40-8698

plateau resources LIMITED

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August 13, 1985

RETURN ORIGINAL TO PDR, HQ.

FEDERAL EXPRESS

Mr. R. Dale Smith, Director
U. S. Nuclear Regulatory Commission
Uranium Recovery Field Office
730 Simms Street
P.O. Box 25325
Denver, Colorado 80225

Dear Mr. Smith:

Enclosed are five copies of a revised Section 5 to Plateau's Renewal Application for SUA-1371. Also enclosed is a blacklined copy of the revised Section 5 marked to show the material added to and the locations of deletions from the November 1984 version (as amended February 1985). The revisions are necessary because of reductions ir the staff of Plateau and the anticipation of an extended non-operational period.

As described in revised Section 5, Plateau has welded the doors to the calciner room closed and will lock the doors to the 600 Area. This will allow a reduction of certain levels of monitoring effective with the issuance of the renewal. Plateau is in the process of stabilizing the tailings using a minimum of one foot of soil and will cover the ore stockpiles using a minimum of one-half foot of soil. This will minimize emissions from the facility such that low levels of monitoring will be adequate. The renewal application therefore contemplates that there will be a further reduction in monitoring on completion of the interim stabilization of the tailings and stockpiles. The proposed mill radiological program for the non-operational period is described in Table 5.5-3 and the environmental monitoring program for that period is described in Table 5.5-8.

The revised Section 5 still contains descriptions of the radiological and environmental monitoring programs for full operations even though it is intended that the renewal license will only provide authorization for non-operational status. The operational information was left in Section 5 in order to comply with the regulatory guides.

DESIGNATED ORIGINAL

Certified By Mary C. Hood

Addl Info
00830

We request approval of the enclosed revisions as part of the November 1984 license renewal application.

Sincerely,

Kenneth E. May
General Manager

sbp

Enc. A/S

cc: Blake O. Fisher
Gregory P. Williams, Esq.
Noel Savignac

(3517s)

5.0 OPERATIONS

Section 5.0 presents the detailed radiological and environmental programs used to control source materials both within the mill and in the environment around the mill. For each monitoring and control program described in Section 5.0 two sets of procedures are presented. Initially procedures for full operating conditions at the mill are presented for compliance with Regulatory Guides 4.14 and 8.30 and to demonstrate a corporate commitment to quality radiation safety and environmental monitoring programs. Subsequently, the interim procedures applicable to the nonoperational status of the mill are presented. Those interim procedures apply to a nonoperational status that may last several years.

5.1 CORPORATE ORGANIZATION AND ADMINISTRATIVE PROCEDURES

The Corporate Headquarters are located at 212 West Michigan Avenue, Jackson, Michigan 49201. The General Office is located at 772 Horizon Drive, Grand Junction, Colorado 81501. The Shootaring Canyon Uranium Processing Facility site offices are located at Ticaboo, Utah 84734.

The President is the Chief Executive Officer of Plateau and has general charge of its business. The Vice President reports to the President and is managing officer of Plateau with general charge of its operations.

The Shootaring Canyon Uranium Processing Facility is currently in an extended period of nonoperations. Minimum personnel assisted by outside consultants are being utilized to maintain the facility. See Figure 5.1-1 for Plateau's August, 1985 organization chart. When operations at the processing facility re-start, the mill staff will be considerably expanded. Prior to such start-up, the staff's qualifications and revised organizational chart will be submitted to the U.S. Nuclear Regulatory Commission for review.

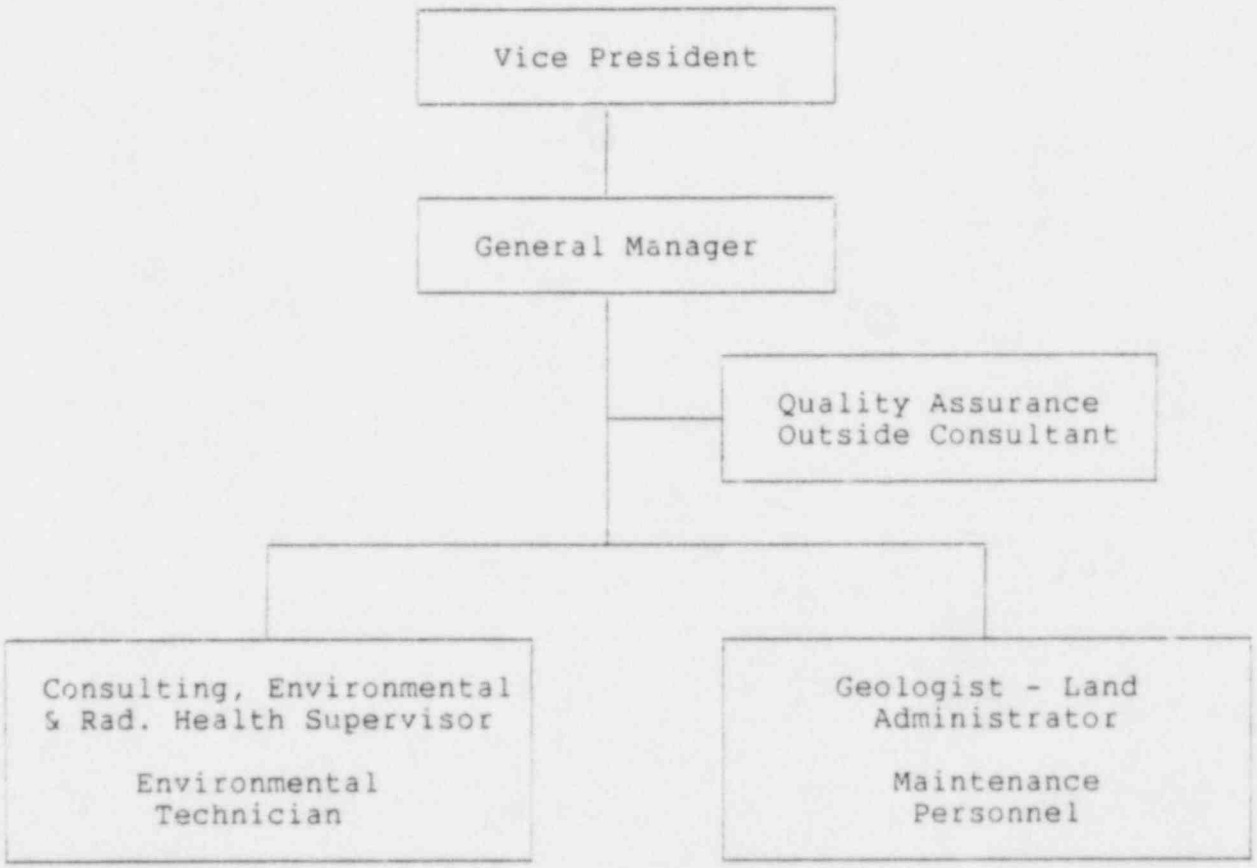
The organizational structure of the company has been specifically designed to provide separate reporting channels for the operations personnel, the quality assurance personnel, and health and safety personnel through the General Manager to the Vice President and hence to the President of Plateau. The pyramid structure provides that all final approvals for implementation and revision of policies and practices rest with the Vice President.

The General Manager and his/her supervisory personnel must ensure adherence to facility operations and company procedures, as well as to regulations and requirements

Figure 5.1-1

PLATEAU RESOURCES LIMITED

ORGANIZATION CHART



administrated by the U.S. Nuclear Regulatory Commission and the Mine Safety and Health Administration. During mill operations, the Environmental and Radiological Health Supervisor ("ERHS") has authority to partially or fully suspend operations that could be hazardous to workers. He reports directly to the General Manager. During nonoperational periods lasting 30 days or more, the Consulting ERHS reports directly to the General Manager and assumes the responsibilities of the ERHS. Any subsequent reference in the license renewal document to the ERHS will refer to the Consulting ERHS during extended periods of nonoperation. The Environmental Technician conducts routine sampling and monitoring under the guidance of the Consulting ERHS and reports to the General Manager for administrative matters such as salaries, vacations, etc.

In the second reporting channel to the General Manager are the maintenance personnel and the Geologist-Land Administrator. The final reporting channel is the Quality Assurance Consultant. Because the Consulting ERHS is in an advisory role as Environmental Technician and Quality Assurance Consultant, the Consulting ERHS may be the same individual during nonoperational periods.

5.1.2 MANAGEMENT CONTROL PROGRAM

Written operating procedures have been established for routine production activities involving

radioactive materials that are handled or processed. Those procedures include consideration of pertinent radiation safety practices. Non-routine operations posing a radiological health risk to workers require review of the procedures by the ERHS or his staff and the issuance of a radiation work permit which establishes the radiological health protection measures. Emergency procedures are presented in Appendix A. Copies of the operational procedures and the radiation safety procedures are available at the mill site and are discussed in the following sections.

All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the ERHS before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the ERHS shall perform a documented review of all existing operating procedures at least annually during operations. During extended periods of nonoperations procedures will be reviewed prior to the resumption of full operations. Obsolete procedures are deleted during the review.

5.1.3 MANAGEMENT AUDITS AND INSPECTIONS

Management audits and inspections of worker health protection practices at Plateau serve to provide

management with the information necessary to conduct the as low as reasonably achievable (ALARA) program.

VISUAL INSPECTIONS

During normal mill operations the ERHS or a designated radiation technician conducts a daily walk-through (visual) inspection of various areas of the mill including ore stockpiles for dusting. The primary purpose of this inspection is to ensure proper implementation of good safety and housekeeping practices in order to minimize contamination as well as to ensure adherence to standard operating procedures. Observations are documented weekly on forms that are forwarded to the General Manager for review. During nonoperational periods lasting 30 days or more, documented visual inspections will occur quarterly.

MONTHLY REPORTS

Each month during mill operations the ERHS provides to the General Manager a written summary of current conditions and summary of monthly activity (interim program - semiannual).

5.1.4 ALARA PHILOSOPHY

The purpose of the radiation protection program at Plateau is to maintain radiation exposures as low as reasonably achievable (ALARA) for all employees, contractors, visitors, and members of the general public. The implementation of a successful ALARA program is the

responsibility of everyone involved in the processing of uranium ores. Responsibilities for the ALARA program are shared by the General Manager, the ERHS, and all employees associated with the mill. The ALARA policy for Plateau Resources Limited is as follows:

ALARA - POLICY STATEMENT

Plateau Resources Limited is firmly committed to the philosophy that occupational exposures to radiation be kept at a level "as low as is reasonably achievable." This philosophy is referred to as ALARA. It is important for all employees to understand both the commitment and involvement of management and the responsibilities of each employee in this basic radiation protection philosophy.

A major purpose of the occupational radiation protection program at the mill is to maintain radiation exposure as low as is reasonably achievable for all employees, contractors and visitors. The implementation and effectiveness of a successful ALARA program is the responsibility of every employee.

Management is responsible for developing, implementing and enforcing the rules, policies, and procedures necessary for an effective radiation protection and ALARA program.

The ERHS and staff are responsible for the technical adequacy and correctness of the radiation protection and ALARA program. The ERHS also has continuing responsiblity for surveillance and supervisory action in the enforcement of the program.

All employees have additional responsibilities to ensure the effectiveness of the ALARA program. First, everyone is responsible for adhering to all rules, notices and operating procedures for radiation safety. Second, each employee is responsible for promptly reporting to the ERHS and supervisors any equipment malfunctions or violations of standard practices or procedures that could result in increased radiological hazard to any

individual. Third, everyone is encouraged to suggest improvements for the radiation protection and ALARA program.

In summary, Plateau's commitment to ALARA requires the involvement of every employee to accomplish our objective of maintaining occupational exposures as low as reasonably achievable.

s/Blake O. Fisher
Vice President
Plateau Resources Limited

Responsibilities under the ALARA program include:

General Management. Management has formulated and/or provided the following:

1. Information and a policy statement to employees, contractors, and visitors concerning ALARA.

2. Management review of audits.

3. During operations appropriate briefings and training in radiation safety, including ALARA concepts for mill employees and, when appropriate, for contractors and visitors.

Environmental and Radiological Health Supervisor. He has been delegated the following:

1. Sufficient authority to enforce regulations and administrative policies.

2. Responsibility to develop and administer the ALARA program.

3. Authority to review and approve plans for new equipment, process changes, or changes in operating procedures to ensure that the plans do not adversely affect the protection program.

Mill Workers. Workers at the mill are responsible for the following:

1. Adhering to rules, notices, and operating procedures for radiation safety established by management and/or the ERHS.

2. Reporting promptly to the ERHS and/or management any equipment malfunction or the violation of practices or procedures that could result in increased radiological hazards to any individual.

3. Suggesting improvements for the ALARA program.

Further details of the ALARA program are provided in Section 5.5 Radiation Safety.

Semiannual ALARA-Quality Assurance Program Audits. During mill operations the ALARA - Quality Assurance Consultant shall conduct a semiannual audit of operating procedures, exposure records, inspection reports, training programs, and reports of safety meetings to evaluate the overall effectiveness of the program and adherence to the ALARA philosophy. Audit results shall be documented and sent to the Vice President, General Manager, and ERHS. During

nonoperation the consulting ERHS will review annually the environmental and radiological monitoring programs and quality assurance programs.

The primary purpose of the audit is to evaluate the overall effectiveness of the mill ALARA program. The audit usually includes a review of the program results in the following areas:

1. Employee exposure and bioassay records and trends (if applicable).
2. Reports on overexposure of workers.
3. Mill surveys and summary reports.
4. Training program.
5. Radiological survey and sampling.
6. Radioactive effluent and environmental monitoring trends (if applicable).
7. New operating procedures.
8. Whether equipment for exposure control and effluent control is being properly used, maintained and inspected.
9. Recommendations on ways to further reduce personnel exposures and effluent releases of uranium and its daughters.

