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John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

We have reviewed the draft Surveillance and Maintenance Plan for the Shiprock, New Mexico UMTRA site, transmitted by your letter dated June 13, 1986. As indicated in the enclosed comments, the lack of plans to monitor contaminant levels in groundwater is a major concern. Due to the scope of the comments, we request that you address them in a separate transmittal prior to the issuance of a final Surveillance and Maintenance Plan for NRC consideration and concurrence.

Should you have any questions regarding this review, please contact Dan Gillen of my staff at FTS 427-4160.

Sincerely,

/S/

Malcolm R. Knapp, Chief
Low-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure:
As stated

WM Record File
WM Project 58
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GENERAL COMMENTS

Need For Implementing a Plan To Monitor Groundwater Quality

The Surveillance and Maintenance Plan (SMP) for Shiprock states that "monitoring of the terrace and river alluvial systems is not necessary at this time," because (1) future use of groundwater is unlikely, (2) alternate drinking water sources are available, and (3) the background water quality is poor. Despite the statement that monitoring is unnecessary, the SMP indicates that a network of monitor wells throughout the site, including wells on the north side of the San Juan River will be maintained. NRC staff conclude that groundwater monitoring should be established as part of the SMP at the Shiprock UMTRA Project site for the following reasons:

1. The stabilized tailings at Shiprock are located in a populated area with limited water resources.
2. Groundwater in the alluvial floodplain, now contaminated, was used in the past; future need of this groundwater is likely.

The following discussion, relevant to the different alluvial sediments, support the position that groundwater monitoring is necessary:

(1) Groundwater Monitoring in the Alluvial Terrace Deposits

Groundwater contamination in the alluvial terrace deposits below the mill tailings probably resulted from the discharge of large volumes of contaminated water from the uranium mill tailings during the mill's operational phase. The remedial action plan concludes that negligible amounts of recharge and subsequent production of contaminants will occur in the future. Thus, the existing contamination should dissipate. This scenario can be confirmed (or discounted) by a monitoring program which examines changes in water levels and water quality in these upper terrace deposits with time.

(2) Groundwater Monitoring in the Floodplain Alluvial Deposits

The floodplain alluvial deposits immediately adjacent to the Shiprock site have been contaminated by uranium milling operations at Shiprock, NM. Contaminant concentrations in the groundwater in these deposits, however, may eventually dissipate to levels where groundwater quality could be considered acceptable for drinking water purposes. Since these deposits were once used as a source of drinking water and water use from the San Juan River is nearly or completely allocated, the potential exists that groundwater in these deposits may be needed in the future for drinking water. Thus, the groundwater resources

should not be restricted anymore than is necessary to protect the public and environment.

To preclude future groundwater use in the floodplain, the proposed plan would incorporate these floodplain deposits within the institutionally controlled area of the site. While precluding present use of groundwater in the floodplain sediments is desirable, NRC staff considers that groundwater quality should be monitored to determine when the institutional controls could be relaxed. Similar concerns have been outlined in NRC comments on the "Shiprock RAP Modification Number 3: Groundwater Contamination in Floodplain Deposits", transmitted to DOE on August 8, 1986.

(3) Groundwater Monitoring in the Alluvial Deposits North of the San Juan River

Since contamination of groundwater in the floodplain sediments on the north side of the San Juan River has been identified, groundwater contamination in these sediments should be monitored to ensure protection of the public and the environment.

Soil Sampling

The need for soil sampling in conjunction with groundwater monitoring is documented in the Guidance Document (DOE, 1986b), Section 4.2 "Background and Baseline Water Quality." According to the Guidance Document (DOE, 1986b), samples analyzed for residual contamination can be used to evaluate whether elevated concentrations of various constituents in the water samples are a result of seepage from the mill tailings, or are from residual contamination released to the water from contaminated soil or rock outside the site perimeter. Soil sampling should be conducted in conjunction with any additional monitoring wells that are installed as part of this program. The soil samples, analysed for the constituents listed in Table 4.1 of the Guidance Document (DOE, 1986b), may serve to identify potential sources of groundwater contamination, and may indicate whether contaminant concentrations in groundwater would be expected to decrease after remedial actions are complete.

SPECIFIC COMMENTS

Page 4, Section 2.1.4, Paragraph 2, Signs

(1) An unattended facility near a populated area is likely to be an inviting location for trespassing and vandalism. For this reason, several warning signs should be mounted on posts within the chain-link fence, out of reach of would-be vandals. Additionally, attaching warning signs on the inside of the fence, rather than the outside, would likely decrease theft.

(2) As part of the planned institutional controls, the SMP states that a series of warning signs on the floodplain south of the San Juan River would be posted to discourage people from drilling for groundwater. However, no such plan has been proposed for the floodplain area north of the river, even though data indicates that the groundwater is contaminated. Because the town of Shiprock is adjacent to the northern floodplain sediments and water retrieval systems (i.e., the infiltration galleries) were used in the floodplain sediments in the past, NRC staff conclude that groundwater may be utilized without knowledge that it is contaminated. Therefore, DOE should institute controls on the groundwater north of the river similar to those found on the floodplain south of the river (i.e. a network of warning signs) or justify why this action is unnecessary.

