



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

May 2, 1999

Mr. T. W. Hardgrove, Manager
Environmental and Regulatory Services
Pathfinder Mines Corporation
935 Pendell Boulevard
P.O. Box 730
Mills, WY 82664

SUBJECT: "NO ACTION" ALTERNATIVE FOR REID DRAW - AMENDMENT NO. 58

Dear Mr. Hardgrove:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of Pathfinder Mines Corporation's (PMC's) environmental report (ER) on the status of Reid Draw submitted by letter dated August 28, 1998. Based on its review of the ER, the NRC staff concludes that PMC's "no action" alternative on cleanup of Reid Draw is acceptable and, therefore, the NRC staff has amended Condition 29 of the Lucky Mc Source Material License SUA-672.

Furthermore, the NRC staff determined that this action would result in no significant environmental impacts, and documented this finding in an Environmental Assessment (EA). The NRC issued a Finding of No Significant Impact in accordance with 10 CFR 51.32, and on March 17, 1999, published in the Federal Register (Volume 64, Number 51), providing notice of: 1) the NRC's proposal to issue an amendment of NRC Source Material License SUA-672, concerning approval of PMC's "no action" alternative on cleanup of Reid Draw; 2) the availability of the EA; and 3) an opportunity for a hearing.

The reissued license and the staff technical evaluation report that documents this licensing action are enclosed. If you have any questions regarding this action, please contact the NRC Project Manager, Mohammad Haque, at (301) 415-6640.

Sincerely,

A handwritten signature in cursive script that reads "N. King Stablein".

N. King Stablein, Acting Chief
Uranium Recovery and
Low-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

2259
Docket No. 40-~~6659~~

Enclosures: As stated (2)

cc: G. Beach, DEQ, WY
R. Chancellor, DEQ, WY
M. Moxley, DEQ, WY

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[Signed by]
N. King Stablein, Acting Chief
Uranium Recovery and
Low-Level Waste Branch
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Docket No. 40-²²⁵⁹~~6659~~
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TAC No. L51724 (closed)
cc: G. Beach, DEQ, WY
R. Chancellor, DEQ, WY
M. Moxley, DEQ, WY

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**TECHNICAL EVALUATION OF
ENVIRONMENTAL REPORT ON
STATUS OF RADIOLOGICAL CONTAMINATION OF REID DRAW AT
GAS HILLS, WYOMING**

DATE: April 19, 1999

LICENSE NO.: SUA-672

DOCKET NO.: 40-2259

LICENSEE: Pathfinder Mines Corporation

FACILITY: Lucky Mc Uranium Mill, Gas Hills, Wyoming

PROJECT MANAGER: Mohammad Haque

TECHNICAL REVIEWER: John Lusher, Health Physicist

SUMMARY AND CONCLUSIONS

By its letter dated August 28, 1998, Pathfinder Mines Corporation (PMC) submitted an Environmental Report (ER) on the status of radiological contamination of Reid Draw (PMC, 1998). The draw is downgradient of the Lucky Mc tailings system at Gas Hills, Wyoming. PMC presented three action alternatives in the ER, and requested the U.S. Nuclear Regulatory Commission's (NRC) concurrence on its proposed "no action" alternative. In response to the NRC staff comments, PMC, by its letter dated February 4, 1999, submitted additional data and revised pages to the ER (PMC, 1999b). In addition, by its letter dated January 12, 1999, PMC submitted the minutes of the meeting held on December 15, 1998, at Lander, Wyoming (1999a). The meeting was held among the representatives from PMC, NRC, Wyoming Department of Environmental Quality (WDEQ), Bureau of Land Management (BLM), and Philp Sheep Company to discuss and evaluate the proposed "no action" alternative.

Based on the NRC staff review of the information presented in the ER and in the meeting, and the input from the discussions in the meeting, the staff concludes that:

- (1) There is no significant health and safety risk involved in the licensee proposed "no action" alternative; and
- (2) Remediation would cause irreversible damage to the current, very stable, environment of the Reid Draw.

