SAFETY EVALUATION REPORT

SOURCE AND BYPRODUCT MATERIAL LICENSE

ARIZONA PUBLIC SERVICE COMPANY

PETERSON PROJECT

DOCKET NO. 40-8771
LICENSE NO. SUA-1386

October 1981

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1.0 DESCRIPTION OF PROPOSED ACTIVITIES

By letter dated June 20, 1980, Arizona Public Service Company (APS) applied to the NRC for a Source and Byproduct Material License to construct and operate a Research and Development (R&D) in-situ leach uranium mine and recovery plant in Converse County, Wyoming. The activity will be known as the Peterson Project and is designed to evaluate the technical, economic, and environmental factors involved with in-situ extraction of uranium. Nuclear Assurance Corporation (NAC) will act as operator of the project for APS.

APS-NAC proposes to perform a R&D test during which uranium will be leached from a limited volume of subsurface ore-bearing sandstone from multiple wells located in up to four well field patterns within a one acre (0.4 hectare) area. The uranium extraction facility will be designed to operate at a maximum extraction pumping rate of 50 gpm (3.2 liters/second), and will process uranium-enriched solution pumped from the wells. Two small solar evaporation ponds will be used to contain process wastes. It is estimated that the test will be completed within one year.

The leaching process is accomplished by injecting an oxidant-charged leach solution (lixiviant) through wells into the mineralized zone. The natural uranium precipitation process that deposited the uranium in the host sandstone is reversed when the lixiviant contacts the uranium. The metal becomes soluble and mobile, and the resulting uranium-enriched liquor is pumped from recovery wells to a surface processing plant where the uranium is extracted by conventional uranium recovery techniques. After being rejuvenated, the lixiviant is recycled to the mineralized zone to dissolve additional uranium. The production and injection rates will be metered and controlled to ensure that the groundwater flow in the solution mining area will be toward the extraction wells. A system bleed of 0.2 gpm will be used to maintain this control. See Section 3.2 for a further description of recovery plant process operations.

The proposed action is to grant a five-year license authorizing the operation of R&D in-situ leach mining and uranium recovery facilities.

A Negative Declaration and Environmental Impact Appraisal, dated October 1981, and this Safety Evaluation Report will provide the basis for the issuance of a five-year Source Material License.

2.0 REVIEW SCOPE

This document details the staff's review of in-plant radiological safety of the applicant's proposed Peterson Project R&D operation. This review included an evaluation of radiological safety information included in the applicant's submittal, "Supportive Information for Application for Source Material License," which was transmitted to the NRC with cover letter dated June 20, 1980.

An inspection may be conducted by I&E Region IV staff to review APS-NAC's development and implementation of administrative and operating procedures and monitoring programs prior to commencing R&D uranium extraction operations. Any problem areas identified by I&E at that time must be corrected prior to operations startup.

3.0 AUTHORIZED ACTIVITIES

The proposed license will authorize APS to solution mine uranium from a low-grade ore body at a maximum extraction pumping rate of 50 gpm (3.2 lps). The uranium-containing solution will be extracted and concentrated at the onsite process facility into a final U_3O_8 slurry product.

3.1 Facility Description

The proposed R&D site lies within the overall Peterson Project area and is located about midway between Douglas and Glenrock, Wyoming; approximately 16 road miles (26 km) from each town. Orpha, an unincorporated community, is located approximately four miles (6 km) east-southeast of the R&D site. The R&D site is generally located within SE¼ SW¼ Section 26 and NE¼ NW¼ Section 35, T34N, R73W. (See Figures 2.1 and 2.3 enclosed.)

The R&D site encompasses approximately 41.3 acres (17 hectares) within the Peterson Project. Within this area only about 4.5 acres (1.8 hectares) will be subject to intense activity. Of this disturbed area the well field area will include 1.4 acres (0.56 hectares), solar evaporation ponds 1.3 acres (0.52 hectares), process plant and office area 1.2 acres (0.48 hectares), and topsoil stockpile area 0.6 acre (0.24 hectares). In addition, the existing access road connecting County Highway 27 with the R&D site must be improved.

Arizona Public Service Company controls all of the uranium mineral rights immediately adjacent to the R&D site. The surface land use rights are leased by APS, however, the surface lands on and immediately adjacent to the R&D site are owned by Hildebrand, Inc., Douglas, Wyoming.

3.2 Process Operations

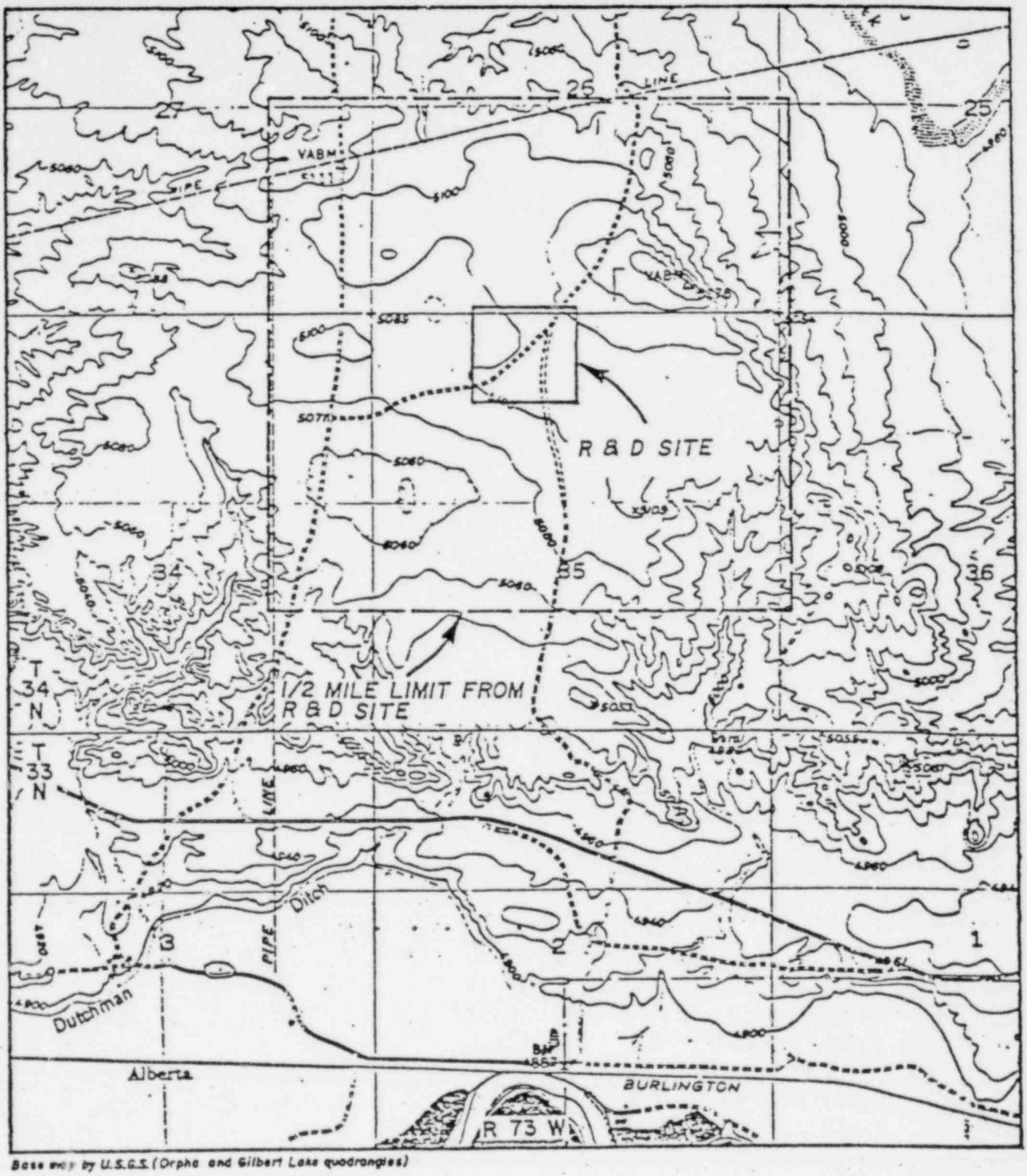
Standard hydrochemical concentration and precipitation processes are planned for use at the R&D operation. APS-NAC proposes to use a lixiviant consisting of sodium bicarbonate and oxygen or hydrogen peroxide in water. The recovery process will consist of three sequential circuits: the well field leaching circuit, the ion exchange elution/precipitation circuit, and the product preparation area. The R&D plant will be designed to operate at a maximum capacity of 50 gpm (3.2 lps). Figure 3.2 presents a process flow chart for the R&D operation and Figure 3.3 shows the facility layout. A yellowcake slurry will be produced and shipped to other facilities for final product preparation. A license condition will require that any changes in the process circuit shall require the approval of the Safety and Environmental Affairs Manager and the Uranium Recovery Licensing Branch.

