



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

40-869

February 16, 1979

MEMORANDUM FOR: Ross A. Scarano, Section Leader
Uranium Mill Licensing Section

FROM: John J. Linehan
Uranium Mill Licensing Section

SUBJECT: SAFETY EVALUATION REPORT (SER) FOR MINERALS
EXPLORATION COMPANY (MEC) SWEETWATER URANIUM MILL

Attached for your review and approval is the SER for the MEC
Sweetwater Mill.

A handwritten signature in cursive script that reads "John J. Linehan".

John J. Linehan
Uranium Mill Licensing Section

Enclosure:
As stated

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SAFETY EVALUATION REPORT

SOURCE MATERIAL LICENSE

MINERALS EXPLORATION COMPANY

SWEETWATER MILL

DOCKET NO. 40-8584

LICENSE NO. SUA-1350

FEBRUARY 16, 1979

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1.0 DESCRIPTION OF PROPOSED ACTION

By application, dated November 16, 1976, and numerous supplements, Minerals Exploration Company (MEC) submitted a request for a source material license to operate a new uranium mill in Sweetwater County, Wyoming, in an area known as the Red Desert.

A Final Environmental Statement, FES (NUREG-0505), issued in December, 1978, a geotechnical and hydrological safety analysis of the tailings impoundment and this Safety Evaluation Report provide the bases for conditioning a five-year term license.

2.0 REVIEW SCOPE

The in-plant safety review of the MEC Sweetwater Uranium Mill included an evaluation of the initial application dated November 16, 1976, a June 14, 1977 meeting with MEC to discuss deficiencies in their application, review of a completely revised application, dated July 11, 1977, a July 27, 1977 meeting with MEC to discuss remaining unresolved issues, review of a completely revised application, dated August 10, 1978, with supplements, dated October 31, 1978 and January 8 and 24, and February 5, 1979, and a final January 11, 1979 meeting with MEC to resolve all outstanding issues.

In addition, an inspection will be conducted by I&E, Region IV staff to review MEC's development and implementation of administrative and operating procedures and monitoring programs prior to mill startup. Any problem areas identified by I&E will be corrected prior to startup of milling operations.

3.0 AUTHORIZED ACTIVITIES

3.1 Facility Description

The mill facilities will consist of several buildings of assorted sizes and an array of various sized tanks designed and arranged to present a well-integrated compact appearance. The mill site will occupy about 400 acres with a surface area of about 300 acres for the tailings impoundment.

3.2 Mill Process

A schematic flow chart for the proposed mill process is shown in Figure 1. Ore from the open pit mines will be hauled by truck to a probe tower where its uranium oxide content will be determined and will then be trucked to the mill stockpile. A front end loader will feed the ore grade material through a hopper into the grinding circuit.

The proposed uranium mill will operate 24 hours per day and process an average of 3,000 tons of ore per day, 365 days per year, over its expected life of 15 years. Based on a 0.048 percent average grade of ore and an estimated 91.7 percent recovery rate, the mill will produce approximately 2,650 pounds of concentrate per day, or about 900,000 pounds per year over its expected life. However, since the daily and annual ore grade and the percent recovery may vary and result in a fluctuation in production rate the mill will be authorized to produce a maximum of 3,200 pounds of uranium concentrate per day, averaged over a year. This fluctuation could result in a maximum increase in ore pad, grinding, and yellowcake stack effluents and resulting doses of 20% in any one year over those presented in the FES. Based on this 20%, the maximum organ dose to an individual at the site boundary would only increase from 3.3 to 4.0 mrem/yr to the lung, as compared to the future 40 CFR 190 dose limit of 25 mrem/yr. Since the average grade of ore over the 15 years will remain at 0.048% and since the radiological source term for tailings was based on the tailings area existing at the last year of operation, the source term and resulting doses from tailings will not vary from that presented in the FES.

The ore will first be processed through a semiautogenous mill circuit to reduce its size. The product from this circuit will then be pumped to a set of hydrocyclones where the pulp ore is separated by size. The fine ore pulp will then be discharged into rubber-lined leach tanks and mixed by mechanical agitation with acid solution to dissolve the uranium minerals. The discharge from the leaching circuit will be pumped to a countercurrent decantation system where the uranium-rich solution will be separated from the tailings in multiple stages of thickeners and filters. The tailings will be pumped to an impoundment and the uranium-rich solution will be clarified and then pumped to a solvent extraction system.

