40-8698

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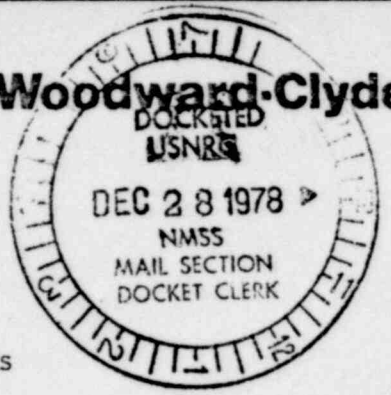
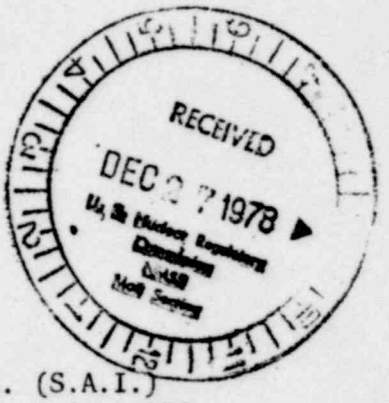
PDR





December 21, 1978
60255A

Mr. G. Trager
Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington,DC 20555

Subject: Shootering Canyon Project, Docket No. 40-8698

Dear Mr. Trager:

This is to respond to the memo from Science Applications, Inc. (S.A.I.) transmitted by telecopier (undated, handwritten) to WCC December 20, 1978. You mentioned in our telephone conversation on December 19 that the SAI memo would be forwarded. The subject of the memo was the quantity of mine waste rock required to neutralize the Shootering project tailings. A commitment to neutralize to a pH of 4.0 was suggested. SAI expressed the opinion that crushed lime or limestone might be required to achieve the suggested degree of neutralization.

Response - Plateau Resources Limited has proposed a tailings management plan which incorporates great flexibility in the operations for the purpose of optimizing performance based on results. The intent is to contain within the tailings impoundment the greatest practical amount of the radioactive and toxic material present in the tailings slurry discharged from the process circuit.

It seems in order here to note the overall principles proposed for management of the tailings liquid. The management system is designed to remove excess liquid from the disposal facility. The plan includes provisions to limit seepage to small amounts, and for the purposes of this discussion, losses of liquid from the system by seepage need not be included. Accordingly, the mechanisms available for removing excess liquid from the system are recycling to the process circuit to reduce net additions to the system, and evaporation.

The tailings in the impoundment will be drained to recover the greatest practical amount of liquid for recirculation. An important purpose of the proposed neutralization is to prevent concentration of dissolved minerals in the recycled liquid that might interfere with the process operations, thereby limiting the amount that may be recycled. At this time it is not known precisely the extent to which various minerals may be concentrated in the tailings liquid or what effects t[illegible] concentrations will have on the process. Careful monitoring of the early operations of the process and the recycled liquid will be required to determine practical limits for those parameters which may be readily controlled.

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One of the procedures proposed for tailings management is to increase the pH of the tailings liquid within the impoundment and thereby reduce the solubility of various constituents best retained within the tailings mass. The expected acidity of the tailings as delivered to the disposal facility is pH = 1.5. Neutralization of some portion of the tailings acidity by reaction with carbonate (or equivalent) contained in locally available mine waste rock is proposed. Woodward-Clyde Consultants have assumed that this procedure would yield a resultant pH of the tailings mass in the range of 5 to 6.5.

We know of no regulations or criteria which set limits on pH in this situation. Any limit set would, of course, be arbitrary. We suggest that there are practical limits to neutralization and that those limits may be established by an evaluation of degree of neutralization achieved as a function of the related costs. For a complex reaction, such as that considered here, we believe that those limits may best be determined by an analysis of the operating results as operating parameters are varied. At this time Plateau Resources Limited considers that it may be feasible to achieve recirculation with little neutralization required of the recycled liquid, and they are planning their disposal operations on that basis. To the extent that neutralization is required they will vary the amount of mine waste rock added to the tailings mass and, if necessary, they will consider adding other neutralizing agents such as lime or limestone, to the tailings slurry to try to obtain the objective. They will, of course, monitor the pH of the liquid in the disposal facility.

Mine waste rock will be added to the tailings system in two ways. First, as the clay liner of the facility is completed it will be covered with other materials to protect the clay from drying and cracking. The other materials will consist of an 18 inch layer of locally available sandy material and an 18 inch layer of mine waste rock. The two layers together are intended to serve as a drainage blanket that will deliver excess tailings liquid from the bottom of the tailings mass to a system of collector drain pipes to be installed over the clay liner. Second, mine waste rock will be added progressively to the impoundment as a part of the operations. Present plans are to place several truckloads of waste rock in the vicinity of each tailings discharge point immediately preceding the start of discharge at the point in each discharge cycle. It is expected that the

major reaction between the tailings acid and the carbonate (or equivalent) in the waste rock will occur promptly following contact at the discharge. In that event the waste rock in the drainage blanket will make only a minor contribution to the neutralization. The number of truckloads of waste rock added in each cycle may of course be varied as required to provide sufficient carbonate for the reaction.

SAI presumed in their approximate analysis of the situation that the total sulfate noted as present in the tailings solution was present only as bisulfate or sulfate in equilibrium with the acid content of the solution. In fact, according to the simulated tailings liquor assay provided by Mountain States Engineers, the bulk of the sulfate appears to be associated with other cations than the acid, principally magnesium. Consequently, it is probably inappropriate to assume, as SAI did, that the bulk of the sulfate is in the form of bisulfate. Neutralization, therefore, would largely lie in the realm of reaction equilibria between various carbonate and sulfate minerals leading to a higher pH than that forecast by SAI.

To the extent that the waste rock in the drainage blanket becomes involved in the neutralization reaction, there is a likelihood that the drainage blanket may become plugged by the precipitates formed in the reaction. For this reason it is planned to construct continuous vertical sand drains over the collector drain pipes. Those sand drains will be constructed of relatively clean, and no longer reactive, tailings sand obtained by hydroaulic separation resulting from the placement procedures.

To conclude, Plateau Resources Limited plans to achieve recycle liquid. To meet this objective they will neutralize the tailings as necessary to maintain acceptable impurity levels in the recycled liquid. Present plans are to rely on mine waste rock for the neutralization, but if satisfactory results cannot be practically achieved by this means, lime or limestone may be added to the system. The primary measure of satisfactory results will be the acceptability of the reclaimed tailings liquid in the process circuit.

The proposed tailings neutralization and drainage procedures would be applicable to the three tailings disposal alternatives evaluated for the project. It is assumed that the construction and operating costs for neutralization and drainage would be equivalent for the three disposal alternatives.

Plateau Resources Limited has an on-going program of testing and analysis of the ores, processes, and products for the Shootering project. The testing and analyses will continue during the project operations. The intent is to expand and improve their understanding of the reactions and products resulting from their operations, and the ways in which the processes and products may be varied to optimize the overall project operations.

Sincerely,

M B Bennedsen

M. B. Bennedsen
Senior Project Engineer

cc: Mr. Sewell, Mr. Rookstool PRL
Mr. M. Kelley, ORNL
Mr. LaMonica SAI