UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 21, 1999

MEMORANDUM TO: Docket File 40-8102

FROM: Mohammad Haque, Project Manager Mohammad U. Haque
Uranium Recovery and
Low-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

SUBJECT: ENVIRONMENTAL ASSESSMENT REGARDING ALTERNATE CONCENTRATION LIMITS FOR GROUNDWATER FOR THE EXXON CORPORATION'S HIGHLAND URANIUM MILL TAILINGS SITE IN CONVERSE COUNTY, WYOMING

By letter of December 18, 1998, Exxon Corporation (Exxon) requested that Source Material License SUA-1139 be amended to allow alternate concentration limits for groundwater constituents, nickel, radium-226 & 228 combined, and natural uranium, at Exxon's Highland uranium mill site in Converse County, Wyoming. The receipt of Exxon's request by U.S. Nuclear Regulatory Commission (NRC) and a Notice of Opportunity for a Hearing were published in the Federal Register on January 13, 1999.

Based on its review of the information provided by Exxon, the NRC staff determined that, in accordance with 10 CFR 51.22, an environmental assessment (EA) was required to document its review of Exxon's request. The EA prepared by the staff is provided as an attachment to this memorandum to be placed in the licensee's docket file.

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Attachment: As stated

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ENVIRONMENTAL ASSESSMENT
FOR
EXXON CORPORATION'S HIGHLAND URANIUM MILL SITE
CONVERSE COUNTY, WYOMING

IN CONSIDERATION OF AN AMENDMENT TO
SOURCE MATERIAL LICENSE SUA-1139 FOR
ALTERNATE CONCENTRATION LIMITS FOR GROUNDWATER

PREPARED BY

THE U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF WASTE MANAGEMENT
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

ENVIRONMENTAL ASSESSMENT
IN CONSIDERATION OF ALTERNATE CONCENTRATION LIMITS FOR GROUNDWATER
FOR EXXON CORPORATION'S HIGHLAND, WYOMING, URANIUM MILL SITE

1.0 INTRODUCTION

1.1 Background

The Exxon Corporation's (Exxon's) Highland uranium mill site is located in Converse County, Wyoming. License SUA - 1139 was originally issued by the Atomic Energy Commission (AEC), and is currently issued by U.S. Nuclear Regulatory Commission (NRC). Exxon, then Standard Oil Company of New Jersey, and operating as Humble Oil and Refining Company, began conventional uranium milling at the Highland site in October 1972. Exxon owned and operated the uranium mines that provided the ore for the mill. A limited amount of toll milling also took place at the Highland facility. Milling operations ended in 1984, and site reclamation began. Most of the surface reclamation was completed in 1989, with the exception of 20 acres of the tailings basin which required additional action to ensure at least 90 percent consolidation of the tailings prior to final reclamation. A portion of the remaining 20 acres is also used for the evaporation ponds in the groundwater corrective action program.

The Highland mill used a conventional acid leach-solvent extraction process to extract uranium from the ore. The mill tailings were deposited in an above grade impoundment formed by damming an unnamed ephemeral tributary to the North Fork of Box Creek. Tailings deposition took place from the mill startup in October 1972, until June of 1984. Reclamation work and groundwater corrective action have taken place since 1984.

1.2 Proposed Action

By letter dated December 18, 1998, Exxon requested that Source Material License SUA-1139 be amended to allow alternate concentration limits (ACLs) for groundwater at the Highland uranium tailings basin in Converse County, Wyoming. The Exxon license amendment application proposes that ACLs be granted for three of the Point of Compliance (POC) wells, on a well-by-well, constituent-by-constituent basis. The licensee must terminate the site corrective action program (CAP) prior to completing placement of the final radon barrier. In order to terminate the CAP, the licensee must meet 10 CFR Part 40, Appendix A, Criterion 5B(5), which requires that the concentration of a hazardous constituent must not exceed: (i) the NRC-approved background constituent concentration in the ground water; (ii) the maximum concentration limit (MCL) value for groundwater protection given in Table 5C of Appendix A; or (iii) an ACL established by the NRC at the POC. Therefore, Exxon requested its license be amended to incorporate the following ACLs:

Well 125: 59 pCi/l UNAT
Well 175: 1.8 mg/l Ni and 25 pCi/l Ra 226&228
Well 177: 71 pCi/l UNAT

Currently, all concentrations of potentially hazardous constituents (PHCs), with the exceptions noted above, meet the established background constituent concentration in the groundwater.

