct, Procedure SA-900 should guide the review of the adequacy and validity of information presented in the CRR, but *not* the Agreement State's procedures and approaches. Steps 2 and 3 should be revised or deleted from the draft, revised procedure.

(d) Risk-Informed, Performance Based Regulation

As noted above, the absence of guidance on how to judge the adequacy and acceptability of a CRR is a serious deficiency in the draft revision of the procedure. Such guidance should include application of the NRC's risk-informed, performance-based regulatory philosophy. For example, guidance to the reviewer in evaluating the comparative risks to human health and safety and the environmental in the event that a decommissioning criteria cannot be totally met (whether as a result of technical or economic limitations) would be advisable. What should the NRC reviewer do in such cases?

SPECIFIC COMMENTS

NEI has prepared a detailed critique of the draft revision of Procedure SA-900. Suggested improvements are highlighted and redundant text has been struck through. As noted earlier, NEI would recommend structuring this guidance as an SRP, thereby necessitating significant modifications to the attached redlined version. Similarly, NEI recommends that Appendices B and C be significantly revised. A few editorial corrections:

- inconsistent usage of the terms "Agency", "Commission" and "NRC". Recommend consistent usage of one term throughout the procedure.
- inconsistent use of verb forms. Recommend using the present tense (rather than the subjunctive) to explicitly state, for example, what is expected in the CRR or what the NRC reviewer is to do.

Termination of Uranium Milling Licenses in Agreement States
SA-900 Procedure (August 2001 Draft Revision

I. INTRODUCTION

This procedure describes the review process for making the determination that all applicable standards and requirements have been met prior to Agreement State uranium ~~recovery~~ milling license termination, as required by 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended (AEA).

II. OBJECTIVES

A. To establish uniform and consistent procedures for NRC staff to review of uranium milling license termination proposals submitted by Agreement States.

B. To provide guidance for use by Agreement States on preparation and submittal of uranium milling license termination proposals for NRC staff review.

III. BACKGROUND

A. Section 150.15a(a) states that the Commission shall determine that all applicable standards and requirements pertaining to byproduct material as defined in 10 CFR 150.3(c)(2) ~~(i.e., uranium mill tailings)~~ have been met prior to termination of any Agreement State license for such material. This provision in NRC's regulations stems from Section 274c(4) of the AEA which reads in part: "[t]he Commission shall also retain authority under any such agreement to make a determination that all applicable standards and requirements have been met prior to termination of a license for byproduct material, as defined in Section 11e.(2)."

B. Two kinds of Agreement State uranium ~~recovery~~ milling licenses are

involved: conventional and non-conventional (mainly in-situ uranium extraction licenses). ~~uranium mill licenses.~~ A conventional uranium mill is a facility that generates mill tailings and will be transferred to a custodial agency for long-term care in accordance with 10 CFR § 40.28 after the entire license is terminated. A non-conventional uranium mill is a facility that generates limited quantities of byproduct material [Comment: The NRC Commissioners determined that fluids used in restoring wellfields are also 11e.(2) byproduct material. Disposition of such 11e.(2) material in a liquid form is unlikely. The language of the following sentence should be clarified to clarify the different types of 11e.(2) byproduct material.] Solid byproduct material from non-conventional milling licensees is normally transferred to tailings impoundments at conventional uranium mills for disposal and therefore no land transfer or long-term custodianship is required at license termination. For both types of licenses, the Agreement State is expected to conduct its review for decommissioning, reclamation and/or groundwater restoration in accordance with ~~State standards and regulations~~ specific license requirements and State standards which are compatible with the requirements of 10 CFR Part 40. Agreement States are responsible for approval of the remediation plans of uranium ~~recovery~~ milling facilities in their States and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans. Upon NRC's ~~concurrence~~ determination that all applicable standards and requirements have been met, the Agreement State will terminate the uranium milling license.

C. [Comment: the following paragraph C should be relocated to Section V(A) for better continuity.]

IV. ROLES AND RESPONSIBILITIES

A. The Director, Office of State and Tribal Programs (~~OSP~~ STP), has overall responsibility for the review of license termination proposals submitted by Agreement States and for making the determination required in Section 274c of the Act that all applicable standards and requirements have been met.

B. The STP Director will appoint a Project Manager (PM) who will be responsible for completing the Agency's review of uranium milling license termination proposals submitted by Agreement States. The PM is the primary NRC contact for the State during the review.

~~The Reviewer is responsible for completing reviews of uranium license termination proposals submitted by Agreement States. The reviewer should consult with the Office of Nuclear Material Safety and Safeguards (NMSS) or other NRC offices as necessary to support completion of the review based on issues raised during the review and their significance. After completing the review, the reviewer prepares a response letter back to the State and obtains the concurrence from the Office of the General Counsel (OGC) and NMSS.~~

C. The PM will assemble a review team to conduct the staff evaluation of uranium milling license termination proposals submitted by Agreement States. A team normally consists of the PM and staff from the Office of Nuclear Material Safety and Safeguards (NMSS) and the Office of the General Counsel (OGC). [Comment: should the responsibilities and roles of OGC and NMSS personnel be stated here?]

V. GUIDANCE

A. [Comment: this paragraph A repeats what was presented in Section III(A), albeit with a little historical perspective. As nothing new is stated, recommend deleting this entire section for it adds nothing new.]

B. Each Agreement State license amendment that terminates a portion of the site from a license should be considered as a partial license termination and the NRC would make the AEA Section 274c(4) determination for each such partial termination .

C. Applicable ~~S~~standards and requirements to be used by NRC to make the determination:

The "applicable standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) are the applicable standards in the Agreement States. Such Agreement State standards were established in accordance with Section 274o of the AEA on one or more of the following occasions: (1) during the initial or amendment of their agreement, (2) during revision of the regulations to maintain compatibility with federal regulations, or (3) during approval of an alternate standard. Agreement State standards, which must be consistent with those of 10 CFR 40 and 10 CFR 40, Appendix A, also include legally binding requirements, orders, or license conditions that implement the requirements of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). "Applicable standards and requirements" may also incorporate conditions or requirements specific to a licensee that could, for example, impose reclamation and decommissioning standards that differ from the Agreement State's normal standards. ~~were reviewed and approved by NRC when agreements were amended. Agreement States are also expected to adopt any changes to NRC's uranium recovery milling rules or programs that are identified as required for compatibility or because of their health and safety significance within 3 years of their enactment.~~

~~The "standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) would be applicable State regulations, State-adopted alternative standards and license requirements in the Agreement State. Agreement States are also expected to adopt any changes to NRC's uranium recovery rules or programs that are identified as required for compatibility or because of their health and safety significance within 3 years of their enactment.~~

D. Bases to be used for NRC determination:

The determination that all applicable standards and requirements have been met prior to termination of an Agreement State license would have two primary supporting bases:

1. The first basis is a cCompletion rReview rReport (CRR) ~~requested from~~ submitted by the Agreement State containing the conclusions

from the State's review of a licensee's completed remedial actions. This report would document the State staff's bases in summary form for its conclusion that all ~~requirements~~ applicable standards and requirements have been met. ~~NRC staff would request a completion review report similar to that contained in Appendix A. Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the Agreement State prior to making its determination. The completion review report should include the following information depending on whether the license being terminated is a conventional or non-conventional uranium mill license.~~

~~a. Conventional Uranium Mill License~~

~~(i) A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.~~

~~(ii)Documentation that the completed surface remedial actions were performed in accordance with license requirements and regulations .~~

~~(iii) Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.~~

~~(iv) Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.~~

~~(v) Discussion of results of State's site closure inspection.~~

~~(vi) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.~~

~~b. Non-conventional Uranium Mill License (Mainly In-situ Uranium Extraction License)~~

~~(i) A brief description of licensee's activities associated with license termination.~~

~~(ii) Groundwater information which demonstrates that the groundwater has been adequately restored to meet the State restoration criteria.~~

~~(iii) Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria . Such documentation could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect.~~

~~(iv) Decommissioning information which documents that all contaminated materials have been removed from the site.~~

~~(v) Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.~~

~~(vi) Discussion of results of the State's site closure inspection.~~

~~(vii) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.~~

~~Note: Additional information may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium license category.~~

2. The second basis is NRC reviews of the Agreement State's uranium recovery regulatory program, which are currently conducted under the Integrated Materials Performance Evaluation Program (IMPEP). The results of the IMPEP reviews would provide a basis for confidence on the determinations and conclusions reached by the Agreement State, as set out in the ~~completion report~~ CRR, and also a basis of confidence that the State's reviews, licensing actions, and inspections associated with termination have been conducted appropriately. The periodic reviews of selected technical areas, conducted under IMPEP, which also include training and qualifications of staff and adherence to necessary program procedures, e.g., license termination process for uranium recovery licenses or equivalent procedures, will also serve as a basis that all applicable standards and requirements are met.

[Comment: the content of the following paragraph is very important and should not be deleted. There should be a clear statement towards the beginning of the Procedure that clearly states the extent of the NRC's review.]

~~Note that the NRC staff would not duplicate the State's review by conducting an independent detailed technical review of the proposed license termination or determination of any specific documentation for the Agreement State licensees. Rather, the NRC staff would rely on a review of the completeness and documentation of the Agreement State action as well as the normal periodic NRC review of the Agreement State program under IMPEP.~~

E. Review of CRRs submitted by Agreement States
[Comment: we do not concur with the need to submit a draft CRR for pre-approval. This section should be revised to remove this requirement.]

The CRR should include the following information depending on whether the license being terminated is a conventional or non-conventional uranium ~~mill~~ milling license. Specific information requirements for each CRR are listed in Appendices B (conventional milling license) and C (in-situ milling license).

a. Conventional Uranium ~~Mill~~ Milling License

(i) A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

(ii) Documentation that the completed surface remedial actions were performed in accordance with ~~license requirements and regulations~~ applicable standards and requirements.

(iii) Documentation that the completed site decommissioning actions were performed in accordance with ~~license requirements and regulations~~ applicable standards and requirements. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets ~~unrestricted release requirements.~~ applicable standards and requirements for the selected release standard.

(iv) Documentation that the completed groundwater corrective actions, if necessary have reduced the concentrations of contaminants of concern below the maximum permissible concentrations specified in the applicable standards..

(v) Discussion of results of State's site closure inspection(s).

(vi) Documentation that release of this portion of the licensed site will not negatively impact the remainder of the licensed site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

b. Non-conventional Uranium ~~Mill~~ Milling License (Mainly In-situ Uranium Extraction License)

(i) A brief description of licensee's activities associated with decommissioning and license termination.

(ii) Groundwater information which demonstrates that the groundwater has been adequately restored to meet ~~the State restoration criteria~~ applicable standards and requirements.

(iii) Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with ~~the State criteria~~ applicable standards and requirements. Such documentation could be a copy of correspondence from the State regulatory agency to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria.

(iv) Decommissioning information which documents that all materials contaminated with radionuclides at levels exceeding applicable standards have been ~~removed from the site~~ properly disposed of or transferred to licensee(s) authorized to possess such materials.

(v) Discussion of results of radiation survey and confirmatory soil samples which indicate that residual concentrations

of radionuclides on the licensed site do not exceed applicable standards.

(vi) Discussion of results of the State's site closure inspection(s).

(vii) Documentation that release of this portion of the licensed site will not negatively impact the remainder of the licensed site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

[Comment: the following comment requires further elaboration. Some examples should be given. How is the reviewer to proceed in this event?] Note: Additional information may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.

3. [Comment: this paragraph 3 is important and should be placed at the beginning of the section – for it tells the NRC reviewer what to do.] The team shall not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination. Rather, the team will review the completeness and appropriateness of the Agreement State's actions as presented in the CRR to establish with reasonable assurance that the applicable standards and requirements have been met.[Comment: this last sentence is inapplicable if Appendices B and C are redrafted as recommended.]

4. Unless there are obvious flaws or deficiencies in the CRR, in which case the Commission will solicit additional relevant information from the Agreement State, the team will focus on whether the State has provided adequate bases in summary form to confirm that closure activities were performed according to the approved plans and specifications. [Comment: the intent of the following sentence is

unclear. So long as the licensed facility had been decommissioned and reclaimed in accordance with provisions of the Agreement State-approved Decommissioning Plan, the NRC staff should not be concerned with whether the design features of the licensed facility remained in strict compliance with regulations during operations. Recommend clarification or deletion of this sentence.]

5. [Comment: the following paragraph does not apply if the draft CRR requirement is deleted.]

6. [Comment: the following paragraph does not apply if the draft CRR requirement is deleted.] \

7. [Comment: recommend combining paragraphs 7 and 8 as follows:] The review team conducts a review of the CRR. If the PM determines that the CRR is complete and that applicable standards and requirements have been met for license termination, after obtaining concurrence from OGC and NMSS, the PM will issue a letter to the Agreement State advising it of the Commission's concurrence with the license termination proposal. Examples of NRC response letters are provided in Appendices D and E.

~~E~~ F. Process to be followed for NRC determination:

1. A detailed step by step license termination process for conventional and non-conventional uranium ~~mill~~ milling licenses in Agreement States is documented in Appendix ~~B~~ A. The NRC staff should review the CRR and rely on the adequacy and compatibility of the Agreement State's program to regulate uranium ~~recovery~~ milling licensees to confirm that the State's conclusions demonstrate that all ~~appropriate requirements~~ applicable standards and requirements have been met by its licensee. [Comment: who will pay for such visits? If the state's CRR is well prepared and documented, there should be little need for NRC staff to require a visit to the site, unless for training or general interest purposes. As stated earlier, the NRC acknowledges that the

state personnel will have a acquired a far broader and comprehensive understanding of the licensed site and be in a better position to have prepared the decommissioning and reclamation reports] Prior to submitting a CRR to the Commission , NRC staff may wish to visit the licensed sites that are being terminated and to discuss the histories and conditions of the licensed sites with Agreement State representatives. An Agreement State licensee's request for amendment to release a portion of site from its license also requires NRC to make a determination based on a site specific ~~completion review report~~ CRR for that portion of the site. Similar license termination processes would be followed for both partial and entire license termination cases.

2. Once the Commission determines that all applicable standards and requirements have been met, it should so notify the State of its determination by formal correspondence. Upon notification from the NRC, the Agreement State should terminate the specific license, if it is a non-conventional uranium ~~mill~~ milling license, or to amend the license to remove the remediated portion from that license, if the license is being partially terminated.

3. An Agreement State may fully terminate a conventional uranium milling license once the following three actions have occurred: (1) the Commission has notified the Agreement State that all applicable standards and requirements have been met; (2) the Commission has notified the Agreement State that the Long-Term Surveillance Plan (LTSP) has been accepted[2] and (3) the long-term care funds have been transferred to the appropriate State agency or the custodial agency.

[2] For the full termination of a conventional uranium milling license, the commission shall conduct a separate review (the review process is not included in this procedure) of a site LTSP submitted by the custodial agency. Provisions and activities identified in the final LTSP will form the bases for approval of the custodial agency's long-term surveillance at the licensed site. Note that portions of licensed sites that have been partially terminated have generally been for areas surrounding the actual milling area and for which no LTSPwas needed.

~~3. For the full termination of a conventional uranium mill license, the NRC staff would also review a site Long-Term Surveillance Plan (LTSP) submitted by the custodial agency. Provisions and activities identified in the final LTSP will form the bases of the custodial agency's long-term surveillance at the site. Note that sites that have been partially terminated have involved areas surrounding the actual milling area which were released without the need for a LTSP. The review of the LTSP would be very similar for both NRC and Agreement State licensees since the review and acceptance of the LTSP is conducted in accordance with 10 CFR § 40.28 which is the sole purview of the NRC.~~

~~Given NRC's determination that all applicable standards and requirements have been met and upon notification from the NRC that a LTSP has been accepted the Agreement State should be ready to terminate the conventional uranium license.~~

VI. APPENDICES

~~Appendix A - Sample Completion Review Report~~

Appendix A - Termination Process for Conventional and Non-conventional Uranium Milling Licenses in Agreement States

~~Appendix B - Termination Process for Conventional and Non-conventional Uranium Mill Licenses in Agreement States~~

Appendix B - Sample Completion Review Report for Conventional Uranium Milling License

Appendix C- Sample Completion Review Report for Non-Conventional Uranium Milling License

Appendix D - Sample NRC determination letter for Conventional Uranium Milling License

Appendix E - Sample NRC determination letter for Non-conventional Uranium Milling License

VII REFERENCES

1. Section 274 Atomic Energy Act of 1954, as amended.

2. 10 CFR Part 150, Exemptions and Continued Regulatory Authority in Agreement States and in Offshore Waters Under Section 274.