3.2.1 Well Field Leach Circuit

A well field area of approximately 1.5 acres (0.6 hectares) has been designated just west of the process plant (See Figure 3.4). Within this area two well fields will be constructed on a smaller area not to exceed one acre (0.4 hectares). Within each well field, two five-spot patterns will be placed adjacent to each other so that two injection wells are shared by the two


R & D SITE
5 miles (8 km)
25 miles (40 km)
50 miles (80 km)
THUNDER BASIN
NATIONAL
GRASSLAND
CONVERSE
Casper
Glenrock
Orpha
Douglas
Evansville
Midwest
Edgerton
Linch
Kaycee
Natrona
Wright
Reno Jct.
Pine Tree Jct.
Lance Creek
Manville
Lusk
Los Springs
Shawnee
Keeline
Shirley Basin
Wheatland
Guernsey
Sunrise
Fort Laramie
Lingle
Veteran
Rochelle
Hampshire
Clareton
Morrisey
Mule Cr. Jct.
Alcova
Taken from the Wyoming Highway Commission Map
1973
Location Map
Wyoming

Figure No. 2.1



Base map by U.S.G.S. (Orpha and Gilbert Lake quadrangles)

N

Figure No. 2.3

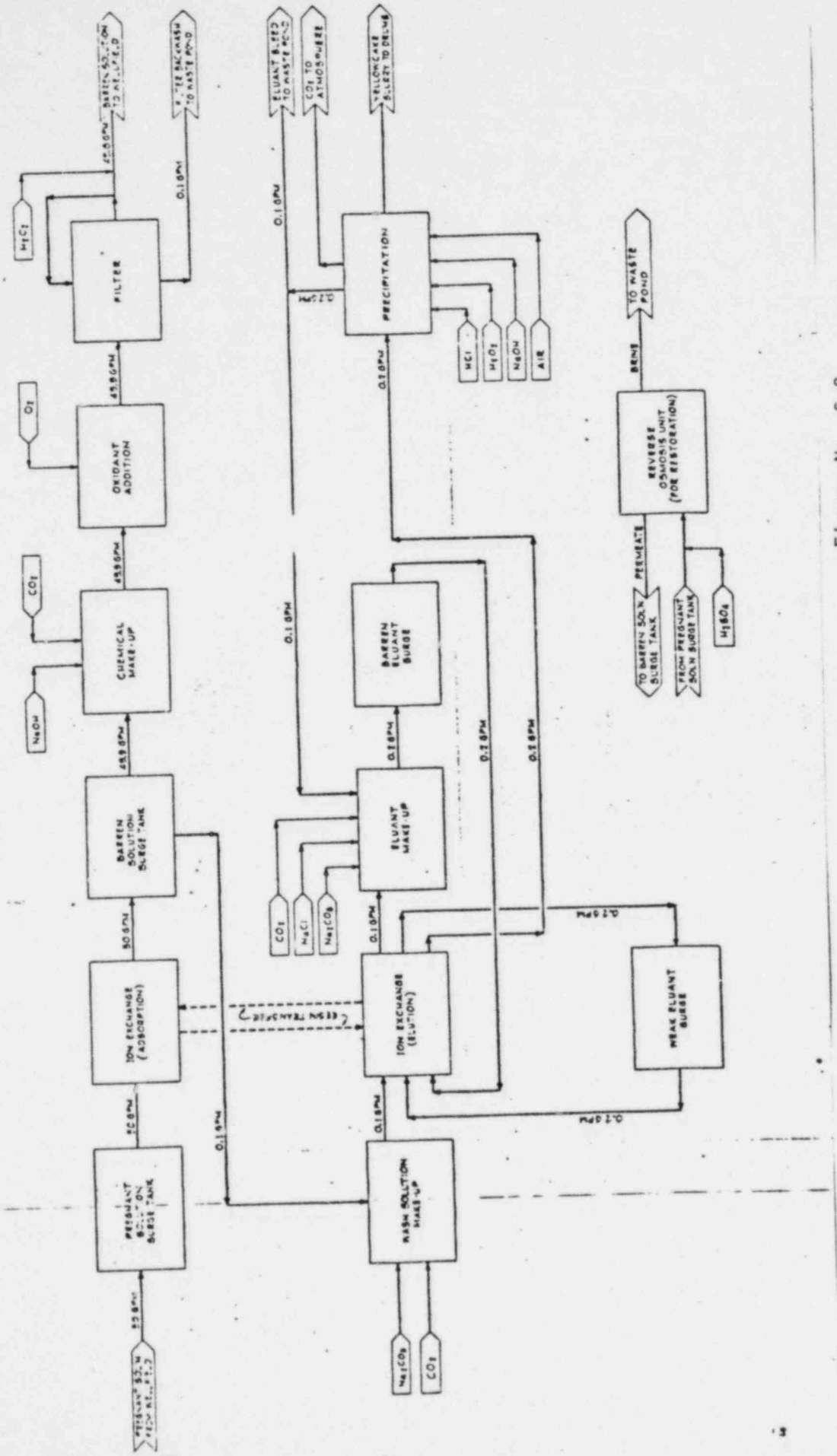
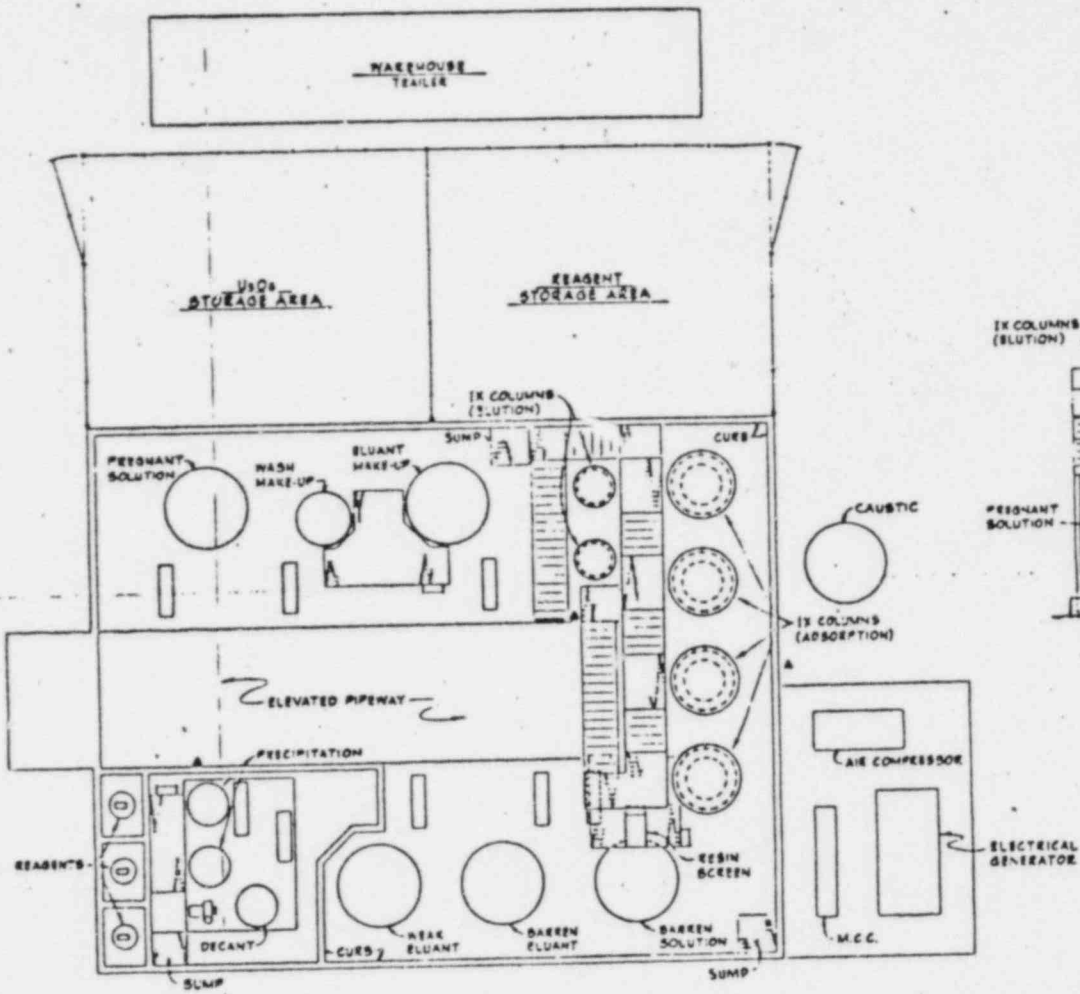
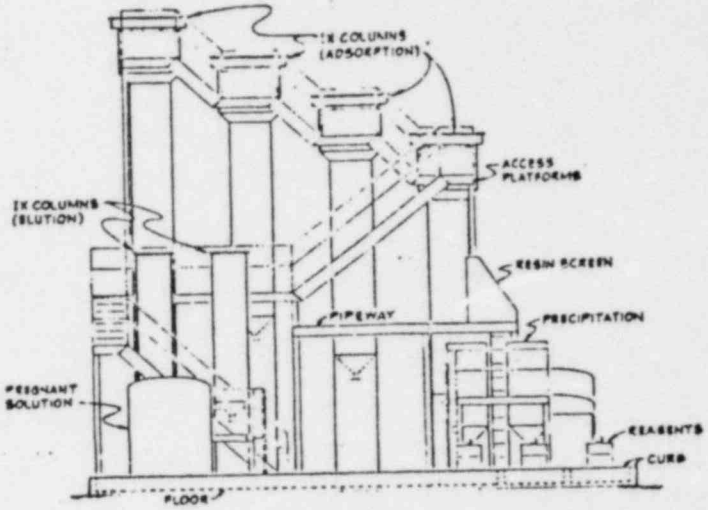

