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REPORT AND EVALUATION  
OF THE  
COLORADO RADIATION CONTROL PROGRAM  
FOR THE PERIOD  
JULY 20, 1974 - MAY 9, 1975

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unable to be present. The review was held on May 9 in the Department's offices in Denver. Also in attendance were Al Hazle, the Director of the Division of Occupational and Radiological Health, Lee Grossman, Assistant Director, Jim Montgomery, and Mike Sangaline.

The following comments were made to Mr. Siek:

1. The inspection of the uranium mill at Uravan had been very informative. The inspectors performed conscientiously and, in fact, were able to complete the work in less time than anticipated. It was obvious that good rapport exists between inspectors and licensee management.
2. With regard to licensing and compliance activities, the file review indicated that a very competent job was being done.
3. We did feel, however, that Colorado should update its radiation protection regulations as soon as possible. A number of amendments have been made to NRC regulations since the last revision and it is necessary that these be incorporated.

Program Changes Related to Previous NRC Comments and Recommendations

1. Comment

During the course of the program review meeting, it was noted that survey instruments being used by State inspectors during inspections of licensees were not being calibrated at appropriate intervals. We suggest that arrangements be made to have these instruments routinely calibrated.

Present Status

The Division has purchased a source to be used for calibration of survey instruments. One staff member has been assigned responsibility for seeing that all instruments are calibrated on a quarterly basis.

2. Comment

It was also noted that none of the three Colorado field inspectors have attended AEC's course "Medical Use of Radionuclides for State Regulatory Personnel." We feel that they could benefit from this course. When arrangements for this course are completed, your staff will be notified and invited to apply. We also feel that Mr. Jacobi, of your staff, could benefit from the ten week health physics training course given at Oak Ridge National Laboratory. As was discussed during the meeting with you, the AEC provides funds for State personnel to attend these courses.

#### Adequacy of Inspector Performance

During this review Mike Sangaline and Dick Gamewell inspected Union Carbide's uranium mill in Uravan, Colorado. A report of this accompaniment is found in Appendix G. In addition to doing a comprehensive job on the inspection the inspectors were able to finish the work in less than the anticipated amount of time.

Since the last review seventeen supervisory accompaniments were made with inspectors.

#### Response to Incidents

Since there were no reportable incidents since the last program review, no investigations have been made. When notified by NRC of the Radionics and Isomedix incidents, the staff checked all license files to see if these or similar equipment were possessed. None were identified.

During the period covered by this report there were no incidents resulting from generic type equipment failures.

#### Enforcement Procedures

Enforcement letters are usually sent within 20 days of the inspection, but a number of instances were noted where this was as long as two months later. This appears to be due to the detail and depth put into the written reports and the period of time taken for review of the reports by the staff. This was discussed with the staff who agreed to try to reduce the longer time lag.

Inspection reports and enforcement letters are written by the inspectors, are reviewed laterally by other staff members, and then are reviewed by the project leader. Finally, Hazle signs the enforcement correspondence. Licensees are given 20 days to respond when there is a violation and both the inspector and Sangaline evaluate this response. All licensee responses are acknowledged.

Provisions are available for "cease and desist" orders and impounding of material.

#### Adequacy of Inspection Reports

Attached as Appendix H is the report of the review of selected inspection files. The reports are written in narrative style and organized into various sections.

Independent Measurements

State inspectors perform appropriate independent surveys during license inspections. Available instrumentation was described in last year's report. As noted above, the State has set up a facility in order to calibrate their own instruments at the prescribed frequencies.

Other Areas Affecting the Adequacy of the State's Total Radiation Program

X-Ray and Radium

As of April 30, 1975 there were 73 radium licenses in effect. As for X-ray registrations, there were 1,370 medical tubes registered, 1,795 dental tubes registered, and 77 industrial tubes registered. Since the last program review 343 medical, 411 dental, and 5 industrial machines have been inspected. The Division is also heavily involved in the DENT, NEXT, and performance standard contract activities.

