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JUL 18 1986

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MEMORANDUM FOR: Malcolm R. Knapp, Chief
WMLU

FROM: Philip S. Justus, Acting Chief
WMGT

SUBJECT: REVIEW OF DRAFT SHIPROCK, NEW MEXICO SURVEILLANCE AND MAINTENANCE PLAN (SMP)

We have completed our review of the Draft Shiprock Surveillance and Maintenance Plan, in response to TAR 86552. Based on our review, we conclude the proposed surveillance practices in the SMP may not be sufficient to protect public health and safety. Specifically, DOE has no plan to monitor contaminant levels in groundwater, even though contaminants have been detected in the groundwater in three geologic deposits in the vicinity of Shiprock; groundwater in one of these deposits was previously used by the town of Shiprock for drinking water. We determined that implementation of a monitoring plan at this time is necessary because of past use of groundwater for drinking water, inadequate characterization of groundwater quality, and the likelihood that Shiprock may need to rely on this groundwater resource in the future. Moreover, although DOE stated institutional controls would be imposed on groundwater use in the floodplain area south of the San Juan River, they did not indicate if any controls would be imposed on groundwater use north of the river, even though DOE acknowledged the groundwater was contaminated.

Comments regarding surveillance and maintenance of the erosion protection features are contingent upon site inspection and approval of the final design, now being completed by the RAC.

Enclosed are our comments to the proposed actions along with recommendations for appropriate modifications to the SMP. This review was coordinated by Michael Young (groundwater hydrology) with input from Michael Weber (groundwater hydrology), Paul Bembia (geochemistry), Joel Grimm (geology) and Ted Johnson (surface water hydrology). If you have any questions regarding our review, please contact Mr. Young.

ORIGINAL SIGNED BY
PHILIP S. JUSTUS
Philip S. Justus, Acting Chief
WMGT

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GENERAL COMMENTS

Need For Implementing a Plan To Monitor Groundwater Quality

In the Surveillance and Maintenance Plan for Shiprock, DOE states "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 its statement that monitoring is unnecessary, DOE plans to maintain a network of monitor wells throughout the site, including wells on the north side of the San Juan River. NRC staff consider that groundwater monitoring is necessary 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 use of this groundwater is likely.
3. DOE has not characterized the extent of contamination in the sediments in the vicinity of Shiprock.
4. Background water quality needs to be confirmed.

The following comments, 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. According to DOE's interpretation of the groundwater flow system, 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. If significant recharge is detected and additional contamination is occurring, then DOE should consider monitoring groundwater quality throughout the long-term surveillance program and implement appropriate actions to protect the public and environment.

(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.

DOE proposes to preclude future groundwater use in the floodplain by incorporating 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 DOE should monitor groundwater quality to determine when the institutional controls should be relaxed. Similar concerns have been outlined in WMGT comments on the "Shiprock RAP Modification Number 3: Groundwater Contamination in Floodplain Deposits", transmitted to WMLU on June 27, 1986.

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

Since DOE has identified contamination of groundwater in the floodplain sediments on the north side of the San Juan River, DOE should monitor for groundwater contamination in these sediments to ensure protection of the public and the environment. This will also allow DOE to confirm that contaminants have migrated under the river and to assess the potential for further contaminant migration in these deposits, which were previously used as a water source for the Shiprock municipal drinking water supply.

(4) Maintenance of Monitor Wells

DOE states that although monitoring is not necessary, the wells "will be maintained as part of a future monitoring network". Because maintaining water wells requires periodic monitoring and purging to ensure continued hydraulic communication with the aquifer material, NRC staff conclude that DOE can also collect and record water level data, and collect water samples from these wells, because these tasks are relatively simple compared to well maintenance.

Soil Sampling in the Northern Section of the Adjacent Floodplain

DOE has not collected and analyzed soil samples on the northern section of the alluvial floodplain. If additional monitoring wells are installed in this region, DOE should also collect soil samples as part of their monitoring program. The need for such soil sampling 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. The soil samples, analysed for the constituents listed in Table 4.1 of the Guidance Document (DOE, 1986b), may serve to document potential sources of groundwater contamination, and may indicate whether contaminant concentrations in groundwater would be expected to decrease after remedial actions are complete.

Preclusion of Groundwater Use

In the Environmental Assessment of the Remedial Action (DOE, 1984) at Shiprock, DOE states "... it may be necessary to include measures in the maintenance and surveillance to ensure that this [floodplain] groundwater is not used for any purpose in the future." In response to concerns about groundwater use in the floodplain areas adjacent to the San Juan River, DOE proposes to place these areas under institutional control to preclude the use of groundwater. There are several comments relevant to this proposal:

(1) DOE plans to inspect the Shiprock area for "obvious signs of utilization ... in the vicinity of the site", during the annual Phase I inspection. However, annual inspections for water use may not be frequent enough to preclude the possible use of contaminated water for nearly a full year before detection by DOE. Therefore, DOE should consider the use of more frequent inspections or alternate surveillance procedures, performed by the DOE or some other authority, to preclude this possibility.

