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TABLES

6.0 Accidents

Radioactive materials handled at the Lisbon Mill have very low specific activities (LSA); tailings piles averaged 0.67×10^{-9} Ci/g by the end of 1984, the ore stockpiles were 0.60×10^{-9} Ci/g during 1984, and refined yellowcake product is normally 5.30×10^{-7} Ci/g. These low specific activities require the release of exceedingly large quantities of materials in order to be of concern; driving forces for such releases are not present at Lisbon mill. Plant accidents involving radioactivity are considered in three categories: trivial incidents, small releases to the environment, and large releases to the environment. Transportation and other accidents are also addressed. No consideration is given for potential accidents in the proposed acid circuit; the accident potential of that circuit will be assessed and submitted to the USNRC, Uranium Recovey Field Office, for review and approval in the form of a license amendment at least three (3) months before acid circuit start-up.

In light of past experience, it is believed that even if major accidents did occur radiation exposures would be too small to cause any observable deleterious effect on the health of the human population (NUREG-0706, page 7-2, September 1980).

6.1 Trivial Incidents Involving Radioactivity

By design, Lisbon mill is located immediately upstream from the tailings impoundments and concrete sumps are provided within the mill. Together with tailings impoundments and ore stockpiles, all plant equipment is located within a restricted (to the public) area boundary. Typical trivial incidents include spills, ruptures in tanks or plant

piping containing solutions or slurries, failures of the centrifuges used for yellowcake dewatering, and rupture of a tailings system pipeline.

Normal operations at Lisbon mill require the dumping of tanks of slurry or solution for circuit flow adjustments and preventive maintenance; concrete sump capacity is sufficient to store the entire contents of any group of tanks that may need draining simultaneously. Although sumps are provided directly beneath all tanks containing radioactive materials, the pachucas and ore thickener are normally drained into the filter section sump within the mill building because their own sumps are only designed to accept minor spills and pipe leaks. The worst-case scenario of radioactive material spillage from tanks would occur if a pachuca tank ruptured or its support steel failed; however, the main damage would be from the possibility of scalding an employee rather than from contamination. Most of the 400 MT of slurry spilled from such a worst-case incident would flow towards the upper tailings impoundment, 125m away; the remainder can be easily cleaned up afterwards. Although less likely to occur, and less dangerous, a similar rupture of the ore thickener would be handled in the same manner. Radioactive materials spilled from the rupture of any other tank or its associated piping would be contained within its respective concrete containment sump.

Three centrifuges are used in the yellowcake section of the mill. Piercing of a tank by the accidental failure of a centrifuge rotor would result in no loss of radionuclides because the entire contents of all tanks within the section can be contained within the section's concrete

sump.

Pipe ruptures in the tailings disposal system rarely occur, but small leaks at pipe joints are relatively commonplace. System design is such that over 90% of piping runs adjacent and parallel to the impoundments and leakage from ruptures flows towards the tailings ponds to be contained with existing tailings material. The worst-case scenario would happen if the leak occurred either between the mill and the upper impoundment or in the pipeline to the lower impoundment where it crosses the upper tailings embankment. In either event, it would be no more than four hours before it was detected and involve no more than 100 MT of material that might not re-enter the impoundment system: material which can simply be cleaned up and put into the impoundment afterwards. To protect against that possibility, flow indicators are installed at the ends of pipelines <u>in use</u> to detect the presence of major leaks. When a major leak occurs the flow indicator activates an alarm in an occupied area of the mill: the boiler operator's control room. The instrumentation is tested daily, and the testing documented, to ensure proper operation.

None of the foregoing trivial incidents result in the release of any radioactive material to the environment as all liquid effluents from mill process buildings, with the exception of sanitary wastes, are returned to the mill circuit or discharged to the tailings impoundments. There is no possibility of any slurry or solution spillage reaching a watercourse which may be used for drinking.

