MAR. 8 1963

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT II-A, II

Name and address of licensee	2. Date of inspection
Atlas Corporation 80 Pine Street New York 5, New York	Nov. 27-29, 1962 and Jan. 15, 1963
	3. Type of inspection Reinspection (1)
	4. 10 CFR Part(s) applicable 20 and 40

License number(s), issue and expiration dates, scope and conditions (including amendments)

License No. R-161 Dated: 6/1/55 Expiration Date: 12/31/66 (Amendment No. 5)

Please refer to report details.

5. Inspection findings (and items of noncompliance)

The licensed program was transferred from the Uranium Reduction Company to the Atlas Corporation by a license amendment dated August 10, 1962.

The licensee's process is essentially the same as noted during the previous inspection conducted during May, 1960, except the acid leaching process has been discontinued due to the high lime content of the present ore. The licensee commenced treating the liquid effluent with barium sulphate shortly after that inspection.

Mill processing personnel are required to work 168 hours in 28 consecutive days. Atlas is permitted, by a license amendment dated April 26, 1962, to comply with 20.103(b) by considering personnel exposure to airborne concentrations of radioactivity on a 28 consecutive day basis.

The licensee is taking about 75 air samples per quarter in order to determine airborne concentrations of radioactivity in the restricted areas of the plant. The licensee has no program, as of the time of the inspection, for determining personnel exposure to airborne concentrations during such dust generating operations as final product bucking and sampling, certain packaging operations, removal of barrels from the hearth furnace dust collector, removal of ashes from the incinerator, etc. The licensee commenced taking environmental air samples on a monthly basis in the unrestricted areas surrounding the plant on June 12, 1962. About 15 locations are sampled. Prior (continued)

7. Date of last previous inspection	8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒ (Specify page(s) and paragraph(s))
May, 1960	

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Original signed by Roger T. Woolsey

Roger T. Woolsey, Radiation Spec.(Rev.)
(Inspector)

Approved by: Donald I. Walker, Director Original Signed by Donald I. Walker

Region IV, Division of Compliance
(Operations office)

March 6, 1963
(Date report prepared)

If additional space is required for any numbered item above, the continuation may be extended to the reverse of this form using foot to head format, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form under appropriate item.

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RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

NO. 22 H-1-a

Item 6 (Continued)

to this,certain locations in the unrestricted areas were sampled on an annual basis. A film badging program involving 105 men in the processing areas was started on July 1, 1962. The licensee has conducted a series of external radiation surveys at about 75 locations within the plant. Monthly effluent samples are taken at the effluent creek and at several locations on the Colorado River above and below the plant.

The following items of noncompliance were noted during the course of this inspection.

10 CFR 20.103(b) Effective February 29, 1957
10 CFR 20.106(b) Effective January 1, 1961

"Concentrations in effluent to unrestricted areas"

- in that, concentrations of Radium-226 in liquid effluents released to unrestricted areas were above the Appendix B limit when averaged over a period of one year (see paragraph 43). See also reports of previous inspections transmitted with covering memorandum dated July 11, 1960.

10 CFR 20.201(b) "Surveys"

- in that, during the period May 1, 1960, to November 29, 1962, the evaluation of personnel exposures to airborne concentrations of uranium for individuals working in the restricted areas within the hearth drier and packaging areas was inadequate. Specifically, breathing zone samples had not been taken at the time those manual operations having a potential for generating airborne uranium were being conducted, and the existing job time studies did not include estimates of the times expended in performing these operations. Also, independent measurements made by the AEC indicate a need for a comprehensive breathing zone air sampling program. (See paragraph 19).

10 CFR 20.202(a) "Personnel Monitoring"

- in that, in all cases, personnel monitoring devices were not issued to individuals working in restricted areas where it was likely that they could receive a dose in a calendar quarter in excess of 25 percent of the applicable value specified in paragraph (a) of 20.101. (See section on Film Badge Program starting on page 11.)

LICENSING HISTORY

The program at Moab, Utah, is presently conducted under the authorization of License No. R-161, Atlas Corporation, 80 Pine Street, New York 5, New York, and License No. R-163, First Security Bank of Utah, 79 South Main Street, Salt Lake City, Utah, the trustee under the first mortgage and deed of trust of the Atlas Corporation. Authority to conduct the program at Moab, Utah, was transferred from the Uranium Reduction Company to the Atlas Corporation pursuant to a license amendment dated August 10, 1962. License amendment dated August 10, 1962, changed the name of the licensee in License No. R-163 to First Security Bank of Utah, trustee under the first mortgage and deed of trust of the Atlas Corporation.

INSPECTION HISTORY

Previous Inspections

The initial inspection of the program conducted by the Uranium Reduction Company, Moab, Utah, was made on December 10, 1957. As a result of this inspection, the licensee was cited in a letter from L&R dated May 23, 1958, for violation of the following sections: 20.201(b), "Surveys"; 20.203(e)(2) and (f)(2), "Posting and Labeling".

On February 24 and 25, 1959, a follow-up inspection was made of the Uranium Reduction Company. As a result of this inspection, the licensee was cited for the following violations in L&R letter dated July 13, 1959: (1) 20.201(b), failure to conduct adequate surveys in mill areas which are occupied by employees to determine the concentrations of airborne radioactivity; (2) 20.201(b), failure to determine the concentrations of radioactive material, including radium, discharged in liquid effluents in the course of licensed activities. Further, as a result of this report, orders were issued to URC on July 13, 1959, to the effect that they must submit, by August 15, 1959, a complete statement of those steps they intended to take to bring their mill into compliance. The licensee replied to this order in a memorandum dated August 10, 1959, outlining the steps they planned to take to bring their program into compliance.

A follow-up inspection of URC was made during the period October 26 through October 29, 1959. Two items of noncompliance were noted during the course of this inspection: 20.103(b) in that, concentrations of radium in liquid effluent released to unrestricted areas were in excess of the permissible limit; 20.203(d)(1) in that, areas where concentrations of airborne uranium exceeded 25% of MPC were not posted. A supplementary follow-up inspection was then made on May 12, 1960, and the reports written on both of these inspections were sent to the Division of Compliance, Headquarters, with a covering memorandum dated July 11, 1960. The two violations noted during the first inspection were itemized in this memorandum; however, it was noted that the violation involving failure to post airborne radioactivity areas had been corrected subsequent to the inspection made during October 1959. In a memorandum, Low/Price, dated July 26, 1960, a recommendation was made that the licensee be informed in writing that they were in violation with 20.103 with respect to the release of liquid effluents to unrestricted areas, and that their request for an extension in time to further evaluate river conditions in anticipation of a possible exemption was under consideration. This memorandum stated that the inspection reports did not show the licensee's status of compliance with 20.103 relative to airborne effluents to unrestricted areas and consequently, this memorandum recommended that L&R inform the licensee that additional inspections would be scheduled in order to make a determination on this matter. No enforcement action was taken as a result of these two inspections. In a letter, Walker/Dubinski, dated December 4, 1961, the Division of Compliance, Headquarters, was informed that a reinspection of URC would be made on or about March 1, 1962.

Current Inspection

A reinspection of the program currently licensed under Atlas Corporation was conducted on November 27 - 29, 1962. George H. Smith, Radiation Specialist, Region IV, Division of Compliance, was present during the latter half of the inspection. Dr. Grant Winn, Utah Department of Health, was present during the course of the inspection on November 27, 28, 1962. The personnel contacted are tabulated below:

Roy Hollis, Vice Pres. Milling - Atlas
R. W. Unger, Mill Superintendent
Henry Baty, Radiation Safety Control Section Technician
Ted Izzo, Assistant Mill Superintendent
John Goff, Plant Metallurgist
Ken Olsen, Personnel Manager

Except where otherwise noted, all information was obtained from Messrs. Goff and Baty and is reported in substance in the following text. The results of the inspection were discussed with Mr. Roy Hollis at the conclusion of the inspection.

Administration

4. The corporate headqurrters of the Atlas Corporation is at 80 Pine Street, New York 5, New York. Kibbe, President, Atlas Minerals, is located in Salt Lake City, Utah. Hollis is Vice President for Milling and is located at Moab, Utah. He is assisted in the supervision of the mill process by Unger, Mill Superintendent, and Izzo, Assistant Mill Superintendent. Baty, Radiation Safety Control Technician, reports to Goff, Plant Metallurgist, who said that no definite assignment as to the Radiological Safety Officer had been made as yet, but he thought that Baty would ultimately assume this responsibility.

CHANGES IN MILL SINCE PREVIOUS INSPECTION

Leaching Area

5. Atlas is now using a carbonate leach process. The acid leach process was discontinued in September, 1960. The ore presently being processed contains a high concentration of lime which precludes acid leaching.

Incinerator

6. A gas fired incinerator for ashing filter papers and filter cloths had been installed sometime prior to May, 1960, on the top, or third, level of the hearth drier area. The licensee was authorized to incinerate wet process papers containing source material by amendment to License No. R-161, dated June 21, 1962. It was noted that the incinerator was vented to the main hearth drier stack. According to Baty, ashes from the incinerator are shoveled into a wheelbarrow, slurried with water, and then shoveled into the hearth furnace for U_3O_8 reclamation. It was noted that there was a vented bonnet over the top of the hearth furnace which would tend to vent off some of the dust, if any, created in shoveling the ash slurry into the hearth furnace.

Barite Treatment

7. Since the last inspection the licensee has been treating the liquid effluent with barium sulphate in order to reduce the radium concentration.

Present Production

8. At the present time, according to John Goff, Plant Metallurgist, the mill is processing about 1400 tons of ore per day with an average U_3O_8 concentration of 0.55%. He said that, with the present 96% recovery rate, the output of final product amounts to about 15,400 pounds of U_3O_8 per day. The long term U_3O_8 concentration has been 0.33%.

AIRBORNE RADIOACTIVE MATERIALS - RESTRICTED AREAS

Summary of Findings

9. It was determined that the licensee's program for evaluating personnel exposure to airborne concentrations of uranium was inadequate, and, consequently the licensee was in violation with 20.201(b) for the following reasons: No breathing zone air samples were taken while the hearth operator was performing routine, potential dust-generating, manual operations associated with final product packaging, yellow cake bucking, U_3O_8 sampling, operating the hearth drier, hearth drier dust collector, and filter paper incinerator. On March 28, 1961, the licensee measured an airborne uranium concentration amounting to 1176.0×10^{-11} uc/ml, (206 x MPC) and no attempt was made to relate this concentration to employee exposure (see paragraph 31). On August 23, 1962, airborne uranium concentrations up to 25.0×10^{-11} uc/ml (4.3 x MPC) were measured at locations outside the hearth drier furnace, and it was

determined that this airborne radioactivity had been caused by a maintenance man re-bricking the inside of the hearth drier furnace. No breathing zone air samples had been taken in order to evaluate this man's exposure to airborne concentrations of uranium. (See paragraphs 32 and 33). See paragraph 23 for a description of the licensee's air sampling program as of the time of the inspection. The licensee's job time studies had not been updated to show estimates of time expended performing the above operations (see paragraph 26). Independent measurements made by the AEC indicate a need for the licensee to establish a comprehensive program for determining employee exposure to airborne concentrations of uranium (see paragraph 34). In a letter to the Commission, dated June 14, 1962, the licensee stated that their method for determining employee exposure to airborne concentrations of radioactivity was as described in the report entitled, "Air Sampling Procedures in Evaluating Exposures", by H. Glauberman and W. E. Harris of the Health and Safety Laboratory, USAEC.

Sampling Equipment and Analytical Method

. The licensee has two Staplex, Model 31, air samplerswhich are capable of sampling at a flow rate of 20 liters per minute. The licensee uses Millipore filters. Baty said that the air samplers are calibrated twice per year, and that they were last calibrated on May 25, 1962.

. The licensee uses the fluorometric process for measuring the uranium content of his air samples, and uses a sodium fluoride standard containing 0.1 micrograms of U_3O_8. With a minimum sample volume of 400 liters, the licensee's lower level of confidence is 1.24×10^{-11} uc/ml.

Locations Sampled and Sampling Method

. The licensee takes about 75 air samples per quarter year at locations such as the following:

Hearth Area (bottom, top, and center decks)
Packaging Area
Sample Tower Area
Top of Ore Bins
Crusher Area
Lot and Moisture Sample Rooms
Ball Mill Area
Precipitation Area

. Baty said that he attempts to sample each location about three times per quarter year and uses these results to determine an average airborne concentration for each location. The licensee's method of taking "breathing zone" samples is incorrect in that no attempt is made to sample the air in the immediate vicinity of an individual being studied while he is performing an operation having a potential for generating airborne radioactivity. For an example of licensee's "breathing zone" samples which were taken in order to evaluate the Hearth Operator's exposure to uranium concentrations see Appendix B. In examining this appendix, it can be noted that on each occasion the licensee has taken a ten minute sample at 20 liters/minute in the Hearth Area, and then sampled air (through the same filter) for ten minutes at 20 liters/minute in the Packaging Area. The licensee's reason for the 50%/50% split was that the Hearth Operator spends about 50% of his time in the Hearth Area and the remaining 50% of his time in the Packaging Area. The licensee's records showed no instances where specific breathing zone air samples were taken while the Hearth Operator was performing potential dust generating operations. This point will be covered further in the report.

DETERMINATION OF PRESENT LIMIT FOR CONCENTRATIONS OF RADIOACTIVE MATERIAL IN RESTRICTED AREAS

. Although the clerical, and some of the maintenance personnel, work a straight day schedule at 40 hours per week, the mill processing personnel work a rotating shift schedule consisting of days, swing, and graveyard shifts. On April 26, 1962, the licensee was permitted to comply with 20.103(b) by considering personnel exposure to airborne concentrations on a 28 consecutive day basis. Following is a tabulation showing the rotating shift schedule:

M	T	W	TH	FR	SAT	SUN
				WD	WD	WD
WD	WD	WD	WD	O	O	O
O	WG	WG	WG	WG	WG	WG
WG	O	O	WS	WS	WS	WS
WS	WS	WS	O			

WD - Worked 8 hours/day, dayshift
WS - Worked 8 hours/day, swing shift
WG - Worked 8 hours/day, graveyard shift
0 - Days Off

An analysis of the above schedule shows that processing personnel average 168 hours of work during any period of 28 consecutive days. Hence, the adjusted Appendix B limit for personnel exposure to airborne concentrations of uranium separated from daughter products would be 160/168's of 6.0×10^{-11}, or 5.71×10^{-11} uc/ml natural uranium. Similarly, the adjusted limit for personnel exposure to airborne concentrations of uranium and daughters prior to chemical processing would be 2.38×10^{-11} uc/ml natural uranium.

Licensee Occupancy Studies

In a letter to the Commission, dated August 12, 1960, the licensee (URC) included the most recent study showing the percentages of time spent in various processing areas by specific job descriptions. At the time of the inspection, Messrs. Goff and Baty indicated that this time study needed to be updated. A copy of this study is attached as Appendix A to this report. In examining this exhibit, it will be noted that no data has been included to show time expended performing specific operations having a potential for generating airborne concentrations of radioactivity such as: (1) packaging operations involving topping final product drums, sampling drums, covering drums; (2) yellow cake bucking operations; (3) changing U_3O_8 barrels at the bottom of the dust collector from the hearth furnace; (4) removing ashes from the incinerator and transferring to the hearth furnace; (5) opening the doors of the hearth furnace in order to observe the drying operation. Results of AEC samples taken during some of these operations are covered later in the report.

RESULTS OF AIRBORNE URANIUM SURVEYS IN RESTRICTED AREAS

The licensee's air sample records were examined for the period May, 1960, through December, 1960, and it was noted that no airborne concentrations in excess of the applicable limits had been recorded.

The licensee's air sample records were examined for the period January, 1961, through September, 1962, the date of the last recorded result. The findings are discussed below.

Areas Where Ore Containing Uranium And Its Daughters Is Processed Or Stored

The highest airborne concentration noted in these areas was 15.2×10^{-11} uc/ml. This was the result of an air sample taken on top of the raw ore bins on 8/29/62. The airborne concentrations measured in this area on 8/27/62 and 9/27/62 were 0.779 and 0.221×10^{-11} uc/ml natural uranium, respectively. The average for all three of these samples was recorded as 5.40×10^{-11} uc/ml. This area is normally frequented by the sample tower operator who spends about 50% of his time in this location and the remainder of his time around the sample tower and the conveyor belt area. The licensee had also taken two air samples during this period in those specific areas normally occupied by the sample tower operator wherein the running time of the air sampler was prorated in accordance with the percentage of time this operator normally occupied these individual areas. The result for 8/30/62 was 1.51×10^{-11} uc/ml, whereas the result for 9/27/62 was 1.76×10^{-11} uc/ml.

