

**ACCEPTING MIXED WASTE AS ALTERNATE FEED MATERIAL FOR
PROCESSING AND DISPOSAL AT A LICENSED URANIUM MILL**

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ABSTRACT

Certain categories of mixed wastes that contain recoverable amounts of natural uranium can be processed for the recovery of valuable uranium, alone or together with other metals, at licensed uranium mills, and the resulting tailings permanently disposed of as 11e.(2) byproduct material in the mill's tailings impoundment, as an alternative to treatment and/or direct disposal at a mixed waste disposal facility.

This paper discusses the regulatory background applicable to hazardous wastes, mixed wastes and uranium mills and, in particular, NRC's Alternate Feed Guidance under which alternate feed materials that contain certain types of mixed wastes may be processed and disposed of at uranium mills. The paper discusses the way in which the Alternate Feed Guidance has been interpreted in the past with respect to processing mixed wastes and the significance of recent changes in NRC's interpretation of the Alternate Feed Guidance that sets the stage for a broader range of mixed waste materials to be processed as alternate feed materials.

The paper also reviews the legal rationale and policy reasons why materials that would otherwise have to be treated and/or disposed of as mixed waste, at a mixed waste disposal facility, are exempt from RCRA when reprocessed as alternate feed material at a uranium mill and become subject to the sole jurisdiction of NRC, and some of the reasons why processing mixed wastes as alternate feed materials at uranium mills is preferable to direct disposal.

Finally, the paper concludes with a discussion of the specific acceptance, characterization and certification requirements applicable to alternate feed materials and mixed wastes at International Uranium (USA) Corporation's White Mesa Mill, which has been the most active uranium mill in the processing of alternate feed materials under the Alternate Feed Guidance.

INTRODUCTION

Under U.S. rules, mixed waste is waste that contains hazardous constituents regulated under the Resource Conservation and Recovery Act ("RCRA") and radioactive constituents regulated under the Atomic Energy Act ("AEA"), as amended, and is hence subject to dual jurisdiction by the Environmental Protection Agency ("EPA") (or the equivalent State authority) and the Nuclear Regulatory Commission ("NRC") (or the equivalent State authority) or the Department of Energy ("DOE")¹.

Thus far, there have been limited disposal options for mixed waste, with the result that large quantities of such wastes (particularly DOE wastes) have had to be exempted from RCRA storage limitations. As a result, disposition of mixed waste has posed a difficult regulatory conundrum that neither generators nor regulators have been able to solve effectively to date.

In light of this substantial regulatory uncertainty, it is useful to know that certain mixed wastes can be processed at a licensed uranium mill as alternate feed material under NRC's "Final Position and Guidance on the Use of Uranium Mill Feed Material Other Than Natural Ores" (the "Alternate Feed Guidance")² for the recovery of contained natural uranium, and the resulting tailings and wastes, including the RCRA constituents, disposed of permanently in the mill's tailings impoundment as 11e.(2) byproduct material, typically at much less cost than direct disposal at a mixed waste disposal facility. As 11e.(2) byproduct material, the wastes are not mixed wastes and are regulated solely by NRC, thereby eliminating dual EPA/NRC jurisdiction.

This paper will briefly discuss the regulatory background applicable to hazardous wastes, mixed wastes and uranium mills and, in particular, the Alternate Feed Guidance under which alternate feed materials that contain mixed wastes may be processed and disposed of at uranium mills. The paper will discuss the way in which the Alternate Feed Guidance has been interpreted in the past with respect to processing mixed wastes and the significance of recent changes in NRC's interpretation of the Alternate Feed Guidance that sets the stage for a broader range of mixed waste materials to be processed as alternate feed materials.

REGULATORY BACKGROUND

Regulation of Hazardous Wastes

Hazardous wastes are regulated by EPA (or the equivalent state authority)³ under RCRA. If a material is a "solid waste," as defined in 40 C.F.R. § 261.2, it may be classified as either a *characteristic* hazardous waste, as defined in 40 C.F.R. §§ 261.20-24, or a *listed* hazardous waste, as defined in 40 C.F.R. §§ 261.30-33. Generally, a *characteristic* hazardous waste is a solid waste that exhibits one of the *characteristics* of toxicity, ignitability, corrosivity or reactivity, and *listed* hazardous wastes are solid wastes that are enumerated on any one of a number of specified lists of chemicals and metals, or that resulted from any one of a number of specifically *listed* processes.

