Form AEC-592
(5-63)

I II Re(3)

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE

1. LICENSEE	2. REGIONAL OFFICE
Atlas Minerals Division of Atlas Corporation P. O. Box 488 Moab, Utah 84532	U. S. ATOMIC ENERGY COMMISSION REGION IV, DIVISION OF COMPLIANCE 1095 W. COLFAX, ROOM 200 DENVER, COLORADO 80215
3. LICENSE NUMBER	4. DATE(S) OF INSPECTION
R-161 (Docket No. 40-3453)	November 9 and 10, 1966

5. The following activities under your license (identified in Item No. 3 above) appear to be in noncompliance with AEC regulations or license requirements, as indicated.

During the period June 10, 1964 to November 9, 1966, surveys were inadequate to demonstrate compliance with 10 CFR 20.106(a), "Concentrations in effluents to unrestricted areas", in that no correlation of sample data to existing weather conditions was made, contrary to 10 CFR 20.201(b), "Surveys".

ORIGINAL SIGNED BY
B. D. BROWN

Supplementary page None attached.

George H. Smith
AEC Compliance Inspector

DEC 2 1966
Date

ORIGINAL: LICENSEE. COPIES: ☑ CO REGION ☐ CO HEADQUARTERS ☐ L&R HEADQUARTERS.

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882-995

1. Atlas Minerals
Division of Atlas Corporation
P. O. Box 488
Moab, Utah

2. November 9 and 10, 1966

3. Reinspection (2)

4. 10 CFR 20, 40

5. License No. R-161 (Docket No. 40-3453)

6. The following item of noncompliance was observed or otherwise noted:

10 CFR 20.201, "Surveys".

(b) in that, during the period June 10, 1964 to November 9, 1966, surveys were inadequate to show compliance with 10 CFR 20.106(a) in that wind speed and direction and weather conditions were not determined at the time of sample collection. (See par. 25, page 7)

7. June 9 and 10, 1964

8. No.

Initials	Inspector	Date
	George H. Smith	12/2/66
RW		11/30/66
Initials	Reviewer	Date

no. 22 H-3-a)

Reinspection

9. The first reinspection of the subject licensed facility was conducted on June 8 and 9, 1964. As a result of this inspection, the subject licensee was issued a Form AEC-591, which stated that "No item of noncompliance was found".

REINSPECTION (2)

10. An unannounced reinspection of the subject licensed facility was conducted on November 9 and 10, 1966. The writer was accompanied by Mr. Dennis Dalley, Environmental Health Section, Utah State Health Department, on November 9, 1966.

11. Mr. T. F. Izzo, Manager; Mr. E. H. Carlucci, Research Metallurgist and Radiological Safety Officer; and, Mr. K. Cooper, Chemist, were contacted during the course of the subject inspection. Mr. Izzo stated that he is in charge of the Atlas Minerals mining and milling operations in the Moab, Utah, area and that he reports directly to Mr. Hollis, Vice President. Mr. Izzo stated that Mr. Baty, who was the Radiological Safety Officer at the subject mill during the previous inspection, left the employ of Atlas Minerals on March 11, 1966, and that Mr. Carlucci has been placed in charge of the radiation safety program. Mr. Carlucci stated that the majority of the sampling is performed by Mr. Cooper.

12. On March 28, 1966, Mr. Izzo informed Dr. D. I. Walker, Director, CO:IV, by telephone that Mr. Baty had been committed to a mental institution. Mr. Izzo stated that during the course of reassigning Mr. Baty's duties he discovered that Mr. Baty had neglected to perform a number of his assigned functions as Radiological Safety Officer. Mr. Izzo stated that he had also informed Mr. Nussbaumer, DML, of this breakdown in radiation safety procedures. Mr. Izzo was instructed by Mr. Nussbaumer to attempt to estimate what the possible concentrations and/or exposures were during the period that Mr. Baty had neglected to collect samples and to record these estimations as the most probable exposures for the periods in question. The periods when samples were not collected are discussed where applicable in the body of the report. Mr. Izzo stated that in order to preclude a recurrence of the aforementioned breakdown in radiological safety procedures, he has inaugurated a report form which must be completed and submitted to him monthly.