Areas Where Uranium Separated From Its Daughters Is Processed Or Stored

It was noted that the licensee had detected concentrations of airborne uranium above the limits applicable during this period. These high airborne concentrations were measured in areas frequented by the hearth operator. A transcript of the results of samples collected in those areas frequented by the hearth operator is attached as Appendix B to this report.

The licensee measured an airborne concentration of uranium amounting to 1176.0 uc/ml natural uranium in the yellow cake control room on 3/28/61. Baty said that he was not sure personnel had occupied this room during the time the sample was taken. Since no attempt had been made to relate this concentration to personnel exposure and, further, since no subsequent attempts had been made to take breathing zone air samples in this location, Messrs. Baty and Goff were informed that this discrepancy constituted noncompliance with 20.201(b), "Surveys". Further, in examining the licensee's air sample records, no

data could be found relating to breathing zone air samples taken while the hearth operator was performing specific operations wherein there is a potential for generating airborne concentrations of uranium. Examples of specific operations not sampled consisted of: yellow cake sample bucking; packaging operations entailing barrel sampling, barrel topping, installing of barrel covers, removing barrels from the barrel filler under the drier; placing empty barrels and removing filled barrels from the enclosure under the hearth drier dust collector; removing ashes from the incinerator and transfering to the hearth drier (furnace). Messrs. Goff and Baty said that they would commence taking air samples in order to evaluate the operator's exposure during these operations.

3. On 8/23/62 airborne concentrations of 25.0×10^{-11}, 18.0×10^{-11}, and 1.10×10^{-11} uc/ml were measured on the top deck, middle deck, and dog house, respectively, in the hearth drier area. Baty, upon being questioned about these results, said that this high concentration of airborne uranium had been caused by a maintenance man re-bricking the upper level of the hearth drier; that he had not been notified in advance that this maintenance job was to take place; that the highest concentration had been measured at a location on the top deck of the hearth drier area about 4 to 6' from where the man had been removing the furnace bricks; that he had not taken a breathing zone air sample to evaluate the exposure of the man who was removing the bricks.

3. Both Baty and Goff were informed that a breathing zone air sample should have been taken inside the furnace at the location where the man had been removing bricks in order to evaluate his exposure to airborne concentration of uranium. Baty and Goff said that they would attempt to establish better communication with maintenance supervision so that they could schedule the necessary breathing zone samples.

Independent Measurements by AEC

4. Five general air samples (volumes varying from 500 to 775 liters) and two breathing zone samples were obtained on November 29, 1962. The licensee obtained three general air samples simultaneously (samplers were placed side by side and turned on and off at the same time). Two samples were exchanged for analysis by the respective organizations. The samples retained by AEC were analyzed by the Analysis Branch, Health and Safety Division, ID, and the samples retained by the licensee were analyzed in the mill laboratory. The results are as follows:

GENERAL AIR

Location	Natural Uranium x 10^{-11} uc/ml AEC	Licensee	% MPC
Middle drier deck, 6' from furnace, 3' from floor. 1/	1.7	0.95	0.298
Top drier deck 12' from furnace, all furnace doors closed	1.8	2.9	0.34
On yellow cake barrel mechanism support at operator face level during operations and barrel change	11.6	---	2.0
Southwest of barrel filling mechanism, on yellow cake grinder support; 6' from men working on access to grinder	3.2	---	0.56
Northeast of position where product barrels are filled; 3' from floor; operator normally stands about 3' south of this location	4.9	7.4	0.86

BREATHING ZONE

Location	Sampling Rate (l/m)	Sampling Time (min.)	Nat. Uranium x 10^{-11} uc/ml	x MPC
Hearth operator removing filled barrels from hearth drier dust collector 2/	12.5	4	165	28.8
Split between barreling station and locations near drier doors 3/	12.5	4	50	8.8

1/ Sample collected with AEC sampler was analyzed by licensee and vice versa.

2/ Inspector's estimate: Operator expends a total of about four minutes per shift removing filled barrels from under the hearth drier dust collector.

3/ During the time this sample was being collected, the operator was changing U_3O_8 barrels under the barrel filler, topping barrels, and checking the operation of the hearth drier. The latter operation involves opening drier doors to permit a visible observation of the material being processed inside. Inspector's estimate of time expended on each of these operations was as follows: changes nine (9) U_3O_8 barrels per shift and consumes 30 seconds to complete one operation; tops nine (9) barrels per shift at 2 minutes per operation; checks the operation of the hearth drier sixteen times per shift a 1 minute 30 seconds per operation.

Discussion

Goff said that breathing zone samples would be taken during those operations having a potential for generating dust.

ENVIRONMENTAL AIR SAMPLES

Airborne Radioactivity - Unrestricted Areas

5. Following is a tabulation of the results of air samples taken on 9/9/62 showing concentrations of uranium in effluents emitted from processing stacks.

Stack	Exit Airborne Concentration uc/ml x 10^{-13}
Ball Mill Dust Collector	1,276
Sample Tower Dust Collector	nil
Crusher, New Dust Collector	nil
Crusher, Old Dust Collector	420
Hearth Drier Dust Collector	6,760

Wet Process Exhaust Stacks

Stack	
CO_2 Removal	nil
A Leach	16,230
B Leach	nil

6. Records were available which indicated that environmental air samples had been taken in the unrestricted areas surrounding the plant during April, 1959, and April, 1960. The records showing the results of the air samples taken during April, 1961, could not be located. Following is a tabulation from the available records.

SAMPLES TAKEN ON APRIL 16, 1959

Location	Airborne Uranium Concentration uc/ml x 10^{-11}
North Fence	0.08
Access Road (MGM River Road)	0.05
West Section of Moab	0.04
East Section of Moab	0.06

SAMPLES TAKEN ON APRIL 8, 1960

Location	Airborne Uranium Concentration uc/ml x 10^{-11}
Tailings Pond Roads	0.0074
West Section of Moab	0.0014
North Section of Moab	nil
South Section of Moab	nil

7. Records were available which showed that environmental air samples had been taken in the unrestricted areas surrounding the plant on a monthly basis since 6/12/62. A minimum of 10,000 liters of air is sampled each time using a Staplex high volume air sampler. These air samples are all analyzed for uranium content and compared with a limit of 8×10^{-13} uc/ml, natural uranium, which is the Appendix B MPC for airborne concentrations in unrestricted areas where the radioactivity consists of uranium and daughter products in ore dust prior to chemical processing. The fourteen locations in the surrounding unrestricted area presently being sampled are the following:

1. Top of Moab Canyon
2. Arches Monument
3. Scale House
4. West end of dike
5. Stock pile area
6. South end of dike
7. Atlas Boathouse
8. Atlas Ballfield
9. Moab end of bridge over Colorado River
10. Old Ranch House
11. Slaven's Lumber Company
12. Below hospital
13. Mouth of Mill Creek
14. Miller's Supermarket

8. Four of the above locations were at about the perimeter of the mill whereas the farthest location sampled was about five miles from the plant. For each sample taken, the licensee records the following information: location, time of day, wind direction, wind velocity, sky conditions, relative humidity, air temperature, and barometric reading.

9. The tabulation shown below is presented in order to note the maximum airborne concentration observed in the licensee's records during each month samples were taken since June, 1962.

Date	Location	Uranium Concentration, uc/ml x 10^{-13}
6/15/62	Scale House	2.77
7/11/62	West End of Dike	2.79
8/1/62	West End of Dike	8.82
8/22/62	Scale House	16.1
10/23/62	Old Ranch House	0.44

10. The tabulation above shows the maximum airborne concentration noted during each month that samples were taken out of a total of about 70 samples. The maximum airborne concentration measured was 16.1×10^{-13} uc/ml, natural uranium. Following is a tabulation of the results of all other samples taken at the Scale House prior to August, 1962.

Date (1962)	Airborne Concentration uc/ml Natural Uranium x 10^{-13}
7/19	0.85
7/17	0.165
7/12	1.81
7/10	0.423
7/5	0.73
6/30	nil
6/28	1.21
6/22	nil
6/20	nil
6/15	2.77
6/12	5.44

11. The average of the twelve air samples taken at the Scale House for the period 6/12/62 through 8/22/62, was 2.45×10^{-13} uc/ml, natural uranium, versus an Appendix B limit of 8×10^{-13} uc/ml.

Liquid Effluents

2. The effluent system consists of two retention ponds in series with overflow through a barite ditch; a portion of the output from the ditch, about 500 gpm, is returned to the process; the remaining portion, about 900 gpm, flows through a narrow creek to the Colorado River. Liquid effluent passing through the barite tranch is contacted with barium sulphate which, according to Goff, removes from 60 to 70% of the radium. Baty said that he bases this statement on two tests which had been run by the licensee. A photograph of the barite ditch is contained in Appendix C. The licensee has installed a small continuous sampler inside a shack which withdraws about 15 liters per day out of the 500 gpm flow returning to the process. A photograph of this sampler is shown in Appendix C. All flow through the creek passes through a weir box equipped with a liquid height measuring gauge. Daily readings are taken on this gauge and the flow rate is determined and recorded. See photographs in Appendix C.

3. File copies of all the liquid effluent sample results made since the last inspection in May, 1960, were reviewed. These liquid samples included a grab sample and a monthly composite sample, taken at a location on the creek approximating the border of the unrestricted area. In addition to these two samples, approximately 15 additional liquid samples are taken on a monthly basis on the Colorado River at locations above and below the mill. These samples are analyzed for radium-226, thorium-230, and uranium, natural. In all instances, since May, 1960, the thorium and uranium concentrations have been below the MPC designated for unrestricted areas. Following is a tabulation of the results of radium-226 concentrations in liquid effluent samples since the last inspection.

RADIUM-266 (N) x 10^{-8} uc/ml

Date	Effluent Grab/Monthly Composite
May, 1960	2.17/2.21
June, 1960	2.27/0.16
July, 1960	4.9/5.1
August, 1960	3.4/3.8
September, 1960	0.19/0.83
October, 1960	4.86/0.996
November, 1960	2.60/1.62
December, 1960	2.54/2.32
(Appendix B Limits Revised)	
January, 1961	3.33/3.49
February, 1961	0.703/2.89
March, 1961	3.66/3.08
April, 1961	4.06/1.54
May, 1961	12.0/3.80
June, 1961	7.07/4.98
July, 1961	5.62/3.92
August, 1961	5.83/5.21
September, 1961	1.31/4.41
October, 1961	4.05/sample lost
November, 1961	3.01/0.92
December, 1961	8.84/1.79
January, 1962	2.75/1.88
February, 1962	4.57/2.49
March, 1962	4.94/3.44
April, 1962	13.36/6.91
May, 1962	3.67/2.76
June, 1962	4.714/no analyses

Samples taken subsequent are still awaiting analysis.

4. In summary, the average (assuming a constant flow rate of 900 gpm) radium-226 grab sample and monthly composite sample for the period May, 1960, through December, 1960, was 2.86 and 2.13 x 10^{-8} uc/ml, respectively, versus the then existing Appendix B Limit of 0.4 x 10^{-8} uc/ml. The average grab sample and monthly composite for the period January, 1961, through June, 1962, (the most recent samples analyzed) was 5.19 and 3.34 x 10^{-8} uc/ml, respectively, versus the present Appendix B Limit of 1.0 x 10^{-8} uc/ml.

INDEPENDENT MEASUREMENTS BY AEC

5. Two liquid effluent water samples were collected during the course of the inspection. The licensee also obtained samples at the same time and at the same location. The samples taken by the AEC were analyzed by the Analysis Branch, Health and Safety Division, ID. Those samples taken by the licensee were analyzed in the mill laboratory. The analysis results are as follows:

AEC/LICENSEE

Location	Radium uc/ml x 10^{-8}	Th-230 uc/ml x 10^{-6}	Uranium uc/ml x 10^{-5}
Effluent stream entering barite ditch	12.5/2.4	0.22/0.003	0.196/0.17
Effluent stream leaving barite ditch	4.4/0.8	0.20/0.004	0.204/0.17

6. The disparity between the AEC and licensee data can possibly be explained by the fact that Atlas filtered their two effluent samples and analyzed the filtrate. The ID Analysis Branch, on the other hand, performs a dissolution of readily-hydrolyzible thorium and radium in the sample by making a 2% acid, by volume, concentration using HNO_3. The sample results were compared with John Goff on 1/15/63 during a telephone conversation. Goff was telephoned again on 2/27/63, and he stated that with the exception of the filtration step, his analytical method was the same as that used by the ID Analysis Branch.

7. The next tabulation shows the maximum radium-226 concentration noted each month in the Colorado River above and below the plant since May, 1960:

RADIUM-226(N) x 10^{-8} uc/ml

Date	Above	Below
May, 1960	0.23	0.25
June, 1960	0.059	0.096
July, 1960	0.22	0.26
August, 1960	0.41	0.25
September, 1960	0.28	0.28
October, 1960	0.14	0.47
November, 1960	0.103	0.238
December, 1960	0.043	0.169
(After 1/1/61)		
January, 1961	0.086	0.048
February, 1961	0.388	0.246
March, 1961	0.106	0.150
April, 1961	0.049	0.142
May, 1961	0.088	0.150
June, 1961	0.187	0.208
July, 1961	0.209	0.262
August, 1961	0.482	0.299
September, 1961	0.127	0.106
October, 1961	0.035	0.040
November, 1961	0.083	0.090
December, 1961	0.050	0.187
January, 1962	0.078	0.103
February, 1962	0.146	0.077
March, 1962	0.024	0.116
April, 1962	0.130	0.264
May, 1962	0.642	0.142
June, 1962	0.184	0.129

EXTERNAL RADIATION SURVEY

. Radiation surveys are made using a Professional Model 111B scintillator. The most recent radiation survey was made on 8/21/62, by Baty. Approximate dose rate measurements were taken at 75 locations within the plant area. Following is a tabulation of all areas having a dose rate greater than 1 mr/hr. All readings were taken at distances of one foot unless otherwise designated:

Location	Dose Rates - mr/hr
Ore Pad, Grizzly	1.25 (3 feet)
Ore in Bins	0.80 to 3.0
Top of A and C Classifier Tanks	1.7
Ohmart No. 1, Thickener Area	1.99
North end of B Precipitation Area	2

FILM BADGE PROGRAM

. Mr. Ken Olsen, Personnel Manager, was interviewed regarding their film badge program. Atlas has been using film badges processed by R. S. Landauer, Jr. & Company since July 1, 1962. Presently, 105 men, consisting of the entire operating section, are film badged. The licensee is presently using eight control badges. The maximum quarterly dose rate as measured with film badges for the period July 1 to October 31, 1962, was 1.030 mrad, beta (defined as "HVL - less than one millimeter of tissue") plus 470 mr, gamma. Personnel monitoring results are recorded on a quarterly basis on Form AEC-20-2 which contains the information required by Form AEC-5. It was noted that none of the film badges had received greater than 25% of the permissible beta limit; however, six men had received doses in excess of 25% of the permissible gamma limit of 1250 mr per quarter. These gamma doses were 320, 320, 320, 320, 330, and 350 mr. Olsen said that Atlas plans to film badge the entire 105 man operating section through January 1, 1963, and then continue to film badge only those individuals who had received greater than 25% of the permissible exposure limit. A summary of previous film badge programs are described in paragraphs 51 to 54.

). There was no film badge monitoring program conducted during the period April 26 to July 1, 1962.

. The record of doses measured by Tracerlab Twin-Film film badges for the period 10/2/61, through 4/26/62, which covered 16 men from the packaging and precipitation areas were reviewed. The maximum quarterly dose rate noted during the fourth quarter of calendar year, 1961, was 1500 mrem consisting of 850 mrad, beta, plus 650 mr, gamma. During this quarter period, 3 of the 16 men film badged received doses greater than 313 mr, gamma. During the first quarter of calendar year, 1962, the two maximum dose rates noted were: (1) 960 mrad, beta, plus 335 mr, gamma, total 1295, mrem; and, (2) during this quarter, 5 of the 16 men film badged received doses greater than 313 mr, gamma.

. During the period 9/4/61 to 1/1/62, eleven "Resin in Pulp" personnel were film badged by Tracerlab. During this period, the maximum quarterly beta dose was less than 100 mrem, and the maximum quarterly gamma dose was 335 mr. All other quarterly gamma doses were less than 313 mr.