Unless specifically exempted, *characteristic* and *listed* hazardous wastes must generally be disposed of in a facility that is regulated under 40 C.F.R. Part 264 (a “RCRA Subtitle C” facility), and is hence subject to the jurisdiction of EPA.

There are a number of exemptions from these requirements, most notably, the *Bevill* exemption, which exempts extraction, beneficiation and certain mineral processing wastes from regulation under RCRA in certain circumstances; the ability to obtain a “contained out” determination where environmental media such as soils or sediments contain *listed* hazardous wastes at *de minimus* levels; the “recycling” exemption, which exempts materials that exhibit a hazardous *characteristic* but are reclaimed to recover a valuable material in accordance with RCRA guidelines; and the *source material* exemption. The recycling exemption and the *source material* exemption will be discussed in more detail below.

Regulation of Uranium Mills

Under the AEA, NRC (or the equivalent state authority⁴) has sole jurisdiction over the regulation of *source material* (i.e., uranium and thorium), special nuclear material and byproduct material (which includes uranium recovery tailings and wastes, i.e., 11e.(2) byproduct material). As uranium mills process *source material ores* for the recovery of *source material*, and in so doing create and dispose of 11e.(2) byproduct material, uranium mills and their operations are primarily subject to regulation by NRC under the AEA, as amended by the Uranium Mill Tailings Radiation Control Act (“UMTRCA”). UMTRCA requires NRC to conform its requirements with applicable EPA environmental standards for uranium mill tailings. Uranium mills are also subject to the requirements of Clean Air Act radon emission limits, and typically air quality permits issued by the state in which the mill is located.

The AEA, as amended by UMTRCA, gives NRC wide-ranging authority to regulate the disposal of 11e.(2) byproduct material. EPA and NRC regulations, developed under UMTRCA, provide a unique and extremely protective regime of controls to limit releases of radionuclides and *non-radiological* (e.g., hazardous) materials into the environment. In addition, when uranium mills are finally decommissioned and tailings are stabilized, NRC regulations require “passive” control systems, paid for by the licensee, which will provide *reasonable assurance* that potential radiological and *non-radiological* hazards will be controlled for a minimum of 200, and to the extent practicable, 1,000 years, without “active” (i.e., ongoing) maintenance. Finally, UMTRCA requires transfer of the tailings impoundments and any other property required for the disposal of byproduct material, along with associated long-term care funds, to DOE or the State where located for perpetual care. As a practical matter, this means that the U.S. Government, through DOE, will become an NRC licensee for each uranium mill site in perpetuity, and will have the funds provided by the mill licensee for long term surveillance and any necessary long-term care. Each operating mill must maintain an NRC-approved financial surety arrangement, adequate to cover the estimated costs, as accomplished by a third party, for decommissioning and decontamination of the mill and the mill site, reclamation of any tailings or waste disposal areas, ground-water restoration as warranted, and long-term surveillance.

NRC's Alternate Feed Guidance

Under a uranium mill's NRC license, the mill is licensed to process natural uranium *ores*. In 1995, NRC issued the Alternate Feed Guidance. Alternate feeds consist of uranium-bearing residues from uranium processing facilities or other metal processing facilities, as well as environmental media (soils) contaminated with natural uranium. Under the Alternate Feed Guidance, NRC permits licensees to process alternate feed materials in uranium mills if the following three conditions are satisfied:

- The alternate feed material meets the NRC definition of “*ore*,” which is “ a natural or native matter that may be mined and treated for the extraction of any of its constituents *or any other matter from which source material [i.e., uranium or thorium] is extracted in a licensed uranium or thorium mill*” [emphasis added]. This includes 11e.(2) byproduct material from other facilities, and other processing wastes from *ores* which have previously been beneficiated for other minerals (i.e., refined or processed ores).
- The proposed alternate feed material does not contain any RCRA *listed* hazardous wastes. However, potential alternate feed materials that exhibit only a *characteristic* of RCRA hazardous waste may be processed as alternate feed materials at uranium mills.
- The alternate feed material must be processed “*primarily*” for its *source material* content. This has recently been interpreted by NRC to mean that the material is actually processed at the uranium mill for the recovery of uranium (alone or in combination with other metals) and it is reasonable to expect that uranium will be recovered. There is no minimum amount of uranium that must be recovered, nor is there any requirement that the value of the uranium recovered must exceed the cost of processing or any processing or recycling/disposal fee