13. Mr. Izzo stated that a copper recovery circuit was added to the mill process circuit in 1965. Mr. Izzo said that the copper recovery circuit has not affected mill production and that the copper is recovered after the recovery of the uranium. Mr. Izzo stated that the copper concentrate contains less than 0.05% U_3O_8 and, therefore, there has been no problem in transferring the material to non-licensed recipients; however, Mr. Izzo stated that very little of the copper concentrations has been transferred and that it is being

stockpiled at the plant. At the time of the inspection, the subject licensee was installing an acid leach circuit and a vanadium recovery circuit. Mr. Izzo stated that the vanadium would also be recovered after the recovery of the uranium. According to Mr. Izzo the acid leach circuit had been mostly scavenged from the old Mexican Hat mill (License No. SUA-712). Mr. Izzo stated that the aforementioned additions to the mill would not increase the mill's U_3O_8 production capacity.

14. Mr. Izzo stated that the mill processes an average of 750 tons of uranium-bearing ore per day; that the raw ore contains an average of 0.34% by weight U_3O_8; and, that the mill process recovers an average of 96% of the contained U_3O_8. Based on the aforementioned information, the mill, at the time of the inspection, was producing an average of approximately 5000 pounds of U_3O_8 per day. Mr. Izzo stated that he has been informed that they are negotiating with several companies to supply them with U_3O_8 but that, to the best of his knowledge, they were not presently under contract to supply U_3O_8 to anyone other than the Atomic Energy Commission.

AIRBORNE RADIOACTIVE MATERIAL RESTRICTED AREA

Summary

15. During the period June 9, 1964 through November 9, 1966, the subject licensee collected a total of 296 general air samples at 23 locations in the mill production buildings and 36 breathing zone samples during four routine operations. During the same period, the subject licensee collected 7 breathing zone samples during non-routine operations. There have been no reported exposures of personnel to concentrations of airborne natural uranium in excess of the applicable limits during the period April 9, 1964 through November 10, 1966.

Sample Collection

16. Mr. Carlucci stated that air samples are collected by the metallurgical and analytical chemistry staff but that Mr. Cooper and he collect the majority of the samples. The sampling locations and the procedures have been described in previous inspection reports. However, a brief description of the sampling procedures are contained in the following paragraphs, 17 and 18. The analytical procedures have been described in previous inspection reports.

17. General Air Samples

Mr. Carlucci stated that they collect general air samples at a total of 23 fixed locations in the mill process buildings. According to Mr. Cooper, the samples are collected for 20 minutes at a sampling rate of 20 liters/minute. The samples are collected at each of the 23 sampling locations three times per calendar quarter.

18. Breathing Zone Samples

Mr. Carlucci stated that routine breathing zone samples are collected three times per calendar quarter. A "lapel" sampler is placed on a worker in an individual job classification (Crusher operator, ball mill operator, sampling plant operator, and precipitation operator) and an eight-hour breathing zone sample is collected from that individual. The lapel sampler is worn on a belt at the individual's waist and the sample head is placed on the individual's lapel as close as possible to the worker's face. Mr. Carlucci stated that the air flow through the sampler is frequently checked by both the individual who is collecting the sample and by the individual wearing the sampler; in this manner the air flow through the collection media is maintained at a constant rate of 3 liters per minute. Mr. Izzo stated that the job classifications from which the general air samples are collected were chosen on the basis of their potential for possible personnel exposure to high concentrations of airborne natural uranium. Mr. Carlucci stated that non-routine breathing zone samples are collected whenever maintenance work where there is a potential for the generation of natural uranium is performed. The individual performing the maintenance is equipped with a "lapel" sampler and he wears the sampler during the entire time that he performs the required maintenance.

Adjusted Permissible Employee Exposures

19. Mr. Izzo stated that with the exception of a one-month vacation shutdown, the mill operates continuously. The mill production employees work 168 hours in any 28 consecutive days, i.e., they work one overtime shift per four weeks, and that the remaining employees, including mechanics, etc., work 160 hours in any 28 consecutive days. On April 26, 1962, the subject licensee was granted exception to 10 CFR 20.103(b), in that, they are allowed to average exposures over 160 hours in any 28 consecutive days. Therefore, in accordance with the aforementioned exception, the adjusted permissible exposure to airborne natural uranium (based on 168 hours of exposure in 28 consecutive days) for mill production employees is as follows:

Mill Area	Permissible Concentrations of U Nat.
Mill process buildings prior to separation of uranium from daughter products.	2.38×10^{-11} uc/ml
Mill process buildings after separation of uranium from daughter products.	5.71×10^{-11} uc/ml