. During the period 2/15/60 to 5/16/60, the thickener operator, the carbonate precipitator operator, and the moisture man were film badged by Tracerlab. The maximum cumulative doses (skin, of whole body) for this period were 315 millirad, beta, plus 160 mr gamma, total 475 mrem, and 310 millirad beta, plus 220 gamma, total 530 mrem.

. According to the licensee's records, the most recent film badge entry subsequent to the period noted in paragraph 52 above was on 10/19/59.

POSTING

. It was noted that the mill compound was enclosed with a seven-foot, chain-link fence with the exception of that area which provides access to the effluent pond area; that the effluent pond area was not fenced off, but was posted, at intervals, with signs which complied with Section 20.203(e)(2); that entry to the area was also controlled by posting with signs which read,

"RESTRICTED AREA - DO NOT ENTER". It was noted that the nine gates providing access to the restricted areas within the mill compound were posted as required by Section 20.203 (e)(2). The hearth drier and packaging areas were posted with signs as required by Section 20.203(d)(2).

6. Seven locations within the mill area, which included offices and employee lounges, were posted with Form AEC-3.

INCINERATION

7. By amendment to License No. R-161, dated June 26, 1962, the licensee was authorized to incinerate wet process papers containing source material in accordance with the procedures described in the licensee's application dated April 2, 1962, as supplemented June 14, 1962. Item 4 of the licensee's letter of application, dated 6/14/62, states that the ash from the incinerator will be slurried with water and then shoveled into the product drying hearth. Goff stated that this procedure was being followed. A photograph of the incinerator is included in Appendix C.

8. This letter also indicates that individual exposures to airborne radiation will be determined by multiple sample time weighted average exposure methods as outlined in the report, "Air Sampling Procedure in Evaluating Exposures", by H. Glauberman and W. E. Harris of the Health and Safety Laboratory, USAEC, N. Y. According to Goff and Baty, no actual breathing zone samples have been taken when employees are removing ashes from the incinerator and transferring them into the hearth.

EMPLOYEE INSTRUCTIONS

9. Employee training was discussed with Mr. Ken Olsen, Personnel Director, who stated that all new employees are indoctrinated by him at the start of employment. He said that the indoctrination included a discussion on permissible doses of radiation and methods to minimize personnel exposure. He also said employees were instructed on how radioactive material may enter the body, how to prevent entry of radioactive material into the body, and on personal hygiene relative to: (1) smoking in areas where radioactive materials are handles, (2) washing before eating, after contact with radioactive materials, and (3) wearing of respirators or gas masks when required. Olsen also stated that monthly safety meetings are held for all operational personnel in which they are given an opportunity to discuss any questions they may have on radiation safety problems.

MEETING WITH MANAGEMENT

10. Near the end of the inspection, a discussion was held with management on November 29, 1962, relative to the results of the AEC inspection and the items of noncompliance. The items of noncompliance were discussed with Hollis, Vice President, Goff, Plant Metallurgist, and Izzo, Assistant Mill Superintendent. Hollis said that he would see that action was taken to begin conducting actual breathing zone studies during periods when employees are conducting operations which could generate airborne radioactivity. He said that he would also see that up-to-date time studies were made and that these would be related to the measured airborne concentrations such that time-weighted exposure evaluations would be completed for the individuals concerned. In the discussion, it was noted that no actual breathing zone studies have been made on such dusty operations as U_3O_8 sampling and bucking, transferral of incinerator ashes to the hearth furnace, transfer of barrels from the bottom of the dust collector from the hearth furnace, and specified packaging operations. There was some discussion relative to amendment to License No. R-161, dated November 23, 1962. Hollis stated that he plans to write L&R in order to get more definitive information so that he may be in a better position to comply with Section 20.106.

11. Hollis stated that he would continue to film badge all his operational personnel until such time as he was able to determine which groups or individuals were receiving less than 25% of the permissible quarterly limits and that he would probably discontinue film badging of those personnel receiving minimal exposures at that time.

1961 TABULATION OF AIR SAMPLES TAKEN IN AREAS FREQUENTED BY THE HEARTH OPERATOR
Uranium Concentration in uc/ml x 10-11

CALENDAR QUARTER	First						Second						Third									Fourth		
	"Breathing Zone" *																							
Date	2/23	2/27	3/1	3/28	3/29	3/30	6/5	6/6	6/7	6/8	6/13	6/14	8/4	8/14	8/15	9/22	9/23	9/25	9/27	9/28	9/29	12/13	12/21	12/29
arth Area (10 min.)	<1.2	<1.2	<1.2						<1.2		<1.2	<1.2			5.4			.60	.34			.55	nil	.17
Packaging Area (10 min.)																								
	"General Air"																							
Hearth:																								
Top Deck				11.8	.07	.13		.16	.78	.73			1.8			.26				.70		.29	.16	.39
Bottom Deck	.11	.12	6.6						.31		.18	.14		1.3						.64	1.1	.39	.78	nil
Yellow Cake Room				1176.0	.13	.12	.57		.34	.22														
kaging				1.6	.10	.13		.31	.48	.19				.46				.69	.59			.12	4.8	.26
Dog House														.14		.92	.13							

* "Breathing Zone" not purposely scheduled while persons were occupying the areas noted; samples were run in the two areas with the running time of the sample prorated in accordance with the percentage of time this operator actually spends in each area.

1962 TO DATE - TABULATION OF AIR SAMPLES TAKEN IN AREAS FREQUENTED BY THE HEARTH OPERATOR
Uranium Concentration in uc/ml x 10^{-11}

CALENDAR QUARTER	First					Second				Third		
						"Breathing Zones"						
Date	2/19	2/22	3/14	3/20	3/28	4/17	6/14	6/19	6/22	8/23	8/28	9/24
Hearth Area (10 min.)			.22	1.66	5.03	.506		.45	1.01	3.00	.365	.28
Packaging Area (10 min.)												
						"General Air"						
Hearth:												
Top Deck	2.94	.27	.29			.597	.773	5.64		25.0	1.61	1.06
Middle Deck										18.0	1.66	.64
Bottom Deck		.290	.690	.964		.506	3.35	3.26				
Dog House	1.93	.276	.934			.212		3.03	.40	1.10	.459	nil
Yellow Cake Room												
Packaging Area			.373	.400	.216			2.54	.397	6.35	.644	1.51

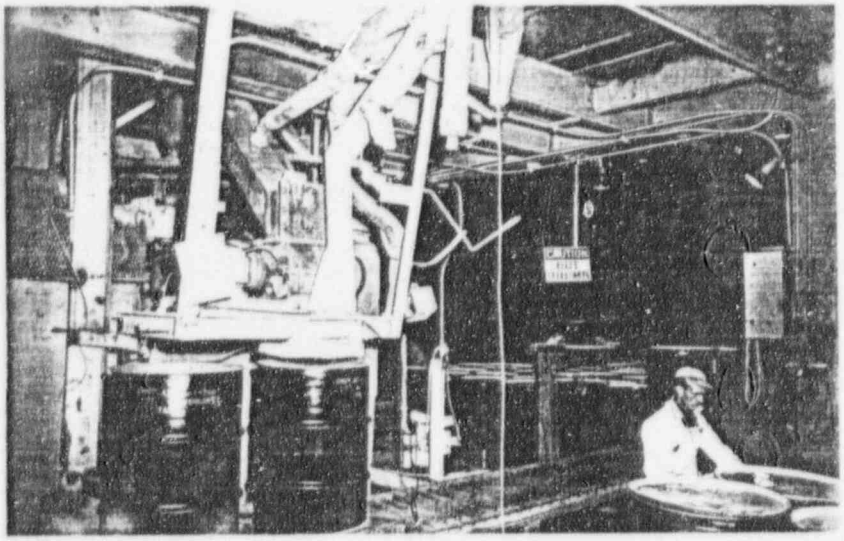


Photo No. 1 - Packaging Area and Packaging Operator

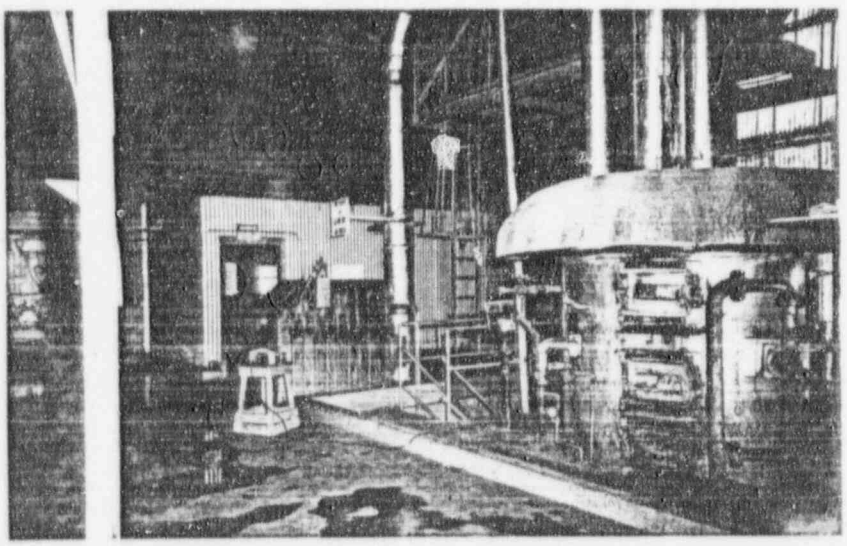


Photo No. 2 - Top of Hearth Drier

APPENDIX C

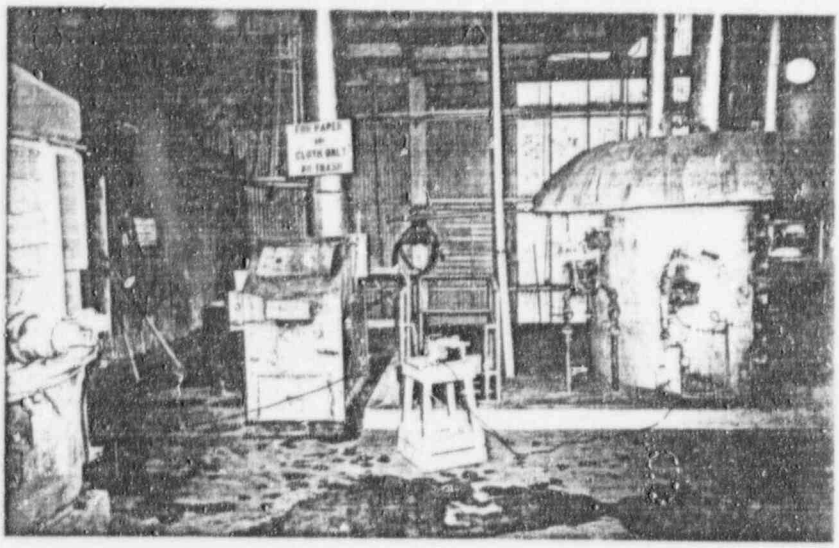


Photo No. 3 - Hearth Drier and Incinerator For Filter Papers and Cloths

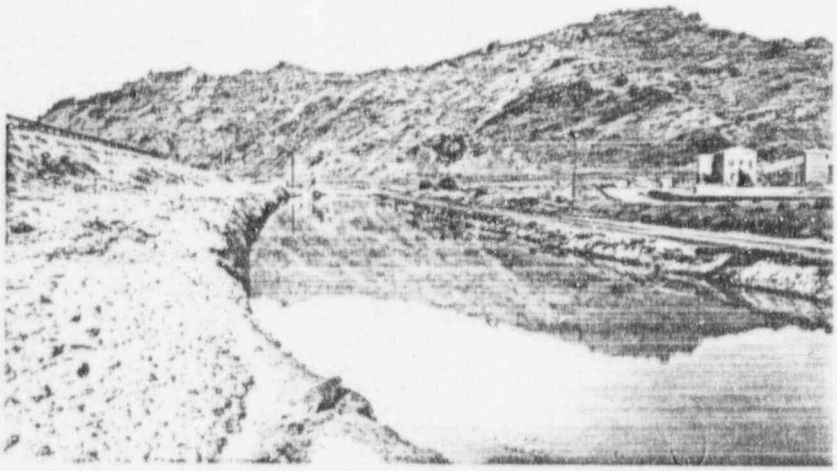


Photo No. 4 - Barite Treatment Creek

Photo No. 5 - Measuring Weir - (Process Operator reads height gauge on a daily basis).

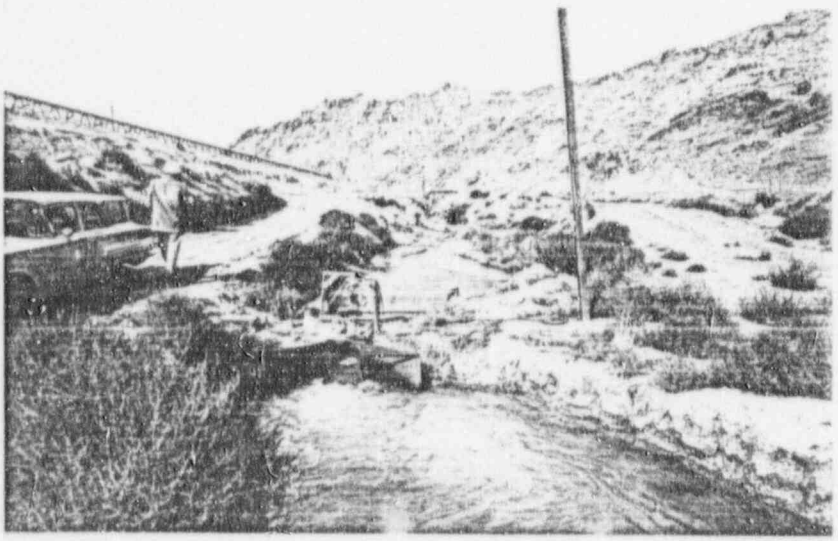


Photo No. 6 - Measuring Weir - (Process Operator reads height gauge on a daily basis).

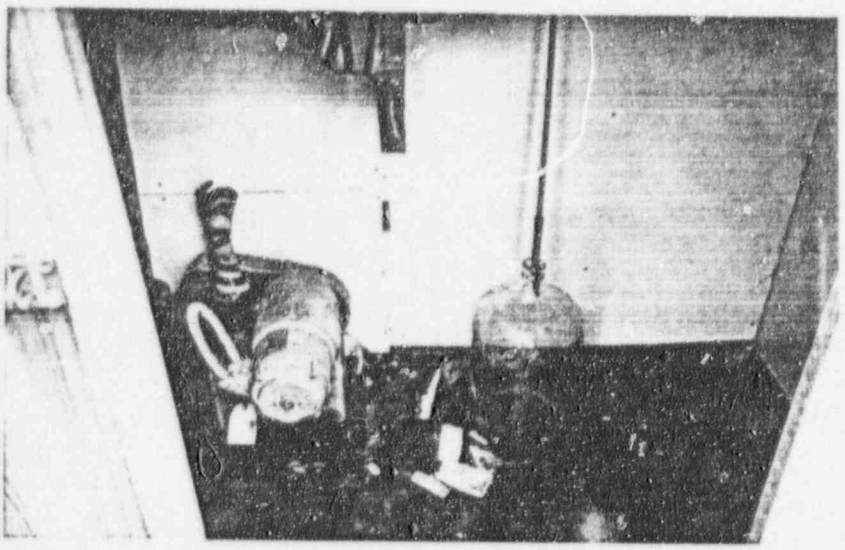


Photo No. 7 - Continuous effluent sampler. (Collects approximately 15 liters/day from the approximately 500 gpm flow returned to plant to be recycled).

APPENDIX C

Inspection Index

1 Administrative Structure
2 Weighted exposures
3 " "
4 Notes on Mill Tour
5 " " " "
6 " " " "
7 Environmental
8 External Radiation & Film Badges
9 Water Analysis
10 Instructions
11 Static Samples
12 Correlation of BZA GA Samples
13 Airborne l/- # of locations & No of Samples
14 Areas Sampled
15 Check on time weighted exposure calculation.
16 Posting of AEC-3
17 Fluorometric Procedure
18 Incineration wet press papers (Appl'n dated April 2, '62 and June 14, 1962

1.

Adm Structure

1. Personnel contacted.
Adm Structure
Responsibility for Rad Safety

R.W. Unger ~~Asst Mill Supt~~ Mill Supt

Henry Baty - Radiation ~~Safety~~ Control Technician - reports to Res Metallurgist

Carl Koropp

Ted Igo Mill Supt, Asst

Roy Hollis V.P. Milling Atlas - Moab

Payne Kibbe - President Atlas Minerals SLC

Corp Hq - in No. Co.

