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Mr. Dan Gillen
Uranium Mill Licensing Section
Division of Fuel Cycle & Material Safety
7915 Eastern Avenue
Silver Springs, MD 20906

DOCKETED
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SUA-667
Docket No. 40-4492

Dear Dan:

Attached are 10 copies each of responses to the NRC request for additional information as follows:

1. Meeting, July 17, 1980, Summary of Conclusions and Commitments, Attachment 1.

   Item #8

   Letter reporting all changes to ER as the result of the decreased proposed throughput from 3,000 tpd to 2,000 tpd.

   Response

   The following pages and/or tables are revised to reflect a decrease in the expanded mill capacity from 2,680 metric tons per day (2,950 short tons per day) to 1,814 metric tons per day (2,000 short tons per day) and ore grade from 0.12% U_3O_8 to 0.15% U_3O_8.

   Other revisions include a water balance and a radiological parameters assessment which were forwarded as answers to NRC inquiries of May 22, 1980, July 3, 1980 and July 17, 1980.

   Section 1, pages 1-1 and 1-2

   Section 3, pages 3-2, 3-10, 3-11, 3-12, 3-13, Table 3.3-1 and Table 3.3-2.

2. NRC letter of July 3, 1980, information form entitled, "Principal Parameters for Radiological Assessment", to be completed based on the revised expansion throughput of 2,000 tpd.

FEE EXEMPT 17314

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add'l info

Response

Attached is a list of Locations of Sources for 2,000 tpd (1814 MTPD) Mill, to be included with the FAP response of August 14, 1980, "Principal Parameters for Radiological Assessment".

Sincerely,

Emmerson Kemp

Emmerson Kemp, P. E.
Consulting
Metallurgical Engineer

EK/gb
Encs.
xc: w/encs: Dr. Minton Kelly-ORNL
Mr. G. W. Pierson-FAP

17314

1. PROPOSED ACTIVITIES 1/

Federal-American Partners (FAP) is a partnership consisting of two corporations. The managing partner, holding a 60 percent interest, is Federal Resources Corporation, a Nevada corporation with offices in Salt Lake City, Utah. American Nuclear Corporation, a Colorado corporation with offices in Casper, Wyoming, holds a 40 percent interest. The Tennessee Valley Authority (TVA) of Chattanooga, Tennessee is the 100 percent leaseholder.

FAP has operated a uranium mill in the Gas Hills Mining District of Wyoming since 1959 under NRC (AEC) Source Material License No. SUA-667. FAP is currently applying under Docket No. 40-4492 to renew this Source Materials License, and to obtain approval for a mill expansion and a modification to the tailings disposal system. This environmental report identifies and defines the potential environmental impact of the expanded mill and modified tailings disposal system. It is submitted to the Nuclear Regulatory Commission to satisfy requirements established under the National Environmental Policy Act of 1969. (Public Law 91-190).

The current mill (Ore Processing Area A) is located in Fremont County on the Gas Hills route approximately 80 kilometers (50 miles) east of Riverton, Wyoming. It is licensed for 860 metric tons (950 short tons) per day. The mill uses occasional ore drying, dry crushing, wet grinding, acid leach, sand-slimes separation, resin ion exchange, solvent extraction, and yellow cake precipitation, thickening and drying processes to recover U_3O_8 from the ore. Tailings are disposed in conventional surface impoundments. The mill is currently processing ore from reserves leased by the TVA in the Gas Hills area. These reserves are being mined by FAP and processed through the FAP mill under mining and milling agreements between FAP and TVA. Ore from these mines is transported to the mill by ore trucks operated over ore haulage roads.

Product yellow cake from the mill would be shipped approximately 1,800 kilometers (1,100 miles) to Kerr McGee's uranium enrichment plant located in Gore, Oklahoma. Transportation would be by trucks operated by an independent interstate trucking company.

Current plans call for the expansion of the mill to 1,814 metric tons (2,000 short tons) per day by expanding the mill process area to include Ore Processing Area B at the existing site. In addition, the existing ore drying, dry crushing, and wet grinding processes would be replaced with a

1/ Revised 9-1-80, changed mill capacity from 2,680 metric tons per day (2,950 short tons per day) to 1,814 metric tons per day (2,000 short tons per day) and ore grades from 0.12% U_3O_8 to 0.15% U_3O_8.

semi-autogenous grinding mill designed to feed both Ore Processing Areas A and B. The existing yellow cake precipitation, thickening and drying systems would be redesigned to process the U_3O_8 strip solution from Ore Processing Areas A and B. Ore Processing Area B would use acid leach, sand-slime separation, resin ion exchange, and solvent extraction unit operations very similar to those in use in Ore Processing Area A.