The salient results of these inspections and audits are presented to the plant ALARA Committee consisting of the following positions:

1. General Manager
2. Mill Operations Personnel
3. ERHS

The ALARA Committee was formed for the purpose of minimizing worker exposure to ionizing radiations. The committee members exchange ideas and information regarding potential radiation hazards that may develop during the processing of uranium ores. The meetings also provide a forum for review of NRC license requirements. Meetings are scheduled as frequently as deemed necessary by any committee member. Typically, during operations the ALARA Committee will meet at least twice a year to evaluate the ALARA audit results. (During nonoperations - once per year).

In compliance with the ALARA philosophy, engineering controls and other methods for improving the ALARA program are balanced against the relative costs and benefits of systems/program modification. If the established routine or special sampling programs indicate that radiation exposures have increased, the management and operating staff will take steps to reduce the likelihood of similar future occurrences.

5.2 QUALIFICATIONS

Plateau Resources Limited's organization has three positions which are assigned responsibility for developing, conducting and administering the radiation safety

program for the mill. These positions are the General Manager, ERHS, and the Environmental Technicians.

The General Manager has the following minimum qualifications:

1. A bachelor's degree from an accredited college or university or an equivalent combination of training and relevant experience.

2. Four years of relevant experience (preferred).

3. Knowledge of federal and state regulations in the areas of occupational safety, radiological safety protection and environmental protection (preferred).

The ERHS has the following minimum qualifications:

1. Education: A bachelor's degree in the physical sciences, industrial hygiene, or engineering from an accredited college or university or an equivalent combination of training and relevant experience in uranium mill radiation protection. Two years of relevant experience will generally be considered equivalent to one year of academic study.

2. Health physics experience: At least one year of work experience relevant to uranium mill operation in applied health physics, radiation protection, industrial hygene, or similar work. This experience should involve

actually working with radiation detection and measurement equipment, not strictly administrative or "desk" work.

3. Specialized training: At least four weeks of specialized classroom training in health physics specifically applicable to uranium milling. In addition, the ERHS will attend refresher training in uranium mill health physics every two years.

4. Specialized knowledge: A thorough knowledge of the proper application and use of all health physics equipment used in the mill, the chemical and analytical procedures used for radiological sampling and monitoring, methodologies used to calculate personnel exposure to uranium and its daughters, and a thorough understanding of the uranium milling process and equipment used in the mill and how the hazards are generated and controlled during the milling process.

During full-scale operation of the mill, there will be a minimum of one full-time Environmental Technician who will have one of the following combinations of education, training and experience:

1. Education: An associate degree or two or more years of study in the physical sciences, engineering, or a health-related field,

Training: At least a total of four weeks of generalized training (up to two weeks may be on-the-job training) in radiation health protection applicable to uranium mills,

Experience: One year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in a uranium mill; or

2. Education: A high school diploma,

Training: A total of at least three months of specialized training (up to two months may be on-the-job training) in radiation health protection relevant to uranium mills,

Experience: One year of relevant work experience in applied radiation protection, and demonstrate a working knowledge of the proper operation of health physics instruments used in the mill, surveying and sampling techniques, and personnel dosimetry requirements.

In addition, the Environmental Technician will receive documented retraining every two years from the ERHS or other qualified persons.

The resumes of the individuals currently holding these positions are included in Appendix B.

5.3 TRAINING

During mill operations the radiological protection training program consists of initial indoctrination training, on-the-job training, annual refresher training, and training for visitors and contract workers. Completion of each type of training will be documented on a form which includes: (1) the dates of the training, (2) the content of the training, (3) the trainee's signature indicating that the training was received, and (4) the instructor's signature. This training record will be maintained on file.

All new employees are instructed in the inherent risks of exposure to radiation and the fundamentals of protection against exposure before beginning their jobs. The current copy of the Radiological Safety Training Manual is included as Appendix C. Each new employee will receive a copy of the current training manual which is used as the text for the initial indoctrination course.

A written or oral test with questions directly relevant to the principles of radiation safety and health protection in uranium milling covered in the training course will be given to each new employee. The instructor will review the test results with each worker and discuss any wrong answers with the employee until he understands the correct answers. Employees who fail the test will be retested after

receiving additional training. These tests and results, or the instructor's record of results in the case of oral tests, will be maintained on file.

All new employees, including supervisors, will receive individualized on-the-job training on the health and radiation aspects of the specific jobs they will perform. This instruction may be given by a qualified supervisor experienced in the assigned tasks, or other person experienced in the assigned tasks. In addition, supervisors will receive additional specialized training on their supervisory responsibilities in the area of worker radiation protection.

Each permanent employee, including supervisors, will receive refresher training annually. The refresher training will include a review of the Radiological Safety Training Manual, relevant information that becomes available during the preceding year, changes in regulations and license conditions, exposure trends, and other current topics. The annual refresher training may be given in one session or as a part of the safety meetings.

Safety meetings lasting at least 30 minutes will be held at least once every two months to discuss matters of concern that arise during plant operations and may include instruction as part of the annual refresher training. The safety meetings will also be used to reinforce the as low as reasonably achievable (ALARA) program by

encouraging employees to participate in the identification of ways to reduce occupational radiation exposures.

During periods of extended non-operation lasting 30 days or more, safety meetings will be suspended. The method for distributing safety information will be commensurate with the number of employees at the mill and the type of work being performed. For example, when it is not feasible to conduct a meeting, safety bulletins may be used. A record will be kept of the employees who receive the information.

All visitors who have not received training will be escorted by someone properly trained and knowledgeable about the hazards of the mill. At a minimum, visitors will be instructed specifically on what they should do to avoid possible hazards in areas of the mill they will be visiting.

Contractors having work assignments in the mill will be given appropriate training and safety instruction. Contract workers who will perform work on heavily contaminated equipment will receive the same radiation safety instruction normally required of permanent employees. Only job-specific radiation safety instruction will be given contract workers who have previously received full training on prior work assignments at the mill or have evidence of recent and relevant radiation safety training elsewhere.

After receiving this training, contractors may be allowed to perform their duties without escort.

5.4 SECURITY

The boundary limits of the processing facility are posted and enclosed by a fence except for sections where cliffs or other topographic features form a natural boundary. The process plant, mill ore storage area, ancillary facilities (such as laboratory, office building, warehouse and maintenance facilities, electrical power distribution, reagent storage, and water wells), and the entire tailings disposal area are located within the boundary limits of the facility. The restricted area is posted with strategically located signs that state "Keep Out - Caution Radioactive Materials." The requirements of 10 CFR 20.203(e)(2) are met by conspicuously posting all entrances to the mill with the words "Any Area Within This Mill May Contain Radioactive Material."

Access to all areas, except the general office building, employee parking and visitor parking, are controlled by fencing, gates, and a security station. Warning and information signs are posted near the main gate. Twenty-four hour security will be provided when the processing facility is in operation. During extended periods of nonoperation, access to the restricted area through the main gate is provided by means of an automatic gate opening

and closing device which is primarily controlled by personnel located in the general office building. Remote control (radio-operated) gate operating devices are assigned to the maintenance personnel and the radiation safety staff. The maintenance staff will provide onsite coverage 40 hours per week to augment the security provision stated above.

All gates are kept closed except for those providing access to employee parking and the general office building during normal business hours or at shift change. Supervisory and security personnel will be provided building keys on an as needed basis. All fencing and gates will be inspected on a semiannual schedule during the extended period of nonoperation by maintenance personnel or other responsible employees to insure system integrity. This inspection will be increased to monthly during operation. The results of the inspections will be recorded in a log.

Visitors, including contract workers to the plant, will be admitted only by permission from supervisory personnel. Each visitor will be checked in and out on a visitors' register and will be escorted while in the restricted area. All visitors are required to read and sign a hazard training form, at least annually. A list of authorized personnel who have completed training or have been authorized to enter the restricted area will be maintained. Visitors are given instructions on what they should do to

avoid possible hazards in the mill. After receiving the training described in Section 5.3, visitors having work assignments, such as an equipment repairman or contractors, may be allowed to perform their duties without escort.

Although yellowcake remains in the yellowcake calciner and the product thickener the doors to the product (600) area are locked and all doors that allow access to the yellowcake calciner are welded closed. Access to the product area is restricted. Only authorized personnel may receive the specific clearance required to enter. Except for emergencies and quarterly inspections, permission to enter the product area can only be granted by the following procedure:

1. A supervisory or managerial-level employee initiates a Radiation Work Permit (RWP) noting work or entry requirements, number of people involved, and an estimate of time required.

2. The RWP form is then routed to the Environmental Technician who specifies conditions or restrictions (such as protective clothing/gear or time in work area), as needed, for the job listed.

3. The Environmental Technician then returns the RWP form to the initiator.

4. Radon property concentrations are measured in 600 area prior to entry.

5. The initiator may then proceed with the direction of the work.

For routine entry for inspections, a standing RWP has been issued.

5.5 RADIATION SAFETY

The radiological monitoring program to be used within the mill during mill operations is summarized in Tables 5.5-1 and 5.5-2. The sampling and monitoring locations are illustrated on Figure 5.5-1. The radiological monitoring program to be used within the mill when the mill is NOT in operation for 30 days or more is summarized in Table 5.5-3. Survey instruments and monitoring equipment used in both programs are presented in Table 5.5-4, along with their sensitivities and ranges. Appendix D presents the exposure and monitoring data collected during the interim mill Radiation Safety Monitoring Program (January 1983 through June 1984) and the environmental monitoring data from January 1983 through June 1984. The selection of data from the mill interim operations period (temporary cessation of mill operations due to low uranium prices) was considered most representative of conditions that may be present at the mill in the near future. The interim mill operational data can then be used to evaluate the interim mill monitoring program.

Monitoring data collected during mill operations, March 1982 through November 1982, is not considered representative of conditions that will be present when mill operations resume. The concentrations observed in the yellowcake packaging area during the 1982 operational period were considered by both the NRC and Plateau to be higher than necessary. Since then Plateau management has been keenly aware of the seriousness of those conditions and recognizes that the engineering controls in the yellowcake packaging area (600 area) are still not adequate to provide the degree of employee radiological protection necessary to meet the ALARA policy statement presented in Section 5.1.4. To help ensure that necessary engineering controls are installed prior to the resumption of mill operations, Plateau commits to submit to the NRC design modifications of the yellowcake drier enclosure. Subsequent to the approval of the modifications, the necessary changes will be made before the mill resumes operation.

Without representative monitoring data from mill operations, Plateau has attempted to follow Regulatory Guide 8.30 closely in the design of monitoring programs presented in this renewal document so that radiological exposures will be maintained to ALARA levels. See Table 5.5-1 which summarizes that program.

Table 5.5-1

MILLS RADIOLOGICAL MONITORING PROGRAM - OPERATIONAL

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Mill airborne particulates	Airborne radioactivity areas	Weekly if area is occupied	30 minute grab or breathing zone or 5-minute high volume	Yellowcake or ore dust
	Other areas	Monthly	same as above	same as above
Radon progeny	See Table 5.5-2	Weekly >0.08 WL Monthly 0.03-0.08 WL Quarterly <0.03 WL	Modified Kusnetz method	Radon daughters
Mill gamma	20 areas	Semiannually	Gamma survey meter	Gamma
Personnel	Mill operations personnel	Quarterly	TLD badge issued for 90 days	Gamma
Surface Contamination	Eating areas, change areas, control rooms	Weekly if above 500 dpm/100 cm^2 otherwise every two weeks	Alpha smear and surface measurement	Removable and fixed alpha
	Administrative offices	Quarterly	Alpha smear and surface measurement	Removable and fixed alpha

Table 5.5-1 continued

MILLS RADIOLOGICAL MONITORING PROGRAM - OPERATIONAL

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
	Personnel	Leaving restricted area	Shower and/or change clothes, alpha survey	Alpha radiation
Urinalyses	Uranium workers, including packaging operators, SX-precipitation operators and shift foreman	Every two weeks	Urinalysis	U-nat
In-vivo lung count	Mill personnel with work assignments in airborne radioactivity areas	Every two years	Gamma counting	Uranium
Waterflow and pressure drops	Yellowcake scrubber	Approximately every four hours during operations	Documented visual inspection	Waterflow and pressure drops

Table 5.5-1 continued

MILLS RADIOLOGICAL MONITORING PROGRAM - OPERATIONAL

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Instrument calibrations	All instruments in use	Semiannually or mfg's suggested interval whichever is sooner*	Approved procedure	Instrument response
	Air samplers	Quarterly	Approved procedures	Flow rate
Visual inspections	Mill work and storage areas	Daily Documented Weekly	Documented visual inspections	Radiation work practices
Trend analyses	N/A	Annually	Routine monitoring programs	Trends
Reports	N/A	Monthly Semi-annual Annual	Summary of mill and environmental monitoring data	N/A

*Instruments may be calibrated as a group or a given instrument may be calibrated prior to use.