3. NRC Management Directive 5.6, "Integrated Materials Performance Evaluation Program."

4. NRC Management Directive 9.15, "Organization and Functions, Office of State Programs."

5. SECY-99-025, "Guidance to Terminate Agreement State Uranium Recovery License"

Appendix B -- Sample Completion Review Report (Conventional)

APPENDIX ~~B~~ A

Termination Process for Conventional and Non-Conventional Uranium ~~Mill~~ Milling

Licenses in Agreement States

Termination of uranium ~~mill~~ milling licenses in Agreement States has been divided into two major parts as follows: (a) termination of conventional uranium ~~mill~~ milling licenses; and (b) termination of non-conventional uranium ~~mill~~ milling licenses (mainly in-situ uranium extraction licenses).

(a) Termination of Conventional Uranium ~~Mill~~ Milling Licenses

Step 1 through step ~~7~~ 5 are applied to entire license termination cases; steps 1~~, 2, 5 and 6~~ through 4 are applied to partial license termination cases.

Step 1: Licensee Documentation of Completed Remedial and Decommissioning Actions

Licensees are required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

Criteria 5A-5D, along with Criterion 13, of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations incorporate the basic groundwater protection standards imposed by U.S. Environmental Protection Agency (EPA) in 40 CFR Part 192, Subparts D and E. These standards apply during operations and prior to the end of closure. In addition, under Criterion 6(7) , the licensee should address the non-radiological hazards associated with the wastes in planning and implementing closure. The licensee should ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. Licensees may refer to the introduction section of the 10 CFR Part 40, Appendix A, or equivalent Agreement State regulations with respect to the use of alternate standards for groundwater protection.

If the applicable groundwater protection standards are exceeded, the licensee is required to put into operation a groundwater corrective action program (CAP). The objective of the CAP is to return the hazardous constituent concentration levels to the concentration limits set as standards. For licensees with continuing groundwater cleanup, State approval is required for the termination of corrective

action. Appropriate groundwater monitoring data and other information that provide reasonable assurance that the groundwater has been cleaned to meet the ~~appropriate~~ applicable standards and requirements are submitted to the State for review.

Step 2: Review of Completed Closure Actions by the Agreement State

[Comment: the language in the following paragraph is too prescriptive to the Agreement State. It outlines activities that the Agreement State will itself conduct and does not address how the CRR will be assessed. If the NRC has confidence in the ability of the Agreement State authorities to prepare the CRR, it should not interfere with the state's methods to prepare the CRR. The language must be revised. Or Step #2 should be deleted.] Upon receipt of the decommissioning report, and if necessary, groundwater completion report, the State staff should review the content of the reports for documentation of acceptable completion of the applicable aspect of closure. The State staff should also review the licensee's completed reclamation of the tailings disposal cell. As part of its ~~review~~ oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final construction-completion inspection, which is expected to consist of a site walk-over.

Typically, there is an observational period following the completion of ~~surface~~ remedial actions for the State to assess the potential long-term stability of the tailings disposal cell. Licensees should report significant cell degradation occurring during this period. All identified hazardous constituents for which groundwater compliance sampling is being conducted at a licensed site must be returned to the concentration limits or alternate concentration limits set as standards prior to termination of a specific license. [Comment: the language should be modified to address what is stated in the approved Decommissioning Plan.] ~~At license termination, the State should require licensees to sample for all constituents previously identified and in the tailings liquor to ensure that no further remediation is necessary. The State should not terminate a~~ The specific license would not be terminated while an active groundwater CAP is in operation. [Comment: what is the meaning of the (following) final sentence? In the previous sentence the guidance states that a license may not be terminated so long as a CAP is in progress. And yet the following sentence implies that the license may be terminated as the CAP progresses. This discrepancy should be addressed. This issue is one that should be discussed in terms of the risk-informed, performance-based regulatory philosophy: the risk should also be evaluated before such definitive statements are made. Revise this sentence text.]Passive groundwater CAPs are acceptable for license termination, as long as the CAP achieves the

applicable standards and requirements before license termination, and shows that groundwater will remain at or below those standards for the design life of the disposal cell.

~~**Step 3: Long-Term Site Surveillance Funding**~~

~~Prior to termination of the specific license, the State should establish the final amount of the long-term site surveillance fund to be paid by the licensee in accordance with Criterion 10 of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations. The State's process for determining this amount should include consultations with the custodial agency. Payment of this amount to the appropriate State agency or the custodial agency is required prior to termination of the specific license.~~

~~**Step 4: Preparation of the Long-Term Surveillance Plan (LTSP)**~~

~~While surface remediation and groundwater cleanup activities are ongoing, it is in the best interest of the licensee to begin interaction with the custodial agency with regard to that agency's preparation of the site LTSP. The custodial agency's responsibilities under the general license are defined in the LTSP. The required contents of which are provided at 10 CFR 40.28 and in Criterion 12 of Appendix A.~~

~~In addition to the regulatory requirements, the NRC should also require that the LTSP contain documentation of title transfer of the site from the licensee to the custodial agency. Because~~
~~the LTSP must reflect the remediated condition of the site, it is expected that the existing licensee will interact with the custodial agency in the preparation of the LTSP.~~

Step ~~5~~ 3: Site Ready for License Termination

When a licensee has completed site reclamation, decommissioning, and/or groundwater corrective action, and is ready to terminate its specific source material license, the licensee should formally notify the State of its intentions.

Step ~~6~~ 4 : ~~Termination of the Specific License~~ NRC review of Completion Review Report (CRR)

[Comment: A restatement of the regulatory basis for NRC concurrence is redundant as this has already been addressed in the 'Regulatory Basis' section of this guidance. This section is seriously lacking in that it states "*...the NRC shall determine...*" but does not provide any guidance to the NRC reviewer on **how** to

Appendix B -- Sample Completion Review Report (Conventional)

make that determination. A new section of this SA-900 Procedure is needed to clearly specify the "Acceptance Criteria" that can be used to make this important determination.] Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of site reclamation, decommissioning, and/or groundwater corrective action. After completing the review of the licensee's performance of remedial actions, the State will ~~be requested to~~ submit a ~~completion review report~~ CRR documenting the State staff's bases for its conclusion that all applicable standards and requirements have been met to the NRC for review.

Upon receipt of the Completion Review Report submitted by the State, NRC staff would examine whether the CRR has documented the State staff's bases in summary form in a manner that substantiates its conclusion that all applicable standards and requirements have been met. If the content of the completion review report did not provide sufficient bases for the conclusions, the NRC could request additional information from the State prior to making its determination. The CRR, a list of contents for which is presented in Appendix B, should include the following information:

~~Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the State prior to making its determination. The completion review report, similar to that contained in Appendix A of Procedure SA-900, should include the following information:~~

1. A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

2. Documentation that the completed ~~surface~~ remedial actions were performed in accordance with license requirements and regulations.

3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements, the approved Decommissioning Plan and applicable regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicate that the subject site is acceptable to the custodial agency and for issuance of a general license .. [Comment: the "unrestricted release requirement" statement may not always be true. Conceivably, there could be some formerly licensed sites that may not be suitable for unrestricted release.]

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

5. Discussion of results of State's site closure inspection.

6. Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

[Comment: the first sentence is very important and should be reproduced or moved to the beginning of the guidance where other guidance is presented to the reviewer on the scope of the NRC review of the CRR.] NRC's determination shall rely upon the State's reviews and acceptance of the documentation provided by the licensee. In addition, results of the State site closure inspection activities, potentially including limited confirmatory radiological surveys, will provide supplemental information to the NRC's determination.

The results of NRC's periodic Integrated Materials Performance Evaluation Program (IMPEP) reviews of the Agreement State's regulatory program will be consulted to provide reasonable assurance that the State's reviews, licensing actions, and inspections associated with termination have been conducted appropriately, from a health and safety (adequacy) and compatibility perspective.

Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. If it is a partial license termination case which an Long-Term Surveillance Plan (LTSP) is not required, the State should be ~~ready~~ prepared to amend the license to remove the remediated portion from it.

Step ~~7~~ 5: Termination of the Specific License/Issuance of the General License

In termination of an entire license, NRC acceptance of the ~~an~~ LTSP is required prior to termination of the specific license and placement of the site and byproduct material under the 10 CFR 40.28 general license[1]. ~~Review and acceptance of the~~

[1] While surface remediation and groundwater cleanup activities, if required, are ongoing, the licensee should interact with the custodial

~~LTSP is the sole purview of the NRC.~~ Note that the NRC review process for the LTSP is not included in this procedure[2].

~~The NRC staff's acceptance of an LTSP should be documented in written notification to the relevant Agreement State, custodial agency, and, separately, by noticing the action in the Federal Register.~~ Given i) NRC's determination that all applicable standards and requirements have been met ~~and~~ ii) upon notification from the NRC that the LTSP has been accepted and the long-term care funds[3] have been transferred to the appropriate State agency and the custodial agency, the Agreement State should be ~~ready~~ prepared to terminate the specific license and to transfer the long-term care funds to the U.S. Treasury. The long-term custodian, for its part, should be prepared to accept title to the land and byproduct material.

(b) Termination of Non-Conventional Uranium ~~Mill~~ Milling Licenses (Mainly In-Situ Uranium Extraction Licenses)

The following steps are applied to both partial and entire license termination cases.

Step 1: Licensee Documentation of Completed Decommissioning and/or

agency to assist it in its preparation of the site LTSP. The custodial agency's responsibilities under the general license are defined in the LTSP, the required contents of which are provided at 10 CFR 40.28 and in Criterion 12 of 10 CFR Part 40, Appendix A.

[2] Review and acceptance of the LTSP is the sole purview of the NRC. Lack of NRC acceptance of a site LTSP can delay termination of the specific license. The NRC staff's acceptance of an LTSP should be documented in written notification to the relevant Agreement State and custodial agency.

[3] Prior to termination of the specific license, the State should establish the final amount of the long-term site surveillance fund to be paid by the licensee in accordance with Criterion 10 of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations. The State's process for determining this amount should include consultations with the custodial agency. Payment of this amount to the appropriate State agency or the custodial agency is required prior to termination of the specific license.

Appendix B -- Sample Completion Review Report (Conventional)

Groundwater Restoration Actions

[Comment: the following paragraph is not relevant to the NRC's review of the CRR. The guidance should specify what information the Agreement State should include in the CRR to demonstrate that the licensee has completed the facility decommissioning and groundwater quality restoration. This paragraph should be re-written as it simply addresses issues of relevance to the Agreement State.] When the surface reclamation and/or groundwater restoration are complete, the licensee should submit to the State for review (i) groundwater chemical analyses which demonstrate that groundwater quality has been restored in accordance with the ~~State criteria~~ applicable standards and requirements and (ii) documentation indicating that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria.

Licensees are also required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

When a licensee is ready to terminate its specific ~~source material~~ uranium milling license, the licensee should formally notify the State of its intention to do so .

Step 2: Review of Completed Closure Actions by the Agreement State

[Comment: the following paragraph is unnecessarily prescriptive by telling the Agreement State what to do. The guidance should specify what summary information is appropriate in the CRR to demonstrate well completion and groundwater restoration. This paragraph should be re-written as it simply addresses issues of relevance to the Agreement State.]Upon receipt of the decommissioning report, and if necessary, groundwater restoration report, the State staff should review the content of the report for documentation of acceptable completion of the applicable aspect of closure. As part of its ~~review~~ oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final site inspection, which is expected to consist of a site walk-over.

Step 3: NRC Review of CRR [Comment: change the title of this sub-section for consistency with earlier sections of the guidance.]

[Comment: A restatement of the regulatory basis for NRC concurrence is redundant as this has already been addressed in the 'Regulatory Basis' section of

this guidance. This section is seriously lacking in that it states "*...the NRC shall determine...*" but does not provide any guidance to the NRC reviewer on how to make that determination. A new section of this SA-900 Procedure is needed to clearly specify the "Acceptance Criteria" that can be used to make this important determination.] Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of decommissioning and/or groundwater restoration actions. After completing the review of the licensee's performance of remedial actions, the State will be requested to submit a CRR documenting the State staff's bases in summary form for its conclusion that all ~~requirements~~ applicable standards and requirements have been met.

~~Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the State prior to making its determination. The completion review report, similar to that contained in Attachment 1, should include the following information:~~

Upon receipt of the CRR submitted from the State, NRC staff shall examine whether the CRR has documented the State staff's bases in summary form in a manner that substantiates its conclusion that all applicable standards and requirements have been met. If the content of the completion review report does not provide sufficient bases for the conclusions, the NRC shall request additional information from the State prior to making its determination. The CRR, a list of contents for which is presented in Appendix C, should include the following information[4].

1. A brief description of licensee's activities associated with decommissioning and license termination.

2. Groundwater chemical analyses which demonstrate that the groundwater has been adequately restored to meet the State restoration criteria.

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[4] [Comment: what additional information? What additional steps? Some guidance is needed here.] Additional information or steps may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.

Appendix B -- Sample Completion Review Report (Conventional)

3. [Comment: this item 3 mixes an 'Area of Review' and 'Acceptance Criteria' for the parameter. As noted earlier, in a restructuring of the guidance, these two topics will be separated.] Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria. A copy of correspondence from the State to the licensee stating that all wells have been abandoned in accordance with state standards should fulfill this requirement.

4. [Comment: the following sentence is wrong. License conditions may permit on-site disposal of contaminated materials that, for example, have trace concentrations of radionuclides below state or federal standards. Modify the language.] Decommissioning information which documents that all contaminated materials have been disposed of in accordance with applicable standards and requirements.

5. Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.

6. Discussion of results of the State's site closure inspection.

7. Documentation that release of this portion of the site (e.g. a production wellfield) will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

~~Note: Additional information or steps may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.~~

NRC's determination will rely primarily upon the State's reviews and acceptance of the documentation provided by the licensee. In addition, results of State site closure inspection activities, such as confirmatory radiological surveys, may also be used by the NRC in making its concurrence determination. The results of NRC's periodic IMPEP reviews of the Agreement State's regulatory program will be used to provide reasonable assurance that the State's reviews and licensing actions associated with termination have been conducted appropriately, from a health and safety (adequacy) and compatibility perspective.

The NRC will notify the Agreement State by formal correspondence of its

determination whether or not all applicable standards and requirements have been met by the licensee. Upon reaching a positive determination and upon notification from the NRC, the Agreement State may terminate the specific license or amend the license to remove the remediated portion from it, if the license is being partially terminated.

Appendix B - Sample Completion Review Report for Conventional Uranium Milling License

[Comment: NEI recommends a complete revision of this Appendix B. Rather than consisting of edited excerpts from existing CRRs, Appendix B should concisely list those technical topics that the Agreement State's CRR should address. The Appendix should also provide some guidance as to what information for each topic might be reasonably expected in the CRR to enable the NRC to conclude that applicable federal decommissioning and reclamation standards have been met and to, therefore, conclude whether or not a concurrence determination is warranted.

Several high-level concerns have been flagged in the existing Appendix B. But in view of our recommendation for a complete re-write, our comments are very limited.]

NOTE TO READER

The following sample Completion Review Report (CRR) was developed by a working group composed of Agreement State representatives and NRC staff. [Comment: the following sentences simply repeat the concurrence procedure that has been thoroughly outlined in the guidance. Delete as redundant.] Prior to license termination, an Agreement States shall submit a CRR on the licensed facility (or portion of a licensed facility in the event that a partial license termination is requested.)for NRC review and approval. The CRR should summarize the information used by the Agreement State that enabled its regulatory staff to conclude that all applicable standards and requirements for decommissioning and restoration have been met by the licensee. This sample CRR is intended to generally show the level of detailed information that the NRC would expect to be provided in the CRR. The working group recognized that no single site, or any existing documentation, could serve as a complete template for all aspects of site closure, since each conventional uranium milling site is likely to have its own unique, site-specific conditions. To cover as many aspects of license termination activities as possible, the sample CRR is a composite of examples from a number of existing documents. Stakeholders' comments and input have also been considered and are reflected in the sample CRR.