Currently, NRC policy requires that a specific license amendment must be obtained for processing each proposed alternate feed material. If a proposed alternate feed material satisfies these three conditions, then, upon application by the licensee, NRC will issue an amendment to the license permitting processing of such materials as *ore*, with the resultant wastes, including tailings, being classified as 11e.(2) byproduct material. 11e.(2) byproduct material is subject to the federal regulatory framework described above under the heading “Regulation of Uranium Mills.”

Regulation of Mixed Wastes

As stated above, mixed wastes are wastes that contain hazardous wastes regulated under RCRA and radionuclides regulated under the AEA. As such, they are subject to dual jurisdiction by EPA and NRC. There are a limited number of facilities in the United States that are licensed to treat and dispose of mixed waste.

As is evident from the foregoing discussion, however, any waste that, were it to be disposed of would be classified as a mixed waste, because it contains *characteristic*

hazardous wastes⁵ together with natural uranium, alone or together with natural thorium and their respective progeny⁶, may be processed as an alternate feed material at a uranium mill if it is reasonable to expect that uranium can be extracted from the materials⁷. The resulting tailings would be disposed of permanently in the mill's tailings impoundment as 11e.(2) byproduct material.

The ability to process these types of mixed wastes as alternate feed materials at a licensed uranium mill and recycle a valuable energy resource provides an alternative to more costly disposal of these types of mixed wastes at mixed waste treatment and disposal facilities.

HISTORICAL APPLICATION OF ALTERNATE FEED GUIDANCE TO PERMIT THE PROCESSING AND DISPOSAL OF MIXED WASTE

While a few alternate feed materials were processed by uranium mills in the 1980's, the primary processor of alternate feed materials since the beginning of the 1990's has been International Uranium (USA) Corporation's ("IUC's") White Mesa Mill, located near Blanding Utah

Since 1994, the White Mesa Mill has received 14 license amendments to process alternate feed materials. The White Mesa Mill is the only facility to have received amendments from NRC under the Alternate Feed Guidance to receive and process alternate feed materials. To date, IUC has not been denied a license amendment request to process alternate feed materials.

Several of these alternate feed materials have exhibited *characteristics* of RCRA hazardous wastes. One of these alternate feeds, the Cotter Concentrate, was actually classified as mixed waste at the Nevada Test Site, due to its RCRA *characteristics*, but was reclassified as an alternate feed material and processed at the White Mesa Mill for the recovery of uranium.

Until January 2001, EPA and the State of Utah Department of Environmental Quality ("UDEQ"), which has RCRA authority in the State of Utah, did not question the ability of uranium mills to process alternate feed materials that contain RCRA *characteristic* wastes under the Alternate Feed Guidance. The agencies relied implicitly on the RCRA recycling exemption that is available to exempt a RCRA *characteristic* waste from regulation under RCRA if it is legitimately recycled in accordance with RCRA guidance. However, no independent analysis under RCRA was ever performed to determine whether or not the RCRA recycling guidance actually applied to exempt any particular alternate feed material from the RCRA requirements. It appears that each agency implicitly accepted the concept that if a material is approved by NRC for processing at a uranium mill for the recovery of uranium, it must be considered to be legitimately recycled under the RCRA Guidance such that it is exempt from RCRA.

RECENT APPLICATION OF ALTERNATE FEED GUIDANCE TO PERMIT THE PROCESSING AND DISPOSAL OF MIXED WASTE

In December 2000, IUC filed an application to amend its NRC license to allow the White Mesa Mill to receive and process certain waste materials from a rare earth producer as alternate feed material pursuant to the Alternate Feed Guidance.

