Corrected to notation vote 7/16/92

POLICY ISSUE

July 7, 1992 (NEGATIVE CONSENT) SECY-92-238

For: The Commissioners

From: James M. Taylor
Executive Director
for Operations

Subject: FINAL TECHNICAL POSITION ON ALTERNATE CONCENTRATION LIMITS FOR TITLE II URANIUM MILLS

Purpose: To inform the Commission of the Nuclear Regulatory Commission staff's intent to announce, in the Federal Register (FR), the availability of the "Staff Technical Position on Alternate Concentration Limits for Title II Uranium Mills" (Enclosure 1).

Background: Alternate Concentration Limits (ACLs) represent alternative limits to two other concentration limits specified in the standards promulgated by the U.S. Environmental Protection Agency (EPA) and subsequently incorporated into NRC regulations for hazardous constituents entering ground water at uranium mill tailings sites, namely, background ground-water quality (background limits) and drinking water limits (Table 5C, Appendix A to 10 CFR Part 40).

The standards for environmental protection at uranium and thorium mills were promulgated by EPA pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). The standards were issued separately for the UMTRCA-designated Title I sites (inactive or abandoned mills) and Title II sites (licensed commercial processing mills).

NOTE: TO BE MADE PUBLICLY AVAILABLE WHEN THE FINAL SRM IS MADE AVAILABLE

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Standards for Title I sites were first published in the Federal Register on January 5, 1983, as Subparts A, B, and C of 40 CFR Part 192 (48 FR 602). The EPA standards for Title I sites were challenged by several industry and environmental groups, who filed challenges to the standards with the Tenth Circuit Appeals Court. On September 3, 1985, the Court dismissed all challenges except those pertaining to the ground-water standards, which were remanded to the EPA. The EPA re-issued proposed standards for Title I sites on September 24, 1987 (52 FR 36000). NRC staff raised several issues concerning the proposed standards and communicated these concerns to the EPA. All but one of the issues raised by NRC staff have subsequently been resolved. The remaining issue is EPA's required concurrence in any ACL which results in the primary standard being exceeded outside the site boundary or at any point greater than 500 meters from the Point-of-Compliance at Title I sites. The promulgation of the EPA's proposed standards for Title I sites is pending the resolution of this issue by the Office of Management and Budget.

Standards for Title II sites were published on October 7, 1983, as Subparts D and E to Part 192 (48 FR 45946). These standards include provisions that allow establishing ACLs on a site-specific basis. The EPA standards for Title II sites were subsequently incorporated into NRC's regulations (Appendix A to Part 40) dated November 13, 1987 (52 FR 43562).

Subsequent to the promulgation of the EPA standards, in 1983, the NRC and EPA staffs held several meetings over a period of about 3 years (September 1984 - April 1987), to develop a mutually-acceptable methodology for establishing ACLs. EPA and NRC have since issued separate ACL guidance. EPA announced the availability of its "Alternate Concentration Limit Guidance, Part 1, Policy and Information Requirements" in July 1987 (52 FR 27579). NRC announced the availability of its draft "Technical Position on Alternate Concentration Limits for Uranium Mills" in June 1988 (53 FR 24820).

The draft technical position was submitted to the Commission in SECY-88-153, dated May 27, 1988, and was approved by negative consent (i.e., no objection), in a memorandum from the Secretary to the Executive Director of Operations, dated June 20, 1988.

Concerned organizations, both in the government and in the private sector, were very interested in NRC's draft technical

position on ACLs. NRC received comments and suggestions from staff members in two EPA offices and from eight other concerned parties, including organizations in the Federal and State governments, affected Indian Tribes, private companies, and the public.

The NRC staff reviewed the comments received on the draft technical position. The comments were subsequently analyzed and grouped, by subject, based on the issues presented by the commenters, and used to revise the draft document and to prepare the proposed final version of the technical position. A summary of the comments received and NRC staff response are provided in Enclosure 2.

In reviewing the comments on the draft technical position, NRC staff identified 16 subject categories of issues raised by commenters. The subjects most commonly addressed by commenters, and that resulted in most revisions to the technical position, were:

(1) hazard and risk-assessment methodology;
(2) basis for ground-water classification and use assessment;
(3) NRC's review and decision-making procedures;
(4) the location of the point of exposure;
(5) identifying and selection of corrective action;
(6) the rationale of applying a generic guidance to site-specific situations; and
(7) the readability and clarity of the technical position.

Discussion: The proposed final technical position represents a revised and updated version of NRC's draft technical position on ACLs. It provides guidance for preparing and reviewing ACL applications for uranium and thorium mill tailings sites regulated under Title II of UMTRCA. Specifically, the technical position describes: (1) NRC requirements for instituting ACLs; (2) standard format and content of ACL applications; and (3) ACL application review criteria and review procedures.

NRC staff considers this technical position to be based on, and generally consistent with EPA's "Alternate Concentration Limit Guidance, Part 1: ACL Policy and Information Requirements," which EPA published in July 1987 for establishing ACLs at hazardous waste management sites under RCRA.

The technical position is needed for proper interpretation of, and compliance with, the applicable ACL standards and regulations, and to ensure that consistent criteria and procedures are followed in preparing and reviewing ACL applications. The release and implementation of the proposed technical position would offer timely guidance to licensees and ACL applicants, as well as to the reviewers of ACL applications from NRC.

NRC's Uranium Recovery Field Office (URFO) has already received three ACL applications and expects more. URFO will not act on ACL applications until the technical position has been issued.

Copies of the proposed final technical position and supporting documentation were transmitted to the Advisory Committee on Nuclear Waste (ACNW), for review. NRC staff briefed the ACNW on April 23, 1992; the ACNW response to the technical position generally was positive. ACNW comments during the briefing have been incorporated in the final version of the technical position. The ACNW specifically mentioned cases where tailings were returned to mined areas, at some uranium mills, and recommended that the staff prepare a corresponding document to address potential application of ACLs for cases "which require considerations different from those in the technical position." However, since there are only two known cases where tailings were returned to mined areas, the staff does not plan to prepare a separate generic ACL guidance for such cases, at this time.

All documents identified in this paper that have not been enclosed are available from the Office of the Executive Director for Operations.

Recommendation: Unless advised to the contrary, by the Commission, within 10 working days from the date of this paper, the staff plans to announce, in the Federal Register, the availability of the proposed final technical position on ACLs for Title II uranium mills (Enclosure 3).

Coordination: The Office of the General Counsel has reviewed this Commission Paper and the proposed final technical position and has no legal objection to the release or implementation of the technical position.

James M. Taylor
Executive Director
for Operations

Enclosures:
1. NRC staff proposed final "Staff Technical Position on Alternate Concentration Limits for Title II Uranium Mills"
2. NRC staff's response to comments received on the draft technical position
3. Federal Register notice of proposed final technical position on ACLs

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Wednesday, July 22, 1992, that the Commission, by negative consent, assents to the action proposed in this paper.

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STAFF TECHNICAL POSITION

ALTERNATE CONCENTRATION LIMITS FOR TITLE II URANIUM MILLS

STANDARD FORMAT AND CONTENT GUIDE, AND STANDARD REVIEW PLAN FOR ALTERNATE CONCENTRATION LIMIT APPLICATIONS

APRIL, 1992

U.S. NUCLEAR REGULATORY COMMISSION

STAFF TECHNICAL POSITION
ALTERNATE CONCENTRATION LIMITS FOR TITLE II URANIUM MILLS

STANDARD FORMAT AND CONTENT GUIDE, AND STANDARD REVIEW PLAN
FOR ALTERNATE CONCENTRATION LIMIT APPLICATIONS

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1. REGULATORY POSITION

1.1 Introduction

Pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), the U.S. Environmental Protection Agency (EPA) promulgated Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites (40 CFR Part 192, Subparts D, and E) on October 7, 1983 [48 FR 45946]. These standards incorporated ground-water protection regulations previously developed by EPA under authority of the Solid Waste Disposal Act. The incorporated regulations include provisions for establishing alternate concentration limits (ACLs) as a part of site-specific ground-water protection programs. These provisions have been subsequently incorporated into the U. S. Nuclear Regulatory Commission's regulations governing the disposal of uranium mill tailings (10 CFR Part 40, Appendix A) on November 13, 1987 [52 FR 43562].

The ground-water protection programs consist of four elements: (1) a list of hazardous constituents; (2) ground-water concentration limits for these constituents; (3) a location where compliance with the concentration limits is verified; and (4) a time period during which compliance is required. Concentration limits may be established as concentrations representative of background ground-water quality (background limits), drinking water limits (10 CFR 40, Appendix A, Table 5C), or ACLs. Under 10 CFR 40, Appendix A, Criterion 5B(6), NRC may approve ACLs for contaminants in ground water provided that the concentration limits are as low as is reasonably achievable considering practicable corrective actions, and that the contaminants will not pose a substantial present or potential hazard to human health or the environment, as long as the ACLs are not exceeded at the compliance point.

The NRC published a notice in the Federal Register on June 30, 1988 (53 FR 24820) requesting comments on the draft Technical Position. The NRC received many comments on the draft Technical Position from Federal agencies, State governments, affected Indian tribes, as well as the public. These comments were reviewed and taken into consideration during the final preparation of this Technical Position.

This Technical Position provides the methodology for the licensee to prepare and the NRC staff to review ACL applications. This Technical Position has been tailored for general characteristics of uranium mill tailings sites. It applies only to review of ACL applications for uranium and thorium mill tailings sites regulated under Title II of UMTRCA. It does not apply to similar reviews at sites regulated by EPA or States under Resource

Conservation and Recovery Act (RCRA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This Technical Position is based on, and is generally consistent with, EPA's "Alternate Concentration Limit Guidance, Part 1: ACL Policy and Information Requirements," which EPA published in July 1987 for establishing ACLs at hazardous waste management sites under RCRA. This Technical Position provides a uniform basis for consideration of the 19 criteria listed in 40 CFR Part 264.94(b) as referenced in 40 CFR Part 192.32(a)(2)(iv) and incorporated into NRC's regulations in Criterion 5B(6) of Appendix A to 10 CFR Part 40.

1.2 Purpose of Guidance

The purpose of this Technical Position is to provide: (1) guidance for the NRC staff's interpretation of the requirements for establishing ACLs according to Criterion 5B(6), Appendix A, 10 CFR Part 40; (2) a standard format and content for ACL license applications; and (3) consistent NRC staff review procedures for ACL applications. The Technical Position describes the composition of an ACL application that the NRC staff would find generally acceptable. The guidance provided in this Technical Position will help to ensure the high quality and uniformity of ACL application reviews conducted by the NRC and Agreement States. This document is intended for use by licensees, NRC staff, and possible use by Agreement States for assessing and establishing ACLs at Title II uranium mills.

1.3 Document Organization

This document is organized in three parts to provide the necessary guidance for both the ACL applicant and the NRC reviewer. Section 1 provides the background and regulatory basis for the NRC Technical Position on ACLs for Title II uranium mill sites.

Section 2 presents the format and content expected for an ACL application. The information presented in this section is of a general nature to allow a degree of flexibility when making an application. It is recognized that each application will be developed from site-specific data and that there will likely be a noticeable variability among applications with regard to the types of data needed to make the ACL demonstration.

Section 3 describes the general ACL application review process and presents guidelines for the reviewer to follow during the detailed application review. This section is designed to encompass all of the factors that might be

included in an ACL application, and provide a consistent framework for the NRC review process. This section can also be used by Agreement States for conducting ACL application reviews.

1.4 ACL Implementation

ACLs may be established as part of the site-specific ground-water protection standards, as described above in Section 1.1. In accordance with NRC requirements in Appendix A of 10 CFR Part 40, licensees implement detection monitoring programs to detect releases of hazardous constituents from tailings impoundments. These programs progress into compliance monitoring if it is indicated that constituent concentrations exceed established standards. Compliance monitoring programs contain concentration limits for hazardous constituents, a point of compliance (POC) in the uppermost aquifer and a period of compliance. The concentration limits are either background values, drinking water limits, or ACLs. ACLs may be established, provided that it is demonstrated that: (1) the constituents will not pose a substantial present or potential hazard to human health or the environment, as long as the ACLs are not exceeded; and (2) the ACLs are as low as reasonably achievable considering practicable corrective actions.

ACLs may not be proposed to delay the implementation of corrective action programs. However, revised ACLs may be proposed if new information indicates that the ACLs should be modified. In all cases, ACL applications must demonstrate that hazardous constituent concentrations will not pose substantial present or potential hazards to humans or the environment at the points of exposure (POE), and the ACLs are as low as reasonably achievable considering practicable corrective actions.

The POC and POE are two locations that must be considered in the review of ACL applications. The POC is defined in Appendix A to 10 CFR Part 40 as the site-specific location in the uppermost aquifer where the ground-water protection standard must be met. In contrast, POEs are defined as the locations where humans, wildlife, or other environmental species could reasonably be exposed to hazardous constituents from the ground water. For example, the POE may be represented by one or more domestic wells that could be constructed and could result in withdrawal of contaminated ground water, or the locations where aquatic biota may be exposed to hazardous constituents as a result of contaminated ground-water discharge to a river. Thus, ground-water quality at the POEs must be maintained at levels that are protective of potential receptors.

In practice, the POC will be located within a vertical surface representing the intersection of the downgradient edge of the reclaimed tailings impoundments with the uppermost aquifer. POEs, in most situations, will be located at the downgradient edge of the land that will be transferred to either the United States or a State for long-term institutional control after the license termination. There may be some instances where the property boundary is a significant distance from the uranium mill and tailings impoundments. A POE could be established at the *distant*[1] site boundary and justified, on the basis that land ownership by the licensee or the long-term care custodian would ensure that no public water resource use would exist on the property. (It should be noted that in some instances, a distant POE may be established without invoking land ownership issues; for example, when the possibility of human exposure is effectively impossible because the ground water is Class III).

The applicant should investigate the consequences of the land transfer provisions of UMTRCA and their effect on the POE with the appropriate government agency, before proposing an ACL based on a distant POE. Under Title II of UMTRCA, at the time the NRC or an Agreement State terminates a license, the title to the land which is used for the disposal of any byproduct materials (tailings); as defined by section 11.e(2) of the Atomic Energy Act of 1954, as amended (AEA); shall be transferred to the United States or to the State in which such land is located, at the option of such State. (In some rare cases, the surface land ownership transfer requirements may be waived for Title II disposal sites, such as with deep burial of tailings where ongoing site surveillance would not be required.) Section 83.b of the AEA specifically requires that only the land used for disposal of any section 11e.(2) byproduct materials be transferred to the Federal government or State for long-term institutional control.