Table 5.5-1 continued

MILLS RADIOLOGICAL MONITORING PROGRAM - OPERATIONAL

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Radiological & Operational Procedures	N/A	Annual Review	N/A	N/A
Quality Assurance audit	N/A	Semiannually	N/A	N/A
Fence	Perimeter	Monthly	N/A	N/A
Radiological survey of equipment leaving restricted area	N/A	As required by Annex A	As required by Annex A	As required by Annex A
Respiratory protection program	As required by RWP	As required by RWP	N/A	N/A

Table 5.5-2

AIRBORNE RADIATION SAMPLE LOCATIONS

1. Ore feed hopper
2. Ore conveyor gallery
3. Ore sampling preparation area
4. Semi-Autogenous mill ore feed area
5. Semi-Autogenous mill ore discharge area
6. Leach tank area
7. Countercurrent Decant thickener area
8. Solvent extraction area
9. Yellowcake precipitation tank area
10. Yellowcake thickener area
11. Yellowcake drum filter area
12. Yellowcake drier area
13. Yellowcake packaging area
14. Yellowcake storage area
15. Laboratory area
16. Lunch area
17. Change room
18. Maintenance shop area
19. Shift foreman office
20. Main office area

Table 5.5-3

INTERIM MILL RADIATION SAFETY MONITORING PROGRAM
(Mill not operational for 30 days or more)

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Mill airborne particulates	Representative workers performing maintenance inside 600 area	When maintenance is performed	Area or lapel sampling, fluorimetry	Natural uranium
Radon progeny	600 area	Prior to working in 600 area under an RWP	Area or lapel sampling, modified Kusnetz	Radon daughters
Mill gamma	N/A	None	N/A	N/A
Personnel	None	None	TLD	Gamma
Surface contamination surveys	Offices	Semiannually	Surface smear, surface measurement	Removable alpha and fixed alpha
	Lunchrooms	Semiannually	Surface smear, surface measurement	Removable alpha and fixed alpha
	Change rooms	Semiannually	Surface smear, surface measurement	Removable alpha and fixed alpha

Table 5.5-3 continued

INTERIM MILL RADIATION SAFETY MONITORING PROGRAM
(Mill not operational for 30 days or more)

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Urinalysis	Mill employees performing maintenance work under RWP	As required by RWP with follow-up as per Reg. Guide 8.22	Fluorimetry	Natural uranium
In-vivo lung count	None	N/A	In-vivo	Natural uranium
Instrument calibrations	All instruments in use	Semiannually or mfg's suggested interval, whichever is sooner*	Appendix F	N/A
	Air samples in use	Prior to use	Appendix F	N/A
Visual inspection	Mill work and storage areas	Quarterly	Documented visual inspection	Radiation work practices
Trend analyses	N/A	Annually	Routine monitoring program	Trends

*Instruments may be calibrated as a group or a given instrument may be calibrated prior to use.

Table 5.5-3 continued

INTERIM MILL RADIATION SAFETY MONITORING PROGRAM
(Mill not operational for 30 days or more)

Sample Collection or Inspection				Parameter to be Measured
Type	Location	Frequency	Method	
Reports	N/A	Annually	Summary of radiological and environmental monitoring	N/A
Radiological and Operational Procedures	N/A	Prior to resumption of mill operations	N/A	N/A
Quality assurance audit	N/A	Annually	Audit by consulting health physicist	N/A
Fence	Perimeter	Semiannually	N/A	N/A
Radiological survey of equipment leaving restricted area	N/A	As required by Annex A	As required Annex A	As required Annex A
Respiratory protection program	600 area	As required by RWP	N/A	N/A

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Table 5.5-4

RADIATION SURVEY INSTRUMENTATION AND DOSIMETERS

Instrument	Mfg*	Model No.*	Detector*	Sensitivity or Efficency	Porta-bility	Measurement Range	Inven-tory**
Alpha Counter	Eberline	SAC-4	ZnS Scint.	80% of 2 pi Pu^{239}	No	Six Decade	2
Count Rate Meter	Eberline	E-140	GM Tube	±5% Full Scale	Yes	0.5 to 50 mr/hr 600 to 60K CPM	1
Gamma Survey	Eberline	E-130M	GM Tube	±5% Full Scale	Yes	10 to 1000 mr/hr	1
Micro R Meter	Ludlum	19	1"x1" NaI(tl) Scint.	±5% Full Scale	Yes	0-5K uR/hr	1
Ratemeter-Scaler	Eberline	PRS-2	--	$2x10^{14}$ coulombs	Yes	Six Decade	2
Portable Scaler	Eberline	PS-2	--	$2x10^{14}$ coulombs	Yes	Six Decade	2
Alarm Rate Meter	Ludlum	177	--	40 MV	No	0 to 500K cpm	3
Pulse Rate Meter	Eberline	PRM-6	--	±5% Full Scale	Yes	0 to 500K cpm	1

Table 5.5-4 continued

RADIATION SURVEY INSTRUMENTATION AND DOSIMETERS

Instrument	Mfg*	Model No.*	Detector*	Sensitivity or Efficency	Porta-bility	Measurement Range	Inven-tory**
Beta-Gamma Probe	Eberline	HP-270	GM Tube	40KEV-1.25MEV	Yes	--	2
Alpha Scint Probe	Eberline	AC-3-8	ZnS Scint	59 cpm/dpm	Yes	--	4
Alpha Scint Probe	Ludlum	43-5	ZnS Scint	--	Yes	--	3
Alpha Scint Detector	Eberline	SPA-1	ZnS Scint	25% of 4 pi	Yes	--	2
Scintil-lation Probe	Eberline	SPA-3	2 x 2 NaI (Tl)	1200K cpm per mr/hr	Yes	--	2
Air Sample Pump	Bendix	44	--	--	Yes	--	2
Thermo-luminescent Dosimeters	Eberline	--	TLD	10 mrem gamma	Yes	$10-10^{4}$ mrem gamma	ex-changed

*Equivalent instrumentation or dosimeters may be used.
**Applicable to full mill operations.

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Laboratory procedures when performed in the Plateau Resources Limited laboratory are contained in Appendix E. Table 5.5-5 summarizes the lower limits of detection for the analysis of radionuclides in different types of samples. All survey instruments in use are calibrated semiannually or at the manufacturer's suggested interval, whichever is sooner. Air samplers are calibrated quarterly when in use. Calibration procedures are a part of the radiological and environmental monitoring procedures that are presented in Appendix F.

The results of sampling, analyses, surveys and monitoring, calibration of equipment, reports on audits, meetings and training courses, reviews, investigations and corrective actions are documented, and unless otherwise specified by the NRC, will be maintained for a period of at least five years.

The purpose of the radiological monitoring program is to maintain radiation exposures to levels that are as low as reasonably achievable. Sections 5.5.1 through 5.5.8, which follow, address both the monitoring programs for mill operations and for those time periods when the mill is NOT in operation for 30 days or more. The monitoring programs for the latter, nonoperational time periods are referred to as interim monitoring programs. Where program

Table 5.5-5

LOWER LIMITS OF DETECTION*

Radionuclide	Sample Type	uCi/ml	Source of LLD
U-nat	Stacks	5×10^{-13}	10 CFR 20 10% Appendix B Table II
U-nat	General Air	1×10^{-11}	R.G. 8.30
	Continuous Air		
	Ore Dust	5×10^{-12}	R.G. 8.30
	Water/Urine	3×10^{-9} (5 ug/liter)	R.G. 8.22
	Soils	2×10^{-7}	R.G. 4.14
Th-230	Stacks	2×10^{-13}	10 CFR 20 10% Appendix B Table II
	Envir. Air	1×10^{-16}	R.G. 4.14
	Water	5×10^{-10}	Plateau
	Soils	2×10^{-7}	R.G. 4.14
	Veg. Food, Fish	2×10^{-7}	R.G. 4.14
Ra-226	Stacks	3×10^{-12}	10 CFR 20 10% Appendix B Table II
	Envir. Air	1×10^{-16}	R.G. 4.14
	Water	5×10^{-10}	R.G. 4.14
	Soils	2×10^{-7}	R.G. 4.14
	Veg. Fish, Food	2×10^{-7}	R.G. 4.14
Rn-222	Air	2×10^{-10}	R.G. 4.14
Pb-210	Air	3×10^{-15}	Alpha Nuclear
	Water	3×10^{-9}	Alpha Nuclear
	Veg.	1×10^{-6}	R.G. 4.14
Po-210	Water	3×10^{-9}	Alpha Nuclear
Radon Daughters	Air	0.03 WL	R.G. 8.30
External Gamma	Air	0.1 mR/hr	R.G. 8.30
Surface Contamination	Surface	500 dpm/100cm^2	R.G. 8.30

* If the measured concentration is higher than the LLD, then the laboratory procedure need only be adequate to measure the actual concentration. Then the standard deviation should be no greater than 10% of the measured value.

commitments vary between the two programs, the operational program commitments will be stated first, followed by the interim program commitments in parentheses.

Trend analyses are an ongoing process conducted by the ERHS or his staff. Whenever new monitoring data are available, these data are compared to existing data to determine if values are abnormally elevated. The analysis of trends of gradually increasing or decreasing monitoring data requires that data be collected over enough time to observe the trends. Thus, in addition to the review and analysis of monitoring data as they are collected, an annual trend analysis of mill and environmental monitoring data is conducted and documented.

5.5.1 SURVEYS AND ACTION LEVELS FOR EXTERNAL RADIATION

Most, but not all, mill workers receive external gamma radiation doses of less than 1.2 rem per year. Gamma radiation exposure rates are generally below 1.0 milliroentgen per hour in contact with incoming ore and are about 1.0 milliroentgens per hour in contact with fresh yellowcake. During the build-up of the uranium daughters in fresh yellowcake, the radiation levels increase following yellowcake production.

During mill operations gamma radiation surveys are performed semiannually throughout the mill at a minimum

of 20 areas representative of where workers are exposed in order to determine "radiation areas" in accordance with 10 CFR 20.203(b) and to evaluate external radiation dosimetry requirements in accordance with 10 CFR 20.202 (interim program - no personnel gamma monitoring due to minimal amount of ore and/or yellowcake in the mill).

Area gamma surveys must be representative of where both routine and non-routine work is performed so that their whole-body radiation exposures can be estimated. Thus, measurements are generally made at about waist height and 12 inches from surfaces. Surface "contact" exposure rate measurements are not used for establishing radiation area boundaries or estimating personnel whole-body exposures because these exposures would not be representative of the worker's true exposures.

Where radiation areas exist, the cause of the elevated gamma radiation levels is investigated, and actions to reduce the radiation levels are taken, if practicable.

The gamma radiation surveys are summarized in the semi-annual reports submitted from the ERHS to the General Manager (interim program - Environmental Technician submits annual report to General Manager). The General Manager reviews the reports for possible corrective actions.

To determine the need for personnel monitoring, the radiation exposures expected for each category of plant

worker may be calculated from measured radiation levels and predicted occupancy times. If the radiation exposure for any individual worker approaches 0.31 rem per quarter, 10 CFR 20.202 requires that the worker will be furnished with a personnel radiation dosimeter, i.e., a thermoluminescent dosimeter (TLD) badge. If external radiation doses to any worker's badge approaches 1.25 rem per quarter, an investigation of the cause will be made and corrective actions taken.

During mill operations employee gamma exposures are monitored using TLDs available from a commercial vendor. The vendor evaluates the TLDs quarterly and issues a report of the gamma exposures in millirems per quarter. During full operations at the mill, approximately 40 TLD badges are used by mill operations personnel. No employee takes his TLD home.

The sensitivity and range of the TLD badges are presented in Table 5.5-4, along with the other survey instruments and monitors used in the program. All instruments in use are calibrated semiannually or at the manufacturer's suggested interval, whichever is sooner.

5.5.2 SURVEYS FOR AIRBORNE RADIONUCLIDES

The following sections describe surveys for airborne uranium ore dust, yellowcake and radon progeny. Subsequently, the criteria for airborne radioactivity are

presented. Appendix E contains laboratory analytical procedures. Appendix F contains the radiological and environmental sampling and monitoring procedures. Air sampler calibrations that are performed quarterly are presented in that appendix.

5.5.2.1 SURVEYS FOR AIRBORNE URANIUM ORE DUST

Surveys for airborne uranium ore dust are necessary to:

1. Demonstrate compliance with the weekly intake limit for workers specified in 10 CFR 20.103(b)(2).

2. Meet the posting requirements for airborne radioactivity areas in 10 CFR 20.203(d).

3. Determine whether precautionary procedures, such as process or other engineering controls, limitation on working times, provision of respiratory equipment, or other precautions are needed to meet 10 CFR 20.103(b)(1) and (b)(2).

4. Determine whether exposures to radioactive materials are being maintained as low as is reasonably achievable.

The uranium ore dust maximum permissible concentration of 5.0×10^{-11} microcuries per milliliter (uCi/ml) of air is applicable to areas where ore dust is handled prior to chemical separation of the uranium from the ore. Where uranium ore dust approaches or exceeds the

maximum permissible concentration, the source of the dust is identified and corrective actions implemented to reduce the dust concentrations to as low as is reasonably achievable.

The sampling program for airborne uranium ore dust includes weekly grab samples for airborne radiation areas that are occupied and monthly grab samples for other areas where ore dust concentrations are above 5×10^{-12} uCi/ml, which is 10% of the MPC for ore dust (interim program - lapel sampling of maintenance workers when maintenance is performed in the 600 area). The ore dust sampling areas are specified in Table 5.5-2. The quantity of air sampled and the fluorimetric method of analysis provide a lower limit of detection of approximately 5×10^{-12} uCi/ml.

Where practicable, engineering controls will be adopted to prevent ore handling areas from becoming airborne radioactivity areas. Unusual results are reported promptly to the ERHS and to the General Manager for their review in the monthly report.

Ore dust samples are to be representative of the air inhaled by the workers. Samples taken between the source and the worker are considered representative. Samples are taken while normal ore handling is occurring. See Section 5.5.2.2 for a discussion of the use of general air samples and breathing zone samples.

5.5.2.2 SURVEYS FOR AIRBORNE URANIUM

Exposure to soluble uranium must be limited to a weekly exposure of 40 hours at a concentration of 0.2 mg/m^3 in air as specified in 10 CFR 20 Appendix B, Footnote 4. This weekly provision for soluble uranium is to protect workers' kidneys from the chemical toxicity. The basis for Part 20 limits for soluble natural uranium is that the chemical toxicity limit is always more restrictive than the radiological limit.

Surveys of uranium concentrations are also necessary to establish the boundaries of airborne radioactivity areas and to determine whether precautionary procedures, such as process or other engineering controls, limitation on working times, provision of respiratory equipment, or other precautions should be considered in compliance with 20 CFR 10.103(b).

Air sampling for uranium is performed monthly in areas where uranium is present, but generally not in sufficient quantity for the area to be designated an airborne radioactivity area (interim program - lapel sampling of representative maintenance workers or area sampling when maintenance is performed in the 600 area). Areas to be sampled during operations are listed in Table 5.5-2. In airborne radioactivity areas that are occupied, weekly

samples are obtained. The yellowcake drier area and packaging area are likely airborne radioactivity areas. Samples must be representative of the air inhaled by the workers and are taken under normal yellowcake processing conditions. The fluorimetric analysis provides a LLD of 1 x 10^{-11} uCi/ml of air as specified in Regulatory Guide 8.30.

