

**Pathfinder Mines Corporation**

**SOURCE MATERIAL LICENSE**

**AMENMDMENT APPLICATION**

**SUA-442**

**DOCKET NO. 40-6622**

**SHIRLEY BASIN URANIUM FACILITY**

**CARBON COUNTY, WYOMING**

**NOVEMBER 1994**

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(Rationale: Mill Decommissioning)

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- ~~C-4 Occupational Exposures to Airborne Uranium and  
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- ~~C-5 Occupational Exposures to Direct Radiation  
(1977-1982) Delete~~

(Rationale: Mill Decommissioning)

## 1.0 Proposed Activities

Pathfinder Mines Corporation, Shirley Basin facility is authorized by The United States Nuclear Regulatory Commission (USNRC) Source Material License SUA-442, to possess byproduct material in the form of uranium waste tailings generated by the Licensee's former mill operations.

The facility, is located in Carbon County, Wyoming. It is wholly owned by Cogema Resources Inc., which is wholly owned by Cogema Inc., Bethesda, Md.

The uranium mill ceased operation in June 1992. It has subsequently been demolished and buried.

The tailings will be reclaimed in accordance with the reclamation plan which is pending approval.

(Rationale: Mill Decommissioning)

## 2.0 Site Characteristics

### 2.1 Site Location & Demography

The Shirley Basin tailings facility is located in a remote area of Carbon County in southeastern Wyoming. The site location and layout are shown in Figures 2-1 and 2-2. The nearest large city, approximately 60 miles north, is Casper, Wyoming (population 46,000). Other towns nearby are Medicine Bow (population 800) about 35 miles south, and Alcova (population less than 500) about 35 miles to the northwest.<sup>1</sup> The area surrounding the site is quite sparsely populated. The nearest permanent residence is the Heward Ranch occupied by family of four people, 3½ miles east of the facility. A trailer park, the Shirley Basin Village, formerly located about 5 miles south of the site, no longer exists. All the housing units and surface structures have been removed and the landfill closed. Population data for the area is shown in Table 2-3. Figure 2-4 shows the population distribution within 50 miles of the complex.

The tailings site is at an elevation of about 7,100 feet and lies within an area of 8,000 acres owned or controlled through long-term permits by Shirley Basin Mine. The site topography is typical of the eastern Wyoming plains with moderate elevation changes.

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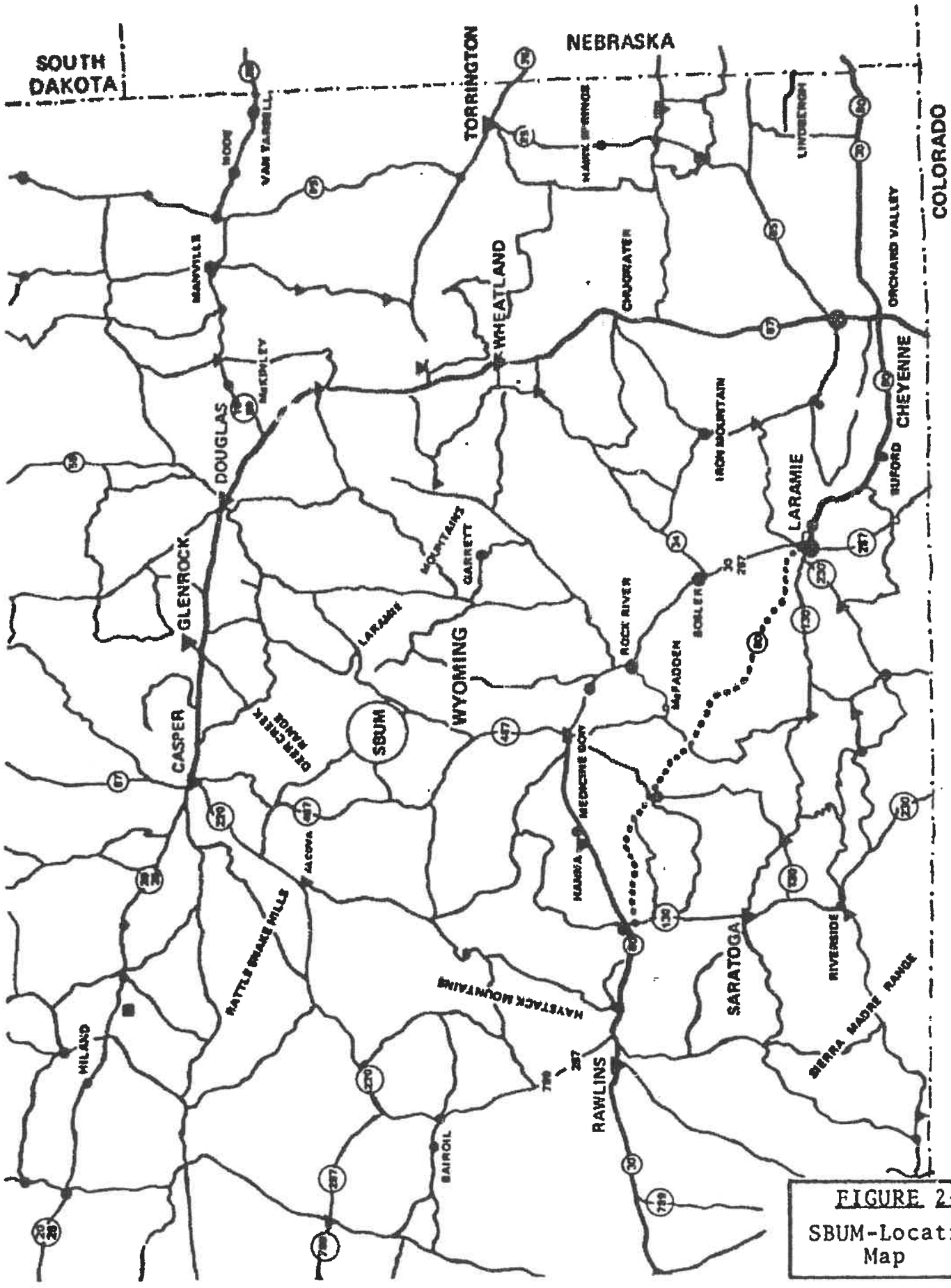
*Population figures for Casper and Medicine Bow are 1990 census figures obtained from City Administration.*

Table 2-3

Population Data

<u>Town or City</u>	<u>Location</u>	<u>1990</u>	<u>1970</u>
Glenrock	45 Miles NNE	2,400	1,907
Douglas	50 Miles NE	5,075	3,922
Heward Ranch	3½ Miles E	4	3
Shirley Basin Townsite	5 Miles S	0	710
Medicine Bow	35 Miles S	800	455
Hanna	55 Miles SW	1,100	460
Alcova	35 Miles NW	< 500	250
Casper	60 Miles NNW	46,000	39,361





**FIGURE 2-1**  
**SBUM-Location**  
**Map**

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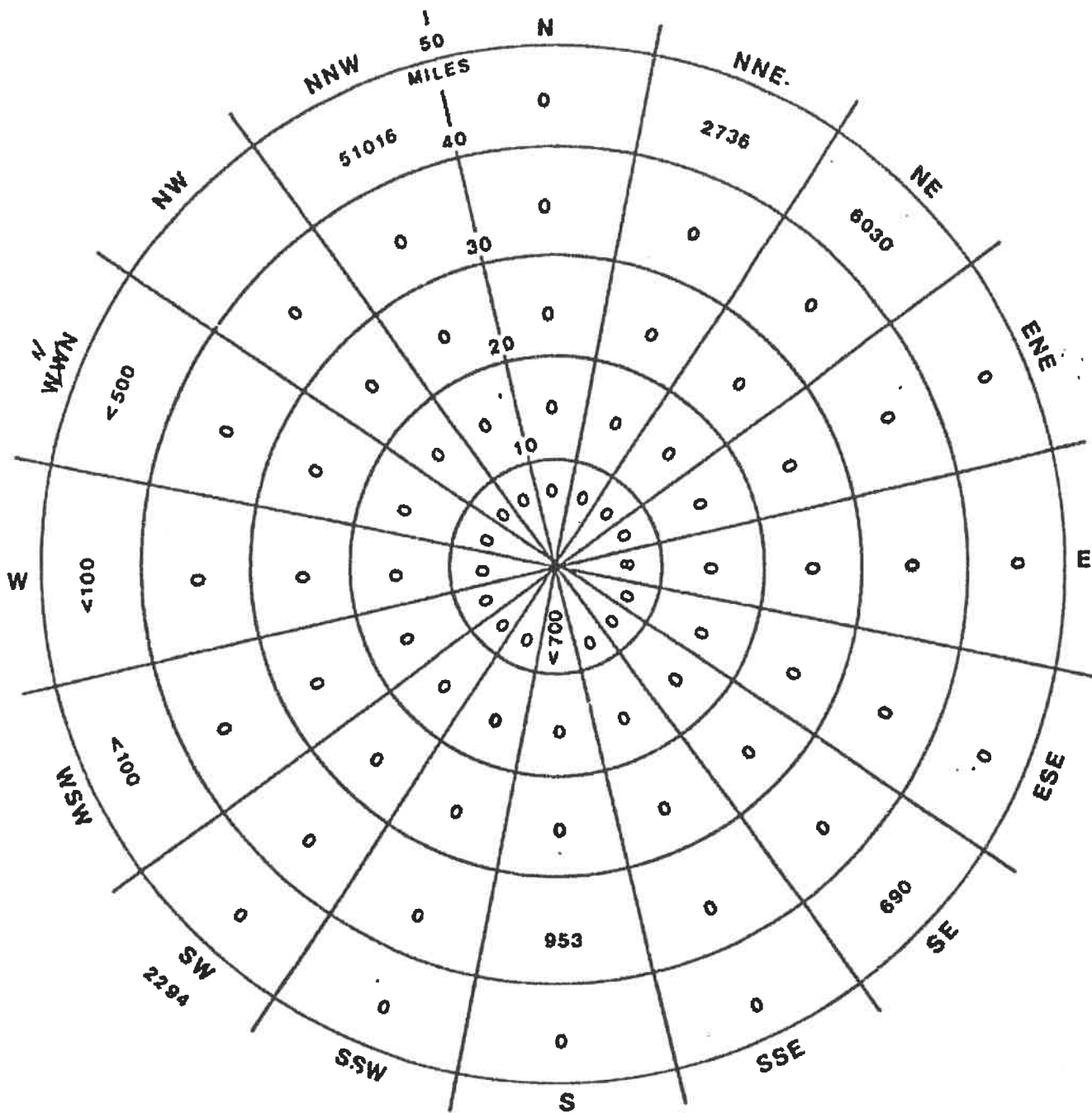
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**PATHFINDER**