The sample CRR is by no means intended to provide a complete list of all applicable standards and requirements that need to be addressed nor does it present the only way in which a licensed facility can be decommissioned.

Appendix B -- Sample Completion Review Report (Conventional)

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: John Smith, M.S.,P.E. (Hydrologic Engineer)

SUMMARY

The ABC Company's XYZ site is the conventional uranium mill and tailings site decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the regulatory agency shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The U.S. Nuclear Regulatory Commission's (NRC's) Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report.

The applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled Radiation Protection-Uranium and/or Thorium Milling. This State regulation is consistent with and compatible with federal regulations, as required by the State's Agreement State status with the NRC.

All applicable standards and requirements, with appropriate references to related sections of the CRR, are identified in Table 1. XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation

Appendix B -- Sample Completion Review Report (Conventional)

Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements		CRR Sections	TER Sections**
	1. tailings isolation	Section 2.1	Section X.XX
	4.	Section 2.2 is missing	
	(a) erosion potential	Section 2.3	Section X.XX
	(b) wind protection	Section 2.3	Section X.XX
	(c) flatness of slopes	Section 2.1.1	Section X.XX
	(d) self-sustaining vegetative cover or rock cover	Section 2.3	Section X.XX
	(e) seismic design	Section 2.1.3	Section X.XX
	5. groundwater cleanup criteria	Section 4.1	Section X.XX

Appendix B -- Sample Completion Review Report (Conventional)

	6. (2) radon flux (4) radon measurements and limit (6) radiation cleanup and control (7) closure and post-closure impacts	 Sections 2.4-2.5 Section 2.4.1 Sections 3.1-3.2 Sections 4.1-4.3	 Section X.XX Section X.XX Section X.XX Section X.XX
	[Comment: Criterion 12 is	Sections 4.1-	Section X.XX
Other applicable standards and requirements			

* As defined in section V.C of the STP SA-900 Procedure issued on date month, 2XXX.
**Sections in TERs or equivalent reference documents.

XDOH concludes that the specific criteria of 10 CFR Part 40 Appendix A (or State equivalent regulations) are met as follows:

Criterion 1. Tailing Isolation

Erosion, disturbance, and dispersion are minimized.
The contaminated tailings are protected from flooding and erosion by an engineered rock riprap layer. The riprap has been designed in accordance with the guidance (reference). XDOH staff considers that erosion protection that meets that guidance will provide adequate protection against erosion and dispersion by natural forces over the long term. As discussed in CRR Section XX, adequate protection is provided by (1) selection of proper rainfall and flooding events; (2) selection of appropriate parameters for determining flood discharges; (3) computation of flood discharges using appropriate and/or conservative methods; (4) computation of appropriate flood levels and flood forces associated with the design discharge; (5) use of appropriate methods for determining erosion protection needed to resist the forces produced by the design discharge; (6) selection of a rock type for the riprap layer that will be durable and capable of providing the necessary erosion protection for a long period of time; and (7) placement of a riprap layer in accordance with accepted engineering practice and in accordance with appropriate testing and

quality assurance controls.

As discussed in CRR Sections XX, XDOH staff considers that the riprap layers will not require active maintenance over the 1000-year design life, for the following reasons: (1) the riprap has been designed to protect the tailings from rainfall and flooding events which have very low probabilities of occurrence over a 1000-year period, resulting in no damage to the layers from those rare events; (2) the rock for the riprap layers was selected to be durable and is not expected to deteriorate significantly over the 1000-year design life; and (3) during construction, the rock layers have been placed in accordance with appropriate engineering and testing practices, minimizing the potential for damage, dispersion, and segregation of the rock.

Criterion 4

(a) erosion potential

The site is located in an area that is flooded by offsite floods from XXXX (area). However, as discussed in the CRR, the site is protected from direct onsite precipitation and flooding by engineered riprap layers for the top and side slopes; the tailings disposal cell will need this protection regardless of where it is located. The riprap for the side slopes and drainage ditches is large enough to resist flooding from the minimal flow velocities of floods occurring from a probable maximum flood (PMF) on the XXXX (area). A large rock apron has been provided to provide protection against the potential migration of the XXXX (area). XDOH therefore concludes that the erosion potential at the site has been acceptably minimized, since any flooding at the site is mitigated by the erosion protection, and the forces associated with offsite floods are minimal.

(b) wind protection

XDOH staff considers that the site is adequately protected from wind erosion by the placement of an engineered riprap layer that protects the tailings from surface water erosion. Studies (reference) have shown that the engineered riprap layer designed to protect against water erosion is capable of providing adequate protection against wind erosion.

(c) flatness of slopes

The relatively flat top and side slopes of the covers is protected from erosion by an engineered riprap layer which has been designed to provide long-term stability (CRR Section XX). The

erosion potential of the covers is minimized by the designing the rock to be sufficiently large to resist flooding and erosion, based on the slope selected. Thus, XDOH concludes that the slopes, with their corresponding rock designs, are sufficiently flat to meet this criterion.

(d) self-sustaining vegetative cover or rock cover

See discussions under Criterion 1 regarding Erosion, disturbance, and dispersion.

Other criteria

[insert summary for other criteria]

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Atomic Energy Act of 1954, as amended (AEA), that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

[Comment: you need some sort of break here – between the Summary and Step 1 of the issues to be discussed.

1. Licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

ABC completed construction of the mill in 19XX, and it was operated until XXXX. Nominal milling capacity was X,XXX tons of ore per day, with an average design ore grade of 0.XXX percent U_3O_8. The company received ore and processed it from [insert sources of ore or materials for reprocessing]. Approximately XX.X million tons of tailings were placed in the impoundment from milling operations. The estimated radium-226 activity in the impoundment is XXX curies, and Th-230 activity is estimated at XXX curies (reference).

Mill decommissioning activities began in XXXX and were completed in XXXX. Approximately XXX,XXX cubic yards (yd^3) of contaminated mill site soils, building equipment, and debris were excavated from the XYZ processing site and hauled approximately XXX miles for placement in the synthetically lined area of the tailings impoundment (reference). Other materials disposed of in the impoundment include [insert direct disposed materials from off-site sources] with estimated radium-226 activities of XXX curies, total uranium activity of XXX curies, and Th-230 activities of XXX curies.

Appendix B -- Sample Completion Review Report (Conventional)

[Impoundments that exist on-site as opposed to a new cell should describe dewatering and other pre-capping activities.]

The millsite was characterized using a combination of scans for gamma radiation and soil analyses of surface soils, and borehole logging and soils analyses for subsurface deposits. Areas with contamination found to exceed applicable standards and requirements were excavated. Contaminated materials were disposed in the [lined] tailings impoundment or repositories (reference). The site cleanup was monitored and a Final Status Survey was conducted following guidance in NUREG 1575 (MARSSIM).

Once filled, the impoundment was covered with more than XX.X feet of site borrow soils, and re-vegetated. A diversion channel was constructed around three upgrading sides of the impoundment. A rock-armored swale outlet for the impoundment cover watershed was installed. All impoundment and margin areas have been covered with either rock armor (riprap) or re-vegetated to provide structural stability (reference).

A Monitoring and Stabilization Plan, in effect during and after reclamation construction in 19XX, has been evaluating site performance. Recent XDOH staff inspections and reviews of monitoring data and analytical justifications provided by ABC indicate that the site has reached a stable condition [Comment: leave in the Summary section., not here]

When all regulatory requirements are completed, the XYZ site will be transferred to XXX (custodial agency) responsibility. The site reclamation fund, held by XXX, will be terminated and the long-term surveillance and control surety fund, held by XDOH, will be transferred to XXX.

2. Documentation that the completed surface remedial actions were performed in accordance with license requirements and regulations.

[Comment: there is a danger that by citing this long-winded example as "the NRC expectation" that other licensed facility CRRS will have to address each of these issues in as much detail. This sets a bad example. There is also very uneven coverage of the technical issues – contrast §2.1 with §2.1.6]

Surface remedial actions include the topics of geotechnical stability, surface water hydrology and erosion protection, and radon emanation.

2.1 GEOTECHNICAL STABILITY (EXAMPLE 1)

Appendix B -- Sample Completion Review Report (Conventional)

[Comment: an explanation is required as to why the Agreement State would use example 1 rather than example 2. The latter is shorter, with far superior prose and clarity in its explanations, etc. When would the state have to use Example 1?]All aspects of reclamation were planned in advance, prepared by experienced professionals, reviewed by XDOH, performed under a quality assurance program, and evaluated in as-built completion reports. All aspects of reclamation have been found technically feasible during XDOH's reviews (reference).

The ABC's XYZ site is located away from large population centers and isolated from natural transportation routes or roadways. The impoundment is not located near a capable fault, as determined by geophysical studies, technical document review, seismic analysis, and field investigations (reference). The XYZ site impoundment received only by-product material from its own mine site.

The reclamation design used at the XYZ site is based on conformity to the surrounding natural environment, and is built so that no ongoing active maintenance is expected.

2.1.1 Slope Stability

Dike structures constructed at the XYZ site include the impoundment dam embankment and the margin areas (berm) located between the impoundment and the up-gradient surface water diversion channel. The embankment dam was initially constructed at the beginning of operations. It had[33]% ([1]v:[3]h) side-slopes and was designed, approved and constructed under the state's Dam Safety regulatory program (reference). During reclamation construction in XXXX, the dam was shortened in height so that it was consistent with the impoundment cover elevation, and graded to a more gentle [20]% ([1]v:[5]h) front-slope. A rock armor (riprap) was placed in the groins on each side of the dam and on the sloped surface of the reconstructed dam embankment. The dam embankment and the margin areas were evaluated for slope stability and found to be acceptable, based on ABCs analysis, as reviewed by the department (reference).

The dam embankment reconstruction design was prepared by ABC, including an evaluation for earthquake and slope stability. Licensed engineers from both the Dam Safety regulatory program and XDOH reviewed the design, independently verified the design calculations, and approved construction plans and specifications.

2.1.2 Credible Faults

The XDOH evaluated potential earthquake sources (such as capable faults) and earthquake hazards for the site. XDOH's determination that the impoundment has

not been placed near a capable fault is based upon review and acceptance of geologic information from literature sources, personal communication with personnel at the State Geological Survey, XDOH review of field mapping of the site by ABC's contractor, XDOH review of subsurface geophysical surveys surrounding the tailings impoundment by ABC's contractor, and XDOH personnel conducting independent field evaluations of the structural geology at the site. Historical seismic activity was also reviewed by the XDOH and State's Dam Safety program.

XDOH review of regional geologic literature has found no evidence of local faulting in the Pleistocene age glacio-fluvial deposits, or in the Miocene age Basalt Member of the River Basalt Group, at least 14.5 million years before present. (Reference). The USGS Open-File Report 91-441-0, Known or Suspected Faults with Quaternary Displacement in the Pacific Northwest, was also reviewed. (Reference). Staff at the State Geological Survey were also consulted for information related to faults in the area during XDOH's assessment of ABC's closure plan. XDOH review of Quaternary faults has concluded that the nearest capable fault is in the XXXX area of the [Cascade Mountains], approximately XXX miles to the northwest.

Detailed geologic mapping at the ABC's XYZ site performed by DEF, Inc. found no evidence of faulting in the Pleistocene glacio-fluvial deposits or Miocene age River basalts, XX.X Million Years Before Present (reference). Geologic field evaluations at the ABC site by XDOH personnel also found no evidence of faults in the glacio-fluvial deposits, XXX River basalts, or Tertiary aged clays found near the tailings impoundment. The layers in the unconsolidated sediments may generally be described as flat lying over structures that have been observed in the older granitic rocks of Cretaceous age. Therefore, the literature review and field mapping indicate that the fracturing and faulting in the Cretaceous rocks are a result of pre-Miocene deformation occurring at least XX.X million years before present.

Two geophysical seismic surveys were conducted for the subsurface around the tailings impoundment by a ABC contractor (reference). XDOH staff independently reviewed the information provided in the XXXX reports and determined that there is no evidence presented in these reports of a capable fault at depth.

Historic seismic data have been reviewed by XDOH and State's Dam safety program. Some of the historic seismic data reviewed are presented in reports prepared for ABC (reference), the XXXX Final Environmental Impact Statement for the ABC site (reference), and the initial engineering report (reference). There are no historic seismic data that suggests large- magnitude earthquakes near the ABC site. Recent earthquake analyses performed by XXXXX have indicated that there have been five low- magnitude events within XX km of the ABC site. However, XXXX's probabilistic seismic assessment analysis has determined that these low-

magnitude seismic events are not significant with respect to stability of the site (reference).

In summary:; (1) faults that have been identified and mapped in and near the site to a distance of 100 miles have not moved once in the last 35,000 years, or twice or more in the last 500,000 years, do not have macroseismicity associated with them, nor are they associated with capable faults such as the XXXX fault; and (2) no historic earthquakes have originated near the site that by magnitude, alignment, or magnitude-distance relationship to the site indicate a buried capable fault source, or any other earthquake source, that should be considered explicitly in the seismic design basis assessment for the site. XDOH evaluated low- magnitude seismic events that appear approximately XX-XX km northeast of the site by reviewing geologic maps for the area and personal communication with XXXX State's seismic experts at the State Geological Survey. Based upon XDOH review conducted in the fall of XXXX, XDOH concludes that these low- magnitude seismic events are not associated with earthquakes along the trace of a capable fault, and the data indicate that these events are appear to be the result of mine blasts.

2.1.3 Seismic Evaluation (Example 1)

A Probabilistic Seismic Hazard Analysis (PSHA) of the likelihood of both cracking of the cap and liquefied tailings reaching the ground surface has been performed. That analysis reflects the combined probability of experiencing ground motions sufficient to trigger liquefaction and the probability that the liquefied zone would have a surface manifestation in the form of cracking or boils of tailings material. The PSHA predicts an annual probability of experiencing liquefaction within some zone of the tailings of 0.XXXXXX (1/XXXX annually).

The PSHA was performed, as there are no known credible faults in the general vicinity of the project. The PSHA considered as loads the suite of earthquakes between Magnitude 5 and the Maximum Credible Earthquake for each seismotectonic source zone as is accepted practice in the field. The resulting cyclic shear stresses (load) induced in the soil column by the suite of earthquakes were assessed with SHAKE91. The cyclic shear resistance (capacity) was estimated from an empirical relationship based on the SPT N-value data from site borings. The Seed-Idriss criteria were employed to predict the occurrence of liquefaction. One boring (reference) was selected as representative of the worst-case conditions in the tailings material. The PSHA considered uncertainty in the maximum magnitude of earthquakes, attenuation relationships, and the magnitude-frequency of earthquakes.

The occurrence of a surface manifestation of liquefaction given liquefaction at depth

is a function of the thickness of the non-liquefied cap. For a cap thickness greater than XX feet, case histories (reference) suggest that there will not be a surface manifestation for ground surface accelerations up to XX% of gravity (X.XXg). Accordingly, a second analysis was performed to determine whether there would be a surface manifestation of liquefaction of the process slimes at depth. This analysis involved generating a ground surface acceleration of approximately XX% of gravity for the range of earthquakes between magnitude X and the maximum credible magnitude. The thickness of the non-liquefied cap was calculated. In all cases, the analysis predicted that the non-liquefied thickness of the cap would exceed XX feet. Thus, an empirical correlation developed from case histories suggests there would not be a surface manifestation from liquefied zones at depth. The calculated annual probability of experiencing a peak ground acceleration of X.XXg at the site, considering all earthquake source zones, was 0.XXXXXXX (1/XXXX annually). Thus, the occurrence of a surface manifestation of liquefaction is more remote than 1 in 10,000, the 1,000-year regulation-based longevity requirement.