<u>6.2 Small Releases Involving Radioactivity</u>

Small additional quantities of radionuclides could be released to the atmosphere if the air cleaning system serving the yellowcake dryer failed or there was an explosion in the yellowcake drying operation. Although maximum ground level concentrations for such emissions would occur well within the restricted area boundary, it is conceivable that a member of the public in the unrestricted area environment could receive a radiation dose, for a short period of time, in excess of the 40 CFR 190 standard if the worst imaginable series of accidents occurred in the yellowcake section.

Operation of the drying and packaging dust control equipment is described in Section 5.5.8 and on pages 3-9 and 3-10 of the alkaline leach process description. Effluent control systems are maintained as specified in Section 5.5.8 and operations are immediately suspended in the affected area of the mill if any of the emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.

Failure in the air cleaning system serving the yellowcake drying area may result in additional releases of radionuclides from any one of the three stacks of the yellowcake drying and packaging dust control equipment shown in Figure 3.1-3: the dryer flue gas scrubber exhaust, the yellowcake barrel loading dust collector exhaust, or the dryer center cooling column exhaust. RAMC implemented several changes in order to improve upon the original equipment manufacturers' design performances and to achieve as low as reasonably achievable emissions: in 1977 a dry cyclone was installed in the dryer gas-offtake pipe to remove more than

90% of the yellowcake dust from the gases before they enter the high energy wet scrubber; in 1982, the chopper grizzley and hammer mill were made airtight to eliminate the need to collect dust from these sources; and, also in 1982, a bag-type filter was installed on the suction of the equipment room fan to reduce center column exhaust emissions.

A loss or reduction in scrubber water supply or the buildup of solids in the dry cyclone are the only conceivable failures in the dryer gas cleaning equipment that could result in additional radionuclide releases to the atmosphere through the gas scrubber exhaust stack. Other problems with the gas cleaning system such as induced draft fan failure or solids buildup on the inside surfaces of the dryer gas-offtake pipe would result only in a loss of furnace draft, which may increase in-plant radionuclide concentrations if the furnace draft is allowed to be lost. (However, the fail-safe nature of the system prevents that possibility because the dryer shuts down automatically if draft is lost).

A reduction in scrubber water flow or "air" pressure differential below the manufacturer's recommended levels is detected by instrumentation which automatically shuts down the induced draft fan, dryer gas supply, and combustion air supply. In addition, checks are made (and documented for USNRC inspection) of water flow and "air" pressure differential approximately every four hours during operation to assure that the scrubber is operating within manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance during all periods of yellowcake drying operations. Thus, additional radionuclide emissions to the atmosphere due to reduced

scrubber water supply and the risk of positive dryer furnace pressures are avoided.

Buildup of solids in the dry cyclone reduces the cyclone's efficiency, allowing more dust to be carried over to the wet scrubber, cyclone separators, and possibly to the scrubber exhaust stack. RAMC conducts regular inspections and cleaning of the dry cyclone to avoid that possibility.

Increased atmospheric releases from the yellowcake barrel loading dust collector occurs when a hole develops in one of the filter bags. To protect against running the dust collector with defective bags for extended periods of time a pressure differential gauge is used to detect the problem and repairs are promptly made. The air pressure differential gauge is installed to measure the pressure drop across the filter bags and the gauge is read (and documented for USNRC inspection) once per shift during operation.

Releases of radionuclides from the dryer center cooling column exhaust may increase if a hole developed in the cooling fan filter bag or there was excessive spillage within the equipment room. Both conditions are detected and corrected promptly by regular maintenance inspections.

Typical additional radionuclide releases to the atmosphere (for 1983) from air cleaning system malfunctions were included to determine the principal parameters for radiological assessment in Table 5.5-6. Environmental effects of such additional releases are insignificant.