Under routine mill operating conditions, a combination of general air samples and breathing zone air samples are used to assess the uranium concentrations in air breathed by mill workers and their radiological exposures. The general air samples are routinely obtained where employees are performing low-exposure jobs and where localized areas of high airborne concentrations are not anticipated. In contrast, breathing zone air samples are obtained where exposure is likely to involve more than 10% MPC in any one week. Such locations may include the yellowcake drier area and yellowcake packaging area. For maintenance personnel working in areas where the U_3O_8 concentration is anticipated to be greater than 25% MPC, personnel breathing zone samples are taken during the entire time period of the maintenance operation.

In areas where both a breathing zone air sample and a general air sample have been obtained, the ERHS will have to select the value most representative of an individual

worker's exposure. That selection will in part be based on the number of samples of each type, the work being performed, who was wearing the breathing zone samples, the quality of the sample, etc.

The lower limit of detection for uranium air sampling is 1 x 10^{-11} uCi/ml as specified in Table 5.5-5 and as recommended in Regulatory Guide 8.30.

5.5.2.3 SURVEYS FOR RADON-222 PROGENY

Significant concentrations in air of radon and its daughters may occur near ore storage bins and crushing and grinding circuits or in enclosed locations where large quantities of dry ore are found. At Plateau, indoor radon daughter measurements are made in preference to radon measurements because the daughter products can build up in concentration and present a greater hazard to workers than is presented by radon alone.

Weekly, monthly, or quarterly working level measurements are made at the 20 sampling locations specified in Table 5.5-2, dependent on the working level concentrations observed in those areas (interim program - radon daughter sampling in 600 area prior to performing maintenance under an RWP). Samples are taken so as to be representative of worker exposure.

The lower limit of detection for radon-222 daughter measurement is 0.03 working level as specified in

Regulatory Guide 8.30. Measured values less than the lower limit of detection, including negative values, are recorded on data sheets.

The annual average for an area is obtained by averaging all measured values, including values obtained that are below the lower limit of detection.

The modified Kusnetz method for measuring working levels is currently used at Plateau. The procedure consists of sampling radon progeny using a high efficiency filter for five minutes and, after a delay of 40 to 90 minutes, measuring the alpha activity on the filter. High efficiency membrane or glass fiber filters are used to minimize loss of alpha counts by absorption in the filter.

5.5.2.4 ESTABLISHMENT OF "AIRBORNE RADIOACTIVITY AREAS"

The yellowcake drier area and yellowcake packaging rooms are usually considered to be airborne radioactivity areas during periods of active milling operations. On the other hand, ore crushing and grinding areas and locations outside yellowcake drying and packaging areas will not normally need to be classified as airborne radioactive areas when normal engineering controls are used. Any area, room, or enclosure is an "airborne radioactivity area" as defined in 10 CFR 20.203(d) if (1) at any time the uranium ore dust concentration or natural uranium concentration averaged over the different sampling locations exceeds 5×10^{-11} uCi/ml

for ore dust or 1 x 10^{-10} uCi/ml natural uranium for yellowcake (i.e., the values in Appendix B, Table 1, Column 1 of 10 CFR Part 20), or (2) the concentration exceeds 25 percent of the values in Appendix B to 10 CFR Part 20 averaged over the number of hours in any one week in which individuals are present in such areas, rooms, or enclosures. For example, if the average natural uranium concentration throughout the time of occupancy exceeds 25% MPC or 2.5 x 10^{-11} uCi/ml for uranium, the area is an airborne radioactivity area.

5.5.3 EXPOSURE CALCULATIONS AND RESPIRATORY PROTECTION PROGRAM

The Handbook of Radiological and Environmental Monitoring Procedures is presented in Appendix F. Page 5-23 of that appendix uses the MPC-hour method of calculating intake of uranium ore dust or yellowcake and expresses that intake in MPC-hours as a percentage of the allowable time-weighted exposures in MPC-hours. As an alternative, exposure can be calculated using the intake method specified in Regulatory Guide 8.30.

Appendix G presents the respiratory protection program. The program was prepared using Regulatory Guide 8.15 and NUREG-0041. References within the program to the position of Radiation Safety Officer are synonymous with the

position of ERHS used throughout this license renewal application.

5.5.4 BIOASSAY PROGRAM

Bioassays are required for all uranium workers during both routine and non-routine operations where reason exists that an exposure to uranium could exceed 40 hrs at 1 x 10^{-10} uCi/ml in one work week or an exposure to ore dust could exceed 3 x 10^{-2} uCi in one calendar quarter.

5.5.4.1 URINALYSES

The urinalysis program is conducted at the mill following Regulatory Guide 8.22, Bioassay at Uranium Mills. Details of the urinalysis program are presented in Appendix F, pages 7-1 through 7-3. The fluorimetic determination of uranium is presented in Appendix E, pages 5-29 through 5-35. (Interim program, employees performing maintenance under a radiation work permit may be required to submit bioassay samples.)

Urine bioassay measurements may also be performed to evaluate the actual effectiveness of respiratory protection devices. If an individual wearing a respirator is subjected to uranium in an airborne concentration that would have approached MPC, urinalysis may be performed to test the actual effectiveness of the device. The lower limit of detection for uranium is 5 ug/l.

5.5.4.2 IN-VIVO LUNG COUNTS

In-vivo lung counts are conducted every two years on mill workers with work assignments in Airborne Radioactivity areas who are routinely exposed to uranium concentrations in excess of 25% of the MPC for 40 hours (interim program - no in-vivo lung scans will be normally conducted because the calciner doors have been welded closed). The program is conducted following Regulatory Guide 8.22, "Bioassay at Uranium Mills."

Appendix F, page 7-3, provides details on the in-vivo bioassay program, except that the two-year frequency for the in-vivo program applies to this license renewal application.

5.5.5 CONTAMINATION SURVEYS

Contamination of skin and personal clothing is controlled in order to prevent the spread of contamination to unrestricted areas, i.e., the workers' cars and homes. Alpha radiation from yellowcake or ore dust on the skin or clothing is not a direct radiation hazard because the alpha particles cannot penetrate the dead layer of the skin. In contrast, uranium is primarily a hazard if it is inhaled or swallowed. The instruments used in contamination surveys are presented in Table 5.5-4, along with their sensitivities or ranges. Appendix F, pages 8-1 through 8-38, presents the instrument calibration procedures.

5.5.5.1 CONTAMINATION SURVEYS OF CLOTHING

Employees working in soluble uranium areas and other areas specified by the ERHS are provided with protective clothing such as coveralls and rubber boots (interim program - no protective clothing will be supplied). Gloves are issued when yellowcake will be handled.

All soiled coveralls are sent to the mill laundry at the end of each shift. After being laundered, the coveralls are monitored once each month for fixed alpha. Those with readings in excess of 10,000 dpm per 100 cm^2 are discarded. The laundry wastewater is discharged to mill tailings.

5.5.5.2 CONTAMINATION SURVEYS OF PERSONNEL

Procedures for the determination of alpha emitting radionuclides on personnel leaving the restricted area of the mill are presented in Appendix F, pages 5-1 through 5-3. Table 5.5-6 presents the maximum allowable levels of surface contamination for exit from the mill.

To ensure the effectiveness of the employee contamination surveys, contamination spot checks are performed and documented by the radiation control staff (interim program - contamination surveys of personnel are not conducted).

5.5.5.3 CONTAMINATION SURVEYS OF EQUIPMENT

Surface contamination surveys are conducted before potentially contaminated equipment is released to unrestricted areas. If contamination is detected above the values presented in Table 5.5-6, the contaminated equipment will not be released from the restricted area until decontaminated, resurveyed and contamination is below the values in Table 5.5-6. Equipment used in the mine may require maintenance in the mill shop. Such equipment will be surveyed upon entry into the restricted area of the mill. That equipment will be allowed to leave the mill restricted area if the contamination levels on the equipment do not exceed those levels measured upon entry into the mill restricted area.

5.5.5.4 CONTAMINATION SURVEYS FOR TRANSPORTATION

Prior to shipment of barrelled yellowcake from the mill, the following survey of external contamination is performed on a representative number of barrels of yellowcake.

Contamination on packages to be shipped cannot exceed Department of Transportation limits of 49 CFR 173.443. The average measured removable alpha contamination determined by wiping 300 cm^2 of the external surface of the package with an absorbent material must be below 22 dpm/cm^2 if a non-exclusive-use vehicle is to be used, or 220 dpm/cm^2 if

TABLE 5.5-6 *

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES [a]	AVERAGE [b c f]	MAXIMUM [b d f]	REMOVABLE [b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm alpha/100 cm^2	15,000 dpm alpha/100 cm^2	1,000 dpm alpha/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emissions or spontaneous fission) except SR-90 and others noted above	5,000 dpm beta-gamma/100 cm^2	15,000 dpm beta-gamma 100 cm^2	1,000 dpm beta-gamma/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

TABLE 5.5.6
2

* The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

' The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

* Reprinted from U.S. Nuclear Regulatory Commission, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," November, 1976.

an exclusive-use vehicle is to be used. Packages having higher contamination levels should be cleaned and resurveyed prior to shipment. Visible yellowcake should be cleaned off.

5.5.5.5 CONTAMINATION SURVEYS OF LUNCH ROOMS, CHANGE ROOMS, CONTROL ROOMS, AND ADMINISTRATIVE OFFICES

Every two weeks during mill operations surveys for removable alpha radiation are conducted in all lunch rooms, change rooms and control rooms that are in use (interim program - semiannual in the lunch rooms, offices and change rooms). If the observed contamination levels exceed the Table 5.5-6 values, the area will be restricted from use until the area is cleaned to below the Table 5.5-6 values. If the observed contamination levels exceed 500 dpm/100 cm^2, the survey frequency is increased to weekly until the observed levels are below 500 dpm/100 cm^2 for three weeks in a row. Administrative offices are surveyed quarterly for removable alpha radiation and are restricted from use and cleaned if the observed values exceed those in Table 5.5-6.

5.5.5.6 CONTAMINATION SURVEYS OF MILL AREAS

Visual surveys are used in the mill process areas to detect accumulations of ore and yellowcake dust accumulations or yellowcake spills. The yellowcake can exist as a yellow material in the solvent extraction and precipitation area of the mill or as a black material in the packaging

area. During mill operations, visual inspections occur continuously as a part of the good housekeeping responsibilities of mill operations. At least weekly during operations, the ERHS or a member of his staff conducts visual inspections of accumulated dust levels and spills. (Interim Program - Quarterly Visual Inspection.) Wet cleanup methods are used. Dry sweeping is prohibited. Special attention is given to the cleanup of walkways, railings, areas where accumulated dust, or dried yellowcake spills could be disturbed to generate airborne dusts for potential inhalation.

5.5.6 ENVIRONMENTAL AND EFFLUENT MONITORING PROGRAM

The environmental monitoring program conducted during mill operations is outlined in Table 5.5-7 and the sampling and monitoring locations are indicated on Figure 5.5-1 in Appendix J. The environmental monitoring program conducted during nonoperational (interim) periods lasting greater than one month is presented in Table 5.5-8. The environmental and effluent monitoring data collected from January 1983 through June 1984 are presented in Appendix D, and the laboratory procedures used in Plateau's environmental laboratory are presented in Appendix E. Currently all laboratory analyses are performed by commercial laboratories with the possible exception of uranium, pH, and conductivity. See Section 7.0 on Quality Assurance and

Table 5.5-7

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - OPERATIONAL

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Air stack particulates	1	Ore crusher stack	Semiannual grab sample	Semiannually	Natural uranium Th-230, Ra-226, Pb-210 and flow rate
	1	Yellowcake dryer and packaging stack	Isokinetic sample	Quarterly	Natural uranium, Th-230, Ra-226, and Pb-210
				Semiannually	Flow rate
Environmental particulates	3	At site boundaries & in different sectors having highest predicted concentrations	Continuous; weekly filter change or as required by dust loading	Quarterly composited	Natural uranium, Th-230, Ra-226, and Pb-210
	1	At nearest residence - Ticaboo	Continuous; weekly filter change or as required by loading	Quarterly composited	Natural uranium Th-230, Ra-226, and Pb-210
	2	Each filter location #2 and 3	Continuous; weekly filter change or as required by loading	Weekly	Visual Observation or weight for dust loading and determination of efficiency of dust control technology

Table 5.5-7 continued

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - OPERATIONAL

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
	1	Control location	Continuous; weekly filter change or as required by dust loading	Quarterly composited	Natural uranium, Th-230, Ra-226, Pb-210
Radon	5	Same as for air particulates	Continuous; TLD or Track Etch	Quarterly	Rn-222
Groundwater	3	Down-ground-water-flow gradient monitoring wells (RM-4, RM-5, RM-6)	3 samples per quarter for 1st year	3 samples per quarter for 1st year	As, Se, pH
			Seminannually for 1st year	Semiannually for 1st year	Natural uranium, gross alpha
			Semiannually after 1st year	Semiannually after 1st year	Natural uranium, gross alpha, As; Se, pH
	1	Groundwater under tailings	Annually	Annually	Rate and direction of flow

Table 5.5-7 continued

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - OPERATIONAL

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
	1	up-gradient control well (RM-1)	3 samples per quarter for 1st year	3 samples per quarter for 1st year	As, Se, pH
			Semiannually for 1st year	Semiannually for 1st year	Natural uranium, gross alpha
			Semiannually after 1st year	Semiannually after 1st year	Natural uranium, gross alpha, As, Se, pH
Surface water	2	Seeps 1 and 2	Semiannually grab samples	Semiannually	Natural uranium, gross alpha, As, Se, pH
Direct radiation	5	Same as for air particulate samples	TLDs	Quarterly	Gamma
Soil	5	Same as for air particulate samples	Annual grab samples	Annually	Natural uranium

Table 5.5-7 continued

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - OPERATIONAL

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Vegetation	1	From animal grazing areas near mill site	Grab, annually during spring growth season	Annually	Ra-226, Pb-210
Instrument calibration	All instruments in use	N/A	Semiannually or at mfg's suggested intervals, whichever is sooner*	Approved procedures	Instrument response
Instrument calibrations	Environmental air samplers	N/A	Quarterly	Quarterly	Flow rate
Visual inspections	Tailings dam		Daily	N/A	N/A

*Instruments may be calibrated as a group or a given instrument may be calibrated prior to use.