The probability of cracks occurring in the cap is essentially the same as for the occurrence of tailings material reaching the ground surface. Focusing on surface cracking as a separate event was judged unnecessary for the specific conditions of the cap at XYZ site for the following reasons. The XX.X foot minimum thickness (as-built) cap is composed of a non-cohesive, slightly gravelly, silty sand. While cracking could result from earthquakes, cracks that might form would collapse, as the soil lacks cohesion to maintain a free-standing void.

The reclamation cap therefore affords a level of structural stability, longevity, and reliability, in accord with the intent of the governing statute.

Although the probability of a surface manifestation is acceptably remote, liquefaction can still occur. As a responsible steward of the facility, it would be appropriate to have a contingency plan to inspect the site, should a large earthquake occur in the immediate vicinity of the facility.

2.1.3 Seismic Evaluation (Example 2)

According to 10 CFR 40, Appendix A (or equivalent State regulations), the impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III (g) of appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific

characteristics of local subsurface material. The SRP describes the methodologies that may be used to conduct this evaluation. Details of the review for [XXX site] were presented in the TER (reference).

A review was conducted of all recorded earthquakes in [name the tectonic province in which the site is located] and in other tectonic provinces within 200 km (124 miles) of the site. The review contained the date of occurrence of the earthquake, its magnitude, and the location of the epicenter.

Data were obtained by [e.g., standard photogeologic analysis] and field reconnaissance of the study area and from review of the pertinent literature (references). Information in the form of maps, papers, or other, specific to the area or region, generated by State and Federal agencies or published in the literature were reviewed (references). [Insert conclusions]

Where possible, an association of epicenters or locations of highest intensity of historic earthquakes with tectonic structures was conducted. Epicenters or locations of highest intensity that were not reasonably identified with tectonic structures were identified with tectonic provinces. Maps on which the locations of epicenters of historic earthquakes associated tectonic structures, and tectonic provinces were produced and presented in the TER (references). [Insert conclusions].

In addition to the historical review, the proposed maximum earthquakes associated with [each tectonic province or capable fault or structure] was determined and a deterministic and/or probabilistic seismic hazard analyses was conducted.

Seismic design ground motion (PHA)
Capability was determined by [suitable methods], such as those outlined by (reference). For each maximum magnitude earthquake, the PHA at the site was determined using [an accepted attenuation relationship between earthquake magnitude and distance] (reference). The PHA value adopted for each capable fault or tectonic source was no less than the median value provided by the attenuation relationship. Possible soil amplification effects were considered (reference).

To assess potential ground motion at the site from earthquakes not associated with known tectonic structures (i.e., random or floating earthquakes), the largest floating earthquake reasonably expected within [the tectonic province] was identified. [insert site-specific results]. In addition, the largest floating earthquakes characteristic of [any adjacent tectonic provinces] was also identified, since such earthquakes may cause appreciable ground motion at the site [insert site specific results]. The 15 km (9 miles) was used as the site-to-source distance for floating earthquakes within [the host tectonic province]. (For floating earthquakes in other

tectonic provinces, the distance between the site and the closest approach of the province boundary was used as the site-to-source distance). The PHA for the site was therefore the maximum value of the PHAs determined for earthquakes from all capable faults, tectonic sources, and tectonic provinces.

Conclusion

The licensee has presented information and used acceptable methods of investigations that support its conclusions about the seismic characterization of the site and the seismic design value. Information presented includes descriptions of historical earthquakes, locations of their epicenters, an analysis of the seismic hazard at the site, and the design considered a deterministic and/or a probabilistic PHA [PSHA]. The information presented is sufficient to support an analysis of the geotechnical stability.

2.1.4 Liquefaction Potential

Earthquake potential to cause liquefaction was evaluated by ABC and reviewed by professional engineers from the Dam Safety regulatory program. Both the dam embankment and the tailings slimes were evaluated. The dam embankment was found to be incapable of liquefaction due to low probability for soil moisture saturation. However, since the tailings slimes are expected to remain saturated over the long term, they could become "liquefied" during a significant seismic event, which could produce rafting of the surface if a conventional thin clay barrier surface cover had been used. As indicated in the Seismic Evaluation section, this likelihood is remote.

The cover design approved and constructed for the XYZ site is a thick (XX.X feet minimum) cover of non-cohesive local borrow soils, which ameliorates the liquefaction concern. Specifically, the potential for surface expression of slimes is limited because of the thick cover design, which is expected to continue performing as designed because of its self-healing nature (reference). Therefore, in the unlikely event of liquefaction, the thick cover of unconsolidated material would not have broad areas of failure.

2.1.5 Settlement Potential

Earthquake potential to cause liquefaction was evaluated by ABC and reviewed by professional engineers from the Dam Safety regulatory program. Both the dam embankment and the tailings slimes were evaluated. The dam embankment was found to be incapable of liquefaction due to low probability for soil moisture saturation. However, since the tailings slimes are expected to remain saturated over the long term, they could become "liquefied" during a significant seismic event,

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2.1.6 De-watering of Tailings

An evaluation of the geochemical properties of the tailings by department staff determined that dewatering of tailings pore fluid was not practical or technically necessary (reference).

In conclusion, the XDOH's review of geotechnical stability has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or State equivalent regulations).

2.2 GEOTECHNICAL STABILITY (EXAMPLE 2)

2.2.1 Introduction

This section presents the results of the XDOH staff review of the geotechnical engineering aspects of the closure action proposed at ABC's XYZ site. The closure action consists of the consolidation of all contaminated materials from the processing site to the adjacent tailings pile near [City, State]. The final disposal cell will be an above-grade stabilized-in-place embankment extending to a maximum height of XXX feet above the prevailing surface grade. Contaminated material and mill debris were added to the disposal cell. The cell was recontoured , and is covered with a X-foot-thick minimum sand cover, plus filter layer and rock armor on the embankment; a XX-inch-thick multiple layer cover plus rock armor over coarse tailings; and a XX-inch-thick multiple layer cover plus rock armor over at least seven feet of regraded coarse tailings over the fine tailings portions of the embankment (reference).

The geotechnical engineering aspects reviewed include: (1) information related to the disposal and borrow sites; (2) materials associated with the closure action, including the foundation and excavation materials, tailings, and other

contaminated materials; and (3) design and construction details related to the disposal site, disposal cell, and its cover.

2.2.2 Site Description

The XXX-acre impoundment is adjacent to the former XXX mill, about XXX miles northwest of the town of [City, State]. The site is located within the [local area], and is drained by the XXXX River. The uranium mill tailings were placed in a single pile consisting of approximately XX.X million tons. The XXX-acre pile forms a deposit with a maximum height of XXX feet. ABC has covered the sides of the pile with an interim soil cover of variable thickness. As the water in the pond atop the tailings has evaporated, additional interim cover has been placed on portions of the top of the pile, working from the edges inward toward the center.

The former mill area is XXX acres in size and contains building foundations and abandoned mill structures which have been partially demolished. Additional contaminated soil lies outside the confines of the tailings pile. The contaminated soil and building rubble generated from the mill demolition will be added to the disposal cell.

2.2.3 Disposal Cell Area

Several subsurface investigations have been performed at the XYZ site in order to characterize the tailings and contaminated materials for geotechnical engineering and radiological aspects of the closure. Drawings in the month date, XXXX report (reference) illustrate the original test boring and test pit locations. Logs of soil borings and test pits were provided in the ABC's earlier submittals (reference). In month of XXXX, additional test pits were excavated within the confines of the mill and the tailings embankment. The [year] test pit logs are reported in Appendix X of the month date, year, submittal (reference), as modified by the month date, XXXX, submittal (reference).

Exploration to depth within the tailings embankment was not previously performed since the presence of an active evaporation pond impeded drill rig access. To further characterize the tailings, and to evaluate the embankment with respect to stability and potential settlement, ABC has committed to perform piezocone or other in-situ tests after the cover has been placed. The piezocone is an instrument which measures the piezometric pressure at a cone tip as the test device penetrates a material. Cone Penetration Test (CPT) pore pressures, thus measured, reflect both the soil type and the stress history of the material. CPT or equivalent test data have been reviewed along with settlement records to better evaluate the time-rate of tailings consolidation.

Appendix B -- Sample Completion Review Report (Conventional)

2.2.4 Borrow Areas

Proposed radon barrier clay soils from the XXXX area were evaluated by [reference]. The XXXX borrow area is located about XX miles north of the tailings pile. Sandy soil for the radon barrier was obtained from material excavated during the reconfiguration of XXXX area (reference). In [year], XX exploratory test pits were excavated in the XXXX area.

Finally, in addition to the sampling associated with the reconfiguration of XXXX area, three additional samples were taken from the proposed borrow area located [west] of the tailings disposal area on the ABC property.

2.2.5 Geotechnical Investigation Conclusions

XDOH staff has reviewed the subsurface exploration discussed above. XDOH concludes that the geotechnical investigations conducted at the processing, disposal, and borrow sites satisfactorily establish the stratigraphy, that the explorations are in general conformance with applicable provisions of Chapter X of the SRP (reference), and that they are adequate to support the assessment of the geotechnical stability of the stabilized tailings and contaminated material in the disposal cell. Additional in-situ testing was performed to confirm the stratification and strength parameters of the tailings and to confirm the settlement analysis. Prior to approval of the settlement evaluation, ABC submitted a field exploration plan for the in-situ exploration program.

2.2.6 Testing Program

Geotechnical engineering characteristics and strength parameters for the tailings, contaminated soil, and natural soils have been determined by ABC, through laboratory analysis of samples from the investigations. Early laboratory testing by [reference], and later testing by [reference], included moisture-density (Proctor) determinations, gradation analyses, specific gravity, saturated hydraulic conductivity determinations, Atterberg Limits, capillary moisture, one-dimensional consolidation, static triaxial, and cyclic triaxial compression. XDOH has reviewed the geotechnical engineering testing program for the XYZ site and concludes that the tests identified above were conducted on representative materials.

ABC's laboratory testing of the XXXX (area) borrow material included gradation, Atterberg Limits, moisture-density determination, specific gravity, saturated hydraulic conductivity, capillary moisture relationships, dispersive tendencies, diffusion coefficient, and triaxial shear strength. ABC states that additional tests

will be made on the borrow soils during construction to confirm conformance with the project specifications.

Within the XXXX area, one composite sample was made from the "affected" (contaminated) sandy soils. A second sample was made from "clean" soils (see Section XXX for additional information). The composite samples were then split into three subsamples, and were redivided for geotechnical and radiological sampling. Laboratory testing by ABC included gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and (for the "affected" soils) radium activity and emanation coefficient determination. Three composite samples from west of the tailings pile area were tested for gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and capillary moisture relationship.

Cover materials were evaluated for durability. Testing included Los Angeles Abrasion, sulfate soundness, absorption, specific gravity, Schmidt Hammer, and Brazilian disk tensile tests. Petrographic analyses were also conducted. Further discussion regarding the tests on proposed cover materials is presented in Section XXX.

On the basis of the field exploration and laboratory testing programs, ABC concluded that the borrow sites contain suitable quantities of material acceptable for the radon barrier. Testing indicated the soils are non-dispersive.

Based on the review, XDOH staff finds that the number and type of tests conducted in the testing program were appropriate for the support of the engineering analyses performed and that the scope of the testing program and the utilization of the test results to define the material properties are in general agreement with the applicable provisions of the SRP (reference).

2.2.7 Slope Stability

The evaluation of the geotechnical stability of the slopes of the disposal cell containing stabilized tailings and other contaminated materials is presented in this section. XDOH has reviewed the exploration data, test results, slope characteristics, and methods of analyses pertinent to the slope stability aspects of the reclamation plan. The analyzed cross-sections with [10] horizontal to [3] vertical side slopes have been compared with the exploratory records and design details. XDOH finds that the characteristics of the slopes have been satisfactorily represented and that the most critical slope sections have been considered for stability analyses.

Soil parameters for the various materials in the disposal cell slope have been

adequately established by appropriate testing of representative materials. Soil parameter values have been assigned to other layers (riprap, gravel bedding, bedrock, etc.) by ABC, on the basis of data obtained from geotechnical explorations at the site and data published in the literature. XDOH finds that the determinations of these parameters for slope stability evaluation follow conventional geotechnical engineering practice, and are also in compliance with the applicable provisions of the guidance document (reference). XDOH also finds that an appropriate method of stability analysis (XXXX method) has been employed by ABC to address the likely extreme adverse conditions to which the slope might be subjected for the static case.

Factors of safety against failure of the slope for static and seismic loading conditions have been determined by the licensee for both short-term (end of construction) and long-term states. Factors of safety for the static loading conditions were calculated by ABC to be X.X (short- and long-term) which are in excess of minimum required values of X.X and X.X, respectively.

The seismic stability of the proposed slopes was investigated by the licensee using the pseudo-static method of analysis, with horizontal seismic coefficients of X.XXg for both the end-of-construction and the long-term cases. The value of the seismic coefficient was consistent with the design ground acceleration value used for the nearby XXXX site. In actuality, a horizontal seismic coefficient equal to X.XX times the maximum ground acceleration,or X.XXg, would be used in a long-term pseudo-static evaluation, thus ABC's model is over-conservative. As a further exercise, ABC arbitrarily increased the horizontal seismic coefficient in order to determine the value which would imply impending failure. The coefficient which resulted in a factor of safety of unity, implying impending failure, was X.XXg.

Subsequently, the licensee performed deterministic and probabilistic ground motion evaluations in month, XXXX (reference). The purpose of XXXX's re-evaluation was to determine a peak horizontal acceleration value more reasonable than that used by DOE at XXXX (area), yet still conservative. XXXX determined that a peak horizontal acceleration of X.XXg, which represents an event with a mean return period of 10,000 years, was an appropriate value for design (see section XXX). Since the licensee's earlier analysis was based on a peak horizontal acceleration in excess of X.XXg, and stable conditions were confirmed, the conservativeness of the seismic design with respect to slope stability was substantiated.

Based on review of these analyses and the results, XDOH staff concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been

made in a manner consistent with the guidance document (reference).

2.2.8 Settlement and Cover Cracking

Long-term settlement of materials in the disposal cell, which could result in either local depressions or cracks on top of the cover, was addressed by the licensee in XXXX's report of [month date, year]. A proposed settlement monitoring program was provided. Settlement monuments have been installed directly on the tailings prior to the initiation of regrading activities. Construction equipment is required to maintain a minimum distance of XXXX feet from all monuments.

The monuments were surveyed for vertical displacement on a daily basis for the first XXX weeks of initial fill placement, weekly for the following XXX months, and then monthly for the final two months. After ABC had concluded that XX percent of the consolidation settlement was complete, and with XDOH's concurrence, final soil cover placement operations began.

Settlement monuments were located in areas where consolidation is expected to be the greatest, including areas believed to have maximum thicknesses of fine tailings. Such an arrangement assures that differential settlement would not adversely affect the integrity of the cover. Additionally, the final soil cover was spread and compacted in a uniform manner to minimize the effects of settlement due to the weight of the final soil cover materials. ABC concluded that XX percent of the primary consolidation should take XX years, based on the fact that there has been no disposal of tailings since XXXX and that the pumping program conducted at the site has accelerated the dewatering process.

In addition, ABC conducted an exploration program within the embankment using XXXX methods. The in-situ data were evaluated along with settlement records to confirm the conclusion that XX percent of the expected settlement has occurred. The in-situ test results were also used to assess the potential for cover cracking. XDOH finds that the settlement monitoring program is sufficient to satisfy applicable portions of Criteria 1, 6, and 12, of 10 CFR Part 40, Appendix A, regarding reclamation design to control radiological hazards for the design life without active maintenance after reclamation is complete.

2.2.9 Liquefaction Potential

The liquefaction potential for the XYZ site was initially evaluated for ABC by [reference]. [reference] evaluated the liquefaction potential based on empirical techniques and on the basis of a laboratory evaluation. Minimum factors of safety of X.XX (empirical) and X.XX (laboratory) were derived in the [reference] study.

Appendix B -- Sample Completion Review Report (Conventional)

Based on the similarity in results, and considering minimum acceptable safety factors of X.X, [reference] concluded that no major problem related to liquefaction would occur during the postulated seismic event, which they considered to be a Magnitude X event with a hypocentral distance of approximately XX km and a maximum ground acceleration of X.XXg.