SHIRLEY BASIN MINE

FIGURE 2-4

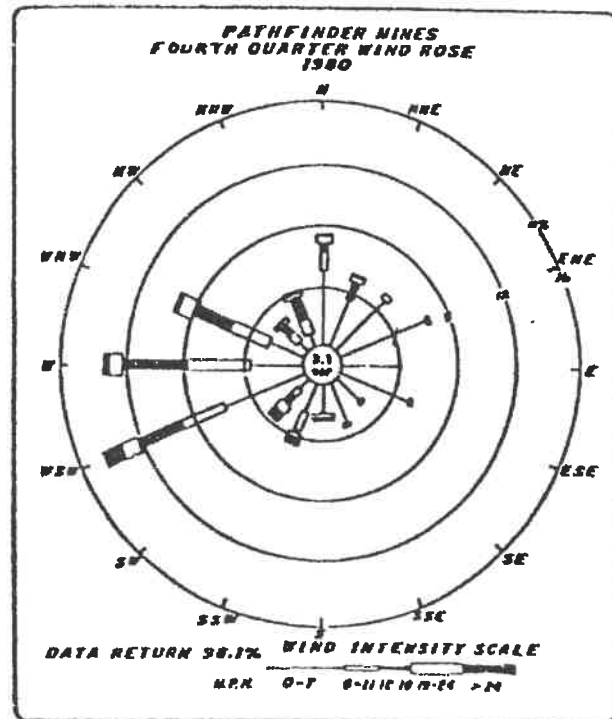
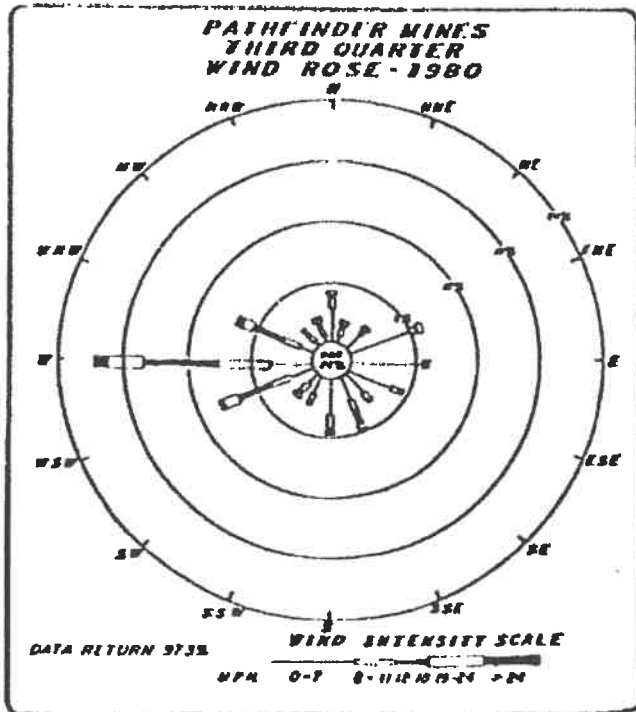
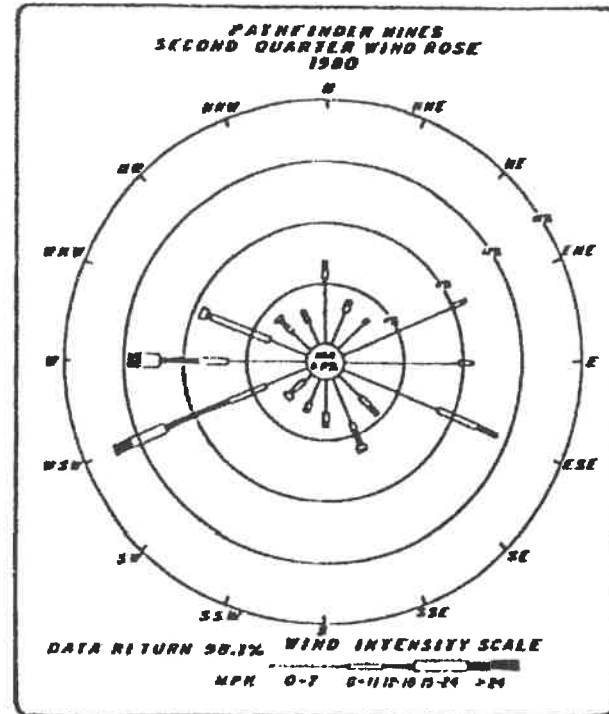
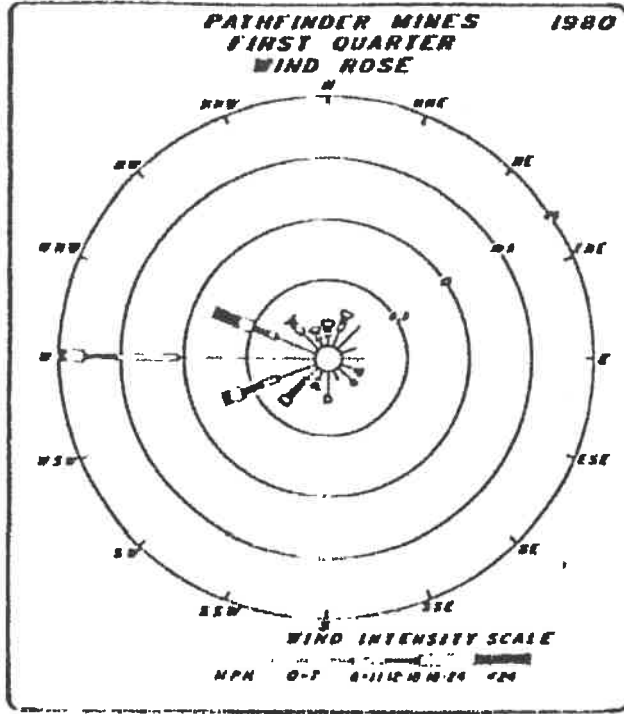
POPULATION DISTRIBUTION

## 2.2 Meteorology

The climate of Shirley Basin is cool and semi-arid. Annual precipitation averages 10-11 inches, approximately half of which occurs between April and July. Normal temperatures range from winter lows of  $-25^{\circ}\text{F}$  to summer highs of  $90^{\circ}\text{F}$ . The prevailing wind is from the west-southwest.

Shirley Basin Mine collects meteorological data, including wind speed and direction, temperature, precipitation and barometric pressure from a near-site weather station. Quarterly wind roses for 1980, typical of Shirley Basin, are shown in Figure 2-5. Temperature and precipitation data are presented in Tables 2-6 and 2-7.

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**PATHFINDER**  
 SHIRLEY BASIN MINE  
 FIGURE 2-6  
 1980 QUARTERLY  
 WIND ROSES 14

TABLE 2-6  
SHIRLEY BASIN MILL  
PRECIPITATION DATA SUMMARY  
1963 - 1981 (inches)

<u>Month</u>	<u>Mean Total Precipitation</u>
January	0.6
February	0.4
March	0.9
April	1.5
May	1.7
June	1.1
July	1.1
August	0.9
September	0.7
October	0.6
November	0.4
December	0.5
<hr/>	
Annual	10.4

TABLE 2-7

SHIRLEY BASIN TEMPERATURE DATA

TEMPERATURE AVERAGES (°F)

<u>Year*</u>	<u>Daily Maximum</u>	<u>Daily Minimum</u>
1968	57.3	25.9
1969	53.1	22.7
1970	50.6	19.7
1971	50.7	21.6
1972	51.6	22.8
1973	49.4	25.0
1974	50.1	21.5
1975	50.3	24.3
1978	51.7	24.3
1979	53.6	24.5
1980	53.8	25.5
1981	56.4	28.3

TEMPERATURE EXTREMES

<u>Year</u>	<u>Extreme Highest</u>	<u>Date</u>	<u>Extreme Lowest</u>	<u>Date</u>
1968	91°	August 6	-21°	December 18
1969	98°	August 25	-20°	March 14
1970	90°	August 2	-27°	January 6
1971	88°	August 22	-24°	January 7
1972	92°	August 12	-33°	December 18
1973	87°	July 6	-24°	February 9
1974	88°	June 19	-37°	January 3
1975	90°	July 27	-18°	April 2
1978	88°	September 3	-39°	December 30
1979	95°	August 5	-34°	January 7
1980	89°	June 27	-32°	January 27
1981	93°	July 7	-22°	February 10

\*Data not available for 1976 and 1977.



## 2.3 Hydrology

### 2.3.1 Groundwater

The groundwater hydrology is described in the Dames & Moore design report for tailings dam No. 5 (1). A more detailed discussion of the hydrology underlying the Shirley Basin tailings impoundment is provided in the Robertson-Pincock seepage investigation report (2) and annual updates of the corrective action program submitted to the NRC.

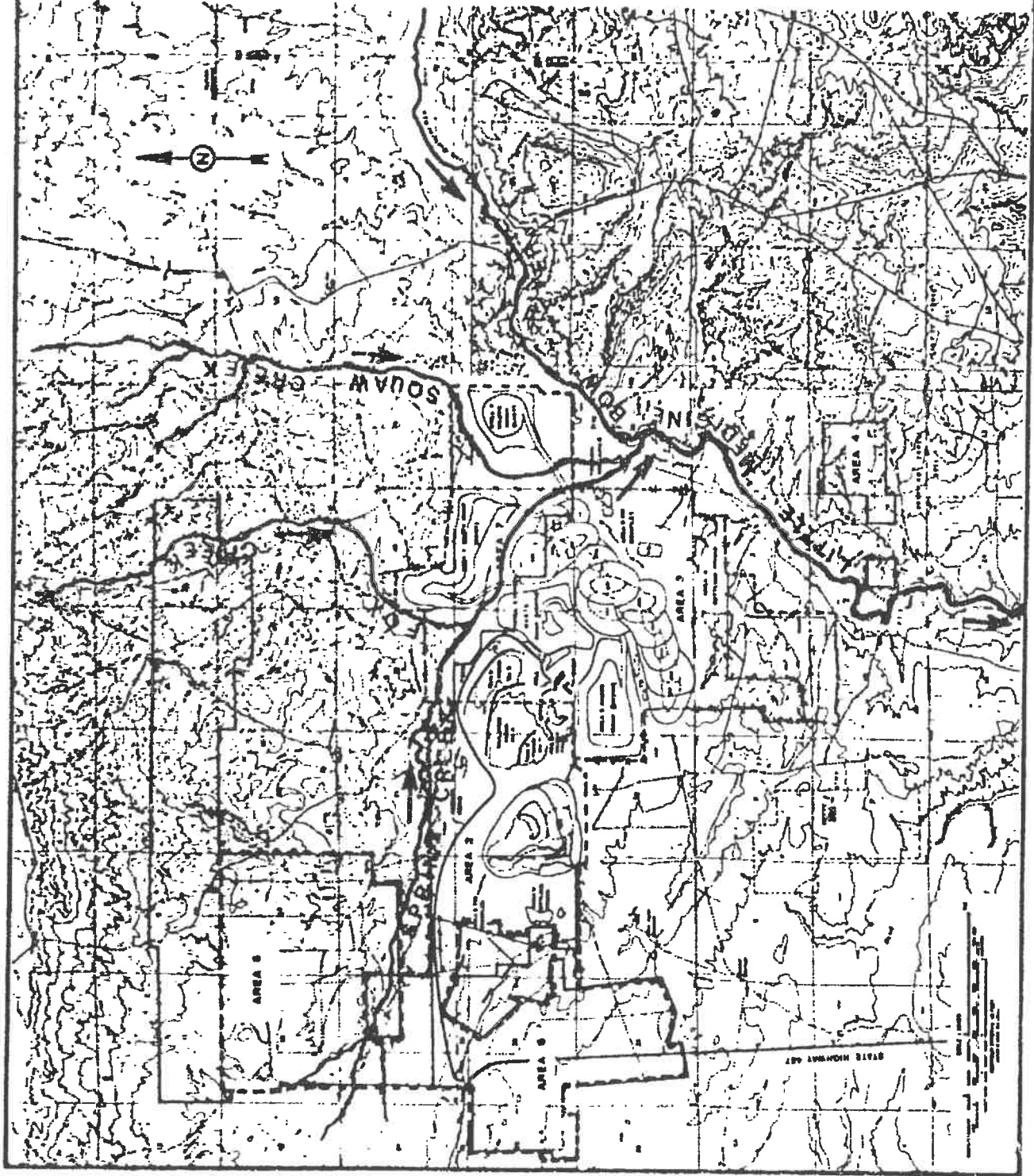
(Rationale: Clarification)

### 2.3.2 Surface Water

The Shirley Basin Mine area is drained by Spring Creek and the Little Medicine Bow River (see Fig. 2-8). Spring Creek is a perennial stream that runs from northwest to southeast through the mine site before emptying into the Little Medicine Bow River. The flow in Spring Creek from natural sources is approximately 300-500 gallons per minute but varies considerably with the season. The Little Medicine Bow River (estimated average flow 13,000 gpm) continues southward and into the Medicine Bow River, a tributary of the North Platte River.