Air Sampling Records

20. A review of the air sampling records for the period June 9, 1964 to November 9, 1966, revealed the following:

(a) A total of 296 general air samples were collected. The maximum concentration of airborne natural uranium noted for a general air sample was 16.94×10^{-11} uc/ml; this sample was collected in an area where uranium is present prior to separation

from its daughter products. The maximum concentration of airborne natural uranium noted in a general air sample which was collected in an area where uranium is present after separation from its daughter products was 5.58×10^{-11} uc/ml. It was observed that general air samples were not collected during the second, third, and fourth calendar quarters 1964, and the second and fourth calendar quarters 1965; during the third calendar quarter 1965, only 12 general air samples were collected. The general air concentrations for the quarters when samples were not collected were estimated by averaging the concentrations noted in the samples collected during the quarters prior to and following the periods when samples were not collected, e.g., the concentrations reported for the second, third, and fourth calendar quarters 1964 were the average of the samples collected during the first calendar quarter 1964 and the first calendar quarter 1965.

(b) A total of 36 routine breathing zone air samples were collected. The maximum concentration of natural uranium reported in a routine breathing zone air sample was 12.97×10^{-11} uc/ml; this sample was collected from a precipitation operator, i.e., uranium was present after separation from daughter products. The maximum concentration of natural uranium noted in a breathing zone sample collected from an employee working in an area where uranium was present prior to separation from its daughter products was 5.27×10^{-11} uc/ml. The averages of the three samples collected from employees working in the same job classification during a calendar quarter were all less than the applicable permissible concentrations (see paragraph 19). It was observed that routine breathing zone samples were not collected during the second, third, and fourth quarters 1964 nor during 1965. The concentrations to which employees would have been exposed during these periods were estimated by averaging the concentrations noted in the samples which were collected during the first quarter 1964 and the first quarter 1966.

(c) A total of 7 non-routine breathing zone samples were collected during specific dust-producing operations. Samples were not collected during the period March 9, 1964 to March 20, 1966. The maximum concentration of airborne natural uranium noted in a non-routine breathing zone sample was 170×10^{-11} uc/ml; this sample was collected during work on the yellow cake dryer.

Personnel Exposures to Airborne Natural Uranium

21. Mr. Carlucci stated that the results of the 3 eight-hour breathing zone samples which are collected from individuals working in a job classification during each calendar quarter are averaged and this average is considered to be the weighted exposure for all persons working

in that job classification. Mr. Carlucci stated that the work records of the various individuals working in a job classification are checked to assure that they have not worked more than 168 hours in any 28 consecutive days. A review of the air sampling records (see paragraph 20) revealed that the following were the maximum recorded exposures for persons in the various job classifications.

Job. Classification	Max. Recorded Conc. of Airborne Natural Uranium to Which Individuals Were Exposed
Sample tower operator	2.36×10^{-11} uc/ml *
Crusher operator	2.32×10^{-11} uc/ml *
Ball mill operator	1.57×10^{-11} uc/ml *
Precipitation operator	5.30×10^{-11} uc/ml **

* Uranium present prior to separation from daughter products.
** Uranium present after separation from daughter products.

The average of the routine breathing zone samples which were collected during the first quarter 1964 and the first quarter 1966 were utilized as the estimates of employee exposures for the periods that samples were not collected. Mr. Carlucci stated that general air samples are not used to determine personnel exposures but that these samples are used to determine trends in dust generation in the various sections of the mill.

22. Messrs. Carlucci and Izzo stated that there is an assignment board in the mill maintenance shop and that a strict policy of rotation is adhered to for the maintenance men when working on natural uranium dust-producing operations. Mr. Carlucci stated that the maintenance foreman informs him prior to the start of all maintenance so that a breathing zone sample can be collected. A time-weighted exposure is calculated for each maintenance man who works in a high concentration of airborne natural uranium. The following formula is used when computing these time-weighted exposures.

$$\frac{\left(\frac{C_1}{MPC_1} \times T_1\right) + \left(\frac{C_2}{MPC_2} \times T_2\right) \ldots}{160 \text{ hours}} = \text{fraction of MPC}$$

where: C_1 = concentration of U nat in area 1 or during operation 1
MPC_1 = permissible concentration of U nat in area 1 or during operation 1
T_1 = time spent in area 1 or during operation 1 ($T_1 + T_2 + \ldots = 160$ hours)

A review of the time-weighted exposure calculations for the various maintenance men revealed that the maximum time-weighted exposure received by a maintenance man in 160 hours in any 28 consecutive day period was 99% of the maximum permissible.