Atlas Minerals is in SLC.

John Goff - RSO
Carl Koropp -
Henry Baty

Ken Olsen - Pers Director

2.

Weighted Exp's

Work Schedule, MPC's (ore)(YC)
Air Sampling Program, Freq, Shifts
Areas above MPC
Air Sampling Equipment – Flow rate for BZ & Gen Air
Last Calibrated, Calib freq
Samples taken at low many locations
Spec locations sampled & enum Y.C. or ore hazards
Results of Gen Air & Time Weighted Exposures

Eg. 12 days on 2 days off = 56 hrs worked in one 7 day per. $\frac{40}{56}$ yMPR = $\frac{5}{7} \times 6 \times 10^{-11}$ $7\overline{)30.00}$ 4.28 4.29×10^{-11} YC

$\frac{5}{7} \times 2.5$ $7\overline{)12.50}$ $7\overline{)1.714}$ 1.71×10^{-4} ore

How are Time weighted Exp Calcs made
List all personnel overexposures based on calculated M.P.C. & TWE's!

Shift Schedule

Avg 42 hr/week mill operating personnell

Days F S S M T W T Shr/day

Graveyard 10- F S S M, 1 T W Th F S S M

Swing O T W th Fr Sat Sun M T W 1 Thursday off before Swing

Tot Days 7 $\frac{40}{21}$
4 40
168 hrs 7 84 840
840 hrs / 4 2 $\frac{21}{28} \times 40$ $\frac{840}{28}$
28 x 21 Avg 42 hr week 7
1
28

Weighted Exposures

$\frac{40}{42} \times 2.5 \times 10^{-11} = 2.38 \times 10^{-11}$

mill limit - airborne

Unshielded area - 8×10^{-15} MPC

Air Sampling on a quarterly basis
Random sampling 3X quarter
75 samples / quarter
v 25 areas & 6 bathing zones

2 ~~Stapler~~ model 31 - multipore filter
20 L/minute - Denali, Fourth Zone
Calibrated - May 23, 1962
" - v 2x year

Last air Sample 75 samples
3rd Quar of 1962
Sampling began on 8-2 & completed
on 9/25
Samples > 2.38×10^{-11}

	$\times 10^{-11}$			Avg
Hearth Top Deck	25.0	1.61	1.06	9.22
" bottom Deck	18.0	1.6	.644	6.77
Packaging area	6.35	.644	1.51	2.83
Packaging operator	3.00	.365	.280	1.22
Pump op	4.26	.365	.115	1.58
Rogrund Cyclone	3.85	2.44	2.80	3.20
3rd Flr Sample Tower	7.20	.309	.644	2.72
Top of Ore Bins	.774	15.2	.221	5.40

v = 2.38×10^{-11}

Weighted Exposures & Air Samples

TWES air samples are taken on a prorated basis based on occupancy of individual operators in various airborne exposed

21 days worked in every 28
40 hr week would be 20 day / 28
$\therefore \frac{21}{20}$ or $\frac{42}{40} \times$ MPL

Top of Ore bins – 5.40×10^{-11}
Sample tower operator works 50% of his time there
MPL – 2.38×10^{-4} — 42 hrs
he works 40 h/w
$\therefore 2.5 \times 10^{-11}$ - MPL
– $\nu 5.0 \times 10^{-11}$ would be MPL for 20 h/week
he is getting 5.4×10^{-4} Avg

Hearth Top Deck 8/23/82 on day job
Top of Hearth 9.22×10^{-11} µc/ml (Based on rebuild hearth – 4 x / year)
Packaging area MPL 2.38×10^{-11}

$9.22\ (.5) \times 10^{-11} = 4.61 \times 10^{-11}$ - 50% on hearth top deck

2.83×10^{-11} 21 hr

$9.22 \times 21 = 194$
$2.83 \times 21 = \frac{59}{253}$

$\frac{253}{41} = \frac{6.2 \times 10^{-11}}{2.38} = 2.6 \times$ MPL

TWES

	$\times 10^{-11}$	Date
Crusher Operator	.353	9/ /62
	.136	9/ /62
	.170	8/31/62
Sample Tower Operator	1.76	9/27
	1.51	8/30
1st Sample Prep Room	.391	9/28
	.441	9/26
	.187	8/30
2nd Mill Operator	1.15	9/26
	.267	8/29
	.644	8/24
Prep Operator	.115	9/24
	.365	8/28
	4.26	8/23
	.280	9/24
	.365	8/28
	3.00	8/23

Operator job

Replacing Buck in booth

Gen Av $\times 10^{-1}$

Working #

Left Ramp	Top	.262	8/27/62
	14	.23	
	Bottom	.644	

Crushing	Near Jaw Crusher		.271	8/27
	Near Cone Crusher		.23	
	Near South Well		.506	
Crushing	#4 Belt Ramp	Top	.547	8/27
		middle	.459	
		Bottom	.221	
Crushing Top of Cone Units	- over #2		.779	8/27
	#6		15×10^{-11}	8/29
	#10		$.221 \times 10^{-11}$	9/27
Crushing 1st Floor Sample Room	E-Side		.138	8/27
	N-Side		.691	"
	Center		.221	"
Crushing 2nd Floor Sample Tower	W Side		.415	8/27
	Center		1.33	
	N-Side		.332	
Crushing 3rd Floor Sample Tower	W-Side		7.20	
	Center		.309	8/27
	East Side		.644	
Crushing 4th Flor Sample Tower	E		1.70	8/27
	Center		.876	
	South		.221	
Ball mill Doghouse			.212	8/24
			.198	8/29
			.335	9/26
grind Cyclone deck	On the dial mill above & directly Ball mill Doghouse	15 minutes per shift by pedometer	3.85	8/24
			2.94 vs 2.38 x 10^{-11}	8/29
			2.80	9/26

A ball mill		1.43	8/24
Dock		1.43	8/24
		1.24	9/26
B Ball mill		1.43	8/24
dock		1.24	8/24
		1.57	9/26
RIP Dock		1.74	8/23
		.133	8/28
		.735	9/24
RIP Doghouse		.691	8/23
		.406	8/28
		.115	9/24
Prep Dock		.920	8/23
		.234	8/28
		.225	9/24
earth [To] Dock	W	25.0 x 10' W	8/23
	N+N	1.61	8/28
	S	1.06	9/24
earth mill Dock		18.0	8/23
		1.66	8/28
		.644	9/24
Hearth Doghouse		1.10	8/23
		.454	8/28
		Nil	9/24
Dock cryng		6.35	8/23
Area		.644	8/28
		1.51	9/24

TWE's

4/11/60 → 6/27/60

2nd Quar 1960 - max < 1.54×10^{-11}

3rd Quar 1960 — from < 1.12 to 1.66×10^{-11}

4th Quarter 1460 — all < 1.24×10^{-11} μc/ml

1st Q 1961 - all < 1.24×10^{-11}

2nd Q 1961 - max -1.57×10^{-11} Cruscher mcc. decks
"A" Pre Op -1.64×10^{-11} μc/ml

3rd Q 1961 BZ all < MPC

4th Q 1961 TWE's and no overexposures

1st Quar 1962 — max 2.30×10^{-11} Hearth #1
" 1.28×10^{-11} #1 Ball Mill Room

2nd Quar 1962

		$\times 10^{-11}$	(Ave of 3 Samples)
6-.547	A. Ball mill Deck —	2.53	
5-1.57	3rd Floor Sample Tower —	5.59 *	
1-14.6	Sample Tower Oper —	2.09	
	ARB Deck —	1.43	
	Hearth Doghouse —	1.21	
	Hearth Top Deck —	2.34	
	" Bottom Deck —	2.37	
	Packaging Area —	1.47	

* Sample Tower Oper, TWE's
6/21/62 - 4.62×10^{-11}
4/17/62 — $.567 \times 10^{-11}$
4/11/62 - 1.09×10^{-11}

Air Sampling

$\frac{40}{42}$ 2.5 — 2.5 × 40 = 100 ÷ 42 = 2.38

[$MPL_{24H} = 2.38 \times 10^{-11}$]

Note: Atlas not using the Unat MPL of 6×10^{-11} μc/ml

Air samples taken 3rd Quar of 1962

3rd Quarter 1962

		× 10^{-4}		Ave
Hearth Top Deck	25.0 #	1.61	1.06	9.22
Batt Deck	18.0	1.66	.644	6.77
P'king Area	6.35	.644	1.51	2.83
Packaging Oper	3.00	.365	.250	1.22
Precip. Oper	4.26	.365	.115	1.58
Regrind Cyclone	3.85	2.44	2.80	3.20
3rd Floor Sample Tower	7.20	.309	.644	2.72
** Top, Ore Bin	8/27 .779	8/29 15.2	9/27 .221	5.40

* Rebricking hearth on 8/23/62
Hearth Op TWE on 9/24/62 — $.230 \times 10^{-4}$

Sample Tower Operation - works 5 1/2 of his shift on top of pyro ore bins
TWE (8/30/62) = 1.51×10^{-11} μc/ml

* Sampler 4'-6' away, sorg Taty, from man removing bricks

Ball mill Deck
Sample Tower
RIP Deck
Hearth
Hearth Dog House
Packing area

2nd Quar 1962

GA

Crushing

4/18 - .318, 1.58, ~~[illegible]~~
6/23 - .70, .341
6/25 - .63, 1.06
4/11 .547, 106, 1.20, .547, .415, .11
4/18 .207 .779, 2.21, 1.57, .202, 106
6/21 .179 .248, .962 (4.6), 1.47, .28

BZ

6/25/62 / .63 X10⁻¹¹
6/23 - .17 X10⁻¹¹
4/18 - 1.16X10⁻¹¹
4/10 - 0
4/17 - .278
6/21 - .128 ~~9~~
6/21 - (4.62X10⁻¹¹)
4/17 - .567
4/1 - 1.09

Ball mill

4/11 - 2.43, 2.25, .382, .691
4/23 - 2.12, 1.47, .212, 1.47
6/20 - 3.03, .832 .147, .876

6/20 .~~55~~ X10⁻¹¹
4/22 1.47
4/11 .588
6/25 .170

1.47 - 3
3.00
1.47

Prep Decks 4R 1P

GA

4/17 - .426, .230, .373,
6/14 - .773, .90, .456,
6/19 - 1.27, 3.15, .212,

BZ

6/23 .303
6/22 .553
6/14 1.27

Hearth Decks

4/17 - .597, .40, .506
6/14 - .773 (3.03) (3.35)
6/19 (5.64) .212 (3.26)

6/22 1.01
6/19 (.450)
4/17 .506

Packaging Area

6/19 2.54
6/22 .397

3rd Quar 1962

Crusher

GA	BZ
8/27 - .202, .271, .597, .774, .138, .415	
8/29 - .23, .23, .459, (15.0), .69, 1.33	9/27 - .136
9/27 - .6441, .506, .221, .221, .22, .332	8/30 - .170
8/27 (7.20), 1.70,	9/27 - 1.76
8/29 - .309, .876,	8/30 - 1.51
9/27 - .644, .221,	9/28 - .391
~~8~~	9/26 - .441
	8/30 - .187

Ball mill

8/24 - .212, (3.45), 1.43, 1.43	9/26 - 1.15
8/29 - .196, (2.94) 1.43 1.29	8/29 - 267
9/26 - .335, (2.80) 1.29 1.57	8/24 - .6441

Pre aer (RIP)

8/23 - 1.74, .691, .920	9/24 - .115
8/28 - .133, .406, .234	8/28 - .365
9/24 - .735, .115 .225	8/23* - 4.26

* Hearth Brick

3rd Quar 1962

Crusher

~~B~~ GA

8/27 - .202, .271, .597, .774, .138, .415
8/29 - .23, .23, .459, (15.0), .691, 1.33
9/27 - .644, .506, .221, .221, .22, .332
8/27 (7.20), 1.70,
8/29 - .309, .876,
9/27 - .644, .221,

~~B~~

BZ

8/27 - .136
8/30 - .170
9/27 - 1.76
8/30 - 1.51
9/28 - .391
9/26 - .441
8/30 - .187

Ball mill

8/24 - .212, (3.85), 1.43, 1.43
8/29 - .198, (2.94) 1.43 1.29
9/26 - .335, (2.80) 1.29 1.57

9/26 - 1.15
8/24 - .267
8/24 - .644

Pre aer (RIP)

8/23 - 1.74, .691, .920
8/28 - .133, .406, .234
9/24 - .735, .115 .225

9/24 - .115
8/28 - .365
8/23* - 4.26

* Hearth Brick replace

Hearth

GA

8/23 - 25.0, 18.0, 1.10
8/29 - 1.61, 1.66, .459
9/24 1.06, .644, nd

BZ

9/24 .280
8/28 .365
8/23 3.00

Replace north sides

Pedregosa Creek

8/23 — 6.35
8/28 — .644
9/24 - 1.51

* Sample taken outside kiln @ 4-6' away from main masonry bricks

Hearth Operator Works @ 5 hours

@ 25.0×10^{-11}

$2.38 \times \frac{40}{5} = 19 \times 10^{-11}$ = MPC per 5 hrs

Worst MPC of Hearth

may have received 25×10^{-11} for 5 hrs

$6 \times 10^{-11} \times \frac{40}{42_8} = 5.7 \times 10^{-11}$ — 42 hr MPC 4.C

$6 \times 10^{-11} \times \frac{40}{5} = 48 \times 10^{-11}$ MPC

$\frac{25}{44}$ of 40 hr MPC

App B.

Job Class – Hearth Operator

62 ← doghouse → (2) | (3) | 61 (3) | (3) | (3)

B.Z.	9/24	8/28	8/23	6/22	6/19	4/17	3/14	3/20	3/28	12/29	12/21	12/13	8/15	9/25	9/27	3/1	2/27	2/23	6/7	6/13	6/14
Hearth Area(10)	.28	.365	3.00	1.01	.45	.506	.221	1.66	5.03	.17	nil	.653	5.44	.597	.344	<1.24	<1.24	<1.24	<1.24	<1.24	<1.24
Pack. Area(10)																					
G.A.																					
Hearth				4/17	6/14	6/19	2/19	2/22	3/14	12/13	12/21	12/29	8/14	9/22	9/28	3/28	3/29	3/30	6/6	6/7	6/8
Top deck(1)	8/23 W	8/28 N	9/24 S	W	N	S	W	N	S(1)	S	W	E	N	S	W	W	E	N	N	S	E
	25.0	1.61	1.06	.597	.723	5.64	2.94	.276	.290	.290	.157	.385	1.77	.257	.69	11.8	.069	.131	.162	.779	.232
Middle deck	8/23	9/28	9/24																		
	18.0	1.66	.64																		
doghouse	8/23	9/28	9/24										8/14	9/22	9/23						
	1.10	.459	nil	.410	3.03	.212	1.93	.276	.934				.141	.920	.129						
Packaging Area	8/23	8/23	9/24	6/19	6/22		3/14	3/20	3/28	12/13 N	12/21 W	12/29 S	8/14	9/25	9/27	N	W	S	S	N	E
	1.35	.644	1.51	2.54	.397		.373	.400	.216	.124	4.82	.207	.465	.69	.59	1.59	.104	.131	.136	.452	.191
Hearth ~~Bottom deck~~				4/17	6/14	6/19	2/22	3/14	3/20				8/14	9/28	9/29						
				.506	3.35	3.26	.290	.690	.964	nil	.779	.385	1.31	.644	1.10	6.57	.121	.111	.312	.135	.143
																3/28	3/29	3/30	6/5	6/7	6/8
C. Control Rm																1176.0	.131	.118	.670	.341	.221

Verify with
[illegible] if last sample
was taken in the
C. C. Rm on 6/14/61

If 1176 $\times 10^{-11}$ that a
man may work 20 in 7 consecutive days

Ask about units no given for GA's

Altus

(3) Packaging area and "Control Room"

(2) Hearth area referred to as "doghouse"

[illegible]

ID-130
(8 - 59)

U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
HEALTH AND SAFETY DIVISION

Serial No.