A gas explosion in the yellowcake drying operation is not possible—normally. Control of the natural-gas-fired furnace is designed to be "fail-safe" to prevent any possibility of an employee getting burned. For instance, several conditions must be met before it is possible to ignite the burner pilot lights: all six burner valves must be in the low-fire position; gas pressure must be correct; the induced draft fan must be running with the correct amount of draft; the combustion air fan must be running; and, the furnace's atmosphere must be completely purged. In addition, after the pilot lights have been ignited, proof of pilot light on all six burners is required before the main gas valve is opened, scrubber water flow and "air" pressure differential across the gas scrubber is required, and the central shaft cooling column fan must be running. However, the condition for a gas explosion could be created if a person either deliberately or in ignorance bypassed a fail-safe system. Although this condition will be detected and immediately corrected on a routine maintenance safety inspection the possibility of an explosion would exist before it was corrected.

Conservative NRC estimates (NUREG-0706, page 7-3) of the environmental effects of the worst-case gas explosion accident at the model mill indicate that individuals would receive 50-year dose commitments to the lung of approximately 65 mrem at 500m and 6.9 mrem at 2,000m; also, NRC predicts (page 7-12) the 50-year population dose commitment to be 0.1 man-rem for the Colorado Plateau Region. Due to the sparse population distribution near the Lisbon mill (Table 2.1-1)

individual and population doses would be even less significant as the nearest resident is 2.5 km away and the nearest downwind resident is 30.1 km away (Table 5.5-6, page 5-79).

6.3 Large Releases Involving Radioactivity

NRC considers only two conditions that could release larger quantities of radioactive materials to the environment than would be released annually from normal operations: dispersion of a large quantity of yellowcake by a Category III intensity tornado, and the release of tailings slurry by a man-made accident or natural disaster. Although releases from those causes could occur at RAMC, the severity and probability of occurrence of such accidents would be much less than envisaged by NRC for the model mill. No other large releases involving radioactivity are conceived by RAMC.

Tornado: Although no tornadoes have ever been recorded in the Colorado Plateau Region (NUREG-0706, Table 7.5) a Category III event was postulated for the model mill, with a maximum wind speed of 110m/s (240 mph)--85m/s rotational and 25m/s translational. In an atmospheric dispersion analysis of 11,400 kg (25,100 lb.) of yellowcake--all in respirable form--lifted by a Category III tornado NRC predicted an insignificantly low maximum exposure level to individuals: a 50-year dose commitment to the lungs of 8.3×10^{-4} mrem. At RAMC no dry yellowcake is free to blow away; it is all packaged in 55-gallon barrels. The strongest winds are from the occasional thunderstorms and "dust devils" and may, conservatively, reach gusts of 45m/s (100 mph)--insufficient to overturn

a 450 kg (1,000 lb.) barrel of yellowcake. A possibility does exist, however, for an improperly stored barrel of yellowcake to fall and burst open when hitting the ground, which could result in a yellowcake release to the atmosphere.

Release of Tailings Slurry: When examining the potential for dam failure and the subsequent release of tailings slurry, several governing factors need to be considered. The most probable scenarios that lead to dam failures are associated with overtopping of the embankment and subsequent breaching, a high phreatic surface which saturates the embankment materials and creates a slope failure, or failure by either offset and rupture or liquifaction caused by a seismic event. Therefore, the following description will present the site conditions and design considerations incorporated into the construction of RAMC's two tailings pond dams and will provide the basis for determining the worst-case scenario of tailings release.

The upper dam has a maximum height of 55 feet and its impounded area has recently been filled to capacity with tailings, leaving only the desired 2.75 feet of freeboard behind the dam to pass the PMP storm through its overflow structure into the lower impoundment. The lower dam is 53 feet high and has an unused capacity of 780 acre-feet, of which 147 acre-feet is flood storage to contain the probable maximum flood (PMF) event. Flood storage capacity at lease equal to the PMF runoff volume will always be maintained in the lower impoundment during the license period.