AIRBORNE RADIOACTIVE MATERIAL
UNRESTRICTED AREA

Summary

23. During the period June 9, 1964 through November 9, 1966, a total of 102 air samples were collected at 21 locations in the unrestricted area. The licensee has not determined wind

direction and speed or weather conditions at the time of unrestricted area sample collection; therefore, surveys as required by 10 CFR 20.201(b) were not adequate to show compliance with 10 CFR 20.106(a).

Sample Collection

24. Mr. Cooper stated that he collects air samples at 20 locations in the unrestricted area monthly. The 20 locations have remained unchanged since the previous inspection with the following exceptions:

(a) A sample is no longer collected at the scale house but is now collected at the intersection of the highway and the mill entrance.

(b) A sample is no longer collected at the south end of the tailings pond dyke but is now collected near the north end of the dyke on the highway.

(c) The sample which was previously collected near the ore stockpile area has been eliminated from the environmental sampling program and is now included in the restricted area sampling program.

Mr. Cooper stated that he uses a Staplex Hi-Volume air sampler to collect the unrestricted area samples and that a 30-minute sample is collected at each station at a sampling rate of 25 cubic feet per minute.

25. Messrs. Carlucci, Cooper, and Izzo stated that during the period June 10, 1964 to November 9, 1966, they did not determine wind direction and speed or general weather conditions at the time of sample collection. Mr. Izzo was informed that failure to determine wind direction and speed and weather conditions at the time of sample collection constituted violation of 10 CFR 20.201(b), in that surveys were not adequate to show compliance with 10 CFR 20.106(a). Mr. Izzo stated that they would immediately start determining wind direction and speed and weather conditions at the time of sample collection.

26. Mr. Izzo stated that they had, previous to the last inspection of the facility, determined that the concentrations of airborne natural uranium at the points of release were well in excess of the unrestricted area MPC. Mr. Izzo stated that in order to determine the efficiency of the dust collector on the yellow cake dryer exhaust, periodic samples are collected from the exhaust. However, the analyses results for these samples are not reported in terms of microcuries per milliliter but in terms of total U_3O_8 released per day. A pitot tube attached to an air pump is used to collect an isokenetic sample.

Records

27. A review of the unrestricted area air sampling records revealed that during the period June 9, 1964 through November 10, 1966, samples were collected in the third and fourth calendar quarters of 1964 and in the first, second, third, and fourth calendar quarters 1966.

The concentrations for 1965 were estimated by averaging the concentrations noted in the third quarter 1964 and the first quarter 1966 samples; the results obtained in the fourth quarter 1964 were not used because all results were reported as less than the limit of detection. The maximum concentration of airborne natural uranium noted in an unrestricted area air sample was 6.6×10^{-13} uc/ml. A compilation of the analyses results for all samples which were collected during the period June 10, 1964 through November 9, 1966, is being retained by this office.

28. A review of the results of the yellow cake dryer dust collector exhaust samples revealed that during the period June 10, 1964 through November 9, 1966, a total of 13 samples were collected. The maximum concentration observed in a dryer exhaust sample indicated that a total of 36.8 pounds of U_3O_8 were being released to the environment per day. With the exception of the aforementioned sample the maximum quantity observed was 5.9 pounds of U_3O_8 per 24 hours. As a result of the 36.8 pounds of U_3O_8 per 24-hour sample results the temperature of the yellow cake dryer was reduced from 1250° to 1100°F and the quantity of U_3O_8 being released was subsequently reduced to approximately 5 pounds per 24 hours. Excluding the one very high result, the average quantity of U_3O_8 released from the stack during the period June 10, 1964 through November 9, 1966 was 3.2 pounds per 24-hour period; a minimum quantity observed was 0.33 pounds per 24-hour period. The licensee had collected samples from the crushing plant dust collector exhaust prior to the previous inspection; however, no samples were collected during the period June 10, 1964 through November 9, 1966.