Table 5.5-7 continued

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM - OPERATIONAL

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Meteorology	1		Continuously; wind speed & direction	N/A	N/A
Trend analyses	Routine monitoring programs	N/A	Annually	N/A	N/A
Reports	1	N/A	Semiannually effluent monitoring report	N/A	N/A
Quality assurance audit	N/A	N/A	Semiannually	N/A	N/A

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Table 5.5-8

INTERIM ENVIRONMENTAL MONITORING PROGRAM

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Air particulates	1	Downwind of impoundment and ore stockpiles	40 hrs/week until interim stabilization of the tailings and ore stockpiles is complete. Thereafter 20 hrs/quarter	Semiannually composited	Natural uranium and Ra-226
	1	Upwind of tailings impoundment	40 hrs/week until interim stabilization of tailings and ore stockpiles is complete. Thereafter, delete the program.	Semiannually composited	Natural uranium and Ra-226
Radon	None	N/A	N/A	N/A	N/A
Air particulates	1	Sample preparation area stack	Representative grab only if stock is operational	Semiannually	Natural uranium and flow rate
Water-Groundwater	(See operational groundwater monitoring plan.)				

Table 5.5-8 continued

INTERIM ENVIRONMENTAL MONITORING PROGRAM

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Water-Surface Water (Seeps)	None	N/A	N/A	N/A	N/A
Direct Radiation	None	N/A	N/A	N/A	N/A
Soil	None	N/A	N/A	N/A	N/A
Vegetation	None	N/A	N/A	N/A	N/A
Instrument calibrations	(See environmental operational monitoring plan.)				
Visual inspections	N/A	Tailings dam	Monthly	N/A	N/A
	N/A	Ore stockpiles	Monthly	N/A	N/A
Meteorology	None		N/A	N/A	N/A

Table 5.5-8 continued

INTERIM ENVIRONMENTAL MONITORING PROGRAM

Type of Sample	Sample Collection			Sample Measurement	
	No.	Location	Method and Frequency	Test Frequency	Type of Measurement
Trend analyses	Routine monitoring program	N/A	Annually	N/A	N/A
Reports	1	N/A	Semiannually effluent monitoring report	N/A	N/A
Audit	N/A	N/A	Annually	N/A	N/A

Appendix I. Where program commitments in the following descriptions vary between mill operations and interim periods, the operational program commitments are stated first, followed by the interim program commitments in parentheses.

5.5.6.1 AIRBORNE EFFLUENT SURVEY PROGRAM

Table 5.5-7 presents the effluent monitoring program for the yellowcake drying and packaging stack and ore crusher stack. Quarterly isokinetic samples are collected from the yellowcake stack and semiannual grab samples from the ore crusher stack (interim program - no sampling because stacks are not operational). The isokinetic sampling procedures are presented in Appendix F and were derived from EPA stack method 5.

The environmental air particulate monitoring sites are illustrated on Figure 5.5-1 in Appendix J and are described in Table 5.5-7 (Interim - Table 5.5-8).

All environmental air particulate monitoring sites during mill operations are accessible throughout the year, are served by electric power, and meet the following criteria for air particulate monitoring site locations as specified in Regulatory Guide 4.14:

1. Locations at or near the site boundaries and in different sectors that have the highest predicted concentrations of airborne particulates.

2. At the nearest residence(s).

3. Control location(s).

The interim program for environmental air particulate monitoring consists of one site downwind of the tailings impoundment and ore stockpiles and one site upwind of the tailings impoundment. Samplers at those two sites will operate approximately 10 hours per day for four days a week which will coincide with the hours that the diesel powered electrical generators are in operation. Once the tailings area has been stabilized with an interim cover and dust control measures have been implemented for the ore stockpiles, only the downwind site will be operated on a 20-hour per quarter schedule. Samples will be composited semiannually and net concentrations of both uranium and radium will be reported to the NRC on the semiannual effluent reports.

Action levels for both the stack and environmental monitoring programs are based on sampling results and trend analyses. If individual environmental sampling results approach 10 CFR 20, Appendix B, Table II values or trends of increasing concentrations as a function of time from either the stack or environmental sampling

results, the ERHS investigates the cause of the problem. Corrective actions usually require adjustments, maintenance, or repair of the stack scrubber systems.

Environmental radon-222 concentrations are monitored continuously at each of the five environmental air particulate monitoring locations (interim program - two sites, then on site). Either passive (thermoluminescent dosimeter) radon monitoring systems or Track Etch radon monitoring systems will be used, changing the TLD or Track Etch film quarterly. The quarterly exchange frequency allows the detector sufficient time to accumulate a response that is large enough to provide good counting statistics using routine readout procedures by the vendor of the monitoring systems (interim program - semiannual exchange).

5.5.6.2 LIQUID EFFLUENT SURVEY PROGRAM

Ground and surface waters are monitored at the locations specified in Table 5.5-7 and as illustrated in Figure 5.5-1 in Appendix J. These locations are designed to monitor any seepage entering surface waters or groundwaters from the tailings pond.

The four groundwater monitoring locations and two surface water monitoring locations were selected using the following criteria stipulated in Regulatory Guide 4.14 and in the EPA Health and Environmental Protection Standards for Uranium Mills, 40 CFR 192, subpart D:

1. Groundwaters hydrologically down gradient and relatively close to the tailings impoundment and hydrologically up gradient, i.e., not influenced by seepage from tailings.

2. The use of indicator chemical and radiological parameters for early detection of tailings seepage.

3. Surface waters passing through the millsite or offsite surface waters that are sufficiently close to the site to be subject to surface drainage from potentially contaminated areas or that could be influenced by seepage from the tailings disposal area. One sample collected upstream of mill site and one sample collected at the downstream site boundary or at a location immediately downstream of the location of potential influence.

The groundwater detection monitoring program as presented to the NRC on September 27, 1984, included:

1. Location, Number and Type of Groundwater Monitoring Wells. One up-groundwater-flow-gradient monitoring well and three down-gradient-water-flow-gradient monitoring wells, all located with respect to the uranium mill tailings impoundment, will be sampled for compliance with 40 CFR 264, Subpart F. The up-gradient well RM-1 is located immediately north of the tailings impoundment. All four wells are completed to the bottom of the uppermost aquifer (Entrada). A summary of the well depths and screen

locations for each of the above wells is given in Table 5.5-9.

2. Monitored Parameters and Frequency.

Monitoring wells RM-1, RM-4, RM-5 and RM-6 will be sampled for the parameters specified and at the frequencies specified in Table 5.5-7.

3. Sampling and Analytical Techniques.

Groundwater samples will be obtained after each well has been bailed or pumped until the specific conductance remains constant or after two well casing volumes have been removed from each well. Each sample will be filtered, preserved and analyzed using EPA analytical procedures or the equivalent. The data from the groundwater samples will be statistically analyzed for significant changes (95% confidence level) between data from control and monitoring wells. The sampling results will be used to determine whether a statistically significant increase in any constituents has occurred and to provide reasonable confidence that the migration of hazardous constituents from the tailings impoundment into and through the aquifer will be indicated. In the event a statistically significant increase in the level of an indicator parameter is determined, Plateau shall comply with pertinent provisions of 40 CFR, Subsection 264.98(h) and, if necessary, shall initiate a compliance monitoring program as specified in 40 CFR, Subsection 264.99.

Table 5.5-9

SUMMARY OF RADIOLOGICAL MONITORING WELLS[a]

Well Number (Elev)	Location of Well Screen Elevation (Depth)		Water Level Elevation (Depth) [Date]	Entrada-Carmel Contract Elevation (Depth)
RM-1 (4453)	4223 (230')	4023 (430')	4273 (180')	3965 (488')
	4123 (330')	3983 (470')	[Ap 1979]	
RM-4 (4380)	4215 (165')	3915 465'	4240 (140')	3875 (505')
	4115 (265')	----	[Ap 1979]	
RM-5 (4347)	4187 (160')	3977 (370')	4240 (107')	3907 (440')
	4147 (200')	3927 (420')	[Ap 1979]	
RM-6 (4372)	4185 (187')	4005 (367')	4240 (132')	3915 (457')
	4145 (227')	3925 (447')	[Ap 1979]	

(a)Data for this table were obtained from Woodward & Clyde Consultants, June 1979.

The chain of custody control will be completed for all samples. That control will begin with the onsite sampling, followed through the laboratory analyses (whether onsite or in a commercial laboratory) and through to the analysis of the data collected. All analytical results will be associated with a degree of confidence, usually expressed as a plus or minus one standard deviation. Quality control procedures are documented in the quality control manual of Plateau.

4. Background Levels. Background data for various constituents for the groundwater monitoring program were collected during the processing facility's pre-operational and operational periods. During the operational period, only the up-groundwater-flow-gradient well has been utilized to obtain background data. That well RM-1 will continue to be used to establish background data for the parameters specified in Table 5.5-7.

The monitoring of two seeps near the project constitutes the surface water monitoring program. The program as outlined in Table 5.5-7 is patterned after the groundwater monitoring program which is designed for the early detection of mobile species in any seepage from the tailings area. During interim operations no samples will be taken from the two seeps due to the low hydraulic head on the tailings.

Action levels for both surface water and groundwater monitoring programs are based on sampling results and trend analyses. If individual sampling results approach 10 CFR 20, Appendix B, Table I values for groundwater samples which are obtained within the restricted area of the mill, or if trends of increasing concentrations as a function of time are observed, the ERHS staff investigates the cause of the problem. Corrective actions involve identification of the source of the contamination and possible mitigating measures, such as the installation of groundwater flow barriers or seepage pump-back systems. Surface water results are compared to 10 CFR 20, Appendix B, Table II values and to previously measured concentrations in the trend analyses. Analytical procedures used in the Plateau environmental laboratory are presented in Appendix E. Currently all analyses, with the possible exception of uranium, pH, and conductivity, are performed by commercial laboratories.

5.5.6.3 OTHER ENVIRONMENTAL MONITORING

Tables 5.5-7 and 5.5-8 present the direct radiation, soil, vegetation or forage and meteorological monitoring programs and the instrument calibration program (interim program - sampling suspended). Figure 5.5-1 in Appendix J presents the monitoring locations. Appendix E presents the analytical procedures used in the Plateau environmental laboratory; however, all analyses of

environmental samples may be performed by commercial laboratories.

The operational monitoring program was designed to meet the following criteria presented in Regulatory Guide 4.14:

1. Vegetation from animal grazing areas near the mill site in the direction of the highest predicted airborne radionuclide concentrations.

2. Soils at each of the locations chosen for air particulate samples.

3. Direct radiation - same locations as for air particulate samples.

Any increasing trend for a monitored parameter will be investigated by the ERHS or his staff. Corrective actions are based on an identification of the potential exposure pathway and disruption of that pathway.

Meteorological monitoring during operations consists of continual wind speed and direction measurements recorded on strip charts. That information is of value in the unlikely event of a puff-type release from one of the mill stacks (interim program - suspension of meteorological monitoring).

Fish sampling and sediment sampling is not conducted because of the lack of streams flowing through the processing facility.

5.5.7 INTERIM STABILIZATION PROCEDURES

During extended nonoperation time periods, tailing liquids in the tailings impoundment will be decreasing in volume through evaporation. Sprinkler systems are used to enhance the rate of evaporation and to keep the tailings beaches wet to minimize the generation of tailings dust. When the tailings liquids become minimal and the operation of the sprinkler system is no longer effective, the tailings will be allowed to further dry to the point where the dry tailings can support earth-moving equipment. Approximately one foot of sandy soil, rubble rock or a combination will then be placed over the dried portion of the tailings as an interim stabilization cover. This approach to covering the tailings will minimize tailings dust generation, as opposed to minimizing radon releases, gamma ray exposure rates above the pile, or wind and water erosion. The latter objectives will be attained when the final tailings cover is placed over the tailings. See Section 5.5.9.

As of August 1985, approximately 40 percent of the tailings in the tailings impoundment cells 1 and 3 has been covered by sandy soil and rubble rock with an average radium-226 content of less than 5 pCi/g. That interim stabilization program was undertaken by Plateau to minimize the dust generation from tailings deposited in cells 1 and 3.

That stabilization program will continue until all tailings have been covered. The soil-moving activities were part of Plateau's program to maintain radiation exposures to levels that are as low as reasonably achievable (ALARA). See Section 5.1.4.

Waste materials generated by normal mill operations will be disposed in mill tailings. Contaminated liquid wastes are not anticipated during the interim program. Solids will be placed in trenches excavated in the tailings beaches and covered with tailings as soon as is practical. The solid wastes include nonsalvageable machinery, filters, coveralls, lab wastes such as towels and glassware, and contaminated mill trash. Any materials such as waste barrels that could cause voids in the tailings will be crushed prior to disposal. Interim program - if disposal of contaminated trash becomes necessary after the interim stabilization cover has been placed over the tailings a disposal trench will be excavated through the cover and into the tailings; solid wastes will be deposited in the trench, and the trench will be filed with tailings. The integrity of the cover will then be reestablished.