Ore would be processed from surface and underground mines operated by FAP in the Gas Hills area. All of those ore reserves are leased by the TVA and would be mined and milled under agreements with the TVA. Current ore reserves are sufficient for approximately ten years of mill operation at the expanded rate. However, exploration, drilling and reserve evaluations are continuing so that additional ore reserves may be located. This may allow the project life to extend beyond the currently projected ten years, depending on economics and the demand for the product.

The mill is expected to process ore 24 hours per day, 340 days per year. At the expanded ore processing rate of 1,814 metric tons (2,000 short tons) per day the mill is expected to process approximately 617,000 metric tons (680,000 short tons) of ore per year. The ore grade is expected to average approximately 0.15% U_3O_8 over the life of the project. The uranium recovery rate is expected to be approximately 91 percent. The U_3O_8 content of the yellow cake product is expected to be approximately 96 percent. Under these conditions, annual yellow cake production would be approximately 877 metric tons (966 short tons) per year.

Under current plans, the tailings disposal system would be modified to include a subsurface disposal area in an existing mine pit. Tailings from both ore processing areas would be combined in a common sump and pumped to the subsurface disposal area. Water would be decanted from the disposed tailings and pumped back to the mill for reuse or disposal in the solar evaporation pond.

Rubber fabrication and carpenter shops would be located in a separate building detached from the main mill facilities. The existing cement block warehouse located to the east of area A would remain. Its dimensions are approximately 47 meters x 10 meters x 6 meters high (154 feet x 32 feet x 20 feet).

Administration offices would be consolidated into a new central structure located in the general vicinity of the project area. An enclosed security station would be located at the entrance to the restricted mill area to provide product security and an added measure of safety to the general public.

A new modern laboratory would be constructed. It would use the latest in analytical equipment for the accurate analyses of process samples, along with environmental, industrial hygiene, and bio-assay samples.

Existing structures housing the crushing plant, ore dryer, offices, rubber shop, laboratory, and carpenter and electrical shops would be dismantled or utilized for other purposes.

3.3 THE MILL CIRCUIT

3.3.1 General Process Description

The expanded mill would consist of ore preparation, ore processing, and yellow cake production operations. The ore preparation facilities would include ore receiving, stockpiling and semi-autogenous grinding (SAG) systems. These facilities would be common for both ore processing areas. The ore processing facilities would consist of acid leach, sand-slime separation, resin-in-pulp (RIP) ion exchange and solvent extraction processes. Ore Processing Area A would include the ore processing operations in the existing mill. Ore Processing Area B would include processes located in the expanded portion of the mill. Common yellow cake production facilities for both ore processing areas would be provided in the Ore Processing Area A and would consist of yellow cake precipitation, thickening, roasting, and packaging systems. Ore crushing, drying and crushed ore storage facilities associated with the existing mill would not be used in the expanded mill. Figure 3.3-1 is a flowsheet showing the expanded mill processes.

3.3.2 Ore Preparation Operations

Ore received from one or more of the mines would be weighed and stored on an expanded outdoor ore pad located adjacent pregnant organic in the mix tanks to transfer the uranium values to the strip solution and would then overflow into the settler tanks for phase separation. After removal of the uranium, the organic would be pumped into a barren organic holding tank for reuse in the extraction system. The strip solution containing the uranium would be pumped into the precipitation tank for precipitation of the uranium as described in the next section. The basic stripping reaction can be characterized as follows:

$$(R_3NH)_4UO_2(SO_4)_3 + (NH_4)_2SO_4 \quad 2(R_3NH)_2SO_4 + (NH_4)_4UO_2(SO_4)_3$$

3.3.4.5 Operating Schedule

Ore Processing Area B is scheduled to operate 24 hours per day, 7 days per week.

3.3.5 Yellow Cake Production

The pregnant strip solution loaded with uranium values from both ore processing areas would be pumped to the precipitation tank where anhydrous ammonia would be injected into the solution through a submerged pipe to increase the pH of the precipitation solution to the range of 8.0 to 8.5. A chemical reaction would result between the pregnant strip solution and the ammonia to produce a precipitate salt of ammonium diuranate $((NH_4)_2U_2O_7)$.