Additional Discussion

29. Messrs. Izzo and Carlucci were informed of the desireability of determining the concentrations of uranium daughter products blowing from the tailings pile. They stated that the next time the tailings were observed to be blowing from the pile they would collect samples from the cloud and send these samples to the writer for analyzes. Mr. Izzo stated that covering the tailings pond dykes (see paragraph 32) had significantly reduced the blowing from the pile. Mr. Izzo stated that they would attempt to analyze for uranium daughter products in air samples taken in the unrestricted area and that if they were unable to perform these analyses they would request that they be performed by the Eberline Instrument Company, Santa Fe, New Mexico.

30. It should be noted that it requires 1/2 ton of uranium ore to produce 3.2 pounds of U_3O_8 (see paragraph 14). Therefore, assuming that the uranium daughter products in the tailings are present in the same concentrations which existed in the uranium ore, it would require an average daily airborne release of 1,000 pounds of tailings before the concentrations of daughter products would be equivalent to the average concentrations of natural uranium which are released from the yellow cake dryer exhaust stack.

LIQUID EFFLUENTS

Summary

31. The tailings, both liquid and sand, are released to a single large tailings pond. The majority of the solids settle in the large pond and the overflow liquid goes to a small pond. From this small pond the liquid is treated with barium chloride as it flows to another small pond. The treated liquid is then released directly to the Colorado River. A continuous sample, which is proportional to the quantity of liquid being released, is collected from the liquid stream prior to its confluence with the River. Six samples are collected monthly from the Colorado River. The liquid stream sample is analyzed for U nat., Ra-226, Th-230, Po-210, and Pb-210 and the River samples are analyzed for U nat., Ra-226, and Th-230.

Tailings Pond Stabilization

32. At the time of the inspection, it was observed that the subject licensee was covering the banks of the tailings pond. The banks were originally composed of sand tails. According to Mr. Izzo, these banks were being covered to a depth of approximately 2 feet with "shale and silt stone from the Moancopi formation". On November 10, 1966, approximately two-thirds of the [illegible] been covered. Mr. Izzo said that they had spent approximately $12,000 on the tailings pond.

Sample Collection

33. The continuous sampler and the sample collection stations have been described in previous inspection reports and in submissions to AEC from the licensee. Mr. Carlucci stated that there are no potable water wells located down drainage from the tailings pond. According to Mr. Carlucci underground drainage is from the tailings pond to the river and drainage on the Moab, Utah, side of the river is also towards the river.

Analytical Procedures

34. With one notable exception, the subject licensee uses procedures for radium, thorium, and uranium analyses similar to those used by the Analysis Branch, ID. Mr. Carlucci said that prior to analysis of a sample, the licensee filters the sample; analyses are performed on the filtrate and Ra-226 analysis is also performed on the precipitate; however, only the results of the analyses on the filtrate are reported to AEC. At ID, the samples are acidified with 2% HCl prior to filtration. Because of this variation in technique, there is a discrepancy between analysis results for Ra-226 and Th-230 as reported by the licensee and as reported by the AEC on duplicate samples. These discrepancies are discussed in a letter to file dated December 9, 1964, which was written following the June 9-10, 1964 inspection of this facility (Exhibit A), and a letter dated May 21, 1965, which was written following an inspection of the subject licensee's Mexican Hat mill (Exhibit B). Mr. Izzo said that in August, 1965, Eberline Instrument Company, Santa Fe, New Mexico, started analyzing the continuous liquid effluent sample for Po-210 and Pb-210.

Records

35. The results of liquid analyses for 1964 were submitted to AEC in a letter dated March 29, 1965, and those for 1965 were submitted in a letter dated April 28, 1966. A compilation of the analyses results for the continuous tailings liquid samples which were collected in 1966 follow:

	Filtrate			Precipitate		
	Ra-226	Th-230	U nat.	Ra-226	Pb-210*	Po-210*
1966	x 10^{-8} uc/ml	x 10^{-6} uc/ml	x 10^{-5} uc/ml	x 10^{-8} uc/ml	x 10^{-7} uc/ml	x 10^{-7} uc/ml
Jan.	.57	.005	.05	2.62	.19 **	.28 ***
Feb.	.49	.007	.06	2.04	.19 **	.28 **
March	.45	.005	.05	3.30	.19 **	.28 **
April	.78	.003	.05	2.96	.1	.4
May	1.5	.010	.002	1.13	.35	.25
June	.39	.005	.002	0.22	***	***

* Analysis performed by Eberline Instrument Company.