PREGNANT SOLUTION FROM RECOVERY
PREGNANT SOLUTION SURGE TANK
ION EXCHANGE (ADSORPTION)
BARREN SOLUTION SURGE TANK
CHEMICAL MAKE-UP
OXIDANT ADDITION
FILTER
HCl
O2
CO2
NaOH
NaCl
Na2CO3
ELUANT MAKE-UP
BARREN ELUANT SURGE
ION EXCHANGE (ELUTION)
WEAK ELUANT SURGE
WASH SOLUTION MAKE-UP
PRECIPITATION
REVERSE OSMOSIS UNIT (FOR RESTORATION)
TO BARREN SOLN SURGE TANK
PERMEATE
FROM PREGNANT SOLN SURGE TANK
BRINE
TO WASTE POND
H2SO4
ELUANT BLEED TO WASTE POND
CO2 TO ATMOSPHERE
YELLOWCAKE SLURRY TO DRYER
AIR
50 GPM
0.1 GPM
0.2 GPM

Figure No. 3.2



PLAN



ELEVATION
LOOKING EAST

A SAFETY SHOWER

0 5 10 15 FEET

OFFICE, LAB, AND CHANGEROOM AREA

Figure No 3.3

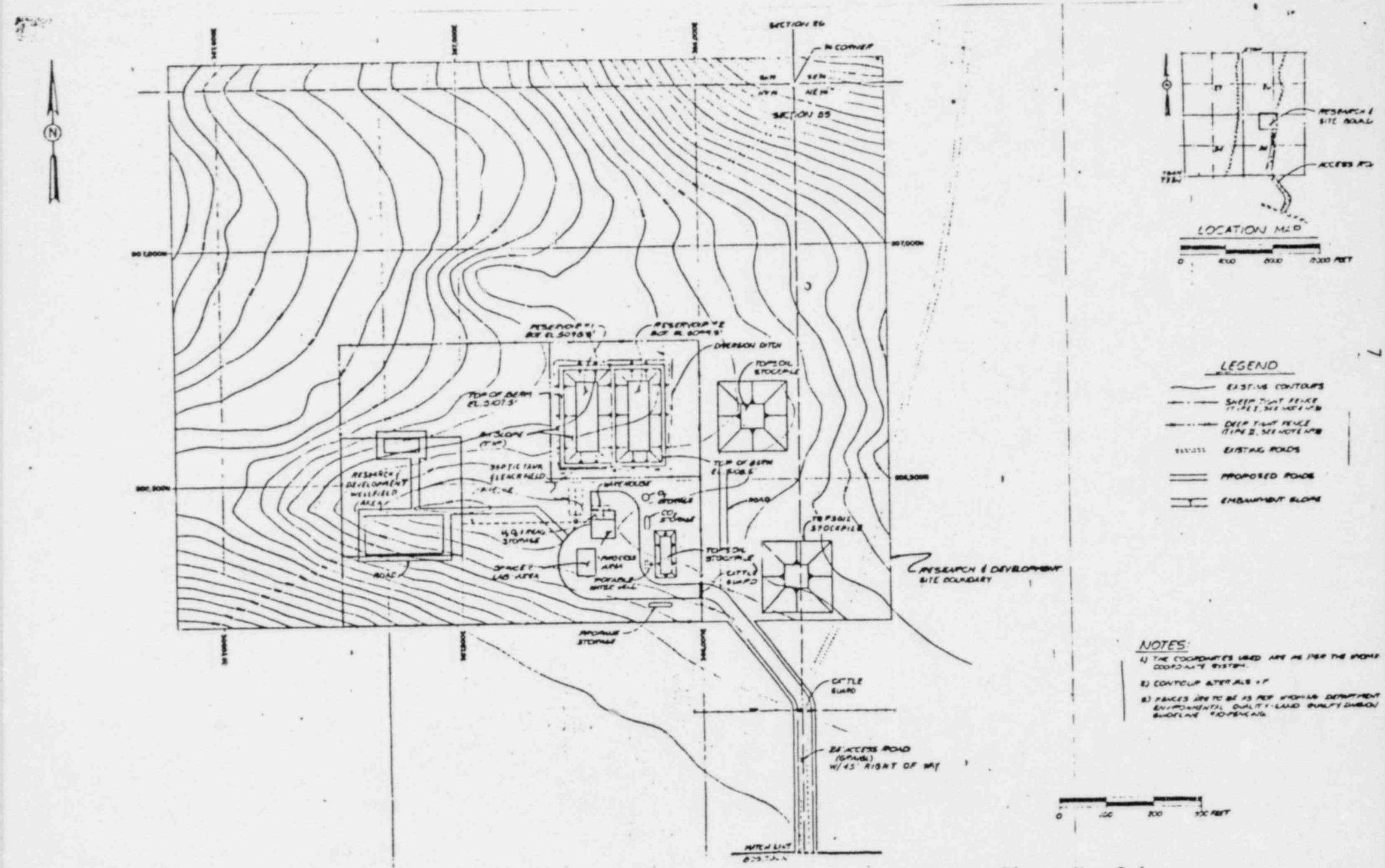

LOCATION MAP
LEGEND
EXISTING CONTOURS
EXISTING ROADS
PROPOSED ROADS
EMBANKMENT SLOPE
NOTES:
RESEARCH & DEVELOPMENT SITE BOUNDARY
ACCESS ROAD (SPACE) W/ 45' RIGHT OF WAY
CATTLE GUARD
DIVERSION DITCH
TOPSOIL STOCKPILE
TOP OF BERM EL 5107.5'
RESERVOIR #1 BOT EL 5098.5'
RESERVOIR #2 BOT EL 5099.5'
SEPTIC TANK LEACH FIELD
WATER HOUSE
HQ & PEAD STORAGE
PROCESS AREA
SPACE & LAB AREA
PROPANE STORAGE
WATER WELL
ROAD

Figure No. 3.4

five-spot patterns in each well field. If only a single five-spot pattern is considered, four injection wells will form a square around the recovery well. However, for the overall well field six injection wells will be constructed in a rectangular configuration. Although initially designated as injection and recovery wells, all of the wells will be capable of functioning for either purpose throughout the test.

The well field leach circuit consists of the ore body, injection and recovery wells, ion exchange absorption columns, lixiviant solution makeup unit, and other auxiliary equipment as indicated in Figure 3.2.

Incoming pregnant leach solution from the well field will be pumped into ion exchange columns, by way of the pregnant solution surge tanks. In the ion exchange columns, uranium will be absorbed onto resins and thereby removed from the solution. The barren solution will then be returned to the well field injection wells.

Before reinjection, the barren leach solution will be treated in a makeup unit to refortify the chemical activity of the solution. This will be accomplished by adding sodium hydroxide and sparging in carbon dioxide. As the reconstituted leach solution is pumped back to the well field, it will be filtered to remove suspended solids that could plug the injection wells.

The oxidant to be used will be either hydrogen peroxide or oxygen. The reconstituted leach solution, after addition of oxidants, will be metered and injected into the ore body to leach out additional uranium.

The total bleed stream routed to the evaporation ponds from the plant circuits will be about 0.2 gpm. The net withdrawal of groundwater created by the bleed from the well field circuit will prevent well field excursions by establishing a hydraulic gradient toward the mining area and producing a constant inflow of ground water from the surrounding aquifer. All process water used in the processing plant will be obtained from the lixiviant bleed stream.

Multi-stage ion exchange columns will remove uranium from pregnant lixiviant by adsorption and ion exchange. During operation of the well field production circuit, the ion exchange column resins will become loaded with uranium in the form of uranyl dicarbonate ion. Periodically a volume of resin will be withdrawn from the loading column and transferred into the elution vessel. After the resin is eluted, it will then be placed back into the adsorption system.

The ion exchange process that will be used consists of the adsoprtion of a uranium complex ion on a strong base ion exchange resin followed by the elution of the uranium complex ion by a strong salt solution. The eluant to be used will be a combination of 0.75 to 1.0 Molar (M) sodium chloride and 0.1 to 0.2 M sodium bicarbonate.

3.2.2. Elution and Precipitation Circuit

The elution reaction will be carried out in two stages, however, the reaction is the same for both. During the elution process, the first half of the

pregnant (uranium-rich) eluate will be transferred to the precipitation tank. The second half of the eluate volume, which is lower in uranium content, will be stored in the weak eluant storage tank to be used in the first half of the next cycle.

After the uranium has been removed from the resin, the stripped resin will be rinsed with a dilute sodium bicarbonate solution. The rinse will remove the high chloride eluant physically entrained in the resin and will partially convert the resin to bicarbonate form. In this way chloride buildup in the leach solution can be reduced.

The pregnant eluate in the precipitation tank will be acidified with hydrochloric acid to destroy the uranyl carbonate complex ion, and air will be sparged through the solution to assist in removal of the resulting CO_2.