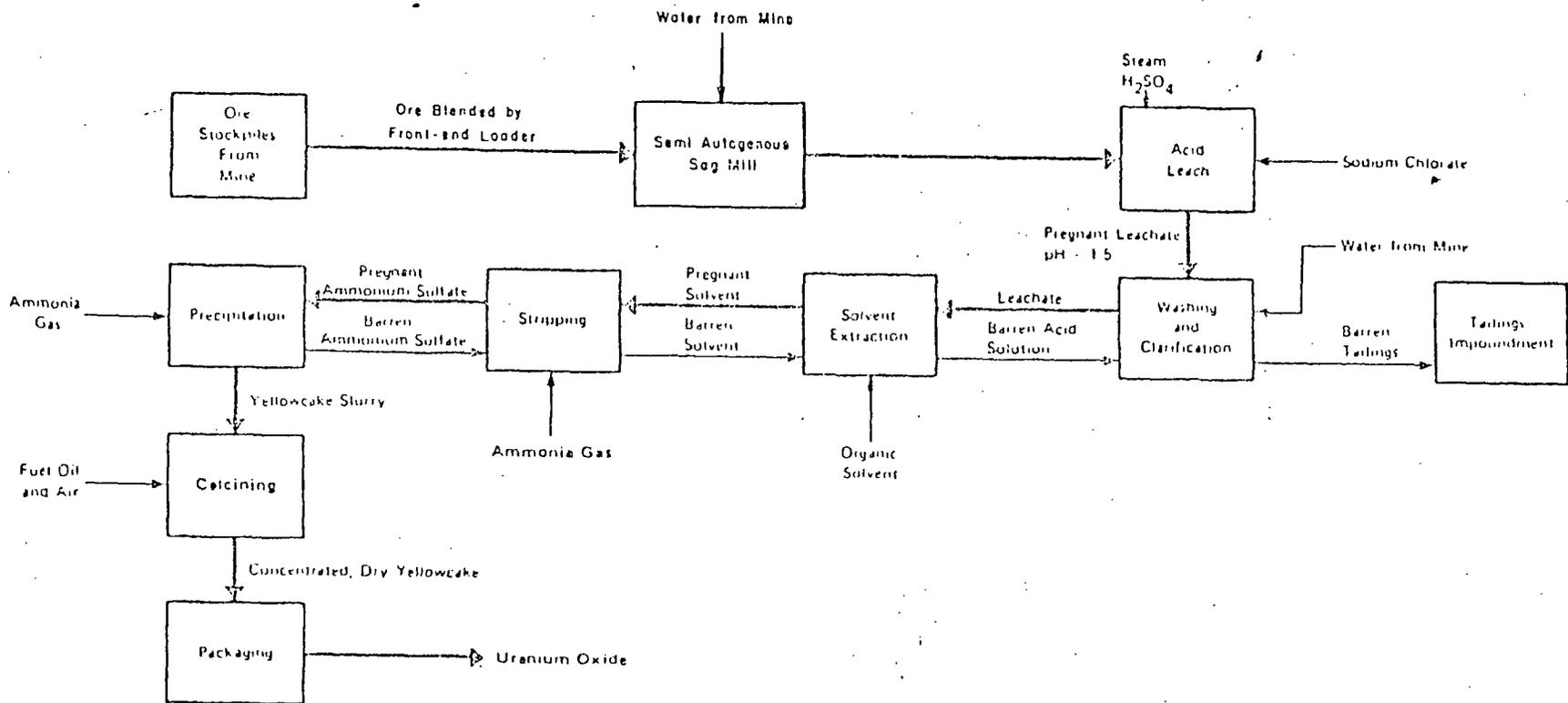


Figure 1. Generalized Block Flow Diagram of Mill Operations.

In the solvent extraction process the uranium is removed from the pregnant aqueous solution by solvent ion-exchange and concentrated into an organic liquid. Most impurities remain in the water and the uranium is substantially concentrated. In the Sweetwater mill this extraction process will take place in four sets of mixing and settling tanks with organic liquid and water moving in opposite directions (countercurrent) through the sets of tanks. The barren aqueous solution will be recirculated to the countercurrent decantation wash circuit or discharged as tailings. The pregnant organic solvent will be cycled to another set of tanks for reextraction of uranium into ammonium sulfate solution. The final uranium concentration will be about 25 g/L. The barren liquid will be recirculated to the extraction system.

The ammonium sulfate-uranium solution will be heated and treated with anhydrous ammonia, precipitating crude ammonium diuranate. The precipitate will be washed, dewatered, and calcined, yielding a product containing about 90% U_3O_8 . The material then will be crushed to minus 1/4-inch sieve size and packaged in steel drums for shipment. The entire drying, crushing, and packaging operation will be conducted in an isolated area under negative pressure to contain and collect by wet scrubbing airborne uranium particulates.

4.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

4.1 Organization

The General Manager for the Sweetwater project reports directly to the Corporate Manager of Operations for Minerals Exploration Company and is responsible for coordinating and directing the activities of all project personnel and all phases of the mining and milling project.