The two dams are located in a small southwest trending valley which

intersects the very pronounced Lisbon Valley. The general millsite and tailings impoundment area is underlain by the Dakota-Burro Canyon Formation, which is jointed (but not faulted) beneath the site. The closest fault (the Lisbon Valley fault) is located about 750 to 1,000 feet downstream from the lower tailings pond embankment. This fault is inactive, with no earthquakes having been registered during the period of record (since 1850 - see Arabasz et al., 1979). It is highly unlikely that any faulting would occur under the dams or tailings impoundment area because of the proximity of the Lisbon Valley Fault and the stress relief which would occur along that fault in an earthquake.

Perusal of the design and construction records for both the upper and lower dams and their subsequent raises show them to possess high factors of safety: 1.55 static and 1.35 pseudo-static for the upper embankment, and 2.09 static and 1.39 pseudo-static for the lower embankment. The original pseudo-static stability analyses for the dams were based on a Richter magnitude of 6 seismic event which has a corresponding horizontal acceleration value of 0.9 g. This magnitude earthquake and associated horizontal acceleration are considered to be the maximum probable seismic event for the La Sal area (an area with an historically low level of seismic activity).

During original design and stability analyses, a phreatic surface was assumed to exist at a fairly high level within each of the two dams. However, subsequent measurements have shown that the insitu phreatic surface is non-existent within either the upper or lower dam, thereby creating an even greater factor of safety for both the static and the pseudo-static conditions. This has been accomplished by maintaining a 100

foot beach area between the ponded water and the embankment, and by maintaining a minimum of ponded water within the storage pool area: both standard practices at RAMC.

From the foregoing discussion, the following conclusions can be drawn with respect to local geotechnical conditions:

(a) The lower tailings impoundment can safely store the PMF.

(b) No faults exist under either of the two tailings embankments or the tailings impoundment area.

(c) No phreatic surface exists now, nor has it ever existed, within the embankments of the upper or lower dams.

Since no faults currently exist under the tailings impoundment area and the likelihood of developing faults is very remote, no rupture or offset of the embankments would occur during the probable maximum earthquake event. In addition, since the dams have never shown a phreatic surface and will be managed to avoid future development of a phreatic surface, liquefaction of the dams will not occur in the event of an earthquake in the region. It is possible, however, that the compacted fill would behave as a brittle material and that fractures that transect the embankment could develop in the fill during a regional earthquake. The only fractures which could possibly develop would be hairline in nature and not exhibit either offset or create an open void, since there are no faults beneath the structures.

Under normal operating conditions, no water is ponded directly on or against the embankment. However, during the design seismic event the tailings would probably liquefy and seek the most stable position: that of a flat surface. After the event is over and during the ensuing

aftershocks, it is possible for water to be ponded directly against the embankment. This ponding against the embankment, even if the embankment had multiple hairline fractures, would not compromise the integrity of the structure since only minimal water would be in the pond. The embankment would need to remain in this condition for several years for sufficient piping to occur to allow significant flow-through of water or minimal flow-through of tailings. The condition would be detected by regular inspections and new beaches would be formed to prevent flow-through.

The worst-case scenario for release of tailings and water from the ponds is the occurrence of the design seismic event with the PMF volume stored behind the lower dam. However, even under these conditions, the lower dam would not collapse catastrophically since the presence of a sand drainage chimney and blanket will prevent the phreatic surface within the dam from being higher than the designed phreatic surface. Design analyses indicated that, under these conditions, no liquefaction of the embankment materials would occur. In addition, if hairline cracks occurred within the embankment as a result of a seismic event, the PMF water behind the dam might migrate along the cracks; but, the contained contaminants would be diluted to harmless levels.

Concentrations of selected constituents in water released from the lower tailings pond during the worst-case scenario are contained in Table 6.3-1 and are determined from dilution of those concentrations recently measured in the upper tailings pond (i.e., to be most conservative). Released concentrations are also based on dilution of existing ponded water behind the upper and lower dams by runoff from the PMF event. Under

worst conditions prior to the PMP event approximately 7.3 acre-feet of water would be stored in the lower impoundment and 2.1 acre-feet in the upper impoundment. The PMF runoff volume to the lower tailings pond is 147 acre-feet. Since the PMF volume represents direct runoff of precipitation, background concentrations in the runoff water should be minimal. Hence, water standing in the tailings pond will be diluted by a factor of 15.6 (147/9.4).