**PATHFINDER**  
 SHIRLEY BASIN 2000  
 FIGURE 2-8  
 SURFACE WATER  
 HYDROLOGY

- LEGEND:**
- - - PERMIT AREA BOUNDARY
  - CLAIMS AREA BOUNDARY (PARTIAL)
  - ↑ DIRECTION OF FLOW



## 2.4 Geology and Seismology

### 2.4.1 Geology

The geology of the Shirley Basin area is described in the Final Environmental Statement for the Shirley Basin Mill (3). More site-specific information is provided in the Dames and Moore design report for dam No. 5 (4) and the Robertson-Pincock seepage study report (5).

### 2.4.2 Seismology

The site lies in a region of low seismic risk. The seismic history of the Shirley Basin area is discussed in the Final Environmental Statement for the Shirley Basin Mill (6) and the Dames and Moore dam design report (7).

REFERENCES - SECTION 2.0

1. Dames & Moore, "Report on Design or Proposed Tailings Dam and Seepage Evaluation - Shirley Basin Mine", April 1975, pp. 10-14.
2. Robertson-Pincock Inc., "An Investigation of Subsurface Contaminant Migration from Tailings Pond No. 5 - Shirley Basin Mine", June 1980, pp. 28-98.
3. United States Atomic Energy Commission, Final Environmental Statement Related to Operation of Shirley Basin Uranium Mill, December 1974, pp. 11-15, 16 (FES).
4. Dames & Moore, April 1975, pp. 7-10.
5. Robertson-Pincock Inc., June 1980, pp. 12-13, 28-38.
6. FES, December 1974, pp. 11-15, 17.
7. Dames & Moore, April 1975, pp. 14-16.

3.0 Mill Process and Equipment

3.1 Mill process (Section deleted. Rationale: Mill Decommissioning)

(Attachments 1, 2 (Which is also Figure 3-1), 3 and 4 deleted. Rationale: Mill Decommissioning)

(Figures 3-2 and 3-3 deleted. Rationale: Mill Decommissioning)

3.2 Mill Equipment  
Decommissioning)

(Section deleted.

Rationale: Mill

### 3.3 Instrumentation

3.3.1 Mill Process Instrumentation (Section Deleted. Rationale:  
Mill Decommissioning)

3.3.2 Radiation Safety Instrumentation

Radiation safety sampling and monitoring instrumentation used at Shirley Basin is listed in Table 3-3.

3.3.3 Byproduct Materials (Deleted. Rationale: Mill Decommissioning)



Table 3-3

Radiation Safety Instrumentation

<u>Type of equipment</u>	<u>use</u>	<u>Range</u>
Low Range Beta/Gamma Survey Meter	Beta and gamma surveys	0-200 mR/hr
Alpha Scintillation Counter	Gross alpha analysis of air samples and smears	Limited only by scaler range
Alpha Scintillation Counter	Gross alpha analysis of radon daughter and personnel samples	Limited only by scaler range
Alpha Scintillation meter	Personnel monitor	0-500,000 cpm
Alpha Survey Meter	Fixed alpha surveys	0-15,000 cpm
Low Volume Air Sampler	Personnel air sampling	0-2 cpm

(Rationale: Mill Decommissioning)

Table 3-4

BYPRODUCT MATERIALS USED AT THE SHIRLEY BASIN URANIUM MILL

(Deleted. Rationale: Mill Decommissioning)

REFERENCES - SECTION 3.0

(Deleted. Rationale: Mill Decommissioning)

## 4.0 Effluent Control & Waste Management Systems

### 4.1 Gaseous & Airborne Particulates

Control of airborne releases from the tailings impoundment are described in Section 5.5.7

(Rationale: Mill Decommissioning)

#### 4.1.1 Ore Grinding

(Deleted. Rationale: Mill Decommissioning)

#### 4.1.2 Clarifiers

(Deleted. Rationale: Mill Decommissioning)

#### 4.1.3 Yellowcake Drying and Packaging

(Deleted. Rationale: Mill Decommissioning)

4.1.4 Sample Preparation Room

(Deleted. Rationale: Mill Decommissioning)

#### 4.2 Liquids & Solids

The tailings are contained in a series of three impoundments formed by dams built across a natural drainage (see Figure 2-2). Dams 3 and 4 are compacted earthfill dams. Dam 5 is an engineered earthfill dam designed to the specifications of NRC Regulatory Guide 3.11.1. Engineering specifications related to the design and construction of Dam 5 can be found in the Dames and Moore design reports for that dam (1) (2).

To insure continued stability and proper operation of the retention system, periodic inspections and monitoring are performed in accordance with Regulatory Guide 3.11.1, "Operational inspection and Surveillance of Embankment Retention System for Uranium Mill Tailings". The surveillance program includes:

- Daily visual inspections (by trained personnel):
- Monthly survey of pond operating levels and;
- Monthly monitoring of piezometer levels.

Other solid waste from the office and shop (trash, papers, etc.) is buried in a landfill operated under a permit from the Wyoming Department of Environmental Quality. There are no liquid effluents from the mill site released into waters of the United States.

(Rationale: The dam is in decommissioned status and monthly monument monitoring is not needed).

### 4.3 Contaminated Equipment

Contaminated equipment will either be decontaminated or will be disposed of in the tailings ponds.

The following contamination levels are considered acceptable for release to unrestricted areas (3):

Average (total)	5,000 dpm alpha per 100cm <sup>2*</sup>
Maximum (total)	15,000 dpm alpha per 100cm <sup>2**</sup>
Removable	1,000 dpm alpha per 100cm <sup>2***</sup>

- \* Averaged over no more than 1m<sup>2</sup>
- \*\* Applies to an area of not more than 100cm<sup>2</sup>
- \*\*\* Determined by smearing with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive matter on the smear.

References - Section 4.0

1. Dames & Moore, "Report on Design of Proposed Tailings Dam and Seepage Evaluation - Shirley Basin Mine", April 1975.
2. Dames & Moore, "Report on Redesign Final Stage No. 5 Tailings Dam - Shirley Basin Mine", November 1976.
3. United States 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.



## 5.0 Operations

### 5.1 Corporate Organization and Administrative Procedures

#### 5.1.1 Organization

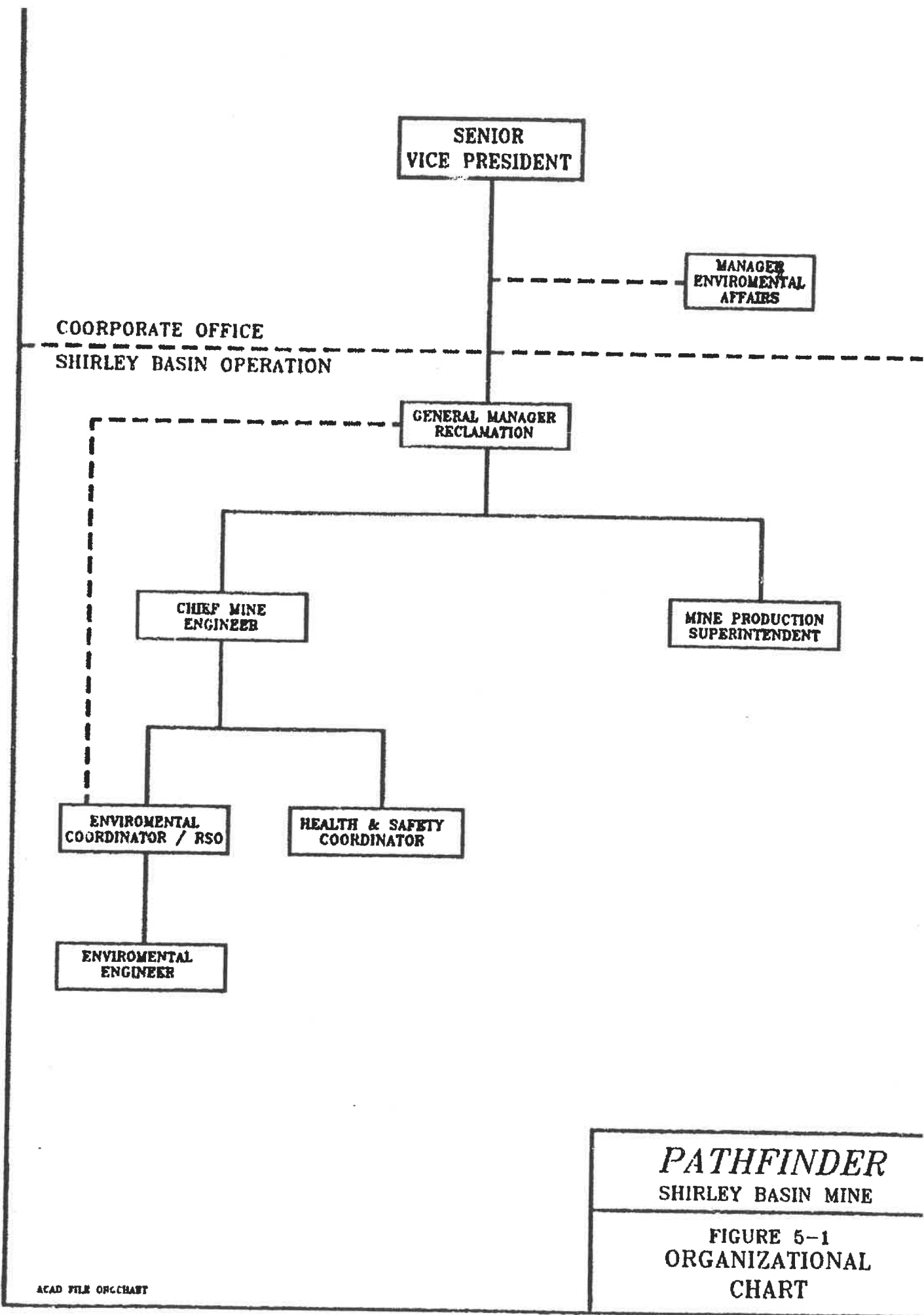
An organizational chart showing the functions responsible for facility management, radiation safety, and environmental quality at Shirley Basin Mine is provided in Figure 5-1.

The General Manager, Reclamation, has responsibility for operations of the Shirley Basin Facility. He reports directly to Pathfinder's Senior Vice President.

The Environmental Coordinator/RSO is directly responsible to the Chief Engineer for implementing the on site radiation safety program. His responsibilities and authorities include:

- Ensuring that radiation surveillance of the tailings site is carried out in accordance with license and regulatory requirements, standard operating procedures, and good health physics practice;
- Investigating unusual incidents or radiation monitoring results that could influence employee radiation exposures;
- Supervising employee radiation training; and
- Apprising the ALARA Committee of the status of the radiation safety program.

(Rationale: Mill Decommissioning)



**PATHFINDER**  
SHIRLEY BASIN MINE

FIGURE 5-1  
ORGANIZATIONAL  
CHART

ACAD FILE ORGCHART

The Radiation Safety Officer has the responsibility and authority to suspend, postpone, or modify any work activity that is potentially hazardous to workers or is a violation of regulations or license conditions. The RSO has the authority to bypass the normal chain of command and report problems directly to the General Manager, Reclamation, if necessary.