The precipitate solution would flow by gravity into the no. 1 yellow cake wash thickener tank where the uranium precipitate would be gravity-separated from the strip solution. The thickener underflow would be pumped to no. 2 thickener tank for further washing and the thickener overflow solution would be recycled to the solvent extraction strip section. The underflow from no. 2 thickener would be pumped to a centrifuge for washing. The solution removed by the centrifuge would be returned to the no. 2 thickener and the washed ammonia diuranate would be converted to U_3O_8 and gaseous ammonia. The dried yellow cake (U_3O_8) would be discharged into a storage bin through a lump breaker.

Yellow cake would be withdrawn from the storage bin for packaging in 200-liter (55-gallon) drums for shipment. A drum scale would be provided to record the weight of the yellow cake that has been packaged.

Yellow cake production operations would take place 24 hours per day, 5 days per week.

At the expanded ore processing rate of 1,814 metric tons (2,000 short tons) per day, 340 days per year, the mill is expected to process 617,000 metric tons (680,000 short tons) of ore per year. The ore grade is expected to average approximately 0.15 percent U_3O_8 over the life of the project. The uranium recovery rate is expected to be approximately 91 percent. The U_3O_8 content of the yellow cake product is expected to be approximately 96 percent. Under these conditions, annual yellow cake production would be approximately 877 metric tons (966 short tons) per year.

3.3.6 Water Supply and Recycle Systems

Potable water is currently obtained from well no. 16 on the FAP property. This source is considered to be sufficient for the expanded mill.

Process water is currently obtained from a nearby FAP mined out mining pit. This existing process water supply is considered to be sufficient for the expanded mill operation. If there is a future need for an alternative process water supply, it would be developed from mining operations, wells, or existing adjudicated water rights.

The expanded mill would make use of the maximum practicable reuse of process water. Tailings from both ore processing areas would be pumped to the below grade tailings disposal area. Water would be decanted from the tailings in the below grade disposal area and pumped back to the mill for reuse. Excess process water would be bled off and pumped to the solar evaporation pond.

Figure 3.3-2 presents a preliminary water balance for the expanded mill and below grade tailings disposal area.

3.3.7 Process Reagent and Material Usage

Expanded mill operation is expected to require the use of a number of process reagents and materials. Annual usage of these reagents is listed in Table 3.3-1 (Annual Usage of Process Reagents) and Table 3.3-2 (Annual Usage of Process Materials).

3.4 SOURCES OF MILL WASTES AND EFFLUENTS

Both radiological and non-radiological wastes and effluents would be generated by the expanded mill. These would consist of solid, liquid, and gaseous wastes and effluents. All wastes and effluents would be controlled, as necessary, and disposed in an environmentally acceptable manner. Table [illegible] summarizes the principal parameters for the radiological [illegible]sessment. Sources of expanded mill wastes and effluents are discussed in the following paragraphs. Emission calculations for mill waste and effluents are presented in appendix A.

3.4.1 Solid and Liquid Wastes (Mill Tailings)

The mill tailings would represent the bulk of both radiological and non-radiological wastes. With the exception of the recovered uranium and some process losses, tailings would account for practically all of the ore solids and the process additives, including water. Approximately 6,070 metric tons (6,690 short tons) of tailings would be discharged from the expanded mill per day. These tailings would consist of approximately 30 percent solids by weight. Tailings solids are usually classified as the following:

- Sand - Consists of solids greater than 325 mesh
- Slimes - Consist of solids less than 325 mesh
- Liquids - Solutions of chemicals from the ore and process reagents.

In the Draft Generic Environmental Impact Statement on Uranium Milling, the NRC assumed that the slimes and liquids would constitute 35 percent and 50 percent of the tailings would consist of sands. Therefore the slimes would consist of approximately 70 percent of the tailings solids.

In the expanded FAP mill the solids would constitute only 30 percent of the tailings by weight. If the solids were assumed to be 70 percent slimes as in the NRC case, the tailings would have the following composition:

Sand	9%
Slimes	21%
Liquid	70%
	100%

The radioactivity of a typical sample of the ore would be approximately:

U nat. - 900 picocuries/gram
Ra-226 - 525 picocuries/gram
Th-230 - 188 picocuries/gram
Pb-210 - 300 picocuries/gram

At the expanded mill processing rate of 617,000 metric tons (680,000 tons) per year the radioactivity entering the mill would be approximately:

U nat. - 555 curie/year
Ra-226 - 324 curie/year
Th-230 - 116 curie/year
Pb-210 - 185 curie/year