Hydrogen perioxide will then be added to the solution to precipitate the uranium.

3.2.3 Product Preparation

The precipitated uranyl peroxide slurry will be allowed to settle, and the clear solution will be decanted. Part of the decant solution will go back to the eluant make-up tank while the remainder will go to the evaporation ponds. The thickened slurry will then be transferred to plastic-lined drums, tightly sealed, and stored in a secured area in the process plant. The product eventually will be shipped to a licensed mill or conversion facility.

4.0 RADIATION SAFETY ORGANIZATION, RESPONSIBILITIES, AND QUALIFICATIONS

4.1 Organization

The APS-NAC organizational chart for the proposed R&D operation is presented in Figure 3.1. The radiation monitoring and protection program will be implemented by the plant Environmental/Safety Supervisor under the guidance of the Plant Manager and the Safety and Environmental Affairs Manager. The Plant Manager, located at the site, is responsible for everyday operations and reports directly to the NAC Project Manager.

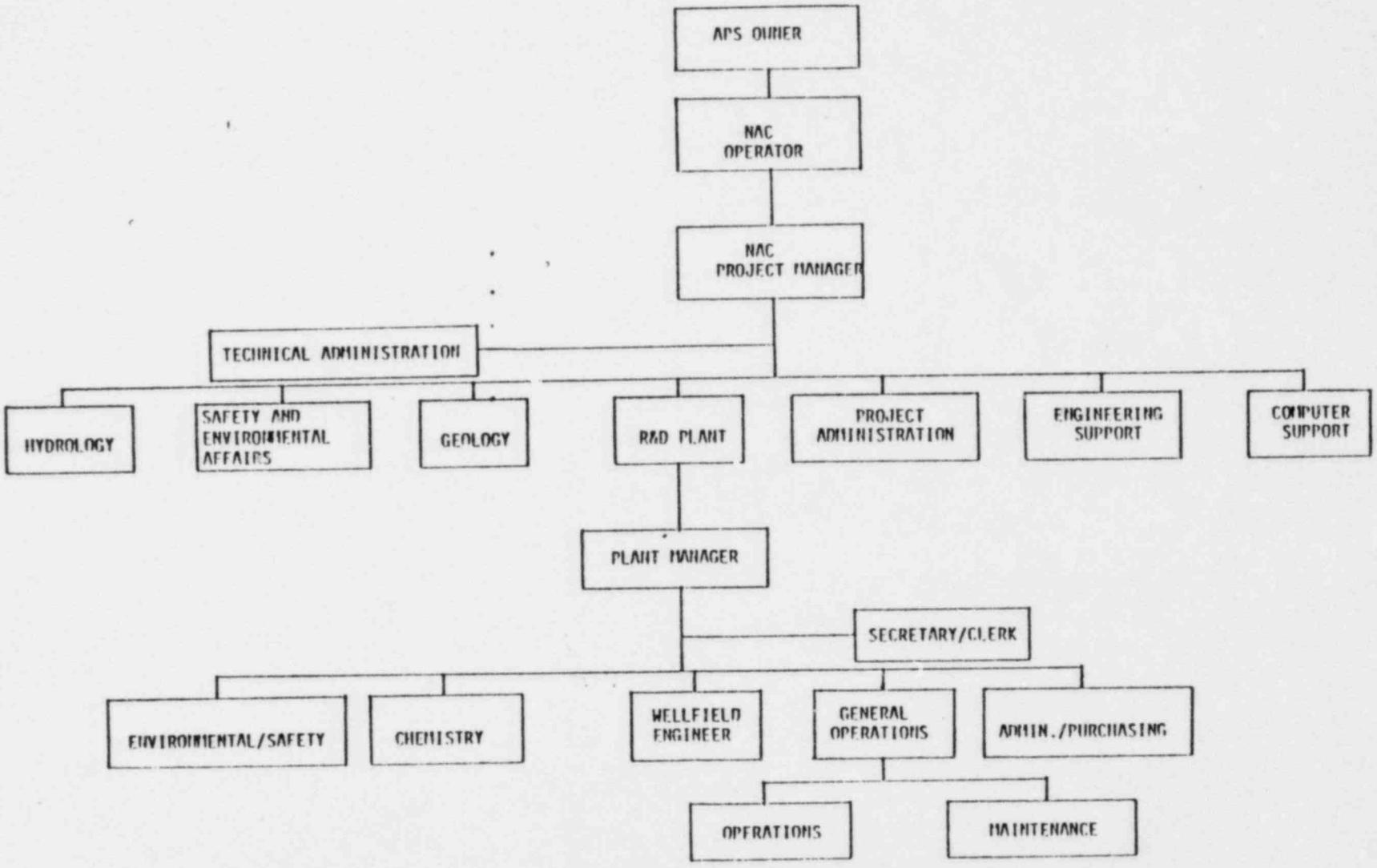
The staff has concluded that the proposed management organization is adequate for an R&D in situ leach uranium mine and recovery plant. The staff recommends, but does not require, that the Environmental/Safety Supervisor (ESS) should not be assigned other production-related duties. The ESS shall supervise any additional radiation safety staff assigned to the site. The ESS may have other safety-related duties, such as responsibility for programs of industrial hygiene and fire safety.

4.2 Radiation Safety Responsibilities

The applicant has not provided a detailed description of the authority and responsibilities of the radiation personnel other than to state: (1) that the radiation monitoring and protection program will be implemented by the plant Environmental/Safety Supervisor under the guidance of the Plant Manager and

FIGURE 3.1

ORGANIZATIONAL CHART
FOR
R&D TEST



the Safety and Environmental Affairs Manager; and (2) that the design of the radiation monitoring program may initially be performed by a qualified consultant.

The staff has concluded that this statement does not provide enough detail or reasonable assurance that these three individuals and other applicable radiation safety staff will properly oversee and audit radiation safety activities at the site in order to achieve ALARA exposures to workers and the general public from this facility operation. The purpose of the radiation safety program at a uranium recovery facility is to maintain radiation exposures ALARA for all employees, contractors, visitors, and members of the general public. Thus, the implementation of a successful ALARA program becomes the responsibility of everyone incidental to the operation of the facility. Responsibility to achieve ALARA are shared by licensee management and the Safety and Environmental Affairs Manager, Environmental/Safety Supervisor, and all facility workers. Therefore, the staff shall require by license conditons that the licensee management, Safety and Environmental Affairs Manager and Environmental/Safety Supervisor shall be provided the following authorities and responsibilities to direct the radiation safety program.

4.2.1 Licensee Management

The staff has concluded and requires that the licensee have a documented commitment to ALARA which provides for the following:

1. Dissemination and posting of information and policy statements on radiation safety for employees, contractors, and visitors.

2. Semiannual ALARA audits of the radiation safety program. The audit shall be performed by the Safety and Environmental Affairs Manager (SEAM) for Nuclear Assurance Corporation or other expert with equivalent qualifications.

3. Annual periodic management review of the health physics program, its staff, and the allocation of adequate space and money.

4.2.2 Safety and Environmental Affairs Manager

The staff shall require by license condition that the Safety and Environmental Affairs Manager (SEAM) shall be delegated the following responsibilities:

1. Authority to enforce regulations and corporate policies that affect any aspect of the facility radiation safety program.

2. Responsibility to plan and administer the ALARA audit program and radiation safety training programs.

3. Authority to review and concur in writing on plans for new equipment, process changes, or changes in operating procedures prior to implementation and to concur that the changes do not adversely impact the radiation safety program or the ALARA objective.

4.2.3 Environmental/Safety Supervisor

The Environmental/Safety Supervisor (ESS) shall have the following responsibilities:

1. Supervise, evaluate, and assure that all in-plant and environmental surveys are properly documented and that such records are maintained.

2. Assure that worker exposures are measured or calculated, documented, and that such records are maintained.

3. Perform inspections of the facility to assure compliance with the regulations and the radiation safety program.

4. Daily review of the facility maintenance work order logs to assure that prescribed radiation safety procedures were followed.

5. Annually review all facility operational and monitoring procedures to assure they are still appropriate and not in conflict with newly established radiation safety policies or regulatory requirements.

4.3 Qualifications of the Radiation Safety Personnel

4.3.1 Environmental/Safety Supervisor

The applicant did not provide the personal qualifications for the Environmental/Safety Supervisor in the license application. The staff requires that the Environmental/Safety Supervisor for the R&D in situ facility shall have the following minimum qualifications:

1. Education: An associate degree in the physical sciences, engineering, or a health-related field. Alternatively, a high school diploma plus four years of relevant work experience in applied radiation protection are acceptable.

2. General Experience: One year of previous work experience in a uranium recovery facility or related industry involving radiation protection.

3. Health Physics Experience: One year of work experience using radiation detection equipment and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in uranium recovery operations.

4. Specialized Training: At least four (4) weeks of formalized training in radiation health protection applicable to radiation hazards normally experienced at uranium recovery facilities.

5. Specialized Knowledge: A working knowledge of the proper operation of health physics instruments to be used in the recovery facility for surveying and sampling techniques, and personnel dosimetry requirements.