Sample from: **Atlas Corp, Moab, Utah**

U. S. ATOMIC ENERGY COMMISSION
REGION IV DIVISION OF COMPLIANCE
P. O. BOX 15266
DENVER 15, COLORADO

SAMPLE RECORD

Address

Collected by: **CHS/RTW**

Date: **11-29-62**

Analyzed by:

Date:

Sample No.	Hour	Sample Description	Sampling: Rate L/M	Sampling: Time Min.	Sampling: Total Liters	Anal. No.	Quantity Used, ml.	Fluor. Read., sc. div.	Uranium present: Total μμ curies	Uranium present: μc/ml x 10"
D-91	All	NE of YC barrel station, on barrel @ 3'—normal *	25	31	775					
	XX	station about 3' south.								
D-90	11:00 AM	SW of barreling mechanism—On YC grinder support	25	20	500					
	to	@ 6½ feet—men working on grinder access.								
D 89	3:00 PM	BZ—YC Barrel Changer-(30 sec @ 9/shift);	12.5	4	50					
		barrel topping (2 min @ 9/shift) & drier check-(1 min 30 sec @ 16/shift)								
D 88		On YC barrel mechanism support @ operator face level routine operation & barrel change	25	25	625					
D 87		Top deck Hearth Furnace, 12' from furnace. All furnace doors closed.	25	20	500					
D 86		BZ— Removing barrels from dust collector—4 min @ once/shift	12.5	4	50					
D 85		Middle Drier Deck—@ 6' from furnace; ht-3'-East **								

* Duplicate sample taken by licensee .

** Duplicate sample taken by licensee, sample retained taken with licensee's sampler.

Standard _____ sc. div. per _____ μg. Blank: _____ sc. div.; Sensitivity _____ microgram/sc. div.

Chief, Analysis Branch

APPROVED

ID-130
(8 - 59)

U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
HEALTH AND SAFETY DIVISION
SAMPLE RECORD

Serial No.

Sample from: Atlas Corp, Moab, Utah

Address

Collected by: U. S. ATOMIC ENERGY COMMISSION
REGION IV DIVISION OF COMPLIANCE
P. O. BOX 15266
DENVER 15, COLORADO
GHS/RTW

Date: 11-29-62

Analyzed by: J.A.

Date: 12-12-6

Sample No.	Hour	Sample Description	Sampling: Rate L/M	Sampling: Time Min.	Sampling: Total Liters	Anal. No.	Quantity Used, ml.	Fluor. Read., sc. div.	Uranium present: Total μμ curies	Uranium present: μc/ml x 10"
D-91	All	NE of YC barrel station, on barrel @ 3'--normal	25	31	775	1	.01/25	38.5	38.	4.9
	XX	station about 3' south.								
D-90	11:00 AM	SW of barreling mechanism--On YC grinder support	25	20	500	2		16.5	16.	3.2
	to	@ 6X feet--man working on grinder access.								
D 89 BZ	3:00 PM	BZ--YC Barrel Changer-(30 sec @ 9/shift);	12.5	4	50	3		25.5	25.	50.
		barrel topping (2 min @ 9/shift) & drier check-(1 min 30 sec @ 16/shift)								
D 88		On YC barrel mechanism support @ operator face level routine operation & barrel change	25	25	625	4		23.	22.5	11.6
D 87		Top deck Hearth Furnace, 12' from furnace. All furnace doors closed. *	25	20	500	5		9.7	9.2	1.8
D 86 BZ		BZ-- Removing barrels from dust collector--4 min @ once/shift	12.5	4	50	6		83.	82.5	165.
D 85	"	Middle Drier Deck--@ 6' from furnace; ht-3'- East **	20?	20?	400?	7		4.3	3.8	0.95

* Duplicate sample taken by licensee .

** Duplicate sample taken by licensee, sample retained taken with licensee's sampler.

Number 113 sc. div. per 0.05 avg. Blank .5 sc. div.; Sensitivity 1.2×10^{-3} microgram/sc. div.

CWS by E.R. Eberside
APPROVED
Chief, Analysis Branch

ID-130
(8 - 59)

U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
HEALTH AND SAFETY DIVISION
SAMPLE RECORD

Serial No.

Sample from:				
Address	Collected by:	Date:	Analyzed by:	Date:

Sample No.	Hour	Sample Description	Sampling			Anal. No.	Quantity Used, ml.	Fluor. Read., sc. div.	Uranium present	
			Rate L/M	Time Min.	Total Liters				Total μμ curies	μc/ml x 10"
D-91		North end of YC barrel station, on barrel @ ~ 3' - normal sta appears 3' south *	2.5	31						
D-90	1109	SW of barreling mech - on ball mill support @ 6' - men working on mill access	2.6	20						
D-89		BZ - YC barrel ch (30 sec - 9/shift), barrel topping (2 min - 9/shift) & dryer check (1 min 30 sec - 10/shift)	12.5	4						
D-88		on YC barrel mech support - @ open face level - nontime op + barrel change *	25	25						
-87		Topdeck hearth furnace, 12' from furnace. All doors closed	25	20						
D-86		BZ. Removing barrels from dust collector - 4 min (1/shift)	12.5	4			☆ Dups sample taken by Mc			
D-85		Middle dryer deck - @ 6'; ht 3' - East **					☆☆ " " " " " " Sample rel.			

Standard ____ sc. div. per ____ μg; Blank ____ sc. div.; Sensitivity ____ microgram/sc. div.

Chief, Analysis Branch

ID-104
(R-1 55)

BaSO4 ppt'd @ 1030 12/1/62 HWC

U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
HEALTH AND SAFETY BRANCH

Serial No. 27331

ROUTINE XX SPECIAL ____

IDO H & S SAMPLE RECORD SHEET

Sample from Atlas Corp. uranium mill, Moab, Utah

Collected by: RTW & GHS

Date submitted 12/3/62

U. S. ATOMIC ENERGY COMMISSION
DIV. OF IV DIVISION OF COMPLIANCE
P. O. BOX 15266
DENVER 15, COLORADO

Samples Received: 12-10-62 0800

Analysis Completed: 12-21-62 0830

Analyzed by: HWC gcs

Method: End Window ___ ; Prop. counter ___ ; Spectrophotometric ___ ; Fluorometric ___ ; Polarographic ___ .

Sample No.	Date	Hour	Sample Description	Anal. for	Quant. used, ml.	U +6 or K+ Trans.	Count time, min.	Total Count.	Gross Count, c/m.	Bkgd., c/m.	Net count, c/m.	K40 corr., c/m.	Ra226 foreign activity pc/ml x 10^9 c/m.	Th230 d/m. pc/ml x 10^8
A	11/29		Tailings liquor overflow-prior to barite treatment.	Ra226	1500	12:13 200	30	6175		60/30m	6115/30m			
						12:20 400	30	5594		39/30m	5555/30m		125±2	
				Th230	50	530	30	358	12±0.6 12/30m Gross Reading	0.9±0.2 12/30m Bkgd Reading	11.1±0.6 Net Reading	Converted by Ford Ebasco Dry Basis 11/2/63		22.2±1.2 ug/ml 5.8 x 8
				Unat	0.1 ml				490	.6	490			
B	11/29		Tailings liquor overflow-after barite treatment.	Ra226	1500	1:13 200	10	7907		1/30m	2847/30m			
						1:20 400	30	5975		34/30m	5936/30m		114±1	
														pc/ml x 10^8
				Th230	50	1:17 600	30	330	11±0.6 Gross Reading	0.9±0.2 12/30m Bkgd Reading	10.1±0.6 Net Reading			20.2±1.2 ug/ml 6 x 2
				Unat	0.1 ml				510.	.6	510.			
			Std is ± SD for 0.05 ug of U											

Notified: _____ Time: _____ Resampling Yes ____

Approved CWS Thru EHS Records

Date 11/15/62
Atlas Pers.

AEC/Atlas Sample Comparison

Duplicate Samples

	AEC	Atlas
✓ D-91	4.9×10^{-11} μc/ml, Ur	7.4×10^{-11}
✓ D-87	1.8×10^{-11}	2.9×10^{-11}

Taken by Atlas, Measured by AEC

✓ D-85 – 3.8 μμC — analyzed by Atlas: 1.7×10^{-11}

Get: L/M ____ Tm ____ Total ____

AEC only

✓ D-90 – 3.2×10^{-11} ✓

✓ D-89, BZ – 50×10^{-11} ✓

✓ D-88 – 11.6

✓ D-86 – 165×10^{-11}

?

All Atlas samples filtered

TAILINGS LIQUOR

Before Barite

	USAEC	Atlas
Ra-226	-125×10^{-9}	2.4×10^{-8} μc/ml
Th-230	-22.2×10^{-8}	$.003 \times 10^{-6}$ μc/ml
Ur	– 5.88 μg/ml	0.17×10^{-5} μc/ml
	– $.196 \times 10^{-5}$ μc/ml	

After Barite

Ra-226	44×10^{-9}	$.8 \times 10^{-8}$ μc/ml
Th-230	20.2×10^{-8}	$.004 \times 10^{-6}$ μc/ml
Ur	– 6.12 μg/ml	0.17×10^{-5} μc/ml
	– 0.204×10^{-5} μc/ml	

* $5.88 \frac{\mu g}{ml} \times .333 \times 10^{-6} \frac{\mu c}{\mu gm} = 1.96 \times 10^{-6} = .196 \times 10^{-5}$

$6.12 \times .333 \times 10^{-6} = 2.04 \times 10^{-6} = 0.204 \times 10^{-5}$

call Monticello Woolen 23 > 100 ppb

Call John Goff on Wednesday, Jan 23, 1962

(1) Show our sample results

(2) Find out if the samples are filtered

(3) Are we using the soluble Ra 226 limit?

(4) When did they start route treatment

2/27/63

John Goff by telephone

Goff said that with the exception of the millipore filtration of the suspended solids in the liquid effluent samples, he is using Claude Sill's, ID, analytical methods for radium, and thorium ~~was identical with the~~. He also said that he ~~was~~ had been analyzing radium and thorium in the portion of solids filter-out, and that he ~~was~~ had been reading these results for the past 2 years.

Mill Tour

crusher
One man on ~~mill~~ clean up — vacuums up all loose debris — also rejects mesh fabric
Ivan Johnston

Ore Bins

One ore bins — one man - sample, loader operator - duties
- keeps bins uniformly filled
- Blends ore

all alkaline leach
↑ Sept 1960 closed down thickened leach process
Highline ore now
- Considerable ore lying on floor under conveyor belt

Bins connected to ducts to a large dust collector

Ball Mills

Most Problem - Some entrainment of Hg in mist — Any air samples > MPC of percolor in dog house, vent with outside air,
- Baty says $X \times 10^{-12}$ or less

Wednesday — AM — Moab — Gen Smith from SLC

Acid & alk leach - found no Hg Air Samples & discontinued sampling ~ 1 year ago
Now no sampling between ball mills and packaging except spot air
- Crushing - Grinding - packaging

27
12/62
today

Mill Tour

~~Sand Stone~~

Pre leach - add (at NH3 as an oxidant → autoclave (digester)

Stock - 80×10^6 L/day — 1 lb of V_3O_5

$500 \times \frac{3\mu}{gm} = \sim 1500\mu$ -

$\frac{1500}{80 \times 10^6 \times 10^3}$ $\frac{1500}{8 \times 10^9} = 20 \times 10^{-8}$

$- 6 \times 10^{-11} - MPC$

$\frac{20 \times 10^{-8}}{6 \times 10^{-11}} = 3000 \times MPC$ Restr Area

Dust collector off of final product bell area — Final Product — V_3O_5

Packaging Area — "Caution Airborne Radioactive Area"

Lat Sample Prep Room

1- man on lat sampling & moisture sampling working - 2 1/2 → 3 hrs / day

Moisture Sampling
- Get Moisture Percentage - alternate - 3 men in Moisture Prep — Spends - ~1 hr a day