An understanding of seismic hazards and the liquefaction process has improved since [year]. Based on more recent interpretations of potential seismic events, and in accordance with a month date, year, request from the XDOH, the licensee re-evaluated the liquefaction potential for the site [reference]. Liquefaction potential was re-evaluated using standard penetration test values, soil gradation, and sample descriptions from previous analyses with updated empirical relationships. The potential induced stresses were estimated from simplified procedures using field-based methods.

Liquefaction susceptibility can be estimated by either of two approaches. The first method correlates resistance with standard penetration test (SPT) blowcounts, measured in-situ. The second method relies on laboratory measurements of dynamic tests that strain soil samples in repeated cycles of motion until liquefaction is induced. [Reference] stated that the field-based method is the preferred analytical procedure.

By using methods detailed in [reference], the in-situ liquefaction resistance was computed. In the [reference] analysis, corrected SPT values are normalized and correlated with the cyclic stress ratio required to trigger liquefaction, in observational data. The field cyclic stress ratio is thus obtained from curves dependent on the normalized blowcounts and soil fines content. For a calculated factor of safety less than X.X, failure is assumed to occur. For a factor of safety between X.X and X.X, liquefaction is not assumed to occur, but the soils may suffer some strength loss.

[Reference] showed that very few sample points indicate susceptibility to liquefaction, and that isolated incidences of liquefaction, if it were to occur, would be deep within the embankment. It was inferred that liquefaction of the tailings and underlying soils is unlikely to occur, and that there is no threat to the stability of the embankment.

Based on a review of the analysis presented by the licensee [reference], XDOH concludes that there is adequate assurance of safety with respect to liquefaction damage.

2.2.10 Cover Design

Appendix B -- Sample Completion Review Report (Conventional)

ABC has used three different embankment cover sections, depending on location:

(1) The final cover profile for the embankment consists of X feet (minimum) of sandy soil above the regraded coarse tailings. The sandy soil is capped by a filter layer
and rock armor of variable thickness.

(2) The cover profile over coarse tailings consists of:

X inches (minimum) of low-grade ore from the mill area,
XX inches (minimum) of affected soil,
X inches (minimum) of compacted clay,
X inches of sandy soil
The coarse tailings areas are covered with rock armor of variable thickness.

3) The cover profile over fine tailings includes:

X feet (minimum) of regraded coarse tailings,
XX inches (minimum) of affected soil,
XX inches (minimum) of compacted clay,
X inches (minimum) of sandy soil
A rock armor of variable thickness will cover the sandy soil.

The cover system described above provides a minimum of XX inches of cover above tailings on the top and sides of the cell. The system has been designed to limit the infiltration of precipitation, protect the pile from erosion, and to control the release of radon from the tailings below. Details of the XDOH's review of the cover's performance related to limiting infiltration are addressed in Section XXX of this report; the review of the cover's erosion protection features is presented in Section XXX, and the review of the radon attenuation aspects of the cover is presented in Section XXX. Certain other design aspects of the proposed cover are discussed herein.

Tests on the compacted clay from XXXX indicate that hydraulic conductivities are near XX-XX cm/sec at placement conditions. In addition, the physical shape and surface grading of the reclaimed tailings embankment effectively remove surface water resulting from precipitation which falls on the area. The relatively low permeability of the cover materials and the low annual rainfall with high evaporation rate prevent significant tailings recharge.

ABC has evaluated the potential for frost penetration using the [BERGGREN.BAS]

computer code developed at the U.S. Army Corps of Engineers (reference). The code has been used on several other uranium mill tailings remediation projects. In order to evaluate the potential for frost penetration, temperature data including the freezing index, mean annual air temperature, length of freezing season, and geotechnical parameters are considered. The model calculates the heat capacity, thermal conductivity, and latent heat of fusion for the soil layers unless these data are entered manually.

Values used in the computer analysis included the mean and worst-case situations based on the available XX years of weather records. In the worst-case scenario, ABC determined that the depth of frost penetration would be XX.X inches. By thickening the sand layer to X inches, and in conjunction with the exterior rock armor, the potential for frost penetration into the clay layer is eliminated, and the cover integrity should not be significantly affected.

XDOH has reviewed the input data used in determining the total frost penetration depth and concludes that these values are a reasonable representation of the extreme site conditions to be expected. Therefore, ABC's evaluation of the frost penetration depth is acceptable to XDOH.

The cover design has been evaluated by XDOH for geotechnical long-term stability and the design is acceptable. The radon attenuation ability of the cover is discussed in Section XX and the hydraulic conductivity aspects of the cover in Section XX.

2.2.11 Subsidence

Possible mechanisms for ground subsidence due to dissolution or creep of underlying salt are discussed in Section XXXX. XDOH concluded that X meter of bedrock subsidence at any location below the pile is a reasonable design basis. ABC presented an analysis [reference] to show that a worst-case scenario of subsidence would not adversely affect the stabilized tailings. The [reference] approach was based on a simplified procedure by [reference], and considered instantaneous subsidence of XX meter and, for added conservatism, of XX meters.

The modified XXXX procedure was developed from finite element analyses and physical models for propagation of earthquake fault ruptures in the bedrock beneath cohesive soil deposits. The analytical and physical model results were also compared with case histories of earthquake fault rupture propagation through soil, such as those described by [reference]. XDOH considers ABC's approach to be conservative for evaluating the surface deformation associated with vertical subsidence caused by salt dissolution because it assumes the deformation to be instantaneous and concentrated within a single narrow zone rather than being

incremental and more distributed, as would be expected for salt dissolution subsidence.

ABC's analysis [reference], using the simplified fault rupture propagation model of [reference], indicates that the thickness of alluvium and tailings is greater than the distance of propagation for XX and XX meter bedrock offsets. Thus, differential displacements of bedrock, resulting from salt dissolution subsidence under the tailings pile, would not be expected to propagate to the surface and impair the function of the clay cap and radon barrier. XDOH concludes that the analysis was conservative for the reasons discussed above. XDOH
therefore concludes that the licensee provided adequate assurance that the potential for differential offsets reaching the surface of the pile as a result of salt dissolution over the next 1000 years is negligible.

2.2.12 Construction Methods and Features

XDOH has reviewed design text, tables, and drawings in the technical specifications submitted by ABC (reference). The text discusses the investigations and testing which formed the basis of the design and specifications. Additionally, the text discusses the design concept in detail. The text is supported by tables which summarize design parameters and figures which clearly show plans, profiles, and details of the proposed remedial action.

In summary, the side slopes were re-contoured to a [10]H to [3]V proportion. [Comment: use of the future in this sentence suggests that the reclamation work is not complete. How can a CRR be submitted if this is true?] Mill debris is to be buried systematically at the toe of the slope. A permanent layered cover provides protection from excessive radon emanation, and permits rainfall to drain away satisfactorily.

XDOH has reviewed and evaluated the geotechnical construction criteria provided in the Reclamation Plan. Based on this review, XDOH concludes that the plans and drawings clearly convey the proposed closure action design features. In addition, the excavation and placement methods and specifications are consistent with accepted standard practice and the guidance document (reference).

2.2.13 Testing and Inspection

XDOH staff has reviewed drawings and technical specifications submitted by ABC (reference). The Technical Specifications discuss testing methods and quality control procedures applicable to the remedial work. Appropriate reference is made to [ASTM] methods which will govern the placement and testing of soil and rock

materials. The specifications are presented in a conventional outline form. Tables and figures are appended to the Technical Specifications.

Based on the XDOH staff review, the plan is found to provide a program for testing and inspection that is generally consistent with the XXXX guidance document (reference).

2.2.14 Conclusions

Based on the review of the geotechnical engineering aspects of the design of the ABC closure action as presented in the Reclamation Plan, XDOH concludes that the embankment and proposed borrow soils have been adequately characterized. Furthermore, the cover system appears to be adequately designed to resist the effects of freezing conditions which can reasonably be expected. XDOH concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been made in a manner consistent with the guidance document (reference). XDOH concludes that there is adequate assurance of safety with respect to liquefaction potential. In conclusion, the XDOH's review of geotechnical stability has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

2.3 SURFACE WATER HYDROLOGY AND EROSION PROTECTION

The constructed reclamation site is robust by design, and includes a thick, vegetated cover design of site soils surrounded by a large surface water diversion channel over X,XXX feet long. The tailings impoundment is situated in a relatively small watershed area (about XXX acres), which limits surface water flow potential. The small catchment area inside the diversion channel is less than XXX acres. The reclamation site is expected to return to a wildlife and forestry land use, similar to the surrounding area, which shows few erosional impacts.

Embankment dam (XX%), margins (XX to XX%), cover (X.XX%), and diversion channel (X.XX to X.XX%) slopes are relatively flat. Erosion protection studies have been performed on these topographic features. Some areas required stabilization by rock (riprap), some by vegetation, and some are naturally stable.

2.3.1 Flood Flow

The primary criteria used to evaluate erosion protection are a determination of long-term erosional stability using Criteron 6 (reference), which requires site

stability for 1,000 years. NRC guidance was used to develop a conservative design basis. A probable maximum precipitation (PMP) event was selected and found to be a X-hour storm of XX.X inches, peaking at mid-storm at 18 inches per hour (reference). Probable Maximum Flood (PMF) surface water flow rates were determined, based on the worst-case precipitation event, surface flow characteristics (elevations and contours, surface roughness and vegetation) at the site, and antecedent soil moisture (near-saturated or frozen ground), using the HEC-1 computer program. The Modified Rational Method was used to verify surface water flow rates on the cover.

XDOH reviewed and independently verified ABC's flood flow estimates. The [reference] method was used to determine that vegetation is not necessary for erosion protection (reference). The margin areas were found to require XX% vegetal coverage for long-term erosional stability, based on a PMF event. Short-term erosion protection requirements were also determined and require XX% vegetal cover, based on a 10,000-year storm (reference). The Monitoring and Stabilization Plan (MSP) was used to verify vegetation productivity performance after reclamation construction was completed. The XX% short-term requirement was met in [year], and the trend line for performance since reclamation construction in XXXX predicts performance in the XX% range by the [summer] of [year] (reference).

PMF flow rates were determined for the diversion channel to be XXXX cfs (cubic feet per second), and for the swale outlet from the impoundment surface area to be XXX cfs. These worst-case flood flow rates were used to determine channel cross-sections and to size the riprap (reference). Diversion channel cross-sections were designed for both the minimum flow resistance, large velocity case (expected just after reclamation is completed), and for the high resistance, low velocity case (expected after the channels have re-vegetated). Rock protection is required for the first case with a smaller channel cross-section. Long-term performance requires limited rock protection but a larger cross-section channel.

Using these two cases, the diversion channel was designed for a large cross-section, but with rock placed only in the lower portion consistent with the smaller cross-section (reference). Rock and filter sizing was performed using the Safety Factors Method or the Stephenson Method, as recommended by NRC guidance. XDOH reviewed and independently verified ABC's analyses (reference). Rock sizes that were placed met, and generally exceeded the minimum rock sizing required by the analysis-based design. ABC chose to oversize the rock to limit the number of rock sizes produced and placed (reference).

2.3.2 Rock Durability and Gradation

Appendix B -- Sample Completion Review Report (Conventional)

Rock durability and gradation were evaluated during construction to meet approved construction design plans and specifications. An initial petrographic examination per [reference] was made to qualify the rock source. XDOH reviewed the report of the independent evaluation and accepted the rock source (reference). Rock samples were then tested every XX,XXX cubic yards of production for Bulk Specific Gravity and Absorption per [reference], Sodium Sulfate Soundness per [reference], Los Angeles Abrasion per [reference], and Schmidt Hammer Rebound per [reference].

Two different rock sources were used, including a local basalt borrow area; and a quartz monzonite area that required blasting.

Rock durability scores, using the NRC-recommended scoring method, averaged XX.X, with the lowest at XX and the highest at XX. XDOH reviewed rock durability test results from the independent laboratory. Rock source gradation was periodically sampled and evaluated by an independent contractor during construction. Department inspectors reviewed inspection records during construction and found the evaluations, methods, and records to be adequate. ABC performed a quality assurance construction performance audit program of ABC operations, contractor construction activities, and independent contractor inspections. The ABC auditor reported to corporate management and exercised independent authority, as observed by XDOH inspectors (reference).

XDOH reviewed the data from the licensee's construction completion report (reference). The basalt rock source qualified and produced a small fraction of the produced rock (about X,XXX cubic yards). Rock durability test results for basalt scored XX on two tests. The quartz monzonite source qualified and produced most of the rock used during construction (about XX,XXX cubic yards). Rock durability test scores for the quartz monzonite averaged XX.X, with a standard deviation of X.X. The department believes that the quartz monzonite source produced uniform rock durability, based on department inspection, the consistency of the rock durability scores, and the small statistical standard deviation for the data.

NRC guidance provides a minimum rock durability score of 80, without oversizing. ABC oversized the rock placed by a considerable amount, on average. Oversizing of rock was by design. Rock production used a small number of screens. The licensee used only X", X" and XX" D_{50} (median stone diameter) rock sizes. Placement sizes were greater, compared with design rock sizes developed to meet erosion protection criteria. The erosion protection criteria were also determined based on conservative criteria.

In addition to conservative methods for rock sizing and durability, the structural integrity of the site is not dependent only on rock for erosion protection. The XYZ

millsite has site-specific attributes (soil, bedrock, weather, etc.) that suggest a durable long-term forest and wildlife environment. Therefore, the rock protection placed during construction becomes less important for structural stability (erosion protection), as vegetation becomes established. The rock performance timeframe is about a thousand years (based on NRC guidance and methods), while the forest succession timeframe is about a hundred years. This is a convenient overlap of performance features.

During reclamation plan development, ABC evaluated erosion protection requirements for the diversion channel for both the vegetated and non-vegetated conditions. For that area, rock was required in the lower section of the channel (for the non-vegetated condition), and not in the upper section of the channel (for the vegetated condition). The difference between conditions is a factor of three in velocity reduction and in channel cross-section increase, once vegetation establishes. The long-term performance expectation is for a similar velocity reduction in all areas of the site after vegetation succession occurs.

2.3.3 Vegetation Cover

For the design of the top slope, ABC addressed the stability of the slope under three conditions: (1) bare soil with no vegetation; (2) normal, fair vegetation cover; and (3) poor vegetation cover. The stability of these three cover conditions was evaluated using the allowable shear stress method (reference) and the maximum allowable velocity (reference), with corrections for depth (referene). Additionally, the staff independently evaluated the stability of the top slope, using very conservative assumptions. It was assumed that the vegetation was burned, deteriorated, and/or damaged to the extent that approximately XX% of its shear resistance capability had been removed (reduced from X.X pounds per square foot to X.X pounds per square foot), coincident with the occurrence of the design PMF discharge of X.X cfs. Further, an evaluation was conducted assuming a XX% reduction in shear resistance (X.X pounds per square foot), coincident with a discharge of X.X cfs (PMF with no flow concentration, or FCF = 1). Under both conditions, the proposed slope of X.XX was found to be stable. Following is a summary of calculations performed by ABC and the XDOH regarding the stable slope design.

Design Method	Cover Condition	Allowable Stress (lb/ft^2)	Actual Stress (lb/ft^2)	Allowable Velocity (ft/sec)	Actual Velocity (ft/sec)	Stable Slope (ft/ft)
Allowable Shear Stress	Bare	[0.08]	[0.44]	NA		[0.0013]

Appendix B -- Sample Completion Review Report (Conventional)

	Poor	[3.0]	[0.5]			[0.012]
	Normal	[4.2]	[0.6]			[0.030]
Allowable Velocity	Bare	NA		[2.9]	[2.9]	[0.003]
	Poor			[3.8]	[3.8]	[0.01]
	Normal			[3.9]	[3.8]	[0.015]
XDOH Independent Estimate (FCF= 3) (FCF= 1)						
	[90%] Lost	[0.4]	[0.4]	NA		[0.01]
	[95%] Lost	[0.2]	[0.2]			[0.01]

Additionally, ABC provided further information and justification regarding the design of the vegetation cover in a special report (reference) which addresses the concerns raised in XXXX (Reference). These concerns included a conclusion in the NRC report which indicated that typical soil loss rates in this portion of the United States were so excessive that a soil cover could not be provided for a 1000-year period, based on results of the Universal Soil Loss Equation. ABC performed detailed calculations of the soil loss rates for the specific design and location chosen; these calculations indicated that the design would provide acceptable protection against sheet erosion.]