Environmental Monitoring

Attached as Appendix I is a summary of the environmental monitoring program carried out by the Colorado Department of Health. The figures are given for calendar year 1974. The frequency ranges from one time on demand to routine as indicated. The types of analyses reflect a general rule with greater or fewer analyses on a select basis.

Uranium Mill Tailings

At the present time there are twelve tailings piles in the State of Colorado. Nine of these are inactive and three are active. The number and location are as follows:

Canon City	1
Grand Junction	1
Durango	1
Gunnison	1
Naturita	1
Maybell	1
Rifle	2
Uravan	2
Slick Rock	2

The three that are active are those at Canon City, Rifle and Uravan. The mill at Rifle ("New Rifle") is used only to process the vanadium extract from the Uravan mill. A description of each inactive pile, the method of stabilization, and the dates stabilized can be found in the "Summary Report: Phase I, Study of Inactive Uranium Mill Sites and Tailings Piles" dated October 1974.

The State of Colorado adopted legislation on December 12, 1966, governing stabilization and reclamation of tailings areas. This has been incorporated into Part VIII of Colorado's regulations entitled "Regulation Requiring Stabilization of Uranium and Thorium Mill Tailing Piles." The attached Appendix contains a copy of this regulation. It requires stabilization of piles against wind erosion, water erosion, etc.

State legislation does not specify a time period regarding stabilization. There is no requirement for fencing, but there is a requirement for controlled access to the area. State legislation does not prescribe monitoring procedures for stabilized tailings piles. However, these piles are inspected on an annual frequency by the Colorado Department of Health. These procedures involve visual inspection for signs of wind and/or water erosion, security, posting, local development, or changes in the pile. Photographs are taken and a summary written. There are no specific provisions for monitoring ground water involvement; however, the Water Quality Control Board does take samples and analyze them for radioactivity content.

Active tailing piles are covered by license conditions.

PART VIII - REGULATION REQUIRING STABILIZATION OF URANIUM AND THORIUM MILL  
TAILING PILES (Radiation Regulation No. 2)

- RH 8.1 All uranium and thorium mill tailing piles and ponds from inactive mills shall be stabilized in the following manner:
- 8.1.1 Ponds shall be drained and covered with materials that prevent blowing of dust. Water drained from the ponds shall be disposed of in a manner approved by the Water Pollution Control Commission.
  - 8.1.2 Taking into consideration the types of materials at each site, piles shall be leveled and graded so that there be, insofar as possible, a gradual slope to ensure that there shall be no low places on the pile where water might collect. Side slopes shall be stabilized by riprap, dikes, reduction of grades, vegetation, or any other method or combination of methods that will ensure stabilization.
  - 8.1.3 If pile edges are adjacent to a river, creek, gulch or other watercourse that might reasonably be expected to erode the edges during periods of high water, the exposed slopes shall be stabilized and the edges shall be diked and riprapped sufficiently to prevent erosion of the pile.
  - 8.1.4 Drainage ditches shall be provided around the pile edges sufficient to prevent surface runoff water from neighboring land from reaching and eroding the pile.
  - 8.1.5 The pile shall be stabilized against wind and water erosion. The method of stabilization may consist of vegetation or a cover of soil, soil containing rock or stone, rock or stone, cement or concrete products, petroleum products, or any other soil stabilization material presently recognized or which may be recognized in the future, or any combination of the foregoing as may be required for proper protection from wind, or water erosion.
  - 8.1.6 Access to the stabilized pile area shall be controlled by the operator or owner and properly posted.
  - 8.1.7 The pile shall be maintained in such a manner that excessive erosion of, or environmental hazard from radioactive materials does not occur.
  - 8.1.8 The owner of the tailing pile site shall give the Colorado Department of Health written notice ten (10) days in advance of any contemplated transfer of right, title or interest in the site by deed, lease, or other conveyance. The written notice shall contain the name and address of the proposed purchaser or transferee. Prior written approval of the Department shall be obtained before the surface area of the land shall be put to use and it shall have been determined that the radiation dosage to the public resulting from the proposed use does not exceed 0.5 rem per year.