The Environmental Coordinator/RSO also has responsibilities and authorities that include:

- Ensuring that environmental and radiation surveillance is carried out in accordance with license and regulatory requirements, standard operating procedures, and sound environmental monitoring practices;
- Investigating unusual environmental and radiation monitoring results;
- Apprising management of the status of the environmental and radiation protection programs.

Technical assistance in developing and administering environmental and radiation programs is available to the Environmental Coordinator/RSO from the Manager of Environmental Affairs at corporate headquarters.

(Rationale: Mill Decommissioning)

### 5.1.2 Management Supervisory Program

Written procedures guide non-operational activities, including radiation safety and environmental monitoring. Prior to implementation, all SOPs will be reviewed by the Environmental Coordinator/RSO. SOPs will be reviewed and revised as necessary, but at least annually.

(Rationale: Mill Decommissioning)

### 5.1.3 Management Audit and Inspection Program

The RSO will submit a semi-annual radiation safety report to the Chief Engineer. This report will summarize bioassay results, and monitoring and survey results.

The RSO will perform an annual audit of the ALARA program and submit a written report to the Chief Engineer. The report will summarize the following information:

1. Bioassay results;
2. Inspection reports;
4. Radiation safety training activities;
5. Monitoring and survey results;

The report will also discuss:

1. Trends in concentrations, levels, and exposures;
2. Pending problems; and
3. Implementation of ways to further reduce radiation hazards.

(Rationale: Mill Decommissioning)

Inspections:

(Delete entire page. Rationale: Mill Decommissioning)

#### 5.1.4 ALARA Program

Pathfinder Mines Corporation is committed to the principle of maintaining occupational radiation exposures and effluent releases to the environment as low as is reasonably achievable (ALARA). This commitment is executed through radiation safety and environmental quality programs based on NRC regulatory guides and branch position papers. These programs include:

- Clearly defined responsibility at all levels of management for protection of employee health and safety and the environment;
- Reporting mechanisms to assure continuing management awareness of exposure and effluent trends;
- ALARA audits to evaluate exposures and effluent releases, and determine how they might be lowered;
- Use of engineering controls, wherever reasonable, to reduce occupational exposures and releases to the environment;
- Surveillance and investigation programs to identify trends in occupational radiation exposures and radioactive effluents to the environment.
- Standard operating procedures for operations, radiation safety, and environmental monitoring activities;
- Radiation safety training programs to teach employees about radiation hazards and ways to reduce exposures; and
- Programs to assure the continuing quality of measurement results for effluent releases and environmental monitoring.

(Rationale: Mill Decommissioning)

Administrative limits, typically 25% of maximum, are routinely employed when evaluating radiation data. Exposures and releases have been very low in the past and a continuous effort will be made to maintain them as low as is reasonably achievable.

## 5.2 Qualifications

Staff within the Shirley Basin Mine organization who have the responsibility for developing and implementing the radiation safety and environmental monitoring programs will meet the minimum qualifications described below. The qualifications of the incumbent in each of these positions are provided in Appendix A.

### General Manager, Reclamation

Appropriate administrative and management experience.

### Radiation Safety Officer

Bachelor's degree in engineering or physical or biological sciences. Two years of radiation safety work experience may be substituted for each year of the educational requirement;

One year of supervisory experience and one year of experience in a radiation-related industry; and

Formalized training in Radiation Safety.

(Rationale: Mill Decommissioning)



Environmental Coordinator

Bachelor's degree in engineering or the physical or biological sciences;

Three years experience in environmental protection;

Short course training in environmental radiation; and

Demonstrated capability to supervise environmental department staff.

Environmental Engineer

Appropriate experience in the physical or biological sciences;

Two years experience in environmental protection; and

Short course training in environmental radiation.

Manager of Environmental Affairs

Bachelor's degree in engineering or the physical or biological sciences;

Advanced degree in health physics or environmental science, or three years experience in environmental protection; and

Short course training in radiation protection.

(Rationale: Mill Decommissioning)

## 5.3 Training

### 5.3.1 New Employee Training

All new employees working in tailings or environmental monitoring will receive training in radiation safety. This training includes the following topics:

1. Fundamentals of Health Protection;
2. Personal Hygiene;
3. Facility Provided Protection;
4. Health Protection Measurements;
5. Radiation Protection Requirements;

In addition to the topics listed above, female tailings workers are given instruction based on Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure".

At the end of the course each employee takes a written test covering the topics discussed during the training. The test results are maintained in the employee's permanent file.

Written instructions relating to radiation safety are provided in the Shirley Basin Mine Employee's Handbook. Example instructions are shown in Appendix B of this document.

(Rationale: Mill Decommissioning)

### 5.3.2 Refresher Training

All tailings related employees receive annual radiation safety refresher training. This is an abbreviated course which covers relevant information that has become available during the past year, a review of radiation safety problems that have arisen during the year, changes in regulations and license conditions, exposure trends, and other current topics.

Employees are given a written examination at the conclusion of the refresher training.

### 5.3.3 On-The-Job Training

New employees and employees working at a new job classification are given specialized instruction on the health and safety aspects of the specific job they will perform. This instruction is given in the form of individualized on-the-job training.

### 5.3.4 Supervisor's Training

Supervisors receive additional specialized training on their supervisory responsibilities in maintaining radiation exposures as low as reasonably achievable. This training is conducted at least annually.

### 5.3.5 Visitors and Contractors

Visitors to the facility are escorted by an individual who is properly trained and knowledgeable of the hazards.

Contractors are given appropriate training and safety instruction.

(Rationale: Mill Decommissioning)

### 5.3.6 Documentation

All formal training is recorded in the individual's permanent file, along with test scores if applicable.

#### 5.4 Security

A fence has been constructed around the restricted area (see figure 2-2). Caution signs bearing the radiation symbol and the words "Caution - Radioactive Materials" are posted along the restricted area fence within the project area. These signs are placed so that at least one sign may be seen from anywhere along the fence.

Access to the facility is controlled through a checkpoint that is a locked gate or manned 24 hours a day by security personnel. Security personnel also patrol the project area on a scheduled basis.

(Rationale: Mill Decommissioning)

## 5.5 Radiation Safety

The primary objective of the Shirley Basin radiation safety program is to maintain personnel exposures and effluent releases as low as is reasonably achievable. This objective is achieved in part through routine monitoring and surveillance programs whose purpose is to identify potentially unfavorable trends, to assure continuing management awareness, and where needed, to assure that timely corrective actions are taken.

Programs to monitor radiation in the ambient environment are described in Section 5.5.7 of this document.

### 5.5.1 External Radiation Surveys

(Rationale: Mill Decommissioning)

Table 5-2  
Radiation Safety Monitoring Locations

<u>Code</u>	<u>Area</u>	<u>Description</u>
H1	Maintenance	Shop and lunch area

(Rationale: Mill Decommissioning)

All tailings personnel, who routinely work in the tailings area, are required to wear a TLD badge. The TLDs are exchanged quarterly and have a range of 1mR to 1000R. If the measured external radiation dose to any individual exceeds, the cause of the exposure is investigated, and corrective action is taken. TLD results are documented in the employee's exposure history files. TLDs are also provided to non-mill personnel (i.e., contractors) whose exposures may exceed 25% of the applicable regulatory limits.

Calibration and quality assurance for TLDs used for area and personnel dosimetry are provided by the vendor. Beta/gamma survey instruments are calibrated at least annually by the manufacturer using National Bureau of Standards (NBS) traceable sources. Calibration is performed according to SOPs or manufacturer's instructions. Prior to each use, the instruments are field checked using a check source.

(Rationale: Mill Decommissioning)

#### 5.5.2 Airborne Radiation Surveys

##### Airborne Uranium

(Deleted. Rational: Mill Decommissioning)



Table 5-4

Air Sampling Frequencies

(Airborne Uranium and Radon Daughters)

Deleted. Rationale: Mill Decommissioning)

Radon daughters:

(Deleted. Rationale: Mill Decommissioning)

### 5.5.3 Internal Radiation Dosimetry

(Deleted. Rationale: Mill Decommissioning)

### 5.5.4 Bioassay Program

Routine bioassay sampling has been discontinued. Bioassays will be obtained at the discretion of the RSO to confirm the absence of uranium intake. Results are documented in the employee's exposure history file.

Urinalysis

(Deleted. Rationale: Mill Decommissioning)

In-Vivo Lung Counting

(Deleted. Rationale: Mill Decommissioning)

Table 5-5

Action Levels for Urinary Uranium Results

<u>Urinary Uranium Concentration</u>	<u>Actions</u>
Less than 15 ug/l	None
15 to 30 ug/l	<ol style="list-style-type: none"><li>1. Confirm results (repeat urinalysis).</li><li>2. Determine why air samples were not representative and did not warn of excessive concentrations of airborne uranium. Make corrections.</li><li>3. Identify the cause of airborne uranium and initiate additional control measures.</li><li>4. Determine whether other workers could have been exposed and perform bioassay measurements for them.</li><li>5. Consider work assignment limitations to ensure the worker does not exceed a urinary uranium concentration of 30 ug/l.</li></ol>
Greater than 30 ug/l	<ol style="list-style-type: none"><li>1. Take the actions given above for 15 to 30 ug/l.</li><li>2. Continue operations only if it is virtually certain that no other worker will exceed a urinary uranium concentration of 30 ug/l.</li><li>3. Establish work restrictions for affected employees.</li></ol>
Greater than 30 ug/l for four consecutive specimens or greater than 130 ug/l for any specimen.	<ol style="list-style-type: none"><li>1. Take the actions given above.</li><li>2. Have additional urine specimen tested for albuminuria.</li></ol>

5.5.5 Contamination Survey Program

Personnel Contamination Control

(Delete. Rationale: Mill Decommissioning)

Area Contamination Control

(Delete. Rationale: Mill Decommissioning)

Table 5-6

ACTION LEVELS FOR IN-VIVO LUNG COUNTING RESULTS

(Delete. Rationale: Mill Decommissioning)

All instrumentation used for contamination surveys is calibrated at least semi-annually using National Bureau of Standards (NBS) traceable sources. Calibration is performed according to SOPs or the manufacturer's instructions. Where appropriate, calibration is confirmed with a check source prior to instrument use.

Table 5-7

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Average (total)	50 dpm/cm2*
Maximum (total)	150 dpm/cm2
Removable	10dpm/cm2

\* Averaged over no more than 1 m2.

\*\* Applies to an area of not more than 100cm2.

\*\*\* Determined by smearing with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the smear.



#### 5.5.6 Respiratory Protection Program

In the event that engineered confinement of radioactive materials is insufficient to reduce concentrations of these materials to less than maximum permissible values, respiratory protection equipment is used to assure that intakes of radioactive materials are as low as reasonably achievable. The respiratory protection program is conducted in accordance with 10 CFR 20.

Only equipment that has been certified or had certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) will be used.

When respirators are used, the concentration of inhaled radioactive material is estimated by dividing the ambient concentration in air by appropriate protection factor.

The bioassay program outlined in Section 5.5.2 is used to evaluate the effectiveness of the respiratory protection program.

Respirator selection, fitting, maintenance, and use are governed by written procedures.

Respirator training is included in the training program outlined in Section 5.3.

A physician determines, prior to initial use and at least annually thereafter, that the individual user is physically able to use the respiratory protective equipment.

### 5.5.7 Environmental Monitoring

Shirley Basin's environmental monitoring program measures radionuclide concentrations in ambient air, ground and surface water, soil and vegetation. The monitoring program, is described below and summarized in Table 5-8. Figure 5-9 shows the location of environmental monitoring stations.