Page 4, Section 2.2, Paragraph 3, Erosion Measurement Markers

(1) According to drawing SHP-PS-40-0010, erosion monitoring will take place at three locations along a relatively short segment of the San Juan River escarpment. Due to the present conditions of the river (thalweg path, orientation of the escarpment, and orientation of point-bar chutes) future fluvial attack of the escarpment is most likely to occur first south of the site, upstream approximately 180 m (600 ft). For this reason, moving the southernmost monitoring station nearer to the southernmost portion of the site should be considered.

The northernmost monitoring station, approximately 100 m from the middle station, is likely to monitor erosion rates which duplicate those of the middle station. The northernmost extent of the escarpment would be unmonitored. Therefore, relocating the northern monitoring station nearer to the northernmost portion of the site should be considered.

Also, considertion should be given to adding a fourth erosion monitoring station at Bob Lee Wash, downstream of the energy dissipation area where a transition to existing topography is made. This area is likely to experience some erosion and should be monitored to assure that erosion does not affect the energy dissipation area.

(2) Erosion monitoring stations will be located on or near the San Juan River escarpment outside the fence (according to drawing SHP-PS-40-0010), and will consist of two rebar posts which extend three feet above ground. Accessibility and visibility of the instrumentation may make it subject to deliberate tampering. The NRC staff suggest use of an anchored monument such as is to be used at the Canonsburg site, as a bench mark for

measurement of escarpment retreat. A USGS-type bench mark, a concrete post, or brass plate mounted close to the ground would be more tamper-proof and sufficiently concealed from casual notice. Survey and boundary monuments included in the SMP could be adapted for this purpose. In addition, a sectional view that displays typical installation details of the erosion markers should be provided.

Page 4, Section 2.3, Settlement plates

This section should briefly cover what total and differential settlements are anticipated based on design predictions. Moreover, it should include a description of the increased visual observations that would be performed during the Phase I inspections, if these anticipated settlements are significantly exceeded and settlements are shown to be non-uniform. The staff suggests this section include a requirement that the settlement data be graphically plotted in the time-settlement format after each recording, where significant changes and trends could be readily viewed and assessed.

Page 7, Section 2.4.1, Paragraphs 1 and 5, Background Levels

Paragraph 1 states that cross-river groundwater contamination is masked by "naturally high levels of sulfate and total dissolved solids and other constituents...". Paragraph 5, states that "constituents other than molybdenum and vanadium...are at background concentrations". Neither the SMP nor Appendix E of the Processing Site Characterizaton Report: "Supplemental Groundwater Information" (DOE, 1986c) provide enough information to support these statements, because the groundwater data collected are insufficient to assess seasonal variations. In addition, the samples were collected from two wells immediately adjacent to one another, though screened at different depths in the same stratigraphic unit. These statements should be removed or modified to reflect the fact that although concentrations of molybdenum, vanadium and other constituents may be high, background levels of these constituents have not been established.

Page 7, Table, Evidence for Cross-River Contamination

Water quality data in the table on Page 7 are used to support the interpretation that contaminated groundwater may have migrated under the San Juan River and degraded water quality in the alluvium north of the river. The following concerns relevant to this table should be clarified through appropriate SMP revisions:

(1) Six samples were tested for both vanadium and molybdenum downgradient (cross-river) of the contaminated floodplain. From the table, it is

unclear whether a total of 6 or 12 water samples were collected because the results of analyses were split up into separate rows. If 6 samples were collected, then the test results should be merged into one row. If 12 samples were collected, the table should indicate why both vanadium and molybdenum were not tested using each sample.

(2) According to the data presented, 14 and 11 samples were collected upgradient of the floodplain and tested for molybdenum and vanadium, respectively. Moreover, the table indicates that all but one sample were collected from the San Juan River. The text, however, does not specify the location of the monitor well from which the one sample was collected; it is unknown whether the sample was collected in the floodplain deposits or the terrace deposits. Also, the sampling point(s) in the San Juan River was not specified. More importantly, using river samples as the sole basis for supporting cross-river contamination may not be appropriate, because water quality in the river may not fully represent water quality in the floodplain. Results from more monitor well samples should be used to provide a better assessment of the upgradient water quality.

Page 8, Section 2.4.2, Paragraph 1, Floodplain Monitor Well Network

A monitor well network composed of 30 wells and wellpoints for the long-term surveillance of groundwater in the floodplain deposits adjacent to the San Juan River has been proposed. This network, however, does not encompass the northern one-third of the floodplain. Based on interpretation of water levels presented Figure E.8 of the Processing Site Characterization Report (DOE, 1986c), groundwater appears to be flowing in a predominately northern direction in the northern section of the floodplain. Because contaminated groundwater flows through this region, the fate of the contaminated groundwater north of wells 624, 627 and 601 is unknown. This lack of monitor wells impedes surveillance of contaminant movement and concentrations. The SMP should include monitoring of groundwater in the northern region of the floodplain area, or should justify why such monitoring is not necessary.