2.3.4 Sedimentation

Sedimentation in the diversion channel was evaluated using the XXXX and XXXX computer programs. The analyses were performed on the PMF case, as well as several lesser flood flow cases, to determine if sedimentation would accumulate in

the diversion channel over time and reduce diversion channel flow capacity. It was determined that, except for the first few years after construction, there is no likely flood flow in the channel for flood recurrence intervals less than XXX years, due to expected infiltration. For larger, low-probability flood events, sediment would likely flush out with the expected flood flow. Even without flushing, sediment accumulation predicted by the analysis was approximately X.X feet at the bottom of the diversion channel. The channel was designed so that a minimum of X foot of freeboard would be present, and included a very conservative design PMF basis, sedimentation in the channel, and re-vegetation of the channel (reference). In addition, the channel was constructed somewhat oversized to meet the design cross-section minimum requirements, and therefore has a capacity excess from the design minimum required.

The impoundment swale outfall requires rock (riprap) erosion protection, since it is designed to convey concentrated flood flow from the impoundment surface and to discharge it away from the reclamation site. This area was evaluated with the same analytical tools as the diversion channel, and found to be adequate. The design was prepared by ABC, and evaluated and approved by the State XXX program and XDOH. Worst-case assumptions were used to evaluate the design, based on NRC guidance. Vegetation productivity on the impoundment cover has reached a self-sustaining performance level and will continue to improve over time, limiting the probability of occurrence of maximum flood flow (reference). The swale outfall is located over a large area of competent quartz monzonite of sufficient structural capacity, extent, and elevation, that limits potential erosion of cover soils from the impoundment. The swale outfall therefore protects the cover from erosion and promotes sedimentation on the shallow-sloping impoundment surface (reference).

2.3.5 Conclusion

In conclusion, the XDOH's review of surface water hydrology and erosion protection has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

2.4 RADON EMANATION

[Comment: this discussion may be better suited for Step 3 rather than Step 2. Relocate?]ABC designed the impoundment cover from site soils and determined that an average cover design thickness of XX.X feet was required in order to meet the regulatory limit of XX pCi/m^{2}s found in Criterion 6 (reference)[Comment: why blank out the regulatory limit from Appendix A? Put it back in with careful

Appendix B -- Sample Completion Review Report (Conventional)

editing]. ABC used the RADON computer code to perform this analysis. The analysis is based on the concentration of radium 226 in the tailings, and on the soil parameter default values recommended by the NRC in guidance documents applicable to tailings impoundment cover design for radon emanation control. The department reviewed ABC's design and analysis reports, verified their results, and approved the design plans and specifications. A sensitivity analysis was performed, using realistic, expected soil parameters, and found that a radon 222 flux of only X.XX pCi/m^2s would be expected during the summer and fall when the cover soils are not expected to be saturated (reference).

A thick, homogeneous soil cover of at least XX.X feet thick was placed over the impounded tailings at the XYZ Project site (per as-built inspection reports). The total volume of soil moved during construction to place the cover is in excess of X million cubic yards (yd^3). The vegetated cover was designed to have long-term performance. Natural materials (vegetation, soils, and rock) have been used to prepare and construct the cover design. Actual materials used in construction had a greater proportion of fine material (percent less than #XXX sieve) than required by the construction design plans and specifications. The actual thickness of the constructed cover averaged over XX.X feet from the sloped sub-grade. The sub-grade, although made up of radium 226--contaminated material, was produced by re-grading the tailings to the required contour and adding additional soil from the contaminated soils cleaned up in the mill area, with clean fill to meet grade requirements. Therefore, the upper portion of the tailings had less radium 226 concentration than was used in the analysis for determining cover thickness. All together, the design is quite conservative and the actual construction more than exceeded the minimum requirements of the approved design plans and specifications.

2.4.1 Radon 222 Measurements

[Comment: several red-lining errors (i.e. text that should have been deleted has not been) in these paragraphs. Correct.] ABC performed radon 222 flux measurements on the tailings impoundment after final cover placement. Measurements were performed in compliance with requirements of ~~WAC 246-252-030~~ XDC XXX-XXX-XXX(10 CFR Part 40, Appendix A). Sampling was performed using the Large Area Activated Charcoal Canister (LAACC) method. Measurements of the approximately XX-acre surface were performed month date, year. A mean radon 222 flux rate of X.XX +/- X.XX pCi/m^2s was measured (PQL of X.X pCi/m^2s). This measurement is well below the regulatory standard from state regulation XDC-XXX-XXX, Criterion 6 (b), and consistent with analytical evaluations, using realistic assumptions and expectations, performed at the XYZ site (reference).

Appendix B -- Sample Completion Review Report (Conventional)

A report of results of testing and analysis for the (month date, year) radon 222 emanation flux rate evaluation was received month date, year, and reviewed by department staff. The report includes details of the testing equipment, methods, and analytical procedures used in the evaluation. This report remains on file with the department and is available to the custodial agency (DOE) upon request. DOE has requested and received many of the main reports and documents necessary to manage the site and may have already received this report.[Comment" "...may have received this report..." is far too detailed for a generic CRR example. Delete] Criterion 6(c) requirements for radon 222 flux emanation rate measurement reporting and records management have therefore been met (reference).

(Sample paragraph)

[Comment: the following paragraph should be relocate to the Summary.]The licensee satisfied the regulatory requirements for attenuation of radon flux. The licensee submitted a reclamation plan which provided the design of a cover system which would reduce the radon flux to XX $pCi/m^2/s$ or less. Use of a published radon flux model (reference) with the design information provided by the licensee confirmed the radon flux reduction provided by the cover system. The licensee also demonstrated that the cover system would continue to reduce radon flux for 1000 years or at least 200 years by using an environment dose assessment model (reference) to confirm that the cover system would perform adequately. After completion of the cover system the licensee made radon flux measurements using the radon flux measurement methodology in Appendix B, Method 115, 40 CFR Part 61. Radon flux measurements averaged over the entire impoundment were less than 20 $pCi/m^2/s$.

2.4.2 Conclusion

In conclusion, the XDOH's review of radon emanation has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples that indicated that the subject site meets applicable standards and requirements for release.

3.1 RADIATION CLEANUP AND CONTROL (EXAMPLE 1)

[Comment: the following paragraph is totally redundant. Delete.] On (month date,

year), ABC submitted the Radiological Verification Program (RVP) (reference) to XDOH for review and comment. Following several meetings between XDOH and ABC, a formal response letter was sent to ABC on month date, year. In response to XDOH's letter, ABC submitted Revisions X and X to the Mill Decommissioning Plan (reference), which XDOH subsequently found acceptable and approved on month date, year through issuance of Amendment XX to ABC's radioactive materials license (reference).

XDOH determined that the RVP provided reasonable assurance that:

- appropriate regulatory standards for soil cleanup are utilized;
- all potentially contaminated areas associated with ABC's mill are properly identified for soil verification;
- background values for radium, thorium, and uranium established by ABC are representative of each soil type identified by ABC and XDOH staff at the XYZ facility (reference);
- soil cleanup standards could be met in process areas such as the millsite barium chloride pond and the clairicone spill area where an accurate correlation or association cannot be developed, through 100% soil sampling and analysis;
- soil cleanup standards for Ra-226 and Th-230 could be met in areas of natural soil deposition by gamma surveys because of the correlation to radium concentrations, and the assurance that an accurate association exists between radium and thorium;
- soil cleanup action levels ensure a XX% or greater confidence that cleanup standards are complied with;
- ABC's Quality Assurance and Quality Control Program would properly control field and laboratory activities, and data management.

Following mill building demolition and disposal into the tailings disposal area, and prior to initiation of the RVP, ABC excavated approximately XX,XXX cubic yards of soil from the mill area. The majority of the excavated soil was from areas where it was believed that elevated residual radioactivity might exist (XX,XXX cubic feet equates to an average depth of approximately X.X feet). In accordance with the approved RVP, approximately X,XXX ten-meter by ten-meter grids were established for gamma correlation surveying. In approximately XXX of these grids, soil samples and analyses were conducted to confirm the gamma-radium correlation. In areas where a correlation could not be demonstrated, approximately XXX additional ten-meter by ten-meter grids were established for soil sample analysis. Core samples approximately 3" in diameter and 6" deep were taken. Since contamination resulting from the milling operation originated at the ground surface, the concentration of contaminants would be greater near the surface and would decrease with depth. Therefore, it was determined that the soil sample protocol

would only require sampling below 6" if contamination was found in the upper 6" soil profile. For the XX grids where the subsurface radium standard was applied, the average minimum and maximum for Ra-226 was X.XX, X.XX, and X.XX; for Th-230 it was XX.XX, XX.XX, and XX.XX. The estimated Ra-226 at 1,000 years is XX.XX, XX.XX, and XX.XX. ABC documented that at least six inches (but in most cases several feet) of fill were placed on these areas.

ABC's standard procedure for excavating areas identified as requiring cleanup was to over-excavate several feet of material in an effort to lower residual radionuclide concentrations to levels which could be considered ALARA, rather than excavating only to surface soil regulatory limits. ALARA philosophy was considered when establishing action limits for soil cleanup, and the allowable action limits were reduced by a value of XX%. As a result, grids having soil sample results in excess of approximately X.XX pCi/g of radium 226 or thorium 230 were cleaned and re-sampled. After these areas had been cleaned up to the approved radium/thorium concentration levels, a new issue regarding uranium concentrations in soils arose. In response to this issue, XDOH evaluated and approved ABC's proposed concentration limit for uranium and their verification procedure. An additional XXX ten-meter by ten-meter grids were established for uranium soil sample analysis, and approximately XX% of them were found to be below the cleanup action level. In areas where soil cleanup action levels were exceeded, soil was removed and the area re-tested until it complied (reference).

3.1.1 ABC Results

A total of XXX,XXX additional cubic yards of potentially contaminated soil were excavated and placed in the tailings disposal area as a result of soil cleanup activities. By the time the millsite cleanup was complete, ABC had performed ~~4968~~ [674] gamma surveys and had ~~1320~~ [354] soil samples analyzed (reference).

[A summary of survey units, scan and sample results is presented below in Tables X-X.]

Table X. Survey unit summary

Survey Unit Classification	Number of Survey Units	Samples per Survey Unit	Area of Survey Unit, m2
I	75	18	100
II	26	10	1500
III	33	varies	varies

Appendix B -- Sample Completion Review Report (Conventional)

Table X. Summary of gamma exposure rate ranges

Analytical categories	Gamma exposure rates (mR/h)
Number of surveys	[674]
Minimum	[9]
Maximum	[1,355]
Mean	[16]

[Note: The limit for gamma exposure rate is xxx mR/h]

Table X. Summary of soil sample analyses

Analytical categories	Concentration (pCi/g)		
	Ra-226	Th-230	U(total)
Number of soil samples	[354]	[271]	[251]
Minimum	[0.5]	[0.0]	[0.2]
Maximum	[34.3]	[35.1]	[82.4]
Mean	[2.2]	[1.7]	[7.6]

[Notes:
1. Results include background.
2. The limit for Ra-226 in value can range from XXX to XXX pCi/g.
3. The limit for Th-230 in value can range from XXX to XXX pCi/g.
4. The limit for U(total) in value can range from XXX to XXX pCi/g.]

3.1.2 State's Results

During the millsite cleanup, XDOH conducted numerous inspections to ensure

compliance with conditions of the RVP. XDOH also conducted its own sampling and analysis verification program. XDOH staff collected or split [100] samples with ABC and sent them to the state laboratory for independent analysis, and performed approximately [140] gamma grid confirmation surveys in the same areas as ABC. [Results of the state's surveys were compared to the ABC's results and are in good agreement.]

3.1.3 Millsite Decommissioning

The only structures remaining within the former mill area are the pump house and its water storage tank. Following mill demolition, the exterior siding and insulation were removed from the pump house and disposed of in the tailings impoundment. The metal siding, pump equipment, interior piping, and the water storage tank were surveyed by ABC and found to meet regulatory requirements. The department has reviewed this information as presented in the Mill Decommissioning Completion Report (reference) and concurred with ABC's finding that these structures can be free-released.

3.1.4 Cover Material

Most of the cover material used in the tailings impoundment came from areas identified by ABC in their RVP as secondary and tertiary, as well as a borrow site in which topsoil was stored when the tailings disposal area was first constructed. These areas were surveyed by ABC and found to be at background levels. In Appendix C, Revision X of the XYZ Project Mill Decommissioning Plan dated month year, radium levels in the borrow areas averaged between X.X and X.X pCi/gm, depending on soil type. The department has conducted a confirmatory survey of XXX gamma measurements, using microR meters, which found that gamma radiation levels on the top of the completed impoundment are at background (XX-XX uR/hr). Competent monzonite outcrops off the tailings disposal area, in unimpacted background areas near the impoundment, had readings as high as XX uR/hr.

3.1.5 Summary

ABC's initial measurements revealed that XX% of all gamma and soil sample grids were below the radium regulatory limit. Following the initial surveys, all gamma grids and soil grids that were in excess of limits were excavated until results indicated concentrations below the applicable limit. XDOH data confirm that ABC's sampling process was valid. In conclusion, the XDOH's review of radiation cleanup and control has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent

State regulations).

3.2 RADIATION CLEANUP AND CONTROL (EXAMPLE 2)

[Comment: some explanation should be given why this Example 2, which is far better written than Example 1, would be acceptable or preferable. Simply cutting out sections from two CRRs without any supporting commentary is not useful or helpful to the reviewer. Add some explanation.]

3.2.1 Introduction

[Comment: this first paragraph is redundant and should be deleted. It is already in the Regulatory Basis section.]

MARSSIM methodologies (NUREG 1575) were applied ~~([~~or an alternate approved method~~)]~~for demonstrating cleanup. The MARSSIM process utilized the Data Quality Objectives process such that stakeholder data requirements were identified and applied (references).

Characterization of the site was performed to identify impacted areas outside the impoundment (e.g., mill buildings, haul roads, bone yards). Background was appropriately determined using reference areas representing the various media [include results]. Areas were then classified properly according to contamination potential.

3.2.2 Millsite Decommissioning

Remediation activities at the site commenced in XXX and ended in XXX. Remediation (demolition/excavation) technologies (or alternate methods) were evaluated and found to be effective. Effluent controls were in effect for air, water, and soil. Environmental monitoring was in place for all affected media. Changes from the Decommissioning Plan were explained and justified (reference). A total of xx structures were remediated, and approximately XXXX cubic yards of material were placed in the impoundment, including building rubble, soils, and other permitted materials. Buildings were remediated by xx process. XX acres of the site were remediated to free-release criteria. Due to XXX factors, sections XXX will require institutional controls, and will be transferred to [DOE's Long Term ~~Custody~~ Surveillance and Maintenance Program] along with the impoundment, as agreed to in XXXX.

3.2.3 Final Status Surveys

Appendix B -- Sample Completion Review Report (Conventional)

Concurrent with remediation activities, Final Status Surveys (FSS) were conducted to demonstrate cleanup to the stated goals. The FSS designs were reviewed and approved by the State (reference). Appropriate instrumentation was chosen for the contaminants of interest and properly calibrated. Th-230 was evaluated by correlation to Ra-226 where feasible, and through soil analysis where a correlation could not be demonstrated. Minimum detectable concentrations of survey instrumentation and other DQOs were compared to plans. The surveys consisted of a combination of gamma scans and soil samples. Borehole surveys for subsurface verification were also made, although subsurface contamination is not addressed under MARSSIM. [A summary of survey units, scan and sample results is presented below in Tables XX-XX (see example 1).]

Verification and validation of the survey results combined with an assessment of the quantity and quality of the data were conducted. The data were validated to ensure that the results supported the objectives of the survey. [Comment: the NRC would never accept the following definitive statement. Correct!] The Final Status Survey was accurate and complete.