The Mill Superintendent reports to the General Manager and is responsible for: mill operations (production, costs, and quality control of operations and product), mill safety and metallurgy.

The Safety and Environmental Administrator reports directly to the General Manager and is responsible for environmental protection, radiation, and industrial safety programs for the mining and mill project and all records necessary to comply

with regulations and requirements of the NRC, EPA, MSHA, and other government agencies. He will serve as management surveillance and an advisor to the Maintenance, Mill and Mine Superintendents and direct project security programs. Reporting to the Safety and Environmental Administrator are the Environmental Assistant and Safety Technician.

4.2 Radiation Safety Staff

The Safety and Environmental Administrator who reports directly to the General Manager is the individual responsible for the radiation safety program. He is responsible for ensuring that monitoring conducted by the Safety and Environmental staff and/or laboratory is conducted in a proper and an accurate manner and has the authority to cancel, postpone or modify any process, or operation which proves an immediate radiological hazard to employees. This decision is subject to revocation only by the General Manager or his designate after consultation. This position carries full authority for the operations and requirements of the radiation safety program and the Safety and Environmental Administrator has the proper authority necessary to discharge his duties.

The Environmental Assistant reports directly to the Safety and Environmental Administrator and is responsible for supervising the environmental protection and radiation safety programs.

4.3 Minimum Technical Qualifications for Radiation Safety Staff

The following are the minimum technical qualifications required of individuals responsible for the radiation safety program.

1. Safety and Environmental Administrator
 - a. BS degree in the physical sciences, mathematics or engineering from an accredited college or university, equivalent experience, or a combination of education and experience. Equivalent experience will be at least four years of relevant radiation safety experience.
 - b. Specialized training in radiation protection, with at least bi-annual refresher course.

- c. Training and experience in management.
- d. A working knowledge of radiation detection instruments, biological effects of radiation and mathematics of radiation.

2. Environmental Assistant

- a. An associate degree in science or a high school diploma and 2 years equivalent work experience.
- b. One year of specific training or work experience in sampling and analytical procedures.

These minimum technical qualifications assure that the individuals filling these radiation safety positions have an adequate formal educational background and/or the necessary specific training and experience to carry out the duties of these positions.

4.4 Administrative Procedures

MEC has committed to maintaining an operating manual covering each phase of operations which will be written by appropriate Department staff and will be made available to each mill and maintenance employee. The Safety and Environmental Administrator will approve the health and safety aspects of the operating procedures. The manual will be on file in appropriate work areas and updated as necessary to reflect any process or operational changes.

The mill licensing section staff have further required that the licensee also maintain operating procedures for the radiation safety program, and the environmental monitoring and control program and that written procedures pertaining to all activities carried on in an area shall be available in each area where radioactive material is processed, handled, or stored and shall be reviewed at least annually. In addition, the staff has also required that for any work or maintenance for which there is no effective operating procedure, and for any non-routine maintenance or repair work, that a radiation work permit signed by the radiation safety staff be prepared and used for performing these activities.

*interim
stabilization
program, and*

The staff has determined that these administrative procedures are adequate to assure that all operations are reviewed for health and safety problems prior to performance.

4.5 Audits and Inspections

MEC has committed to a monthly inspection of work and storage areas and practices with respect to radiation safety. All monitoring and exposure data will be reviewed monthly to ensure compliance. Any trends or deviations from the "as low as reasonably achievable" (ALARA) philosophy will be addressed. A formal report will be prepared and reviewed by the General Manager and all department heads. The report will address any upward trends, unusual discharges, problem areas, monitoring data, items of regulatory non-compliance, and recommendations for necessary corrective actions. The report will also include an evaluation of the adequacy of the implementation of license conditions.

In addition, MEC has committed to the following audits and inspections by Corporate Staff:

- a. A semi-annual audit including review of operating procedures, exposure records, monthly inspection reports, training programs, safety meeting reports, and the ALARA philosophy. All phases will be evaluated to determine the total programs' effectiveness.
- b. Corporate management will inspect and review the project, its programs and records on at least an annual basis.
- c. The Corporate Medical Department will inspect, review and approve the project health physics safety programs and records on at least an annual basis.

In addition to the above, the mill licensing staff have conditioned MEC's license to require a daily documented visual surveillance of all mill areas by the operating mill foreman to insure proper implementation of good radiation safety practices and a weekly inspection by the Environmental Assistant of all work and storage areas and a report to the Safety and Environmental Administrator on any items of non-compliance with operating procedures, license requirements, or safety practices affecting radiological safety.

The mill licensing staff have also required that all such inspections and any required reports and corrective actions will be documented and documentation retained for at least five years. *

MEC's audit and inspection program, as supplemented by the specific license conditions developed by the staff and discussed above, is comparable to programs that have been proven to be effective at other mills and at other types of facilities handling radioactive materials.