The applicant should provide written assurance in the ACL application that the appropriate Federal or State agency will accept the transfer of the specific property (legal deed description), which includes land in excess of that used for the disposal of any section 11e.(2) byproduct materials, if the ACL is based on a distant POE. In instances where the licensee chooses to keep the mill property under specific NRC license and apply for an ACL as part of a

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[1] Distant refers to any POE that is spatially beyond the area that the appropriate Federal or State agency is required to accept for perpetual care under the land transfer provisions of UMTRCA.

compliance monitoring program, the applicant should still provide written assurance in the ACL application that the proper government agency will accept the transfer of the specific property, including land in excess of that used for disposal of byproduct material after the termination of the specific license.

Furthermore, it should be noted that the licensee must provide financial assurances within the specific license for the restoration of ground water, with the surety scaled to the anticipated cost and time frame for achieving compliance before the land is transferred for long-term care. Additionally, unreasonably long time periods in order to achieve compliance through natural attenuation and flushing are not acceptable for license continuation.

The spatial relationship between the POC and POE is critical to the establishment of ACLs. Natural processes such as dilution, dispersion, decay, and sorption may attenuate hazardous constituents between the POC and POE. Thus, ACLs for hazardous constituents established at the POC may be greater than appropriate health and environmental concentration limits for those constituents at the POE and still be protective of human health and the environment. However, the assumption of a low-concentration projection at the POE may not be valid in cases where the majority of a contaminant plume for a particular constituent may have already passed the POC. The likelihood of this situation should be identified and addressed by the ACL applicant.

Ultimately, ACLs must be protective of human health and the environment at the POE. If there is a case where there is no practicable corrective action involving ACLs which is protective of human health and the environment, then the ACL framework is not appropriate for a licensing action. Instances such as this would have to be addressed by the Commission on a case-by-case basis.

2. APPLICATION CONTENT AND FORMAT

2.1 Application Content

Table 1 provides an outline of a generic ACL application. The application should contain sufficient information to demonstrate that hazardous constituent concentrations will not pose a substantial present or potential hazard to human health or the environment as long as the ACLs are not exceeded, and that the ACLs are as low as reasonably achievable considering practicable corrective actions. The demonstration should assess the hazards associated with present and potential exposure to hazardous constituents, and evaluate the reasonableness of the concentration limits, considering corrective actions. The demonstration must consider the 19 factors listed in Table 2 (Criterion 5B(6), Appendix A, 10 CFR 40). Hazard assessments should evaluate the: (1) existing distribution of hazardous constituents as well as the potential source(s) for future releases of these constituents; (2) transport of hazardous constituents in ground water and hydraulically-connected surface water; and (3) risks associated with exposure of humans and the environment to hazardous constituents. Corrective action assessments should (1) identify practicable corrective actions; (2) assess their technical feasibility; (3) determine the costs and benefits; and (4) select a practicable corrective action to achieve hazardous constituent concentrations that are as low as reasonably achievable.

ACL applications should be sufficiently detailed to allow the NRC reviewer to independently verify that the ACLs will not pose a significant hazard (present or future) to human health or the environment, and that they are as low as reasonably achievable considering practicable corrective actions. Much of the ACL application material may already be available in licensing documents. Commonly, hydrogeologic information is available in environmental reports, license applications, or detection monitoring submittals. This information can be readily incorporated into the ACL application. ACL application information may also include contaminant transport assessments and effects of human and environmental exposure to hazardous constituents.

Site characteristics, milling processes, disposal operations, and ore composition should be discussed in the ACL applications. Information related to each of the 19 factors listed in Criterion 5B(6), Appendix A, 10 CFR 40 (Table 2) should be addressed, but all factors may not be applicable due to the site-specific nature of an ACL application. If this is the case, the ACL application should provide an explanation of why a particular factor is not

appropriate. Commonly, ground-water discharge to surface waters does not occur near mill tailings sites. Therefore, information such as stream flow characteristics and transport assessments within the surface water may not be necessary. However, the burden of proof resides with the applicant to demonstrate that selected factors do not need to be considered.

2.2 Application Format

A standard format for ACL applications is proposed for the following reasons: (1) helps to assure that applications contain the information required by Criterion 5B(6), Appendix A, 10 CFR 40; (2) assists the applicant and the NRC reviewer in assuring the completeness of the provided information; (3) guides both the reviewer and application reader to pertinent and critical information; and (4) contributes to the time efficiency of the review process. Conformance with this standard format is not required. The NRC staff will accept applications with different formats, if the application adequately demonstrates the suitability of the proposed ACLs. However, reviewing an ACL application with a different format may require considerably more time to achieve the same level of detail than would have been accomplished if the application were submitted in the standard format. But, the NRC staff recognizes that the format and content of individual applications may vary somewhat, due to the site-specific differences of compliance demonstrations which may make stringent observance of this format impractical.

The applicant should present the information contained in the ACL application as clearly as possible. The technical information provided should support the applicant's demonstration that the ACLs meet the requirements in Criterion 5B(6) of Appendix A to 10 CFR Part 40. Applicants should follow the numbering system and headings of the standard format. Applicants are encouraged to use appendices to provide supporting data not specifically included in a particular section. Conventional abbreviations should be used consistently throughout the application. Any abbreviations, symbols, or special terms should be defined where they first appear in the text. Where appropriate, calculated error bands or estimated uncertainties should be included along with numerical values. Some types of information are better presented in a clear and concise graphical manner by using maps, graphs, drawings, or tables in addition to text descriptions. Applicants should ensure that graphical materials are legible and that the physical scales are adequate to clearly show details and notations. Symbols should be clearly defined and referenced.

An outline for a generic ACL application is shown in Table 1. It provides

supporting information on the site and its setting, a hazard assessment, a review of practicable corrective actions, and the proposed concentration limits. The goal of standardizing the application format is to reduce review time and organize the applications.

It is strongly suggested that applications be structured to allow ready substitution of pages in response to reviewer's comments and information requests. Pages should be punched for a standard loose-leaf binder. Revisions should be provided on pages that will replace the original pages, with the changes indicated by a "line change" demarkation. The date and revision number should be indicated in the bottom outside margin of each change page, and each package of revisions submitted should include a listing of all page changes in that submittal.

Essential to all applications is a map showing the tailings disposal area, the location of the reclaimed outslopes, the POC, the POE, other monitoring wells, and the boundary of the land to be utilized for long-term control. This map should become the base map for isoconcentration maps depicting the current and estimated future distributions of hazardous constituents.

Table 1
Standard Format of an ACL Application

EXECUTIVE SUMMARY

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   1.2 Facility Description
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2. Hazard Assessment

   2.1 Source and Contamination Characterization
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3. Corrective Action Assessment

   3.1 Results of Corrective Action Program
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   3.3 Corrective Action Costs
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4. Proposed Alternate Concentration Limits

   4.1 Proposed Alternate Concentration Limits
   4.2 Proposed Implementation Measures

5. References

6. Appendices and Supporting Information

3. APPLICATION REVIEW PROCEDURES

3.1 Areas of Review

A systematic approach to reviewing ACL applications has been developed, based on regulatory requirements in Criterion 5B(6) of Appendix A to 10 CFR Part 40, and Subparts D and E of 40 CFR 192. This approach considers two major review elements and eight sub-components as shown below. The two major elements and the applicable components include:

1. Hazard Assessment Review

   The NRC staff reviews the licensee's assessment of the (1) distribution and extent of hazardous constituents, as well as the potential for future releases of constituents; (2) transport of hazardous constituents in ground water and hydraulically-connected surface water; and (3) risks associated with exposure of humans and the environment to hazardous constituents.

2. Corrective Action Review

   The NRC staff reviews the licensee's corrective action assessment relative to (1) identification of alternatives; (2) technical feasibility; (3) estimated costs; (4) estimated benefits; and (5) selection of practicable corrective actions for controlling, reducing, mitigating, or eliminating ground-water contamination.

The information required to perform an acceptable hazard assessment and corrective action review will contain all relevant site-specific data to determine what level of corrective action, if any, may be needed at the site. The proposed ACLs are evaluated, based upon the measured or predicted hazardous constituent concentrations, as are the selected measures that will ensure compliance with the proposed ACLs.

3.2 Acceptance Criteria

3.2.1 Acceptance Review

An ACL application is initially reviewed to determine whether the application provides sufficient information content to allow a Detailed Review, relative to the requirements in Criterion 5B(6), Appendix A, 10 CFR Part 40. Deficiencies that are identified during the Acceptance Review will be compiled in a list that will itemize the incomplete information. Submittal of additional information from the applicant may be necessary before the Detailed Review can begin. In some cases where the deficiencies are few, the review can proceed while the additional information is pending. Acceptance of the application does not preclude later requests for additional information by the NRC staff through the course of the detailed review.

A tentative schedule for the completion of the Detailed Review may also be established at this time. The schedule is not binding nor mandatory, but will represent the anticipated time-frame of the pending Detailed Review. It is expected that the tentative review schedules will be unique to each application and be heavily dependant on the amount and quality of the supporting information submitted by the applicant. The schedule should be developed with consideration of the current and projected regulatory workload, amount and quality of submitted information, receipt of any additional information from the applicant, and any other anticipated information exchanges between the NRC staff and the applicant.

An ACL application can be rejected if (1) the application is made for the purpose of delaying corrective action when significant human health or environmental hazard(s) exists, or (2) the application is found to lack sufficient content to permit a detailed review and evaluation of the ACL demonstration. The specific findings of the Acceptance Review and the basis for the application rejection will be described and transmitted to the applicant in writing for any ACL application not accepted for a Detailed Review.

3.2.2 Regulatory Basis and General Criteria

EPA issued standards relative to uranium and thorium mill tailings in 40 CFR Part 192. The EPA standards in 40 CFR Part 192.32(a)(2)(iv), as well as Criterion 5B(6) of Appendix A to 10 CFR Part 40, provide for the establishment of site-specific ACLs. These regulatory criteria assume that background concentrations of hazardous constituents pose no incremental risks and the drinking water limits provide acceptable hazards. It is further

recognized that these two options may not be practicable or achievable at a specific site. Due to this, alternate concentration limits that present no significant hazard may be proposed provided that it is demonstrated that the limits are as low as reasonably achievable, considering practicable corrective actions. In reviewing this demonstration, the NRC staff will establish alternate concentration limits for hazardous constituents if the proposed limits are as low as reasonably achievable considering practicable corrective actions; and that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In making the present and potential hazard finding, the 19 factors listed in Table 2 will be considered.

ACL demonstrations utilize monitoring data and physical characteristics of the site as well as the proposed reclamation plan criteria to demonstrate that hazardous constituents in the ground water will meet the criteria discussed above. In the absence of this type of information, modeling based upon an adequate amount of monitoring data and site characterization work, is an acceptable alternative. The application should provide or reference sufficient information to allow the NRC staff to verify the demonstration used to support the proposed ACLs.

Table 2
Factors for Consideration in Establishing
Alternate Concentration Limits
[10 CFR 40, Appendix A, Criterion 5B(6)]

A. Potential Adverse Effects on Ground-Water Quality

1. Physical and chemical characteristics of the waste in the licensed site, including its potential for migration.

2. Hydrogeological characteristics of the facility and surrounding land.

3. Quantity of ground water and the direction and rate of ground-water flow.

4. Proximity and withdrawal rates of ground-water users.

5. Current and potential future uses of ground water in the area.

6. Existing quality of ground water, including other sources of contamination and their cumulative impact on ground-water quality.

7. Potential for health risks caused by human exposure to waste constituents.

8. Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.

9. Persistence and permanence of potential adverse effects.

B. Potential Adverse Effects on Hydraulically-Connected Surface-Water Quality

1. Volume and physical and chemical characteristics of waste in the licensed site.

2. Hydrogeological characteristics of the facility and surrounding land.

3. Quantity and quality of ground water, and the direction and rate of ground-water flow.

4. Patterns of rainfall in the region.

5. Proximity of the licensed site to surface waters.

Table 2 (concluded)

6. Current and future uses of surface waters in the area and any water quality standards established for those surface waters.

7. Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality.

8. Potential for health risks caused by human exposure to waste constituents.

9. Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.

10. Persistence and permanence of potential adverse effects.

3.2.3 Specific Criteria

3.2.3.1 Review Element 1: Hazard Assessment Review

The hazard assessment review includes (1) characterization of the source(s) and extent of ground-water contamination; (2) assessment of hazardous constituent transport in ground water and hydraulically-connected surface water; and (3) assessment of risks associated with exposure of humans and the environment to hazardous constituents.

3.2.3.1.1 Source and Contamination Characterization

Characterization of the contaminant source(s) and their extent provides the source term for contaminant transport assessments. The source characterization should provide reliable estimates of the release rates of hazardous constituents as well as constituent distributions.

In addition to the contaminant source, facility characterization is also necessary and should consist of: (1) the uranium recovery process(es) used at the facility; (2) types and quantities of the reagents used in milling; (3) ore compositions milled at the facility; and (4) historical and current waste management practices. This information should be considered in conjunction with the physical and chemical composition of the waste for estimating the source term of contaminant transport (e.g., location of waste discharges, retaining structures for wastes, and waste constituents). Information from these four elements should be presented in the demonstration that the ACLs will not pose a significant (present or future) hazard to human health or the environment as long as the ACLs are not exceeded.

The waste characterization includes those characteristics that significantly affect the release or transport of the hazardous constituents. Waste characterization should include the identification of hazardous constituents in the waste and in the leachate generated by the waste, including any degradation products of the constituents. Depending upon the hazardous constituents present, additional waste-characterization information may be necessary, such as: (1) the hazardous constituent characteristics of density, solubility, valence state, vapor pressure, viscosity, and octanol-water partitioning coefficient; (2) presence and effect of complexing ligands and chelating agents, to the extent that constituent mobility may be enhanced; (3) potential for constituents to degrade due to biological, chemical, and physical processes; and (4) attenuation properties of constituents and the

affected hydrogeologic media, considering such processes as ion exchange, adsorption, absorption, precipitation, dissolution, and ultrafiltration.