One man on nights spends ~2 hr a shift

Dust Collectors
a) - 2 - man cyclone b) 1 - Sampling Tower — c - ball mill

Mill Tour

Drain —

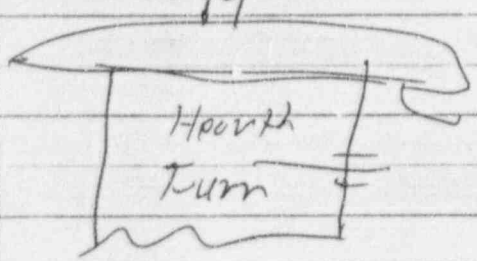
Press paper + old filter cloths

Papers are shaken off - wet

Vented to main hearth stack

Ashes are wheel barred slurried with water & shoveled into the hearth furnace

— Draft on hearth furnace —



pulled by operator shoveling in ashes

pumped in from # 2 repulp tank

Avg 1400 ton/day Avg 55/100 of 1% max

long term — 33/100's

96% recovery 15,400 lb-/day on present grade @ 1400 ton/day

John Goff - Plant - Metallurgist

Barite treatment — all flow through

$BaSO_4$ — Rodman absorbed

Avg on test - 96 — 60% on 2 tests

Avg 60 - 70% absorption

Mill Tour

~~~1200 gpm~~ flowing from pond to river

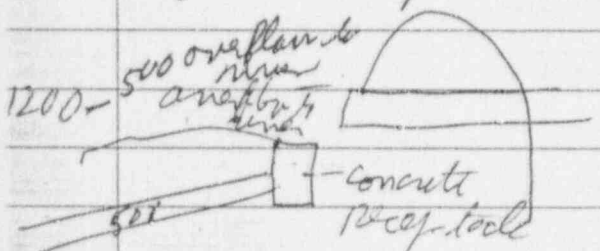
Monthly aliquot - composited from a continuous sampler -

Prim pond → 2nd Pond → Faulé ditch → Stream → Colorado River

Well on West side of Prim Pond -
135' to water - Sampled - 2 times

Prim Pond - "Caution Radiation moderate Area"
2nd Sign - "Restricted area - Do not Enter"

1400 gpm - Pond
1500 gpm - Recycle to plant
Continuous sample - 15 L / day out of the 500 gpm recycled back to process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Atlas Minerals
Division of Atlas Corporation
P. O. Box 488
Moab, Utah

January 31, 1963

Mr. R. C. Woolsey
United States Atomic Energy Commission
Division of Compliance, Region 4
Box 15266
Denver 15, Colorado

Dear Mr. Woolsey:

The air sample which we took on November 11, 1962, and exchanged with you was taken at a flowrate of 20 liters per minute for 20 minutes.

Very truly yours,

ATLAS MINERALS
Division of Atlas Corporation

Henry Baty
Radiation Control Technician

HB:cf

7.

Environmental

Equipment used, Flow rates, calib, etc

Note: MPC Unrestricted:

Before 1/1/61 Uv-1.7x10^{-12} ~~Th-1x10^{-12}~~ Ra-(8x10^{-13}

After 1/1/61 - Uv - 2x10^{-12}
Ra-226 - 1x10^{-12}
Th- 1x10^{-12}

~~Alpha~~ Actively x 10^{-13} - Uv fluorimetric analysis

		x10^{-13}	
1	Top of Moab Canyon	.444	8/22/63
2	Arches Monument	.221	
3	Scall House	16.1 x10^{-13}	
4	West End of Duke	7.41	
5	Electrical Power	1.82	
6	South End of Duke	.221	
7	URC Boathouse	.221	
8	URC Ball Field	.221	
9	Moab end of Bridge	N.I	10/23
10	Old Ranger House	.444	
11	Slovens Lumber Co	.221	
12	Below Hospital	~~N.I~~ .221	
13	Mouth of Mill Creek	N.I	
14	Miller Super Mkt	.221	
~~15~~			

Scale House Prev to 8/22

#3 on 6/12/62 - 5.44 x10^{-13}	6/30 N.I
6/15 - 2.77 x10^{-13}	7/3 N.I
6/20 - N.I	7/5 N.I
6/22 - N.I	7/10 .423 x10^{-13}
6/28 - 1.21 x10^{-13}	7/12 1.81
	7/17 .165
	7/19 .850

Environmental

VRC Boathouse	6.9×10^{-13}	7/20
Sealebarre	.850	7/20
W End of Dike	8.82×10^{-13}	7/31
Sealebarre	.294	4
Sealebarre	7.08×10^{-13}	8/2
VRC Boathouse	$.216 \times 10^{-13}$	8/3
W End of Dike	$.866 \times 10^{-13}$	8/3

Hearth Stack Calc

May 16, 1962

1625 ft^3/min

V_3O_8 — 0.65 lb/day

Activity 13080×10^{-13} μc/ml

$$\frac{13.080 \times 10^{-13}}{6 \times 10^{-11}} = 2170 \times 10^{-2}$$

$$\text{Hr} = \times 21 \text{ MPC}$$

Sample from Stacks 9/19/62

Ball Mill Dust Collector Stack	1276×10^{-13} μc/ml
Sample Tower " " "	Nil
Crusher New Dust C Stack	Nil
Crush Old " " "	430×10^{-13}
Hearth	6760×10^{-13}

Wet Process Exhaust Stacks

CO_2 Removal	Nil
A Leach	16230×10^{-13}
93 Leach	Nil

Environmental

14 areas sampled around the plant perimeter
High
16.1×10^{-13} Scale House on 6/22

6/12, 6/13, 6/14 - 21 locations sampled - high 5.44×10^{-13} pc/ml - Scale House

Notes on Meteorological conditions: Location, Time of Day, Wind Dir & Velocity, Ext Rad level at point sampled, Sky - Clear/Cloudy, Rel Humid. Temp, Bore Rdg

6/15, 6/18, 6/19
6/15, Scale House 2.77×10^{-13} (215)

6/20, 6/21, 6/22 - max Tof of moab Canyon 0.191×10^{-13} (2) samples

6/22, 25, 6/26 (215) nil

6/27/28/29 - (215) max 1.21×10^{-13} Scale House

6/30, 7/2, 7/3 (215) max .0165 $\times 10^{-13}$ moab End of Bridge

7/3/4/5 - (215) Nil

7/5/9 215 Nil

Environmental

7/10, 7/11 (215) W end of Dike — 2.79×10^{-13}

7/12/13 - (215) Scale House - 1.81×10^{-13}

7/16/17/18/62 - 1.661×10^{-13} Junction Alt Highway

7/31, 8/2, 8/1/62 (215) 8.82×10^{-13} W End of Dike

8/2, 3, 4, 6, 7/62 (218) — 7.08×10^{-13} Scale House

8/17/19/62 (215) 0.173×10^{-13} Stevens Lumber Yard

10/22/23/24/62 — No Results

5.

External Rod & Film Badges

Survey Onets used, Freq, Loc's [redacted]/Surveyed

Film Badges - To whom issued, No of Control Badges, - Get highest & 2nd Highest for each quarter of period from 5/60 →

Form AEC-5 — Overexposures

Rod Survey on 8/21/62

		mrem/hr	SBX [redacted] 1113
	One Rod Supply	1.23	3' & Inst
	Overburden	.80 — 3.6	
11	#1 Belt	.96	1'
days	Crusher Bldg Top Level	.42	
1'	MCC Deck	.178	
unless	Jaw Crusher	.149 @ 1'	
other wise	#4 Belt	.72	
verified	Top of Bins	1.3	
	Bottom Bins	.47	
	#1 Sample Cattle	.58	
	Ground Floor	.23	
	Sample Locker	2.3	
	Gallery	.29	
	Tail Pulley Pits	A .47	B —
	Scalping Belts	.47	
	Ball Mills	A .7	B C .65 1.6
	Closed Area	A 2.1	B 1.8
	Cyclone Deck	1.0	
	Dog House	.24	
	Understorage	.72	
	" A & C	1.7	
	Top of Tanks	.38	
	" of A & C	1.7	

8 Ext Rd Surveys

Sand Slime - Dog House		.16
	Pen Area	.235
	Pump Area	.25
	Tank Temp	.52
Thickener Area		
	W Pump Area	.75
	S Pump Area	.19
	Chimney #1	1.99
	" #2	.47
	" #3	.68
Boiler Room Stack TKS	Gen Area	.12
	" "	.12
A Repulp TKS	#1	.4
	#2	.45
B Repulp TKS	#1	.21
	#2	.37
A Precip	Top of Tanks	.395
	Bottom of TKS	.379
A & C Thickener	Top	1.25
	Bottom	1.0
A Drum Filter Area	Pump Area	.505
	Drum Filters	.505
	Filter Presses	.63
Mill Office	Floor	.24
	Wall Nearest	.42
	" Furthest	
Hearth Dryer	#1 Hearth	.63
	#5 "	.70
	Packaging Area	.36
	Stock Scrubber Screen	.55
	Dry House	.24
	Ingen	.43

Barrels—1.7

Mill Sump — Gen Area .136

RIP Section	A Doghouse	.75
	A B Bridge	.77
	B Doghouse	.14
A RIP	B Bridge	.16
Catwalks	S End	.75
	Center	1.7
B Precip	N End	2.9
	Top of TKS	.13
	Bottom "	.12
B KC Thickener	Top	.14
	Bottom	.70
B Drum Filter area	Pump Area	.12
	Drum Filters	.31
	Press	.13
	Floor	.16
Scale	Gen Area	.145
Marston Rm	" "	.180
Sat Rm	" "	.180

Film badges — R.S. Landauer, Jr. & Co.
Matteson, Ill.

Present program started July 1, 1962.
Badges processed monthly.
— Last report for period 10/1 to 11/1/62 —
8 controls — 108 men badged
entire operating section

Max July 1 to Oct 21, 1962 — 39.2
1030 mr β (defined as "HVL = less than 1 mm tissue")
470 mr γ

— Ken Olsen —
Plan to badge to January 1, 1963, then pick out those individuals >25% and continue to badge them —

Nine college students in summer (all over 18), these persons are always badged.

No AEC-5 @ present
59 employees maintained

~~see next page~~

During period 10/2/61 to 4/26/62 16 men (Dry Pack & Recap Ops) were badged — Gracen labs "Twin Towns".

Cum badge "4th quarter cumulative report 1961" max { 1040 β + 295 γ / 850 β + 680 γ / 3 of 16 > 312 mr γ

" " " 1st quarter report 1962 max { 960 β + 835 γ / 820 β + 350 γ / 5 of 16 > 318 mr γ

1 RIP personal badged by Isaclab "Dumpton 9/4/61 to 1/1/62
3 quarter 1961 cum (4 weeks) all badges ≤ 40 mr β + 25 mr γ.
4 quarter 1961 cum max { all β < 100 mr
γ max 335 mr only 1

2 Eastman Opr, Carb precipitator + moisture man 2/18 to 8/16/60
by Isaac-lab:
Cum for period — max { 315 β + 160 γ 315 160 475
310 β + 220 γ 310 220 530

Olsen states that Isaac badges were utilized when job classifications changed.

---

no other badges since 1969 - 59; exposure records

Form AEC 20-2

cont'd Landauer badges:

July 1 to October 1.

ave γ ~ 180 mr

additive — max 350 γ
1030 β
1380

for the quarter July 1 to Oct 1, 1962
no men over ¼ Rita MPD

γ - 320 mr 320 320 360 320 330

6 men received in excess of ¼ γ MPD.

7

RBO
6

41 x MPF
1 hour

9 barrel - ~~for~~ shift.

Form AEC-20-2 last entry 10/19/~~xx~~ 59

1. Name
2. Social Security ~~xx~~
3. Date & birth
4. Age in full years
5. Place of birth
6. Permissable Dose @ beginning of period covered.
7. ~~Nature~~ Method of Monitoring
8. Period of Exposure
9. Gamma
10. beta
11. neutron
12. total
13. Running total for Calendar quarter
14. Previous total
15. Total Dose Recorded on this sheet
16. Total Accumulated Dose
17. Max. Perm. Acc. Dose 5(N-18)
18. Permissible dose

Atlas

9. Water Analysis

{ 2 x 10^-5 mc/ml
  1 x 10^-5 mc/ml
  Agree

	MPC's Prior 1/1/61	After 1/1/61
~~Eff~~		
Ur nat	7×10^{-6}	2×10^{-5}
Th	~~$\times 10^{-8}$~~	1×10^{-6}
Ra-226	4×10^{-9}	1×10^{-8}

Jan 1960 Unreated Effluent Segundo

1/15/59 good

Ra 226 $\times 10^{-8}$

Calo above Dolores	.20
Dolores above Calo	.67
Calo - 1S below Dolores	.11
Calo at Moab Bridge	.15
1/4 mile below Mill	.05
1/2 " " "	.17
1 " " "	.06
5 " " "	.10
10 " " "	.48
20 " " "	.36
30 " " "	lost

Note complete data sheets on environmental water analyses are attached!

20 miles above .48
Confluence Calo & Green
1 mile above Conf .48

Green above Conf .24
of below Conf Lost

Effluent Grab - 2.88 = Th .0097 $\times 10^{-6}$

Effluent (1 mo Comp) 4.0 = Th - .0023 $\times 10^{-6}$ | Ur .042 $\times 10^{-5}$

Water Well a few hundred feet west of tailing pond
- water (salt) @ 135' ~~135 gpm~~ 7.5 gms % Nacl
Sample taken Nov 61 & June 62
Avg of two — Ra226 = 0.046 $\times 10^{-8}$, Th-230 - 0.0015 $\times 10^{-6}$
Ur .0005 $\times 10^{-5}$ uc/ml

Water analyses

From Jan 1960 – June 1962

Nothing Reported since Jan '62

Copies of Data are attached

Ra 226 is ~ 4 x MPC

Th & Ur are OK

ID-104
(R-1-55)

U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
HEALTH AND SAFETY BRANCH
IDO H & S SAMPLE RECORD SHEET

Serial No. _____

ROUTINE XX SPECIAL ____

Sample from: Atlas Corp. uranium mill, Moab, Utah

Collected by: RTW & GHS

Date submitted: 12/3/62

U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
[illegible]
DENVER, COLORADO

Samples Received: _____

Analysis Completed: _____

Analyzed by: _____

Method: End Window___ ; Prop. counter___ ; Spectrophotometric___ ; Fluorometric___ ; Polarographic___ .

Sample No.	Date	Hour	Sample Description	Anal. for	Quant. used, ml.	U^{+6} or K^{+} Trans.	Count time, min.	Total Count.	Gross Count, c/m.	Bkgd., c/m.	Net count, c/m.	K^{40} corr., c/m.	Foreign activity	
													c/m.	d/m.
	11/29		Tailings liquor overflow-prior to barite treatment.	Ra226										
				Th230										
				Unat										
B	11/29		Tailings liquor overflow-after barite treatment.	Ra226										
				Th230										
				Unat										

Notified: _____ Time: _____ Resampling Yes_____

June, 1962 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Green River	.146	.0044	.0004
lo above Dolores	.184	.0051	.0002
lores above Colo	.131	.0060	.0005
lo below Dolores	.188	.0021	.0005
" above mill	.052	.0060	.0005
" below mill	.129	.0032	.0020
" "	.121	.0019	.0007
" " "	.214	.0026	.0013
ffluent (Grab)	4.714	.0388	.154
" (Comp)			

May, 1962 MONTHLY RIVER [illegible]TER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Green River Below	.059	.0121	.0005
Colo above Dolores Above	.642	.0038	.0001
Dolores above Colo "	.271	.0067	.0025
Colo below Dolores Above	.087	.0035	.0004
" above mill	.203	.0044	.0006
" below mill	.142	.0042	.0006
" " "	.098	.0041	.0004
" " "	Not taken - Road flooded.		
Effluent (Grab)	3.67	.0060	.175
" (Comp)	2.76	.0350	.120

April, 1962 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
reen River	.054	.0038	.0007
' above Dolores	.130	.0030	.0006
lores above Colo	.093	.0037	.0030
' below Dolores	.163	.0023	.0008
r above mill	.124	.0035	.0010
r below mill	.087	.0041	.0008
" "	.097	.0041	.0006
" "	.264	.0046	.0005
Fluent (Grab)	15.36	.0448	.118
" (Comp)	6.91	.0083	.090

March, 1962 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Green River	.024	.0041	.0007
Dale above Dolores	.034	.0035	.0010
Dolores above Colo	.132	.0053	.0008
Colo below Dolores	.038	.0021	.0007
mi. above mill	.015	.0037	.0011
mi below mill	.067	.0046	.0013
" " "	.055	.0033	.0010
" " "	.116	.0026	.0007
Effluent (Grab)	4.94	.0339	.0549
" (Comp)	3.47	.0032	.090

February, 1963 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
ween River	.026	.0023	.0010
bove Dolores	.146	.0009	.0022
lores above Colo	.324	.0017	.0064
lo below Dolores	.038	.0017	.0007
ml above mill	.081	.0016	.0005
ml below mill	.037	.0044	.0008
" " "	.077	.0041	.0015
" " "	.030	.0032	.0008
ffluent (Grab)	4.57	.0054	.0613
" (Comp)	2.49		

January 1962 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
een River	.078	.0012	.0008
b above Dolores	.063	.0005	.0007
below Dolores	.054	.0030	.0007
" above mill	.067	.0033	.0010
" below mill	.241	.0001	.0013
" "	.063	.0004	.0016
" "	.103	.0043	.0010
fluent (Grab)	2.75	.0008	.0653
" (Comp)	1.88	.0014	.0541

December, 1961

MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
reen River	.050	.0060	.0006
la above Dolores	.058	.0038	.0003
la below Dolores	.047	.0037	.0007
ni above mill	.066	.0044	.0009
ni below mill	.187	.0033	.0009
" " "	.067	.0051	.0007
" " "	.074	.0058	.0010
ffluent (Grab)	8.84	.0035	.0333
(Comp)	1.79	.0037	.0230

Os in

November, 1961 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
mi above mill	.049	.0075	.0005
mi below mill	.083	.0151	.0006
" " "	.057	.0044	.0006
" " "	.090	.0024	.0009
Effluent (Grab)	3.01	.0113	.0355
" (Comp)	.92	.0053	.0411

As is

October 1961

MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
½ mile above mill	.055	.0005	.0006
½ mile below mill	.034	.0005	.0011
" " "	.040	.0006	.0010
" " "	.019	.0006	.0013
Fluent (Grab)	4.05	.0044	.0347
" (Comp)	Sample	lost	

0.5 ml

[S]eptember 1961 MONTHLY R[IVE]R SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Colo above Dolores	.137	.0053	.0003
Dolores above Colo	.090	.0049	.0018
Colo below Dolores	.018	.0041	.0003
Colo at Moab Bridge	.047	.0017	.0003