** Samples not submitted by Baty for analysis ∴ average of 1965 results used.

*** Analysis results had not been received from Eberline Instrument Company.

Mr. Izzo stated that they did not discharge liquid effluents during the months of July, August, and September, 1966. It should be noted that the subject licensee has been granted an exception to 10 CFR 20.106(a) whereby they are permitted to discharge concentrations of Ra-226 in excess of those listed in Appendix B.

36. Mr. Izzo stated that they gain a Ra-226 decontamination factor of approximately 10 by treating the liquid waste with barium chloride. However, the total Ra-226 (filtrate plus precipitate) indicates that the average decontamination factor is less than two. A transcript of the Ra-226 concentrations in the liquid effluent, before and after treatment, for the period January 1 to June 30, 1966, follows:

		Ra-226 x 10^{-8}					
		Jan	Feb	March	April	May	June
Effluent feed solution	filtrate	2.34	2.33	3.68	3.48	3.8	3.1
	precipitate	1.62	1.86	1.86	1.46	.1	.21
	total	3.96	4.19	5.54	4.94	3.9	3.31
Effluent discharge solution	filtrate	.57	.49	.45	.78	1.5	.39
	precipitate	2.62	2.04	3.30	2.96	1.13	.22
	total	3.19	2.53	3.75	3.74	2.63	.61

Independent Sampling

37. The writer collected liquid samples from the liquid overflow ponds prior to treatment with barium chloride and at the point where the licensee collects the continuous sample. The liquid samples were transmitted to the Analysis Branch, H&S, ID, for analyses on November 14, 1966; as of the date of this report, the results of these analyses had not been received from ID.

PERSONNEL MONITORING

38. All mill production employees are film badged for at least one calendar quarter each year or whenever there is a change in the mill process. The film badging was to start on

December 1, 1966, in order to determine what changes might be expected or might be noted in the acid leach process. A review of the film badge records revealed that all exposures were less than 25% of the applicable limits. Film badges are supplied and processed by R. S. Landauer, Jr., on a monthly exchange basis. The film badges are stored in a rack inside a closet in the employee's change room when not in use.

POSTING, LABELING AND SECURITY

39. Posting, labeling, and security at the subject facility have been discussed in previous inspection reports; it was observed that these procedures have remained unchanged.

INSTRUCTION OF PERSONNEL

40. Instruction of personnel and posting of Forms AEC-3 have been discussed in previous inspection reports; it was observed that these procedures have remained unchanged.

INCINERATION OF SOURCE MATERIAL

41. Mr. Izzo stated that they have discontinued the practice of incinerating filter cloths. Mr. Izzo stated that these cloths are now buried in the tailings pond.

DISCUSSION WITH MANAGEMENT

42. The item of noncompliance noted during the course of the inspection was discussed with Messrs. Izzo and Carlucci at the termination of the inspection. Mr. Izzo stated that Mr. Hollis, Vice President, was not in Moab and was not expected to return until after November 18, 1966. Mr. Izzo stated that he reports directly to Mr. Hollis. The item of noncompliance and the licensee's proposed corrective action are contained in paragraph 25 of this report.

DEC 9 1964

Robert C. Paulus, Inspection Specialist
(Health Physicist), Division of Compliance, Headquarters

Glen D. Brown, Radiation Specialist (Supervisory)
Region IV, Division of Compliance, Denver

ORIGINAL SIGNED BY
DONALD I. WALKER
for [illegible]

ATLAS MINERALS, MOAB, UTAH - LICENSE NO. R-161, DOCKET NO. 40-3453 - INDEPENDENT ANALYTICAL RESULTS FOR LIQUID SAMPLES

CO:IV:LCR

Attached are the analytical results for liquid samples collected during the inspection of the subject licensee on June 8-9, 1964. The inspection was concluded with an appropriately completed form AEC-591.

As noted in the report of the inspection conducted on November 27-29, 1962, and January 15, 1963, the licensee's analytical procedure for analysis of the tailings pond effluent discharge called for filtration at the first step to remove any suspended solids. The remaining steps in the analysis are reportedly the same as the procedure used by Claude Sill of the Analysis Branch, ID. As a check on this procedure, two effluent discharge samples were collected. One sample (Sample No. 1 in the attached table) was analyzed by the standard method used by Sill, i.e., adding dilute nitric acid as the first step for dissolution of the readily hydrolyzable thorium and radium. The second sample (Sample No. 2 in the table) was first filtered by Sill and then the filtrate and residue solids were each analyzed for Ra-226 and Th-230.