TABLE 6.3-1

CONTAMINANT CONCENTRATIONS IN PREDICTED WORST-CASE TAILINGS WATER RELEASE

Constituent	Concentration		NAS Water Quality Standards for Livestock
	Existing (a)	Diluted (b)	
Dissolved Constituents (mg/l)			
Chloride	1780	113	3000
Fluoride	406	26	2
Nitrate (as N)	402	26	45
Selenium	1.09	0.07	0.05
Sulfate	7790	498	250
TDS	38,300	2449	7000
Radionuclides (uCi/ml)			Unrestricted Area mpc
Ra-226 (E-9)	155.2	9.9	30
Th-230 (E-9)	227.3	14.5	2000
Po-210 (E-9)	24.2	1.5	700
Pb-210 (E-9)	183.8	11.8	100
U-nat (E-7)	1200	76.7	300

(a) Average concentrations in the upper pond during 1984.

(b) Concentrations released.

Even if piping of the embankment did occur and cause some tailings to be carried with the water through a breach, the tailings solids would be deposited at a 2% slope from the breach and would be contained within the borrow area at the toe of the lower impoundment--an area which is within RAMC's restricted area boundary. In addition, although the foregoing discussion applies equally well to the upper tailings embankment, any failure of the upper embankment would have no effect on the environment because all releases would be contained within the lower tailings impoundment.

Although the foregoing arguments show there is no possibility of radioactive material releases to the environment from RAMC's tailings impoundments, the following general response plan will be implemented by RAMC in the event of a dam failure emergency:

6.3.1 Dam Failure - Emergency Response

The following RAMC personnel will be immediately notified in the event of a problem with a tailings dam:

Mine Manager & President, M.D. Lawton	259-6402
Radiation Safety Officer, L. Perkins	678-2040
General Plant Superintendent, R. S. Pattison	259-5287

and the licensee shall immediately notify the U. S. Nuclear Regulatory Commission of any failure to the tailings dam or tailings discharge and solution return system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure, by telephone or telegraph at the following addresses:

U. S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011
Telephone: (817) 860-8100

Uranium Recovery Field Office, Retion IV
U. S. Nuclear Regulatory Commission
P. O. Box 25325
Denver, Colorado 80225

Corrective measures such as sealing any embankment breach shall be implemented immediately; advice of consultants will be sought if necessary. Any area that becomes contaminated with mill tailings below the lower embankment shall be cleaned up and put back into the tailings impoundment as soon as possible thereafter. Although any liquid spillage below the lower embankment is expected to directly enter the fresh groundwater aquifer to the south and be diluted further than those values shown in Table 6.3-1, increased downgradient groundwater monitoring shall be conducted to ensure that the best mitigative measures can be taken. And, if necessary and possible, the restricted area boundary shall be extended to encompass any contaminated area until contaminants can be cleaned up to unrestricted area levels of concentration.

Thermoluminescent dosimeter (TLD) badges will be placed along the fences that surround the contaminated areas: the number of badges used shall be determined by the extent of contamination and the potential for exposure of the general public. Radioactive material releases, if any, are expected to be contained within the borrow area (i.e., within the present fenced area) south of the lower embankment, eliminating the need for additional radon monitoring. If it is necessary to extend the perimeter boundary to contain contaminant releases, however, additional

radon monitoring shall be performed. Also, should the contaminated materials dry out before they can be cleaned up and create an additional source of airbourne particulate contamination, one or more continuous air sampling stations will be installed and the area will be wetted as needed until it is cleaned up. During clean-up, soil samples will be collected from the contaminated areas to ensure that clean-up is effective and to meet regulatory standards.