The materials consisted of approximately 17,750 tons of lead sulfide sludge containing uranium. The materials, which resulted from the extraction of lanthanides and other rare earth materials, were stored in ponds at the generator's facility. The materials were estimated to have an average uranium content of approximately 0.15%. The lead content in the materials was a natural component of the *ore* (similar to many *ores* processed by IUC) and was at levels such that the materials might not have passed EPA's Toxicity Characteristic Leaching Procedure ("TCLP"). Consequently, unless exempted from RCRA, the materials potentially could have been subject to regulation as a RCRA *characteristic* hazardous waste. The materials did not however, contain any *listed* hazardous waste as defined in RCRA.

In a letter received by NRC on February 12, 2001, EPA headquarters expressed concerns regarding IUC's application. Specifically, EPA advised NRC that according to EPA's Region 9 Office, the materials were regulated under RCRA as a *characteristic* hazardous waste and had been classified by the State of California as such.⁸ EPA further stated that it is "unclear whether RCRA jurisdiction would apply to some components of the waste after it is licensed as a *source material*," and, in particular, questioned IUC's analysis, as stated in the license amendment request, that once NRC has determined the waste to be deemed *source material* it could be removed from the generator's facility as a "recycled mineral waste." In the letter, EPA requested that NRC meet with EPA to clarify this point and to work with EPA to reach a consensus on the issue. In a follow-up letter received by NRC on April 5, 2001, EPA advised NRC that the determination as to whether the materials were hazardous waste required resolution of several issues, including whether the materials in question were "solid wastes." EPA noted that generally materials are not classified as "solid wastes" when they are legitimately reclaimed, and therefore such materials are not considered hazardous wastes under Subtitle C of RCRA. The letter further stated that EPA had authorized the State of California and the State of Utah to implement their State RCRA programs in lieu of the Federal RCRA program and that NRC should obtain the views of California, Utah and Nevada (through which the materials were to be transported) on this matter. In discussions with the State of Utah Division of Solid and Hazardous Waste ("UDSHW"), UDSHW advised IUC that it interpreted the April 5, 2001 EPA letter as EPA deferring to the State with respect to whether the processing of the materials as an alternate feed material would be exempt from RCRA. UDSHW advised IUC that, based on the letter from EPA, UDSHW would apply standard RCRA guidance to determine whether or not the materials would be legitimately "recycled" at the White Mesa Mill, and hence exempt from RCRA pursuant to 40 C.F.R. § 261.2(e).

In response, IUC argued that the primary issue was not whether the materials would be “recycled” and, therefore, would not be hazardous waste, but rather whether the materials were *source material ore* and hence were not solid waste and, therefore, not regulated under RCRA.

Specifically, IUC argued that only “solid wastes” may be regulated as “hazardous waste” under RCRA. *See* 42 U.S.C. § 6903(5); 40 C.F.R. § 261.3. *Source material* is expressly excluded from the definition of “solid waste.” RCRA provides that the term “solid waste” does not include:

source, special nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, (68 Stat. 923) [42 U.S.C. §§ 2011 *et seq.*].

42 U.S.C. § 6903(27); *see also* 40 C.F.R. § 261.4(a)(4). Consequently, since *source material* is not a “solid waste,” it cannot be classified as “hazardous waste.” Therefore, *source material* is not subject to regulation by EPA or an authorized state pursuant to RCRA.

Since RCRA must rely on the AEA definition of *source material*, an understanding of what qualifies as “*source material*” under the AEA was critical to IUC’s argument. *See* 42 U.S.C. § 6903(27); 40 C.F.R. § 261.4(a)(4). The term *source material* is defined to mean:

(1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of section 61 to be *source material*; or (2) *ores* containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.

42 U.S.C. § 2014z (*emphasis added*). NRC has determined that licensable or licensed *source material ore* must contain at least 0.05% uranium and/or thorium. *See* 10 C.F.R. § 40.4. Thus, any material that satisfies NRC’s definition of *ore* and contains 0.05% or greater uranium is *source material* and, therefore, is excluded from regulation under RCRA.

