



PATHFINDER

February 11, 2005

Mr. Gary Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Ref: Docket No. 40-6622, Source Material License No. SUA-442

Dear Mr. Janosko:

Enclosed please find two copies of an annual radiation safety ALARA audit report covering year 2004 for the Shirley Basin mill and tailings site as required by condition 36 of Source Material License No. SUA-442.

Sincerely,

T. W. Hardgrove
Manager, Reclamation Operations

Enclosure

Cc: J. Whitten, USNRC, Region IV
D. L. Wichers

Annual ALARA Audit

For 2004

PATHFINDER MINES CORP.

Shirley Basin Mine

Source Material License SUA-442

Prepared By

T. W. Hardgrove

February 8, 2005

A. Introduction

An annual ALARA audit of the radiation safety program at the Shirley Basin Mine was conducted during the first week of February, 2005. The audit was conducted in fulfillment of condition 36 of the license. The audit entailed a review of 2004 radiation safety records and an evaluation of conformance with requirements of the license.

B. Personnel Dose Records

Attachment 1 is a summary of the annual Pathfinder (PMC) and selected contractor employee radiation doses for 2004. TEDEs were assigned to the three PMC hourly employees and to the contractor heavy equipment operators who were subject to the highest doses. Those contractor employees were the three individuals who operated scrapers for a significant amount of time directly on the tailings. The highest PMC annual TEDE was 270 mrems or 5% of the annual limit of five rems. All hourly employees are issued TLD badges. No badges recorded any doses for the year. Therefore, all doses were due to internal committed effective dose. The highest dose for a contractor scraper operator was 413 mrems or 8% of the annual limit. The contractor with the highest dose operated a self-loading or so-called paddle wheel scraper. That type of scraper generates more dust than a conventional scraper. Subsequent tailings re-grading has involved only limited use of a self-loading scraper. Like PMC employees there was no penetrating radiation dose recorded for any contractor employees as indicated by TLD badges issued to representative scraper operators. As noted in last year's audit, the most recent doses were substantially lower than the previous years, in part due to the results of a re-evaluation of the contribution of different radionuclides to the dose. The reader is referred to the audit covering 2003 for a discussion of that sampling program. Regardless of the relative radionuclide contributions to dose, the annual doses have been in a downward trend for a number of years (see Attachment 2). This trend is most likely due to the progressive covering of tailings and declines in PMC personnel hours actually spent directly on the tailings.

As noted above, external radiation doses as measured by dosimeters were zero for 2004. Little or no external dose has been the case at the site for some time now, reflecting the status of the facility (no mill plant and interim cover on much of the tailings even during grading operations).

C. Bioassays

Only two urine samples were analyzed during 2004. Since bioassay samples have not indicated any uranium uptake at this site for a number of years, a single quarterly sample is typically obtained in conjunction with a radiation work permit issued for the receipt of a shipment of ISL waste. This limited program acts as a confirmatory exercise to demonstrate no uptake. The ISL waste receipt is the only activity that remotely presents an opportunity for uranium uptake. Samples were taken for the first two quarters of the

year, but the sample was missed for the third quarter. There were no ISL waste shipments during the fourth quarter. Bioassays are not required by the approved radiation safety program at Shirley Basin. Both bioassay samples were less than the detection level. Spiked samples of water were analyzed for QA/QC purposes with each urine sample, and results for all spikes were acceptable.

D. Inspections

A routine announced NRC inspections occurred on July 20, 2004. No items of non-compliance or significant issues were identified during that inspection. In addition there was an inspection by NRC headquarters personnel on October 12, 2004, focusing on the status of the tailings reclamation program. No significant problems were noted during that inspection.

E. Training

The required annual refresher radiation safety training was given to two PMC hourly employees on October 12, 2004. A written test was administered at the conclusion of the training session. A third PMC employee was on extended sick leave. One employee was hired by PMC during the year. That individual was hired as a scale operator to weigh incoming shipments of rip rap to be used in tailings reclamation. His position does not bring him in contact with tailings or other contaminated materials. Consequently, no radiation safety training was deemed necessary for that individual. Contractor employees were given an introductory presentation on radiation hazards and appropriate conduct to minimize exposure, including personal cleanliness and avoidance of food consumption while working directly on tailings. The training program is adequate for the level and type of activities at this site.