During normal mill operations, the generation of tailings dusts may be minimized by any of the following methods:

1. Controlled deposition of tailings slurry in select areas of each cell, such as on dry tailings beaches.

2. The sprinkling of tailings solutions on dry tailings beaches.

3. The periodic application of chemical dust suppressants on exposed tailings beaches not wetted by tailings solutions.

Dusting from the ore stockpile areas is controlled by:

1. The formation of a crust on the stored ore by rainfall.

2. Spraying the ore pad area and/or the ore pile with a chemical dust suppressant.

3. Sprinkling the ore pad area and/or the ore pile with water.

The adequacy of the above dust control measures is demonstrated by the results of the environmental air particulate monitoring program presented in Appendix D. The annual average concentrations are all below the maximum permissible concentration for radionuclide releases to unrestricted areas. See Section 3.2.2 for methods of demonstrating the adequacy of dust suppression techniques.

The interim stabilization program for the ore stockpiles near the mill will consist of placing an average

of six inches of locally obtained soils on the ore stockpile. The cover material will decrease the production of dust from the piles and is intended to last until the ore can be processed in the mill or until the mill is decommissioned. Visual inspection of the integrity of the cover will be based on the difference in color between the reddish color of the cover and the gray color of the ore. Those visual inspections will occur annually. Maintenance required to reestablish the cover integrity will take place annually.

5.5.8 PERFORMANCE ANALYSIS FOR MILL VENTILATION AND EFFLUENT COLLECTION SYSTEMS

Plateau's goal is to maintain dust concentrations to levels that are as low as reasonably achievable, both inside the mill where employees are working and in the mill stacks discharging to the environment. Within the mill, containment of dusts at their source or origin is an operational objective, as opposed to the unconfined generation of dust followed by cleanup operations.

All dust collectors are provided with draft gauges to measure the pressure drop between the inside and outside of the dust enclosures. When the pressure drop falls outside the normal operating range, that portion of the mill generating the dust is shut down. The area is evaluated by the ERHS staff for restricting access. The employees working

in that area may be required to wear respirators. Repair of the dust collection system and cleanup of the affected area follow such events.

The mill has an ore dust collection system and a yellowcake dust collection system, described on Table 3.2-1. During operation of the yellowcake dust collector system, the efficiencies of the system are monitored as indicated on Table 3.2-1. Effluents from these stacks are monitored as indicated in Table 5.5-7. The operational efficiency of the ore dust collection system is monitored by mill operations personnel by observing the pressure drop gauges, the air dust concentrations, and the buildup of dust around the dust collector during mill operations. As a backup, the mill ERHS observes the buildup of dust on his weekly inspections of the mill. (Interim Program - no stacks operational. ERHS performs quarterly visual inspection.)

5.5.9 MILL SITE DECONTAMINATION AND RECLAMATION

5.5.9.1 INTRODUCTION

This plan amends the NRC-approved "Decommissioning and Reclamation Plan, January 7, 1982" and

changes to 10 CFR Part 40 resulting from EPA's issuance of 40 CFR Part 192 (Federal Register, October 7, 1983).

5.5.9.2 DECOMMISSIONING

Decommissioning of the processing facility will entail dismantling, decontaminating, and disposing of buildings, foundations, contaminated equipment, and excavating contaminated areas as necessary to permit unrestricted use of the site. The last cells of the tailings storage area will be capped and stabilized. The tailing cells will be progressively covered during the operating life of the processing facility, and an estimated 6.25 acres will require capping clay, sand, and gravel at the time of final decommissioning. When decommissioning is completed, the site will be reclaimed.

DISMANTLING, DECONTAMINATION, DISPOSAL

Salvageable equipment and buildings will be dismantled and decontaminated to the maximum allowable surface contamination levels specified in Table 5.5-6 prior to release to unrestricted areas. Sandblasting, scrubbing with detergents, high-pressure water and other methods of physical decontamination will be adopted as prescribed by the ERHS. Concrete floors, foundations, sumps, subsurface piping or other materials with surface contamination levels exceeding the Table 5.5-6 values will be broken up, removed, and buried in the tailings area. Contaminated earth, such as

may be found beneath the foundations and ore stockpile pads, where the average Ra-226 contamination in land, averaged over areas of 100 m^2, which, as a result of uranium byproduct material, does not exceed the background level by more than 5 pCi/g averaged over the first 15 cm below the surface, and 15 pCi/g, averaged over 15-cm thick layers more than 15 cm below the surface, will be excavated and taken to the tailings area for disposal.

Equipment and buildings (especially those constructed of bolted prefabricated steel construction) that meet the NRC surface radiation standards at the time of decommissioning may be sold or reused elsewhere.

The security fence constructed around the tailings impoundment area will be maintained throughout the operating life of the project. This fence may be left in place.

POSTOPERATIONAL MONITORING PROGRAM

Monitoring and decontamination during decommissioning will be supervised by the ERHS. Supervisory and industrial safety requirements will be enforced and the needed protective equipment provided. The radiological survey conducted after cessation of milling will involve making direct and indirect measurements of surface contamination. Surface and sub-surface soil profile sampling will be done in combination with gamma-dose rate measurements at the site to

demonstrate compliance with land cleanup requirements stated above.

5.5.9.3 RECLAMATION

The purpose of this reclamation program is to restore lands disturbed by project activities (except for the tailings impoundment) to a productive condition consistent with past and present uses of the area. This consists of restoring landscape contours to slopes similar to predisturbance conditions and, in some instances, replacing a sufficient thickness of topsoil to enable native vegetation to become reestablished.

Several characteristics of the project area, and southern Utah in general, are considered nonconducive to the rapid establishment of native plant species on disturbed areas. The low average annual precipitation of 6 to 8 inches (15-20cm); frequent droughts; extreme temperatures; high wind erosion; and a loose, undifferentiated soil profile with poor moisture-holding capacity and little organic content are a few of those characteristics.

Based on the types of disturbances anticipated, the environmental characteristics of the area, the present and proposed land uses, and the state-of-the-art knowledge on reclamation in arid environments, reclamation of areas disturbed by the project will include:

(a) Covering and stabilizing the tailings impoundment area;

(b) Removing structures and regrading disturbed areas to blend with the surroundings;

(c) Replacement of stockpiled topsoil in selected areas amenable to plant growth; and

(d) Revegetating disturbed areas using native and introduced species.

PRESENT AND PROPOSED USE OF THE LAND

Historically, the project area has been used for seasonal livestock grazing and as wildlife habitat. Human use of the project area for activities, such as camping, hiking, sightseeing, and hunting, has been minimal to date in part because of the availability of other areas in southeastern Utah for these activities.

Limited livestock grazing and wildlife habitat will probably continue to be the principal uses of the affected area after termination and closure of the project. Agricultural use of the area, for either crop or hay production, is not anticipated due to the poor soil structure and scarcity of water. There are presently no urban or industrial developments in the project area other than the facilities related to the project; and none are currently planned for the future.

The purpose of the reclamation program is to restore those lands disturbed by project activities (except the tailings impoundment area) to an acceptable condition for limited livestock grazing and as a wildlife habitat. Since the existing vegetation is generally sparse and is dominated by widely spaced shrubs and by relatively few grasses that produce useful amounts of forage, successful reclamation in the project area will result in the establishment of sparse vegetation with generally low forage production.

LANDS DISTURBED FOR ORE PROCESSING FACILITY

Approximately 18 acres (7.28 ha) were leveled for construction of the plant office, ore stockpile pads, plant buildings, and auxiliary structures. After topsoil removal and stockpiling, approximately 90% of the area was graded to develop a smooth, nearly level surface. Topsoil stockpiling and stabilization have been accomplished. The surface gradient for runoff is sloped toward the tailings impoundment area. Filling was required over the balance of the graded area. Typically, cuts ranged from zero to about 15 feet (4.57 m) in depth except in localized areas (such as the ore dump pocket and connecting conveyor tunnel) where excavation was as deep as 45 feet. Maximum fill depth was approximately 40 feet at the southwest corner of the ore storage pad.

At project termination all plant structures and facilities will be leveled, and uncontaminated portions will be used to fill depressions within the plant area, such as the excavation for the ore dump pocket. All depressions within the plant site will be filled and the general surface gradient of the graded area will be maintained so all runoff from the area will continue to flow to the tailings impoundment area. Heavy equipment will be used to recontour the site to blend with the natural surrounding topography. Topsoil will be added where practical to help establish natural vegetation. Fertilization, if needed, and seeding will follow seedbed preparation to promote the establishment of vegetation in accordance with the Utah Mined Land Reclamation Act. Mulch will be used where necessary. Existing fences will remain standing until revegetation is successful. Plant species to be seeded are likely to include: sagebrush (Artemisia spp.), Indian ricegrass (Oryzopsis hymenoides), Mormon tea (Ephedra spp.), galleta (Hilaria jamesii), Siberian or crested wheatgrass (Agropyron sibiricum or A. desertorum), Salina wildrye (Elymus salinas), saltbushes (Atriplex spp.), blackbrush (Coleogyne ramosissima), Apacheplume (Fallugia paradoxa), and/or desert bitterbrush (Purshia glandulosa), and rabbitbrush (Chrysothamnus spp.).

An area adjacent to the plant site was cleared and graded for use as a construction equipment and materials storage yard. At closure, the construction yard will be closed, all equipment will be removed, the area will be regraded to conform with the general topography of its surroundings, and disturbed areas will be seeded.

TAILINGS IMPOUNDMENT AREA

A staged covering and reclamation of the tailings impoundment area will be used to minimize radon and tailings dust emissions during operation. This tailings management technique consists of dividing the whole impoundment area into three sections. Each section represents a storage area for tailings during select time periods when the mill is operational.

Section I involves a total storage area of approximately 25 acres (10.16 ha) and will last for about four years of operation. This area of the impoundment will contain five tailings collection cells, each having an underdrainage system of perforated pipes. Operational procedure will dictate the number of the cells used at any one time. After the tailings in any cell have reached a predetermined elevation, the cell will be deactivated. The tailings will be allowed to dry sufficiently to allow the movement of equipment on the tailings. Then the cell will be stabilized.

Construction of tailings impoundment cells in Section II of the impoundment area (south of the present cross-valley berm) will begin before all cells in Section I are filled. Thus, when all cells in Section I are filled, the tailings will be placed into the Section II cell(s) without any interruption of plant operations. There are 25 acres in the Section I impoundment, and the berm face would cover approximately four acres after regrading it to a 3H:1V slope. By the time tailings begin to be discharged into Section II cells, one or more of the Section I cells would have been stabilized so the surface area of exposed tailings will not exceed the area covered by surety.

When the last of the Section II cells are being filled with the tailings after approximately four to five additional years of operations, the dam will be raised to Stage II height (approximately 120 feet (36.58m) high), and cells will be constructed for Section III. Tailings will then be discharged into the Section III cells while the most recently used cell or cells in Section II are drying and being stabilized. The surface area of uncapped tailings will not exceed the area covered by surety.

This operational philosophy would leave a very small area to be reclaimed at the final closure of the processing facility. After the final stage of the operation, the maximum area left for reclamation will be about 25

percent of the 25-acre (10.16 ha) area of the six cells. Operational experience obtained in the design and construction of Section I will be used in the design and construction of subsequent sections.

At project termination, the tailings dam will be approximately 120 feet (36.58m) high, and will have a maximum base width of about 500 feet. The crest of the dam will extend about 13 feet (3.96m) above the level of the tailings against the dam face. Reclamation of the tailings impoundment will be accomplished by capping the remaining open cells, namely those not capped during plant operation. Each cell will be covered with approximately 6 feet (1.8m) of compacted clay to control radon emissions to the atmosphere, 2 feet (0.6m) of locally available sandy soils and 1 foot (0.3m) of gravel and cobbles to protect the cover from erosion.

After reclamation, two spillways will be constructed to protect the dam and tailings cap against erosion and flood flows. To provide for the long term stability of the tailings containment system, water flowing across the face of the dam will be minimized. One spillway will be excavated in the sandstone of the left (east) abutment of the dam to direct drainage to the downstream portion of the impoundment basin. The other spillway will be excavated in the sandstone formation along the northwest corner of the

impoundment. This spillway would divert drainage to Lost Springs Wash. Both spillways will have crest elevations three feet (0.9m) above the level of the cap and will be sized to pass the maximum probable flood. However, until sediment deposition fills in the impoundment to the level of the spillway crests, spillway flows will be rare events.

Continuous accretion of the cap is anticipated due to retention of sediments carried onto the cap by runoff from the small tributary watershed of the basin until a dynamic equilibrium between erosion and sedimentation occurs. Water flowing onto the cap will seep down through its upper layers onto the clay layer. This will tend to maintain the clay's moisture content at near saturation, and enhance the cap's effectiveness as a barrier to the movement of radon gas emanating from the tailings. The massive bluff west of the impoundment provides a windbreak that is expected to cause a net deposition of wind-borne soil onto the cap, adding to its thickness.

Should reclamation be required due to unforeseen circumstances prior to the end of the useful life of the processing facility, any tailings impoundment area not reclaimed during operations will be covered with the clay, sand, and gravel cap as described above. The cap will extend beyond the outer limits of the tailings to ensure complete coverage of the tailings to minimize radon emanation. The

downstream face of the cross-valley berm will be sloped to a stable configuration (3H:1V slope) and the cap will be extended to cover the face to protect it from erosion.

Given the scenario of the processing facility's shutdown after only one or two cells are partially or completely filled, reclamation would proceed in much the same manner as discussed previously, but additional earthwork will be required. The exposed sides of the dikes between the used and unused cells will be reshaped to lessen their slope, and then they would be reclaimed by continuing the cap over them.

There are two basic configurations that the covered tailings impoundment could have if this scenario should happen. If cells 1, 2, and 3 were used, the cap will be extended (at an approximately level grade) to the north to disallow impoundment of runoff behind the cells. The extension of the cap that would be constructed with the purpose of bringing the low areas up to grade will not necessarily be constructed in the same manner as the portions of the cap that covers tailings. The cap extension will be constructed of locally available fill materials and will be covered with cobble or gravel to prevent erosion.