- 8.1.9 With the exception of use at a mill or for reprocessing at the site or another location, prior written approval of the Colorado Department of Health must be obtained before any tailings material is removed from any active or inactive mill.
- 8.1.10 Detailed plans for stabilizing tailings piles shall be submitted to the Colorado Department of Health for review and approval prior to undertaking stabilization of the pile.
- 8.1.11 The State Board of Health may waive individual requirements in regard to stabilization or utilization of tailings material if it can be shown that they are unnecessary or impracticable in specific cases.
- 8.1.12 The effective date of this regulation shall be 45 days after the date of adoption.

Adopted: December 12, 1966

APPENDIX C

Inspection of Union Carbide's Uranium Mill at Uravan, Colorado  
Colorado License No. SUA-673

This was the annual routine announced inspection of the uranium mill covered by Union Carbide's License SUA-673. The previous inspection had noted three items of noncompliance. This inspection was conducted by Mike Sangaline and Dick Gamewell. After first meeting with the plant supervisor, the two inspectors split up to carry out independent activities. Sangaline spent the first day taking air samples with the Department's equipment at various locations at the facility. Gamewell spent half of the first day taking gamma readings at various locations in the mill circuit and another half investigating the embankment structures of the tailings ponds. Gamewell took numerous photographs to determine physical pond integrity.

While conducting his walk-through inspection of the plant Gamewell obtained information on processes involved and maintenance procedures required.

The inspectors obtained records pertaining to airborne dust samples, effluent water samples, and personnel monitoring which they examined during the evening of the first day. These records were then discussed the following morning with the person given responsibility for radiation safety.

On the second day water samples were obtained at various points; for example, the effluent discharge into the San Miguel River, the well which supplies drinking water for the town of Uravan and points along the river itself. These will be analyzed at the Department's facilities.

The summary concerning the results of the inspection was held in Grand Junction with Mr. R. G. Beverly, Union Carbide's Director of Environmental Control. He was informed that the previous items of noncompliance had been adequately handled. No new items of noncompliance were noted.

Comments

In discussing the licensee's calibration of survey equipment, the inspectors were told that the small check source was used for this purpose. We do not consider this acceptable and the Colorado inspectors should have issued a citation for this method of calibration. Also, no attempt was made to determine what sort of program is followed with regard to respirator procedures, cleaning, maintenance, etc. No discussion or observation was

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made concerning the changing of work clothes, especially with regard to the yellow cake area, or procedures for laundering contaminated clothing until mentioned by the NRC representative.

The NRC representative expected to review the bioassay program carried out for this uranium processing facility. However, it was learned that the license does not require any bioassay program and therefore none is being performed. Since the license is up for renewal July 31, 1975, it was suggested that this be looked into.

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May 10, 1975 -  
July 16, 1976

Other Areas Affecting the Adequacy of the State's Total Radiation Program  
Radiation Machines

There are 3641 registered X-ray tubes in the State and installations having these machines have been 98% inspected. During calendar year 1975, approximately 1388 inspections were made of X-ray machines. There are 9 accelerators registered. These have not been inspected in detail as there are no regulations specifically for the use of accelerators. The updated State radiation regulations will provide performance regulations for accelerators.

Environmental Monitoring

This area continues to be a large program in the Division. The largest efforts are directed to continuous monitoring of operations at Rocky Flats. The contract with the power company operating the reactor Fort St. Vrain, requires analysis of a large number of samples. The program is still keeping a watch on the environment at the sites of the underground gas stimulation experiments Rio Blanco and Rulison. Additionally, there are State surface water samples collected routinely and analyzed. Hazle stated that he has been trying to get more staff for the environmental program, mainly in the laboratory, but has not been successful. Recently, Burt Crist who was in charge of the environmental program, left to join ERDA at the Rocky Flats site. Hazle reassigned Mike Pollock from the agreements material program to the laboratory. Appendix K is a summary of the Colorado environmental monitoring program.