At sites which have highly developed plumes, the spacial distribution of the various hazardous constituents must be defined. This information is needed to calibrate contaminant transport models and to evaluate whether humans and environmental populations are currently being exposed to elevated concentrations of hazardous constituents. Characterization of the contamination extent should include (1) the distribution of hazardous constituents in the ground water; (2) the distribution of hazardous constituents in contaminated materials other than the uranium tailings; (3) the detection monitoring program, water quality data for radionuclides, trace metals, as well as ions; and (4) documentation of sampling, analysis, and quality control / quality assurance programs.

3.2.3.1.2 Transport Assessment

The transport assessment is used to estimate the projected distribution and exposure potential of hazardous constituents. The transport assessment generally includes the following (1) hydrogeologic characteristics; (2) ground-water flow direction and quantity; (3) background water quality; and (4) estimated transport rates, geochemical attenuation, and concentrations of hazardous constituents in the ground water and hydraulically-connected surface water.

The hydrogeologic characterization must describe the ground-water environment in sufficient detail to define the hazardous constituent transport mechanisms. The scope of the hydrogeologic characterization should be equivalent to the anticipated proportions of the potential hazards associated with ground-water contamination, along with the relative distance to the affected human and environmental populations at risk. Applicants may develop estimates that conservatively bound the magnitude of the processes affecting hazardous constituent transport for some aspects of the transport assessment.

Characterizations of site hydrogeology generally include (1) identification of hydrogeologic units that have been or may be affected by transport of hazardous constituents; (2) characteristics of the hydrogeologic units (both aquifers and aquitards) such as geometry, stratigraphy, structural inconsistencies, lithology/mineralogy, hydraulic conductivity, effective porosity, potentiometric data, recharge/discharge locations and rates, and dispersivity; (3) representative conceptual models of the ground-water flow

system; (4) surface water characteristics used in assessing the surface water transport of hazardous constituents; (5) climatic characteristics such as distributions and amounts of precipitation, evapotranspiration rate, estimated infiltration rates into contaminated materials, and the effects of variable recharge on ground water and surface water flow characteristics; (6) representative lateral and vertical ground-water flow rates and directions, including information such as estimated discharge and recharge rates, temporal variations in flow rates and directions; and (7) descriptions of the monitoring practices, procedures, and quality assurance / data validation programs used to characterize site hydrogeology.

Where possible, the hydrogeologic characterization should be based upon actual aquifer monitoring data and hydraulic measurements. This information will be utilized to assess the constituent concentrations that will likely exist in the future. Critical monitoring locations include the points of compliance and points of exposure.

Background water quality is defined as the quality of water that would be expected if milling contamination had not occurred at the facility. Background ground-water quality characterization should include (1) a map showing the locations of background monitoring sites; (2) a description of the monitoring wells, springs, surface-water samplers, suction lysimeters, and other devices; (3) descriptions of the distribution of wastes at the site; (4) information on historical changes in hydraulic heads, flow directions, flow rates, and ground-water quality; (5) analytical background water quality data; (6) descriptions and analysis of potential sources of off-site contamination; and (7) descriptions of the sampling, analysis, preservation, and quality assurance protocols.

Contaminant transport estimates are based on the hydrogeologic characteristics, transport rates, attenuation factors, background water quality, extent of contamination, and sources of contamination. The objective of the hazardous constituent transport assessment is to develop defensible and realistic exposure estimates based on reasonable projections of contaminant concentrations in ground water and surface water. This assessment should consider anticipated future events that may alter exposure and transport rates and pathways as well as the transfer of hazardous constituents from aqueous media to other environmental media, as necessary. Transport assessments should include (1) reasonably conservative estimates of the hazardous constituents transport rate in ground water and hydraulically-connected surface water; (2) estimates of the duration of constituent migration,

(3) projected temporal and variability distribution of hazardous constituents; (4) waste composition and water quality monitoring data used to validate projections of constituent transport; (5) assessments of the long-term potential for desorption and remobilization of contaminants into ground water or hydraulically-connected surface water; (6) characterization of the source term for hazardous constituents for ground water and surface water transport; and (7) assessment of uncertainties associated with the projected concentrations and distribution of hazardous constituents and the site hydrogeologic conditions.

3.2.3.1.3 Exposure Assessment

The exposure assessment determines the risks associated with human and environmental exposure to hazardous constituents; evaluates whether projected concentrations of hazardous constituents pose substantial present or potential hazards to human health or the environment; and identifies the maximum permissible levels below which such hazards do not occur. The assessment is conducted at the POE defined in the application. The maximum allowable concentrations at the POE provide the basis for the proposed ACLs. The exposure assessment also considers the ground-water resource classification and water uses, as well as an evaluation of human health and environmental hazards.

The human exposure analysis partially depends on the extent to which people are likely to use the water resources that may be affected by contamination from the site. Therefore, the current and projected future uses of ground water and surface water are assessed by determining existing and anticipated water uses, classification of water resources, institutional controls on water users, relevant water use standards, as well as the availability and characteristics of alternative water supplies. Assessments of existing and future water uses should include (1) location, type and rate of water use, as well as statutory or legal use issues; (2) water quality criteria, standards and guidelines; (3) Federal, State, or other ground-water classification; and (4) availability and characteristics of alternative water supplies. Where applicable, agricultural, industrial, domestic/municipal, environmental, and recreational water uses should be discussed.

Health and environmental hazard assessments discuss the exposure pathway identification, hazard identification, dose-response assessment, and risk characterization. The hazard assessment should project the response of human and environmental populations to the hazardous constituent exposure, based on

the projected constituent concentrations, anticipated exposure pathways, as well as available toxicological and epidemiological information. Hazard assessments commonly consider two potential human exposure pathways; (1) ingestion of contaminated water, and (2) ingestion of contaminated foods. Other pathways, such as inhalation and dermal exposure are also considered in the assessment when these exposures could result in significant hazards to people or the environment. The assessments distinguish between health impacts associated with threshold and non-threshold constituents. Mutagenic, teratogenic, and synergistic effects are considered in the analysis, if applicable, based on toxicological testing, structure-activity relationships, or epidemiological studies. The hazard assessment should also identify the assumptions and uncertainties associated with the projected health and environmental impacts.

Potential responses of environmental or non-human populations to the various hazardous constituents are assessed if such populations may realistically be exposed to contaminated ground water or hydraulically-connected surface water. Terrestrial and aquatic wildlife, plants, livestock, and crops are included in the assessment. The assessment should provide (1) inventories of potentially-exposed environmental populations; (2) recommended tolerance or exposure limits; (3) contaminant interactions and their cumulative effects on exposed populations; (4) projected responses of environmental populations from exposure to hazardous constituents; and (5) anticipated changes in populations independent of the hazardous constituents exposure. Alternatively, an applicant may demonstrate that environmental hazards are not anticipated, because the exposure will not occur.

The hazard assessment also evaluates potential damage to physical structures (such as corrosivity), that may result from exposure to the hazardous constituents in ground water and hydraulically-connected surface water. Alternatively, an applicant may demonstrate that damage to physical structures is not anticipated, because the exposure will not occur.

The hazard assessment concludes with a brief statement of the concentration limits below which the hazardous constituents no longer pose a substantial present or potential hazards to human health or the environment; along with a summary of the narrative basis for each proposed concentration limit.

3.2.3.2 Review Element 2: Corrective Action Review

Corrective actions assessments consider (1) practicable remediation

alternatives; (2) technical feasibility; (3) costs and benefits; (4) selection of appropriate corrective actions; and (5) demonstrate that the proposed concentration limits are as low as reasonably achievable, considering practicable corrective actions. The assessment should provide supporting calculations and assumptions used in estimating the costs and benefits of each of the alternatives.

The corrective action assessments are linked with the proposed concentration limits resulting from the hazards assessment section. Acceptable assessments are those that demonstrate that ACLs will be no higher than the maximum allowable concentration limits identified in the hazards assessment. If practicable corrective actions lead to constituent concentrations below those identified in the hazard assessment, then it may not be necessary to achieve the most stringent alternative. The corrective action assessment considers at least three different target concentration limits proposed by the licensee that are at or below the level identified in the hazard assessment and that can reasonably be attained by practicable corrective actions. The assessment also evaluates the costs and benefits associated with each set of target concentrations. Evaluating the costs and benefits associated with corrective action to attain the target concentrations assures that the proposed ACLs are as low as reasonably achievable, considering practicable corrective actions.

3.3 Review Procedures

3.3.1 General

In conducting reviews of ACL applications, the NRC staff verifies that the proposed ACLs would not pose a substantial present or potential hazard to human health or the environment, and that the ACLs are as low as reasonably achievable, considering practicable corrective actions. Open issues or requests for additional information are generally transmitted to the applicant in the form of written comments. The comments document the issues; discuss the significance of the comment in terms of the proposed ACLs; and suggest, if appropriate, a technical approach that may resolve each of the issues. The NRC staff may conduct literature surveys, data assessments, and perform evaluations as needed to confirm the basis for the proposed ACLs, and to verify that the proposed ACLs satisfy the general criteria listed in Section 3.2.2.

3.3.2 Review Element 1: Hazard Assessment Review

The hazard assessment used to support ACL demonstrations should ensure that the following are satisfied:

1. The hazardous constituent source term must be adequately characterized with respect to the transport assessments.

2. The rates and directions of hazardous constituent migration must be adequately determined with respect to exposure assessments.

3. The routes, amounts, and effects of human and environmental exposure to hazardous constituents must be adequately assessed.

4. The proposed concentration limits for hazardous constituents must ensure the prevention of substantial present or potential hazards to humans and the environment.

3.3.2.1 Source Term Characterization

The reviewer evaluates the characterization of the hazardous constituents source term considering the transport assessment. Generally, the source term will include existing contaminated ground water and tailings, if applicable; contaminated soils; and other wastes that may cause future releases of hazardous constituents should be considered contributing to the source term. The reviewer determines whether the characterization is sufficient to provide a defensible estimate of the types, characteristics, and release rates of hazardous constituents that have been or are anticipated to be released from the source term.

The reviewer will ensure that the demonstration (1) identifies appropriate hazardous constituents in the waste or leachate derived from the waste; (2) identifies the extent and characteristics of contaminated ground water and soils; (3) characterizes the properties of the hazardous constituents that affect their transport; and (4) estimates release rates of hazardous constituents as a function of time and space.

The reviewer generally assesses information on the uranium recovery process; the amounts and types of reagents that were used; the composition of ores as well as transport characteristics and leachability of the hazardous constituents. These factors are combined with the current distribution of contaminated ground water to evaluate potential transport of hazardous constituents. Other relevant information may include the volume of waste, as

well as volatility, octanol-water partitioning coefficient, viscosity, degradation rate constants, and density, if these properties may significantly affect transport or toxicity of hazardous constituents. Based on this assessment, the reviewer either confirms the licensee's characterization of the source term or determines that the source term has not been conservatively or realistically characterized.

3.3.2.2 Rate and Direction of Transport

The adequacy of the rate and direction of hazardous constituent transport considers (1) hydrogeology characteristics including attenuation factors; (2) hydraulic heads and water level data; and (3) rainfall patterns that may affect transport. Additionally, the characterization of background water quality is reviewed to verify existing and potential future uses of water resources.

The review of the rate and direction of hazardous constituent transport examines the hydrogeologic characterization of the site to determine if the hydrogeologic characterization of the site is adequate to support the projected extent and distribution of hazardous constituents. The review considers site-specific and regional information on the physical and hydrogeologic characteristics of ground water and surface water systems as well as an assessment of the defensibility of the technique and approach utilized to determine transport rate and direction. Additionally, the reviewer evaluates potential changes in transport rates and directions related to mine dewatering and facility operation as well as rainfall distribution. Commonly, rainfall distribution is not a variable; however, construction practices could cause changes in recharge into waste materials which, consequently, could modify the releases of hazardous constituents.

Attenuation considerations for establishing ACLs should be reviewed, based on (1) extent of existing ground-water contamination, (2) projected extent of future contamination, (3) duration and spatial distribution of attenuation, (4) uncertainties associated with attenuation mechanisms, and (5) other factors.

The review of hazardous constituents transport includes an evaluation of constituent mobility in ground water and also surface water, if the ground-water discharge contributes to surface water. The reviewer determines whether estimated hazardous constituent concentrations and projected distribution are

either best estimates or reasonably conservative representations of the rate, extent, and direction of constituent transport. This determination is made considering the existing distribution of hazardous constituents in ground water and their characteristics, as well as the effects of such factors as chelation, degradation, and attenuation mechanisms. The reviewer confirms that all likely and significant pathways of hazardous transport in ground water and surface water have been identified and assessed, considering conservative or realistic effects to humans or the environment and that the assessments used to estimate constituent transport are appropriate to support regulatory decisions. Additionally, the reviewer confirms that the projections have been sufficiently validated and calibrated based on site-specific information.

The reviewer also evaluates the adequacy of the existing detection monitoring program, water quality data, modeling approach and results, facility characteristics, and the procedures used to measure the background concentrations. The reviewer determines whether the transport assessment reasonably characterizes facility impacts on the quality of ground water and surface water. Background concentrations may be complicated in areas where there are several affected aquifers, or where existing contamination from activities unrelated to uranium milling has altered ambient water quality. The reviewer should verify that appropriate characterizations of background water quality are established for each affected aquifer and for hydraulically connected surface-water bodies that are downgradient from the facility.

At sites where entire aquifers are contaminated by seepage, the reviewer evaluates the applicant's justification for not characterizing background water quality and the applicant's estimate of the unaffected water quality. The reviewer evaluates site and facility information and either confirms the determination of background water quality or determines that the estimates are not reasonably conservative. Facility information is reviewed to ensure that estimates of background water quality are sufficient to support analyses of potential use and effects associated with human and environmental exposure to hazardous constituents.

3.3.2.3 Exposure Assessment

The reviewer verifies that the POE proposed in the application meets the Point of Exposure definition presented in Section 1.4 ACL Implementation. In most cases, the POE for pathways assuming well-water use will be proposed at the downgradient limit of the perpetual care boundary. The reviewer must verify

that the application contains properly documented assurance that the appropriate Federal or State agency will accept the transfer of the specific property, including land in excess of that needed for tailings disposal. The reviewer also evaluates the assessment of the risks associated with human and environmental exposure to hazardous constituents, considering the source term rates and directions of constituent transport, and the location of the POE. The assessment includes characterization of existing and potential uses of water resources that may be affected by the facility, evaluation of human and environmental exposure to hazardous constituents, and assessment of the permanence and persistence of any adverse effects associated with exposure.