1.3 Review Scope

In accordance with Title 10, Code of Federal Regulations, Part 51, this Environmental Assessment (EA) serves to :

(i) Present information and analyses for determining whether to issue a Finding Of No Significant Impact (FONSI), or to prepare an Environmental Impact Statement (EIS);

(ii) Fulfill the NRC's compliance with the National Environmental Policy Act when no EIS is necessary; and

(iii) Facilitate preparation of an EIS when one is necessary. Should the NRC issue a FONSI, no EIS would be prepared and the commercial source material license, or amendment thereof, would be granted, subject to operating conditions contained in the existing source and byproduct material license.

1.4 Federal/State Jurisdiction

As a result of the concurrent jurisdiction allowed under the Uranium Mill Tailings Radiation Control Act of 1978, Exxon's Highland site is also regulated by the Wyoming Department of Environmental Quality (WDEQ). There are certain parameters for which the WDEQ is preempted from jurisdiction; some parameters are under joint NRC and WDEQ jurisdiction; and some parameters are solely under the jurisdiction of the WDEQ. Furthermore, unlike NRC, the present WDEQ groundwater standards have no risk-based provision such as ACLs. This EA only covers impacts for parameters regulated by the NRC and does not assess impacts for parameters regulated solely by the WDEQ.

2.0 SITE CHARACTERISTICS

Exxon's Highland uranium mill facility and associated tailings are located in the Powder River Basin, 35 miles north of Douglas, Wyoming. Uranium was removed from the Highland deposit through surface, underground, and in-situ leach (ISL) mining. Overburden removal for surface mining began in September of 1970, and underground mining began in 1973, with the sinking of the Buffalo Shaft. ISL mining occurred in a pilot mine that was initiated in 1972, and terminated in 1981.

During operation, seepage from the tailings basin resulted in the development of a groundwater mound under and around the tailings basin. As the mound grew, it eventually reached an elevation that caused tailings fluid seepage to enter the alluvial deposits on the downstream of the dam. The center of the dam was keyed into the underlyingTailings Dam Shale (TDSH), which prevented any seepage moving under the dam. However, the wings of the dam were not keyed into the TDSH, and allowed seepage to move through the wings and outside of the tailings impoundment. In 1975, a sump system was constructed to capture this seepage and pump it back to the tailings basin. All aspects of mining and milling ceased in 1984, when reclamation activities began.

The underground and open pit mining that took place at the Highland site necessitated lowering the local water table below the working level in the mines. The overburden from new mining operations was placed in old mined out pits. The final two pits were not filled, and are now the Highland Reservoir.

Groundwater beneath the tailings impoundment will be cut off from recharge by the final cover over the tailings pile and the location of the pile itself. This lack of recharge will enable the groundwater beneath the pile to remain stagnant, which, in turn, will induce reducing conditions similar to the groundwater conditions prior to mining in this area. The reducing environment will encourage the PHCs remaining to move out of solution and precipitate onto sand grains in the Tailings Dam Sandstone (TDSS) formation. Once that has taken place, the groundwater will have been returned to background conditions. Additionally, some cation exchange will aid in attenuating the remaining levels of PHCs above background.

3.0 OPERATIONS

Exxon's Highland mill operated from 1972, until shutdown in 1984. The mill processed about 10.5 million tons of uranium ore, which did not have significant concentration of vanadium or molybdenum typical of some uranium ores. The mill contained a conventional dry crusher and wet rod mill to separate the individual grains in the ore. The resulting slurry was leached with sulfuric acid and sodium chlorate at a pH of between 1 and 1.5. The uranium was separated from the tailings through countercurrent decantation using a series of thickeners. Barren tailings were pumped into the basin at about 35 percent solids by weight. The uranium liquor was processed by solvent extraction to yield a rich eluate for uranium precipitation and drying.