¼ mi below mill	.071	.0053	.0003
½ " " "	.078	.0023	.0006
1 " " "	.059	.0028	.0003
5 " " "	.073	.0033	.0006
10 " " "	.047	.0032	.0003
30 " " "	.096	.0053	.0003
50 " " "	.043	.0052	.0003
70 mi above conf	.077	.0014	.0003
1 " " "	.106	.0016	.0015
Green above conf.	Not Taken	—	—
Colo below conf.	" "	—	—
Effluent (Grab)	1.31	.0075	.0294
" (Comp)	4.41	.0013	.0588

Feb. 1st 1961 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
b above Dolores	.058	.0135	.0003
lores above Colo	.482	.0056	.0029
b below Dolores	.138	.0058	.0009
b at Moab Bridge	.098	.0071	.0006
mi below mill	.131	.0034	.0009
" " "	.100	.0053	.0006
" " "	.055	.0032	.0009
" " "	.079	.0063	.0006
" " "	.072	.0042	.0006
" " "	.188	.0069	.0006
" " "	.078	.0029	.0003
mi above conf	.175	.0037	.0006
" " "	.299	.0047	.0006
een above conf.	.014	.0032	.0003
b below conf	.146	.0047	.0003
ffluent (Grab)	5.83	.0069	.1470
" (Comp)	5.21	.0063	.0588

July 1961 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
½ above Dolores	.053	.0564	.0003
ores above Colo	.209	.0293	.0003
½ below Dolores	.197	.0590	.0003
½ at Moab Bridge	.092	.0597	.0006
mile below mill	.131	.1409	.0003
" " "	.113	.0551	.0003
" " "	.134	.0078	.0003
" " "	.121	.0049	.0006
" " "	.154	.0047	.0005
" " "	.182	.0060	.0003
" " "	.263	.0053	.0003
miles above conf	.216	.0044	.0006
" " "	Not Taken	—	—
een above conf	"	—	—
½ below conf.	"	—	—
ffluent (Grab)	5.62	.1416	.0882
" (Comp)	3.92	.0133	.1176

June 1961 MONTHLY RIVER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Colo above Dolores	.058	.0104	.0002
Dolores above Colo	.187	.0085	.0006
Colo below Dolores	.053	.0065	.0003
Colo at Moab Bridge	.084	.0088	.0002
1 Mile Below mill	.083	.0139	.0002
" " "	.120	.0033	.0002
" " "	.114	.0046	.0003
" " "	.105	.0051	.0005
" " "	.128	.0051	.0005
" " "	.112	.0054	.0021
" " "	.136	.0054	.0005
1 miles above Conf	.208	.0058	.0006
" " "	.168	.0058	.0003
Green above conf	.029	.0049	.0003
Colo below conf.	.182	.0051	.0006
Effluent (Grab)	7.07	.0255	.1176
" (Comp)	4.98	.0148	.1176

May 1961

MONTHLY RIVER [illegible]ER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
abore Dolores	.042	.0042	.0003
res abore Colo	.088	.0066	.0006
below Dolores	.116	.0045	.0006
at Moab Bridge	.074	.0032	.0003
½ below m. 11	.045	.0042	.0006
" " "	.025	.0056	.0006
" " "	.077	.0060	.0003
" " "	.066	.0045	.0013
" " "	.101	.0044	.0009
" " "	.107	.0058	.0009
" " "	.115	.0053	.0006
miles abore conf.	.150	.0047	.0003
" " "	.144	.0030	.0006
een abore conf.	.087	.0032	.0005
lo below conf.	.148	.0044	.0029
ffluent (Grab)	12.0	.0063	.0882
" (Comp)	3.80	.0055	.1176

April, 1961

MONTHLY RIV. ER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
6 above Dolores	.049	.0065	.0012
lores above Colo	.077	.0116	.0009
6 below Dolores	.055	.0090	.0007
6 at Moab Bridge	.136	.0060	.0016
6 ¼ mi. below mill	.097	.0060	.0011
½ " " "	.081	.0070	.0007
1 " " "	.105	.0062	.0011
5 " " "	.153	.0060	.0011
10 " " "	.092	.0057	.0011
20 " " "	.075	.0060	.0009
30 " " "	.133	.0054	.0008
20 mi. above Confl.	.121	.0090	.0013
1 " " "	.147	.0038	.0041
reen above Confl.	.015	.0035	.0006
lo below Confl.	.036	.0033	.0006
ffluent (Grab)	4.06	.0162	.0529
" (Comp)	1.54	.0086	.2058

MARCH, 1961 MONTHLY RIVER [illegible]R SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
O ABOVE DOLORES	.106	.0054	.0006
RES ABOVE COLO	.111	.0063	.0023
O BELOW DOLORES	.092	.0038	.0011
O AT MOAB BRIDGE	.097	.0058	.0006
ILE BELOW MILL	.092	.0037	.0009
" " "	.066	.0019	.0009
" " "	.059	.0042	.0011
" " "	.093	.0051	.0008
" " "	.067	.0038	.0006
" " "	.088	.0021	.0006
" " "	.115	.0035	.0008
MILES ABOVE CONF	.121	.0042	.0008
" " "	.150	.0051	.0007
EED ABOVE CONF.	.015	.0037	.0003
LO BELOW CONF.	.046	.0026	.0007
FLUENT (GRAB)	3.66	.0041	.1617
FLUENT (COMP)	3.05	.0090	.053

FEBRUARY, 1961 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
o ABOVE DOLORES	.388	.0023	.0009
ORES ABOVE COLO	.111	.0042	.0014
o BELOW DOLORES	.047	.0049	.0007
O AT MOAB BRIDGE	.023	.0037	.0005
ILE BELOW MILL	Nil	.0028	.0012
" " "	.059	.0033	.0005
" " "	.077	.0051	.0006
" " "	.061	.0042	.0017
" " "	.081	.0035	.0010
" " "	.083	.0023	.0013
" " "	.175	.0016	.0011
ILES ABOVE CONF	.169	.0021	.0013
" " "	.246	.0016	.0010
ED ABOVE CONF.	.025	.0030	.0008
O BELOW CONF	.165	.0030	.0016
ELUENT (GRAB)	.703 ~~3 wks~~	.0167 ~~.0044~~	.120 ~~.0120~~
LUENT (COMP.)	2.59	.0027	.119

JANUARY, 1961 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural * (N) x 10^{-5} uc/ml
0 ABOVE DOLORES	.086	.0060	.0007
ORES ABOVE COLO	.018	.0075	.0011
0 BELOW DOLORES	.121	.0032	.0002
0 AT MOAB BRIDGE	.158	.0054	.0005
ILE BELOW MILL	.100	.0178	.0006
" " "	.032	.0063	.0006
" " "	.072	.0105	.0010
" " "	.019	.0067	.0005
" " "	.048	.0142	.0005
" " "	—	—	—
" " "	—	—	—
MILES ABOVE CONF	—	—	—
" " "	—	—	—
GN ABOVE CONF.	—	—	—
0 BELOW CONF.	—	—	—
FLUENT (GRAB)	3.33	.0088	.0735
FLUENT (COMP)	3.49	.0095	.1235

* CALCULATED ON THE BASIS OF 1 DPM CURIE OF URANIUM.

DECEMBER, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
o Above Dolores	.039	.0037 ~~.0050~~	.0016
Dres Above Colo	.043	.0041 ~~.005~~	.0026
o Below Dolores	.026	.0017	.0026
o at Moab Bridge	.044	.0044	.0021
Mile Below Mill	.045	.0016	.0011
" " "	.017	.0016	.0005
" " "	.084	.0063	.0020
" " "	.025	.0049	.0015
" " "	.045	.0075	.0010
" " "	.043	.0056	.0016
" " "	.168	.0040	.0018
Mills Above Conf.	.139	.0028	.0011
" " "	.169	.0246	.0026
een Above Conf.	.023	.0130	.0016
ld Below Conf.	.091	.0179	.0058
Fluent (Grab)	2.54	.0079	.20
Fluent (Comp)	2.32	.0107	.083

NOVEMBER, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
LO ABOVE DOLORES	.019	.047	.0002
LORES ABOVE COLO	.103	.053	.0009
LO BELOW DOLORES	.054	.0025	.0006
LO AT MOAB BRIDGE	.037	.0019	.0004
MILE BELOW MILL	.132	.0039	.001
" " "	.034	.0030	.001
" " "	.063	.0117	.001
" " "	.178	.0109	.0007
2 " " "	.057	.0045	.0009
0 " " "	.124	.0038	.0004
0 " " "	.155	.0050	.0007
2 MILES ABOVE CONF.	.142	.0056	.0008
" " "	.238	.0143	.001
EEN ABOVE CONF.	.016	.0038	.0004
OLO BELOW CONF.	.170	.0055	.0007
EFLUENT (GRAB)	2.60	.0034	.31
FFLUENT (COMP)	1.67	.0069	.33

OCTOBER 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
O ABOVE DOLORES	.081	.005	.0016
ORES ABOVE COLO	.14	.005	.0032
O BELOW DOLORES	.035	.008	.0021
O AT MOAB BRIDGE	.055	.002	.0017
MILE BELOW MILL	.15	.002	.0013
" " "	.55	.002	.0026
" " "	.24	.003	.0022
" " "	.057	.003	.0019
" " "	.076	.002	.0017
" " "	.12	.003	.0028
" " "	.071	.003	.0019
MILES ABOVE CONF.	.28	.002	.0017
" " "	.47	.002	.0049
EEN ABOVE CONF.	—	—	—
LO BELOW CONF.	—	—	—
FFLUENT (GRAB)	4.86	.013	.553
EFLUENT (COMP.)	.996	.0016	.812

SEPTEMBER, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
COLO ABOVE DOLORES	~~.05~~ .03	.003	.0007
DOLORES ABOVE COLO	~~##~~ .28	.002	.002
COLO BELOW DOLORES	~~##~~ .04	.002	.001
COLO AT MOAB BRIDGE	.04	.002	.003
¼ MILE BELOW MILL	.10	.007	.0007
½ " " "	.06	.002	.001
1 " " "	.15	.001	.0007
5 " " "	.09	.002	.0007
10 " " "	.12	.002	.0007
20 " " "	.09	.003	.0002
30 " " "	.07	.002	.0008
20 MILES ABOVE CONF.	.25	.003	.001
1 " " "	.28	.005	.001
GREEN ABOVE CONF	.02	.002	.0004
COLO BELOW CONF	.16	.004	.001
EFFLUENT (GRAB)	.19	.015	.062
EFFLUENT (COMP)	.83	.035	.12

AUGUST, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
O ABOVE DOLORES	.05	.0054	.001
ORES ABOVE COLO	.41	.0054	.001
LO BELOW DOLORES	.04	.0043	.0004
LO AT MOAB BRIDGE	.03	.0060	.001
MILE BELOW MILL	.04	.0017	.0006
" " "	.05	.0024	.001
" " "	.04	.0020	.001
" "	.08	.0010	.0006
" " "	.08	.0030	.002
O " " "	.13	.0020	.001
O " " "	.15	.0030	.002
O MILES ABOVE CONF.	.21	.0020	.001
" " "	.27	.0010	.001
REEN ABOVE CONF.	.01	.0010	.0008
XO BELOW CONF.	.25	.0070	.001
FLUENT (GRAB)	3.4	.035	.30
FLUENT (COMP)	3.8	.024	.42

JULY, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
O ABOVE DOLORES	.06	.0034	.00006
ORES ABOVE COLD	.72	.0030	.0010
O BELOW DOLORES	.08	.0027	.00020
O AT MOAB BRIDGE	.05	.0010	.0020
MILE. BELOW MILL	.03	.0010	.00030
" " "	.06	.0027	.0005
" " "	.05	.0010	.0006
" " "	.15	.0024	.0066
" " "	.15	.0027	.0008
" " "	.18	.0040	.0005
" " "	.17	.0017	.0007
MILES ABOVE CONF.	.21	.0017	.0008
" " "	.26	.0030	.0007
EN ABOVE CONF.	.04	.0020	.0003
LO BELOW CONF.	.16	.0010	.0008
EFLUENT (GRAB)	4.9	.0047	.48
EFLUENT (COMP)	5.1	.010	.54

JUNE, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
OLO ABOVE DOLORES	.057	.0008	
OLORES ABOVE COLO	.059	.0014	
OLO BELOW DOLORES	.077	.0015	
OLO AT MOAB BRIDGE	.057	.0008	
MILL BELOW MILL	.067	.0015	
" " "	.037	.0015	
" " "	.045	.0017	
" " "	.028	.0015	
" " "	.064	.0005	
" " "	.079	.0006	
" " "	.078	.0007	
MILES ABOVE CONF.	.067	.0010	
" " "	.016	.0017	
EEN ABOVE CONF.	.013	.0015	
OLO BELOW CONF.	.096	.0010	
FLUENT (GRAB)	2.27	.0107	
FLUENT (COMP.)	.16	.0065	.30

MAY, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
ABOVE DOLORES	.06	.0027	
ORES ABOVE COLO	.23	.0016	
BELOW DOLORES	.15	.0045	
AT MOAB BRIDGE	.07	.0010	
ILL BELOW MILL	.11	.0010	
" " "	.08	.0017	
" " "	.06	.0023	
" " "	.08	.0021	
" " "	.16	.0010	
" " "	.09	.0015	
" " "	.25	.0037	
MILES ABOVE CONF.	.24	.0016	
" " "	.18	.0030	
LEN ABOVE CONF.	.07	.0012	
LO BELOW CONF.	.17	.0030	
FLUENT (GRAB)	2.17	.0037	
FLUENT (COMP)	2.21	.0037	.12

APRIL, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
O ABOVE DOLORES	.08	.0031	
ORES ABOVE COLO.	.16	.0056	
O BELOW DOLORES	.06	.0023	
O AT MOAB BRIDGE	.13	.0016	
ILL BELOW MILL	.17	.0013	
" " "	—	—	
" " "	.05	.0035	
" " "	.19	.0055	
" " "	.10	.0021	
" " "	.17	.0050	
" " "	.06	.0026	
MILES ABOVE CONF.	—	—	
" " "	.19	.0001	
EEN ABOVE CONF.	.003	.0040	
LO BELOW CONF.	.038	.0050	
FLUENT (GRAB)	.76	.0225	
FLUENT (COMP)	6.14	.0012	.18

MARCH, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
D ABOVE DOLORES	.15		
ORES ABOVE COLO	.31		
D BELOW DOLORES	.09		
O AT MOAB BRIDGE	.12		
MILL BELOW MILL	.14	.0023	
" " "	.13	.0030	
" " "	.13	.0026	
" " "	.18	.0046	
" " "	.23	.0050	
" " "	.28	.0033	
" " "	—	—	
MILES ABOVE CONF	.29	.0036	
" " "	.33	.0043	
EEN ABOVE CONF.	.001	.0070	
LO BELOW CONF.	.24	.0063	
EFLUENT (GRAB)	4.0	.0059	
EFLUENT (COMP)	4.7	.0010	.060

FEBRUARY 1, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
ABOVE DOLORES	.05		
RES ABOVE COLO	.30		
BELOW DOLORES	.16		
AT MOAB BRIDGE	.19		
MILL BELOW MILL	.30		
" " "	.28		
" " "	.30		
" " "	.28		
" " "	.35		
" " "	.47		
" " "	—		
MILLS ABOVE CONF.	.65		
" " "	.44		
EGA ABOVE CONF.	.11		
LO BELOW CONF.	.38		
EFLUENT (GRAB)	4.7	.0035	
FLUENT (COMP)	4.2	.014	.060

JANUARY, 1960 MONTHLY RIVER WATER SURVEY

LOCATION	Ra 226 (N) x 10^{-8} uc/ml	Th 230 (N) x 10^{-6} uc/ml	U Natural (N) x 10^{-5} uc/ml
Above Dolores	.20		
Res. Above Colo	.67		
Below Dolores	.11		
At Moab Bridge	.15		
Mile Below Mill	.05		
" " "	.17		
" " "	.06		
" " "	.10		
" " "	.48		
" " "	.36		
" " "	—		
Miles Above Conf.	.48		
" " "	.48		
Below Above Conf.	.37		
Colo Below Conf.	—		
Effluent (Grab)	2.88	.0097	
Effluent (Comp)	4.0	.0023	.042

Instructions

see next sheet

Safety meetings held in which personnel are undocumented on road safety problems

August 10, 1959

Personnel Department

Subject: Employee Indoctrination on Radiation

At the present time there is not any conclusive evidence that low dosages of radiation spread over a long period of time will have any life-shortening effect. However, it is known that an extreme short time exposure to radiation can cause physical damage and even death. For example, 100 rems of radiation received within a 24 hour period will cause nausea and fatique. Under the present AEC regulations the maximum amount of radiation an employee is allowed to receive in a twenty year period is 100 rems of radiation.

It is believed that the human body can withstand small doses of radiation without any apparent effect. Perhaps a similar comparison can be found in the daily consumption of small quantities of alcohol. Most men can drink an ounce of 100 proof whiskey every day without any apparent affect, but let him drink three months supply in a single setting and the chances are likely he will end up in the morgue. The body cannot fight off such a large quantity of alcohol and consequently the man would probably die from alcoholic poisoning.

Even though the amount of radiation we may receive here at Uranium Reduction is very small we want to keep it as low as possible. Our concern then, is how to be protected from even the small amounts of radiation. Radioactive materials can attack the bodies in two ways, one from a source external to the body, second, from a source inside the body.

Protection from external radiation

Protection from external radiation exposure at this plant may be obtained by the use of the safety factors of time and distance.

The Safety factor of Time

The shorter the period of time the body is exposed to radioactive materials, the less radiation it will receive.

The Safety factor of distance

The farther away the body is from the source of radiation, the smaller is the amount of radiation received.

Therefore, to protect yourself from external radiation you should spend as little time as possible in highly radioactive areas. Secondly, keep the source of radiation as far away from your body as possible. This would also indicate keeping radioactive materials off your face, hands and clothing.

Protection from internal radiation

There are four possible ways to get radioactive materials into the body:

1. By breathing
2. By swallowing
3. Through breaks in the skin
4. By absorption through the skin