The lower limits of detection (LLDs) for analysis of samples collected for Pathfinder's environmental monitoring program will be those specified in NRC Regulatory Guide 4.14. However, if the actual concentrations of radionuclides being sampled routinely exceed these LLDs, sampling and analysis procedures may be used that are only adequate to measure the actual concentrations.

Pathfinder will report the results of the environmental monitoring program to NRC in a semi-annual monitoring report as required by 10 CFR 40.65.

An ALARA audit of the environmental monitoring program will be performed annually to confirm that releases of radioactivity to the environment are maintained as low as reasonably achievable.

#### Stack effluent

(Delete. Rationale: Mill Decommissioning)

**TABLE 5-8  
ENVIRONMENTAL MONITORING PROGRAM  
SHIRLEY BASIN FACILITY**

Type of Sample	Sample Collection			Sample Analysis	
	Number	Location	Method	Frequency	Type of Analysis
Air Low Volume	2	Site Boundary (2R, 10R)	Low-Volume (Continuous)	Qrtly. composite of weekly samples	U-nat, Th-230, Ra-226, Pb-210
	1	Nearest Residence (7R)	Low-Volume (Continuous)	Qrtly. composite of weekly samples	U-nat, Th-230, Ra-226, Pb-210
	1	Background Location <del>MC14</del> 4R	Low-Volume (Continuous)	Qrtly. composite of weekly samples	U-nat, th-230, Ra-226, Pb-210
Ambient Radon	4	Same locations as low volume	Passive, continuous	Read and exchanged Qrtly.	Rn-222
Water Groundwater		Hydrologically down gradient near tailings impoundment surficial aquifer (RP120A, RP121B, RP142A, MC7, MC6, 5A1, MC9, RPI19B, NPO1, <del>MC14</del> , MC11)  <i>Background location MC14</i>	Grab	Quarterly	CL, NO3, SO4, pH, TDS, Water Level
	8	Spring Creek, Mine Creek, Fox Creek, Little Medicine Bow River (SW-1A, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8)	Grab	Semi-annually	As, ba, be, cd, ch, gross A, Pb, Mo, Ni, Ra-226 & 228, Se, Th-230 and Uranium
Soil	4	Same locations as low volume	Grab	Annually	U-nat, Th-230, Ra-226 Pb-210
Vegetation	4	Same locations as low volume	Grab	Annually	Ra-226, Pb-210
Direct Radiation	4	Same locations as low volume	Passive, continuous	Quarterly	Gamma exposure rate

### Airborne Particulate

Air particulate samples are collected continuously at four locations using low-volume air samplers. Samples are collected at the nearest residence (Heward Ranch-7R), one representative background location (4-R), and two site boundary locations downwind from the mill and tailings area (2R and 10R). Sample filters are changed weekly, or as required by dust loading. The weekly samples are composited quarterly and analyzed for natural uranium, thorium-230, radium-226 and lead-210.

(Rationale: Mill Decommissioning)

### Ambient Radon

Radon-222 concentrations are measured continuously at each of the four air particulate monitoring stations using passive radon monitors (Track Etch devices). The data chips are exchanged and analyzed quarterly.

### Groundwater

Eleven monitoring wells located near the tailings impoundment are sampled quarterly and semi-annually. One monitoring well is hydrologically upgradient from the tailings area (MC-14); one is a drinking water well (WW-20); one well is hydrologically downgradient from the tailings and in the White River Aquifer (WW-22). The remaining ten wells are hydrologically down-gradient from the tailings and in the Surficial Aquifer (MC-7, RPI-20A, RPI-21B, MC-6, 5A-1, RPI-42A, MC-9, RPI-19B, NP-01, and MC-11).

(Rationale: Mill Decommissioning)

The quarterly grab samples are analyzed for chloride, nitrate, sulfate, pH, TDS, and water level. The semi-annual sampling is for arsenic, barium, berillium, radium, chromium, gross alpha, lead, molybdeum, nickel, radium-226 and 228, selenium, thorium-230 and uranium.

#### Surface Water

The surface water monitoring program consists of nine sampling locations: four on Spring Creek (SW-1A, SW-2, SW-3, SW-9), three on the Little Medicine Bow River (SW-4, SW-5, SW-7) and one each on Fox Creek (SW-6) and Mine Creek (SW-8). Grab samples are taken semi-annually at each location, including once during spring runoff. The samples are analyzed for natural uranium, thorium-230, radium-226, lead-210 and polonium-210.

#### Vegetation

Vegetation samples are collected once a year at each of the air particulate monitoring stations. Samples are collected during the growing season and analyzed for radium-226 and lead 210. Only new growth within a 60 foot radius of the air sampling station and representative of vegetation grazed by cattle is sampled.

#### Soil

Soil samples are collected annually at each air particulate monitoring station. Several soil samples, to a depth of approximately one-half inch, are taken within a 15 foot radius of the air sampling station and composited until approximately two pounds is collected. The composites are analyzed for natural uranium, thorium-230, radium-226 and lead-210.

(Rationale: Mill Decommissioning)

### Direct Radiation

Direct radiation is monitored continuously at each air particulate monitoring station using thermoluminescent dosimeters (TLDs). The TLDs are exchanged and analyzed quarterly to determine gamma exposure rate.

#### 5.5.8 Interim Stabilization Procedures

Only one pile of low grade ore remains on the ore pad. This material contains enough moisture (8-12%) to control dusting. During dry weather, haulage roads are routinely sprinkled by mine water trucks to reduce dust emissions.

Tailings beach areas are sprinkled with solution or treated with chemical stabilizer as necessary to control blowing of tailings. The remainder of the tailings impoundment area is covered with solution or overburden. Snow fence has also been used to control blowing tailings.

(Rationale: Mill Decommissioning)

5.5.9 Performance Analysis for Mill Ventilation and Effluent  
Collection Systems

(Deleted. Rationale: Mill Decommissioning)



5.5.10 Mill Site Decommissioning

The Mill Decommissioning Plan, submitted in June 1992, is currently under NRC review.

Table 5-10

MILL DECOMMISSIONING COST ESTIMATE

(Deleted. Rational: Plan Submitted June 1992)

5.5.11 Tailings Reclamation

(Delete Entire Section. Rationale: Plan Submitted October 1993)

Delete pages 5-40 through 5-53. This includes Figures 5-9, 5-11, 5-12, 5-13, 5-14, and 5-15.

6.0 Accidents and Contingency Response Plans

6.1 Mill Accidents Involving The Release Of Radioactive Materials

(Delete. Rationale: Mill Decommissioning)

## 6.2 ACCIDENTS INVOLVING THE TAILINGS RETENTION SYSTEM

Procedures followed for accidents involving the Tailings Retention System are addressed in the Spill Prevention and Counter Measure Plan. A copy of this plan is in Appendix C of this document.

An example of a tailings accident with moderate consequences would be a release from the tailings pond that does not reach a watercourse. Such an accident would be detected soon because of on-site security surveillance.

An example of a severe accident involving the release of tailings would be a release from the tailing pond that reaches a watercourse. A release of tailings from the impoundment could be caused by an earthquake, tornado or flood. The probability of earthquake and tornado damage is very low. The possibility of a failure of the tailings dam by flooding is remote because of the semiarid climate of the area, the small rainfall catchment area upstream of the tailings ponds, and the 4.5 feet minimum freeboard maintained at all times. Furthermore, dam No. 5 was designed to withstand back-to-back probable maximum precipitation (PMP) and maximum recorded 24-hour precipitation events (3).

(Rationale: Mill Decommissioning)

### 6.3 TRANSPORTATION ACCIDENTS

Pathfinders response to transportation accidents, fires, natural disasters, etc. is contained in the Emergency Response Plan included as Appendix D of this document.

(Rationale: Mill Decommissioning)

#### 6.4 FIRES

(Deleted. Rationale: Mill Decommissioning)

#### 6.4 Training

Training for response to a radiological accident is covered during the new employee radiation safety course and during annual radiation safety refresher training.

Training for response to industrial emergency situations is presented to each employee during the initial and refresher safety training required by Pathfinder. Industrial safety is also discussed during monthly "tool box" safety meetings.

(Rationale: Mill Decommissioning)



References - Section 6.0

1. R.G. Beebe, "Tornadoes in Wyoming", May 1, 1980, (Unpublished paper, National Oceanic and Atmospheric Administration).
2. Unites States Nuclear Regulatory Commission, Final Generic Environmental Impact Statement on Uranium Milling, September 1980, pp. 7-13.
3. Dames & Moore, "Report on Design of Proposed Tailings Dam and Seepage Evaluation - Shirley Basin Mine", April 1975, pp. 18-20.

## 7.0 Quality Assurance

The quality assurance program for environmental monitoring is described in the Environmental department quality Control manual. A description of quality assurance programs for radiation safety is included in Sections 4.0 of this license amendment application.

(Rationale: Clarification)

REFERENCES - -SECTION 7.0

1. "Environmental Quality Assurance Program for Pathfinder Mines Corporation Shirley Basin Mine". (Reviewed annually by Pathfinder)

## 8.0 Alternatives

Because the proposed action is an amendment of the source material license for an existing uranium facility, an evaluation of alternative facility sites is not appropriate.

(Rationale: Clarification)

APPENDIX A

STAFF QUALIFICATIONS

Lee Nugent

General Manager Reclamation

Education:

Bachelor of Science - Mining Engineering  
University of California - Berkeley, California

Engineering and Management Course  
University of California at Los Angeles

Master of Business Administration - incomplete due to  
reassignment.  
University of Utah - Salt Lake City, Utah

Experience:

1975-Present Pathfinder Mines Corporation - Lucky Mc Mine

General Manager, Reclamation, for the Shirley Basin and Lucky Mc Mines. Report to the Senior Vice President and is responsible for the management of the mine and tailings facilities which are now in the reclamation and decommissioning mode.

1972-1975 Utah International, Inc. San Francisco, California

Executive Engineer - Reported to senior vice president of the Australasia Division. Attended board meeting of Joint Ventures and affiliated companies. Required travels to Australia and Japan. Supported management activities with respect to parent corporation board reporting responsibilities. Australian mines were large strip coal mines with wash plants producing metallurgical coal for export and a moderate size iron ore mine producing metallurgical coal for export and a moderate size iron ore mine producing direct shipping ore for export.

Jack D. Wadsworth

Chief Engineer

Education

B.S. Civil Engineering, University of Missouri, Columbia.

9 Hrs. toward M.S. Civil Engineering, University of Southern California, Los Angeles.

Extension courses: Evaluation and Investment Decision Methods; Mineral Law; Computer Applications and the Managerial Grid Seminar.

Experience

1978 - Present                      Pathfinder Mines (COGEMA, Resources Inc.),  
Shirley Basin

Chief Mine Engineer - Responsible for management of the Engineering Department at the Shirley Basin Mine in Wyoming. The department is responsible for all phases of mine planning, including design, geology, scheduling, equipment selection, mine department operating and capital budgets, and supervision of construction projects. Engineering also assists other departments in such areas as environmental permitting, surveying, and land acquisitions.

1975 - 1978                      Continental Oil Company, Denver, CO

Senior Mining Engineer - Main responsibility was to monitor the mining portion of a feasibility study for a large open pit uranium mine in Niger, Africa. Was also responsible for negotiating a toll milling contract and a joint operating agreement for Conoco's Conquista Uranium Operation in Texas. Other responsibilities included coordinating the mining and milling portions of the Minerals Department annual budgets.

E. Stratford Murdock

Environmental Coordinator/RSO

Education

B.S. Political Science, University of Utah (1965).

M.S. Geography, University of Utah (1968).