The reviewer determines whether the characterization of exposure pathways is adequate, considering human and environmental exposure to hazardous constituents. Physical and biological pathways of constituent transport by ground water and surface water are primary considerations. The reviewer confirms the applicant's identification and characterization of sensitive human and environmental populations, and that the sensitive populations have been adequately considered in the exposure assessment. The assessment must consider human exposure due to ingestion of drinking water and contaminated food products. If other exposure pathways are likely, these should also be identified and considered.

The applicant's assessment of adverse effects associated with present and potential human exposure to hazardous constituents should be confirmed, based on the exposure pathways characterization. The human exposure assessment includes: (1) classification of affected water resources; (2) assessment of existing and potential water uses; (3) evaluation of the likelihood that people will be exposed to hazardous constituents; and (4) evaluation of adverse effects associated with exposure to hazardous constituents, including assessment of the permanence and persistence of adverse effects.

When ground-water flow contributes to surface water, the reviewer also ensures that the ACLs prevent (1) hazardous constituent concentrations in surface water from exceeding health or environmental levels or background concentrations, and (2) the exposure of human and environmental receptors to contaminated ground water between the POC and the location where the ground water discharges into the surface-water body (point of exposure).

3.3.2.3.1 Resource Classification and Water Use

A review of resources classification, as well as existing and potential water

uses, confirms that the applicant considers domestic and municipal drinking water, fish and wildlife propagation including special ecological communities, industrial, agricultural and recreational water uses. Additionally, assurance must be provided that the applicant's assessment of water yields, costs for development of alternate water supplies, and assessment of legal, statutory or other administrative constraints on the use and development of the water resources are verified. The applicant's assessment of existing and potential uses of water at the facility should be consistent with Federal, State, and local water use inventories, thereby providing an adequate basis on which to assess existing and potential human and environmental exposure to hazardous constituents.

The reviewer ensures that the assessment conservatively estimates the probability of human exposure to contaminated water. Such estimates are often difficult to establish quantitatively. Consequently, defensible qualitative estimates are often nec ssary. Qualitative determinations include either of the following:

1. Reasonably likely - exposure has or could have occurred in the past, or available information indicates that exposure may reasonably occur during the duration of the contamination; or

2. Reasonably unlikely - exposure could have occurred in the past, but will probably not occur in the future, because initial incentives for water use have been removed, or available information indicates that no incentives for water use are currently identifiable, based on foreseeable technological developments.

Qualitative exposure determinations consider existing and potential water uses relative to background water quality. In general, the reviewer considers existing and potential uses of water that may be affected by the facility. Existing use may include past uses, even though water resources are not presently being used. Potential uses include anticipated and possible uses. Anticipated water use includes only those uses that are reasonably sure to occur. Possible uses are those that are compatible with background water quality without water treatment before use.

The review of long-term water use considers aquifer classifications consistent with EPA's "Groundwater Protection Strategy". The reviewer assumes that exposure is likely to occur for Class I ground waters, unless the applicant

demonstrates that exposure to people using the Class I ground water is effectively impossible. The reviewer considers potential uses of Class II ground water, but such uses are not considered for Class III ground waters, unless they are currently utilized for beneficial purposes.

The reviewer confirms the assessment of existing and anticipated uses of water by comparing background water quality with Federal, State, and local water quality standards. Background water quality is compared with the water quality standards, considering legal constraints, to determine existing and potential water uses. When standards are inconsistent among several intended water uses, the more stringent criteria prevail unless the applicant demonstrates that lesser standards apply. Additionally, the reviewer considers water use estimates based on demographic projections, zoning patterns, and projected population growth estimates. The reviewer may also utilize information on water use from local organizations, water supply companies and State and Federal agencies, along with considering wellhead protection areas as defined by the Safe Drinking Water Act.

The most significant pathway for human exposure to waterborne contaminants is through consumption of contaminated drinking water. Other pathways include dermal contact, inhalation, and food ingestion. These pathways should be considered, but need not always be assessed by the applicant. Class II ground water is further clarified as a Class A resource – having a mean annual total dissolved solids (TDS) concentration less than 3000 mg/l or a Class B resource – with a mean annual TDS concentration equaling or exceeding 3000 mg/l in water. The reviewer may determine whether the water representative of background quality is Class A or B, on a site-specific basis, by considering concentrations of other constituents that affect human exposure to hazardous constituents.

For Class A resources, the reviewer assumes that humans will withdraw water from affected aquifers and/or surface water bodies at any hydraulically downgradient point beyond the site boundary (either current or perpetual care). This assumption applies to Class A resources regardless of whether or not water resources are currently being used. For Class B resources, the reviewer evaluates adverse effects on human health considering the location and purpose of the nearest downgradient, existing or potential water use. Generally, human health effects, due to exposure from using Class III groundwater resources, are not evaluated unless the water is currently utilized or future use is anticipated.

3.3.2.3.2 Evaluation of Health Hazards

The applicant's assessment is reviewed to determine if it provides reasonably conservative or best estimates of potential health effects caused by human exposure to hazardous constituents. This determination is based on comparisons of existing and projected constituent concentrations with appropriate exposure limits and dose-response relationships from available literature. The reviewer confirms that the applicant considers Maximum Contaminant Levels (MCLs) for drinking water, reference doses (RfDs), or risk specific doses (RSDs) in assessing potential health hazards for each constituent for which an ACL is proposed. In the absence of applicable MCLs, RfDs, or RSDs, the reviewer confirms that the applicant has assessed dose-response relationships based on literature searches or toxicological research. The reviewer verifies that the exposure analysis distinguishes between threshold (toxic) and non-threshold (carcinogenic) effects associated with human exposure as well as teratogenic, fetotoxic, mutagenic, and synergistic effects.

The RfDs are the amounts of toxic constituents to which humans can be daily exposed without suffering any adverse effect. RSDs are the amounts of proven or suspected carcinogenic constituents to which humans can be daily exposed without increasing their risk of contracting cancer above a specified risk level. RSDs and RfDs for most hazardous constituents in uranium tailings can be obtained from EPA. The RfD and RSD assessment assume a human mass of 70 kg and consumption of 2 liters of water per day. More stringent criteria may apply if sensitive populations are exposed to hazardous constituents.

The reviewer confirms that the applicant has used the appropriate risk level in the RSD calculations. Generally, a lifetime risk level of 1×10^{-6} is utilized; however, an alternate risk level in the range of 1×10^{-6} to 1×10^{-4} may be utilized by considering (1) facility-specific considerations that influence the likelihood of human adverse effects associated with exposure; (2) other environmental health factors borne by the affected population; and (3) uncertainties associated with the data and assessments used to evaluate potential adverse effects.

The applicant should consider the cumulative effects of human exposure to hazardous constituents for which ACLs are proposed and other constituents present in contaminated ground water. The reviewer confirms that an additive approach is utilized in assessing adverse effects associated with exposure to hazardous constituents.

The reviewer also confirms that the applicant identifies and justifies a maximum allowable human exposure level for each ACL constituent. The reviewer verifies that the applicant has considered uncertainties in estimating risks and the persistence and permanence of adverse effects. The reviewer determines whether the proposed human exposure levels are reasonably conservative, defensible, and sufficiently protective of human health to avoid a substantial present or potential hazard to people for the estimated duration of the contamination.

3.3.2.3.3 Evaluation of Environmental Hazards

Similar to the review of human health effects, the reviewer verifies the assessment of risks associated with hazardous constituent exposure to environmental populations. The review includes consideration of adverse effects to aquatic and terrestrial wildlife, plants, agricultural crops, animals, and physical structures. The reviewer confirms that the assessment adequately identifies and evaluates the adverse effects such as: (1) contamination-induced biotic changes, (2) loss or reduction of unique or critical habitats, and (3) jeopardizing endangered species. If adverse effects on endangered species and critical habitats are predicted, they are included in the assessment. The U.S. Fish and Wildlife Service may be consulted for verification of potential effects in these areas.

For each potential exposure pathway, the reviewer compares existing and predicted constituent concentrations with chronic toxicity levels for plants and animals. Acute and subchronic effects may be considered based on estimated constituent concentrations and limits for acute and subchronic environmental exposure. For physical structures, such as foundations, underground pipes, and roads; the reviewer ensures that estimated constituent concentrations will not result in any significant degradation or loss of function as a result of contamination exposure. The reviewer verifies that the applicant's assessment adequately evaluates the potential adverse effect to environmental species and physical structures that may be exposed to contaminated ground water and hydraulically-connected surface water.

Bioaccumulation and food web interactions are also considered, in reviewing adverse effects. Aquatic wildlife effects are evaluated by comparing estimated constituent concentrations with Federal and State water quality criteria. The reviewer ensures that the applicant considers terrestrial wildlife exposure to constituents through direct exposure and food web interactions. The assessment should identify and assess terrestrial habitats

at sites where terrestrial wildlife may potentially be exposed to hazardous constituents.

Agricultural effects consider both direct and indirect exposure pathways, crop impacts, reduced productivity, and bioaccumulation of constituents. Reasonably conservative estimates of constituent concentrations are compared with Federal and State water quality criteria to estimate agricultural effects associated with constituent exposure. Additionally, crop exposures through contaminated soil, shallow ground-water uptake, and irrigation; along with livestock exposure through direct ingestion of contaminated water and indirect exposure through grazing should be assessed. The reviewer ensures that the agricultural assessment is consistent with any assessment of human exposure to hazardous constituents through ingestion of contaminated food products.

3.3.3 Review Element 2: Corrective Action Review

The applicant's assessment of the need for and selection of corrective actions is reviewed, in conjunction with the hazard assessment. Previous, current, and proposed practicable corrective actions are reviewed to determine if the applicant has demonstrated that the proposed ACLs are as low as reasonably achievable. The demonstration includes identification of alternative corrective actions, assessment of their technical feasibility, implementation, costs and benefits, and selection of practicable corrective actions.

The corrective action assessment should ensure that the following are satisfied:

1. A complete range of reasonable alternative corrective actions has been identified.

2. The identified corrective actions are feasible and appropriate to reduce constituent concentrations at the site.

3. The corrective actions have been designed to optimize their effectiveness.

4. An objective comparison of the costs and benefits associated with the corrective actions is complete.

5. The proposed ACLs are as low as reasonably achievable.

The reviewer verifies that the applicant's assessment identifies and evaluates an adequate range of reasonable corrective action measures. The assessment should provide sufficient descriptive detail for each of the identified measures, so that the reviewer can independently verify reasonableness of the corrective action. Numerous corrective actions are currently in operation at Title II uranium mill sites. These corrective actions, their results, and their application at other sites can serve as the basis for an applicant's selection of a corrective action program. Sufficient analytical data exist to accurately predict the hazardous constituent concentrations that would likely result from implementation.

Following the review of the identified corrective actions, the reviewer verifies the applicant's assessment of the technical feasibility for each of the identified actions. The technical feasibility review considers site-specific hydrogeologic characteristics that may affect the performance of the corrective measure. In addition, the contamination extent and the potential for human and environmental exposure are also considered. The applicant's feasibility assessment should be based on proven applications of corrective action techniques at other contaminated sites; however, this does not limit the applicant from proposing new and promising corrective action techniques for approval, given there is adequate documentation of the likelihood for success. Additionally, the reviewer confirms that the identified corrective action is followed by a suitable monitoring period to verify that the remediated water quality is stable.

The reviewer should then determine whether the feasible corrective actions have been designed to optimize the effectiveness in reducing hazardous constituent concentrations. Optimization calculations should provide approximations of the effects on the hydrogeologic system.

The direct and indirect benefits of implementing each of the identified corrective actions should be compared with the costs of performing (or not performing) such measures. The cost estimates include consideration of capital costs for design, implementation, and decommissioning, along with operation and maintenance costs. The reviewer verifies estimates of the current and projected value of pre-contaminated water resources based on water rights, availability of alternative water supplies, and projected water use demands. The reviewer generally considers the value of potentially contaminated water resources as equal to either the cost of domestic or municipal drinking water supplies, or the cost of supplied water to replace the contaminated resources. The absence of alternative water supplies

increases the relative value of potentially contaminated water resources. The adequacy of the benefits assessment is similarly evaluated considering the avoidance of adverse health effects, value of pre-contaminated ground-water resources, prevention of land value depreciation, and benefits accrued from performing the corrective action.

Finally, the adequacy of the applicant's consideration of practicable corrective actions and the demonstration that proposed ACLs are as low as reasonably achievable are evaluated. The reviewer considers relevant guidance such as the as low as reasonably achievable philosophy in Appendix I to 10 CFR Part 50, National Council on Radiation Protection and Measurements Report Number 39, and International Commission on Radiological Protection Publication 22. The reviewer verifies that the applicant's assessment has demonstrated that the proposed ACLs are as low as reasonably achievable, considering practicable corrective action.

3.4 Review Findings

The findings from the detailed application review will likely support one of the following recommendations: (1) approval of the entire application proposal, (2) approval of selected ACLs, or (3) non-approval of the application in its entirety. The reviewer develops a separate written report which fully documents the recommendations, including a detailed description of the technical basis that supports each recommendation. The report should address the general and specific criteria presented in Sections 3.3.2 and 3.3.3; along with any other criteria than may be relevant, because of site-specific conditions presented in the application. The documentation report must be prepared before formal approval of the proposed ACLs, so that it can be used for reference in the licensing action.

If the applicant's ACL submittal satisfies the acceptance review criteria and the detailed review confirms the basis for the proposed ACLs, then it can be concluded that regulatory compliance has been achieved. The reviewer may then recommend approval of the site-specific alternate concentration limits for the constituents requested by the applicant and provide the documentation to support the approval.

The reviewer may also recommend establishing ACLs for only those constituents for which the applicant's demonstration is sufficient to satisfy regulatory requirements. In this case, the reviewer would document and describe which

ACLs proposed by the applicant were not recommended for implementation along with those approved. These descriptions should cite specific inadequacies that caused the demonstration to fail for the selected constituents, describe the technical basis for the review conclusions, and identify an alternative technical approach that might resolve the inadequacies. The reviewer will also develop documentation for the approved ACLs.

If the applicant's ACL submittal fails to demonstrate compliance with Criterion 5B(6) of Appendix A to 10 CFR Part 40, then the reviewer documents the basis for the failure, cites specific inadequacies, and describes the technical basis for the review conclusions. These review findings are then transmitted to the applicant for resolution.