As a basis for comparison, the licensee's analytical results for the first three months of the year are also listed. Perhaps it is worth noting that, while the licensee performs an analysis of the solid residues obtained from the filtration, the results reported to the Commission by letter dated January 28, 1964, include only the data for the filtrate.

You will note that the Pb-210 result for the tailings pond effluent slightly exceeds the permissible concentration of 1×10^{-7} µc/cc. The licensee, of course, has not performed Pb-210 or Po-210 analyses.

Please contact us if you have any questions regarding the analytical results.

Enclosure:
Table

EXHIBIT A

9612190371

Sample Description	AEC Sample Results (μc/ml)				
	Ra-226	Th-230	U Nat.	Pb-210	Po-210
1. Tailings Pond Effluent Discharge (not filtered)	2.2×10^{-8}	$\times 10^{-8}$	[illegible]	1.7×10^{-7}	1.8×10^{-7}
2. Tailings Pond Effluent Discharge (filtered)					
(a) Filtrate	8.7×10^{-9}	3.9×10^{-8}	-	-	-
*(b) Residue solids	*4.1×10^{-3} (μc/g)	*3.1×10^{-3} (μc/g	-	-	-
*Total quantity of residue was 0.034g in a 1 liter sample; this corresponds to 1.4×10^{-7} μc Ra-226 and 1.1×10^{-7} μc Th-230 as solids per milliliter of effluent.					
3. Colorado River - one mile upstream from mill	$< 3 \times 10^{-9}$	$< 2 \times 10^{-8}$	$< 2 \times 10^{-8}$	$< 1 \times 10^{-8}$	$< 3 \times 10^{-8}$
4. Colorado River - 10 miles downstream from mill	$< 3 \times 10^{-9}$	$< 2 \times 10^{-8}$	$< 2 \times 10^{-8}$	$< 1 \times 10^{-8}$	$< 3 \times 10^{-8}$

Atlas Minerals Analytical Results for Tailings Pond Effluent Discharge Samples (μc/ml)

Month	Sample	Ra-226	Th-230	U Nat.
January - 1964	Filtrate	1.9×10^{-9}	1.1×10^{-8}	2.6×10^{-8}
	Residue Solids	7.9×10^{-8}	5.8×10^{-8}	3×10^{-9}
February - 1964	Filtrate	2.5×10^{-8}	8.1×10^{-8}	1.7×10^{-8}
	Residue Solids	1.0×10^{-7}	-	-
March - 1964	Filtrate	1.1×10^{-8}	4.1×10^{-8}	1.9×10^{-8}
	Residue Solids	2.1×10^{-7}	-	-

5-21-65

R. G. Page, Chief, Enforcement Branch
Division of State & Licensee Relations, HQ

Roger T. Woolsey, Radiation Specialist (Reviewer)
Region IV, Division of Compliance, Denver

A-Z MINERALS CORPORATION, P. O. BOX 597, SALT LAKE CITY, UTAH
LICENSE NO. SUA-712, DOCKET NO. 40-1376

CO:IV:GHS

The following information supplements paragraphs 19 and 28 of the report of the February 17-19, 1965, inspection of the subject licensed facility.

The result of the analysis of the air sample (paragraph 19) was received from the Analysis Branch, Health & Safety Division, ID, on March 9, 1965; the results of the analyses of the liquid effluent samples (paragraph 28) were received from ID on May 10, 1965. The licensee was contacted by telephone on May 10, 1965, and the caller (G. H. Smith) was informed that they had not started their analyses. On May 18, 1965, Mr. H. G. Baty, Radiation Control Technician, Atlas Corporation, Moab, Utah, reported the results of their analyses of the duplicate liquid effluent samples by telephone (Mr. Baty's name was misspelled in the aforementioned report). The results of the analyses are attached.