BACKGROUND

The Lucky Mc mill site is located at Gas Hills, Wyoming. Reid Draw formed as a result of surface water erosion. Upon developing the mill, the mill tailings management structures were

Enclosure

built at the head of the Reid Draw. The tailings system consists of a series of earthen embankments across the original draw and extends to approximately 3,500 meters (2.2 miles) down the draw. The mill site itself is situated immediately adjacent to the upper reaches of the Reid Draw. The upper portion of the tailings system consists of three "ponds" that store solid tailings. Downgradient from the solid tailings is a series of three solution ponds that held the so-called barren solution (recoverable uranium had been removed) that was generally not recycled through the mill. This solution had a low pH (2.0 - 3.0), had high levels of dissolved solids, including various heavy metals, and contained high concentrations of radionuclides such as Th-230 and Ra-226. The relative concentrations of the various constituents in the tailings solution were undoubtedly less than those seen in more recent times due to the concentrating effects of evaporation over the years.

In the early days of mill operation, there was only one embankment, the No. 1 solid tailings dam. It served as the sole tailings storage facility from the inception of milling in 1958, until 1960, when the No. 2 dam was constructed. The licensee reports that a review of early company records indicates that excess tailings solution was routinely discharged down the Reid Draw from the No. 1 dam until June 1, 1960, when the No. 2 dam was commissioned. Apparently, this discharge was considered an acceptable and normal practice in those days since the site was subject to Atomic Energy Commission inspections during that time.

The furthest downgradient embankment in the tailings system consists of the No. 4 dam. The original structure was constructed in 1961, and was a much smaller dam than the reconstructed version that exists today. The Reid Draw watershed encompasses a basin of approximately 16.8 square kilometers (6.5 square miles), including the present day tailings basin. The tailings system drainage basin down to the No. 4 dam encompasses approximately 3.5 square kilometers (1.4 square miles).

The Reid Draw is subject to only intermittent flows. However, a period of unusually rainy weather in June 1963, culminated with a protracted storm on June 15. The No. 4 solution pond capacity had been taxed due to the earlier precipitation, and the three inches of rain on June 15 proved too much for the system. Out of concern for the integrity of the No. 4 dam in the imminent event of an uncontrolled overtopping, the licensee made a decision to cut a relief overflow, allowing some of the impounded water to escape. The licensee documentation at the time indicates that an estimated 23 million gallons of water were released. This released water, however, was significantly diluted due to the precipitation runoff.

The early releases and the single No. 4 dam breach event account at least in part for the levels of radionuclides found in Reid Draw at the present time. It is also likely that there is a natural contribution to the radionuclide levels in Reid Draw due to the fact that Reid Draw heads at the outcrop of a naturally mineralized area. It is likely that the erosion forces that created Reid Draw over time carried some of this mineralization down the draw. Since the controlled release during June 1963, there have been no other releases of tailings solutions to Reid Draw. The No. 4 dam underwent a major reconstruction during 1980-1981 that entailed excavation down to competent Cody Shale in order to key the dam into impermeable material, and the overall size of the dam was expanded greatly. There is no evidence of ground-water impacts from seepage

through the reconstructed dam, based upon the monitoring data from the piezometers, and the monitoring of water quality in the immediate downgradient point of compliance well R-2 which is located in Reid Draw.

The long-term care area boundary (LTCAB), also called the restricted area boundary for the mill site, lies just below Dam No. 4 (to the North). The area extending approximately 900 meters (0.6 miles) downgradient of the LTCAB is Federal land administered by the BLM. The portion of the draw that is of concern is located on private land belonging to the Philp Sheep Company. Philp grazes cattle in the general area, or leases the grazing to other individuals. The licensee reported that the Reid Draw gamma surveys conducted downgradient from tailings dam No. 4 and beyond the Reid Reservoir (located on the draw owned by Philp) indicated that the measurable contamination terminated just above the Reid Reservoir. The Reid Reservoir is approximately 3,000 meters (1.9 miles) down the draw from the toe of the No. 4 dam. The reservoir existed prior to any upgradient milling activity. Additionally, radionuclide analysis of surface water and a water sample from the Reid Reservoir indicate that the concentrations are well within the NRC effluent water concentration limits for radionuclides.