If the Environmental/Safety Supervisor does not meet the educational requirements specified above, however, he or she possesses prior work experience in radiation safety, then the licensee may consider two years of applied radiation safety work experience as a substitute for each year of the college level educational requirement. In cases where the ESS possesses a college degree, with major emphasis in the area of the physical sciences and some specialized courses in radiation safety, the requirement for additional specialized training may be waived.

4.3.2 Safety and Environmental Affairs Manager

The applicant did not provide the personal qualifications for the Safety and Environmental Affairs Manager (SEAM) in the license application. The staff has concluded that minumum qualifications need to be established for this position since the SEAM shall have direct responsibilities in developing the radiation safety program and administering the training and ALARA audit programs. The staff requires that the minimal qualifications for the position of Safety and Environmental Affairs Manager shall be as outlined in Regulatory Guide OH 941-4 entitled, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable," dated August 1980, and as presented below.

The Safety and Environmental Affairs Manager (SEAM) shall have the following minimum qualifications:

1. Education: A bachelor's degree in the physical sciences or engineering from an accredited college or university.

2. General Experience: One year of supervisory experience and one year of experience in a uranium recovery facility or related industry.

3. Health Physics Experience: One year of work experience in applied health physics, radiation protection, industrial hygiene, or similar work. This experience should involve actually working with radiation detection and measurement equipment rather than only administrative or "desk" work.

4. Specialized Training: A formalized intensive course in health physics of at least four (4) weeks duration. At least one (1) week of the course should be specifically applicable to health physics problems associated with uranium recovery facilities. In addition, every two (2) years, the SEAM shall attend a refresher course on health physics.

5. Specialized Knowledge: A thorough knowledge of: the proper application and use of all health physics equipment used in the uranium recovery facility; the chemical and analytical procedures used for radiological sampling and monitoring; and the methods used to calculate personnel exposure to uranium and its daughters.

If the individual selected for the SEAM officier position does not meet the educational requirements specified above, however, he or she possesses prior work experience in radiation safety, the licensee may consider two years of applied radiation safety work experience as a substitute for each year of the college level educational requirement. In cases where the SEAM possesses a graduate degree, with major emphasis in radiological and environmental sciences, the requirement for specialized training may be waived.

5.0 RADIATION SAFETY PROGRAM

5.1 Operating Procedures

The applicant did not provide for the development of standard written operating procedures. The staff has concluded that standard written operating procedures shall be established for all operational activities involving radioactive materials that are handled, processed, stored, or transported. Written procedures shall also be established for nonoperational activities, to include in-plant and environmental monitoring, sampling, analysis, and instrument calibration. An up-to-date copy of each written procedure shall be kept in each area where it is used.

All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the Safety and Environmental Affairs Manager before being implemented and whenever a change in a procedure is proposed to ensure that proper radiation protection principles are applied. The Environmental/Safety Supervisor shall review all existing operating procedures on an annual basis. For work or nonroutine maintenance jobs where the potential for exposure to radioactive material exists and for which no standard written operating procedures already exists, a radiation work permit (RWP) shall be required. Such permits shall describe the following:

1. The scope of the work to be performed.

2. Any precautions necessary to reduce exposure to uranium and its daughters to as low as is reasonably achievable.

3. Any supplemental radiological monitoring and sampling necessary during and following the completion of the work. Nonroutine maintenance involving exposure of workers to airborne particulates of uranium and its daughters shall require the use of continuous breathing zone monitoring.

The ESS shall indicate by signature the review of each RWP prior to the initiation of work, and the work shall be carried out in strict adherence to the conditions of the RWP. When the ESS is not available, a supervisory member of the production staff who has received specialized radiation protection training may review and sign RWPs.

5.2 Training

The applicant proposed that a specific health and safety training course will be given to personnel regarding the handling of equipment, plant layout and

operation, and chemical and radiation hazards. The staff finds this general statement on training to be inadequate. Therefore, the staff requires that the following items be incorporated into the training program.

An initial training program shall be conducted by the SEAM or other expert with equivalent qualifications. This training program shall include: the basic principles of radiation safety; the health hazards of exposure to uranium and its daughters; the personal hygiene practices for a uranium recovery facility; the facility radiation safety procedures; and the appropriate response to emergencies and accidents involving exposure to radioactive materials.

Upon completion of the initial training program, each individual shall be given a written examination. Each worker must achieve a predetermined passing score on the examination. The instructor shall review the incorrect answers with the worker until the instructor determines the worker has a passing knowledge of the instructional information. The examinations shall be maintained on file. Annually, each permanent facility worker shall be given a refresher training course. Retraining shall include: a discussion of relevant information that has become available during the past year; a review of safety problems during the past year; a discussion of changes in regulations and license conditions; an explanation of exposure trends; and a discussion of other pertinent topics. Also, six (6) times a year, all permanent site workers shall attend a general facility safety meeting at which radiation safety problems shall be offered for discussion. Safety meeting minutes, attendance records, and training program records shall be maintained on file.

All permanent site workers shall be given specialized instruction on the radiation health and safety aspects of the specific jobs they will perform. This instruction shall be in the form of individualized on-the-job training performed by supervisors with the assistance of the ESS.

5.3 Radiation Surveys - Area Monitoring

The applicant has not proposed a radiation survey program. The staff has determined that even though the process plant is in the open air a radiation area surveying program is still necessary to assure that the radiological environment for the worker will be evaluated at proper frequencies. In addition, even though the uranium recovery process is entirely a wet process a potential transitory airborne hazard might exist due to 1) the spillage, drying, and resuspension of yellowcake, or 2) the emission of radon gas from process tanks. Therefore, the staff shall require by license condition that periodic surveys of all restricted areas to be occupied by workers be performed for both natural uranium and radon gas or its progeny. The staff recommends that radon progeny measurements would be preferable to active radon gas measurements. Surveys for natural uranium (resuspended yellowcake) shall be on a monthly basis in the process area and in all enclosed structures inhabited by workers with the exception that the surveys shall be increased to weekly for any enclosed area meeting the requirements of an "airborne radioactivity area" as defined in 10 CFR Part 20.203(d) and an investigation of the cause of the high levels shall be made. Surveys for radon or its daughters shall be performed monthly in all enclosed structures inhabited by workers. If the radon or

radon progeny concentrations are found to exceed 8 pCi/l or 0.08 WL (Working Levels), respectively, then radon surveys shall be performed on a weekly basis. Such weekly sampling shall be maintained until four (4) consecutive weekly samples exhibit concentrations less than 8 pCi/l or 0.08 WL. Additionally, prior to commencing operations, the NRC shall require the applicant to submit for review and approval, in the form of a license amendment, the designated locations for surveys of airborne natural uranium and radon. The staff advises that the fluorometric analysis for uranium in disequilibrium with its daughters is preferred over the radiometric method.

The staff has noted that the applicant did not address the need for periodic gamma surveys of restricted areas and process equipment. The staff notes that there is the potential for radioactive materials of reasonably high specific gamma ray constant (Ra-226) to plate out and concentrate on process equipment (i.e., ion exchange column). Therefore, the staff shall require that quarterly gamma radiation surveys be performed in the restricted area. Prior to commencing operation, the applicant shall submit, for NRC review and approval, in the form of a license amendment, the location designations for the gamma radiation surveys.

The applicant did not address the need to perform contamination surveys for alpha emitters (yellowcake) in areas normally occupied by workers. The staff has concluded that alpha surveys are necessary to determine if uranium contamination exists and whether decontamination might be necessary to protect the health and safety of workers. Therefore, the staff requires that the licensee shall perform alpha contamination surveys of the facility, laboratory and offices monthly, and of the eating and change areas, weekly. If the applicant performs the analysis of urine bioassay samples at a facility laboratory then all surfaces used for urine sample preparation shall also be surveyed preceding the analyses.

If the alpha contamination levels exceed those listed in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," dated November 1976, i.e., the Uranium Recovery Licensing Branch Position, the area shall be decontaminated. The source of the contamination shall be determined, control measures initiated, and the results documented.

As discussed in an earlier part of this section, the staff shall require the Environmental/Safety Supervisor to review the need to monitor nonroutine maintenance activities or changes in the process circuit. Any special surveys shall be representative of the breathing zone or work areas experienced by the workers during the maintenance activity. This is meant to include nonroutine airborne surveys for natural uranium, radon or radon progeny, and uranium surface contamination surveys.

5.4 Environmental Surveys

The details of an unrestriced area environmental monitoring program is beyond the scope of this document. For an explanation of the staffs conclusions on monitoring and surveys for radiological effluents, the reader is referred to Section 5 of the Environmental Impact Appraisal dated October 1981.

5.5 Personnel Dosimetry

5.5.1 External Dosimeters

The applicant did not provide details on the manner in which external exposures to workers would be determined. Such measurements are required under 10 CFR 20.202(a) to determine compliance with the limits specified in 10 CFR 20.101. Therefore, the staff shall require that either TLD or film-type dosimeters be used for all operating personnel and that these dosimeters be exchanged on a monthly basis. The dosimeter shall be designed to measure exposure to penetrating radiation (e.g., gamma radiation and beta particles with a range greater than 7 mg/cm^2).

