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Docket File 6659  
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URFO:GRK  
 Docket No. 40-6659  
 SUA-551, Amendment No. 11  
 04006659261E

MEMORANDUM FOR: Docket File No. 40-6659

FROM: Gary R. Konwinski, Project Manager  
 Licensing Branch 2  
 Uranium Recovery Field Office, RIV

SUBJECT: AMENDMENT NO. 11 TO SOURCE MATERIAL LICENSE SUA-551

Background

By letter dated April 1, 1985, Petrotomics Company submitted the specifics of a updated ground water management program. The submittal was in response to License Condition No. 36 which in part states that the licensee's submittal, "... shall include a study and implementation schedule for an enhanced ground water remedial action program as well as a proposal for a representative ground water monitoring system ...". As detailed in the Petrotomics submittal, the proposed program consists of three parts: ground water monitoring, tailings solution evaporation and seepage collection and return. Upon receipt of the Petrotomics' submittal, the staff drafted a review and met with the Wyoming Department of Environmental Quality (WDEQ), on October 30, 1985, to discuss an appropriate course of action. Recommendations from that meeting were transmitted by WDEQ letter dated December 11, 1985 to the URFO. These recommendations represent joint considerations and are incorporated into this licensing action as appropriate.

Ground Water Monitoring

The current ground water monitoring program at the Petrotomics Mill consists of sampling from 9 wells: the Mine Site, RTH wells 1-5, the Shirley Basin Townsite, 1AC and the seepage collection well. The water

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samples are analyzed for thirty-five chemical parameters on an irregular frequency and are routinely analyzed for eighteen chemical parameters and five radionuclides each quarter. Initial concern over the ground water monitoring program was discussed in the license renewal effort. It was noted that wells RTH 2 and 3 were dry, old RTH 1 went dry and was redrilled and renamed new RTH 1 or IDC. This well was subsequently destroyed during construction activities. Additionally, RTH 4 and RTH 5 were almost 1 mile (upgradient) of the tailings impoundment and completed in a formation which has no relevancy to the current operations. The Shirley Basin Townsite well is about 3 miles upgradient from the millsite and completed in an unknown formation. Similarly, the Mine Shop well is upgradient of the impoundment and completed to a depth of more than 300 feet. Well IAC primarily samples percolation from surface runoff and is not therefore representative of ground water conditions. The Townsite and Mine Shop wells as well as well IAC are hydrologically incapable of receiving seepage. Similarly, the seepage collection well adds little information to the monitoring program because its water quality is generally the same as the tailings impoundment solution.

Because much has been learned about the tailings management system and the associated seepage, the current set of ground water monitoring wells was considered to be inadequate. In response to this, Petrotonics proposed to utilize a series of SC (shallow cased) wells and some of the existing wells in their ground water monitoring program. Table 1 compares the existing and proposed ground water monitoring wells. Figure 1 shows the proposed sampling wells and the known zones of seepage.

As can be seen from Table 1 there is a significant reduction in the number of parameters which Petrotonics proposes to monitor for. The eleven parameters which they propose to monitor, on a quarterly frequency, are adequate to monitor for tailings derived seepage and associated ground water movement in the vicinity of the tailings impoundment. The staff has reviewed past ground water monitoring data and noted that of the 36 parameters Petrotonics monitors for, seven continually are found at less than detection limits. A review of the analytical results obtained for the tailings impoundment indicates that these parameters are either absent from the tailings solution or in trace amounts. Furthermore, these parameters are in families of constituents which potential movement can be predicted by other monitored parameters.