F. Safety Meetings

Documented routine safety meetings were held with Pathfinder employees on a bimonthly basis. Safety meetings are often utilized as a means of re-enforcing the radiation safety refresher training. Such meetings were documented, including topics discussed.

G. Radiological Surveys and Sampling Data

See Attachment 3 for a 2004 summary of values resulting from routine area surveys for airborne particulates. The overall alpha particulate levels remained generally low. Attachment 3 provides the overall annual average airborne concentrations for U, Ra226, and Th230, and the corresponding percentages of the applicable DAC's. Th230 remains the radionuclide of greatest concern with the average annual concentration at 11% of the DAC.

Radon with daughters monitoring was done quarterly (see Attachment 3). Measured working levels (WL) remained low, averaging less than one percent of the DAC. The

highest measured WL was two percent of the DAC. Overall, radon with daughters was lower than in 2003.

Area gamma levels were consistently low with the highest reading of 0.08 mR/hr at a location on top of tailings pond No. 4. The ISL burial trench also exhibited a beta/gamma level of 0.08 mR/hr for the fourth quarter. Other sites were 0.06 or less mR/hr, and the mill shop sample sites were 0.01 to 0.02 mR/hr. Background gamma levels adjacent to the office are around 0.02 mR/hr.

Surface alpha contamination levels were consistently low and well below the action level. Checks were made quarterly, appropriate for the low alpha levels observed. The highest reading was 16.9 dpm/100 cm² on the locker bench during the first quarter. Personnel alpha contamination survey records were examined; there were no cases of contamination necessitating decontamination and re-monitoring. Site workers monitor out if they have been working on ISL waste shipment receipts. ISL waste shipment truck drivers were also checked routinely for alpha contamination, and no problems were evident. The drivers do not come in contact with the byproduct waste, making it highly unlikely they would incur any contamination. Note that exit contamination personnel surveys are not specifically required by the license and approved radiation safety program at this site.

Surveys of equipment (primarily ISL waste delivery trucks) prior to release from the restricted area are well documented with no problems apparent. Some heavy equipment used by the contractor on tailings was also surveyed for release with no contamination problems evident. Spot checks of small vehicles used within the restricted area indicated no problems with surface contamination. Typical surface alpha and gamma levels were at or near background levels.

H. Equipment Used for Exposure Control

Radiation detection instrument calibration records were examined and found to be in order. Acceptable documentation of instrument function checks was noted. Breathing zone air pump samplers were found to be calibrated and so documented in a timely manner.

I. Reports on Overexposures

There were no overexposures during 2004.

J. Standard Operating Procedures Review

The records with the SOPs documented the required annual review of all SOPs by the RSO.

K. Radiation Work Permits

There were two radiation work permits (RWPs) during 2004, both related to the receipt of ISL byproduct shipments. Measured doses from RWPs have been trivial for a number of years. No doses were assigned as a result of any of the RWPs in 2004.

L. Recommendations on Ways to Further Reduce Personnel Exposures

- Continue to emphasize good housekeeping and personal hygiene practices as a means to avoid contamination problems, particularly in conjunction with ISL waste shipments delivery.
- The continuation of contractor monitoring until all exposed tailings are covered with clay will help assure that exposures are kept as low as reasonably achievable. However, the nearly complete re-grading and covering of the tailings by the ongoing reclamation program has nearly eliminated tailings as an area of concern relative to personnel exposures.

M. Concluding Comment

During 2004 radiation doses continued the pattern of decline that has been evident during recent years. The radiation safety program at Shirley Basin conforms with the requirements of the license and is appropriate for the kind and level of activity at the site. There are no upward trends in doses to the limited number of PMC site personnel, and doses to contractor personnel appear to be acceptably low. It is anticipated that the already low doses will continue to decline as the mill and tailings site is capped and reclaimed.