Attended MESA Training Course - "Radiation Monitoring and Control".

Attended Radiation Safety Officers School 10 CFR, Part 20 Training.

Experience

Nineteen years experience as Environmental Coordinator at Pathfinder's Shirley Basin Mine and Utah International's Navajo Mine (Farmington, N.M.). Seven years experience as a natural resource specialist, U.S. Bureau of Land Management, in Arizona and Utah.

Five years acting RSO and overseeing the Radiation Safety programs at Shirley Basin for Pathfinder Mines Corporation.



Ray Aherens

Environmental Engineer

Education

High School Diploma

2 Years College work

Experience

Forty-one years, heavy equipment, mining and construction work. Three years working at Shirley Basin for the Environmental Department doing air, water, vegetation, and soil monitoring.

Don Sears

Mill Tailings Employee

Education

Graduated: Natrona County High School in 1969.

Graduated: Casper College in 1973, Associate of Applied Science in Business Management.

United States Basic Military Training:  
August 1, 1971 to September 10, 1971

Administrative Specialist Course Wyoming Air National Guard  
September 22, 1971.

Honorable Discharge Wyoming Air National Guard, June 1977.  
Staff Sergeant, 153d TAC ALFT GP.

Experience

April 1973 to Present - Pathfinder Mines Corporation working as a mill laborer.

6-25-73 Utility Mill Operator  
Trained in barreling operations, shipping, and cleanup.

7-23-73 Mill Operator  
Trained in counter current decantation circuit, ball mill grinding circuit, leach circuit, and precipitation circuit.

2-4-74 Mechanic Apprentice  
Trained in welding and cutting operations, plastic and fiberglass repair.

6-30-75 Mill Mechanic  
Trained in several types of pump repair and related equipment such as air compressors, tanks, gears and belts, speed reduces, air operated valve, yellow cake dryers, water meter repair, submersible pump repair, and basic electrical wiring for installation of motors for submersible and vertical pumps. Also trained to operate a 988 Cat Loader, D4 Cat Blade, Cat Ore Trucks, and White Flatbed Haul Truck.

Bob Poyser

Senior Environmental Engineer (Corporate)

Education

M.P.H. Degree Environmental Health, University of California at Berkely (1978).

B.A. Degree Chemistry, Smith College (1975).

Completed five-week training course in Applied Health Physics at Oak Ridge Associated Universities. Attended "Uranium Resources and Technology" at Colorado School of Mines.

Experience

Senior Environmental Engineer at Pathfinder since July 1981. Four years experience on corporate environmental staff of Utah International Inc. Two years experience in occupational health research at Stanford Research Institute.

APPENDIX B

EMPLOYEE RADIATION SAFETY INSTRUCTIONS

Control of Exposure

Employee Radiation Safety Instructions

Shirley Basin

1. Employees shall wash their hands thoroughly before eating.
2. Skin eruptions, cuts, abrasions, or open wounds shall be covered with a sterile bandage while working in the tailings area.
3. Eating is allowed only in the following areas:
  - a. Main office;
  - b. Shop Maintenance Room;
  - c. Old nurses office
4. Good hygiene and common sense will go far to prevent exposure to radioactive materials.
5. Tailings workers will insure safe and secure footing while working on beaches or where "quicksand" conditions may exist.

## TLD Program

### Employee Radiation Safety Instructions

1. Each tailings employee will be issued and will wear a TLD Badge.
2. Wear only your own badge.
3. The badge will be worn on the outside layer of clothing, clipped to the collar, flap of the jacket or shirt, or one of the pockets above the waist. The badge should be visible at all times.
4. Do not wear your badge on your belt or inside a pocket.
5. If you lose your badge notify the Radiation Safety Office immediately. A replacement will be issued.
6. If you find a badge, return it to the Radiation Safety Office, do not put it back on the rack.
7. If your badge becomes splashed with tailings solution, or contaminated, wipe it off promptly. Do not wash the badge, it may become water damaged.

## Respiratory Protection

### Employee Radiation Safety Instructions

#### Shirley Basin Facility

1. Respirators will be qualitatively (smoke test) fitted for each employee annually. You may wear only the respirators for which you have been fitted.
2. Respirators are available in the maintenance office. Cartridges will be issued by Radiation Safety personnel. If a special cartridge (for example, ammonia or acid gases) is needed, it may be obtained at the Radiation Safety Office. For emergency use, some special combination cartridges are also located in the Radiation Office. Before using any special cartridges read the label to make sure you are using the correct one.
3. Particulate cartridges may be reused, other types or cartridges will not be reused. After use, particulate cartridges will be cleaned by the Radiation Safety Office, inspected and returned to the respirator rack. You must have your name on your cartridges. If at any time you notice that it is more difficult to breathe or your cartridges become wet, return them to the Radiation Safety Office and you will be issued new cartridges.
4. Do not use another person's respirator.
5. Always check your respirator before putting it on to insure that the cartridge gaskets are in place, and that the inhalation and exhalation valves are working properly.
6. Do not attempt to put a respirator on over a hard hat or glasses.
7. Put your respirator on before entering the contaminated area.
8. All mill employees are required to clean shave the areas of the face where the respirator seals to the skin.
9. Respirators may be worn by anyone at any time they desire; however, certain respirators are worn when designated by the the RSO, under certain conditions. These respirators and conditions are outlined below.
  - a. A half-mask may be worn when ISL waste is deposited.
  - b. A half-mask must be worn when designated by the RSO while using heavy earthmoving equipment on dry tailings.

Protection Clothing (Coveralls)

Employee Radiation Safety Instructions

Shirley Basin Facility

1. Coveralls are for use while working and are not to be worn home or taken off the property.
2. There is a washing machine and dryer available for laundering coveralls as well as other work clothing contaminated with mud or tailings solutions. These laundering facilities are for tailings workers only.
3. Cloth overalls are issued to individuals on a payroll deduction basis. You will be responsible for laundering your own and keeping them in your locker. If you leave Pathfinder you will be expected to return them or pay for them just like hard hats and non-prescription safety glasses.
4. Coveralls worn-out through fair wear and tear will be replaced by Pathfinder. Damages other than fair wear and tear will be paid for by the individual.
5. Employees should wear clean coveralls each operating shift.
6. Disposable coveralls will be issued for special work orders. These overalls are issued without cost. They should be disposed of after each use.



Bioassay Program

Employee Radiation Safety Instructions

Shirley Basin Facility

Uranium in Urine

1. Urine specimen bottles will be filled on the morning of the date written on the bottle and returned to the Radiation Safety Office that same day.
2. If you are absent from work or on vacation the day the specimen is due to be collected contact Radiation Safety personnel for instructions.
3. Try to fill the bottle at least half full but leave a half inch of space at the top.
4. Tighten the bottle cap securely and deliver the specimen to the Radiation Safety Office.

In-Vivo Lung Counts

(Delete. Rationale: Mill Decommissioning)

Personnel Monitoring Procedure

Employee Radiation Safety Instructions

Shirley Basin Mill

1. You must monitor yourself every day at the end of your shift.
2. The machine is always on, all that is necessary is to run the detector very slowly over your exposed skin and clothing.
3. The detector must be in contact with the surface being monitored.
4. Give special attention to your shoes or boots while monitoring.
5. Sign your name in the log and put a check in the "monitor" column.
6. If you shower before you leave put a check in the "shower" column. It would be a good idea to check your boots before leaving even though you have showered.
7. The alarm is pre-set to go off if there is contamination present that exceeds limits. If the alarm sounds push the "Alarm Reset" button and remonitor the area that set the alarm off. If the alarm goes off again the part being monitored must be decontaminated. The following procedures should be used.
  - A. Boots-wash off, remonitor.
  - B. Clothing-remove the contaminated article and wash it, remonitor.
  - C. Skin-if your hands are contaminated wash them and remonitor, if other portions of your skin are contaminated take a shower then remonitor.

In any case NOTIFY THE RADIATION SAFETY OFFICER.

8. The detector is a delicate piece of equipment, please use it carefully. If the monitor malfunctions (alarm sounds continuously, meter doesn't work, alarm sounds for no apparent reason, etc.) turn the machine off and notify the RSO.

**APPENDIX C**  
**SPILL PREVENTION AND COUNTER MEASURE PLAN**

SPILL PREVENTION CONTROL & COUNTERMEASURE PLAN

Part 1

General Information

1. Name of facility Pathfinder Mines Corporation
2. Type of facility Uranium Mine and Processing Mill
3. Location of facility Shirley Basin, Wyoming 82615
4. Name and address of owner or operator:  
Name Pathfinder Mines Corporation  
(Subsidiary of COGEMA Resources Inc.)  
Address Shirley Basin Mine  
Shirley Basin, Wyoming 82615  
E. L. Nugent, General Manager, Reclamation
5. Designated person accountable for oil spill prevention at facility:  
Name and title: Gene Jones - Production Superintendent
6. Facility experienced a reportable oil spill event during the twelve months prior to Jan. 10, 1974 (effective date of 40 CFR, Part 112). (If YES, complete attachment #1). NO

MANAGEMENT APPROVAL

This SPCC Plan will be implemented as herein described.

Signature:   
Name: E. L. Nugent  
Title: General Manager, Reclamation

CERTIFICATION

I hereby certify that I have examined the facility and, being familiar with the provisions of 40 CFR, Part 112, attest that the SPCC Plan has been prepared in accordance with good engineering practices.

George L. Hoffman

  
Signature of Engineer

Registration No. 2402

State Wyoming

Part 1  
General Information

7. Potential Spills - Prediction & Control:

<u>Source</u>	<u>Major Type of Failure</u>	<u>Total Quantity</u>	<u>Direction of Flow</u>	<u>Secondary Containment</u>
1. Tailings	Dam failure	3,000 ac. ft.	N. East	None
2. Delivery Truck (Petroleum Products and Propane)	Truck Unloading		N. West	Tailings Dam
3. Diesel Storage tank (ANFO)	Tank Rupture	2,500 gals.	North	Tailings Dam
4. Diesel Storage (NW of lube bay)	Tank Rupture	51,000 gals.		Secondary containment in place Tailings Dam
5. Diesel Storage (mill generator room)	Tank Rupture	300 gals.		
6. Antifreeze	Tank Rupture	17,000 gals.	N. East	Tailings Dam
7. Waste Antifreeze (outside lube bay)	Tank Rupture	10,000 gals.	N. East	Tailings Dam
8. Mineral Spirits	Tank Rupture	500 gals.	North	Tailings Dam
9. Above-ground Gasoline	Tank Rupture	8,500 gals.	N. West	Secondary containment in place
10. 15-40W Oil (wash bay)	Tank Rupture	2,963 gals.	N. East	Tailings Dam
11. 10W Oil (wash bay)	Tank Rupture	2,963 gals.	N. East	Tailings Dam
12. 40W Oil (wash bay)	Tank Rupture	2,963 gals.	N. East	Tailings Dam
13. Waste Oil (wash bay)	Tank Rupture	5,500 gals.	N. East	Tailings Dam
14. Waste Oil (outside lube bay)	Tank Rupture	10,000 gals.	N. East	Tailings Dam
15. Waste Oil (outside mine shop)	Tank Rupture	8,500 gals.	N. East	Tailings Dam
16. Heater Oil (wash bay)	Tank Rupture	200 gals.	N. East	Tailings Dam
17. Auto. Transmission Fluid (wash bay)	Tank Rupture	2,963 gals.	N. East	Tailings Dam
18. PCB Transformers	Leakage	-	-	Quonset hut and #10 transformer have secondary containment in place
19. ISL Waste	Truck Spill	10 yds <sup>3</sup>	N/A	In place

Part 1  
General Information

8. Containment or diversionary structures or equipment to prevent oil from reaching navigable waters are installed.
9. Inspections and Records
  - a. Inspections are performed and documented quarterly.
  - b. The written documentation will be signed by the appropriate supervisor or inspector.