The second basic configuration would occur if a combination of cells 1, 2, and 5; or 1, 3, and 4 were used. Either of these combinations could also lead to a situation in which runoff water would be impounded. To

prevent impounding water, the berms will be shaped and capped as described previously. The cross-valley berm will be breached (where it was not containing the tailings), and a riprapped diversion channel will be built outside of the tailings cap perimeter. Construction of the channel will prevent runoff from eroding the cap and will divert water through the breached part of the cross-valley berm.

The above two configurations will cost significantly less than the surety posted for the impoundment area. Both will entail relatively small expenditures for engineering, fill materials, and haulage. Cost of constructing a riprapped diversion channel and breaching the cross-valley berm will be significantly less than constructing a level cap to preclude water impoundments.

As stated in Section 3.3.2.1 of NUREG-0583 (FES for the Shootaring Canyon Uranium Project; July, 1979) and Section 9.4 of the Environmental Report, Shootaring Canyon Uranium Project, Garfield County, Utah, locally available materials will be used to construct the impoundment cap. Bentonitic clay from the Brushy Basin Member of the Morrison Formation will be compacted to form the 6-foot (1.8m) layer. This clay will be obtained from the same borrow area ("Ga") as the clay used for the impoundment liner. Borrow Area "Ga" is located on Bureau of Land Management (BLM) controlled land and is covered by a materials sale contract (U-45859) with

Plateau. Reclamation and surface protection requirements for this borrow area are stipulated in the contract, and the BLM holds a performance bond as surety.

The 2-foot (0.6m) layer of sandy material will be obtained from Borrow Area E. This material is a red, fine sand, with silt varying from a trace to a significant percentage. Borrow Area E is located west of the processing facility. Material will be removed from this borrow area in a sequential stripping operation so very little, if any, recontouring will be required. Much of the area will be stripped to bedrock and the remaining parts of it will be reseeded.

Borrow Areas A, A', or C will be the source of the gravel, cobble, sand layer that will protect the cap from erosion. Test pit logs for these areas describe the materials as hard, sub-rounded to sub-angular cobbles and gravel, and sand with calcareous cement. Material from these areas was used during construction of the processing facility under material sales contract U-44547 with the BLM. The BLM requires a surety bond of twenty percent of the contract amount for this type of sale to cover reclamation costs.

5.5.9.4 LONG-TERM SURVEILLANCE, MAINTENANCE, AND CONTROL

The design, construction, operation, and closure of the tailings disposal system have been planned

with the objective of creating a facility that, after closure, will endure for many years without requiring either monitoring or maintenance while continuing to provide an environmentally safe and satisfactory performance. As a minimum, annual site inspections shall be conducted by the government agency retaining ultimate custody of the site where tailings or wastes are stored to confirm the integrity of the stabilized tailings or waste systems and to determine the area, if any, for maintenance and/or monitoring. Results of the inspection shall be reported to the Nuclear Regulatory Commission within sixty days following each inspection. The Commission may require more frequent site inspections if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

Factors of long-term concern with respect to uranium tailings are the dispersal of tailings by erosion, the contamination of groundwater, and the release of radon to the atmosphere.

TAILINGS DISPERSAL BY EROSION

To control water erosion, the final stage of the processing facility's tailings impoundment dam has been designed and constructed with a crest extending above the maximum water level that would be reached in the impoundment

area under the conditions of the maximum probable precipitation likely to occur at the site. Spillways will divert runoff exceeding the retention capacity of the impoundment. Because the spillway crest will be about three feet (0.9m) higher in elevation than the top of the cap to be placed over the tailings, the dead storage volume provided over the cap and below the spillway crest must be filled before any runoff is passed downstream from the dam. This storage is provided to maximize the capture of available moisture and thereby keep the tailings perpetually moist or wet for purposes of reducing radon emissions without reducing the safety of the structure. Overtopping of the dam crest, with consequent possible erosion, will be prevented by the spillway. The toe of the dam will be protected from erosion during periods of spillway discharge. The downstream face of the dam is protected from rainfall induced erosion by riprap.

Surveillance to establish that the dam will continue to perform as designed (no overtopping) will consist of visual checks of the spillway channels to see that they are unobstructed. Wind-deposited sand, rock falls or slides from the walls of the channels, and heavy vegetative incursions into the channels are conceivable types of obstructions. Channel maintenance would involve removal of such obstructions in the unlikely event that it becomes necessary.

The dam was constructed on a sandstone foundation. The techniques employed in construction of the dam yield a stable and dense structure. Some deflection in both the vertical and downstream directions must be expected. Although not expected to be significant, normal settlement under and within the dam will cause the crest of the dam to deflect with respect to the level of the spillway crest. If any settlement is noted by the annual inspections, instrument measurements may be necessary to determine the amount of settlement and the consequent risk of dam overtopping. Settlement on the order of one foot (0.3m) or more would require a geotechnical investigation to determine the causes of the settlement. Nominal settlement due merely to internal consolidation of the dam after project closure could be remedied by adding materials to the crest, to prevent possible overtopping during heavy precipitation. Major settlement due to any cause would probably require an engineered remedy after the causes of the settlement were established. To prevent dispersal of project tailings by water erosion, the dam must not be subjected to substantial and prolonged overtopping.

The rock and gravel zones on the downstream slope and crest of the dam, and the rock and gravel layer to be placed at the top at the tailings cap, will prevent wind

erosion of those exposed surfaces. Also, because the tailings disposal basin is effectively surrounded by natural cliffs and hills, net deposition of wind-borne soils is expected to occur over the impoundment area, rather than loss of covering over the tailings due to wind erosion. Accordingly, natural deposition will be exploited to enhance the security of the projected tailings impoundment.

Surveillance or monitoring to determine the effects of wind on the tailings impoundment will be by visual inspection of the dam and the tailings disposal area. If there are any signs of local erosion, rather than deposition, measures will be taken in the eroding areas to improve the erosion resistance of the surface.

GROUNDWATER CONTAMINATION

The tailings management plan for the Shootaring Canyon uranium project has been developed to prevent contamination of groundwater underlying the tailings disposal area. A clay blanket has been placed over the natural sandstone of the impoundment area to limit the rate of seepage from the tailings into the foundation rock. To reduce the amount of tailings liquids available for seepage from the impoundment, tailings will be distributed around the basin, in such a manner as to continuously provide a large wetted area exposed for evaporation. Also, if excess tailings liquids collect in the drainage system of the impoundment,

the tailings liquids will be recycled to the process circuit. By keeping the tailings wet during and after placement, wind erosion and dispersion of the tailings can be minimized.

At the project site, net evaporation from exposed water surfaces will average approximately 70 inches (177.8cm) per year, which is equivalent to approximately 3.6 gallons (13.63 1) per minute per acre of exposed surface. At an ore processing rate of 1,000 tons (907 mt) per day, and assuming a tailings slurry containing 49 percent solids by weight, approximately 175 gallons (662.4 1) per minute of tailings liquids will be delivered to the impoundment. Saturated, dense, settled tailings would be expected to have a moisture content of approximately 35 percent. Based on this assumption, approximately 90 gallons (321.7 1) per minute of the tailings liquids will be retained in the settled tailings, leaving approximately 85 gallons (321.7 1) per minute of liquid available for evaporation and/or collection in the drainage system.

Since the tailings management plan provides a means for disposing of all excess tailings liquids during the project operation, no significant amount of free tailings liquid will remain in the impoundment at project termination to seep into the groundwater. Also, after the project is terminated, normal evaporation from the tailings cap will dispose of much of the incident precipitation, including

runoff from the basin watershed, on the impoundment basin. A limited potential therefore exists for groundwater contamination from this project, and the requirements for surveillance of the groundwaters of the area will be minimal. The monitoring wells located near the impoundment perimeter for monitoring seepage from the basin during project operation will be maintained and be available for subsequent groundwater monitoring.

RADIATION EMISSIONS

The cap to be placed over the tailings impoundment area for final reclamation was designed and will be constructed with the goal of limiting radon gas and gamma radiation emissions from the tailings. The waste disposal area shall be closed in accordance with a design* which shall provide reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years, and (ii) limit releases of radon-222 from uranium byproduct materials to the atmosphere so as not to exceed an

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* The standard applies to design. Monitoring for radon after installation of an appropriately designed cover is not required.

average** release rate of 20 pCi/m^2 Sec^{-1}. Direct gamma exposure from the tailings or wastes should be reduced to background levels.

The design requirements in this criterion for longevity and control of radon releases shall apply to any portion of a licensed and/or disposal site unless such portion contains a concentration of radium in land averaged over areas of 100 square meters, which, as a result of byproduct material does not exceed the background level by more than: (i) 5 pCi/m of radium-226 averaged over the first 15 cm below the surface, and (ii) 15 pCi/g of radium-226 averaged over 15-cm-thick layers more than 15 cm below the surface.

5.5.10 APPENDIX A SPECIFICATIONS

The following subsections present the tailings reclamation performance objectives as a part of the discussion of compliance with 10 CFR Part 40, Appendix A criteria. Each of those criteria is addressed below.

** This average shall apply to the entire surface of each disposal area over periods of at least one year, but short compared to 100 years. Radon will come from both uranium byproduct materials and from covering materials. The standard, however, applies only to emissions from uranium byproduct materials to the atmosphere.

5.5.10.1 TAILINGS RECLAMATION PERFORMANCE OBJECTIVES

The Plateau mill and tailings area are both within the restricted area to which access is controlled by a multi-strand barbed wire fence, cyclone fence, or topographic features that form natural boundaries. The restricted area is posted with signs stating, "Any Area Within This Mill May Contain Radioactive Material," along with the radiation symbol. The nearest residence is in Ticaboo, Utah, approximately 2.5 miles south of the processing facility. Figure 2.2-1 in Appendix J is a topographic map of the area around the processing facility. Under normal operating conditions, the geographic location of the mill and tailings area relative to the nearest residence result in individual exposures at the nearest residence of much less than 25 mrem per year. See the semiannual effluent reports in Appendix D.

The isolation of radionuclides and chemicals from groundwater sources is monitored on the frequencies indicated in Tables 5.5-7 and 5.5-8. Results are compared to both restricted and unrestricted area maximum permissible values presented in 10 CFR Part 40, Appendix A, and analyzed for trends of increasing or decreasing concentrations as a function of time.

Erosion, disturbance, and dispersion of tailings by natural forces over the long term will be minimized

or prevented by the actions presented in the decommissioning and reclamation plan presented in Section 5.5.9.

5.5.10.2 NONPROLIFERATION OF SMALL WASTE DISPOSAL SITES

To avoid proliferation of small waste disposal sites and thereby reduce perpetual surveillance obligations, radioactive materials, contaminated equipment, and contaminated scrap from milling operations will be placed, with NRC approval, in the tailings impoundment for disposal. Precautions will be taken to place the materials in the tailings in such a way as to minimize any future subsidence of the area.

5.5.10.3 BELOW-GRADE DISPOSAL

Plateau's tailings impoundment is in a natural depression enclosed on the downstream end by an engineered, NRC approved dam. Such a tailings area minimizes the dispersion of tailings by wind and water erosion.

5.5.10.4 SITE AND DESIGN CRITERIA

The Plateau tailings disposal facility was designed to minimize the dispersal of tailings by wind and water, to minimize the seepage of potentially detrimental chemicals and radionuclides into groundwaters beneath the impoundment, and to minimize radon and gamma ray emission from the covered tailings. Specific design criteria for the tailings impoundment and the final reclamation cover are provided in Woodward-Clyde (April 1978); Woodward-Clyde (May

1978); and Woodward-Clyde (June 1978). Those documents indicate that the nine-foot-thick cover, combined with the design features of the impoundment, will provide reasonable assurance of longevity of the tailings disposal facility.

5.5.10.5 SEEPAGE

Cells 1, 3, 4 and 5 of Section I of the mill tailings disposal area have been lined with a clay blanket of not less than two feet in thickness. The clay blanket has been overlain with sandy material covered with gravel, which is designed to collect slimes. Within the sand layer and adjacent to the clay liner are drainage pipes which drain to a collection sump. The collection sump, located downstream of the cross-valley berm, is equipped with a pump. The liquid that filters through the sand-gravel layers is pumped, either to the mill or used to sprinkle on the tailings beaches. Keeping the exposed tailings damp reduces the possibility of wind-blown dusting. The mill circuits have been designed to maximize the use of return liquid, to reduce the mill water through-put requirements, and to dewater the tailings slurry as discharged into the tailings impoundment.

Woodward-Clyde Consultants calculated that over the predicted 20-year life-span of the tailings disposal system, approximately 413 acre feet of seepage would seep through the clay liner. Assuming a water table 150 feet below the clay liner, an average porosity of the underlying

sandstone of 25 percent, the calculated voids would be 2600 acre feet. Therefore, the total seepage may not be sufficient to saturate the underlying rock. The Entrada sandstone underlying the disposal system has a high calcite (calcium carbonate) content and a permeability of 5×10^{-5} cm/sec, as computed from field test data.

This high calcite content will effectively neutralize any acid (pH 1-2) tailings solution that may contact the calcite. The acidic tailings are not anticipated to penetrate more than 10 feet of the underlying sandstone. Neutralization raises the pH, which in turn precipitates the radionuclides and heavy metal present in the tailings liquids.

For a more detailed discussion of the geology of the underlying material, refer to Section 2.4.

Water used in the process comes from the Navajo Formation which lies at a depth of 600 feet below the surface in the tailings disposal area. The Carmel Formation separates the Entrada and Navajo Formations, providing a barrier to mixing.

Seepage from the ore storage pad will be minimal. The limited rain water runoff from the ore stockpiles and ore storage pad is diverted to the drainage for the tailings area.

5.5.10.6 CONTROL OF RADON RELEASE AND GAMMA EXPOSURE RATES

Woodward-Clyde (June 1978), provides a cover design for the tailings impoundment consisting of six feet of compacted clay covered by two feet of sandy material covered by one foot of cobbles, gravel and sand. That cover was designed to yield a radon emanation rate of 2 $pCi/m^2/sec$, which is a factor of 10 lower than the current standard of 20 $pCi/m^2/sec$, and gamma exposure levels that are equivalent to background gamma levels.