The obvious technique to keep from obtaining internal radiation by any of the foregoing methods is to have all working areas entirely free from radioactive materials. However, in the processing of uranium ore certain amounts of radioactive materials are bound to get into the air, but the amount of airborne radioactive materials is largely determined by the care utilized in processing the ore and the safety mindedness of the operating personnel. The Company recognizes the importance of maintaining working surroundings as free from radioactive materials as possible. This is evidenced by doing frequent air sample studies, monitering personnel, and maintaining the kind of equipment that can keep the air reasonably free from radioactive dust. It is up to each employee for his protection to extend his fullest cooperation to the Company by doing items such as the following as directed by the supervisors:

1. Maintain good housekeeping techniques
   a. Use vacuum cleaners - reason - brooms stir up radioactive dust and cause it to become airborne.
   b. Those areas that can be wet down, wet them and keep them wet.

2. Don't smoke in areas where radioactive materials are handled - reason - radioactive materials are transferred from the hands to the cigarette to the mouth, and into the body.

3. Wash up before you eat - reason - radioactive materials on the hands go on the food, to the mouth and into the body.

4. Wear a respirator or gas mask when required.

In general, obey Company policies and regulations regarding radiation, they are made for your protection.

Stack Samples

Data is under Environmental

12. correlation of Breath Temp & Gen Air Samples

Note: They are not taking adequate BZ samples. BZ samples are actually only general air samples proprated in time in various locations in proportion to the proportion of times/ indiv operations work in these locations

13

Airborn Uv - No of Locations & No of Samp's

Month	GA Samples	BZ Samples	Area Samp
9/62		1	Crusher Oper
"		1	" "
"		1	" "
"		1	Sample Tower Oper
"		1	" for samp. Prep Mats
"		1	" "
8/62		1	" "
9/62		1	Ball mill Oper
8/62		1	" " "
8/62		1	" " "
9/62		1	Precip Oper
8/62		1	" "
8/62		1	Pre "
9/62		1	Hearth Oper
8/62		1	Hearth Oper
8/62		1	" "
		17 BZ's	
8/62	3		Crushing - #1 Belt Ramp
	3		Crushing MBC Deck
"	3		Crushing #4 Belt Ramp
"	3		Crushing Top of Feed Ore Bins
"	3		Crushing 1st Floor Sample Tower
"	3		" 2nd Floor Sample Tower
"	3		" 3rd Floor Sample Tower
"	3		" 4th Floor Sample Tower
"	3		Ball mill Doghouse
"	3		Regrind Cyclone Deck
"	3		A Ball mill Deck
"	3		B Ball mill Deck
"	3		A RIP Deck
"	3		A RIP Doghouse
"	3		A Precip. Deck
"	3		Hearth Top Deck

Areas Sampled

Month	GA Sampler	Areas Sampled
8/62	3	Hearth Mill TK
8/62	3	" Doghouse
8/62	3	Packaging Area
	57 Ten airs	

19
3
5-7
11
7 4 total
3rd Quar

5.44×10^{-6} gm V_3O_8 x .842

$\frac{4.6 \times 10^{-6} \text{ gms U}_3\text{O}_8}{4.00 \times 10^{5} \text{ ml}} = 1.07 \times 10^{-11} \frac{\text{gms}}{\text{ml}}$

$1.07 \times .333 \frac{\mu c}{\text{gm}} = .35\gamma \times 10^{-11} \frac{\mu c}{\text{ml}}$

they show $.400 \times 10^{-11}$ OK

↑
A Ball mill Decks on 12/22/61

5.

Check on Time Weighted Exposure Rate

6 Posting & AEC-3

✓ 1/ Employees Lounge in Adm Building
✓ 2/ Bull Board in Lab
3/ ~~Dog House in~~ Mill Office
✓ 4/ Scale House (Crusher Office)
✓ 5/ ~~Log Dog House~~ Employee Change House
6/ ✓ Shop Bldg - Bull Board

26.203 (e)(2)

✓ 1/ Main Gate
2 E Ent to Adm Bldg
3 3/ Maint Ent
4/ NE Gate
5/ Boathouse Gate
6 E Scalehouse Gate
Yarding Pond Posted
7 Rear Gate
8 2nd Rear Gate (open days - locked @ 4 pm)
9 Gate - to water/Kent

7. Fluorometric Procedure

See procedure attached !

Note typo error - ea NaF pellet actually contains ca. 1 μgm = 1×10^{-7} gm U_3O_8

FLUORIMETRIC ANALYSIS OF U_3O_8 IN AIR SAMPLES

Place filter paper in 250 ml beaker, add 10 ml of $HCLO_4$ and 20 ml of HNO_3 and take to $HCLO_4$ fumes. Add 10 ml portions of HNO_3 to the cooled $HCLO_4$ in the beakers until all the color from the organic matter is gone and the sample is clear. Cool, add 2 ml of HF, 5 ml HNO_3, and again take the sample to $HCLO_4$ fumes; continue to fume until sample contains 5 ml of $HCLO_4$. Cool and transfer to a 25 ml volumetric flask and dilute to the mark with distilled water.

Transfer by pipette 4 ml of sample from the 25 ml volumetric flask to a 40 ml vial, add 15 ml of saturated $Al(NO_3)_3$ solution, 10 ml of ethyl acetate, cap the vial and shake on an Eberbach shaker for 2 minutes.

Allow the aqueous and the ethyl acetate phases to separate and pipette 0.1 ml of the ethyl acetate phase onto each of two .4 gram NaF pellets, previously prepared and placed on clean, dry platinum dishes.

Prepare a 1g/L U_3O_8 standard, take 1 ml of this standard and dilute it to 100 ml with distilled water, and 10 ml of 1:1 HNO_3. Take 1 ml of this standard solution and place in a 40 ml vial, add 15 ml of $Al(NO_3)_3$ and 10 ml of ethyl acetate, transfer 0.1 ml of the ethyl acetate phase to 4 NaF pellets. Each standard pellet then contains .1 microgram of U_3O_8. — .1 ugm

Place pellets under a heat lamp for 10 minutes, cool for 15 minutes and read on a Jarrell Ash Fluorimeter.

NOTE: All glassware and other apparatus used in this procedure should be set aside and used only for air samples.

CLEANING OF GLASSWARE: All beakers, pipettes, watch-glasses, vials and flasks - wash with detergent and water, 1:1 HNO_3, and rinse with distilled water, and thoroughly dry.

CALCULATIONS:

$$\frac{1 \times 10^{-7} \text{ gm } U_3O_8 \times \left[\frac{\text{Sample Reading - Blank}}{\text{Standard Reading - Blank}}\right] \times 625}{\text{Volume of Air in Liters}} = \text{gm } U_3O_8/\text{Liter of Air}$$

$$(\text{gm } U_3O_8/\text{Liter Air}) \left[\frac{2.94 \times 10^{-4} \text{ u Curie/ml}}{\text{gm } U_3O_8/\text{Liter}}\right] = \text{u Curie/ml Air}$$

2.36

3 gm/uc

.332 uc/gm

For example in the case where 200 liters of air is taken and readings are as follows: Standard, 72.0; Sample, 10.0; Blank, 2.0.

.842

V_3O_8 - 42

$$\left[\frac{(1 \times 10^{-7} \text{ gm } U_3O_8) \times \frac{8}{70} \times 625}{200 \text{ Liters}}\right] \times \left[\frac{2.94 \times 10^{-4} \text{ u c/ml}}{\text{gm } U_3O_8 \text{ Liters}}\right] - 1.85 \times 10^{-11} \text{ u c/ml}$$

Limits of the method:

$(6.25 \times 10^{-5})(\frac{4}{65}) = 3.88 \times 10^{-6}$ total gm U_3O_8

400 Liters Air: $(9.70 \times 10^{-9})(2.94 \times 10^{-4}) = 2.85 \times 10^{-12}$ u c/ml

1,000 Liters Air: $(3.88 \times 10^{-9})(2.94 \times 10^{-4}) = 1.14 \times 10^{-12}$ u c/ml

10,000 Liters Air: $(3.88 \times 10^{-10})(2.94 \times 10^{-4}) = 1.14 \times 10^{-13}$ u c/ml

100,000 Liters Air: $(3.88 \times 10^{-11})(2.94 \times 10^{-4}) = 1.14 \times 10^{-14}$ u c/ml

Fluorometer Std

$\frac{1\ gm}{L} = \frac{1\ gm}{1000\ ml}$ $\quad 1000\overline{)1.000}\ .001$

$\frac{.001\ gm}{100\ ml} = .00001\ gm$

~~Et Ac = .000001 gm~~

$\frac{.00001\ gm}{10\ ml\ Et\ Ac} \quad \frac{.000001\ gm}{1\ ml\ Et\ Ac}$

$\frac{.0000001\ gm}{1} \quad 1 \times 10^{-7}\ gms$

$= .1\ \mu gm$

$1 \times 10^{-7}\ gm\ V_3O_8$ [5 mg Rdg

- 25 ml →

$\frac{4}{25} \times \frac{1}{10} = \frac{4}{250}$

25 ml - 2 ml to 10 take .2

$\frac{2}{25} \times \frac{1}{10} \times \frac{1}{5} = \frac{2}{1250} \quad 2\overline{)1250}\ \frac{625}{}$

$\frac{250}{5}$

125^{0}

$.333\ \frac{\mu c}{gm}$

$.333\ \frac{\mu c}{gm}$

$gm\ V_3O_8 \times .842 = gms\ Un \times .333 \frac{\mu c}{gm} \times 10^{-3}$

$.280 \times 10^{-3}$

$= 2.86 \times 10^{-7}$

Incineration

- Checks to see if ashes are slurried with water before shoveling into the product burning chamber
- BZ samples while handling ashes

See letter dated 6/14/02

John Goff – Ashes are shoveled out of the furnace into a mixed barrel, then water slurried and then deposited either into the hearth furnace or the yellow-cake sump. (– Sump contents are pumped back to the RC thickener

Notes
RTW
10/23/62

Atlas, Moab

Initial Inspection 12/10/57 -

Process

A. Primary Crushing
B. Secondary Crushing
C. Sampling
D. Grinding by Ball Mill
E. Acid Leaching
F. Separation of the Sands & Slimes by classifiers
G. Extrac of Soluble Ur from Slimes by RIP Exchange Proc.
H. Eluding of the Ion-Exchange Resins
I. Ppt of the Ur as Uranate
J. Thickening of the Ppt.
K. Drying of the Ppt.,
L. Packaging of the Final Product.

FU Inspection Febr 24, 25, '59

20.201 (b) - no surveys of: (1) external rad dosages
(2) conc's of airborne radio activity
(3) conc's in liquids to unrestricted areas.

Fluorometric Analysis - sensitivity - 12% of MPC by sampling 50 ft³ of air or 1.4×10^3 liters

Ft³ sampled & % of MPC they can detect using their fluorometric analysis.

Insp on 5/12/60 - Sec pt

Moab Process

A - Ore is crushed to pass a 1" screen by a Traylor Jaw Crusher

D - Wet Grinding in 2 parallel circuits each containing a 7 by 7' ball mill in closed circuit with a 78" classifier. The overflow from both classifiers is pumped to a blending agitator and split to the parallel leaching circuits

E - 2 Leaching Sections — Each section consists of five 24 x 14' tks equipped with three 30-hp Turbo-mixers H_2SO_4 & MnO_2 oxidant

F - Dorr classifiers & cyclones prepare the fine slimes for RIP.

[Total H_2O used per ton of ore is about 5 tons of which 4.8 passes through the RIP circuit]

G - RIP - 2 11 circuits ~~= a circuit~~ of 14 banks; each bank contains four 6 x 6 foot baskets. Both circuits are operated on 10 banks on exhaustion & 4 banks on elution. Ea basket contains 35 - 40 ft³ of coarse bead (plus -20 mesh) resin.

H - Elution - Use nitric acid & Ammonia for removal and precipitation

I - Continuous precipitation with 3 tanks in series.

3.

Ammonia is added to each tanks to increase the pH to 3-5-7

J - Slurry is thickened & filtered by 2 stages of rotary filters. The thickener overflow is clarified in a plate-and-frame press, and nitric ac. is added for makeup nitrate and acidity. About 2,8 lbs of nitric acid is add per pound of V_2O_5 produced.

K - Drier - Multiple Hearth Unit 6 feet in diameter, with 6 hearths. Air temp is held to a max of 900°F

Insp on Oct 26-29, 1954

1. 10CFR20.103(6) - conc's of Ra-226 in effluents to unrestricted areas >MPC
2. 10CFR20.203(d)(1) - Airborne radioactivity areas not posted.

Ra 226 - 4×10^{-9} μc/cc - MPL

Their fluorometer anal can detect 1.85×10^{-11} μc/ml, Uv, ± 15%, with a 200 ℓ airsample.

$1.85 \times 10^{-11} \frac{\mu c}{ml} \times 200 \times 10^{3} ml = 370 \times 10^{-8} \mu c$

Pr 11/1/61 — $\frac{1.47 \text{ gm Uv}}{\mu c}$ $3.7 \times 10^{-6} \mu c \times \frac{1.47 \text{ gm}}{\mu c}$

$= 5.44 \times 10^{-6}$ gms

$= 5.44$ μgms of Uranium

Orders to Ur Reduction 7/13/54

Reply to Orders by R.F. Hollis Gen Mgr by ltr dated 8/10/54

Time Weighted Exposure Philosophy

Get from Vitro

4.39×10^{-5} gms U_3O_8

= ~~4.0×10^{-5} gms U~~

$4.39 \times 10^{-5} \times (.843)$

$= 3.7 \times 10^{-5}$ gms U

$\frac{1.47 \text{ gms U}}{\mu c}$ or $\frac{.68 \mu c}{\text{gm}}$

$(3.7)(.68) \frac{\mu c}{\text{gm}} \times 10^{-5}$

$= 2.5 \times 10^{-5} \mu c =$

$\frac{500}{30}$
$\frac{}{1500}$

500 ft3 air sampled.

$500 \times 28.3 \times 10^3$ cc

$= 14000 \times 10^3$ ml

$\frac{2.5 \times 10^{-5} \mu c}{1.4 \times 10^7 \text{ ml}}$

$= 1.8 \times 10^{-13} \mu c/\text{ml}$

Uranium Product Co (Now Atlas Co)
Moab, Utah

1.	Initial Inspection	Dec 10, 1957	20.201 (b) 20.203 (e)(2) 20.203 (f)(2)
2.	FU Inspection	Febr 24, 25, 1959	20.201(b)
(3)	Supp Follow Up	May 12, 1960	20.103(b)

concs in effluents to unrestricted areas, Ra-226, in excess of MPC

11/5/62

Inspection Format

Ur MPC before 1/1/61 5×10^{-11} μc/cc

μc = 1.47 gm Uranium

$U_3O_8 \times .843 = Ur$

after 1/1/61 - 6×10^{-11}

μc = 3 gms

Mill Management

a) Adm structure

b) Responsibility for Rad Safety

Licensing Actions

dR – Lic. No R-161, dated Dec 28, 1959, Exp Dec 31 '66

Exempted from 20.303 (e)(2) & (f)(2) provided all entrances are posted in accordance with 20.203 (f)(2).

ic – Letter dated Nov 29, 1960 requested exemption from monitoring for Th-230 & Uv in liq effluents to unrestricted areas.

c – L'tr dated 9/18/61 – Exemption from using film badges? States they monitor continuously the tailings pond effluent for Ra 226, Th-230, & Uv.

Also they take a monthly sample of Colorado river water: (1) 1 mile above the Moab mill; (2) 5 miles downstream; (3) 10 miles downstream.

ic – April 2, 1962 Applic for perm to incin wet press papers from the plate & frame presses.

c – Apr 5, 1962 Applic to calc exp to airborne conc's over a period > a 7 day per. Apparently average 42 hrs/week over a 4 week period.

dR – Apr 26, 62 Permission to calc airborne on a basis of 160 hrs in any period of 28 consecutive days.

LR Apr 27, 62 Questions on:
1. Descrip of incin
Denied permission 2. Quants of Vr involved
& exempt 3. Freq of incin
room 20.202 4. Proc's for handling ash
(1) for employee 5. Proc's to prevent overexposures
> 25% of the of personnel to airborne conc's
lic limit during incin.
See below

LR 6/4/62 — Request to Notify L&R in the event of failure of an earthen retention dam.

L 6/12/62 — Compliance with the 6/9/62 ltr.

L 6/14/62 Answers to ?'s on incin
1 - D'winds enc
2 - 60 lbs of V_2O_5 rec daily
3 - daily
4 - ashes into product drying hearth
5 - exhaust gases to main hearth stack.

LR 6/21/62 Amendment auth incineration per applic dated April 2, 62 & supp dated 6/14/62

R April 27, '62

Denied lic applic dated Dec 2, 60 (?) req. perm not to film badge employees receiving > 25% of the limit.
Also asked for more info on ~~per~~ request to discharge effluents > the App B limits.

R Aug 1, 60 — Rogers and consultants to visit plant re discharge of effluents

ic- July 20, 62 - Incorp by Atlas

dR Aug 10 62 - Transf of lic from Uranium Reduc Corp to Atlas Corp

ic Oct 11 '62 - Move info relative to the applic requesting perm to exceed App B conc's rel to liq. effluents to unrestricted areas.

ic 10/17/62