As discussed above, in order to be approved for processing at a uranium mill under the Alternate Feed Guidance, an alternate feed material must be an *ore*. Therefore, an alternate feed material with a uranium content of 0.05% or greater is *source material ore*, and, for the reasons stated above, such *source material ore* is exempt from regulation under RCRA.

Based on this logic, and because the lead sulphide sludge material contained in excess of 0.05% uranium, it was unnecessary to engage in a RCRA recycling analysis with respect to the materials. IUC argued that upon issuance by NRC of an alternate feed material license amendment to IUC to process the materials as *source material ore* at the White

Mesa Mill, and the materials were destined for processing at the White Mesa Mill pursuant to that amendment, neither EPA nor a state with delegated RCRA authority had jurisdiction over the materials under RCRA.

NRC and EPA accepted these arguments, and NRC issued the license amendment on this basis.

SIGNIFICANCE OF THE RECENT NRC DECISION ON THE PROCESSING OF MIXED WASTES AS ALTERNATE FEED MATERIALS

NRC's recent position on this issue is significant for three reasons. First, it makes it absolutely clear that any alternate feed material that exhibits *characteristics* of RCRA hazardous waste and contains at least 0.05% uranium and/or thorium can be processed at a uranium mill for the recovery of uranium, without any need to refer to RCRA recycling guidance. The alternate feed materials are *source material ore* and are exempt from RCRA.

Second, while not applicable in the case of the lead sulphide sludge materials discussed above, which had an expected average concentration of greater than 0.05% uranium, and hence not yet specifically addressed by NRC, alternate feed materials containing less than 0.05% uranium should also be considered alternate feed *ores* and hence exempt from RCRA for different reasons. Any alternate feed material that is approved by NRC for processing at a uranium mill, regardless of its concentration of uranium, must be an *ore* that is subject to AEA jurisdiction. As such it should be considered to be a primary raw material feedstock for AEA and RCRA purposes, cease to become a solid waste and therefore cease to be regulated under RCRA. This argument, while consistent with NRC's position on alternate feed materials that contain in excess of 0.05% uranium or greater, has not yet been specifically addressed by NRC.

Third, there is no reason why the foregoing analysis and conclusions should apply only to RCRA *characteristic* wastes and not to RCRA *listed* wastes, as listed hazardous wastes are not necessarily more hazardous than characteristic hazardous wastes. Whether or not the alternate feed materials contain 0.05% or greater uranium, in which case they are *source material ore* under the AEA, or they contain less than 0.05% uranium and are exempt from RCRA because they are *ores* and are not solid wastes, the exemption from RCRA should apply equally to *listed* hazardous wastes as to RCRA *characteristic* hazardous wastes because once processed and the uranium removed the resulting 11e.(2) byproduct material is exempt from RCRA regulations.⁹

At this time, NRC has not addressed the question of whether or not RCRA *listed* hazardous wastes should be treated the same as RCRA *characteristic* wastes under the Alternate Feed Guidance. It should be noted, however, that to the extent an alternate feed material that either exhibits RCRA *characteristics* or contains RCRA *listed* hazardous wastes is exempt from RCRA, NRC in approving the license amendment for the alternate feed material will ensure that adequate safeguards exist at the uranium mill to ensure that public health, safety and the environment are protected.

POLICY RATIONALE FOR EXCLUDING ALTERNATE FEED MATERIALS FROM RCRA JURISDICTION

Congress gave NRC the authority to regulate both the radiological and *non*-radiological aspects of *source material ore* processing and the resulting byproduct material, in conformity with standards set by EPA. In Section 84 of the AEA, Congress directed NRC to regulate both the *radiological and nonradiological* components of mill tailings in conformance with the manner in which EPA manages hazardous waste under RCRA. Specifically, EPA promulgated standards that NRC relied on when promulgating its 10 C.F.R. Part 40, Appendix A criteria. However, unlike the EPA standards, NRC criteria include additional protections and slight variations to address the unique issues associated with the presence of radionuclides in *source material ore* and byproduct material. The AEA, as amended by UMTRCA, requires NRC to regulate wastes from processing *source material* based on standards that provide equivalent protection to EPA standards, and, as a result, no permit is required under the Solid Waste Disposal Act for the “processing, possessing, transfer, or disposal of byproduct material.” Section 275 b.(2).