(2) The SMP proposes posting a series of warning signs on the floodplain south of the San Juan River to discourage people from drilling for groundwater. However, no such plan has been proposed for the floodplain area north of the river, even though DOE states 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.

SPECIFIC COMMENTS

Page 4, Section 2.1.4, Paragraph 2, Signs

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.

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, DOE should consider moving the southernmost monitoring station nearer to the southernmost portion of the site.

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. We suggest, therefore, relocating the northern monitoring station nearer to the northernmost portion of the site.

Also, we suggest 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) The DOE design for erosion monitoring includes a post at the escarpment edge and one approximately 10 m inland. If significant acceleration of scarp retreat occurs, eroding both posts, the surveillance team will be unable to document quantitative estimates of actual retreat and retreat rates. Additionally, the DOE method for erosion monitoring involves measurement of distance from a marker (post) to the "sharp break in slope..." This terminology is somewhat subjective and measurements are likely to be inconsistent from year to year. Inaccuracies may occur due to changes in monitoring staff and subtle changes in slope profiles. Also, the escarpment could naturally develop a rounded profile, making identification of the sharp break in slope difficult or ambiguous. We suggest that a monitoring instrument be located further inland, near the ditches, in order to maintain a secure zero-point in case of accelerated scarp retreat (as identified in the RAP, (DOE, 1985)). Measuring from these locations, the surveillance team will be capable of determining scarp retreat if posts nearest to the escarpment are eroded.

(3) 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 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.

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

In paragraph 1, DOE states cross-river groundwater contamination is masked by "naturally high levels of sulfate and total dissolved solids and other constituents...". In paragraph 5, DOE states "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 groundwater data 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. DOE should modify these statements to indicate 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 DOE's interpretation that contaminated groundwater may have migrated under the San Juan River and degraded water quality in the alluvium north of the river. There are two concerns relevant to this table:

(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, DOE should state why both vanadium and molybdenum were not tested using each sample.

(2) DOE stated 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. DOE should use results from more monitor well samples to provide a better assessment of the upgradient water quality.

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

DOE has proposed 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. The proposed 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 precludes

surveillance of contaminant movement and concentrations. Thus, NRC concludes that DOE should monitor groundwater in the northern region of the floodplain area, or justify why such monitoring is not necessary.

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

DOE proposed six wells to monitor the water quality in the terrace deposits surrounding the tailings pile; DOE states a perched aquifer is contained in these sediments. Four of these wells are hydraulically upgradient of the pile, two are downgradient. All are screened in the terrace deposits. 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 possible 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 eminated radially from the location of the former rafinnate pond and may have migrated to the west past Bob Lee Wash. Therefore, NRC staff conclude that DOE should install at least one monitor well southwest of Bob Lee Wash 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 only 0.25 miles beyond site boundaries. We conclude that, in order to document future changes on the San Juan floodplain (especially upstream of the site), erosion in Many Devils and Bob Lee washes, and piping and retreat along the escarpment, quarter-mile photographic coverage will be inadequate. Extension of photography to 0.5 mi should be undertaken to verify the stability of geomorphic features in the area. Additionally, the SMP should define which site conditions will require an undertaking of new aerial surveys in the future.

Page 13, Section 5.0, Paragraph 2, Aerial Photography

DOE states 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. NRC staff agrees that aerial photographs are necessary to document erosion of the tailings pile and vicinity. We suggest, however, that DOE revise this statement 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. DOE should revise this section of the Draft Surveillance and Maintenance Plan 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. DOE will arrange for the Bureau of Reclamation to notify the DOE if any large-scale, unplanned releases from Navajo Dam are imminent. Other weather related events (such as flash floods or tornados) apparently will not trigger a contingency inspection. Because severe weather events could seriously affect site stability and barrier performance, DOE should arrange to be notified by the National Weather Service if flash flood or tornado warnings are issued for the Shiprock area. These warnings should trigger contingency inspections to determine if the severe weather event has affected site stability, performance or security.

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. DOE should revise the title of the appendix to reflect the actual contents.

Appendix A, Missing Records

The completion diagrams for the wells and wellpoints in Appendix A omit the records for well DM1, DM5 and DM7, and are missing information for other wells in the proposed monitoring network. Without complete information, it is difficult, if not impossible, for an independent reviewer to evaluate the utility of these wells in the monitoring program. DOE should revise the

appendix by providing sufficient information to enable assessment of the wells as constructed. If the records are not available, DOE should consider constructing new monitor wells, with completion specifications suitable to detect water level changes in the terrace and floodplain sediments and to collect water samples.

Drawing SHP-PS-40-0010

(1) The terminology for slopes is inconsistent and should be modified and shown on the plan either as percents (2-4%) or ratios (5:1). If the latter is chosen, the terminology should indicate that the slope is 1V on 5H.

(2) 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.

Drawing SHP-PS-40-0010, Legends

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.

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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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