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TABLE 1

Comparison of Existing and Proposed Ground Water Monitoring Programs

Wells		Parameters		Sampling Frequency	
				Current	Proposed
Old RTH 1	#	Aluminum	*	I	
1DC (New RTH 1)	= #	Ammonia	*	I	
RTH 2	= #	Arsenic	*	A Q	Q
RTH 3	= #	Barium	*	I	
RTH 4	=	Bicarbonate	*	A	
RTH	=	Boron	*	I	
1AC	=	Cadmium	*	I	
Mine Shop	=	Calcium	*	I	
Townsite	=	Carbon(organic)*	=	A	
Seepage Collection	=	Carbonate	*	A	
1 SC	#	Chloride	*	A Q	Q
3 SC	#	Chromium	*	I	
4 SC	#	Copper	*	A	
5 SC	#	Fluoride	*	I	
39 SC	#	Hardness	*	A Q	
40 SC	#	Iron	*	A	
41 SC	#	Lead	*	A Q	
42 SC	#	Magnesium	*	I	
44 SC	#	Manganese	*	A	
45 SC	#	Mercury	*	I	
		Molybdenum	*	A	
		Nickel	*	I	
		Nitrate	*	A Q	
		Potassium	*	I	
		Selenium	*	A	Q
		Sodium	*	A	
		Sulfate	*	A Q	Q
		TDS	*	A Q	Q
		TSS	*	A	
		Vanadium	*	I	
		Zinc	*	I	
		pH	*	A Q	Q
		U-nat	*	Q	Q
		Th-230	*	Q	Q
		Ra-226	*	Q	Q
		Pb-210	*	Q	Q
		Po-210	*	Q	Q

Petrotomics will attempt to redevelop these wells in the summer of 1985

# proposed ground water monitoring program

= existing ground water monitoring program

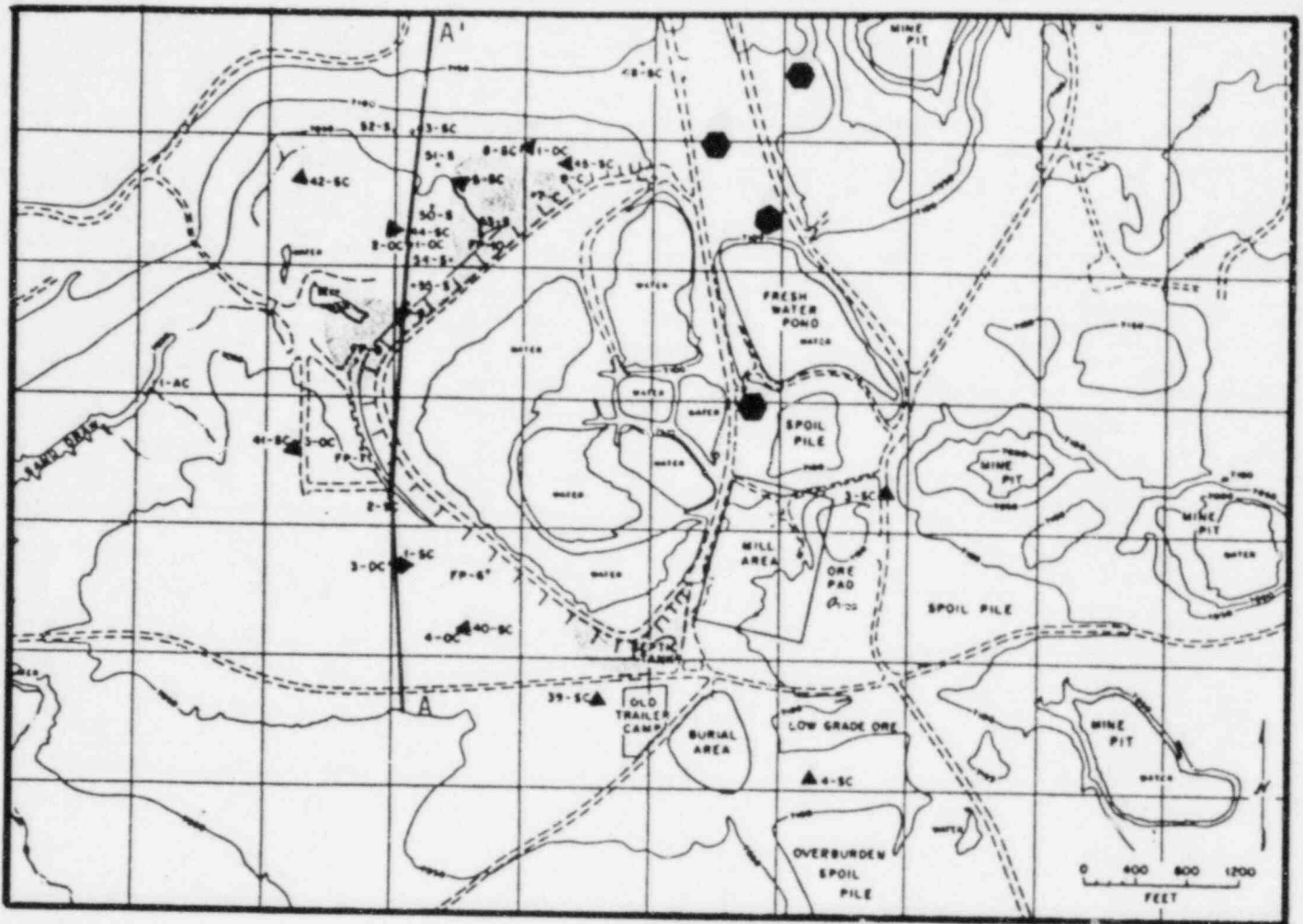
\* parameters monitored on a irregular frequency