5.5.2 Internal Dosimetry

The applicant did not provide details on the manner in which worker exposures due to the inhalation and ingestion of airborne radon and its daughters or radioactive particulates of uranium would be determined. The regulations under 10 CFR 20.103(a)(1-2) currently require the control and assessment of exposure to radon and its daughters on a calendar year basis, whereas, the soluble form of uranium (yellowcake) must be evaluated and controlled on the basis of a 40-hour work week. Therefore, to assure these regulatory objectives, the staff shall require as stated earlier that natural uranium and radon or its progeny be surveyed on a monthly basis and the surveys for airborne natural uranium in defined airborne radioactivity areas shall be performed on a weekly basis.

The calculation of internal exposure to radon, radon progeny, or natural uranium shall be based upon a TWE (Time Weighted Exposure) calculation incorporating a consideration of both occupancy times and average airborne working level or activity concentrations. If occupancy times are established as an average for each category of workers, then the licensee shall also, by means of a semiannual time study, determine the basis upon which average occupancy periods are set.

For unusual or nonroutine maintenance procedures that require airborne sampling due to RWP requirements or where the work is of such nature that routine area surveys could not establish accurately the activity concentration to the worker, the exposure calculation shall be based on the actual occupancy time and the airborne concentration determined by continuous breathing zone monitoring.

If an employee reaches or exceeds 25 percent of the maximum permissible exposure limits as specified in 10 CFR Part 20 based upon a calculated TWE for the week or the calendar quarter, dependent on the solubility of the material, the ESS shall initiate an investigation of the employee's work record and exposure history to identify the source of the exposure. Necessary corrective measures shall be taken to ensure reduction of future exposures to as low as is reasonably achievable. Records shall be maintained of these investigations. These requirements are contained in a license condition.

5.5.3 Bioassay

The applicant did not provide details on the manner in which a worker's individual exposure would be determined. Therefore, the staff has concluded that bioassay, in the form of an urinalysis program, shall be conducted on a monthly basis. The applicant shall be required to collect baseline urine samples from all employees prior to initial assignment at the facility. While workers should not routinely be exposed to dry yellowcake, exposures may occur due to the drying of spills or during maintenance activities. The possibility of ingestion also exists, expecially for those workers who routinely handle the wet yellowcake product. Also, a bioassay program will aid in determining whether the airborne monitoring program is adequate.

The staff shall require, by license condition, the implementation of a bioassay program as described in Regulatory Guide 8.22 "Bioassay at Uranium Mills," with the following exceptions:

1. The applicant shall perform a baseline urinalysis for all permanent employees prior to their initial assignment at the facility.

2. The frequency of urine sample collection shall be monthly.

3. Anytime an action level of 15 µg U/l of urine for any worker is reached or exceeded, the licensee shall provide documentation to the U.S. NRC indicating what corrective actions have been performed to satisfy the actions outlined in Regulatory Guide 8.22. This information shall be included as part of the ALARA audit report required by License Condition No. 26.

   Anytime an action level of 30 µg U/l for four consecutive urine specimens or 130 µg/U/l for any one specimen is reached or exceeded, the licensee shall provide documentation within thirty (30) days to the Uranium Recovery Licensing Branch and Inspection and Enforcement, Region IV, U.S. NRC, indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22.

5.6 Inspection and Auditing Program

The applicant has proposed that management and safety supervisory personnel will frequently inspect the R&D site to identify and rectify potential health and safety hazards. The applicant, however, did not present any further details on an inspection program and no details on an inspection and auditing program in the submittal. Therefore, the staff has established the following procedures and criteria to which the applicant shall adhere. The primary concern of an effective inspection and auditing program is to evaluate (in a formal written outline/synopsis) the overall effectiveness of the radiation safety program and the ALARA objective.

5.6.1 Inspection Program

The inspection program shall be conducted by the ESS whose responsibility, along with those items specified in Section 4.2, will be to perform a daily

"walk through" inspection of the operating area. Any items of noncompliance or violations of procedures, policies, regulations or license requirements shall be documented in a log and maintained on file. All problems noted having safety implications shall be brought to the attention of the Plant Manager and proper remedial action taken.

It is the ESS's responsibility that all items mentioned in the above paragraph and in items 1-6, Section 4.2, be reviewed, evaluated and assured proper documentation. To ensure that the inspection program is maintained and all operational data, surveys and inspection results are compiled properly, an auditing process will also be implemented.

5.6.2 Auditing Program

The staff requires that the Safety and Environmental Affairs Manager or other expert with equivalent qualifications perform a formal semiannual ALARA audit of the radiation safety program and submit a detailed report (written) to the Plant Manager, the Uranium Recovery Licensing Branch and I&E, Region IV. In order to evaluate the ALARA objective the licensee shall review the following records as part of the semiannual audit:

1. Bioassay results including any actions taken when the results exceeded action levels in Table 1 of Regulatory Guide 8.22.

2. Exposure records, of external and internal time-weighted calculations.

3. Safety meeting minutes, training program records and attendance records.

4. Daily inspection log entries and summary reports of the monthly reviews.

5. In-plant radiological survey and monitoring data as well as environmental radiological effluent and monitoring data.

6. Surveys required by radiation work permits.

7. Reports on overexposure submitted to NRC, MSHA, or the State.

8. Reviews of operating and monitoring procedures completed during this period.

The written semiannual audit report shall be specific in addressing any noticeable trends in personnel exposures for identifiable categories of workers and types of activities, any trends in radiological effluent data, and the performance of exposure and effluent control equipment and whether it is being properly used, maintained, and inspected. Any recommendations to further reduce personnel exposures or environmental releases of uranium or radon and radon progeny shall be included in this report.

6.0 FACILITY AND EQUIPMENT

6.1 Facility Design

The applicant's proposed layout for process equipment, offices, the laboratory, and worker change areas is presented in Figures 3.3 and 3.4. The office/laboratory will consist of two or three house trailers attached as a single unit. In addition to the office and chemistry laboratory, a change room will be housed in this unit.

The staff has concluded that the applicants proposed plant layout design should probably prevent the spread of contamination to nonprocess areas such as the office and the laboratory. To further ensure that contamination is not spread to nonprocess areas, the staff shall require that all personnel returning from the process area monitor themselves for contamination, using a calibrated alpha survey instrument, before entering the office areas or the laboratory. In addition, the staff will require that eating shall only be allowed in administrative offices and in enclosed lunch areas.

6.2 Ventilation Design

The applicant's proposed process plant, well field and chemical storage areas will be in the open air. Consequently, the need for ventilation equipment is limited. In addition, the applicant has proposed that if radioactive dusts, mists, fumes or gases accumulate in the office or warehouse areas adequate ventilation systems will be installed. The staff requires that the applicant install appropriate ventilation equipment for the enclosed and inhabited areas which exceed the levels specified in Section 5.3.

6.3 Protective Clothing and Equipment

The applicant has proposed that adequate protective clothing, safety showering, and wash facilities will be maintained onsite. The staff finds the information on this topic to be insufficient and has determined that the following shall be required by license condition.

The applicant shall provide and require that all process and maintenance workers, who work in yellowcake areas or work on equipment contaminated with yellowcake, wear protective clothing including coveralls and boots or shoe covers. Workers who package yellowcake slurry for transport shall also be provided gloves. Before leaving the restricted area, all process workers involved in the precipitation, handling, packaging, or transport of yellowcake slurry shall either shower and/or monitor their face and hands using a calibrated alpha survey instrument. Where alpha monitoring is used exclusive of showering, the monitoring results shall be documented and maintained on file. In addition, the applicant shall perform spot surveys for alpha contamination at least monthly on all workers leaving the facility proper.

Alpha contamination greater than 1000 dpm/100 cm^2 on skin or clothes shall be cause for decontamination and resurveying, and for an investigation by the radiation safety staff. Records shall be maintained of these investigations.

6.4 Access Control

The applicant has committed to restrict the access to the proposed project site by locating the processing area and the evaporation pond within the fenced area of the R&D site. Gates and fencing will be posted with warning signs. Entrances to the site will have gates which will be locked except during operating periods or when access is required.

By license condition, the staff will exempt the applicant from the requirements of Section 20.203(e)(2) of 10 CFR Part 20 for areas within the process facility, provided that all entrances to the facility are conspicuously posted in accordance with the words, "CAUTION - ANY AREA OR ROOM WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

6.5 Release of Equipment and Materials

The applicant has not provided information concerning the release of contaminated equipment. The staff will require, by license condition, decontamination prior to release of equipment, materials, and packages from the restricted area. This will be achieved by following the guidelines of the WMUR Branch position, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated November 1976.

The staff will require by license condition that degraded resin shall be transferred to an NRC licensed uranium recovery facility for disposal in their tailings impoundment or the resin shall be shipped to a licensed radioactive waste disposal site.