Enclosure 2

U. S. Nuclear Regulatory Commission Staff Response to Comments on Draft Technical Position on Alternate Concentration Limits for Uranium Mills

March 31, 1992

U. S. Nuclear Commission Staff Response to Comments on Draft Technical Position on Alternate Concentration Limits for Uranium Mills

INTRODUCTION

The United States Nuclear Regulatory Commission announced the availability and solicited comments on the draft "Technical Position on Alternate Concentration Limits (ACLs) for Uranium Mills," in the Federal Register on June 30, 1988 (53 FR 24820). Comments on the draft Technical Position were received from a total of eight public and private organizations, including the American Mining Congress, Colorado Department of Health, the Hopi Tribe, Kerr-McGee Corporation, Texas Department of Health, Umetco Minerals Corporation, U.S. Department of Energy, U.S. Department of the Interior, and Western Nuclear, Inc. In addition, staff comments were received from two offices of the Environmental Protection Agency (EPA): Office of Federal Activities and Office of Emergency and Remedial Response.

The received comments were reviewed by NRC staff and grouped by subject, based on the issues presented by the commenters. This resulted in identifying the following subject categories:

1. Editorial comments to improve readability and clarity.
2. Applicability to Title I sites.
3. Generic versus site-specific guidance.
4. Review and decision-making process.
5. Ground-water classification and uses.
6. Concentration limits.
7. Point of Compliance (POC).
8. Point of Exposure (POE).
9. Hazard and risk assessment.
10. Contaminant plumes.
11. Corrective action.
12. Costs and benefits of corrective action.
13. Passive remedial action measures.
14. Period of Compliance.
15. Post-closure care.
16. State Programs.

The comments received in these subject categories are summarized and discussed in the following paragraphs. Included under each category are: listing of the commenters that presented one or more issues relative to that category's subject; a summary of the issues raised by the commenters; discussion and response to comments by NRC staff; and any modifications made to the Technical Position in response to these comments.

The numbers in parenthesis after the commenters names were assigned by NRC staff during the comment reviews and refer to the specific commenters' issues. These numbers are also shown on the attached copies of the commenters' transmittals to NRC.

NRC STAFF RESPONSES TO COMMENTS

1. Editorial Comments to Improve Readability and Clarity

1.1 *Commenters*

American Mining Congress (A1)
Umetco Minerals Corporation (F2)
Department of Energy (G2)
EPA's Office of Emergency and Remedial Response (I12, I17, I18)

1.2 *Summary of Issues*

These commenters indicated that the draft Technical Position contained excessive detail, redundancies, and typographical errors. Commenters also suggested expanding the Table of Contents, relegating Tables 1 and 2 to the appendices, and including a bibliography.

1.3 *Discussion and Response to Comments*

NRC staff agrees that certain parts of the draft Technical Position contain excessive detail and redundancies that need to be revised. The draft Technical Position has been revised accordingly, as described in the following section. It is noted, however, that the Technical Position is intended for use by both licensees and reviewers of ACL applications and should therefore provide detailed guidance to ensure that the applications are adequately prepared and can be consistently reviewed in a timely manner. In this way, the decision to establish ACLs at specific sites can be made objectively, on the basis of all the available information and data.

NRC staff agrees also that the Table of Contents should be expanded. However, NRC staff prefers not to include a bibliography in the Technical Position, because of the concern that reference material will in time be outdated, and that a bibliography will limit the literature search activities by applicants or the reviewers.

1.4 *Modifications to the Technical Position*

NRC staff has made significant revisions and editorial changes throughout the Technical Position to improve the readability and clarity. The Table of Contents has been expanded, and a section has been added describing the organization of the Technical Position. Typographical errors have also been corrected.

2. Applicability to Title I Sites

2.1 *Commenters*

The Hopi Tribe (C1, C5, C6, C14)
U.S. Department of Energy (G1)

2.2 *Summary of Issues*

The commenters inquired mainly about the applicability of the Technical Position to Title I sites. One commenter also asked about the relationship of the ACL review to the licensing of Title I sites and the impact of Title I licensing on the quality of the human environment.

2.3 *Discussion and Response to Comments*

The Technical Position, in its current form, is intended for application to Title II sites only. However, NRC staff recognizes that there is a need for a similar Technical Position for Title I sites, and will, in time, take necessary action to prepare such a document.

2.4 *Modifications to the Technical Position*

The Technical Position has been revised to clearly indicate that it is applicable to Title II sites only. Only standards and regulations pertaining to Title II have been cited and all regulatory citations pertaining to Title I sites have been removed.

3. Generic Versus Site-Specific Guidance

3.1 *Commenters*

American Mining Congress (A2, A3)
The Hopi Tribe (C18)
Kerr-McGee Corporation (D1)
Western Nuclear, Inc. (K1, K2)

3.2 *Summary of Issues*

One Commenter requested that NRC discuss the rationale for developing a generic Technical Position for a process that is based on site-specific evaluations. Two commenters stressed the importance of site-specific factors and information in establishing the ACLs, and that the assessment of ACL applications should, therefore, be made on the basis of site-specific considerations. One commenter indicated that site-specific factors should be considered in locating the POC and the POE.

3.3 *Discussion and Response to Comments*

The rationale for issuing the Technical Position is reflected in its purpose, which is described as: (1) to offer guidance for NRC staff's interpretation of the regulatory requirements for establishing ACLs at tailings sites according to Criterion 5B(6), Appendix A of 10 CFR Part 40; (2) to provide a standard format and content for ACL applications; and, (3) to establish consistent NRC staff review procedures for ACL applications. The Technical Position is designed for use by both licensees and regulatory reviewers of ACL applications.

NRC staff agrees with the commenters with respect to site-specific considerations in the ACL applications. It is noted that relevant regulations in Appendix A of 10 CFR Part 40 require consideration of 19 site-specific factors to establish that the contaminants will not pose a significant present or potential hazard to human health or the environment, as long as the ACLs are not exceeded. These regulations also require that the ACLs are as low as reasonably achievable considering practicable corrective actions, which are also site-specific. The use of site-specific information in establishing ACLs has been stressed throughout the draft Technical Position.

3.4 *Modifications to the Technical Position*

The purpose of the Technical Position has been revised to clearly describe its purpose and rationale. The need for using site-specific information in establishing ACLs, which was incorporated in the draft document, has also been stressed in the final Technical Position.

4. Review and Decision-Making Process

4.1 *Commenters*

American Mining Congress (A3, A4, A14, A16)
The Hopi Tribe (C2, C3, C4, C5, C6)
Texas Department of Health (E1, E2, E3)
Umetco Minerals Corporation (F1)
Western Nuclear Inc. (K14)

4.2 *Summary of Issues*

One commenter suggested that the ACL application and review process should be flexible, not rigid, because the Technical Position is not a rule-making document. The commenter also suggested that the Technical Position should include standard tests to evaluate the adequacy of ACL applications, and that the information provided in ACL applications should be evaluated on the basis of reasonable expectations.

One commenter asked if complete records of NRC staff reviews and decision-making process for ACL applications would be made part of the administrative record; if third parties would have standing to provide input to the ACL review; and what the relationship would be between the ACL review and NRC licensing.

One commenter suggested that in applying ground-water protection standards, NRC should differentiate between existing uranium processing facilities and new milling facilities.

Two commenters commented on the review schedule. One suggested that a time limit should be set in the Technical Position for the acceptance review of ACL applications by NRC staff. The other commenter indicated that the complex technical issues in ACL applications may lead to an increasing number of

public hearing requests, and the review schedule should, therefore, consider the delays that can result from such hearings.

Finally, four commenters raised issues concerning NRC's review and decision-making staff. These included concerns about the need for the commitment of staff with specialized skills to conduct ACL reviews; the qualifications and authority of the reviewers and the decision-makers; reviews of decisions made by the regional staff; and the mechanism for licensees to appeal NRC's decisions on ACL applications.

4.3 *Discussion and Response to Comments*

Flexibility in the ACL application and review: NRC staff agrees that the Technical Position is not a rule-making document. The regulations for establishment of ACLs at Title II uranium mill tailings sites are provided in Appendix A to 10 CFR Part 40. The Technical Position is intended to provide technical guidance to licensees and the reviewers of ACL applications. NRC staff further notes that flexibility in the Technical Position is needed to ensure that ACL applications and review procedures are based on site-specific data. Adequate flexibility has therefore been included in both the draft as well as the final documents of the Technical Position.

Standard qualitative test of application adequacy: NRC staff considers it inadvisable to include a standardized test in the Technical Position that can be used to accept or reject these applications, given the site-specific nature of the ACL applications. ACL applications must be evaluated on a site-specific basis, considering the regulatory provisions specified in Criterion 5B(6) of Appendix A to 10 CFR Part 40.

Administrative record: NRC intends to make all formal staff reviews of ACL applications part of the public record. The ACL materials submitted and the formal response to these materials will be filed as part of existing dockets for the corresponding sites. These docket files are available to the public.

Third-party Standing: The ACL review is a part of the formal licensing process of mill tailings sites. Interested parties may therefore provide input to the decision-making process in accordance with NRC licensing procedures outlined in 10 CFR Part 2 and 10 CFR Part 40. Should this be subject to judicial review, the court of jurisdiction will determine whether parties have standing.

Relationship of ACL review to licensing: The Technical Position does not specifically address licensing actions. However, the ACL review constitutes an integral part of the licensing process for those instances when a licensee wants to apply for an ACL under the ground-water protection provisions in Appendix A to 10 CFR Part 40.

It should be noted that ACLs must be protective of human health and the environment at the POE. If there is a case of contamination at an existing site where a practicable corrective action that is protective of human health and the environment cannot be identified, the ACL process and framework would

not be used as a vehicle for licensing action to resolve this situation.

Existing versus new facilities: NRC's regulatory provisions for ground-water protection at active uranium mill sites are provided in Appendix A to 10 CFR Part 40. These provisions do not differentiate between existing and proposed new facilities.

Review schedule: ACL applications are site-specific and each site may have unique characteristics and issues. As noted by one of the commenters, the ACL review may take a considerable time if the review process for a particular site involves a lengthy public hearing. It is not possible, therefore, to specify the time required for the review in the Technical Position, which is a generic document. However, NRC staff may set a tentative review schedule with licensees on a site-specific basis during the acceptance process. In any case, NRC staff will endeavor to complete thorough reviews of all applications as expeditiously as possible.

Review and decision-making staff: The NRC review and evaluation of ACL applications will be carried out by competent technical staff, and consistent with existing NRC policies, procedures and practices. The administrative record for all decisions related to licensing will follow the general and specific provisions of 10 CFR Part 2, as appropriate. These provisions govern the detailed construction and maintenance of the public record.

Existing NRC procedures will be followed in handling appeals to NRC's decisions resulting from ACL acceptance reviews by NRC staff. These include the general and specific provisions of 10 CFR Part 2, as appropriate.

4.4 *Modifications to the Technical Position*

Answers to the majority of the issues raised under this subject category are found in existing NRC regulatory documents, and fall outside the scope and purpose of the Technical Position. However, some revisions to the Technical Position were made on the basis of the issues raised in this section. The most important revision involved expanding and rewriting the section discussing the acceptance review of ACL applications, which now provides for NRC staff to set a tentative (non-binding) schedule for the detailed review, at the time of the acceptance review. A general guideline that offers some guidance on the acceptance and rejection of ACL applications has also been included in this section.

5. Ground-Water Classification and Uses

5.1 *Commenters*

American Mining Congress (A8, A17, A18)
EPA's Office of Federal Activities (H5)
EPA's Office of Emergency and Remedial Response (I1, I2, I3, I4, I6, I7, I9, I10, I11, I13, I15)
U.S. Department of the Interior (J1, J3)
Western Nuclear, Inc. (K9, K15, K16)

5.2 *Summary of Comments*

Two commenters commented on background and pre-existing water quality. One commenter stated that NRC should take into account the pre-existing water quality in establishing the ACLs and in determining whether or not corrective actions should be initiated. Another commenter indicated that for the sites that existed prior the enactment of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), the background water quality should be defined as the quality of the water at the time that the regulations resulting from UMTRCA were formally issued in final form or, at the earliest, when the UMTRCA legislation was enacted. This commenter also suggested that determining background levels should take into consideration site-specific natural variations in ground-water quality.

Two commenters indicated that NRC should use and appropriately reference the EPA's classification and definition of useable water. A third commenter objected to the use of the most stringent criterion when the standards are inconsistent.

Two commenters offered comments concerning the protection of Class I ground water, down-gradient from a milling/disposal site. The commenters objected to the language used in the Technical Position indicating that exposure to Class I ground water would be likely unless a licensee demonstrates that such exposure would be "impossible". Both commenters suggested that the word "impossible' should be replaced by the word "unlikely". One commenter also requested an explanation for the assumption made in the Technical Position that humans will withdraw water from Class I ground water at any point down-gradient from the site.

One commenter raised a concern that appropriate water quality criteria for some of the constituents generated at tailings sites may be lacking for certain uses (e.g., aquatic life and agricultural crops were cited by the commenter). The commenter indicated that the Technical Position should state which criteria should be used in such situations.

One commenter suggested that ground-water classification and proximity to well-head protection areas be used in locating the Point of Compliance; evaluating concentration limits; designing and implementing compliance monitoring and corrective action programs; assessing and reviewing corrective action programs; and evaluating hazards to humans.

Finally, one commenter suggested deleting an apparent inference that ground-water classification may be affected by development costs and administrative constraints.

5.3 *Discussion and Response to Comments*

Background and existing ground-water quality: Ground-water quality at the time of enactment of the UMTRCA legislation or the subsequent issuance of pertinent regulations cannot be accepted as background water quality at existing milling facilities unless it characterizes the ambient water quality that has not been affected by leakage from the mill facility. NRC staff agrees that the background water quality should be established considering site-specific data and information. Ambient ground-water quality has already been established at a majority of the sites through other ground-water monitoring actions in each license.

Water classification and use standards: Water classification and use standards are adequately covered in the Technical Position. The use of the EPA's water quality criteria for classification of ground water has largely been followed, and a reference has now been cited in the Technical Position. But it is noted that the EPA standards should be used along with, not in lieu of, other Federal, State, and local water quality standards.

A distinction was made in the Technical Position between two categories of Class II water; water with Total Dissolved Solids (TDS) of less than 3,000 mg/l and water with a TDS in excess of 3,000 mg/l. This is because, with very few exceptions, water containing more than 3,000 mg/l TDS is not considered suitable for drinking. It is noted that the Federal guidelines for secondary drinking water standards in public water supplies includes a maximum TDS limit of 500 mg/l (40 CFR Part 143).