A annual sampling frequency

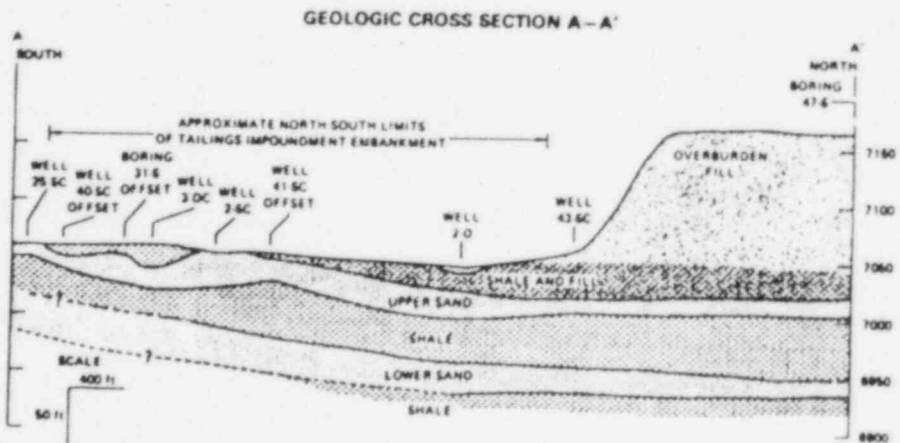
Q quarterly sampling frequency

I irregular sampling frequency

FIGURE 1 - TAILINGS MANAGEMENT SYSTEM



- Major Zones of Seepage
- Proposed Monitoring Wells
- Potential Locations for Additional Monitoring Wells



The staff will therefore recommend that these seven parameters (boron, cadmium, carbon [organic], chromium, mercury, nickel and Zinc) be dropped from the ground water monitoring program.

Previous studies indicate that tailings derived seepage from the Petrotoxic's tailings impoundment appears to be confined to the Upper Sand. Due to this, the staff concludes that the Upper Sand should be the unit which receives the majority of the monitoring. However, as a check to assure that if seepage should contaminate the Lower Sand it does not go undetected, one well (new RTH 1 or IDC) should be redrilled and sampled in this unit. As a further check on the Lower Sand, Petrotoxic has proposed to redevelop wells old RTH 1 and RTH 3. The redevelopment effort will take place in the Summer of 1985. The staff feels that the redevelopment of these wells is very important to the groundwater monitoring program and will require, by license condition, that if redevelopment of these wells is unsuccessful, then they will be redrilled adjacent to their existing locations. For a geologic cross section, which shows the Upper and Lower Sand units, see Figure 1.