5.5.10.7 PRE-OPERATIONAL AND OPERATIONAL ENVIRONMENTAL MONITORING PROGRAM

The pre-operational environmental monitoring program and the data collected are presented in the Environmental Report, and in the Final Environmental Statement (NRC, 1979(b)). The operational and interim environmental monitoring programs are described in Section 5.5.6.

5.5.10.8 CONTROL OF AIRBORNE EFFLUENTS

All airborne effluents from milling operations will be reduced to levels that are as low as reasonably achievable, which in turn controls exposures to populations around the site and site contamination to the maximum extent reasonably achievable.

Airborne effluent controls include:

1. Sprinkling the potentially dry tailings beaches with tailings solutions and the controlled deposition of tailing slurry as described in Section 5.5.7.

2. Crust formation and sprinkling with water and/or the application of chemical dust stabilizers in the ore pad areas as described in Section 5.5.7.

3. The use of the dust collection systems in the mill as described in Section 5.5.8. The operational characteristics of these systems are presented in Table 3.2-1, and the instrumentation and inspection in Section 3.2.2.

4. The use of the yellowcake dust control systems in the mill as described in Section 5.5.8. The operational characteristics of these systems are presented in Table 3.2-1, and the instrumentation and inspection in Section 3.2.2.

Daily inspections of the tailings retention system will be conducted and documented as specified in Table 5.5-7 (interim program - Table 5.5-8, monthly inspections). The NRC regional office will be notified immediately of any failure of the tailings retention system which results in a release of tailings or waste into unrestricted areas and/or any unusual conditions, not contemplated in the design of the

retention system, which if not corrected could indicate the potential for release of tailings to unrestricted areas.

5.5.10.9 FINANCIAL SURETY

Financial surety arrangements were established in 1982 by Plateau prior to the commencement of operations. Plateau obtained and has renewed Letter of Credit No. 45340 from the National Bank of Detroit which names the U.S. Nuclear Regulatory Commission as the beneficiary. The surety amount was revised to $1,759,000 on November 9, 1983, to reflect the decreased activities at the processing facility and the small area expected to contain tailings in the short term. Sufficient funds are made available by means of the letter of credit to carry out the decontamination and decommissioning of the facility and site and for the reclamation of the tailings disposal area. The amount of funds ensured by the surety arrangement is based on cost estimates and the decommissioning plan approved by the Commission in November 1983 which provide for (1) decontamination and decommissioning of mill buildings and the facility site to levels which would allow unrestricted use of these areas upon decommissioning, and (2) the reclamation of the tailings disposal area in accordance with the approved technical criteria. Plateau has committed to phased reclamation of the tailings accumulated throughout the operational life of the facility. The surety will provide

funds that are sufficient to cover the costs of decommissioning and reclamation of the areas that are presently disturbed. (No additional areas are expected to be disturbed unless there is a change in the operational status of the licensee and appropriate license and surety modifications are first obtained.)

The surety arrangements are reviewed annually by the licensee and adjusted with the approval of the Commission, when needed, to account for any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Letter of Credit No. 45340, as currently written, expires on April 13, 1985. Plateau proposes to submit at least sixty days prior to the expiration date of amended Letter of Credit No. 45340 or of any subsequent surety arrangements, a copy of the proposed new surety or revision, and supporting documentation providing a detailed basis for the covered reclamation, decontamination and decommissioning costs, to the NRC, Uranium Recovery Field Office, for review and approval.

5.5.10.10 LONG-TERM MAINTENANCE

Prior to the termination of the source material license, Plateau will pay to the general treasury of the United States, or to an appropriate state agency, the funds necessary to cover the costs of long-term surveillance.

5.5.10.11 LAND OWNERSHIP

The processing facility and its tailings disposal area are located on land purchased by Plateau from the State of Utah on November 20, 1981. The patent for this property was obtained on March 1, 1982, from the State of Utah, which obtained the land from the U.S. Bureau of Land Management. As shown on Figure 2.1-2 in Appendix J, Plateau has staked millsite claims to control development on the contiguous land administered by the Bureau of Land Management to provide a three-quarter mile buffer zone around the processing facility as required by the State of Utah.

The United States reserved a right-of-way for ditches and canals constructed by authority of the United States in the purchased lands and also reserved oil and gas. The grant from the United States was made subject to then existing rights-of-way for the haulage road and telephone and sewer lines serving the facility. The State of Utah reserved coal and other mineral rights. Plateau holds a lease from the State of Utah covering metalliferous minerals. A Garfield County road, constructed and maintained by Plateau through an agreement with the county, provides access to the processing facility from State Highway 276, as shown on Figure 2.1-2. Beehive Telephone Company (an independently owned telecommunications company) that serves the processing facility, Tony M mine and Ticaboo, Utah, was granted a

right-of-way for a buried telephone cable that runs, in part, in a generally north to south direction through the eastern portion of the site.

Prior to termination of the source material license, Plateau will comply with the ownership requirements of Criterion 11 of Appendix A to 10 CFR Part 40 for sites used for tailings disposal. Title and custody of the byproduct material (tailings), and the tailings disposal area, including any interests therein, will be transferred to the United States or the State of Utah, at the option of the state. As noted above, mineral rights are already owned by the United States (as to oil and gas) and the State of Utah (as to all other minerals).

Plateau reserves the right of first refusal provided in Section D of Criterion 11.

Plateau reserves the right to maintain, transfer, sell or otherwise dispose of its property adjacent to the tailings disposal area. Plateau may, at its option, abandon or transfer the millsite claims that provide the three-quarter-mile buffer around the restricted area after the source material license is terminated.

5.5.10.12 INSPECTIONS

As described in Section 5.5.9, the design of the reclaimed tailings disposal area should result in a stable configuration that will not require ongoing

maintenance to preserve isolation after decommissioning. However, to ensure the continued isolation of the tailings, annual site inspections, unless more frequent inspections are deemed necessary by the Commission, shall be conducted by the government agency retaining ultimate custody of the tailings disposal area to confirm the integrity of the stabilized tailings and to determine the need, if any, for maintenance and/or monitoring.

5.5.11 RADIOLOGICAL DOSE CALCULATIONS USING MILDOS

The computer program MILDOS (NRC, 1981) is used to predict the radiological doses from the operation of the Plateau uranium mill and tailings facility. Parameters to be entered into MILDOS are in part derived from Table 5.5-10.

Table 5.5-10

PRINCIPAL PARAMETERS FOR RADIOLOGICAL ASSESSMENT

Parameter	Value
Ore quality, U_3O_8	0.15%
Ore activity, U-238, U-234, Th-230, Ra-226, and Pb-210	U-238 437.91 U-234 2.33
Operating days per year (plant factor)	365 days (340)
Ore process rate	3.31×10^5 tonnes/yr
Mill water throughput	1.79×10^5 m^3/yr
Annual average morning mixing height	Not available
Annual average afternoon mixing height	Not available
Ore Handling and Storage	
Estimated capacity of ore per delivery	35.83 MT
Number of deliveries	25.32 per day, 177.2/week
Estimated ore dust released in delivery	0 kg/hr or MT/yr
Average grade of ore (and ranges)	(0.15) (0.07 - 0.24%)
Capacity of ore pad: final year of operation	87967 MT
average during operation	87967 MT
Maximum area of ore pad and height of ore storage pile	14800 m^2 3-8 m

Table 5.5-10 continued

Parameter	Value
Approximate amount of ore handled per day, i.e., unloaded, loaded bulldozed, etc.	907.18 MT/day
Operation time of front-end loaders, hoppers, feeders, and other ore pad equipment	16 hr/day
Estimated amount of fugitive ore dust emission from handling of ore on ore pad	Not available
Dust emission control reduction factor by wetting, chemical, or other controls	97%
Ore storage time	120 days

Crushers, Grinders, Rod Mills, Fine Ore Blending, Solvent Extraction, Countercurrent Decantation, Ion Exchange, and Leaching

For each piece of potential radioactive emission source equipment, report the following:	SAG	SX	CCD	LEACH	
Operation time	6	24	24	24	hr/day
Estimated dust lost to atmosphere	0	0	0	0	MT/yr
Estimated radon released to atmosphere - all sources	15.1 Ci/yr				
Efficiency of emission control devices (effective and design)	99.9%				
Estimated dust lost to atmosphere through internal ore transportation devices (e.g., conveyor belts)	0.768 MT/yr				

Table 5.5-10 continued

Parameter		Value
Efficiency of emission controls of internal ore transportation devices (effective and design)		99.8%
Average daily capacity of temporary bin storage (fine ore bins)		N/A
Efficiency of controls for temporary bin storage		N/A
Yellowcake Drying and Packaging (estimates based on best available Information)		
(Give parameter values for drying and packaging)		
Processing rates	Drying	84.5 days/yr & 5.57 hr/day
	Packaging	N/A N/A
Operation time	Drying	same
	Packaging	same
Efficiency of control of U_3O_8 dust released to atmosphere (design and effective)	Drying	99.7%
	Packaging	N/A
Estimated U_3O_8 dust released to atmosphere	Drying	0.53 MT/yr
Stack height(s)	Diameter	0.46 m (inside)
	Flow	1.42 m^3/sec
	Height	27.43 m
Recovery rate of U_3O_8		94%
Yellowcake yield		453.65 tonnes/yr
Yellowcake quality, U_3O_8		89.82±1.47

Table 5.5-10 continued

Parameter	Value
Heap Leach Piles (if applicable)	
Dimensions (height, width, length)	N/A
Volume	N/A
Capacity	N/A
Pile activity for U-238, Th-230, Ra-226, and Pb-210	N/A
Fugitive dust emissions	N/A
Control efficiencies for dusting	N/A
Solid and Liquid Disposal Impoundments (Tailings, evaporation, and settling ponds)	
Sand tailings	
Area	0.22 km^2
Volume	2.56 x $10^6 m^3$
Capacity	3.98 x 10^6 MT
Slime tailings	
Area	0.055 km^2
Volume	6.4 x $10^6 m^3$
Capacity	9.95 x 10^5 MT
Area of each tailing impoundment	N/A
If different grades of ore are used or if a time-dependent scenario is planned, indicate the following for each change:	
Area, volume, capacity of sand tailings	Not available
Area, volume, capacity of slime tailings	Not available

Table 5.5-10 continued

Area, volume, capacity of submerged tailings	Not available
Operating time for impoundment area	20 yrs
Fraction of U-238, Th-230, Ra-226, Pb-210 to tailings for each particular ore grade, if applicable	U-238 0.06%
Tailings density	dry 1.55 g/cm^3 wet 1.95 g/cm^3
Drying time prior to reclamation	2-3 yrs
Efficiency of controls for fugitive dusting (wetting, chemical, etc.)	N/A
Activity, U, Ra-226, Th-230, and Pb-210 in slimes	Not available
Activity, U, Ra-226, Th-230, and Pb-210 in sand	Not available
Activity, U, Ra-226, Th-230, and Pb-210 in solution	U-nat 22.9 x 10^3 pCi/l Ra-226 0.04 x 10^3 pCi/l
Activity - Total tailings	Not available
Total tailings area - last year of operations	19147 m^2
Tailings pond (solution) area	11403.93 m^2
Tailings solids area	7743 m^2
Seepage rate from tailings impoundment - design	12.75 gpm

Land Use and Grazing of Cattle

Fraction of year spent grazing locally - near mill	33%

Table 5.5-10 continued

Parameter	Value
Fraction of feed that is pasture graze while grazing	0%
Fraction of stored feed that is grown locally	<1%
Acreage required to graze one animal unit (450 kg) for one month (AUM)	93-217 ha
Length of growing season	7.5 months/yr
Fraction of local consumption of locally produced:	
Vegetables	<1%
Meat	0%
Milk	0%

Table 5.5-10 continued

Locations of Sources and Receptors

All locations should be given in terms of:
x kilometers east of the yellowcake dryer stack
y kilometers north of the yellowcake dryer stack
z meters elevation from the base of the yellowcake dryer stack
(Denote locations to the south and/or west by a negative value.)

Source	east (km)	north (km)	elevation (m)
Yellowcake dryer	0.0	0.0	27.5
SAG mill	-0.03	-0.005	-4.23
Ore pad	0.04	0.18	-3.68
Tailings pond no. 1 (midpoint)	-0.55	0.09	-42.92
Other sources: de-mister	-0.04	-0.04	14.25
dump pocket	0.03	0.06	22.21

Extra Receptors

Nearest resident - Ticaboo	-1.0	-4.0	-95.10
Nearest resident in prevailing wind direction - Greenriver, UT	46.0	142.0	-140.82
Ranch - Trachyte - Catt	6.7	28.6	177.39
Farm - Fairview Ranch	-4.5	56.0	193.55
Orchard - Notom, UT	-37.5	58.0	213.36
Grazing location 1 - Upper Little Rockies	0.26	0.0	-4.27
Grazing location 2 - Lower Little Rockies	0.0	-1.0	39.62
Garden - Bullfrog	-2.2	-20.7	-238.35
Ranger bunk house - Natural Bridges	64.0	-15.0	432.21
Town 1 - Boulder, UT	-65.0	22.0	584.61
Town 2 - Hanksville, UT	-2.0	74.0	-70.71
Other nearby residents (industrial or recreational facilities) - Halls Crossing	-1.0	-24.5	244.45

Table 5.5-10 continued

Source	east (km)	north (km)	elevation (m)
Restricted area boundaries			
N	0.0	0.52	-18.59
NE	0.28	0.28	-16.15
E	0.26	0.0	-4.27
SE	-0.26	0.26	-18.90
S	0.0	-0.32	-15.85
SW	-0.52	-0.52	-52.73
W	-1.01	0.0	52.73
NW	-0.52	0.52	37.19

Meteorological data - See Section 2.2