6.4 Transportation Accidents

Transportation of materials to and from the mill can be classified into three categories - (1) shipments of refined yellowcake from the mill; (2) shipments of ore from outside mines to the mill; and, (3) shipments of process chemicals from suppliers to the mill. An accident in each of these categories has been considered.

Shipments of Yellowcake: The refined yellowcake product is packed in 55-gallon drums holding an average of 430 kg (950 lb) and classified by the Department of Transportation as Type A packaging (49 CFR Parts 171-189 and 10 CFR Part 71). The yellowcake is shipped by truck an average of 2400 km (1500 miles) to a conversion plant. The average truck shipment contains approximately 40 drums, or 17MT (19ST) of yellowcake. Although the alkaline leach mill capacity is 770ST of ore per day and the mill is operating on a ten-on and four-off schedule, no yellowcake is currently being shipped from RAMC, and no shipments are expected for the foreseeable future.

The quantity of yellowcake released from the containers in the event

of a truck accident is estimated by NRC to be about 530kg (1200 lb). Most of the yellowcake released from the container would be deposited directly on the ground in the immediate vicinity of the accident. Some fraction of the released material, however, would be dispersed to the atmosphere. For insoluble uranium, particles which are in the respirable size range, a 5^{o} sector, and a population density of 2.9 persons/km^2 the general public would receive 50-year dose commitments of approximately 0.7 man-rem to the lungs. It is equally likely that this accident could occur in the more densely populated regions of the country where the uranium conversion plants are located. Using the population density of 61 person/km^2 of the Eastern United States, the general public would receive 50-year dose commitments of approximately 14 man-rem to the lungs.

6.4.1 Yellowcake Transportation Accidents - Emergency Procedures

All surveys and inspections required to comply with 49 CFR 173.392 (b) and (c) are completed before yellowcake is shipped by road truck from the mill. The vehicle is placarded to comply with the requirements of 49 CFR 172.556. The carrier's driver is given a copy of the following "EMERGENCY PROCEDURES" and "EVALUATION QUESTIONNAIRE" together with the bill-of-lading and packing slips and are kept in the driver's cab at all times from the Lisbon mill to the conversion facility, or point of unloading.

EMERGENCY PROCEDURES

TO WHOM IT MAY CONCERN:

1. Rescue and lifesaving may be done with little fear of the hazards from the cargo on this truck. If possible, avoid breathing dust from spilled cargo. DO NOT DELAY RESCUE EFFORTS!

2. This vehicle contains drums of uranium ore concentrate, commonly called yellowcake or U308. Its color may be yellow, greenish brown, or black. It cannot burn or explode.

   Yellowcake on the skin or clothing is relatively harmless and simple washing methods will remove it. If you become contaminated with yellowcake, please wait for advice from health officials. To avoid ingestion of uranium do not eat, drink or smoke while near the spill.

3. Contact the local law enforcement agency. Tell the police of the accident with spillage of "Low Specific Activity" (LSA) radioactive material called uranium ore concentrate - "Yellowcake". Ask them to notify the state health department. Give them the location of the accident site and tell them of any injuries to persons.

4. Cover the spilled uranium ore concentrate. Bystanders should be instructed to stand upwind of the spill and 25 feet or more from it. As soon as possible, the affected area should be roped off and all spilled concentrate should be covered with a tarpaulin, plastic sheeting or dirt to prevent its spread by wind or rain.

5. Fill out the attached questionaire. Please obtain all of the information asked for on the attached form. You will need to relay this information to the carrier and the shipper.

6. Telephone the carrier and shipper.

   a) Carrier: (call the nearest location)

	Name	Phone
ANR - Garrett Freightlines Pocatello, Idaho	Jim Turner	(208) 232-8831
ANR - Graves Freightlines Overland Park, Kansas	Lloyd Pendergrass	(913) 827-0471
ANR - Associated Truck Lines Grand Rapids, Michigan	Bill Fuller	(616) 456-2727

b) Shipper:

Rio Algom Mining Corp. (801) 259-5904
Moab, Utah 84532

Read the completed questionnaire to whomever answers your calls. If necessary for complete understanding, read the questionnaire a second time.