It should also be noted that a detection monitoring program which meets the requirements of 40 CFR 192 has recently been added to the Petrotoxic's Source Material License. This program will utilize wells 5 SC, 39 SC and 41 SC as monitoring points and could potentially be used to monitor for groundwater parameters in addition to those listed in Table 1 of this memorandum. Based upon the above discussion, the staff concludes that sampling and analysis from the proposed wells is adequate to monitor seepage leaving the tailings impoundment. However, the staff in consultation with WDEQ, concludes that the sampling program should include ground water samples from areas more distant from the tailings impoundment. Such sampling would require the installation of additional wells. Upon review of the available data, the staff would recommend the installation of at least four monitor wells. Ideal locations of the monitoring wells would be: two wells north-northeast of the tailings impoundment equally spaced on a line with the Pit 4 impoundment as well as two wells east of the tailings impoundment. The approximate locations of these wells are shown on Figure 1. With the inclusion of the previously described monitoring wells, as well as the annual full suite analysis as previously described, the staff would conclude that a reasonable ground water monitoring program has been developed and therefore recommend that it be incorporated into Petrotoxic's Source Material License.

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Ground Water Study

The staff has reviewed all available ground water information for the Petrotomics' facility and conducted several on-site studies over the 1984 and 1985 field seasons. These studies have identified several deficiencies in the amount of ground water data available for the site. This led to the conclusion, as previously discussed, that additional monitoring wells would be needed for the site. In conjunction with the need for these wells, it would also be appropriate for Petrotomics to assemble the data from their completed wells as well as additional ground water data which has been collected since the previous comprehensive ground water report dated July 20, 1981, into an updated ground water study.

The staff discussed this situation with the WDEQ, and finds agreement that an updated ground water/seepage related study should be performed for the Petrotomics site. The installation of the new monitoring wells plus the data from the SC series wells will help to define the seepage as well as the quality of the ground water in areas where no previous information existed. Additionally, this data will aid in the determination of reasonable surety arrangements, ground water restoration and monitoring, as well as the formulation of a potentiometric surface map for areas previously unmapped.

Tailings Solution Evaporation

As stated in the background discussion, Petrotomics was directed by License Condition No. 36 to study and propose an implementation schedule for an enhanced ground water remedial action program. In response to this Petrotomics included in their April 1, 1985 submittal a proposal for enhanced tailings solution evaporation. The proposal consists of four lines of spray nozzles. The lines have 70 to 80 spray nozzles which are mounted on risers attached to the main discharge lines. Table 2 shows the predicted evaporation potential of the system and Figure 2 shows the layout of the proposed enhanced evaporation system.

When License Condition No. 36 was originally written the staff had assumed that Petrotomics would propose to recover more seepage water from the Upper Sand and return it to the tailings impoundment. The staff