Page 8, Section 2.4.2, Paragraph 1, Terrace Monitor Well Network

The SMP proposes maintenance of six wells for potential future monitoring of the water quality in the perched aquifer of the terrace deposits surrounding the tailings pile. Four of these wells are hydraulically upgradient of the pile, two are downgradient. However, DOE has not specified any monitoring points west and south of Bob Lee Wash; the only monitor wells in this area are well DM5, immediately adjacent to the tailings embankment and wellpoint #633, which was constructed in the wash itself. These wells cannot detect

contaminated groundwater flowing west past the headlands of Bob Lee Wash. Well DM5 and wellpoint #633 are located too far north to detect contaminated groundwater migrating towards the west. Thus, contaminated groundwater could flow west though terrace alluvium undetected and possibly degrade groundwater quality to the southwest of the tailings.

Although the extent of groundwater contamination has not been determined west of the tailings, contaminated groundwater has already been detected in upgradient monitor wells southeast of the tailings in wells 4H and 6GT, and northwest of the tailings in wellpoint #633, which yielded groundwater samples that contained uranium in concentrations of up to 7.21 mg/l. NRC staff suspect that contaminated groundwater emanated radially from the location of the former raffinate pond and may have migrated to the west past Bob Lee Wash. Therefore, at least one monitor well southwest of Bob Lee Wash should be installed to provide reasonable assurance that contaminated groundwater flowing in this direction will not endanger public health or the environment, and to ensure that levels of groundwater contamination do not worsen following completion of the remedial action.

Page 13, Section 5.0, Paragraph 1, Aerial Photography

According to the Guidance Document (DOE, 1986b), an objective of aerial photography is to monitor and measure changes in site conditions and land use surrounding the site. The draft SMP specifies that aerial photographs taken at the time of site closure will extend 0.25 miles beyond site boundaries. In order to adequately encompass the area of likely future fluvial attack on the escarpment, aerial photography coverage should be extended upstream at least as far as Many Devils Wash.

Page 13, Section 5.0, Paragraph 2, Aerial Photography

The SMP indicates that "aerial photography format will be selected in concert with technical specialists...". This statement is somewhat confusing, since the Guidance Document (DOE, 1986b) contains specific format guidelines by which these photographs would be taken. The statement should be revised to be consistent with the specifications of the Guidance Document or justify an alternate format.

Page 15, Section 6.1, Paragraph 1, Custodial Maintenance

The Draft Surveillance and Maintenance Plan, Shiprock, New Mexico, states that "No custodial maintenance will be required at the Shiprock site". Table 6.3 of the Guidance Document (DOE, 1986b), however, lists 10 custodial maintenance or repair actions, all of which could eventually be required at the Shiprock site.

One repair action in particular is the replacement of warning signs emplaced on the floodplain adjacent to the San Juan River. This section of the Draft Surveillance and Maintenance Plan should be revised to indicate that maintenance or repair actions such as those listed in Table 6.3 of the Guidance Document (DOE, 1986b) may have to be performed if deemed necessary during the Phase I site inspections.

Page 15, Section 6.2, Paragraph 2, Contingency Plans

The Draft Surveillance and Maintenance Plan states that contingency inspections at the Shiprock site will be triggered by reports from Federal, State, or local agencies and local authorities. The planning includes arrangements for the Bureau of Reclamation to notify the DOE if any large-scale, unplanned releases from Navajo Dam are imminent. However, other weather related events (such as flash floods or tornados) are not mentioned. Because severe weather events could seriously affect site stability and cover performance, the Shiprock SMP should be consistent with the Canonsburg plan and include arrangements to be notified by the National Weather Service, if flash flood or tornado warnings are issued for the Shiprock area.

In addition, this section should be revised to require timely notification of the NRC with the reporting to DOE of any extreme natural event at the Shiprock site, prior to DOE actually conducting the contingency inspection. This revision request is intended to give early notification to the NRC and opportunity to determine whether the NRC staff should be actively involved in the contingency inspection and the ensuing impact evaluation.

Appendix A, Title

The title of Appendix A "Logs of Test Borings", is incorrectly stated since the appendix contains completion diagrams for the test wells and wellpoints with the exception of lithologic logs for two wells. The title of the appendix should be revised to reflect the actual contents.

Appendix A, Missing Records

The completion diagrams for the wells and wellpoints in Appendix A omit the records for wells DM1, DM5 and DM7, and are missing information for other wells in the proposed monitoring network. Without complete information, it is difficult for an independent reviewer to evaluate the utility of these wells in the monitoring program. The appendix should be revised by providing sufficient information to enable assessment of the wells as constructed.

Drawing SHP-PS-40-0010

(1) Cross section A is confusing and unclear. According to its location on the plan, the section extends from the tailings embankment to the San Juan River floodplain. This section should be corrected. Additionally, the section should show a horizontal scale.

(2) Several site features need to be explained in the legend. The features include drainage ditches, fence lines, open circles along fence lines, dashed line along escarpment, and large grid "X" markings.

REFERENCES

U.S. Department of Energy, 1986a, Draft Surveillance and Maintenance Plan Shiprock, New Mexico, UMTRA-DOE/AL-350204.0000, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuqueque, New Mexico.

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