4.6 ALARA Program

MEC has committed to keep occupational radiation exposures as low as reasonably achievable. Any trends or deviations from ALARA will be addressed by the Safety and Environmental Administrator in his monthly inspection report. To ensure that the philosophy is being pursued, MEC Corporate staff will conduct an audit on a semi-annual basis. The Corporate Medical Department staff will conduct the audit. Items to be reviewed are:

1. Operating procedures
2. Exposure records
3. Monthly inspections reports
4. Training program
5. Safety meeting reports

The mill licensing staff have further required that a formal report of a semi-annual review of all audits and inspections as well as employee exposures (including bioassay data), effluent release data and environmental monitoring data shall be prepared by the Safety and Environmental Administrator and along with his conclusions and recommendations submitted to the General Manager and Corporate Medical or Environmental Sciences Department to determine (1) if there are any upward trends developing in personnel exposures for identifiable categories of workers or types of operations or effluent releases, (2) if exposures and effluents might be lowered under the concept of as low as reasonably achievable, and (3) if equipment for effluent and exposure control is being properly used, maintained and inspected. This requirement for a formal report was developed by the staff to provide a document which would clearly indicate MEC's compliance with the "ALARA" concept.

MEC's acceptance of this license requirement for a formal report, along with MEC's audits, inspections, employee training, and administrative procedures, demonstrates both a commitment and a mechanism to ensure compliance with the "ALARA" concept.

4.7 Personnel Training

All new employees will receive a minimum initial training in radiation safety, industrial safety and process operations. The Safety and Environmental Administrator will administer the safety and radiological training programs.

Basic indoctrination in radiation protection will be given to all employees prior to being assigned to work in the mill area. Detailed training will then be given during the first month of employment. Safety meetings will be conducted monthly with at least 30 minutes devoted to radiation safety. Indoctrination training will include a written examination. Employees and their respective supervisors will sign a statement that the employee received radiation protection training, successfully completed testing of that training, and the date the training was received. The signed statement and the examination will be retained. Retraining will be given at least every 2 years and will also be documented.

Additional training will be given to supervisors so they will be able to provide specific job-related training and evaluate their subordinates' performance. Supervisor training will be documented in the same manner as indoctrination training, with retraining required every 2 years.

Mill employees will receive on-the-job training from supervisors. For maintenance personnel, a continuous training program will be administered to ascertain that safe practices and proper procedures are followed

during both the operation and maintenance of equipment. Maintenance employees' job performance with respect to radiation protection will be appraised annually by their supervisors to determine if retraining is necessary.

Technicians performing radiation protection duties will receive additional training consisting of lectures and/or on-the-job training. Oral and demonstration tests will be given to evaluate the technician's job performance. Documentation will include written examinations kept in the employee's personnel folder.

The overall training program proposed by MEC is consistent with training programs within the nuclear industry that have proven to be effective.

5.0 RADIATION SAFETY CONTROLS AND MONITORING

5.1 Effluent Control Techniques

The mill was designed to combine efficient operations with minimized environmental impacts and safety hazards. To this end the mill circuit is essentially enclosed and wet, thereby eliminating the hazards associated with dry operations. The design of the mill is such that any leaks or spills will be collected and recycled to the appropriate part of the process. Emission control equipment is listed in Table 1.

The dust collecting, venting and fume control systems in the plant are designed to control emissions when the plant is operating at a design rate of 3300 TPD.

Table 1

EMISSION CONTROL EQUIPMENT SUMMARY

<u>Location</u>	<u>Emission Control Equipment</u>
Ore Mill Feed Area	Wet Scrubber
Leach Tanks	Wet Scrubber
Yellowcake Precipitators, Thickeners and Centrifuge	Wet Scrubber
Yellowcake Dryer	Wet Scrubber
Yellowcake Product Drumming Area	Wet Scrubber
Emergency Power Generator	None
Laboratory Hoods	Wet Scrubber

The failure of all dust collector, ventilator and scrubber fans will be alarmed in the appropriate control rooms as follows:

- a. Ore receiving area.
- b. Leach tank scrubber exhaust fan. Failure of the water supply to the scrubber will also be alarmed.
- c. Solvent extraction building ventilator fans.
- d. Yellowcake thickener and precipitation tank scrubber exhaust fan. Failure of the water supply to the scrubber will also be alarmed.
- e. Yellowcake dryer scrubber exhaust fan. Failure of the water supply to the scrubber will also be alarmed.
- f. Yellowcake packaging wet collector fan.

Failure indication time in all cases is less than five seconds. Scrubber circuits from the concentrate drying and packaging areas will be checked every hour and documented. Manometer readings will be recorded once per shift and such readings will be documented to ensure proper operation.