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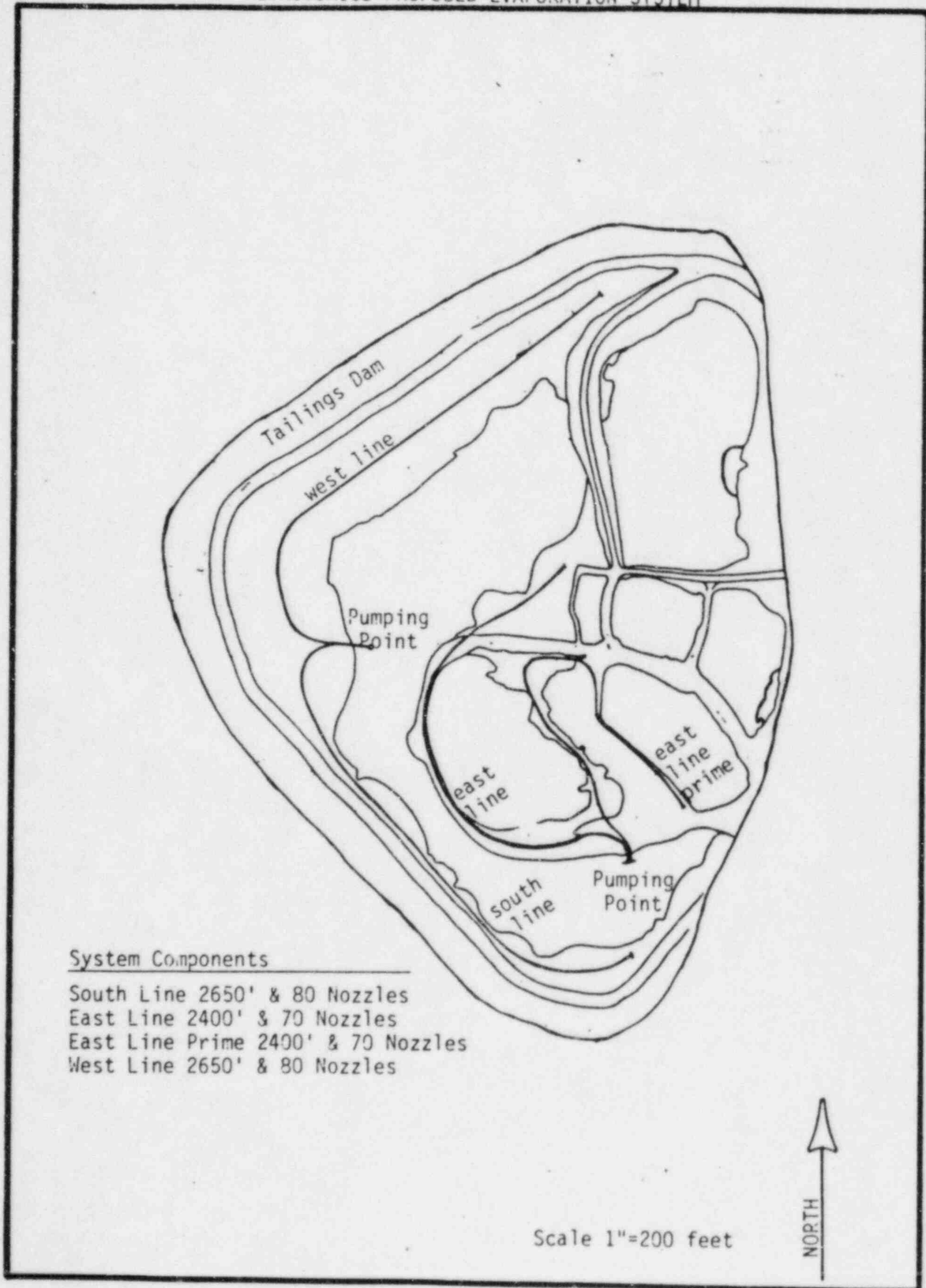
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TABLE 2  
Evaporation System Design Assumptions

LINE	NO. OF NOZZLES	NOZZLE GPM	ASSUMED GPM	TOTAL GPM	GAL/ 12 HRS	EVAPORATION RATE (GALLONS)	
						@ 23% <sup>1</sup> /12 HR	@ 10% <sup>1</sup> /12 HR
SOUTH	80	3.2	3.1	248	178,560	41,068	17,856
WEST	80	3.2	3.1	248	178,560	41,068	17,856
EAST	70	3.5	3.3	231	166,320	38,254	16,632
EAST <sup>1</sup>	70	3.5	3.3	231	166,320	38,254	16,632
TOTALS	300	--	--	958	689,760	158,644	68,976

1. Assumed efficiency rates of evaporation loss of 23% and 10%.

FIGURE 2- PETROTOMICS PROPOSED EVAPORATION SYSTEM





concur with the idea of eliminating the free water surface in the tailings impoundment and thereby reducing the driving force behind the seepage water. The system as proposed would totally evaporate the tailings solution in 2.5 to 3.0 years. This estimate is very conservative, based upon the 10% to 23% estimated evaporation rate which the staff feels should be closer to 20% to 40%. Regardless of the actual evaporation rate the staff finds the proposed system to be an effective means of reducing the driving force behind tailings impoundment seepage into the underlying aquifer.