Uranium Tailings Piles

There has been no real change in the status of uranium tailings piles since the last review. Nine of the twelve piles are stabilized and three are active. Two of those active have operating mills, Canon City and Uravan. The third active pile has some processing for vanadium at Rifle. A heap leach process has been licensed for use with ore at the old mill site near the Maybell pile, however, this operation does not involve the tailings pile. A license has been issued for the pile at Grand Junction because a company is excavating low grade ore which is surrounding the edges of the pile.

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base for effluent concentration averages for a 12-month period. A memo to the file from Pollock dated May 6 commented on the April 20 letter from the licensee. Also in the file under May 6, there was a memo from Pollock reporting on the meeting with the licensee on April 13. On May 10, 1976, Jim Montgomery telephoned the licensee to give him verbal approval to go ahead and order up to 4 curies of krypton-85. On that same date the license was issued. The license contains a condition that written approval shall be obtained from the Department of the licensee's downwind sampling analysis procedure for krypton-85 prior to the performance of any injections. The license also has a condition that the licensee shall immediately notify the department in the event that concentrations in excess of the limits for either controlled or uncontrolled areas are exceeded and at such point immediately cease all operations using krypton-85. The license is adequately supported by the information supplied.

11. Union Carbide Corporation  
Metals Division  
270 Park Avenue  
New York, New York

License No. 660-01  
Amended in its Entirety  
Issued: 6/8/76  
Expires: 6/30/77

Application was made April 13, 1976, for a leaching operation involving natural uranium ores. The proposal is to make a pond in the vicinity of Maybell, Colorado which would be lined with clay. In the center of the pond would be placed piled up quantities of uranium ores which would be leached by sulfuric acid. The pregnant liquor from this percolation would be pumped to ion exchange columns for recovery of the uranium. A report of the environmental studies on the proposed uranium heap leaching project under contract with Dames and Moore had been submitted previously to the State by Union Carbide Corporation. The license as issued contains a condition that the licensee shall immediately notify the department in the event that the earth dam retention system releases radioactive material into uncontrolled areas. Also a condition that upon completion of the program the licensee will stabilize the tailing piles. The frequency of environmental sampling of airborne and liquid samples from the evaporation ponds is stated in the license. Also stated is the requirement for evaluation of quarterly samples from the three monitoring wells around the operation. This license is adequately supported by the material in the file.

12. Colorado Springs Community Hospital  
3205 North Academy Boulevard  
Colorado Springs, Colorado

License No. 265-01  
Issued: 11/26/75  
Expires: 11/30/78

17-1-1-70  
m of 28, 1972  
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An inspection was conducted 3/22/71 by B. Crist. Two non-compliance items were identified in an enforcement letter dated 4/1/71. The licensee sent an adequate reply on 4/20/71.

Denver General Hospital  
Denver, Colo.  
Lic. No. 5-1116-2

Past authorizations for nonroutine uses have been appropriately referred to the Medical Advisory Committee.

An application for a Tc 99m sulfur colloid kit submitted on 10/18/71 was filed without being acted upon. A second request was submitted 12/10/71.

Union Carbide Corp.  
Rifle, Colo.  
Lic. No. SUA-679

This mill license was inspected by B. Crist of 10/19/71. The report was detailed and showed that extensive independent measurements had been made during the inspection. An enforcement letter showing two items of non-compliance was sent 11/29/71. The licensee's reply could not be found, although it was referenced as being sent on 12/17/71 in a subsequent letter of explanation sent from the State.

Southern Colorado State College  
Fubelo, Colo.  
Lic. No. 5-9405-1

This industrial radiography program was inspected 5/3/72 by J. Montgomery. One non-compliance item and three recommendations were contained in a letter of 5/24/72.

WILEX  
1728 Old Spanish Trail  
Houston  
Lic. No. Colo. 120-01

This license was issued 9/14/71 based on adequate back-up information.