Cleanup criteria for off-pile areas of uranium mill sites are specified in 10 CFR Part 40, Appendix A, Technical Criteria. Specifically, Technical Criterion 6(6) specifies that a radon barrier is required for all areas of a remediated uranium mill site unless the Ra-226 concentration in soil, averaged over areas of 100 square meters, which, as a result of byproduct material, does not exceed the background level by more than: (i) 5 pCi/g of Ra-226, averaged over the first 15 cm below the surface, and (ii) 15 pCi/g of Ra-226 averaged over 15-cm thick layers more than 15 cm below the surface. However, it is stated in 10 CFR Part 40, Appendix A, that licensees may propose alternatives to these specific requirements. In the introduction to Appendix A, it is stated that alternatives may be proposed which "...take into account local or regional conditions, including geology, topography, hydrology, and meteorology. The NRC may find that the proposed alternatives meet their requirements if the alternatives will achieve a level of stabilization and containment of the sites concerned, and a level of protection for the public health, safety, and the environment from radiological and non-radiological hazards associated with the sites, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by the standards promulgated by the Environmental Protection Agency in 40 CFR Part 192, subparts D and E." The Appendix makes a provision that "all site specific licensing decisions will take into account the risk to the public health and safety and the environment with due consideration to the economic cost involved and any other factors the Commission determines to be appropriate." These include benefits to society and socioeconomic considerations.

DESCRIPTION OF LICENSEE'S AMENDMENT REQUEST

By its letter dated August 28, 1998, PMC submitted an ER (PMC, 1998) on the status of radiological contamination of the Reid Draw, downgradient of the Lucky Mc tailings system at Gas Hills, Wyoming, and requested the NRC staff's concurrence in its proposed "no action" alternative. In response to the NRC staff comments, PMC, by its letter dated February 4, 1999, submitted additional data and revised pages to the ER (PMC, 1999b).

The ER includes the accumulated data resulting from PMC evaluation of the draw over the past four years and three action alternatives. PMC based the alternatives on considerations of the resulting dose, the ecological impacts, and the cost. The alternatives discussed in the ER are:

- (1) No further remedial action, leaving the draw in its present state;
- (2) Decontamination of only the upper portion of the draw (some 3,500 feet), covering sections of the draw owned by PMC or the Federal government and administered by the BLM; and
- (3) Complete decontamination of the contaminated section of the draw, encompassing over 10,000 feet of the draw.

The licensee requests the NRC staff's concurrence in the "no action" alternative.

TECHNICAL EVALUATION

The NRC staff based its evaluation on the information provided in the ER (PMC, 1998) submitted by letter dated August 28, 1998; the additional data and revised pages submitted by letter dated February 4, 1999 (PMC, 1999b); and the input from the discussions in the meeting held at Lander, Wyoming, on December 15, 1998 (PMC, 1999a). The meeting was attended by representatives from PMC, BLM, WDEQ, Philp Sheep Company, and NRC.

The licensee performed radionuclide analyses on surface water from precipitation events that produced flowing water since 1983, and on a water sample from the Reid Reservoir. The analyses indicate that the radionuclide concentrations are well within the NRC effluent water concentration limits.

The licensee collected soil samples from the bottom of the Reid Draw and analyzed them for radionuclide contents. The 0 - 15 cm depth samples ranged from 1.4 - 135 pCi/g Ra-226; and the 15 - 30 cm samples ranged from 5 - 230 pCi/g Ra-226.

The licensee also performed dose estimates for the future use scenario, using the modeling code RESRAD 5.62, developed by Argonne National Laboratory (ANL, 1993). The code modeled the transfer of the principal radionuclides through the food chain of uranium, Ra-226, Th-230, and Pb-210, from soil and vegetation to livestock, then to man. This analysis shows that should a person eat all of his/her beef from an animal that had spent six months grazing in Reid Draw and six months eating from another uncontaminated food source, the annual dose to the individual would be 0.015 mSv/y (1.5 mrem/y) and in 1000 years 0.055 mSv/y (5.5 mrem/y). The average dose equivalent to people in the United States from all sources of radiation is 4.0 mSv/y (400 mrem/y), which includes a contribution from background radiation of approximately 2.0 mSv/y (200 mrem/y). Operational nuclear facilities are required to limit additional exposure to members of the public from the facility operations to less than 1.0 mSv/y (100 mrem/y). This 0.015 mSv/y (1.5 mrem/y) from eating beef is a very small fraction of any existing or proposed dose equivalent limit for the public, and is considered very low.