TWH

YEAR 2004 - TOTAL YR. - PMC HOURLY EMPLOYEES - SHIRLEY BASIN

NAME	AREA	HOURS	CONC.				CONC.				CONC.				WL				CEDE (mrem)
			SOL U	U (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Ra226	Ra (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Th230	Th (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Rn w/ dau.	Rn (WL-hr)	DOSE (rem)	INTAKE (uCi)	
LEE, D.	REST. AREA	1500	6.36E-13	9.54E-10	0.005	0.0000	1.56E-13	2.34E-10	0.002	0.0002	3.23E-13	4.85E-10	0.202	0.001	0.002	3	0.023	0.455	231.32
SEARS, D.	REST. AREA	1752	6.36E-13	1.11E-09	0.006	0.0001	1.56E-13	2.73E-10	0.002	0.0003	3.23E-13	5.66E-10	0.236	0.001	0.002	3.504	0.027	0.531	270.18
LEE, A.	REST. AREA	326	6.36E-13	2.07E-10	0.001	0.0000	1.56E-13	5.09E-11	0.000	0.0001	3.23E-13	1.05E-10	0.044	0.000	0.002	0.652	0.005	0.099	50.27

ALL TLD's WERE ZERO DOSE FOR THE YEAR.

CRE SCRAPER OPERATORS W/ GREATEST DOSES ON TAILINGS, YEAR 2004 - SHIRLEY BASIN

NAME	AREA	HOURS	CONC.				CONC.				CONC.				WL				CEDE (mrem)
			SOL U	U (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Ra226	Ra (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Th230	Th (uCi-hr/m)	DOSE (rem)	INTAKE (uCi)	Rn w/ dau.	Rn (WL-hr)	DOSE (rem)	INTAKE (uCi)	
HERMISILLO, M	TAILINGS	1131	5.47E-13	6.19E-10	0.003	0.0000	1.34E-13	1.52E-10	0.001	0.0002	2.78E-13	3.14E-10	0.131	0.001	0.002	2.262	0.017	0.343	152.50
ROOSE, A.	TAILINGS	493	3.75E-12	1.85E-09	0.009	0.0001	9.20E-13	4.54E-10	0.004	0.0005	1.91E-12	9.42E-10	0.392	0.002	0.002	0.986	0.007	0.149	412.84
SOMERS, J.	TAILINGS	1182	2.13E-13	2.52E-10	0.001	0.0000	5.23E-14	6.18E-11	0.001	0.0001	1.08E-13	1.28E-10	0.053	0.000	0.002	2.364	0.018	0.358	72.87

ALL TLD's WERE ZERO DOSE FOR THE YEAR.

Attachment 2 - Exposure (CEDE) Trend at Shirley Basin Uranium Mill & Tailings Site

PMC Employee CEDE (mrems/year)		
Year	High	Average
2000	789	590
2001	675	480
2002	530	378
2003	302	224
2004	270	184

Note: Total dose (TEDE) comprised solely of CEDE. TLD badges recorded no external dose for years 2000-2004.