6.6 Quality Assurance and Equipment Calibration

The applicant has not provided information concerning a quality assurance program at the R&D site. The staff will require, by license condition, that all radiation monitoring, sampling and detection equipment shall be recalibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use. Furthermore, for airborne radioactive particulate samplers, air flow rates through filters shall be determined by calibrating pumps for the filter paper used and the altitude of the facility. The applicant will also be required, by license condition, to develop a quality assurance program for all sampling and analyses performed as part of the in-plant radiation safety and environmental monitoring programs that includes all of the recommended elements of a quality assurance program specified in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

In addition, prior to commencing operations, the applicant will be required to submit to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, for approval in the form of a license amendment, complete specifications for this quality assurance program.

7.0 EMERGENCY PROCEDURES

The applicant addressed a number of surface accident situations and these are summarized below.

A failure of the leach or eluant solution tanks would release fluids which would be caught on the concrete pad, drained to sumps, and then be diverted to the solar evaporation ponds.

A rupture of a trunkline, an injection well feeder line, or a production well collection line would result in either barren or pregnant leach solution contaminating the soil near the break. The piping systems will be equipped with automatic high-pressure and low-pressure shutdown systems; both with alarms. If fluid were released by a pipeline rupture, the localized area potentially affected by the leach solution would be surveyed. Any contaminated material would be transferred to the evaporation ponds, and the contaminated area would be reclaimed.

The fire protection program will include adequate fire extinguishers being located throughout the facility. In addition, the fresh water make-up tank will supply water under pressure for fire hoses stored at strategic locations.

The staff shall additionally require, by license condition, that the applicant quickly clean up spilled yellowcake using wet methods and maintenance procedures which should minimize airborne particulates. Furthermore, the staff concluded that the applicant did not provide in their application the needed detail of information to ensure that, in the event of an accident involving radioactive materials, the individuals involved in the accident will know the responsible individuals to be notified and the proper actions to be taken. The staff concluded that the applicant shall submit, for NRC review and approval, a general plan for emergency procedures which specifies a position responsible for the development of written emergency procedures for the facility, those areas or situations for which emergency procedures will be developed, the items or areas of concern to be addressed in the emergency procedures including notification and actions to be taken in case of an emergency, and a commitment to rereview these emergency procedures at least annually. Emergency situations which should be addressed in the procedures include: evaporation pond dam failure, yellowcake spills, tank and pipe breaks, etc. The staff intent of this license requirement is that the applicant supply the NRC with assurance that, in the event of an accident, procedures to handle the accident would be available and properly implemented.

8.0 DECOMMISSIONING

The applicant has committed to reclaiming disturbed areas of the site including the well field, building areas, evaporation ponds and roads. The staff will require, by license condition, that the reclamation and decommissioning shall be in conformance with NRC "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material," November 1976, and with U.S. EPA Environmental Standards in effect at the time for cleanup of open

lands and buildings. This topic is covered in detail in the Environmental Impact Appraisal.

9.0 SURETY REQUIREMENTS

The applicant stated that a bond for the total amount of the estimated reclamation costs will be posted with the Wyoming Department of Environmental Quality, Land Quality Division, to ensure funds are available for the reclamation program. The surety requirements are discussed in detail in the Environmental Impact Appraisal.

10.0 CONCLUSION

Upon completion of the safety review of the applicant's license application, the staff has concluded that the proposed Arizona Public Service Company Peterson In Situ Uranium Extraction Project operations described in this SER and the Environmental Impact Appraisal, subject to all conditions imposed by the staff, will be protective of public health and safety and fulfills the requirements of 10 CFR Part 20.

The staff, therefore, recommends that Arizona Public Service Company be issued a license subject to the following conditions:

9. All sampling and monitoring data, calibration records, reports on audits, inspections, and other analyses, training records, and safety meeting minutes, as well as any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in the U.S. Nuclear Regulatory Commission regulations, all such documentation shall be maintained for a period of at least five (5) years.

10. The licensee shall notify, in writing, the U.S. Nuclear Regulatory Commission, Region IV, Office of Inspection and Enforcement, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011, and U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, at least six (6) weeks prior to commencing mining operations so that an NRC inspection may be conducted to review the licensee's development and implementation of administrative and operating procedures and monitoring programs.

11. The licensee shall have a documented commitment to ALARA which provides for the following:

    1. Dissemination and posting of information and policy statements on radiation safety for employees, contractors, and visitors.

    2. Semiannual ALARA audit of the radiation safety program. The audit shall be performed by the Safety and Environmental Affairs Manager

for Nuclear Assurance Corporation or other qualified expert with equivalent qualifications.

3. Annual management review of the health physics program, its staff, and the allocation of adequate space and money.

12. The Safety and Environmental Affairs Manager shall have the following responsibilities:

1. Authority to enforce regulations and corporate policies that affect any aspect of the facility radiation safety program.

2. Responsibility to plan and administer the ALARA audit and radiation safety training programs.

3. Authority to review and concur in writing on plans for new equipment, process changes, or changes in operating procedures prior to implementation and to concur that the changes do not adversely impact the radiation safety program or the ALARA objective.

13. The Environmental/Safety Supervisor shall have the following responsibilities:

1. Supervise, evaluate, and assure that all in-plant and environmental surveys are properly documented and that such records are maintained.

2. Assure that worker exposures are measured or calculated, documented, and that such records are maintained.

3. Perform inspections of the facility to assure compliance with the regulations and the radiation safety program.

4. Daily review of the facility maintenance work order logs to assure that prescribed radiation safety procedures were followed.

5. Annually review all facility operational and monitoring procedures to assure they are still appropriate and not in conflict with newly established radiation safety policies or regulatory requirements.

14. The Environmental/Safety Supervisor (ESS) shall have the following minimum qualifications:

1. Education: An associate degree in the physical sciences, engineering, or a health-related field. Alternatively, a high school diploma plus four years of relevant work experience in applied radiation protection are acceptable.

2. General Experience: One year of previous work experience in a uranium recovery facility or related industry involving radiation protection.

3. Health Physics Experience: One year of work experience using radiation detection equipment and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in uranium recovery operations.

4. Specialized Training: At least four (4) weeks of formalized training in radiation health protection applicable to radiation hazards normally experienced at uranium recovery facilities.

5. Specialized Knowledge: A working knowledge of the proper operation of health physics instruments to be used in the recovery facility for surveying and sampling techniques, and personnel dosimetry requirements.

If the individual selected for the ESS position does not meet the educational requirements specified above, however he or she possesses prior work experience in radiation safety, then the licensee may consider two years of applied radiation safety work experience as a substitute for each year of the college level educational requirement. In cases where the ESS possesses a college degree, with major emphasis in the area of the physical sciences and some specialized courses in radiation safety, the requirement for additional specialized training may be waived.

15. The Safety and Environmental Affairs Manager (SEAM) shall have the following minimum qualifications:

1. Education: A bachelor's degree in the physical sciences or engineering from an accredited college or university.

2. General Experience: One year of supervisory experience and one year of experience in a uranium recovery facility or related industry.

3. Health Physics Experience: One year of work experience in applied health physics, radiation protection, industrial hygiene, or similar work. This experience should involve actually working with radiation detection and measurement equipment rather than only administrative or "desk" work.

4. Specialized Training: A formalized intensive course in health physics of at least four (4) weeks duration. At least one (1) week of the course should be specifically applicable to health physics problems associated with uranium recovery facilities. In addition, every two (2) years the SEAM shall attend a refresher course on health physics.

5. Specialized Knowledge: A thorough knowledge of the proper application and use of all health physics equipment used in the uranium recovery

facility, the chemical and analytical procedures used for radiological sampling and monitoring, and the methods used to calculate personnel exposure to uranium and its daughters.

If the individual selected for the SEAM position does not meet the educational requirements specified above, however he or she possesses prior work experience in radiation safety, the licensee may consider two (2) years of applied radiation safety work experience as a substitute for each year of the college level educational requirement. In cases where the SEAM possesses a graduate degree, with major emphasis in radiological and environmental sciences, the requirement for specialized training may be waived.

16. Standard written operating procedures shall be established for all operational activities involving radioactive materials that are handled, processed, stored or transported. Written procedures shall also be established for nonoperational activities, to include in-plant and environmental monitoring, sampling, analysis, and instrument calibration. An up-to-date copy of each written procedure shall be kept in each area where it is used.

All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the Safety and Environmental Affairs Manager before being implemented and whenever a change in a procedure is proposed to ensure that proper radiation protection principles are applied. The Environmental/Safety Supervisor shall review all existing operating procedures on an annual basis. For work or nonroutine maintenance jobs where the potential for exposure to radioactive material exists and for which no standard written operating procedures already exists, a radiation work permit (RWP) shall be required. Such permits shall describe the following:

1. The scope of the work to be performed.

2. Any precautions necessary to reduce exposure to uranium and its daughters to as low as is reasonably achievable.

3. Any supplemental radiological monitoring and sampling necessary during and following completion of the work. Nonroutine maintenance involving exposure of workers to airborne particulates of uranium and its daughters shall require the use of continuous breathing zone monitoring.

The ESS shall indicate by signature the review of each RWP prior to the initiation of work, and the work shall be carried out in strict adherence to the conditions of the RWP. When the ESS is not available, a supervisory member of the production staff who has received specialized radiation protection training may review and sign RWPs.