It is further noted that a threshold of 3,000 mg/l TDS has been incorporated in the EPA's Underground Injection Control Program (40 CFR Part 146), as one of the criteria to allow underground injection of waste into aquifers. Under these standards, an aquifer or any portion thereof may be "exempted" and therefore used for underground injection of waste if it contains water with a TDS concentration of more than 3,000 and less than 10,000 mg/l, and it is not reasonably expected to supply a public water system (40 CFR Part 146.4(c)). In addition, practical experience in uranium milling districts indicates that consumers develop water supplies with TDS concentrations substantially less than 3,000 mg/l and reject water with higher concentrations.

In the event that the water use standards are inconsistent, it is expected that the most stringent standard that preserves the water for the most beneficial use will be used by the licensees. It is emphasized that the standards are in place to protect ground water for the most beneficial use possible. Therefore, NRC staff maintains the position that the most stringent standard should be applied to choose the most beneficial use, unless a licensee demonstrates that a lesser water use is warranted at a particular site.

Useability of Class I ground water: Class I ground waters are defined by the EPA as resources of unusually high value; they are highly vulnerable to contamination, and are either irreplaceable sources of drinking water or ecologically vital. It is for these reasons the Technical Position incorporates a conservative approach and language to protect these resources from contamination or the impairment of their use.

It is further noted that the Technical Position conservatively evaluates the probability of human exposure to contaminated Class-I water. Thus, if there is a chance that Class I ground water will be contaminated, there is a probability of human exposure to that contamination. NRC staff realizes, however, that the word "impossible" imposes unrealistic constraints, and this word has now been changed to "effectively impossible".

Criteria for certain water uses: Development of criteria for protection of aquatic life and agricultural crops is not the responsibility of NRC. The Technical Position calls for using standards and criteria that are promulgated by the appropriate Federal, State, and local government agencies. It is the responsibility of the licensee to provide information and analysis related to the projected responses of terrestrial and aquatic wild life, plants, livestock, and crops from estimates of exposure to hazardous constituents. In those instances where appropriate water quality criteria may not be available, NRC staff expects the licensee to conduct a thorough literature search that involves a comparison of the available criteria, to conservatively assess the risks associated with environmental populations exposed to hazardous constituents.

Use of ground-water classification and proximity to well-head protection areas in establishing ACLs: It is noted that ground-water classification figures prominently in the assessment of existing and potential water uses, and constitutes an important site-specific factor in establishing ACLs. Well-head protection areas should be treated as existing water rights and water use areas, which have been adequately covered in the Technical Position. But in any case, explicit language has now been introduced in the Technical Position to signify the importance of these areas.

Impact of cost and administrative constraints on ground-water classification: The Technical Position directs the reviewer to verify the licensee's assessment of water uses. Such assessment should consider relative costs for water resource development and administrative constraints on use and development. But contrary to the comment, the Technical Position does not infer a connection between ground-water classification and economic and administrative constraints of resource exploitation.

5.4 *Modifications to the Technical Position*

As previously stated, modifications made in response to commenters have included replacing the word "impossible" to "effectively impossible"; incorporating a reference citation for the EPA's water quality classification; and incorporating new language to offer an explicit reference to well-head protection areas.

6. Concentration Limits

6.1 *Commenters*

EPA's Office of Federal Activities (H4)
Department of the Interior (J4)
Western Nuclear, Inc. (K11)

6.2 *Summary of Issues*

One commenter proposed that the concentration limits should be established to prevent off-site contamination of ground water above allowable levels. Another indicated that the concentration limits should be based on an integrated consideration of such factors as the site boundary, the POE, and the natural restoration process in the underground ecosystem. The third commenter suggested that the Technical Position should identify and discuss the contaminants to be considered for ACLs.

6.3 *Discussion and Response to Comments*

Existing standards and regulations require that ACLs be established in a manner that prevents hazardous constituents from posing a significant present or future hazard to human health or the environment, and the Technical Position has been prepared to conform with these standards and regulatory requirements.

NRC staff agrees also that the derivation of ACLs should be based on an integrated consideration of site-specific factors, including the site boundary, location of the POE, natural restoration processes, planned land transfer to State or Federal government control after the site closure, and other relevant information. However, NRC staff disagrees that the contaminants should be identified in the Technical Position. It is noted that the contaminants considered for ACLs should be identified on a site-specific basis, using the definition and criteria provided for this purpose in Appendix A to 10 CFR Part 40. The generic identification of these contaminants, without consideration of site-specific factors, would not be consistent with the regulations.

6.4 *Modifications to the Technical Position*

Modifications were made in the Technical Position to clarify NRC staff's position on the above issues.

7. Point of Compliance (POC)

7.1 *Commenters*

American Mining Congress (A13)
Western Nuclear, Inc. (K1)

7.2 *Summary of Issues*

One commenter indicated that the discussion in the Technical Position pertaining to the application of ACLs at the POC and down-gradient from the POC when the contaminant plume extends considerably down-gradient from the POC is confusing, and asked for a clarification. The other commenter suggested that in defining the POC for a tailings impoundment, the contaminated areas beneath and around the tailings impoundment should be considered as a part of the disposal area: This commenter has specifically suggested that the POC should be located at either (a) the boundary of the property that will be turned to the State or Federal government for perpetual care after the site closure; or, (b) the boundary where institutional controls cease to apply.

7.3 *Discussion and Response to Commenters*

Definition of ACLs at the POC and down-gradient of the POC: NRC staff acknowledges that this concept was not clearly described in the draft Technical Position, and the wording has now been modified. The spatial relationship between the POC and the POE is critical to the establishment of ACLs because contamination may be attenuated by natural processes taking place between the POC and the POE. Thus, ACLs for hazardous constituents may be established at the POC that are greater than appropriate health and environmental standards for these constituents at the POE, and still be protective of human health and the environment. This may not be valid, however, in cases where the contaminant plume for a particular constituent may have already passed the POC. The likelihood of this situation occurring at a particular site should be addressed by ACL applicants.

POC location: By definition, the POC is located at the hydraulically down-gradient edge of the tailings impoundment or disposal area, not the exposure area, so as to provide prompt and early detection of ground-water contamination. The exposure is expected at the Point of Exposure not the POC.

7.4 *Modifications to the Technical Position*

The Technical Position has been revised on the basis of the above comments so that ACL applicants are directed to adequately address the situation at existing sites where the contaminant plume may have passed the POC.

8. Point of Exposure (POE)

8.1 *Commenters*

American Mining Congress (A5, A6)
The Hopi Tribe (C12)
Texas Department of Health (E4, E5)
EPA's Office of Federal Activities (H7, H8, H10)
Western Nuclear, Inc. (K2, K3, K5, K10)

8.2 *Summary of Comments*

Commenters have generally raised questions about NRC's definition of the POE and suggested or requested a more definite procedure for locating the POE.

Specifically, two commenters suggested that NRC should allow flexibility on a site-specific basis in locating the POE, and suggested that land acquisition and/or institutional controls should be considered in defining the POE. One of the commenters indicated that establishing the POE should not be constrained by presumptions that are non site-specific and restricting to the developments of ACLs.

Two commenters requested that NRC provide a more definite procedure for locating the POE, with one suggesting the use of such criteria as the historical and present uses of ground water, potential locations of ground-water extraction areas, and likely uses of water during the restoration period.

One commenter suggested that the POE should be located at a contamination plume, inside the site boundary if the plume has not reached the boundary and no farther from the POC than the facility boundary where the leading edge of the plume extend off-site. This commenter also suggested that for non-potable aquifers having a TDS concentration in excess of 10,000 mg/l, the POE location should be decided on a case-by-case basis.

One commenter indicated that the POE concept is unclear and too restrictive, especially when a site boundary may be moved inward after the site closure, in order to minimize the land deeded to the State government for perpetual control. Another commenter suggested that the POE may be located at the edge of the 200-year or 1000-year seepage front, on the grounds that such land would eventually be deeded to the State or the Federal Government.

One commenter wanted to know if the location of the POE would coincide with that of the POC for locations with Class I and Class IIA ground water. The commenter reasoned that the it is indicated in the Technical Position that at such localities, potential future use would be assessed at the point where legal control of the surface passes from the applicant to another party.

8.3 *Discussion and Response to Comments*

Definition of POE: The Technical Position defines the POE as the location where humans, wildlife, or other environmental species could reasonably be exposed to hazardous constituents from the ground water in the uppermost aquifer. Factors and criteria to be considered for defining the POE on a site-specific basis are also provided, including such factors as relevant water quality standards and water use criteria; ground-water classification; present, historical, and anticipated future uses of ground water; and planned transfer of land to State or Federal government for post-closure control. In the event that exposure can be expected to take place for more than one constituent and/or at more than one location at a particular site, the most stringent location will be considered as the POE for use in calculating the

ACLs at the POC.

The above definition is considered protective of human health and the environment, and in conformance with the applicable regulations for ACLs. NRC staff believes that the definition is also realistic and allows for the site-specific flexibility needed to render the ACL concept practical and useful.

Locating the POE at the edge of contaminant plumes: It is NRC staff's position that the POE should be located on a case-by-case basis, whether the aquifer contains useable or non-useable water. NRC staff agrees that the POE will usually be located no farther than the licensed facility boundary when the uppermost aquifer contains useable ground water. However, defining the POE at the edge of a contamination plume would not be consistent with the definition of the POE.

Land transfer to government control: ACL applicants should be aware that the land transfer provisions of UMTRCA will be considered by NRC staff in reviewing ACL applications. Section 83.b of the Atomic Energy Act of 1954, as amended (AEA), specifically requires that only the land used for disposal of any Section 11.e(2) byproduct materials be transferred to the State or Federal government for long-term control. The applicant should provide written assurance in the ACL application that the appropriate State or Federal agency will accept any land transfer in excess of that used for the disposal of any Section 11.e(2) byproduct materials, in order to justify a POE location distant from the POC.

At contaminated facilities where an entire site can not be transferred to State or Federal government control, the license remains in effect until such time as the hazardous constituents have been attenuated to established standards at the POC. It is noted, however, that the holding of licenses for unreasonable time periods to achieve compliance would not be acceptable.

Coincidence of the POE with the POC: NRC staff notes that based on the definitions of the POC and the POE, the POE would usually not coincide with the POC, even at sites with Class I and Class IIA ground water. Typically, the POC is located adjacent to the tailings pile or disposal facility, to ensure early detection of contamination. In contrast, the POE is the location where humans, wildlife, or other environmental species could reasonably be exposed to hazardous constituents from the uppermost aquifer. In the absence of an existing water use within the licensed facility boundary (e.g., discharge to a surface water body or to a water supply well), the location of the POE for Class I and Class II ground water will be the location where long-term control of the site ceases. The POE may, therefore, extend to the licensed facility boundary if there is assurance that ground-water use within the facility will not occur and that the entire site can be transferred to the State or Federal government for long-term control.

It is noted, however, that it is possible for the POE to coincide with the POC in cases where a tailings pile extends to the licensed facility boundary, where ground water extraction for use is allowed at the POC, or where State or Federal government long-term control is limited to the tailings impoundment only.

8.4 *Modifications to the Technical Position*

The Technical Position has been revised to clarify the definition of the POE and its use to establish ACLs at the POC. The Technical Position has also been revised to include guidance that the transfer of licensed land to the State or Federal government for perpetual control after the site closure will have to be considered in locating the POE.

9. Hazard and Risk Assessment

9.1 *Commenters*

American Mining Congress (A10, A11, A15, A19)
The Hopi Tribe (C8, C9, C10, C11, C15)
U.S. Department of Energy (G2)
EPA's Office of Federal Activities (H11, H12)
EPA's Office of Emergency and Remedial Response (I8, I13, I14)
U.S. Department of the Interior (J2)
Western Nuclear, Inc. (K5, K13)

9.2 *Summary of Issues*

Three commenters commented on the allowable risk level (lifetime cancer risk associated with exposure). One commenter suggested the use of the approach provided in the EPA's ACL Guidance (EPA/530-SW-87-017; dated July, 1987), to determine the risk level and the risk level range that should be allowed; namely that a risk level of 1×10^{-6} should normally be assumed, but that an alternate risk level of between 1×10^{-4} and 1×10^{-7} may be considered if it can be justified based on site-specific factors. Another commenter requested clarification about the burden of proof of the risk level assumed, and about the classes of health effects to which NRC's adopted risk-level criterion would apply. The third commenter indicated that a risk of less than 1×10^{-6} is negligible and should not warrant any consideration.

Two commenters suggested setting allowable concentration levels at the POE based on water use criteria. One of the commenters suggested that for setting these limits in useable ground-water areas, consideration should be given to using MCLs (EPA's maximum contaminant levels for drinking water pathways), and to using RfDs (EPA-derived Reference Doses) or RSDs (Risk Specific Doses) for those constituents for which no MCL exists. The other commenter indicated that the concentration levels should reflect reasonably expected use of ground water at the site.

One commenter inquired about the criteria that would be applied to evaluate the environmental effects. This commenter requested an explanation as to why the "evaluation of alienation of culturally important resources for indigenous peoples" was not included as a factor in establishing ACLs or in the environmental hazards evaluation. Another commenter requested that NRC outline procedures for identification of dominant terrestrial habitats and

community diversity assessments, which are mentioned in the Technical Position.

One commenter suggested that the risk analysis be directly related to site-specific conditions, and that the ACLs be evaluated based on "reasonable risk analysis." Another commenter indicated that the licensees should only be responsible for those potential risks or hazards that result from contamination in excess of the pre-existing contamination levels at their facilities, and that they should not be held responsible for cumulative impacts from sources outside their control.

Two commenters pointed out the need for guidance to assess the impacts of non-radioactive and non-hazardous materials. One of the commenters noted that the primary risk at mill tailing sites may come from non-radiological substances, and that the EPA has no specific information on the water pathways for radioactive and toxic materials from tailings piles. This commenter went on to state that the failure to assess this risk is unreasonable since most of the contaminants found at uranium mill tailings piles occur in the native water and soil, and do not contain many of the organic and other contaminants regulated under the Resource Conservation and Recovery Act (RCRA) of the EPA.