It should be noted that the concentration of natural uranium which was observed in the breathing zone sample is 33 times the applicable MPC for 168 hours of exposure in any 28 consecutive days. Unfortunately the licensee's operations were terminated before they could collect breathing zone samples and evaluate the time-weighted exposures to airborne natural uranium of the yellow cake packaging personnel. However, the licensee reported in their reply to our Form AEC-592 that they had determined the exposures to concentrations of airborne natural uranium of their employees during the decommissioning of the yellow cake dryer and packaging mechanism. Mr. Baty stated that during the decommissioning of this equipment the employees wore "lapel type" air

(continued)

EXHIBIT B

samplers during the entire operation and that the samplers were frequently checked to assure that the collection ability of the samplers was not adversely affected by build-up of material on the collection media.

It should be noted that, with the exception of natural uranium, the concentrations of the various isotopes in the barren raffinate, as reported by ID, are in excess of the AEC limits for average annual release of these isotopes in the soluble form. There is a significant variance in the concentrations of Ra-226 and Th-230 as reported by ID and the licensee. This variance is probably a direct result of a difference in ID's and the licensee's analytical procedures. Prior to analysis of a sample, the ID procedure calls for acidification of the sample with a 2% solution of HCl (page 9, "Determination of Radium 226 and Thorium 230 In Mill Effluents", by Ebersole, et al) whereas, Mr. Baty reported that prior to analysis they filter the sample. Mr. Baty stated that their rationale for filtration is based on their interpretation of "solubility" as meaning soluble in the carrying fluid. We prefer the ID technique because it is our opinion that "solubility" is defined as being soluble in human body fluids and acidification with dilute HCl would be more representative of the process which takes place in the human gut.

Operations at the subject licensed facility were terminated on March 1, 1965, therefore, additional samples are not available. A citation for release of concentrations of Ra-223, -224, and -226, Th-228 and 232, Pb-210 and Po-210 in excess of the 10 CFR 20, Appendix B, limits is not applicable based on the results of a single sample because concentrations may be averaged over a period of one year (10 CFR 20.106(b)). A citation for noncompliance with Condition No. 12.A.(2) of the subject license is warranted; however, because the subject licensed facility is no longer in operation we feel that this citation would serve no useful purpose.

Based on Mr. McCormick's statement during the inspection, that they had not processed Alaskan ore since the previous inspection, the concentrations of Th-232, Th-228, and Ra-224 in the barren raffinate were surprising. However, Mr. Baty stated that during the process of scraping the ore pads prior to decommissioning they had probably uncovered some previously unprocessed Alaskan ore. It should be noted that the licensee was processing the scrapings from the ore pads at the time the barren raffinate sample was collected.

Attachment
Results of Analyses (as noted above)

cc: COHQ, w/attach.

bcc: Atlas Corporation, Moab, Utah File

BREATHING ZONE AIR SAMPLE

Operation	Operation Time and Sample Time	Nat. Uranium x 10^{-11} uc/ml	x MPC
Auger sampling of a full barrel of yellow cake.	3 minutes	190	13.3

LIQUID SAMPLES

Sample Description	Ra-226 x 10^{-8} uc/ml			Th-230 x 10^{-6} uc/ml			U nat. x 10^{-5} uc/ml			Pb-210 1/ x 10^{-7} uc/ml		Po-210 1/ x 10^{-7} uc/ml		Ra-223 1/ x 10^{-7} uc/ml		Ra-224 x 10^{-6} uc/ml		Th-227 1/ x 10^{-6} uc/ml	
	A-Z	AEC	x MPC	A-Z	AEC	x MPC	A-Z	AEC	x MPC	AEC	x MPC	AEC	x MPC	AEC	x MPC	AEC	x MPC	AEC	x MPC
Barren raffinate collected at discharge from automatic sampler.	nil 3/	30.0	10	13.7	200.0	100	0.17	0.12	< 0.1	56.0	56	14.0	2	20.0	2.9	10.0	5	3.0	
Combined seeps - collected ~ 100 yds above confluence with San Juan River.	0.5	0.8	< 0.1	0.02	<0.02	<0.1	0.06	0.09	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	4/	4/	4/	4/	4/	4/

Sample Description	Th-228 1/ x 10^{-6} uc/ml		Th-232 1/ x 10^{-6} uc/ml		Suspended Solids	1/	2/
	AEC	x MPC	AEC	x MPC			
	20	2.9	16	8	7 mg/l		
	4	4/	4/	4/	4/	4/	

1/ Not analysed for this isotope by licensee.
2/ Suspended solids which were not soluble in 2% HCl.
3/ Batty stated that this result was<0.3x10^{-8} uc/ml.
4/ Not analysed for this isotope by AEC.