NRC, not EPA, is charged with active implementation and enforcement of UMTRCA-generated requirements including ensuring that the standards providing equivalent protection to RCRA, set forth at 40 C.F.R. Part 192, Subpart D, are applied “during and following processing of uranium ores.” 40 C.F.R. § 192.30. Similarly, the applicable surface impoundment design standards and groundwater protection requirements for Subtitle C facilities are incorporated into 10 C.F.R. Part 40 Appendix A, which include the requirements applicable to mill tailings impoundments and the operations of uranium mills generally. See 40 C.F.R. § 192.32. For example, since the long-lived nature of radionuclides pose an additional potential threat beyond mere *characteristic* waste, the Appendix A criteria, incorporating the 40 C.F.R. Part 192, Subpart D standards, have unique features such as passive controls for 1,000 years through an engineered encapsulation system and a mandatory governmental custodian licensed in perpetuity by NRC, which provide additional protection above and beyond that provided by a state of the art RCRA impoundment.

Congress in adopting the AEA, as amended by UMTRCA, delegated to NRC exclusive jurisdiction over AEA definitions for *source material* and 11e.(2) byproduct material. Had it been intended that EPA should have jurisdiction over these materials, either of which could and both of which frequently do contain hazardous constituents, Congress would not have exempted them from RCRA and provided that where there is a conflict between AEA and RCRA, RCRA yields.¹⁰ Therefore, it is only proper that alternate feed material, which NRC determines to be *source material ore*, is exempt from regulation as hazardous waste under RCRA. If NRC did not assert its sole authority over these materials, it could result in an entangled web of dual jurisdiction of the very kind Congress intended to avoid.

From the standpoint of environmental protection, RCRA recycling management requirements are duplicative of NRC’s license amendment process and could lead to confusion or conflicts as a result of the application of two similar, yet distinctly different, regulatory programs.¹¹ The ultimate objective of the RCRA analysis is the same as the

analysis NRC performs under the AEA when evaluating whether to approve an alternate feed license amendment—to evaluate whether materials proposed for recycling/processing will indeed be recycled/processed to produce a valuable product (*i.e.* yellow cake) and to assure that all wastes generated will not avoid appropriate regulatory controls, and will be used and managed in a manner that is protective of human health and the environment.

ADVANTAGES OF PROCESSING MIXED WASTES AS ALTERNATE FEED MATERIALS VERSUS DIRECT DISPOSAL

Mixed waste that contains recoverable amounts of natural uranium, alone or together with other recoverable metals may be recycled for the uranium content and other metals. These resources would otherwise be wasted were the mixed wastes to be directly disposed of (either with or without stabilization treatment). In some circumstances, the recovery of such resources can offset or eliminate the costs associated with disposal.

To the extent that uranium is extracted from the materials, not only are energy resources preserved, but the wastes that will ultimately be disposed of will be less radioactive than they would otherwise be, which reduces further long term concerns about potential impacts to the environment.

From a regulatory standpoint, as discussed above, the conversion of mixed wastes into 11e.(2) byproduct material will result in the maximum amount of protection to the generator from long term liabilities. EPA and NRC regulations, developed under UMTRCA, provide a unique and extremely protective regime of controls to limit releases of radionuclides and *non*-radiological (e.g., hazardous) materials into the environment. In addition, as noted above, when uranium mills are finally decommissioned and tailings stabilized, the “passive” control systems and mandatory perpetual governmental custodian will provide control and protection for 1,000 years.

CHARACTERIZATION, CERTIFICATION AND ACCEPTANCE OF ALTERNATE FEED MATERIALS CONTAINING *CHARACTERISTIC* HAZARDOUS WASTES

General

As is evident from the foregoing discussions, uranium mills such as IUC's White Mesa Mill, can currently accept mixed wastes that contain *characteristic* hazardous wastes for processing as alternate feed materials.¹² In order to determine whether or not a proposed mixed waste is acceptable for processing at a uranium mill it is therefore necessary to determine if the waste qualifies as an alternate feed material that may be processed at the mill.