7. When help arrives: please cooperate with all civil authorities and carrier's and shipper's personnel who arrive at the scene. Follow their health and safety instructions for checking possible contamination of your clothing or body.

Please be assured that your exposure to this material will be relatively harmless, particularly if you have followed these instructions. The health and safety personnel who arrive will be glad to answer any questions you have about this matter.

Thank you very much.

EVALUATION QUESTIONNAIRE

1. Name of Truck Driver ______________________________
2. Name of Trucking Company ______________________________
3. Bill of Lading Number ______________________________
4. Destination of Shipment ______________________________
5. Time of Accident ______________________________
6. Place of Accident ______________________________
7. Name of Police Dept. Notified ______________________________
8. Phone No. of Police Notified ______________________________
9. Is the Driver Injured? __________ Others? ______________
10. Is the Truck Roadworthy? ______________________________
11. Are Drums Outside of the Truck? ________ How Many? ________
12. Estimate the Number of Square Feet of Spilled Material ________

13. Has the Spill Been Covered? ______________

14. Is the Spill on Ground? ______________

15. Is the Spill in Water? _______ Lake? _______ Stream? _______

16. Is Spill Near a Building? _______ Sewer? _______

17. Is the Accident Place Lighted at Night? ______________

18. Other Comments ______________

____

____

19. Where Can You Be Reached by Phone? ______________

    (a) Near the Accident Site ______________

    (b) Home or Business Phone ______________

Persons at RAMC mill who are likely to receive the call from the carrier regarding a yellowcake transportation accident have been informed to notify the following personnel immediately:

Mine Manager & President, M. D. Lawton	259-6402
Radiation Safety Officer, L. K. Perkins	678-2040
Mill Superintendnet, J. L. May	259-6293

and the Radiation Safety Officer will notify by telephone or telegraph the U.S. Nuclear Regulatory Commission at the following address:

U. S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 760 1
Telephone: (817) 860:8100

RAMC personnel will endeavour to determine the exact nature of the accident from the carrier or local (to the scene) law enforcement agency before taking action.

If the accident does not involve the release of yellowcake the carrier will handle the situation by transferring (if needed) the intact barrels of yellowcake to another vehicle after getting approval from the shipper to break the truck door seal (if not already broken). RAMC will dispatch radiation safety personnel to the scene if they are needed or, depending on location, if it is practicable to do so.

If the accident is more serious and involves the release of yellowcake from barrels, or there is a risk of contaminating a watercourse, etc. RAMC personnel will be dispatched to the scene, regardless of the distance involved. The RSO will determine the need for measuring and proctetion equipment at the site from state health officials, or those qualified persons (if any) first on the scene. Equipment such as alpha survey meters, gamma scintillometers, respirators and other protective equipment will be made available by the RSO. When RAMC radiation safety personnel arrive at the accident site they will work with the carrier and local authorities to ensure the containment and cleanup of radioactive materials and to prevent any unnecessary individual exposures. The site shall be surveyed and soil and water (if applicable) samples collected to ensure adequate site cleanup has been achieved. Decontamination of the site will be continued until contaminant levels are below those of Table 5.5-4 (5000dpm total alpha and 1000dpm removable alpha). All radioactive material cleaned up from the site will be transported to a licensed facility--probably back to RAMC.

Urine specimens will be collected from individuals involved in the cleanup operation to ensure that no one was overexposed. Also, vehicles involved in the accident will be surveyed to ensure they are cleaned up

to comply with the requirements of 49 CFR 173.392 (b) and (c) before being permitted to leave the accident area.