The quantity of U_3O_8 entering the tailings is expected to be approximately 10 kilograms/hour (22 pounds/hour) or approximately 8.8 percent of the U_3O_8 entering the mill. Therefore, approximately 8.8 percent of the natural uranium entering the mill is expected to end up in the tailings. In the Draft Environmental Statement Related to Operation of Morton Ranch Uranium Mill, the NRC estimated that the product yellow cake would contain 5 percent of the Th-230, 0.2 percent of the Ra-226, and 0.2 percent of the Pb-210 originally in the ore (ref. 2). If it is assumed that the remaining quantities entered the tailings, 95 percent of the Th-230, 99.8 percent of the Ra-226, and 99.8 percent of the Pb-210 originally in the ore would enter the tailings. Based on the above percentages, the radioactivity leaving the mill in the tailings would be approximately:

U nat. - 49 curie/year
Ra-226 - 323 curie/year
Th-230 - 110 curie/year
Pb-210 - 185 curie/year

At an annual tailings discharge rate of approximately 2,064,000 metric tons (2,275,000 short tons), the radioactivity of the tailings would be approximately:

U nat. - 15 picocuries/gram
Ra-226 - 105 picocuries/gram
Th-230 - 36 picocuries/gram
Pb-210 - 59 picocuries/gram

In the Draft Generic Environmental Impact Statement on Uranium Milling, the NRC assumed that 85 percent of the radioactivity in the tailings would be concentrated in the slimes (ref. 3).

As stated above, the tailings liquids would consist of solutions of chemicals from the ore and process reagents. Process reagents used by the expanded mill are discussed in section 3.3.7.

3.4.2 Dust and Gaseous Effluent Releases

Dust and gaseous effluents would be discharged to the atmosphere from various portions of the expanded mill. Sources of these effluents would include the ore storage pad, various locations in the wet processing areas of the mill, the yellow cake drying and packaging operations, and the tailings disposal and solar evaporation pond areas. Figure 3.4-1 shows the location of dust and gaseous effluent release points. Table 3.4-2 presents information on the stacks discharging effluents. Table 3.4-3 presents the average annual radioactive nuclide emissions to the atmosphere during milling operations. Sources of dust and gaseous effluents are discussed in the following paragraphs.

TABLE 3.3-1

ANNUAL USAGE OF PROCESS REAGENTS

Reagent	Annual Usage
Ammonia	1,736 metric tons (1,914 short tons)
Sulfuric Acid	20,000 metric tons (22,100 short tons)
Sodium Chlorate	1,119 metric tons (1,227 short tons)
Ferrous Sulfate	N/A*
Soda Ash	753 metric tons (827 short tons)
Caustic Soda	44 metric tons (49 short tons)
Kerosene	26,984 liter (7,100 gallon)
Tertiary Amine	1,373 kilograms (3,024 pounds)
Isodecanol	2,173 kilograms (4,800 pounds)

*Ferrous sulfate would only be used occasionally when the iron content of the ore is insufficient for proper process operation.

TABLE 3.3-2

ANNUAL USAGE OF PROCESS MATERIALS

Material	Annual Usage
Resin	20 cubic meters (712 cubic feet)
Celetom (Filter Aid)	7 metric tons (8 short tons)
Activated Carbon	2,800 kilograms (6,200 pounds)

Locations of Sources for 2,000 tpd (1814 MTPD) Mill

	Sources	X (km) East	Y (km) North	Z (m) Elevation
1.	Yellowcake Dryer	0	0	18
2.	Grinder(s)	NA	NA	NA
3.	Crushers	--	--	--
4.	SAG Ball Mill	-0.015	0.061	2
5.	Ore Pad	-0.169	0.058	2
6.	Fine Ore Blending	NA	NA	NA
7.	*Pond No.1 (mid point) Evap.	-0.732	0.991	-3
8.	Tailings pond no. 2 (mid point)	-0.168	0.442	3
9.	Heap Leach Pile	NA	NA	NA
10.	Other Sources (Subsurface Tailings Pond)	--	--	--
	A. Submerged Tailings	-1.532	-0.405	-21
	B. Exposed Tailings Sands	-1.532	-0.405	-21
	C. Exposed Tailings Slimes	-1.532	-0.405	-21

*Present evaporation pond.

a. All locations should be given in terms of:
x kilometers east of the yellowcake dryer stack
y kilometers north of the yellowcake dryer stack
z meters elevation from the base of the yellowcake dryer stack

b. Locations to the south and/or west shall be denoted by a negative value.