One commenter requested that the hazard assessment should focus on potential hazard, not just contamination; that the potential human exposure pathways should be clearly identified; and that the hazard evaluation should include more realistic exposure scenarios involving individuals. The commenter also indicated that the assessment should use such information as statistics on normal movement of individuals and normal drinking habits, as well as quantitative evaluation of the uncertainties associated with such analyses.

One commenter suggested that proximity to well-head protection areas and ground-water classification should be considered as two separate criteria in the hazard assessment review.

Finally, one commenter suggested that the risk assessment in the ACL application should be presented in a manner that conforms to what the EPA and other Federal agencies would expect to see in a risk assessment report. This commenter indicated that the draft Technical Position appears to require that information for risk assessment be repeated in different sections of the ACL application.

9.3 *Discussion and Response to Comments*

Allowable risk level: NRC staff notes that the allowable risk level and risk level range included in the draft Technical Position are similar to those provided in the EPA's ACL Guidance. However, the EPA has subsequently made revisions in the allowable risk level; while the allowable lifetime risk that can normally be assumed remained the same (i.e. 1×10^{-6}), the range of alternative risk levels that may also be considered on the basis of site-specific factors has been changed from "1×10^{-7} to 1×10^{-4}", to "1×10^{-6} to 1×10^{-4}" (40 CFR Part 300; Hazard Ranking System, Final Rule). NRC's Technical Position on ACLs has therefore been revised to reflect the EPA's revised risk level. ACL applicants should normally assume a risk level of 1 x

10^{-6} in determining ACLs; alternative risk levels between 1×10^{-6} and 1×10^{-4} may also be considered by NRC staff, however, if an applicant can demonstrate that the alternate limit is justified based on site-specific factors.

The risk levels are related to the calculated Risk Specific Doses (RSDs), which are the amounts of constituents to which humans can be exposed on a daily basis without increasing their risk of contracting cancer over a specified risk level. RSDs characterize the potency of carcinogenic constituents.

The ACL applicants should distinguish between threshold (toxic) and non-threshold (carcinogenic) effects in calculating the risk level, and that the burden of proof for an assumed risk level that is different from 1×10^{-6} is the responsibility of the applicants.

Allowable concentration levels at the POE: NRC staff agrees to using MCLs to establish contaminant concentration levels at the POE when possible, in useable ground-water areas. If MCLs do not exist for a particular constituent in the ground water at a particular site, the RFDs and RSDs can be used as a basis for establishing concentration levels at the POE. When more than one use of the water is contemplated, the use with the most restrictive standard should be considered in evaluating the ground-water quality standard used at the POE.

Potential hazard, exposure pathways and scenarios: The Technical Position makes it clear that the ACLs are evaluated in consideration of the potential hazard to human health and the environment.

Human exposure pathways have now been clearly identified in the Technical Position.

In reviewing reference and risk-specific doses proposed by the licensees, NRC staff has adopted a standard (human mass of 70 kg and 2 liters of drinking water per day), so that it may be possible to conduct impartial and consistent evaluation of risk. NRC staff does not consider it feasible for individual licensees to collect and assess statistical data on the normal movement of individuals within populations and normal water drinking habits, and to conduct quantitative evaluation of the uncertainties associated with such data, as has been suggested by one commenter.

Site-specific factors: NRC staff recognizes that the likelihood of adverse impacts due to exposure may be influenced by site-specific conditions and other environmental health factors as well as uncertainties associated with the data and the assessment used to evaluate potential adverse effects, which may therefore have to be considered in evaluating the risk level. But once again, the burden of proof for the assumed risk levels other than 1×10^{-6} is the responsibility of the licensees. Furthermore, licensees should consider the cumulative effects of human exposure to hazardous constituents.

Evaluation of environmental effects: NRC staff notes that the Technical Position offers specific criteria for evaluation of the environmental hazards, considering potential exposure to contaminated ground water and contaminated surface water. For each exposure pathway, the existing and projected constituent concentrations are to be compared with the chronic toxicity levels established by the EPA or evaluated in the technical literature for plants and animals. Acute and sub-chronic effects may also be considered when warranted, based on estimated constituent concentrations and the corresponding limits. Similarly, it must be ensured that the estimated constituent concentrations will not cause any substantial degradation or loss of function to structures as a result of the exposure.

The effects of bio-accumulation and food web interactions are to be evaluated based on published data in the literature. Aquatic life effects are to be estimated based on Federal and State water quality criteria. At sites where terrestrial wildlife may be exposed, such habitats will need to be adequately identified and assessed.

Agricultural effects are to include both direct and indirect exposure pathways. Agricultural effects associated with exposure to hazardous constituents will be evaluated based on available Federal and State water quality criteria, as well as, applicable estimates in the literature.

In evaluating the above effects, conservative estimates of the hazardous constituent concentrations are to be assumed.

Terrestrial habitats: NRC staff notes that ACL applications will include hazard assessments that evaluate potential response of environmental populations to exposure to hazardous constituents. Such assessments are to include identification of dominant terrestrial habitats and community diversity assessments, except in those instances when an applicant demonstrates that environmental hazards are not anticipated because exposure will not occur.

Culturally important resources for indigenous people: The factors to be considered in the establishment of ACLs are taken directly from those specified in Criterion 5B(6) of Appendix A to 10 CFR Part 40. The Technical Position is intended to provide guidance for implementation of the regulations in Appendix A to 10 CFR Part 40, with respect to one component of ground-water protection programs at uranium milling and tailings disposal sites; namely, the provisions for establishing ACLs. As a result the Technical Position does not address criteria and factors outside those provided in Appendix A to 10 CFR Part 40.

Impacts of non-radioactive and non-hazardous materials: NRC staff notes that a contaminant may be eligible for consideration for an ACL only if it is determined to be a hazardous constituent. According to the regulations, a constituent may be designated as hazardous if and when it meets all of the following three criteria: (1) The constituent is reasonably expected to be derived from the waste that is disposed at the site under consideration; (2) the constituent has been detected in the uppermost aquifer: and, (3) the constituent is listed in Appendix A to 10 CFR Part 40. While the Commission

reserves the right to add to the list of hazardous constituents defined on the basis of the EPA's criteria, a constituent must qualify as a hazardous constituent for consideration for an ACL.

Ground-water classification and proximity to well-head protection areas: NRC staff notes that ground-water classification is already considered in the hazard assessment review, because it forms the basis for existing and future water uses and water rights in the vicinity of a milling or disposal site. The Technical Position has been revised to refer explicitly to the well-head protection areas as existing water uses/rights.

Presentation of hazard assessment in ACL applications: NRC staff has developed the hazard assessment to meet the requirement that a constituent for which an ACL is established will not pose a hazard to human health or the environment. Evaluation factors were selected specifically for constituents at uranium mill tailings sites, and are not intended for broad application at other hazardous waste sites. The ACL application format has been organized so that applicants can identify and assess existing contamination and provide projections about potential contamination in the future. Accordingly, the assessment includes a source characterization to identify any constituents that may have already reached the uppermost aquifer from the tailings pile; and a transport assessment to evaluate the constituents that have moved away from the site. While there may appear to be some repetition of information, the reality is that the output of the source characterization is only used logically as input to the transport assessment.

9.4 *Modifications to the Technical Position*

Three modifications have been made in the Technical Position on the basis of the above comments. First, the lowest risk that need to be used for consideration of an alternate risk level has been changed from 1×10^{-7} to 1×10^{-6}. The risk level now included in the Technical Position (1×10^{-6} for a normally assumed level and between 1×10^{-6} and 1×10^{-4} for the range of an alternate level) is consistent with the EPA's current rule on hazard risk assessment.

The Technical Position has also been modified to more clearly identify and describe the primary human exposure pathways to be considered in ACL applications, and to indicate that ACL applicants should describe and evaluate the impacts from other pathways that may have to be considered based on site-specific factors.

The third modification involved including an explicit mention of the well-head protection areas as existing water use/water rights areas to be considered in hazard assessments.

10. Contaminant Plumes

10.1 *Commenters*

EPA's Office of Federal Activities (H2, H9)

10.2 *Summary of Issues*

Two issues were raised concerning existing ground-water contaminant plumes. First, it was proposed that contaminant plumes should not increase in size or concentration above allowable health or environmental levels. Second, it was proposed that if a contaminant plume is already discharging into surface water, ACLs should be set in a manner that prevents: (a) statistically significant increases in contaminant concentrations above background concentrations in the surface water; and, (b) receptors exposure to unsafe levels of contamination before the contaminants reach the surface water. The commenter also indicated that allowable health and environmental limits may be substituted for the background levels in the surface water.

10.3 *Discussion and Response to Comments*

Limiting the size and concentration levels of contaminant plumes: Stringent implementation of this requirement would either preclude establishment of ACLs at existing sites or promote disregard for the Technical Position because compliance is not attainable. It is noted that even with corrective action, contaminant plumes could increase in size and/or concentration as a result of advection, dispersion, and other natural processes that may influence or control contaminant transport. Additionally, the commenter's proposal makes no reference to the location of the plume relative to the POC or the POE, and would therefore require that plumes not increase in size or concentration regardless of the contaminant concentrations at these two control points. Accordingly, a stringent implementation of this requirement is considered inappropriate by NRC staff.

A less stringent interpretation and implementation of the above requirement may allow increases in the size or concentration of contaminant plumes, provide that the volume of ground water that is contaminated above allowable levels does not increase. It is noted, however, that even this requirement could be violated as dispersion transports contaminants away from the highest contamination at the core of the plume.

It is further noted that plume growth or contraction is of limited significance unless it can be related to protection of humans or the environment. For example, a contaminant plume may be allowed to expand up-gradient from the POE in concentrations above allowable exposure limits provided that such limits are not exceeded at the POE.

Finally, it is noted that the intent of ground-water protection at uranium mills, as defined in EPA's and NRC's regulations, is to provide protection to humans and the environment from ground-water contamination. At sites where contamination already exists, ACLs need to be established so that they are:

(a) protective of human health and the environment; and, (b) as low as reasonably achievable, regardless whether or not the contaminant plumes increase in size and/or concentration. The proposed requirement that existing contaminant plumes not increase in size or concentration goes beyond the current applicable regulations of the EPA and NRC under the AEA.

Plume discharge into surface water: NRC staff is in agreement that ACLs be set to protect surface water resources and potential receptors of contaminants from surface waters, by ensuring that discharges from contaminant plumes to surface waters do not result in surface water contamination in excess of background or allowable health or environmental levels.

10.4 *Modifications to the Technical Position*

The Technical Position provides for protection of potential receptors against significant contamination received from ground-water contaminant plumes discharging into surface waters. No revisions are needed.

11. Corrective Action

11.1 *Commenters*

American Mining Congress (A12, A20)
The Hopi Tribe (C7)
EPA's Office of Emergency and Remedial Response (I2, I3, I4, I7, I15)
Western Nuclear, Inc. (K8, K12, K17)

11.2 *Summary of Issues*

Two commenters raised questions about the provision that licensees should consider only proven techniques in corrective action programs. Both commenters indicated that new techniques and technologies should be encouraged, not discouraged, if licensees demonstrate that the new techniques stand a good chance of being successful and effective.

One commenter indicated that there is no need to prepare a corrective action plan unless and until the applicable ground-water quality standard has been exceeded.

One commenter suggested that NRC should include consideration of ground-water classification and proximity to well-head protection areas in the assessment and review of corrective actions as well as in the design and implementation of compliance monitoring and corrective actions.

Three commenters raised issues concerning the concept of "as low as reasonably achievable" or ALARA. Two commenter questioned the applicability of this concept to mill tailing sites, with one indicating that there was no statutory basis for ALARA in UMTRCA and this concept should therefore be deleted from the Technical Position. The other commenter indicated that it was not reasonable to require contaminant reduction to ALARA levels if threshold

pollutants are involved; and noted further that ALARA had traditionally involved engineering controls, which may appear to be in conflict with reliance on natural remediation processes, which need not be the case. The third commenter requested that NRC policy on ALARA be discussed with respect to the criteria that would apply in assessing "reasonably" achievable levels and "practicable" corrective actions, particularly at Title I sites.

11.3 *Discussion and Response to Comments*

Proven techniques: The Technical Position was not intended to rule out the application of new techniques or technologies that may be developed and prove to be effective in the future. The Technical Position has now been revised to indicate that new and promising corrective actions proposed by the ACL applicants will be considered provided there is an adequate documentation of the likelihood for success.

Development of alternative corrective actions: NRC staff notes that the applicable regulations in 40 CFR Part 192 Subparts D&E and Appendix A to 10 CFR Part 40 require that ACLs be as low as reasonably achievable (ALARA), considering practicable corrective actions. The regulations therefore require that alternative practicable corrective actions be developed, and that a corrective action meeting the ALARA criterion be chosen and used to establish the ACLs. Accordingly, ACLs may not be established independently of the corrective action program as suggested by the commenter.

Ground-water classification and proximity to well-head protection areas: Ground-water classification and well-head protection areas, which can be considered as existing water use areas, have been adequately considered in the hazard assessment review. Using these factors in the assessment and review of corrective actions would be redundant. Furthermore, the regulations has specifically indicated that the review and assessment of corrective actions and selection of appropriate action would be based on the ALARA criterion; therefore, consideration of ground-water classification and well-head protection areas in the corrective action review as suggested by the commenters is also not consistent with the regulations.

As for the consideration of these factors in the design and implementation of corrective actions and compliance monitoring programs, it is noted that the Technical Position is intended to provide guidance for establishing and applying for ACLs. Although alternative practicable corrective actions will be identified and analyzed for establishing appropriate ACLs, guidance for performance monitoring and operational corrective action is beyond the scope of the Technical Position.

Use of ALARA: NRC staff notes that the use of ALARA is mandated by Criterion 5B(6) of Appendix A to 10 CFR Part 40, which states that NRC will establish ACL for a hazardous constituent, if it finds that "the proposed limit is as low as reasonably achievable." Similarly, 40 CFR Part 192.32(a)(2)(iv) states that the ACLs may be granted by the NRC provided that these limits are "as low as reasonably achievable." The Technical Position simply provides guidance

for implementing these regulations, and the inclusion of ALARA in the Technical Position is not therefore debatable.

The term "reasonably achievable" in ALARA takes into account practicable corrective actions and such relevant factors as the state of remedial action technology, economics, public health and safety and other societal and socioeconomic considerations.