SBM Area Airborne Particulates			SBM Radon w/ Daughters		
	Th230 uCi/ml	U-Nat uCi/ml	Ra-226 uCi/ml	Date	WL
01/07/04	1.58E-13	3.11E-13	7.64E-14	03/03/04	0.007
01/07/04	1.14E-13	2.25E-13	5.53E-14	03/03/04	0.000
01/07/04	2.53E-13	4.97E-13	1.22E-13	03/03/04	0.002
01/07/04	2.76E-13	5.43E-13	1.33E-13	03/03/04	0.006
02/03/04	2.38E-13	4.68E-13	1.15E-13	03/03/04	0.004
02/03/04	4.36E-13	8.57E-13	2.10E-13	03/03/04	0.000
02/03/04	3.34E-13	6.56E-13	1.61E-13	06/21/04	0.000
02/03/04	1.54E-13	3.02E-13	7.41E-14	06/21/04	0.000
03/02/04	1.58E-13	3.11E-13	7.64E-14	06/21/04	0.002
03/02/04	1.14E-13	2.25E-13	5.53E-14	06/21/04	0.001
03/02/04	2.53E-13	4.97E-13	1.22E-13	06/21/04	0.001
03/02/04	2.76E-13	5.43E-13	1.33E-13	06/21/04	0.001
04/06/04	6.16E-14	1.21E-13	2.97E-14	09/13/04	0.002
04/06/04	3.64E-13	7.15E-13	1.76E-13	09/13/04	0.001
04/06/04	2.26E-13	4.45E-13	1.09E-13	09/13/04	0.001
04/06/04	2.17E-13	4.26E-13	1.05E-13	09/13/04	0.001
04/06/04	2.92E-13	5.75E-13	1.41E-13	09/13/04	0.000
05/20/04	2.77E-13	5.45E-13	1.34E-13	09/13/04	0.001
05/20/04	3.59E-13	7.06E-13	1.73E-13	09/13/04	0.001
05/20/04	3.38E-13	6.64E-13	1.63E-13	12/21/04	0.004
05/20/04	8.41E-14	1.65E-13	4.06E-14	12/21/04	0.006
05/20/04	2.08E-14	4.09E-14	1.00E-14	12/21/04	0.004
05/04/04	5.94E-13	1.17E-12	2.87E-13	12/21/04	0.003
05/04/04	6.45E-13	1.27E-12	3.11E-13	12/21/04	0.001
05/04/04	3.30E-13	6.48E-13	1.59E-13	2004 AVG.	0.002
05/04/04	3.71E-13	7.30E-13	1.79E-13	% DAC	0.6
05/04/04	1.20E-13	2.37E-13	5.81E-14		
06/10/04	1.23E-13	2.41E-13	5.92E-14		
06/10/04	4.30E-13	8.45E-13	2.08E-13		
06/10/04	4.10E-13	8.07E-13	1.98E-13		
06/10/04	3.64E-13	7.16E-13	1.76E-13		
07/07/04	3.58E-13	7.05E-13	1.73E-13		
07/07/04	3.58E-13	7.03E-13	1.73E-13		
07/07/04	1.99E-13	3.92E-13	9.62E-14		
07/07/04	1.56E-13	3.07E-13	7.54E-14		
07/07/04	2.55E-13	5.01E-13	1.23E-13		
07/07/04	3.98E-13	7.83E-13	1.92E-13		
08/03/04	5.30E-13	1.04E-12	2.56E-13		
08/03/04	5.15E-13	1.01E-12	2.48E-13		
08/03/04	1.61E-13	3.17E-13	7.79E-14		
08/03/04	2.29E-13	4.51E-13	1.11E-13		
09/15/04	1.34E-13	2.64E-13	6.48E-14		
09/15/04	6.57E-14	1.29E-13	3.17E-14		
09/15/04	2.87E-15	5.63E-15	1.38E-15		
09/15/04	8.62E-15	1.69E-14	4.16E-15		
09/15/04	1.42E-14	2.80E-14	6.87E-15		
10/07/04	9.27E-13	1.82E-12	4.48E-13		
10/07/04	1.46E-12	2.86E-12	7.03E-13		
10/07/04	5.85E-13	1.15E-12	2.82E-13		
10/07/04	4.45E-13	8.74E-13	2.15E-13		
10/07/04	3.27E-13	6.43E-13	1.58E-13		
11/09/04	8.89E-13	1.75E-12	4.29E-13		
11/09/04	5.04E-13	9.90E-13	2.43E-13		
11/09/04	6.10E-13	1.20E-12	2.94E-13		
11/09/04	6.30E-13	1.24E-12	3.04E-13		
11/09/04	2.61E-13	5.12E-13	1.28E-13		
12/07/04	3.33E-13	6.55E-13	1.61E-13		
12/07/04	3.62E-13	7.11E-13	1.75E-13		
12/07/04	3.11E-13	6.11E-13	1.50E-13		
12/07/04	1.96E-13	3.85E-13	9.45E-14		
12/07/04	1.15E-13	2.26E-13	5.55E-14		
2004 Average	3.23E-13	6.36E-13	1.56E-13		
% DAC	11	1	1		