The staff has further required by license condition that operations shall be immediately suspended in the affected areas of the mill if any of the emission control equipment, for the ore feed or the yellowcake drying or drumming areas specified in Table 1 is inoperative.

Spillage of solids, slurry and solutions will be minimized by level controllers and high level alarms on all major tanks and sumps. If spillage occurs material will be contained by dikes or curbs and will drain or be directed to floor sump pumps that will discharge back to the mill circuit. Spills from some uncurbed outside tanks will flow via a specially excavated channel to a catchment basin where they will be contained and subsequently cleaned up.

The following is a description of the specific effluent control techniques to be utilized at various stages in the mill circuit:

a. Ore storage pads

MEC will be required to minimize dispersal of dust from the ore piles by water sprinkling or other dust suppression techniques, unless a documented weekly inspection indicates that the moisture content of the ore and/or weather conditions are controlling dusting. Runoff from the ore stock pile as a result of rain or snow will be collected in the general mill drainage system and used as mill process water.

b. Ore Receiving and Grinding

The ore is normally fed to the plant at a moisture content of 10-14% which should not cause any dust problems. To assure protection of the environment, the dust collecting system for this plant is designed to collect dust from the dry ore which may be introduced into the system infrequently. All entrained air from these operations, together with any dust which may be present, are vented through a wet scrubber.

c. Leaching

The leach tank effluents will be vented through a wet scrubber and the acid removed by the scrubber will be returned to the mill circuit.

d. Washing and Clarification

At this wet stage of the operation, the uranium charged leach solution is separated out and the tailings and leaching solution discharged to the tailing impoundment area. No emission control system is utilized at this stage of the process.

e. Solvent Extraction

Kerosene vapors from the solvent extraction system will result from evaporation and will escape to the atmosphere through building ventilator fans.

f. Precipitation

At this stage of the process, the uranium bearing solution is neutralized with ammonia to precipitate out ammonia diuranate, yellowcake, which is thickened by dewatering. Effluents from this process are vented through a wet scrubber.

g. Concentrate Drying and Packing

The thickened yellowcake slurry is further dewatered by a centrifuge and pumped to a multiple hearth furnace for drying. The dried yellowcake is then passed through a crusher and then packaged in steel drums. The entire drying and packaging operation will be conducted in an isolated area with a negative ventilation pressure equipped with self-closing access doors. Both the drying and product packaging stages of the process will be equipped with wet scrubbers to collect greater than 95 percent of the uranium particles contained in the process effluent. The emissions from the yellowcake precipitator-thickener-centrifuge scrubber, the dryer scrubber, and product drumming scrubber all discharge to a single common stack.

h. Tailings impoundment

MEC will be required to prevent release of airborne particulates from the tailings pile by maintaining a water cover over the tailings. If any tailings are not covered by standing water MEC will be required to take measures to minimize dispersal of blowing tailings. The effectiveness of these measures used shall be evaluated weekly by means of a documented tailings area inspection.

The equipment and techniques to be used by MEC for process effluent control are considered to be state of the art for the uranium milling industry.

5.2 In-Plant External Radiation Monitoring Program

Some measureable external radiation exposure may be anticipated in areas associated with incoming ore and in the product storage areas, where the radiation level will increase with time of storage of the product because of the buildup of daughter products. Under unusual conditions, intermediate or final products may accumulate in pipes and tanks and create local radiation areas. MEC has committed to a survey of the restricted area quarterly for the first year and semi-annually thereafter, to determine the levels of external radiation present at representative locations. Twenty-two (22) locations have been identified within the restricted area for survey. The staff have reviewed these points and found both the number and locations to be adequate. In addition, the staff have determined that the survey meters available at the mill will be adequate for these surveys.

Instruments will be calibrated after repair and as recommended by the manufacturer or at least semi-annually, whichever is sooner. To assure that the instruments operate properly before each use, a check source will be used to assure operating order.

MEC's in-plant external radiation monitoring program along with its personnel external monitoring program is adequate for the hazards anticipated and meets standard health physics practices.

5.3 Personnel External Monitoring

All mill and maintenance employees will wear TLD badges during working hours. The badges will be exchanged on a monthly basis, and the exposed badges will be returned to the supplier for processing and reading. In addition, stationary badges or dosimeters will be placed in selected locations, determined under actual operating conditions and read quarterly.

MEC has committed that any badge exposure exceeding 25 percent of the maximum permissible exposure in any calendar quarter will be evaluated and the situation causing the exposure will be investigated and corrective action initiated promptly.

This program meets the guidelines described in "IAEA Safety Series No. 43," pages 19 and 20.