The following sections summarize the relevant characterization, certification and acceptance procedures for materials that are proposed for processing at IUC's White Mesa Mill as alternate feed materials. Any mixed waste that satisfies these procedures and requirements may be processed and disposed of at the White Mesa Mill.

IUC's Acceptance Procedures for Alternate Feed Materials

IUC's alternate feed recycling and disposal program involves the general procedures illustrated in Table I.

Table I. IUC's Acceptance Procedures for Alternate Feed Materials

Step 1:	Determine if material meets Feed Acceptance Criteria through initial screening/characterization. See FACTS described below under the heading "Characterization – IUC's Feed Acceptance Criteria for Alternate Feed Materials."
Step 2:	Complete any further site or material characterization if required and complete Radioactive Materials Profile Record ("RMPR") described below under the heading "Certification."
Step 3:	Conduct initial scoping process testwork.
Step 4:	Finalize commercial arrangements.
Step 5:	Apply for routine license amendment. Typical required information includes: <ul style="list-style-type: none"> • Site and material history • Radiochemical data • Material composition and volume • Hazardous constituent data • Transportation/logistics • Special health/safety handling requirements
Step 6:	Arrange transport of material to White Mesa Mill.

Characterization -- IUC's Feed Acceptance Criteria for Alternate Feed Materials

In addition to compliance with applicable federal and state laws, IUC is required to operate the White Mesa Mill in compliance with the conditions of its NRC License and in conformance with the environmental parameters that formed the technical basis for that License. In order to ensure that alternate feed materials conform to the environmental assumptions included in the White Mesa Mill's License, IUC applies Feed Acceptance Criteria and Tests ("FACTS") to alternate feeds. IUC's FACTS include Content and Volume Requirements, Physical Requirements, Analytical Requirements, and General Acceptance Requirements. A copy of IUC's FACTS is available on IUC's web site at www.intluranium.com.

While reference should be made to the FACTS for all specific detailed acceptance criteria, generally IUC can accept and process alternate feed materials that satisfy the following requirements:

Radionuclides

- Materials containing natural uranium in any form and associated daughter products
- From relatively low grade FUSRAP type material to very high grade materials - IUC has handled material grading over 40% U₃O₈
- Classification of material, whether 11e(2), pre-1978 11e(2), LLRW, NORM or TENORM does not matter if it otherwise satisfies the Alternate Feed
- Guidance. The tailings from the processing of the alternate feed materials will always be 11e.(2) byproduct material
- Must contain recoverable amounts of uranium. What constitutes “recoverable amounts” of uranium must be determined on a case-by-case basis. The White Mesa Mill has processed alternate feed materials in the 0.01% U₃O₈ (0.0085% U) range and would consider materials that contain lower levels of uranium if the circumstances warrant.
- Can contain Thorium 232 and its daughter products, so long as it contains recoverable amounts of uranium
- Cannot accept depleted uranium, special nuclear materials or transuranics¹³

Mixed Waste

- Mixed waste that contains *characteristics* of hazardous waste is generally acceptable.
- Currently cannot accept *listed* RCRA hazardous waste¹⁴

Acceptable Physical *Characteristics*:

- Any non-gaseous form, e.g. soil, *ore*, sands, slag, liquid, slurry are acceptable
- White Mesa Mill can accommodate a large range of particle sizes and any moisture content
- White Mesa Mill can accommodate most forms of debris that are consequential to excavation activities (cement, asphalt, timbers, etc.)

Other Recoverable Metals

- Other metals such as vanadium, tantalum, niobium, titanium, zirconium, and scandium can be recovered in certain circumstances in conjunction with uranium processing

Certification

If the proposed alternate feed material meets the FACTS, the generator of the materials must certify to the characterization of the materials by completing and executing a Radioactive Materials Profile Record (“RMPR”), a copy of which is available on IUC’s web site at www.intluranium.com, which includes a certification as to the accuracy of the information contained therein.

CONCLUSION

Mixed wastes that contain recoverable amounts of natural uranium and that meet the acceptance criteria discussed in this paper can be processed for the recovery of valuable uranium, alone or together with other metals, at licensed uranium mills, and the resulting tailings permanently disposed of as 11e.(2) byproduct material in the mill's tailings impoundment.