Discussion: The fuel storage areas are routinely visually inspected for leaks and spills each quarter. In addition, operating personnel make daily or weekly inspections of tanks for leaks. These inspections are not recorded, but are part of an everyday work routine.
10. Personnel Training and Spill Prevention Procedures
  - a. Personnel are properly instructed in the following:
    1. Operation and maintenance of equipment to prevent oil discharges.
  - b. Scheduled prevention briefings for the operating personnel are conducted frequently enough to assure adequate understanding of the SPCC Plan. For example, fire fighting and damage control classes are held annually. During these classes, instruction is given regarding the spill prevention control and countermeasure plan.

Part II  
Design and Operating Information

- A. Facility Drainage
  - 1. Drainage from the shop and mill areas, where a spill is most likely to occur, is toward the tailings impoundments.
- B. Tank Loading and Unloading Occurs at the Facility
  - 1. The containment system will hold the maximum capacity of any single compartment of a tank truck loaded/unloaded in the plant. All tanks are arranged to drain into a containment area which does not drain to a navigable waterway or potable water supply.
  - 2. The delivery truck operator is responsible for disconnect before moving his truck.
  - 3. Drains and outlets on tank trucks and tank cars are checked by the operator for leakage before loading/unloading or departure.
- C. Facility Transfer Operations, Pumping, and In-Plant Process
  - 1. Corrosion protection for buried pipelines:
    - a. Pipelines are protected with cathodic protection.
- D. Security
  - 1. The facility is fenced.
  - 2. The entrance gate is locked when the plant is unattended or not in production.
  - 3. All storage tanks are located well within the facility, and should a rupture or other inadvertent spill occur, all material would be wholly contained on site. A full-time security guard is employed.
  - 4. Discussion of the lighting around the facility: Lighting around the facility is adequate and allows proper surveillance of storage and work areas.

OIL SPILL CONTINGENCY PLANS AND WRITTEN  
COMMITMENT OF MANPOWER, EQUIPMENT, AND MATERIALS

In the event of an oil spill, the following manpower, equipment and materials will become available for immediate use:

Manpower

Primary responsibility for initial mobilization of equipment and manpower in the event of a spill on the project lies with the line supervisors. They should immediately request assistance from the Mine Operations Department for necessary earth-moving equipment to contain the spill. The appropriate department head should be notified and any or all of the following: E. L. Nugent, Eugene C. Jones, Jack Stephenson, or Strat Murdock. A timely telephone and written report will be made to:

Water Quality Division  
Wyoming Department of Environmental Quality  
State Office Building  
Cheyenne, Wyoming 82002      Phone 777-7781

and

Environmental Protection Agency  
Permits and Technical Support Branch  
Enforcement Division  
1860 Lincoln Street  
Denver, Colorado 80203      Phone 303-293-1788 (24 hr emergency number)

1. Information required:
  - a. Cause of accident or condition
  - b. Length of expected duration
  - c. Contents of discharge
  - d. Steps already taken and what will be taken to alleviate the problem
  - e. Measures to protect or notify downstream water users
  - f. Any additional monitoring and recording activity
  - g. Steps taken to prevent recurrence

(Continued on next page)



OIL SPILL CONTINGENCY PLANS AND WRITTEN  
COMMITMENT OF MANPOWER, EQUIPMENT, AND MATERIALS

Equipment or Materials

Earth-moving equipment will be immediately available for cleanup operations in the event of a spill. The equipment list will consist of the following:

- Cat D-9 tractors
- Cat 988 front-end loaders
- Cat 35-ton dump truck
- Cat 651 scrapers
- Cat motor graders
- Pickups and other support vehicles
- Rubber tired dozer

Emergency Spill Procedures:

1. Give first aid to injured persons or take precautions to avoid injury to operating personnel.
2. Contain the spill with whatever means immediately available.
3. Notify the Mine Operations Department for equipment and manpower assistance.
4. Record accident details as follows:
  - a. Time of accident.
  - b. Location.
  - c. Kind of spill.
  - d. Who was notified for assistance.
  - e. How spill was contained.
  - f. Were there any injuries.
5. Notify one or all of the following: E. L. Nugent, Eugene C. Jones, Jack Stephenson, or Strat Murdock. One of these four will make a timely telephone call and write a report to EPA and DEQ.

APPENDIX D  
EMERGENCY RESPONSE PLAN

Reviewed	
Initials	Date
E J /	7/25/94

Pathfinder Mines Corporation  
 Shirley Basin Mine  
 Standard Operating Procedure

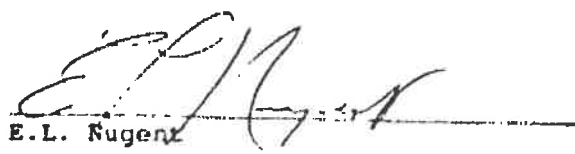
Title: Emergency Response Plan

File: SOPE2.5

Effective: July 26, 1994

INTRODUCTION

THE INTENT OF THE FOLLOWING INFORMATION IS TO PROVIDE A GENERAL COURSE OF ACTION TO BE TAKEN DURING AN EMERGENCY SITUATION AT THE SHIRLEY BASIN MINE. THIS PLAN ASSIGNS RESPONSIBILITY AND AUTHORITY DURING AN EMERGENCY.

  
E.L. Rugent  
General Manager, Reclamation

Revised: July 19, 1994

## Page One/Personnel Responsibilities and Authority

### Personnel Responsibilities and Authority

In the event of an emergency, prompt action by an individual, group of, or all property employees will be necessary to protect lives, prevent injury, and prevent or minimize property damage.

The responsibilities and authority for staff personnel are outlined in the following information. Telephone numbers for various staff personnel are included and should be used for a quick reference during an emergency.

During an emergency, staff personnel are required to keep logs and records concerning the emergency. All information recorded will be submitted to the General Manager, Reclamation or Safety Coordinator.

The detailed responsibilities and authority are outlined below:

A. Emergency Event - Possible emergency situations include tailings dam spills, petroleum products or chemical spills, surface or mine fires, releases of radioactive materials, human injuries resulting from a variety of circumstances.

B. Event Discoverer

Responsibilities:

1. Any employee discovering an emergency situation shall correct or remedy the situation, if it can be done safely.
2. The emergency event shall be brought to the attention of a supervisor as soon as possible after the discovery.

C. Supervisor

1. If an emergency is declared by the supervisor whereby the event cannot be brought under control, the supervisor shall investigate and record the following information.
  - a. Time emergency event was discovered.
  - b. Where emergency event occurred.
  - c. Number and status of persons involved.
  - d. Equipment involved.
  - e. Remedial action taken to alleviate the situation.
2. As soon as practical, the supervisor shall notify and inform the Manager, Personnel & Safety, General Manager, Reclamation and respective Department Head.

**Page Two/Personnel Responsibilities and Authority**

3. The supervisor shall control and direct personnel at the emergency site until relieved by the General Manager, Reclamation, Manager, Personnel & Safety or respective Department Head.

\*\*\*\*\*THE MANAGER, PERSONNEL & SAFETY, GENERAL MANAGER, RECLAMATION, MEDIA COORDINATOR, AND RESPECTIVE DEPARTMENT HEAD WILL ASSEMBLE IN THE CONFERENCE ROOM AS SOON AS POSSIBLE AFTER BEING NOTIFIED.\*\*\*\*\*

**D. General Manager, Reclamation (or designated alternate)**

**Responsibilities and Authority:**

1. As soon as practical following notification of an emergency, the Manager shall meet with the staff, notified through the Safety Coordinator, in the conference room to review and determine a course of action to remedy the situation.
2. The General Manager, Reclamation shall appoint a staff member not directly involved with the emergency to supervise property security during the emergency. The Manager may also authorize the use of leased equipment or contractors during the emergency.
3. The Manager shall notify the corporate office of the emergency situation and advise them of the emergency situation and action being taken to alleviate the problem.
4. The Manager shall consult with the Safety Coordinator and/or the Environmental Coordinator to determine which regulatory agencies must be informed and what information need be provided.
5. The Manager shall notify corporate offices of information to be released to regulatory agencies. After corporate approval has been obtained, the Manager may himself, or through the Safety Coordinator or Environmental Coordinator, release the information to the regulatory agencies. If contact cannot be made with the corporate officials, the Manager shall assume the corporate responsibilities until such contact is made.
6. The Manager shall advise the Shirley Basin Media Coordinator on what information is to be released to the news media.
7. The Manager and Media Coordinator shall obtain guidance and approval for new releases from corporate headquarters. \*Note: See corporate phone listings, page three, Emergency Telephone Numbers.
8. If a government agency assumes control of the emergency, the Manager shall work with the government official and transmit information to the Safety Coordinator or Environmental Coordinator.

E. Safety Coordinator and Environmental Coordinator

Responsibilities and Authority:

1. The Manager; Personnel & Safety shall have the authority to direct any property personnel and appropriate any property equipment to cope with the emergency and recovery from the emergency.
2. The Manager; Personnel & Safety shall obtain a head count and verify the location and condition of each employee on the shift when the emergency occurred. When the head count is complete, the information shall be given to the Manager for review.
3. The Manager; Personnel & Safety and/or Environmental Coordinator shall inform the Corporate Environmental and/or Safety staff of the emergency and status of measures being taken to alleviate the problem.
4. The Manager; Personnel & Safety and/or Environmental Coordinator shall advise the Manager as necessary or as requested during the emergency.
5. The Manager; Personnel & Safety and/or Environmental Coordinator shall inform the various agencies, as required by law, of the emergency after obtaining clearance from the Manager. The Manager; Personnel & Safety and/or Environmental Coordinator may communicate with government agencies if legal time constraints do not allow the Manager's approval of the information. The Manager; Personnel & Safety and/or Environmental Coordinator shall work with and be the liaison for any government agencies' representatives appearing at the property.

F. Shirley Basin Media Coordinator

1. The Media Coordinator shall ensure that the office is manned to meet and direct persons entering the project to the proper area.
2. The Media Coordinator shall have clerical staff available to perform typing, data logging, or other tasks as needed.
3. The Media Coordinator shall set up the conference room for use by the news media personnel during the emergency.
4. The Media Coordinator shall obtain and log the names of all news media personnel involved.
5. The Media Coordinator shall communicate with the Manager or corporate representatives for guidance and directions in preparing statements for release to the media.
6. The Media Coordinator shall release only approved information to the

media.

Page Four/Personnel Responsibilities and Authority

7. The Media Coordinator, as directed by the Manager, shall notify community and public officials of the emergency.

Accommodations and Facilities for the News Media

1. A room shall be designated as the work area for any news media personnel visiting the Shirley Basin Mine.
2. Office supplies, as approved by the Media Coordinator, can be made available to media personnel.
3. The following information shall be made available to the press:
  - a. Organizational chart.
  - b. Published articles on the Shirley Basin operation.
  - c. Employment and payroll levels.

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PRESS RELEASE

AT APPROXIMATELY \_\_\_\_\_ AM OR PM, AN INCIDENT OCCURRED AT THE SHIRLEY BASIN MINE NEAR MEDICINE BOW, WYOMING, INVOLVING THE OPERATION'S \_\_\_\_\_ (whatever the incident is).

THE PROPERTY'S EMERGENCY RESPONSE PLAN HAS BEEN IMPLEMENTED AND OFFICIALS ARE INVESTIGATING THE SITUATION.