5.4 Contamination Surveys

The staff has required that surface contamination surveys (both smear and total contamination) be conducted at least weekly in eating areas, change rooms, control rooms and offices. In addition, the staff has also required that the operating Mill Foreman conduct and document a daily visual surveillance of all mill areas to insure proper implementation of good radiation safety practices, including good clean up practices to minimize unnecessary surface buildup of radioactive particulates.

The above is an acceptable surface contamination control program that meets current standard health physics practices.

In addition, if surface contamination levels in the eating areas, change rooms, control rooms and offices exceed the applicable values in Annex C, the area will be decontaminated and a study performed to determine the cause of buildup and corrective measures taken to prevent recurrence.

MEC has proposed that decontamination of facilities and equipment to be released from the restricted area meet the limits in Annex C, Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, which is an informal guide developed by NMSS staff.

In addition, all contaminated clothing will be laundered on site.

5.5 In-Plant Airborne Monitoring Program

Most airborne contaminants in the mill are expected to result from localized sources. Because concentration gradients in the vicinity of points of release are expected to exist and produce large variations, frequent measurements are required for exposure evaluation and control measures.

The rationale for conducting an airborne monitoring program is based upon the following facts. During the initial stages of processing the ore, U, Ra-226, and Th-230 are expected to be in equilibrium; but during subsequent operations, this equilibrium will be disturbed, and the concentration of individual radionuclides must be measured for the assessment of hazards. In the precipitation and product recovery sections, airborne material expected would normally be uranium. Radon concentrations may occur near ore storage bins and crushing and grinding circuits. Exposures due to airborne concentrations may also occur in sample preparation and assay rooms. In many cases, because of the physical layout of the process, airborne effluents in one area may tend to influence exposures in other adjacent areas.

Routine Sampling

Airborne radioactivity will be sampled at at least seventeen locations. These locations are based on expected employee occupancy and sources of airborne radioactivity. Thirteen of the 17

locations will be sampled a minimum of once per month , the other four at least quarterly. All samples will be analyzed for uranium and Rn-222 daughters. In addition, filter samples collected in representative areas will be analyzed for Ra-226 and Th-230 semi-annually.

In addition, the staff has required that in-plant airborne monitoring be performed under conditions typical of employee exposures and that along with results of airborne activity, a record of the state of operation of both process and effluent control equipment and ventilation conditions be kept.

Personnel breathing zone samples (2-8 hours) will be worn quarterly by operators at five representative process locations and analyzed for uranium. In addition, portable air sampling will be conducted on representative employees of the yellowcake area, employees involved in maintenance of yellowcake equipment, and additional representative employees in locations where airborne uranium dust is suspected.

The staff have reviewed this sampling program and have found the number, type, and location, as well as the frequency of sampling, to be sufficient.

Exposure Calculations

A time study of all mill and maintenance employees will be conducted to determine the amount of time spent in each area. This information, along with the area airborne concentration, will be used to calculate exposures. A computer program or equivalent method will be used to determine weekly and quarterly exposure. Any abnormal exposures will be included in the exposure calculation and records.

On a periodic basis, portable sampling pumps will be attached to employees during the shift in order to determine time-weighted averages. In addition, time records will be kept during a non-routine maintenance of spill to maintain a close accounting of individuals' exposures.

If an employee reaches an action level of 25 percent of MPC based on TWE (time weight exposure) over a period of one quarter, the Safety and Environmental Administrator will institute an investigation of their work record and exposure history to identify any problem areas. If any problem areas are noted, they will be studied and necessary corrective measures taken to ensure that the exposure is as low as reasonably achievable.

NEC's program for monitoring in-plant airborne activity and determination of employee exposures is adequate and comparable to the programs carried out successfully at existing mills.

5.6 Protective Equipment for Personnel

1. Showers, Change Rooms, and Protective Clothing

Persons required to work in refined product areas or perform maintenance on equipment from these areas will be issued coveralls. These coveralls will be laundered in facilities maintained at the mill for this purpose.

All mill personnel will be provided with change facilities including shower facilities so that they may leave their work clothes at the mill. A washer and dryer will be provided and all coveralls will be washed on the property. Employees receiving direct body contamination will be surveyed for contaminants after showering. They will not be allowed to leave the restricted area without authorization of the Safety and Environmental Department.

The staff have required that prior to leaving the restricted area, all mill employees either shower or monitor themselves after changing clothes. If clothing is not changed then clothing shall also be monitored. A radiation survey meter shall be available at the exit to the change room. In addition, the licensee shall perform spot surveys for alpha contamination at least quarterly on workers leaving the plant. Alpha contamination on skin or clothes greater than 1,000 dpm/100 cm² shall be cause for additional showering or decontamination and an investigation by radiation safety staff.

The above program is adequate to minimize as much as is reasonably possible the spread of contamination from the plant process areas to unrestricted areas.

2. Respirators

MEC's respiratory protection program is based on Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" and NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials. The program will be directed by the Safety and Environmental Administrator.