4.0 ENVIRONMENTAL EFFECTS

The Exxon Highland site is licensed by the NRC under Source Material License SUA-1139 to possess byproduct material in the form of uranium waste tailings, as well as other radioactive wastes generated by past milling operations. The Exxon milling process was an acid leach process, which resulted in an acidic leachate from the tailings and a low pH groundwater plume immediately under the tailings pile. Modeling data provided by the licensee indicate that the resultant low pH plume will be naturally attenuated before reaching any potential points of exposure. Currently, all concentrations of groundwater hazardous constituents of concern to NRC, with the exception of uranium, radium, and nickel, meet the established groundwater background values for the site as measured at the site POC wells. The uranium, radium, and nickel concentrations meet the proposed groundwater ACLs for the site at the POC wells.

5.0 ALTERNATIVES

The action that NRC is considering is approval of the licensee's request to amend the source material license issued pursuant to 10 CFR Part 40. The alternatives available to the NRC are:

(i) approve the license amendment request;

(ii) establish other standards than those proposed; or

(iii) deny the request

Based on its review of the request, the NRC staff has concluded that there are no significant environmental impacts associated with the proposed action. Therefore, alternatives with equal or greater impacts need not be evaluated.

The licensee provided an evaluation that considers other practicable corrective actions, as required for ACL proposals by Criterion 5B(6) of 10 CFR Part 40, Appendix A. The licensee's evaluation of various options, including continuation of the CAP, treated water reinjection, fresh water injection, and installation of reactive barriers, resulted in a conclusion that the net reduction of constituent concentration would not be significant. The NRC staff review verified the licensee's findings of no significant improvement possible with increased corrective actions.

Since the licensee has demonstrated that the proposed ACL values will not pose substantial present or potential hazards to human health and the environment, and that the proposed ACLs are as low as is reasonably achievable (ALARA), considering practicable corrective actions, establishing other standards more stringent than the proposed ACLs was not evaluated.

The alternative to the proposed action would be to deny the requested action and require the licensee to continue operation of the existing CAP or implement some alternative corrective action. Based on its review, the NRC staff has determined that the environmental impacts of the proposed action and the alternatives considered by the licensee will be similar in outcome, because the alternatives will result in little or no net reduction of constituent concentration.

6.0 SUMMARY AND CONCLUSIONS

Based on an evaluation of the radiological impacts of the Exxon amendment request, the NRC staff has determined that the proper action is to issue a FONSI in the Federal Register. The following statements support the FONSI and summarize the NRC staff's conclusions resulting from its EA.

(i) Currently, the concentrations of uranium, radium, and nickel meet the proposed groundwater ACLs for the site at the POC. Due to the attenuation capability of the formations through which the groundwater plume will move, and the lack of movement for most of the plume in the TDSS, the residual amounts of PHCs will be reduced to background levels that will not pose any greater health risk than that assigned to the maximum concentration limits for groundwater protection. The concentrations of the remaining constituents of concern to NRC meet the established groundwater background values for the site for which no ACLs have been proposed.

(ii) Present and potential health risks were assessed for various exposure scenarios, using conservative approaches. The result of these assessments indicates that present and potential future hazardous constituent concentrations at the specified POEs will not pose significant risks to human health and the environment. The POEs are located along the site boundary of the restricted area that will be maintained for long-term care by the long-term care custodian, the U.S. Department of Energy, following termination of the Exxon license.

(iii) Climatological extremes and sparse vegetation indicate that future use of groundwater is likely to be limited to seasonal livestock (e.g., cattle) and wildlife (e.g., pronghorn antelope) watering. Domestic use of groundwater from the Tailings Dam Sandstone is unlikely because of the low volume of water available in the unit, and the remote location of the site.

(iv) Additional corrective action will have little effect on the net reduction of constituent concentrations of concern to the NRC and, therefore, will have little impact on groundwater quality.

7.0 CONSULTATION AND SOURCE INFORMATION

In completing this action, the NRC staff held telephone discussions with representatives of the WDEQ.

For public participation opportunities, the NRC announced the receipt of the Exxon ACL application in a Federal Register Notice dated January 13, 1999.

References:

1. Exxon Corporation, 1998, Letter dated December 18, 1998, from Linda Z. Krupnik, to J. Holonich, NRC, transmitting the Alternate Concentration Limits (ACL) Application.

2. U.S. Atomic Energy Commission, Directorate of Licensing; March 1973; Final Environmental Statement.

3. U.S. Nuclear Regulatory Commission, 1996, "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."