3.2.4 Independent Verification
An independent verification survey was conducted by XXX. Approximately XX% of the survey units were surveyed by the independent verification contractor. Results from the independent verification surveys were compared to the results of the site contractor. The results were in relative agreement, indicating that the FSS report is representative of site conditions. A letter of verification accompanied the report (reference).

3.2.5 State Oversight [insert narrative]

In addition to the independent verification, the state conducted XX site visits, XX inspections, collected XX samples, and conducted XX gamma surveys on XX survey units. Results of the state's surveys were compared to the site contractor's results and are in good agreement.
(references). [Insert table with results of State analyses].

3.2.6 Summary

Remedial Action was effective and comprehensive. The Completion Report is comprehensive and represents decommissioning efforts. Appropriate oversight for the project was maintained through the licensing process. In conclusion, the XDOH's review of radiation cleanup and control has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

Appendix B -- Sample Completion Review Report (Conventional)

Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

4.1 GROUNDWATER REMEDIATION (EXAMPLE 1: No Action Scenario)

There is no evidence of impact to ground water at ABC's tailings facility. From the beginning of ABC's operations, tailings were neutralized prior to discharge to the lined impoundment, significantly reducing the risk for ground water contamination (reference).

The hydrogeology of the site was evaluated prior to construction of the tailings impoundment in 1978 and again as part of the design phase of the reclamation cover. The basin hydrologic evaluation was performed by ABC to characterize physical parameters, which control groundwater occurrence, flow, and potential transport of contaminants. Results of this evaluation and the tailings impoundment investigation were reviewed by XDOH (reference). XDOH supplemented review of ABC's hydrogeologic evaluation with geologic and hydrogeolgic field evaluations by XDOH staff. XDOH staff also independently reviewed published geologic and hydrogeologic literature for the area of ABC's facility. XDOH staff reviews have confirmed the findings reported by XDOH (reference).

4.1.1 Monitoring Wells

Monitoring wells have been in place surrounding the tailings impoundment since before operations began through the Monitoring and Stabilization phase of the project. Groundwater data have been evaluated by XDOH since 1978 for possible leakage from the impoundment (reference). ABC sampled tailings pore fluid for all hazardous constituents defined by XDOH regulations (reference) and found that the hazardous constituents which could be of concern for ground water are uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium (reference). Therefore, ground water samples were analyzed for these constituents along with other indicator parameters such as TDS, pH, temperature, sulfate, chloride, and other metals. Samples have been obtained quarterly by ABC since before operations began.

4.1.2 State's Split Sampling

XDOH has split ground water samples from all of the monitoring wells with ~~WNI~~ ABC and had the samples analyzed at the department's independent laboratory.

Appendix B -- Sample Completion Review Report (Conventional)

Samples have been obtained from monitoring wells by XDOH semi-annually since operations began in 1978, through 1999. Ground water samples are collected by XDOH when static water levels of the aquifer are at the seasonally high and low periods of the year. Review of the analytical results from the department's laboratory shows the same water quality trends compared to the analytical results from ABC's laboratory.

The Monitoring and Stabilization Plan included three levels of monitoring for frequency and constituent evaluation depending upon conservative trigger exceedances. Although conservative trigger levels have resulted in increased monitoring surveillance, no federal or state regulatory standards have been exceeded (reference). XDOH's review of all ground water quality data has determined that the hazardous constituents in the tailings impoundment (uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory levels. Fluctuations in static water levels and indicator parameter values (e.g., sulfate and chloride), observed during post-reclamation construction compliance monitoring, are consistent with anticipated trends and values (reference).

4.1.3 Geo-Chemistry

An extensive independent geochemical review of the tailings impoundment and chemistry of the groundwater was conducted by a XDOH Geochemist. The purpose of the review was to evaluate long-term water quality of the site. The conclusions of this review are that the tailings should remain saturated (not dewatered), and groundwater quality should remain good (reference). Dewatering of tailings was considered, but XDOH determined that for long-term groundwater protection, dewatering of tailings was not desirable or required (reference).

4.1.4 Summary

XDOH has made a determination that the closure of licensee's facility is in compliance with State ground water regulations associated with uranium mill closure. The closure is specifically in compliance with the following ground water criteria delineated in Chapter XXX-XXXX [State regulations], Criterion 5 and Criterion 13, which incorporate the basic groundwater protection standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A which specifies groundwater monitoring requirements.

4.2 GROUNDWATER REMEDIATION (EXAMPLE 2: Remediation Scenario)

Appendix B -- Sample Completion Review Report (Conventional)

Analytical results of groundwater samples collected from monitoring wells at the licensee's facility indicate that the shallow aquifer has been contaminated by the tailings impoundment at concentrations in excess of applicable standards (reference). Using these validated groundwater data, the extent of contamination was delineated by constructing isoconcentration plume maps for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium (reference). These data indicate that degradation of groundwater quality has occurred as a result of the licensee's milling operations which warranted groundwater restoration actions. Subsequent to dewatering, removal, and transfer of the tailings to another licensed site, XDOH worked with the licensee to remediate groundwater contamination (reference).

4.2.1 Remedial Selection

The following groundwater remedial alternatives were reviewed by XDOH (reference):

1) natural flushing,
2) hydraulic gradient control via infiltration galleries,
3) slurry wall, ground water pumping wells, and evaporation pond disposal,
4) groundwater pumping wells, wastewater treatment, and discharge to the XXXX River, and
5) permeable reactive barriers.

Results of the review indicated that Option 5, permeable reactive barriers, was the most technologically efficient and cost effective remedy based on site-specific characteristics and the nature and extent of groundwater contamination at ABC's facility (reference). Permeable reactive barriers avoid the technological limitations and budgetary constraints associated with traditional approaches such as pump and treat technology (reference). Another significant advantage of permeable reactive barriers is the greatly reduced operation and maintenance costs which are limited to simple groundwater head and water quality monitoring (reference). Permeable reactive barriers are placed in the path of a migrating plume of contaminated ground water and reactive media within the barrier promote geochemical reactions that result in the destruction, neutralization, immobilization, and/or stabilization of groundwater contaminants.

4.2.2 Alternate Concentration Limits (optional)

Additional assessment studies of tailings contaminant fate, aquatic toxicology, and environmental risk were conducted to develop alternate concentration limits (ACLs) for the contaminants of concern at ABC's facility including ammonia, chloride,

molybdenum, nitrate, selenium, sulfate, and uranium (Reference). The establishment of ACLs was dependent on the approval by the State Water Quality Board and the exclusion of current and future water rights for local groundwater and surface water by the State Engineers Office (reference).

4.2.3 Remedial Implementation

After delineating the areal extent of groundwater contamination and characterizing the horizontal and vertical hydraulic gradients of the aquifer, two separate permeable reactive barriers were installed at ABC's facility including: 1) a zero-valent iron reactive wall was installed across the tailings area and the former mill site location to remediate uranium and heavy metals, and 2) a shorter zeolite reactive wall was installed in a second trench located behind the zero-valent iron reactive wall to remediate ammonia (reference). Both permeable reactive barriers were installed as simple reactive walls because site characteristics prevented the construction of low-permeability funnel walls on the sides of the reactive walls (reference). The design and installation of the permeable reactive barriers included ground water flow modeling and engineering analysis for optimal reactive wall design and to properly position the reactive walls in the local groundwater flow system (reference).

The design analyses for the permeable reactive barrier included evaluations of the barrier's life- cycle; considering the amount of reactive mass necessary to assure that groundwater concentrations would remain within compliance limits for the closure design life, and whether the barrier permeability would not be adversely impacted by the precipitation of minerals or microbial growth (reference). Post-closure monitoring of the permeable reactive barrier was performed for a period of XX years before the license termination request was submitted to demonstrate the barrier was performing as designed (reference).

[Scenario for post-license termination monitoring of reactive barrier if warranted at a specific site]

Even though post-closure monitoring has confirmed that the reactive barrier is performing as designed, monitoring is recommended beyond license termination in order to evaluate long-term groundwater and reactive barrier chemistry. The costs associated with long-term groundwater monitoring and potential reactive barrier replacement have been calculated and included in the Perpetual Care and Maintenance Fund.

4.2.4 Remedial Monitoring

Appendix B -- Sample Completion Review Report (Conventional)

Monitoring wells and piezometers were completed in the contaminated and uncontaminated portions of the aquifer and in the permeable reactive barriers to monitor groundwater head and water quality during remediation (reference). Piezometers were installed in the zero-valent iron and zeolite reactive walls to monitor reactive wall performance including changes in internal groundwater head, flux, and water chemistry (reference). Bimonthly monitoring was conducted by the licensee during the first two years of operation followed by semi-annual monitoring in years three to five, then annually thereafter (reference).

Split groundwater samples were analyzed by the State Laboratory on a semi-annual basis for the first five years of remediation and annually thereafter. Groundwater samples were collected by the State when static water levels of the aquifer were at seasonally high and low periods of the year. Analytical results of split samples from the State Laboratory are in agreement with ABC's laboratory analytical results and indicate that all contaminants of concern have been reduced to concentrations below applicable standards (references).

4.2.5 Permeable Reactive Barrier Closure

In-place closure of the permeable reactive barriers was achieved by grouting the reactive walls in order to hydraulically and chemically isolate the zero-valent iron and zeolite reactive media.

4.2.6 Post-Closure Monitoring

Post-closure ground water monitoring of point-of-compliance (POC) wells will be conducted as part of the long-term surveillance plan (LTSP) to ensure that the closed reactive walls remain hydraulically and chemically isolated. Groundwater samples from POC wells will be analyzed for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium.

4.2.7 Summary

XDOH has determined that groundwater contamination at ABC's facility has been remediated to concentrations below applicable standards [or ACLs] and license requirements for the contaminants of concern which include ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium. As a result of these successful groundwater restoration actions, XDOH has determined that closure of ABC's facility is in compliance with State groundwater regulations (reference) associated with uranium mill closure. The closure is specifically in compliance with the following groundwater criteria delineated in Chapter XXX-XXX-XXX State regulations, Criteria 5, 6(g), and 13, which incorporate the basic groundwater

protection standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A, Criteria, 5, 6(7), and 13, which specify groundwater monitoring requirements.

(Sample Paragraph)
The licensee provided sufficient information to characterize the geologic units of interest, the transport properties, extent of contamination, and water use from the aquifer. A groundwater sampling program (monitoring well placement and sampling protocols) was proposed and approved by XDOH. The licensee presented the results of the groundwater monitoring program which enabled the licensee to devise a remediation strategy and justification which was approved by XDOH.

5. *Discussion of results of State's site closure inspections*

XDOH has performed many site closure inspections over the years as the site remediation moved from one phase to the next. XDOH has employed inspection staff or provided specialized consultants to review and verify virtually every aspect of site closure. Please see page 1 of this report, indicating the technical reviewers (and their credentials and expertise) involved in recent reclamation aspects (over the past XX years). There have been many other department staff involved in the ABC project, who have provided state regulatory responsibility and stewardship of this site during its early phases.

Results of XDOH's site inspections have been to provide a presence to ensure the site reclamation activities are performed as required by regulation and license condition. For significant aspects of reclamation, ABC submitted detailed plans and specifications for the work. These plans were reviewed and approved by XDOH. In these cases, XDOH inspectors have performed many field inspections to verify conformance of site activities to approved plans. This is particularly the case for reclamation construction of the diversion channel and thick, vegetated cover. Of particular emphasis was inspection of soil, rock, vegetation, and groundwater.

Monitoring during site closure has continued to evaluate environmental media and site performance. Periodic inspection and monitoring activities have been performed to determine radionuclide concentrations in soil, air, and ground water. ABC has been required to perform this monitoring and to report results annually. XDOH has performed split sampling and has evaluated monitoring results in the State's independent laboratory to provide verification of ABC's results.

6. *Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate*

Appendix B -- Sample Completion Review Report (Conventional)

State regulatory agency which confirms that the impact has been evaluated and included the bases for the State's conclusion.

XDOH has determined that the release for unrestricted use and removal of the subject site will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date, based on the following: The site being removed from the license is not contiguous with any other site associated with licensed activities: removal of the sites from their associated license will not in any way prevent or hinder the licensee ability to complete decommissioning of the remainder of the licensed areas.

REFERENCES

Appendix C - Sample Completion Review Report for Non-conventional Uranium Milling License

[Comment: See identical comments for the introduction to Appendix B.]

The reader is advised that the sample CRR is by no means to provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: John Smith, M.S.,P.E. (Hydrologic Engineer)

SUMMARY

The ABC Company's XYZ site is ~~the~~ an in-situ leach mining and processing site decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the state regulatory agency shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The U.S. Nuclear Regulatory Commission's (NRC's) Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report.

The primary applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled Radiation Protection-Uranium and/or Thorium Milling. This State regulation is consistent with and compatible with federal regulations, as required by the State's Agreement State status with the NRC.

All applicable state standards and requirements, with appropriate references to related sections of the CRR, are identified in the Table below. XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

Appendix D -- NRC Determination Letter (Conventional)

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements	CRR Sections	TER Sections**
State regulation XX.XXXX Restoration of ground water with all wells plugged and capped. Criteria for groundwater restoration	Sections 2 and 3	Section X.XX
State regulation XX.XXXX Surface decontamination to a level sufficient for unrestricted use. Criteria for release for unrestricted use	Section 4	Section X.XX
State regulation XX.XXXX Release of equipment and materials. Criteria for release of equipment and materials for unrestricted use	Section 4	Section X.XX
Other applicable standards and requirements		

* As defined in section V.C of the STP SA-900 Procedure issued on date month, 2XXX.
**Sections in TERs or equivalent reference documents.

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Atomic Energy Act of 1954, as amended (AEA), that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

1. Licensee's activities associated with decommissioning license termination.

The XYZ project is an in-situ leach uranium mine located near XXX, State. XYZ's

uranium leases cover approximately X,XXX contiguous acres of land. The site facility included a main building (housing offices, a warehouse, a lab, and maintenance facilities), a processing plant,[four PVC lined] water storage ponds, a production well-field, an irrigation area, and a deep disposal well. The site was operated from 19XX to 19XX when production operations ceased.

From XXXX until XXXX [active/passive] ground water restoration was performed along with limited surface reclamation. The State Water Commission authorized ceasing groundwater restoration and final plugging of all wells [in the Fall of 19XX]. Following plugging of all wells, full-scale surface reclamation and decommissioning began. Any material and/or equipment which was contaminated was disposed of by 1) transfer to another licensed mine site; 2) decontamination and release for unrestricted use; or 3) disposal at [a licensed byproduct disposal facility]. The State staff has determined that proper release for disposal, recycle or reuse, of all material and /or equipment was adequately documented by the licensee.

The licensee performed surveys to confirm the effectiveness of reclamation and decommissioning activities. The surveys consisted of scans, direct and /or swipe surveys of all affected areas. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from four 10 meter by 10 meter areas per acre or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.]. Reclamation and decommissioning activities were completed in XXXX.

In XXXX, XDOH staff performed confirmatory surveys of the facility. [Comment: the following phrase is misplaced. Perhaps you mean to say *"Two times background concentration was used as the permissible limit for residual radioactivity."*?[Two times background (reference). The survey was performed by walking 10 meters apart moving across the wellfield pattern. Soil samples were taken from a 100 square meter area around areas that exceeded two times background. Or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.] Post-cleanup surveys conducted by XDOH staff indicate that the site has been decontaminated to a radiation level that meets the State release criteria (reference). Analysis of all soil samples indicates that average radium-226 and uranium concentrations were below release criteria of [5 pCi/g and 30 pCi/g, respectively].

On site disposal of radioactive materials was not authorized at this facility, thus there is no land to be transferred to the State or the Federal Government.

Groundwater Restoration Information

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: XDOH has received the restoration data for Production Area

XX of the XYZ mine. A review of the data shows that the production area has been restored in accordance with the specifications contained in permit XX-XXXX and as required by State regulations XX-XXX-XXXX. ABC has been authorized to cease any restoration activities, including monitoring, at the production area.

Wellfield Decommission Documentation

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: In accordance with State regulations XX-XXXX-XX, XDOH revokes permit XXXX. Groundwater was restored following criteria set forth in State regulations XX-XXXX-XXXX. All of the Class III wells were plugged as of month year, and certifications have been received from the mine operator and from an independent registered processional engineer that plugging was accomplished in accordance with the plugging and abandonment plan in the permit.