17. The licensee shall have a training program as described below.

An initial training program shall be conducted by the SEAM or other expert with equivalent qualifications. This training program shall include: the basic principles of radiation safety; the health hazards of exposure to uranium and its daughters; the personal hygiene practices for a uranium recovery facility; the facility radiation safety procedures; and the appropriate response to emergencies and accidents involving exposure to radioactive materials.

Upon completion of the initial training program, each individual shall be given a written examination. Each worker must achieve a predetermined passing score on the examination. The instructor shall review the incorrect answers with the worker until the instructor determines the worker has a passing knowledge of the instructional information. The examinations shall be maintained on file. Annually, each permanent facility worker shall be given a refresher training course. Retraining shall include: a discussion of relevant information that has become available during the past year; a review of safety problems during the past year; a discussion of the changes in regulations and license conditions; an explanation of exposure trends; and a discussion of other pertinent topics. Also, six (6) times a year, all permanent site workers shall attend a general facility safety meeting at which radiation safety problems shall be offered for discussion. Safety meeting minutes, attendance records, and training program records shall be maintained on file.

All permanent site workers shall be given specialized instruction on the radiation health and safety aspects of the specific jobs they will perform. This instruction shall be in the form of individualized on-the-job training performed by supervisors with the assistance of the ESS.

18. The licensee shall perform monthly surveys for natural uranium in the process area and in all enclosed structures inhabited by workers with the exception that the surveys shall be increased to weekly for any enclosed area meeting the requirements of an "airborne radioactivity area" as defined in 10 CFR Part 20.203(d) and an investigation of the cause of the high levels shall be made. The licensee shall also perform monthly surveys for radon or radon progeny in all enclosed structures inhabited by workers with the exception that radon or radon progeny surveys shall be increased to weekly if the radon or radon progeny concentrations are found to exceed 8 pCi/l or 0.08 WL (Working Levels), respectively. Such weekly sampling shall be maintained until four (4) consecutive weekly samples exhibit less than 8 pCi/l or 0.08 WL. Prior to commencing operations and within sixty (60) days of the issuance of this license, the licensee shall submit to the Uranium Recovery Licensing Branch, for NRC review and approval in the form of a license amendment, the designated locations for surveys of airborne natural uranium and radon or radon progeny.

The calculation of internal exposure to radon, radon progeny, or natural uranium shall be based on a TWE (Time Weighted Exposure) calculation

incorprating a consideration of both occupancy times and average airborne working level or activity concentrations. If occupancy times are established as an average for each category of worker, then the licensee shall also, by means of a semiannual time study, determine the basis upon which average occupancy periods are established.

If any employee reaches or exceeds 25 percent of the maximum permissible exposure limits as specified in 10 CFR Part 20 based upon a calculated TWE for the week or the calendar quarter, dependent on the solubility of the material, the ESS shall initiate an investigation of the employee's work record and exposure history to identify the source of the exposure. Necessary corrective measures shall be taken to ensure reduction of future exposures to as low as is reasonably achievable. Records shall be maintained of these investigations.

19. The licensee shall perform quarterly gamma radiation surveys in the restricted area. Prior to commencing operations and within sixty (60) days of issuance of this license, the licensee shall submit to the Uranium Recovery Licensing Branch, for NRC review and approval in the form of a license amendment, the locations for the gamma radiation survey.

20. The licensee shall perform alpha contamination surveys of the facility laboratory and offices monthly, and of the eating and change areas weekly. If the licensee performs the analysis of urine bioassay samples at a facility laboratory, the licensee shall also survey all surfaces used for urine sample preparation preceding the analyses.

    If the alpha contamination levels exceed those listed in the attached "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated November 1976, the area shall be decontaminated. The source of the contamination shall be determined, control measures shall be initiated, and the results shall be documented.

21. Any changes in the process circuit, illustrated and described in Figure 3.2 of the license application dated June 20, 1980, shall require the approval of the SEAM and shall be submitted to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, for prior approval in the form of a license amendment.

22. The licensee shall use external personnel dosimeters, either TLD or film type dosimeters, for all operating personnel and the dosimeters shall be exchanged monthly. The dosimeters shall be designed to measure exposure to penetrating radiation (e.g., gamma radiation and beta particles with a range greater than 7 mg/cm^2).

23. The licensee shall implement a bioassay program as outlined in Regulatory Guide 8.22, "Bioassay at Uranium Mills," with the following exceptions:

    1. The licensee shall perform a baseline urinalysis for all permanent employees prior to their initial assignment at the facility.

2. The frequency of urine sample collection shall be monthly.

3. Anytime an action level of 15 µg U/l urine is reached or exceeded for any worker, the licensee shall provide documentation to the U.S. Nuclear Regulatory Commission indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22. This information shall be included as part of the ALARA audit report required by License Condition No. 26.

Anytime an action level of 30 µg U/l for four (4) consecutive urine specimens or 130 µg U/l for any one specimen is reached or exceeded, the licensee shall provide documentation within thirty (30) days to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, and Office of Inspection and Enforcement, Region IV, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011, indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22.

24. The licensee shall perform a semiannual ALARA audit of the radiation safety program which shall be conducted by the Safety and Environmental Affairs Manager or other expert with equivalent qualifications who shall submit a detailed, written report to the Plant Manager, and the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555 and the Office of Inspection and Enforcement, Region IV, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011. In order to evaluate the ALARA objective, the licensee shall review the following records as part of the semiannual audit:

1. Bioassay results including any actions taken when the results exceeded action levels in Table 1 of Regulatory Guide 8.22.

2. Exposure records of external and internal and time-weighted calculations.

3. Safety meeting minutes, attendance records, and training program records.

4. Daily inspection log entries and summary reports of the monthly reviews.

5. In-plant radiological survey and monitoring data as well as environmental radiological effluent and monitoring data.

6. Surveys required by radiation work permits.

7. Reports on overexposure submitted to NRC, MSHA, or the State.

8. Reviews of operating and monitoring procedures completed during this period.

The written seminannual audit report shall be specific in addressing any noticeable trends in personnel exposures for identifiable categories of workers and types of activities, and trends in radiological effluent data, and the performance of exposure and effluent control equipment and whether it is being properly used, maintained, and inspected. Any recommendations to further reduce personnel exposures or environmental releases of uranium or radon and radon daughters shall be included in the report.

25. Eating shall only be allowed in adminstrative offices and in enclosed lunch areas.

26. All personnel returning from the process area shall monitor for contamination, using a calibrated alpha survey instrument, before entering the office or the laboratory.

27. The licensee shall provide and require that all process and maintenance workers who work in yellowcake areas or work on equipment contaminated with yellowcake wear protective clothing including coveralls and boots or shoe covers. Workers who package slurry for transport shall also be provided gloves. Before leaving the restricted area, all process workers involved in the precipitation through packaging for transport of yellowcake slurry shall either shower and/or monitor their face and hands using a calibrated alpha survey instrument. Where alpha monitoring is used exclusive of showering, the monitoring results shall be documented and maintained on file. In addition, the licensee shall perform spot surveys for alpha contamination at least monthly on all workers leaving the facility proper. Alpha contamination greater than 1000 dpm/100 cm^2 on skin or clothes shall be cause for decontamination and resurveying, and for an investigation by the radiation safety staff. Records shall be maintained of these investigations.

28. Release of equipment, materials, or packages from the restricted area shall be in accordance with the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated November 1976.

29. All radiation monitoring, sampling and detection equipment shall be recalibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use. Furthermore, for airborne radioactive particulate samplers, air flow rates through filters shall be determined by calibrating pumps for the filter paper used and the altitude of the facility.

30. The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR Part 20 for posting areas within the facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "CAUTION - ANY AREA OR ROOM WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

31. The licensee shall develop a quality assurance program for all sampling and analyses performed as part of the in-plant radiation safety and environmental monitoring programs that includes all of the recommended elements of a quality assurance program specified in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment." In addition, prior to commencing opertions and within ninety (90) days of issuance of this license, the licensee shall submit to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, for review and approval, complete specifications for this quality assurance program.

32. In addition to the responsibilities, specified in License Condition No. 14, the ESS shall perform a daily "walk through" inspection of the operating area. Any items of noncompliance or violations of procedures, policies, regulations or license requirements shall be documented in a log and maintained on file. All problems noted having safety implications shall be brought to the attention of the Plant Manager and proper remedial action taken.

33. Within ninety (90) days of issuance of this license and prior to commencing operations, the licensee shall develop and submit to the Uranium Recovery Licensing Branch, for NRC review and approval, a general plan for emergency procedures that specifies a position responsible for development of written emergency procedures for the facility, those areas or situations for which emergency procedures will be developed, the items or areas of concern to be addressed in the emergency procedures including notification and actions to be taken in case of an emergency, and a commitment to rereview these emergency procedures at least annually. Emergency situations which should be addressed in the procedures include: evaporation pond dam failure, yellowcake spills, tank or pipe breaks, etc.

34. Degraded resin shall be transferred to an NRC licensed uranium recovery facility for disposal in their tailings impoundment or the resin shall be shipped to a licensed radioactive waste disposal site.

Jeffrey L. Kotsch
Operating Facilities Section II
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Approved by: _____
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