Respirators will be required on routine operations at the discretion of the Safety and Environmental Administrator or Mill Superintendent, and on any employee who enters the yellowcake areas (drying and packaging).

The staff has added a condition stating that "Notwithstanding any of the protection factors for respiratory protective devices specified in Appendix D of Section 5 of the licensee's application, the licensee shall not apply protection factors in excess of those specified in Table 1 of NRC Regulatory Guide 8.15 in estimating employee exposures."

5.7 Bioassay Program

MEC's bioassay program will consist of the following:

- a. Urine specimens shall be routinely collected from all regular mill workers and all personnel involved in maintenance tasks in which yellowcake dust may be produced. Specimens shall be collected monthly, as close as is reasonably possible, after 48 hours and not more than 96 hours of last exposure. The measurement sensitivity shall be 2 $\mu\text{g/l}$ or less. A special urinalysis shall also be performed if there is any reason to suspect an inhalation exposure to yellowcake exceeding 40×10^{-10} $\mu\text{Ci-h/ml}$ in a period of one work week.

A baseline urine sample shall be obtained from any new worker, who will be subject to urinalysis, prior to start of work.

- b. In vivo measurements shall be performed on all mill workers, all yellowcake maintenance workers, and all other maintenance workers routinely assigned to work in the mill at least once every two years with equipment capable of measuring 9 nCi or less of uranium in the lung. In vivo counting shall be performed each year on approximately half of the above workers and any worker whose intake of radioactive material for any calendar quarter since his last in vivo count exceeds 25% of the intake that would result from exposure to the concentration of radioactive material listed in 10 CFR 20, Appendix B, Table 1 for a period of one quarter.

Baseline in vivo measurements shall be performed on all new workers who will be subject to in vivo counting the first time the in vivo counter is available.

- c. Action levels based on bioassay measurements shall be in accordance with Tables 1 and 2 of NRC Regulatory Guide 8.22, "Bioassay at Uranium Mills" (July 1978). In addition, all bioassay results shall be evaluated by the Safety and Environmental Administrator and Corporate Medical Department.
- d. In addition to any evaluations of employee exposures and any notifications required pursuant to Sections 20.103 and 20.405 of 10 CFR Part 20, the licensee shall make a formal documented evaluation if bioassay measurements exceed any of the following criteria:
 - (1) The urinary uranium concentration exceeds 30 $\mu\text{g}/\text{l}$ for any two consecutive sampling periods.
 - (2) The urinary uranium concentration for any measurement exceeds 80 $\mu\text{g}/\text{l}$.
 - (3) Any in vivo thorax measurement exceeds 16 nCi.
- e. Urinalysis results exceeding 15 $\mu\text{g}/\text{l}$ shall be reported to the Safety and Environmental Administrator within ten days of specimen collection.

Urinalysis results exceeding 30 $\mu\text{g}/\text{l}$ and in vivo results exceeding 16 nCi shall be reported to the Safety and Environmental Administrator by telephone.

- f. Prevention of specimen contamination shall be in accordance with Section C.6 of NRC Regulatory Guide 8.22 (July 1973).
- g. The licensee shall implement a documented quality control program for urine specimens that includes background samples, blanks, and spikes and also criteria for requiring repeat collection and analysis. This quality control program must be approved by the NRC prior to implementation.
- h. If an individual wearing a respirator is subjected to a concentration of yellowcake in air within a period of 1 week such that the exposure if he or she had not been wearing the device would have exceeded $40 \times C \text{ } \mu\text{Ci-h/ml}$ (where C is the concentration value given in 10 CFR Part 20, Appendix B, Table 1, Column 1, for soluble natural uranium), urinalysis should be performed to test the actual effectiveness of the respirator.

The above bioassay program was developed by the staff using elements of MEC's proposal and elements of the program outlined in Regulatory Guide 8.22, Bioassay at Uranium Mills.

The program is comparable to that outlined in Regulatory Guide 8.22 and should be adequate to indicate any uptake and/or retention of radioactive material by mill personnel.

6.0 ENVIRONMENTAL AND EFFLUENT MONITORING PROGRAMS

MEC will conduct an effluent and environmental monitoring program as specified in Tables C-3 and C-4 of their application and modified by Condition No. 43 of their license. The environmental monitoring program was designed around the source terms, radionuclides present, meteorological considerations, identifiable pathways, and receptors.

This monitoring program is the same as that presented in Table 6.2 of the FES, except for changes in yellowcake area stack and air particulate perimeter monitoring. The frequency of isokinetic sampling of the yellowcake area stack was changed from monthly to quarterly and one of the three 24-hour/every six days air particulate perimeter samples has been changed to a continuous sample, resulting in two continuous air particulate perimeter samples and two 24-hour/every six days air particulate perimeter samples. The staff has determined that these changes do not affect the quality of MEC's monitoring program and that the revised program is equivalent to that described in the FES.