As designed, the proposed evaporation system will eventually eliminate the free liquid in the tailings impoundment. At this time the staff will review the total tailings management system (evaporation system, dust suppressant system and seepage collection) to determine the appropriate course of action. The staff realizes that there will be a point in time when the seepage collection system will lose its efficiency and eventually require reduced operating time and potentially elimination.

#### Seepage Collection and Return

In the fall of 1981, Petrotomics installed a seepage collection system. As detailed in the "As-Built Description of Petrotomics Company Tailings Seepage Collection System" dated April, 1982, the system consists of a tiled and gravel filled trench which drains to a sump. The sump is equipped with a pump which then returns the seepage to the tailings impoundment. The average monthly seepage return rate is 1.0-1.5 million gallons of solution.

Petrotomics has proposed to maintain the existing seepage collection system in its present form. The staff concurs with this proposal for the near term. However, based upon the data obtained from the installation of wells as previously proposed in this memorandum, the staff may require additional efforts on behalf of Petrotomics to recover seepage water from contaminated zones which are known to exist outside of the present seepage collection system.

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Conclusion

The ground water management program which Petrotomics has proposed with the inclusion of the staff recommended additions; i.e., additional wells and annual full suite sampling, represent a program that is consistent with current tailings management goals. With the cessation of milling and the lack of discharge of solution to the tailings impoundment occurring in June of 1985, significant progress can be made towards dewatering the tailings impoundment via enhanced evaporation. This will not only decrease the ground water mound, but also control blowing of tailings due to the increase in beach moisture. Based upon this discussion the staff concludes that the Petrotomics' license should be amended to reflect the proposed ground water monitoring program with the additions as discussed above. The staff therefore recommends that Source Material License No. SUA-551 be amended by deleting License Condition No. 32 and revising License Condition No. 41 to read as follows:

41. The licensee shall implement the environmental and effluent monitoring program as specified in Table 5.5.7-1 of the renewal application as revised on March 27, 1985. Notwithstanding the above submittal, the licensee shall by June 1, 1986, implement a ground water monitoring program as described below:
  - A. Sample SC Wells 1, 3-5, 39-42, 44 and 45 on a quarterly frequency for: arsenic, chloride, selenium, sulfate, TDS, pH, U-nat, Th-230, Ra-226, Pb-210 and Po-210. Annually the licensee shall sample the above wells for the above parameters as well as: aluminum, ammonia, barium, bicarbonate, calcium, carbonate, copper, fluoride, hardness, iron, lead, magnesium, manganese, molybdenum, nitrate, potassium and sodium.
  - B. Redevelop or redrill Wells IDC, RTH 1 and RTH 3 as well as complete four additional monitoring wells, in the Upper Sand aquifer, in the area north and east of the tailings impoundment. Completion details shall be submitted to the USNRC, Uranium Recovery Field Office, by June 30, 1986.
  - C. Maintain, at a minimum, the enhanced evaporation system as described in the April 1, 1985 submittal. Furthermore, the licensee shall maintain the seepage recovery system

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and return all collected seepage to the tailings impoundment.

Additionally, the licensee shall by August 15, 1986, submit an updated ground water study for the Petrotomics site which defines the movement and extent of tailings derived seepage as well as future mitigative actions.

*[Signature]*  
Gary R. Konwinski, Project Manager  
Licensing Branch 2  
Uranium Recovery Field Office, RIV

Approved by:

*[Signature]*  
Harry J. Pettengill, Chief  
Licensing Branch 2  
Uranium Recovery Field Office, RIV

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