The consideration of "practicable corrective actions" in determining ALARA concentration limits is taken directly from the regulations and cannot therefore be replaced. NRC staff notes that in the introduction to Appendix A to 10 CFR Part 40, it was stated that the Commission will consider "practicable" and "reasonably achievable" as equivalent terms. NRC staff agrees that the use of the term "practicable" may be tied to a balancing of costs and benefits, but it is noted that this applies to Title II sites only, because Title I sites are not covered in the final Technical Position.

11.4 *Modifications to the Technical Position*

The Technical Position has been modified so that new and innovative corrective action techniques proposed by ACL applicants will be considered in the establishment of ACLs if a strong likelihood of success can be demonstrated.

12. Costs and Benefits of Corrective Action

12.1 *Commenters*

American Mining Congress (A9)
The Hopi Tribe (C7, C16, C17)
EPA's Office of Emergency and Remedial Response (I16)
Western Nuclear, Inc. (K7)

12.2 *Summary of Issues*

Two commenters requested that NRC review of ACL applications should give greater emphasis to corrective action costs and the balancing of the costs and benefits. The commenters noted that the cost of active remediation measures can be extremely high compared to the expected benefits.

One commenter asked if the costs and benefits should be considered in evaluating "practicable" corrective actions and if so, what the basis in law is for allowing the balancing of the costs and benefits of remediation at Title I sites. This commenter also stated that the Technical Position should describe criteria used to assess the costs and benefits under Section 102(B) of the National Environmental Policy Act (NEPA), if a cost-benefit analysis is to be performed. The commenter further asked that NRC justify the use of reductions in the hazardous constituent concentrations as a surrogate for all corrective action benefits. The commenter noted that this is a limitation that may skew the decision-making by systematically underestimating the benefits.

It was also noted that other benefits should be considered, including those accruing from avoiding the costs of health and environmental effects and the benefits from moving from one level of beneficial use of the resources to another. The commenter indicated that it would be more appropriate to use a standard decision-making model that considers "externalities" and marginal analyses of social costs and social benefits, instead of private costs and benefits, in order to accomplish economic efficiency in a social context.

One commenter indicated that certain language used in the Technical Position may be construed to imply that non-monetary benefits may be discounted, and that the Technical Position should therefore be modified to remove this ambiguity.

12.3 *Discussion and Response to Comments*

Corrective action costs: The Technical Position adequately covers the corrective action costs, as the cost constitutes an important consideration in selecting the corrective action used in ACL assessments.

Basis in law for balancing the costs and benefits at Title I sites: The term "practicable" used to characterize corrective actions feasibility in the Technical Position allows for balancing of the costs and benefits in ACL assessments. NRC staff notes, however, that the final version of the Technical Position applies to Title II sites only; therefore, discussing the basis in law for allowing such balancing of the costs and benefits for Title I sites is beyond the scope of this document.

Criteria for evaluating the costs and benefits with respect to Section 102(B) of NEPA: The factors that NRC staff considers in evaluating ACLs are explicitly delineated in Criterion 5B(6) of Appendix A to 10 CFR Part 40. These criteria were derived from, and are identical to, the criteria presented in 40 CFR Part 264.94 as well as 40 CFR Part 192. NRC staff must consider these criteria because UMTRCA directs that NRC's requirements should conform "as closely as practicable" to the general standards established by the EPA in 40 CFR Part 192. The draft Technical Position is designed to implement the provisions of Appendix A to 10 CFR Part 40, not to establish new criteria for consideration in ACL assessments.

Corrective action benefits: The Technical Position calls for consideration of both direct and indirect benefits of corrective actions at milling and tailings sites. Specifically, the following benefits have been mentioned: (1) Avoided adverse health effects and potential damage to livestock, crops, vegetation, physical structures, and wildlife; (2) the value of protected ground water that can be recovered for beneficial uses; (3) prevented land depreciation; (4) benefits accrued as a direct result of performing corrective action; and (5) other indirect benefits that may be realized as a result of avoiding adverse environmental effects identified in the hazard assessment review.

Marginal analysis of social costs and social benefits: NRC staff believes that calculation of remedial action benefits as described in the Technical Position provides enough technical detail to adequately cover the marginal analysis of the social costs and the social benefits associated with remedial action at milling and tailings sites. It is planned that the analysis will be conducted on a site-specific basis, but NRC staff will ensure that the analysis consider factors regarding the health and environmental costs of failing to meet the ALARA standard encompassed in Appendix A to 10 CFR Part 40.

Non-monetary benefits: NRC staff notes that the implication that non-monetary benefits should be discounted is neither apparent nor is it intended in the Technical Position. The Technical Position directs reviewers to ensure that costs and benefits are compared objectively, and to specifically consider such non-monetary benefits such as the benefits accrued from avoiding adverse health and environmental effects.

12.4 *Modifications to the Technical Position*

Modifications were made in the Technical Position to clarify NRC staff's position on the above issues.

13. Passive Remedial Action Measures

13.1 *Commenters*

American Mining Congress (A7)
EPA's Office of Federal Activities (H1, H3)
EPA's Office of Emergency and Remedial Response (I5)
Western Nuclear, Inc. (K1, K4, K6)

13.2 *Summary of Issues*

Three passive remedial action measures were addressed by commenters: Natural attenuation processes, institutional controls, and land/property holdings.

Three commenters suggested or agreed that NRC should consider and recognize the importance of natural attenuation processes as passive contaminant containment and/or corrective measures in site remediation. There was some disagreement, however, about the length of the attenuation path, with one commenter indicating that the entire site/property should be considered for attenuation, and another commenter suggesting that attenuation should be considered only between the POC and the POE. One of the commenters noted also that since more time is needed for natural attenuation to be effective, one measurement above an ACL should not trigger a corrective action program.

Two commenters advanced opposite views on consideration of institutional controls in the development of ACLs, with one commenter indicating that institutional controls should be considered for this purpose and the other suggesting the deletion of institutional controls from the Technical Position altogether.

Two commenters advance opposite views on the use of increased land/property holdings in ACL assessments. One commenter stated that there is no reason why increased land holdings should not be used for allowing greater ACLs, but the other commenter indicated that increased property holdings should not be used for such purpose.

13.3 *Discussion and Response to Comments*

Natural attenuation processes: Natural attenuation processes have been addressed in the Technical Position. Such processes as dilution, dispersion, decay, and sorption that may attenuate hazardous constituent concentrations are adequately covered as natural contaminant containment measures.

Contaminant attenuation by natural processes at tailings disposal sites can be expected to take place between the tailings impoundment and the uppermost aquifer at the POC, and between the POC and the POE. ACLs should be established considering the effects of attenuation on a site-specific basis. If the amount of attenuation can be defensibly estimated between the tailings impoundment and the POE, the ACL may then be back-calculated from health and environmental limits established for the POE. The site-specific consideration of attenuation in determining ACLs is consistent with the EPA standards in 40 CFR Part 264.94(b)(1)(ii) and(2)(ii), and with NRC's regulations in Appendix A to 10 CFR Part 40, Criterion 5B(6).

The ACL demonstration should consider both the temporal and spatial distribution of attenuation. For example, reliance on attenuation may not be appropriate if it will merely delay contamination at the POE for a number of years.

Where attenuation is not effective in reducing contaminant concentrations and at sites where extensive contamination has already occurred, it may be appropriate to disregard attenuation as a significant process in determining ACLs.

Finally, it is noted that the purpose of the Technical Position is to provide guidance for applying for ACLs and review of ACL applications. NRC is required by regulation to verify that the proposed ACLs are protective of human health and the environment and that they are as low as reasonably achievable, considering practicable corrective actions. Accordingly, NRC will need to review a range of alternative corrective action programs, which may include natural attenuation, as part of the ACL application review, in order to ascertain that the established ACLs are as low as reasonably possible. But performance monitoring and triggering and applying of operational corrective action programs to remedy contamination is beyond the scope of the Technical Position.

Institutional controls: It is noted that Sections 104 and 202 of UMTRCA provide for the use of institutional controls to isolate the tailings from the human environment. The likelihood of human exposure to contaminated ground water could be significantly reduced if appropriate institutional controls are adopted to preclude such exposure. NRC staff will therefore consider a form

of institutional control due to perpetual care in its review of ACL applications. This position is adequately reflected and described in the Technical Position.

Land/property holdings: As noted above, UMTRCA provides for the use of institutional controls to isolate the tailings from the human environment. NRC staff considers the ownership and control of land and subsurface water rights through perpetual care a form of institutional control that can provide protection against the use and consumption of contaminated ground water.

Furthermore, ACL applicants should be aware that the land transfer provisions of UMTRCA will be considered by NRC staff in reviewing ACL applications. Section 83.b of the AEA specifically requires that only the land used for disposal of any Section 11.e(2) byproduct materials be transferred to the Federal government or State for long-term institutional control. The applicant will therefore have to provide written assurance in the ACL application that the appropriate Federal or State agency will accept any land transfer in excess of that used for the disposal of any Section 11.e(2) byproduct materials. The Technical Position has now been revised to clearly state NRC staff's position on this issue.

13.4 *Modifications to the Technical Position*

The Technical Position was revised, where appropriate, to clarify NRC staff's position on consideration of the above-mentioned passive remediation measures in ACL assessments.

14. Period of Compliance

14.1 *Commenters*

The Hopi Tribe (C13)

14.2 *Summary of Issues*

The commenter asked that NRC describe the criteria to be used for determining the compliance periods for Title I and Title II sites. The commenter concluded by stating that there was no reason to limit compliance to a specific time frame, implying that compliance should be effective indefinitely.

14.3 *Discussion and Response to Comments*

The period of compliance for both Title I and Title II sites is defined in the regulations as 1,000 years, to the extent it is reasonably achievable, and, in any case, for at least 200 years. These criteria were derived from, and are identical to, the general standards promulgated by the EPA in 40 CFR Part 192.32(b)(i).

14.4 *Modifications to the Technical Position*

No modifications were made in the Technical Position on the basis of the above comment.

15. **Post-Closure Care**

15.1 *Commenters*

EPA's Office of Federal Activities (H6)

5.2 *Summary of Issues*

The commenter proposed extending the post-closure care period at facilities where contaminant concentrations in useable ground water exceed allowable health and environmental levels.

15.3 *Discussion and Response to Comments*

Pursuant to UMTRCA, custody of the tailings sites is to be transferred, following stabilization and closure by the licensee, to the State or Federal government for perpetual control. If ground water contains contaminants in excess of allowable health or environmental levels, transfer of the site to government control would include the contaminated areas; or the contaminated ground water will have to be restored to appropriate levels prior to the transfer. Consequently, there is no need to extend the post-closure period at tailings sites because they will be licensed under perpetual government control.

15.4 *Modifications to the Technical Position*

No modifications were made in the Technical Position as a result of the above comment.

16. **State Programs**

16.1 *Commenters*

Colorado Department of Health (B1, B2, B3, B4, B5)

16.2 *Summary of Issues*

The commenter noted that under DOE's Title I Uranium Mill Tailings Remedial Action (UMTRA) program, Colorado will pay its share or 10% of the remedial action cost for seven Title I sites located in Colorado. The commenter then proceeded to raise a number of issues that are largely related to the State's participation in the ACL development process at such sites.

The commenter stated that the establishment of ACLs would be necessary at Title I sites for some contaminants because it is not technically feasible to design a cell that will "completely" eliminate infiltration of precipitation

into the tailings, but noted that only minor "exceedances" are expected at most of the Title I sites.

The commenter indicated that Colorado is an Agreement State, which gives it the authority to assume NRC's licensing authority for active uranium mill tailings sites. The commenter indicated that NRC had "expressed" that the authority to grant ACLs for inactive Title I sites will also be deferred to the State, but gave no reference to this "expression" by NRC. The commenter concluded that the Technical Position would serve as a guide to the decision makers in the State.

The commenter further noted that because ACLs should be granted on the basis of ground-water classification, and in that ground-water classification in Colorado are granted by the Colorado Water Quality Control Commission, an agreement could be reached for vesting the State authority to approve ACLs for DOE's Title I sites with that organization. The commenter proceeded to present alternative procedures that the State could provide to the Colorado Water Quality Control Commission for setting ground-water standards for Title I sites.

The commenter indicated that the DOE had requested guidance on how the ACL approval process for Title I sites would be implemented by the State. The commenter further indicated that due to time constraints on Title I site remediation, DOE must receive approval of ACLs "as soon as possible". The commenter proceeded to describe a procedure that the State could use for this purpose, using its "Basic Standards for Groundwater" to specify some compliance area beyond which the contaminants are not expected to migrate.

16.3 *Discussion and Response to Comments*

Guidance for ACL development at Title I sites is not addressed in the final Technical Position.

16.4 *Modifications to the Technical Position*

Reference to Title I sites has been removed from the Technical Position.

Enclosure 3

U.S. NUCLEAR REGULATORY COMMISSION

Uranium Mill Facilities: Availability of Final Technical Position
on Alternate Concentration Limits for Title II Uranium Mills

AGENCY: U.S. Nuclear Regulatory Commission

ACTION: Notice of Availability

SUMMARY: The Nuclear Regulatory Commission is announcing the availability of a final staff Technical Position entitled "Staff Technical Position on Alternate Concentration Limits for Title II Uranium Mills." This Technical Position offers guidance for preparing and reviewing applications for the establishment of alternate concentration limits (ACLs) at Title II uranium mill tailings sites, pursuant to Criterion 5 of Appendix A to 10 CFR Part 40.

The final Technical Position represents a revised and updated version of NRC's draft Technical Position on ACLs, which was announced in the Federal Register in June of 1988 (53 FR 24820). The revisions were made largely in response to comments that NRC received on the draft Technical Position.

ADDRESSES: Requests for copies of the final Technical Position should be addressed to Latif S. Hamdan, Uranium Recovery Branch, Division of Low-Level Waste and Decommissioning, Office of Nuclear Material Safety and Safeguards, Mailstop 5-E-4 OWFN, U.S. Nuclear Regulatory Commission, Washington D.C. 20555.

FOR FURTHER INFORMATION CONTACT: Latif S. Hamdan, Uranium Recovery Branch, Division of Low-Level Waste and Decommissioning, Office of Nuclear Material Safety and Safeguards, Mailstop 5-E-4 OWFN, U.S. Nuclear Regulatory Commission, Washington D.C. 20555. Telephone: (301) 504-2528.

Dated at Rockville, Maryland this ____ day of _____, 1992.

FOR THE NUCLEAR REGULATORY COMMISSION

John J. Surmeier, Chief
Uranium Recovery Branch