7.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL

The mill and tailings impoundment will be fenced and posted with signs in accordance with 10 CFR 20.203. Parking facilities for employee and visitor vehicles will be outside this fenced area. A gate adjacent to the office will provide access for personnel reporting on and off shifts.

By license condition the licensee has been exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.203(e)(2) and with words, "Any area within this mill may contain radioactive material."

All visitors will be required to register and will be escorted while within the secured area.

Contractors having work assignments will be given security, safety and radiation protection orientation prior to performing their duties without escort.

8.0 EMERGENCY PROCEDURES

The Safety and Environmental Administrator will establish emergency procedures for the project. A detailed Spill Prevention Countermeasure and Control plan will also be prepared. Accidents which are possible for this type of activity have been identified in Section 5 of the FES (NUREG-0505). Precautions and measures which the applicant will take to reduce the possibility of occurrence of these accidents include the following:

1. Tailings Impoundment

MEC will make and document at least daily an inspection of the entire tailings retention system including the embankments of the tailings retention area and the exposed protective soil cover over the liner and make repairs if any erosion occurs.

MEC will also maintain a minimum of 5 feet of freeboard between the top of the tailings dam and the pond level throughout the project life.

2. Fire Protection

Heat sensors will be strategically located in the mill to detect fires and approved fire extinguishers will be available throughout the site. Selected employees will

be trained in fire control techniques. A light water system will be installed in the solvent extraction building. This system consists of necessary tanks, proportioners, piping, mixing valve, distribution valves, and individual sprinklers strategically placed. Foam activation will be via heat sensors.

3. Spill Prevention and Containment

Tanks will be equipped with high level alarms to reduce the possibility of spillage due to tank overflow. Dikes and/or curbs will be constructed around process and storage tanks (excluding the water, ammonia, and sulfuric acid tanks) to confine the material in the event of tank spill. In the event of an ammonia tank spill, the material would be expected to quickly evaporate. A sulfuric acid tank spill would flow via a specially excavated channel to the catchment basin where it would be fully contained and subsequently cleaned up.

9.0 DECOMMISSIONING

By letter dated January 19, 1979, MEC submitted to the Commission a decommissioning and stabilization plan for the Sweetwater Project that outlines a generalized program to return the lands disturbed by the project to their former use and productivity. The plan addresses facility decommissioning, tailings stabilization, and land reclamation by planned revegetation.

MEC has further committed to submission of a detailed decommissioning plan for approval by the Commission prior to terminating the milling operation and to maintenance of a bond with the State of Wyoming until successful reclamation has been accomplished. In addition, MEC has committed to decommissioning of facilities or equipment in accordance with Annex C, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or SNM," which is an informal guide prepared by NMSS staff.

10.0 BONDING

A surety bond in the amount of \$10,075,000 has been posted with the Wyoming Department of Environmental Quality (DEQ) for the disturbance caused by first year site activities, to cover reclamation of the mill and mine sites and tailings impoundment area in the event of a forfeiture. During this first year (11/78-11/79) there will be no milling activities. The mill is not scheduled to start up until mid-1980. Prior to the initiation of milling activities and the associated generation of tailings, MEC will be required by license condition to revise the bond held with the Wyoming DEQ to include tailings and mill site reclamation costs reviewed and approved by the NRC staff.

11.0 CONCLUSION

Upon completion of the safety review of the licensee's application and a review of this SER and the proposed license conditions by I&E, Region IV and Headquarter staff, the staff has concluded that issuance of a license to MEC, subject to the additional conditions developed by the staff, will not constitute an undue risk to the health and safety of the public, and has determined that the application and supplements fulfill the requirements of 10 CFR 40. The staff has further determined that conformance by MEC to their proposed conditions, as well as those developed by the staff, should ensure a safe operation.

The staff, therefore recommends that MEC be issued a license subjected to the following conditions:

9. The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings generated by the licensee's milling operations authorized under SUA-1350.
10. Authorized place of use: The licensee's uranium milling facilities located in Sweetwater County, Wyoming.
11. For use in accordance with statements, representations, and conditions contained in Section 5 (including appendices), and subsections 3.3.2, 3.3.4, 3.3.6, 3.3.7, 3.3.8, 4.3, 6.4, 7.3, 7.4 and 7.5 and Table 4.1 of the licensee's revised application dated August 10, 1978, and supplements dated October 31, 1978, and January 24 and February 5, 1979. Whenever the word "will" is used in the above mentioned sections, it shall denote a requirement.
12. The maximum mill throughput shall not exceed 3,200 lbs. of barreled U₃O₈ per day, averaged over a year.