Site Decommissioning Documentation

(Sample Paragraph 1)
During surface reclamation and decommissioning all material and equipment was surveyed for radioactive contamination. Any material and/or equipment which was contaminated was released by utilizing one of the following methods: 1) transfer to another licensee; 2) decontamination and released for unrestricted reuse or recyling; 3) or disposal at a licensed byproduct disposal facility.

(Sample Paragraph 2)
All materials, equipment and facilities to be released for unrestricted use (e.g., reuse, recycle, or disposal) have been surveyed by ABC to demonstrate compliance with State regulations for control of radiation xx.xxx. The surveys consisted of scans, direct measurements and swipes for determination of removable activity. These surveys ~~has~~ have been taken and documented by ABC to meet these criteria as summarized below:

[(1) Removable surface contamination: 1000 dpm alpha per 1000 m^2
(2) Fixed surface contamination (average over 1 m^2): 5000 dpm alpha/beta per 100 cm^2
(3) Maximum fixed contamination: 15,000 dpm alpha/beta per 100 cm^2]

All soils have been surveyed to demonstrate compliance with the requirements of State regulation xx.xxx. These surveys have been completed and documented to meet these criteria:

[(1) 5 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over the first 15 cm depth of soil

Appendix D -- NRC Determination Letter (Conventional)

(2) 15 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over any subsequent 15 cm depth of soil.
(3) 30 pCi/gm of U-nat.]

(Sample Paragraph 3)
A closure plan was written that identified all areas potentially contaminated by licensed activities and accidents included:

(a). Radiological surveys (including measurement, sampling, and laboratory analysis)
to assess radiological contamination of all soil, equipment, and buildings.
(b). Criteria and procedures for decontamination of soil, equipment, and buildings.
(c). Criteria for release of soil, equipment and buildings for unrestricted use.
(d). Disposal of contaminated soil, equipment, and buildings.
(e). Decommissioning of storage/treatment ponds.
(f). Post-cleanup surveys.

Discussion of Results of Radiation Survey and Confirmatory Soil Samples

Surveys, conducted by ABC, to confirm the effectiveness of reclamation and decommissioning activities were performed by scans, direct and /or swipe surveys of equipment and structures to be turned over to the landowner. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from three 10 meter by 10 meter areas per acre. or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc]. ABC subsequently requested termination of its license.

In month, year, XDOH staff performed confirmatory surveys of the wellfield. The surveys were performed using [one-by-one sodium iodide probes and XXXX survey meters]. The survey was performed by [walking 10 meters apart moving across the well field pattern (reference) Or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.]

[Comment: the following two paragraphs provide far too detailed and site-specific information that is inappropriate for general guidance. Revise.] Background gamma count rate readings were approximately [x,xxx cpm or mR/hr] on all meters. As a result of the surveys, [twenty-nine] areas were identified as having readings greater than the action level. These areas were cleaned up by the licensee and resurveyed by XDOH personnel. All areas resurveyed had readings which were less than action level.

Appendix D -- NRC Determination Letter (Conventional)

Concurrently XDOH personnel collected soil samples form xx areas. Soil sample results were within the regulatory limits for radium-226 and natural uranium soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively], except for [two] soil samples which exceeded these limits.

In month, year, XDOH staff returned to the production area to resurvey and take soil samples after the licensee had cleaned the two areas that had exceeded release limits. Soil sample results were within the regulatory limits for radium-226 and natural soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively].

Discussion of results of State's site closure inspections.

On month date, XDOH staff performed a survey of ABC's XYZ site. The surveys were performed using [one-by-one sodium iodide probes and XXXX ~~survey~~ instruments]. The purpose of the survey was to allow ABC to release the X.X acres for unrestricted use. Two times background was used as an allowable limit (Regulatory Guide X.XX). The survey was performed by walking 10 meters apart moving across the wellfield pattern. Background readings ranged from XXXX - XXXX cpm.

[Comment: the following paragraph is far too detailed. Delete.]

Since no elevated readings were found in the production [except for the pile of visible pipescale], soil samples were not collected.

On-site disposal of solid radioactive material or byproduct material was not authorized at the XYZ site, thus there is no land to be transferred to the State or the Federal Government. As a result of these findings, XDOH is proposing to remove the XYZ site from the license.

Statement of Basis for Release [Partial license termination]

XDOH has determined that the release for unrestricted use and removal of [the subject site] will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date,. XDOH based its decision on the following: The site(s) being removed from the license [is/are] not contiguous with any other site associated with licensed activities that may lead to recontamination of the release site(s), and removal of the sites from their associated license will not in any way prevent or hinder the licensee's ability to complete decommissioning of the remainder of the licensed areas.

REFERENCES

Appendix D - Sample NRC determination letter for Conventional Uranium Milling License

[Comment: this letter reads very well].

Month Date, Year

, Director
State Agency Address

Dear

We have completed review of your Month Date, Year submittal, regarding the proposed termination of Radioactive Material License, xx-xxxx-x, issued to ABC. The license covered the ABC's XYZ Site, a conventional uranium mill facility located near XXX, State. You requested in your submittal that the U.S. Nuclear Regulatory Commission make a determination that all applicable standards and requirements pertaining to reclamation of the XYZ Site have been met.

The process that we used to make the determination is set out in the Office of State and Tribal Programs Procedure SA-900. Our determination is based on two supporting bases: review of a Completion Review Report (CRR) documenting the State Department of Health (XDOH) staff's bases for its conclusion that all requirements have been met; and review of State Agreement State uranium recovery program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP).

First, the information you have submitted in the CRR, dated Month Date, Year, documents that the XDOH has performed a complete review of the XYZ Site for compliance with regulatory and license requirements. XDOH's review covered all necessary technical areas and regulatory requirements relating to reclamation of the XYZ Site including geotechnical engineering, surface water hydrology and erosion protection, radiation cleanup and control, and groundwater protection. XDOH also conducted appropriate inspections of site reclamation activities at the XYZ Site. Based on the review findings documented in the CRR, XDOH concluded that the XYZ Site has met all regulatory and license requirements.

Second, the most recent IMPEP review of the State Agreement State Program, conducted in Month Year, concluded that the State program is adequate to protect

public health and safety, and compatible with NRC's regulatory program. This finding is consistent with previous State program evaluation findings.

Based on our review of the above information and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License, XX-XXXX-X.

A copy of our evaluation report, without associated attachments, entitled "Documentation of NRC Review on the Termination Findings of the ABC's Uranium Milling License Submitted by the State Department of Health" is enclosed.

If you have any questions, or we can be of further assistance, please contact me or STP Staff Name at (301) 415-XXXX.

Sincerely,

STP Director
Office of State and Tribal Programs

Enclosure:
As stated

Appendix D -- NRC Determination Letter (Conventional)

Documentation of NRC Review on the Termination Findings of the ABC's XYZ Uranium Milling License Submitted by the XXXX State Department of Health

Licensee: A... B... C... (ABC)
Licensee No.: XX-XXXX-X
Location:
Area: approximately XXX acres
Type of License: Conventional Uranium Milling License
Full / Partial License Termination: Full License Termination

A. Documentation of major events/activities related to the review of the XYZ Proposal

1. On month date, 2XXX, the NRC staff received a letter from the U.S. Department of Energy (DOE) regarding the Long-Term Surveillance Plan (LTSP) for the ABC's XYZ site. The DOE letter can be found in Attachment X.

2. On month date, 2XXX, NRC staff received the ABC's XYZ draft proposal from XDOH. A letter dated month date, 2XXX with a copy of the XDOH's draft Completion Review Report (CRR) can be found in Attachment X.

3. The review was conducted by an NRC staff team. A list of NRC staff technical reviewers can be found in Attachment X.

4. On month date, 2XXX, NRC staff discussed the review process and status of NRC's review of the XYZ's draft proposal at a meeting with DOE, XDOH and ABC representatives.

5. On month date, 2XXX, after completing review of the draft CRR, NRC staff provided comments to XDOH. The cover letter and attached comments can be found in Attachment X.

6. On month date, 2XXX, NRC staff met at the ABC's XYZ site with DOE, XDOH and ABC representatives to observe site conditions and to discuss LTSP issues. NRC's comments (See Attachment X) on XDOH's draft CRR were also discussed.

7. On month date, 2XXX, NRC staff received XDOH's response to the month date, 2XXX letter. The letter, dated month date, 2xxx and its attachment, ABC's response letter to NRC's comments, can be found in Attachment X.

Appendix D -- NRC Determination Letter (Conventional)

8. On month date, 2XXX, NRC and XDOH staff met to discuss the status of NRC's review, areas needing further information or clarification (See Table below), XDOH feedback and comments on the review process, future actions, and a proposed schedule for completion of the review.

Sample Table

No.	REVIEW AREA	POTENTIAL SIGNIFICANCE
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Staff needs further supporting information to complete our review of XDOH's basis for its conclusion that the subject site has been cleaned up to the standards.
2.	Identify applicable standards / requirements	Provide brief description of further supporting information needed to complete NRC's review of XDOH's basis for its conclusion.

9. On month date, 2XXX, NRC staff met with DOE, XDOH and ABC representatives to discuss the status of NRC's review, areas where further information or clarification were needed, and the schedule for completion of the review.

10. On month date, 2XXX, NRC staff received Revision #1 to the draft CRR from XDOH. XDOH indicated Revision #1 to the draft CRR provided responses to NRC's comments as documented in Attachment X. The month date, 2XXX letter and its attachment can be found in Attachment X.

11. On month date, 2XXX, after completing review of Revision #1 to the draft CRR, NRC staff communicated with XDOH staff through e-mail on areas where further information or clarification was needed. On month date, 2XXX, XDOH staff provided responses to NRC's comments through e-mail. These e-mails can be found in Attachment X.

12. On month date, 2XXX, NRC staff provided comments to DOE on a draft LTSP. The comments reflect consideration of information contained in the draft CRR and resulting from NRC staff review of the draft CRR. The letter notes that because the mill tailings will be saturated for an indefinite period of time, and a

large amount of water is impounded behind the dam, the tailings impoundment system is formally classified as a dam. To meet Federal obligations under the requirements of the National Dam Safety Program Act, the dam must be inspected at regular intervals. The letter concludes that additional inspection items that must be included in the LTSP to meet applicable requirements. The comment letter and its attachment can be found in Attachment X.

13. On month date, 2XXX , NRC staff received the final CRR, from XDOH. Following review, NRC staff concluded that the final CRR addressed all NRC's comments and provided XDOH staff's bases for its conclusion that the ABC's XYZ Site has met all regulatory and license requirements. The letter and its attachment can be found in Attachment X.

14. The five issues identified during the month date, 2XXX meeting were closed based on additional information documented in the final CRR (Items X-X) or based on information provided in the month date, 2XXX letter from NRC to DOE (Item X). This is summarized in the Table below.

Sample Table

No.	REVIEW AREA	COMMENTS
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Additional information is documented in the Radiation Cleanup and Control portion of the final CRR.
2.	Identify applicable standards / requirements	Additional information is documented in the XXXX portion of the final CRR.

B. Documentation of review comments on items specified in the STP procedure SA-900 "Termination of Uranium Mill Licenses in Agreement States."

1. A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

   Comment: This information is provided in section X of the final CRR. The submitted information was found to be complete.

2. Documentation that the completed surface remedial actions were performed in

accordance with license requirements and regulations.

Comment: This information is provided in section X of the final CRR. XDOH staff reviewed geotechnical stability, surface water hydrology and erosion protection, and radon emanation aspects of the reclamation of ABC's XYZ site. Based on its evaluation, it was concluded that reclamation of the site has met all applicable standards and conformed with design specifications. The submitted information was found to be acceptable.

Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation surveys and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.

Comment: This information is provided in section X of the final CRR. It is stated that ABC's initial measurement indicated that XX% of all gamma and soil sample grids were below the radium regulatory limit. Following the initial surveys, all gamma grids and soil grids that were in excess of limits were excavated until results indicated concentrations below the applicable limit. XDOH data confirm that ABC's sampling process was valid. It was concluded by XDOH that residual radioactive material in all the areas potentially impacted by the mill operation were cleaned up to the State standards. The submitted information was found to be acceptable.

Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

Comment: This information is provided in section X of the final CRR. XDOH's review of all groundwater quality data has determined that the concentrations of hazardous constituents in the tailings impoundment (uranium, Ra-226, Ra-228, Th-230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory limits. It was concluded by XDOH that the closure of ABC's XYZ site is in compliance with XXXX State groundwater regulations associated with uranium mill closure. The submitted information was found to be acceptable.

Discussion of results of State's site closure inspection(s).

Appendix D -- NRC Determination Letter (Conventional)

Comment: This information is provided in section X of the final CRR. It is stated that XDOH staff has performed appropriate site reclamation inspections over the years as site remediation moved from one phase to the next. XDOH employed inspection staff or provided specialized consultants to review and verify all important aspects of site closure. It was concluded that results of XDOH staff site inspections have provided a presence to ensure that site reclamation activities were performed as required by regulation and license conditions. The submitted information was found to be acceptable.

Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

Comment: Not applicable. This is a full license termination.

IMPEP review of the XDOH uranium recovery regulatory program

Comment: Based on 2XXX IMPEP review, the XDOH uranium recovery program was found to be satisfactory based on the IMPEP evaluation criteria. (A satisfactory rating is the highest rating possible for each IMPEP common and non-common performance indicator.) The overall XXXX (State name) Agreement State program was found to be adequate to protect public health and safety and compatible with NRC's program. The IMPEP team had one recommendation in the Uranium Recovery area that the State develop additional specialized inspection procedures.

Based on review of the above information, as specified in the STP SA-900 Procedure, and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, the staff determines that all applicable standards and requirements have been met for the termination of the Radioactive Material License, XX-XXXXX-X.

Project Manager: _____ Date: _____
Full Name, Title
Office of State and Tribal Programs

Appendix D -- NRC Determination Letter (Conventional)

Office Director: _____ Date: _____
Full Name, Director
Office of State and Tribal Programs

Appendix E - Sample NRC determination letter for Non-conventional Uranium Milling License

State Agency
Address
Austin, Texas 78756-3189

Dear XXXX

We have completed our review of your month date, year submittal regarding the proposed termination of the Radioactive Material License No. XXXX issued to ABC, an in-situ leach uranium recovery facility located near City, State.

Closure of an in-situ leach uranium recovery site requires a demonstration that the groundwater has been adequately restored, all the wells have been closed and plugged according to the appropriate State statute, disposal or transfer of radioactive material is documented, and radiation surveys and confirmatory soil samples indicate that the site meets unrestricted release requirements.

The information you have submitted indicates that the groundwater has been restored by the licensee to the satisfaction of the State Agency. All the wells have been plugged and abandoned by the licensee as authorized by the State Agency. Based on the XDOH of the license termination, you reported that proper disposition of radioactive materials took place at the site and there has been no on-site disposal of radioactive materials; therefore, there is no need to transfer ownership of land to the State or the Federal Government.

XDOH has reviewed the results of radiation surveys submitted by the licensee and performed confirmatory surveys for the subject site. Post-cleanup surveys conducted by XDOH indicate that the site has been decontaminated to a radiation level that meets the State criteria. According to the XDOH report, the analysis of soil samples indicates that average radium-226, Thorium-230, and uranium concentrations were below the release criteria of [insert derived criterion 6(6) values]. The statements made in the submittals indicate that the XDOH has adequately determined that all license obligations have been met by the licensee.

The most recent review of the State Name Agreement State Program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP) in month year, indicates that the State program is adequate to protect public health

and safety, and compatible with NRC's program. This finding is consistent with the previous State program evaluations. Based on our review of the above information and in accordance with 10 CFR 150.15a(a), we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License No. XXXX.

If we can be of further assistance in this regard, please contact me or [name] at (301) 415-2598.

Sincerely,

Name , Director
Office of State Programs

From: Michael Lesar
To: Doris Mendiola
Date: 9/24/01 3:14PM
Subject: Fwd: Comments on Draft Revision of Procedure SA-900

RECEIVED
2001 SEP 25 PM 12:13
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NRC/RO