Because the actual samples of vegetation indicated lower levels of radionuclides than those used in the model, the staff considers the results conservative and, therefore, acceptable.

Due to its isolated location and rough terrain, it is highly unlikely that Reid Draw will be developed for continuous human habitation. It is possible that livestock could be grazed in the area of the draw. As a result, individuals performing ranching and livestock control activities could spend temporary periods in and near the draw and, therefore, be considered the most highly exposed. It was assumed that the hypothetical individual in the scenario is a rancher who set up a temporary camp near the draw, and is present for a seven day period during any one year. The dose model is based upon habitation directly over the source, requiring camp establishment in the draw proper. This scenario is very unlikely since significant rainfall events occur in this region. The fear of loss of life from flash flooding would restrict most individuals from placing a campsite in the draw.

The maximum annual dose to the rancher in the near term is calculated to be 0.11 mSv/y (11 mrem/y) while the dose over the next 1,000 years would be expected to increase with time, reaching a maximum of 0.19 mSv/y (19 mrem/y) after 1,000 years. This should be compared to the average dose equivalent to people in the United States from all sources of radiation (4.0 mSv/y or 400 mrem/y), which includes a contribution from background radiation of approximately 2.0 mSv/y (200 mrem/y). Operational nuclear facilities are required to limit additional exposure to members of the public from the facility operations to less than 1.0 mSv/y (100 mrem/y). This 0.11 - 0.19 mSv/y (11 - 19 mrem/y) is a very small fraction of any existing or proposed dose equivalent limit for the public and is considered very low.

Since the numbers used in the modeling were conservative, the staff considers this evaluation acceptable.

Furthermore, the staff evaluated the licensee's following observations:

The draw is currently stable with established vegetation;

Little or no movement of material is taking place as suggested by evaluation of the data;

The area provides one of the best habitats for wildlife, and any remedial action would destroy this habitat with no assurance that it will be possible to restore it to its current condition; and

Most likely, the cultural resources prevalent in the areas adjacent to the draw will be destroyed or will require protection if the draw is remediated.

Based on its assessment of the above observations, the staff concurs in the licensee's proposed "no action" alternative as it does not pose any significant health and safety risk.

RECOMMENDED LICENSE CHANGE

The staff recommends that Condition 29 of the Source Material License SUA-672, for the Lucky Mc uranium facility be amended to reflect NRC concurrence in the "no action" proposal on cleanup of the Reid Draw.

ENVIRONMENTAL IMPACT EVALUATION

The staff's review was documented in an Environmental Assessment (EA) in accordance with the requirements of 10 CFR Part 51. The conclusion of the EA is a Finding of No Significant Impact (FONSI) for the proposed licensing action. The staff issued the FONSI in accordance with 10 CFR 51.32, and published that finding in the Federal Register of March 17, 1999.

REFERENCES

Argonne National Laboratory (ANL), 1993. *Manual for Implementing Residual Radioactive Material Guidelines using RESRAD.*

Pathfinder Mines Corporation (PMC), 1998. Letter dated August 24, 1998, from Tom Hardgrove, PMC, to Joseph J. Holonich, NRC, transmitting Environmental Report (ER) on status of radionuclide contamination of the Reid Draw.

PMC, 1999a. Letter dated January 12, 1999, from Tom Hardgrove, PMC, to Joseph J. Holonich, NRC, transmitting Minutes of Meeting of December 15, 1998.

PMC, 1999b. Letter dated February 4, 1999, from Tom Hardgrove, PMC, to Joseph J. Holonich, NRC, transmitting additional data and revised pages for the ER.