NO DETAILS ARE KNOWN AT THIS TIME. MORE INFORMATION WILL BE MADE AVAILABLE AS FACTS BECOME KNOWN.

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G. Shirley Basin Department Heads

1. Advise the Manager; Personnel & Safety as needed.
2. Advise and assist the Manager as requested.

H. Shirley Basin Security

1. Patrol the property or emergency site to prevent unauthorized persons from entering the area.



Page Five/Personnel Responsibilities and Authority

2. Escort unauthorized personnel from the emergency site area or off property. DO NOT use force to escort persons off the property. Call local law enforcement if unauthorized persons will not leave the area.
3. Direct persons requesting information to information center designated by the Media Coordinator.

I. Employee Relatives Liaison - Personnel Supervisor

1. Coordinate the distribution of information on the status of employees to their relatives.
2. Watch over and provide for the needs of the relatives in assigned area.
3. Work with Shirley Basin Security to control entry and exit from the mine property.

Relatives Liaison

Responsibilities:

SERIOUS INJURY

1. If during the course of a major property emergency, Shirley Basin employees become seriously injured, the Relatives Liaison, under direction of the Manager, shall notify the employee's next of kin, as listed in the employee's records, of the employee's situation.
2. Notification may be made in person or by telephone.
3. Information to be relayed to the relative may include:
  - a. Hospital to which employee has been taken.
  - b. Extent of injuries, if known.

NOTIFICATION OF EMPLOYEE'S RELATIVES OF AN EMPLOYEE'S DEATH:

1. As soon as the death of an employee has been verified by a coroner or physician, the Relatives Liaison will, if possible, accompany local officials to the home of the deceased to inform next of kin.
2. UNDER NO CIRCUMSTANCES IS A DEATH NOTIFICATION TO BE MADE BY TELEPHONE.

J. Telephone Operator

Responsibilities:

1. Answer and log all incoming calls. The following information is required on each incoming phone call:
  - a. Time of call.
  - b. Caller's name and affiliation.
  - c. Person to whom call is transferred.
  - d. Type of information given.
2. The operator shall direct all calls from employee's relatives to the Relatives Liaison.
3. The operator shall direct all media requests to the Media Coordinator or read a prepared answer for such requests to the caller.
4. The operator shall direct all other calls as directed by the Manager.
5. The operator will report directly to the Manager.

K. Release of Information to News Media

1. Only the Manager and the Media Coordinator may talk to and release information to the news media.
2. Only information approved by the Manager may be released to the news media.
3. Early in the emergency, and if conditions warrant, a previously prepared news release, which has been reviewed and approved by the Manager, may be issued to the news media.
4. All press releases are to be in written form and be a concise statement of pertinent information about the emergency and approved by the Manager. Short verbal statements can be made for clarification purposes in a press release. Speculative comments are to be avoided at all times.
5. If conditions warrant, the Manager may authorize, with corporate approval, the following:
  - a. An interview session between the media and Manager.
  - b. A site visit by the media, if no hazards exist.

Page Seven/Personnel Responsibilities and Authority

6. At least two members of the Shirley Basin staff shall be present at all news releases. One member shall be the Media Coordinator or Manager, who shall make the release. The second staff member shall make no comments and shall record all questions and answers to and from the Manager or Media Coordinator.

L. Telephone Inquiries by Employee's Relatives

1. If the telephone operator receives a call from an employee's relative, on the status of the employee, the operator will transfer the call to the Relatives Liaison.
2. The Relatives Liaison will talk with the relative and try to answer their questions. The Liaison may confirm that the employee is safe if the verified personnel list has been obtained from the Manager or Media Coordinator. If the relative has not been previously notified as per the Notification of Injury, the Liaison may, if verified, inform the relative of the injury or the employee.

M. Visitation and Waiting of Employee's Relatives at the Mine Site

Authority:

1. Security will escort any visiting employee's relative to the Safety and Personnel Office.
2. The Relatives Liaison shall be contacted and meet with the relatives in the Safety and Personnel Office. Information on the employee in question may be passed on to the relative by the Relatives Liaison.
3. Relatives may wait during the emergency in the Safety and Personnel Office or the area designated by the Media Coordinator.

## Emergency Procedures

### Death

1. Notify Safety Manager -- K. R. Hurley -- 237-0055
  2. Notify Reclamation Manager -- E. L. Nugent -- 856-3509  
Mills Office -- 234-5019  
Lucky Mc Mine -- 457-6626  
Mobile-Riverton -- 850-8450  
Mobile-Casper -- 267-1357
  3. Notify respective Department Head
  4. Management Personnel must notify Cogema Resources -- Andre Coste -- (306)244-2554
  5. Safety Manager will notify:
    - a. State Mine Inspector
    - b. Carbon County Coroner
    - c. Carbon County Sheriff's Office
  6. IMPORTANT NOTE: DO NOT rearrange or remove anything from the accident scene. Investigate thoroughly and document all information.
- 

### Suspect Death

1. Administer necessary first aid
  2. Notify Safety Manager -- K. R. Hurley -- 237-0055
  3. Notify Reclamation Manager -- E.L. Nugent -- 856-3509  
Mills Office -- 234-5019  
Lucky Mc Mine -- 457-6626  
Mobile-Riverton -- 850-8450  
Mobile-Casper -- 267-1357
  4. Notify respective Department Head
  5. Management Personnel must notify Cogema Resources -- Andre Coste -- (306)244-2554
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### Serious Injury

1. Administer first aid
2. Notify Safety Manager -- K. R. Hurley -- 237-0055
3. Notify Mine Manager -- E.L. Nugent -- 856-3509  
Mills Office -- 234-5019  
Lucky Mc Mine -- 457-6626  
Mobile-Riverton -- 850-8450  
Mobile-Casper -- 267-1357
4. Notify respective Department Head
5. Management Personnel must notify Cogema Resources -- Andre Coste -- (306)244-2554
6. Call Natrona County Memorial Hospital -- 577-7201
  - a. Describe injury.
  - b. State that injury is covered by Worker's Compensation.
  - c. If injured indicates a preference for a doctor, give that

- information to whomever you are speaking.
- d. State estimated time of arrival at hospital.
  7. Notify Highway Patrol (265-9488) or Sheriff's Office (234-1581) for an escort if required.
  8. Document all relevant information and complete the required accident form.
  9. DO NOT rearrange or remove anything from the accident scene until the Manager; Personnel & Safety or his representative has instructed you to do so.
- 

Equipment Damage or Fire

1. Call Safety Manager -- K. R. Hurley -- 237-0055
2. Call respective Department Head
3. DO NOT rearrange or remove anything from the accident scene until the Safety Manager or his representative has instructed you to do so.
4. The Safety Manager will advise the proper personnel.

Tailings Dam Failure

1. Take immediate action to contain the spill. Mobilize equipment and personnel.
2. Notify E. L. Nugent
 

- Reclamation Manager	-- 856-3509
Mills Office	-- 234-5019
Lucky Mc Mine	-- 457-6626
Mobile-Riverton	-- 850-8450
Mobile-Casper	-- 267-1357
3. Notify J. D. Wadsworth - Chief Mine Engineer -- 235-4759
4. Notify E. S. Murdock - Environmental Coord. -- 266-1938
5. Notify E. C. Jones - Mine Department -- 235-1148
6. Notify the Nuclear Regulatory Commission
 

a. NRC, Region IV, Arlington, Texas	(817) 860-8106
b. NRC, Washington, DC	(301) 504-3439
c. NRC, Emergency Operation, Washington, DC	(301) 951-0550

\*Notification of only one of the above is necessary. Be prepared to give the following information: (1) area of spill; (2) preventative measures being taken to contain spill. Notification will be made by the Environmental Coordinator or his designated representative.

Release of Radioactive Material

1. Take immediate action to:
  - a. Protect personnel from the material.
  - b. Preclude any additional release.
  - c. Contain released material.
2. Notify E. L. Nugent
  - Reclamation Manager -- 856-3509
  - Mills Office -- 234-5019
  - Lucky Mc Mine -- 457-6626
  - Mobile-Riverton -- 850-8450
  - Mobile-Casper -- 267-1357
3. Notify J. D. Wadsworth - Chief Mine Engineer -- 235-4759
4. Notify E. S. Murdock - Environmental Coord. -- 266-1938
5. Notify E. C. Jones - Mine Department -- 235-1148
- 6.\* Notify the Nuclear Regulatory Commission
  - a. NRC, Region IV, Arlington, Texas (817) 860-8106
  - b. NRC, Washington, DC (301) 504-3439
  - c. NRC, Emergency Operation, Washington, DC (301) 951-0550

\*Notification of only one of the above is necessary. Be prepared to give the following information: (1) area of spill, (2) preventative measures being taken to contain spill. Notification will be made by the Environmental Coordinator or his designated representative.

Page One/Emergency Telephone Numbers

Shirley Basin Mine  
Department Heads

E. L. Nugent	--	Reclamation Manager	--	856-3509
		Mills Office	--	234-5019
		Lucky Mc Mine	--	457-6626
		Mobile-Riverton	--	850-8450
		Mobile-Casper	--	267-1357
Kenneth R. Hurley	--	Safety & Personnel Department	--	237-0055
Eugene C. Jones	--	Mine & Maintenance Department	--	235-1148
E. Stratford Murdock	--	Environmental Dept	--	266-1938
Jack D. Wadsworth	--	Engineering Dept	--	235-4759

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State Mine Inspector  
Phone Numbers

Donald Stauffenberg	--	Inspector	--	(307) 856-3470
Patsy Lowseth	--	Secretary	--	(307) 362-5555

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Carbon County Law Enforcement

Sheriff	--	Rawlins	--	(307) 324-2776
Deputy Sheriff	--	Medicine Bow	--	(307) 379-2424
Highway Patrol	--	Rawlins	--	(307) 324-2249
Highway Patrol	--	Medicine Bow	--	(307) 379-2525

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Carbon County Coroner

Coroner's Office	--	Rawlins	--	(307) 324-2611
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Page Two/Emergency Telephone Numbers

Natrona County  
Law Enforcement

Sheriff	--	Casper	--	234-1581
Highway Patrol	--	Casper	--	Emergencies 265-9488

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Medical

Project Ambulance	--		--	Ext. 202, 0
Natrona County Memorial Hospital	--	Emergency Room	--	577-2425
	--	Life Flight	--	1-800-442-2222

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\*Nuclear Regulatory Commission

Region IV, Arlington, Texas	--		--	(817) 860-8106
Washington, DC	--		--	(301) 504-3439
Emergency Operation, Washington, DC	--		--	(301) 431-0550

\*Note: Call only with authorization from either the Mine Manager, Environmental Coordinator, or their designated representative.

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Media Coordinators

John D. Atkins	--	Senior Governmental & Public Affairs Representative	--	634-0556 Home 635-1226 Office
Jack D. Wadsworth	--	Project Media Coordinator	--	235-4759 Home Ext. 230 Office

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Page Three/Emergency Telephone Numbers

Pathfinder Mines Corporation

T. W. Pennington	--	General Counsel & Secretary	--	(301) 986-8585 Office
			--	(301) 530-5537 Home
Michel Poissonnet	--	President	--	(306) 244-2554 Office
Andre Coste	--	Sr. Vice President	--	(306) 244-2554 Office

Relatives Liaison Committee

Media Coordinator	--	Jack D. Wadsworth	--	235-4759
Department Head	--	Employee Involved (See Department Head telephone listing)		
Personnel Department	--	K. R. Hurley	--	237-0055

Manager's Alternates

J. D. Wadsworth	--	Chief Mine Engineer	--	235-4759
E. C. Jones	--	Production Superintendent	--	235-1148