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5. Posting at the mill entrance was inadequate.
6. The company safety manual was changed without notification to or review by the State.

Recommendations were:

1. Suspect air samples should be rerun.
2. An annual summary of time-weighted exposures would be helpful in evaluating the radiation control program.

The paragraph of the report relating to the inspector's opinion of the licensee's program was limited to one matter and I suggested it should be broader in scope. Attached to the report were lab results of all samples collected by the State.

An enforcement letter was sent to the licensee on 6/12/72 by Hazle. It was directed to the Executive Vice President and covered the items above. The letter also discussed the need for a license application requesting authority to process Th-230. Both the report and the letter stated that the State planned to resample the air since lab results indicated some may be exceeding MPC. The State indicated trips had been scheduled to do this but cancelled due to weather conditions so had not yet been conducted. The enforcement letter required a 20 day reply and was well written. The licensee replied on 6/26/72. Hazle acknowledged it as acceptable on 7/13/72 in regard to the items of noncompliance. Kerr indicated he did not feel the response regarding the safety manual was adequate. Hazle's reply discussed further the problem of Th-230 processing and ordered the company to submit within 20 days a health and safety program for this operation. The licensee replied on 7/27/72 regarding the Th-230 operation but it was not considered satisfactory. Siek sent another letter on 8/24/72 clarifying the need for and type of information to be submitted. On 11/16/72, Hazle sent another letter saying the 8/24/72 letter was apparently being ignored. The licensee replied on 12/4/72 and requested a meeting with the State. The file contained a memorandum regarding a meeting on 1/4/73. The licensee submitted the required information on 1/11/73 and an amendment authorizing the processing of Th-230 was issued.

2. Union Carbide Corp.  
New York, New York  
License No. SUA-673

This license authorizes possession of unlimited amounts of uranium for processing of ore at the Uravan, Colo. plant.

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An announced reinspection was performed by Crist and Montgomery on 5/15-16/72. The inspection was conducted with the Plant Supt. and the Plant Engineer (RSO). The report followed the general format as described in Item 1 above. In addition to the inplant aspects, the report included a discussion of the waste water handling including pond areas. Improvements being made to the ponds were discussed. The report included the results of all analyses of air and water samples collected during the inspection.

The report also included information on the inspection of 10 industrial gauges possessed and used under License No. 05-393-05. There were no problems noted in connection with their use.

The report included a summary of the management discussion. The one item of noncompliance on SUA-673 was the failure to conduct a 9-month overall plant airborne survey. Three recommendations related to:

1. A running tally should be kept on air sampling data.
2. The plant operating cycle should be recorded with the collection of river grab samples.
3. One film badge record was improperly recorded.

The report was signed by Crist, Montgomery and Hazle. An enforcement letter was sent by Hazle on 6/16/72 to the Director, Radiation & Pollution Control. It covered the items noted above and required a reply in 20 days. A satisfactory response to the item of noncompliance was submitted on 6/29/72. There was no comment on the recommendations and no followup by the State. The letter was acknowledged by Hazle on 7/14/72.

3. Kaman Sciences Corp.  
Colorado Springs, Colorado  
License No. 90(5608)-01

This license authorizes use of 80.0 Ci H3 in any form, mCi quantities of several isotopes in sealed sources, 1 Ci Cs-137 in any form, 500 mCi of irradiated circuitry, 11 mg Ra as sealed sources and a 120 mCi Cs-137 calibrator. The licensee is principally engaged in making neutron generators and components. They can demonstrate and service equipment throughout the State and install and replenish H3 cartridges at customer sites.

Montgomery and Crist conducted an announced reinspection on 8/31/72. The report covered the status of previous items, licensee administration and organization, procurement and inventory, waste disposal, leak

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Houston  
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Montgomery and Crist conducted an announced reinspection on 8/31/72. The report covered the status of previous items, licensee administration and organization, procurement and inventory, waste disposal, leak