Recycling of wastes in this manner can be accomplished at costs to the generator that are less than have traditionally been charged by mixed waste disposal facilities, and in a manner that provides maximum protection to the environment and that minimizes any potential long term liability to the generator.

FOOTNOTES

¹ DOE has self-regulatory authority under the AEA and, indeed it has by far the largest volume of mixed waste. However, for convenience sake, references in this paper are primarily to NRC regulatory authority, as uranium mills are NRC (or the equivalent state authority) licensees.

² See Final Position and Guidance on the Use of Uranium Mill Feed Materials Other than Natural Ores, 60 Fed. Reg. 49296 (September 25, 1995), as amended by Regulatory Issue Summary 2000-03 (Nov. 2000) (Interim Position and Guidance on the Use of Uranium Mill Feed Material Other than Natural Ores).

³ EPA can delegate authority to approved states for primacy under statutes such as the Clean Air Act and RCRA. For convenience, all references to EPA in this paper will include states with such delegated authority.

⁴ Under Section 274 of the AEA, a state can elect to assume the responsibilities of NRC in a number of areas, including the regulation of uranium mills and mill tailings, by becoming an "Agreement State" in those areas. For convenience, all references to NRC in this paper will include Agreement States.

⁵ At the present time, alternate feed materials may only contain RCRA *characteristic* hazardous wastes. However, recent pronouncements by NRC logically would lead to the conclusion that any type of RCRA hazardous wastes may be processed as alternate feed materials, if they otherwise meet the requirements applicable to alternate feed materials. See the discussion below under the headings "Recent Application of Alternate Feed Guidance to Permit the Processing and Disposal of Mixed Waste" and "Significance of the Recent NRC Decision on the Processing of Mixed Wastes as Alternate Feed Materials."

⁶ At this time, uranium mills are not licensed to receive any materials that contain special nuclear materials or transuranics. However, the National Mining Association ("NMA") and the Fuel Cycle Facilities Forum ("FCFF") are preparing submissions to NRC aimed at allowing uranium mills to accept de minimus levels of these types of materials. These submissions are currently under discussion between NRC, NMA and FCFF.

⁷ As discussed above, so long as the alternate feed material will be processed at the uranium mill and it is reasonable to expect that uranium will be recovered from the processing, the materials will be acceptable feed materials. It is irrelevant whether or not the value of the uranium recovered justifies the cost of processing or whether or not a recycling/disposal fee is paid to the mill by the generator of the waste.

⁸ IUC understands that while the State of California had previously classified a lead precipitate stored in drums at the generator's facility as hazardous waste, it had never asserted jurisdiction over the lead sulfide sludge that was stored in the ponds. Moreover, under EPA guidance, 54 Fed. Reg. 36597 (September 1, 1989), because the lead sulfide sludge materials had not been actively managed since the mid-1980's, IUC understands that they were not subject to regulation as hazardous wastes.

⁹ Prior to a uranium mill accepting alternate feed materials that contain listed hazardous wastes, NRC would have to amend its Alternate Feed Guidance to reflect this legal conclusion. No such amendment has been made by NRC to date.

¹⁰ Congress has made it clear that, in the event of a conflict between RCRA and the AEA, RCRA requirements must yield. RCRA § 6905(a) provides that:

Nothing in this chapter shall be construed to apply to (or to authorize any State, interstate, or local authority to regulate) any activity or substance which is subject to ... the Atomic Energy Act of 1954 except to the extent that such application (or regulation) is not inconsistent with the requirements of such Acts.

¹¹For example, RCRA recycling guidance considers economics as a factor (although acknowledging that all mineral recovery recycling does not necessarily have to be profitable to be legitimate). NRC however, as explained *supra*, has determined that the economics of uranium recovery at a uranium mill are irrelevant to valid recycling as long as uranium can reasonably be expected to be (or is) extracted at a mill.

¹²As discussed above, the recent pronouncements by NRC logically would lead to the conclusion that NRC should amend its Alternate Feed Guidance to allow the processing of alternate feed materials that contain *listed* hazardous wastes. No such amendment has been made to date.

¹³ See note 6 *Supra*

¹⁴ See note 5 *Supra*.