<u>Shipments of Ore to the Mill</u>: Outside uranium ores are shipped to the Lisbon ore stockpiles adjacent to the mill in 26.7MT loads by road truck. The average haul distance from the uranium mines to the mill stockpile is approximately 100km (63 miles). 97,700MT were hauled in 1983 and 86,900MT in 1984: less than ten trips per day average. Because of the low specific activity of the material and the ease with which the contamination can be removed, the radiological impact is not considered significant.

As ore comes from the mine, it contains a significant fraction of moisture and has a lower percentage of fines than ore that has been crushed. It is conservatively assumed that the ore contains 1.0% respirable dust by weight, and that in an accident all of this dust would be released from the truck and be avaliable for dispersal. The quantity of dispersible ore released to the atmosphere in the event of a truck accident is approximately 2.1kg. The consequence of a truck accident involving a shipment of ore from the mine to the mill would be a maximum 50-year lung dose commitment of 130mrem at 500m and 14mrem at 2000m from the accident scene.

<u>Shipments of Chemicals to the Mill</u>: The most serious trucking accident involving the transportation of chemicals to the mill would most likely accident is 1.6 x 10^{-6}/km, but not all of those predicted accidents would release ammonia. If, however, large amounts of ammonia were released, human lives could be endangered.

6.5 Other Accidents

Fire Control and Chemical Hazard Protection Systems: The mill design provides for the isolation of mill areas where there is a high potential for fire and where urainum could be dispersed as the result of a fire. Provisions have been made for fire alarms, fire extinguishers, sprinkler systems, fire hydrants, water tanks, and other general fire fighting equipment. Emergency procedures and training include immediate fire control as a priority item. Mill design features include automatic fire suppression equipment in high fire-potential areas.

Appropriate caution signs are posted in areas of fire hazard and the fire control systems are tested by means of fire drills. Drills are performed approximately semiannually. See Appendix 6.5.1.

In the event of a catastrophic accident, radiological assistance will be summoned. The NRC maintains Regional Coordinating Offices which will receive telephone requests for radiological emergency assistance 24 hours a day and will initiate the support most appropriate for the incident conditions. These requests for assistance may be handled directly by the NRC or state radiation control officers. If the incident were found to be a hazardous situation or have potential for expanding into a highly undesirable situation, the Interagency Radiological Assistance Plan (IRAP) could be called upon for additional assistance.

Accidents Not Involving Radioactivity: The potential for environmental effects from accidents involving nonradiological material is expected to be small. Failure of the boiler that supplies process steam to the

alkaline leach stage of the mill circuit could release low pressure steam to the room possibly causing minor injuries to workers, but neither chemicals nor radiological materials would be released to the environment. Ducting and ventilation systems have been provided in the precipitation and drying stages of the process to vent and dilute the chemical vapors emitted and protect the workers from any hazardous fumes. Failure of these ventilation systems might result in the interim collection of these vapors in the building air. Since the vapors would ultimately be discharged to the atmosphere in either case, such a failure would have no incremental effect on the environment.

A number of chemical reagents used in the process are expected to be stored in relatively large quantities at the mill site. Specifically, storage tanks are provided for sulfuric acid, sodium hydroxide, and ammonia. If an overflow or rupture were to occur, drainage of the liquid reagents would be contained in the mill sumps or flow toward the tailings pond.

The only chemical which might seriously impact the environment is ammonia. The anhydrous ammonia storage tank is located near the mill. A break in the tank's external piping would result in only a minor release. It is possible that the line carrying ammonia to the storage tank from the tank truck could be ruptured, in which case the release rate is assumed to be limited to 100 g/s (0.2 lbs) of vapor. The resulting concentration of ammonia at 2000m is conservatively estimated to average approximately 35,000 ug/m^3 over the entire period of release. This concentration is slightly more than the 27,000 ug/m^3 threshhold limit value for exposure up to 15 minutes without producing deleterious effects

on humans.[1]

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[1]American Conference of Governmental Industrial Hygienists, 1979, "Threshhold Limit Values for Chemical substances in Workroom Air."