NAVAJO NATION ENVIRONMENTAL PROTECTION AGENCY
Water Quality/NNPDES Program
P.O. Box 1999
Shiprock, New Mexico 87420
Phone: (505) 368-1037
FAX: (505) 368-1416

WM-58

Joe Shirley, Jr.
PRESIDENT

Frank J. Dayish, Jr.
VICE PRESIDENT

January 16, 2004

Art Kleinrath, LTSM Program Manager
U.S. Department of Energy Grand Junction Office
2597 B ¾ Road
Grand Junction, CO 81503

RE: Navajo EPA Water Quality Program Concerns at the Shiprock Uranium Mill Tailings Site

Mr. Kleinrath,

The purpose of this letter is to raise some concerns about the Shiprock UMTRA site. These concerns are based on issues raised by Larry Breckenridge of SRK consulting, a thorough review on my part of the sampling data at Shiprock, and comments made at the November 2003 meeting in Durango.

Terrace West Groundwater

It is time to stop talking about the influence of irrigation water on water quality in Terrace West as if it were a major cause of the problems observed. It is not a significant source of water except in the middle to western end of Terrace West. This is readily apparent by the documented geology of the area. In addition, groundwater chemistry indicates that irrigation water is not a significant source of contamination. I have already detailed this in my comments on the draft EA in June of 2001 and the draft GCAP in March of 2002. The DOE's response in both cases was to generally agree with my assessment. However, because new staff are working at the Shiprock site, I think it is worth taking the time to reiterate this point.

Gradient and Water Quality

Both the groundwater gradient (Figure 2-3 of GCAP) and the dip of the Mancos shale (Figure 4-7 of SOWP) are to the northwest and north from the irrigated areas. The most highly contaminated areas are along and east of US 491 (formerly US 666). Based on historic aerial photos of the terrace (Figures 3-1 and 3-4 of SOWP), irrigation has not occurred any closer than 1200-1500 feet west of US 491. Thus, any water and contaminants associated with irrigation would have to travel 1200-1500 feet up or across both the groundwater and the Mancos shale

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gradients in order to reach the leading edge of the highest contamination. This makes no sense given the steep downward gradients to the northwest.

If the irrigation water has done anything, it has provided a groundwater "barrier" that has slowed down the contaminant plume migration and forced it from the buried channel toward the north (e.g., Figure 2-7 of the GCAP). It has also helped to dilute the contaminant plume as it moves through Terrace West.

In addition to the hydrogeology, the water quality data indicate that the highly contaminated groundwater found under and east of the US 491 corridor could not be from irrigation. Figures 2-5 through 2-11 of the GCAP indicate that the irrigated area typically has the lowest contaminant concentrations in the terrace. This would not be the case if irrigation water were a significant source of groundwater contamination either from fertilizer use or leaching from the Mancos shale.

Groundwater Contaminant Studies

So, from where did the contamination and the water come? I am aware of two studies that have been conducted by DOE in an attempt to show that groundwater in Terrace West was not contaminated by the mill operations: a Kjeldahl nitrogen study and a uranium isotope study. Both studies supported the opposite conclusion.

The Kjeldahl nitrogen study presented on page 4-144 of the SOWP was conducted to determine if septic leaks could account for some of the nitrate and ammonium found in the terrace. The results showed that organic nitrogen was negligible, indicating an inorganic source. Only 2 of the 14 wells used in this study were located in the area influenced by irrigation. Thus, the likely source for most of the inorganic nitrogen is the former uranium mill.

The uranium isotope study presented on pages 4-207 through 4-213 of the SOWP was conducted to determine if differences in uranium sources could be detected in the groundwater. It was determined that the uranium ore and associated waste would have a different U-234/U-238 isotopic signature from the uranium naturally present in the Mancos shale. Samples collected throughout the terrace in June of 2000 indicated that, in general, the uranium found in groundwater near the old mill site carried the ore signature and the uranium found elsewhere carried the Mancos Shale signature. The conclusion drawn from this study was that there was widespread ambient contamination within Terrace West due to leaching from the Mancos shale. Thus, supplemental standards were justified for Terrace West. I have always disagreed with this conclusion for the following reasons:

1) Isotopic data were collected in several other wells during February of 2001. The isotopic signatures for uranium in this study indicated that either mill-related uranium was much more prevalent than first determined or the isotopic analysis was too variable to draw any meaningful conclusions.

2) The conclusion ignores the fact that the "widespread, ambient contamination" was neither widespread nor ambient. Again, a look at the water quality under the irrigated area shows

that a large portion of Terrace West is pretty clean. The only areas with elevated contaminant levels are those in closest contact with Terrace East.

3) In drawing this conclusion, DOE has either ignored or overlooked the role of highly acidic raffinate and filtrate water. Aerial photos of the mill site during the 1950s and 1960s show that the raffinate ponds covered large areas near the mill. A 1962 Public Health Service report stated that all of the liquid waste produced during different stages of uranium ore processing were stored in these ponds. The greatest amount of waste was the raffinate, which had a pH of 2.0 and which flowed into the ponds at a rate of 130 gallons per minute. Additional waste produced during the formation of yellow cake had a pH of 3.0, but the flow rate was not reported. Water used for cooling was discharged into Bob Lee Wash, so it was not used to dilute these wastes.

   The raffinate ponds were unlined and located on top of coarse alluvial deposits. Thus, the liquid that did not evaporate (or spill into Bob Lee Wash) percolated down to the Mancos Shale. Even in 1960, when the Public Health Service conducted their initial inspection, this raffinate was surfacing along the escarpment. In fact, there was so much that a now-buried channel at sample site 0425 flowed at 20 gallons per minute.

   In contrast with the neutral to alkaline irrigation water, this highly acidic raffinate likely did leach large quantities of naturally occurring contaminants from the Mancos Shale. This would explain why wells that are clearly impacted by mill water (e.g., 0812) are dominated by Mancos Shale uranium.

   The only thing that the isotope study showed was that uranium from the ore did not transport very far from the mill site--this is even debatable given the results from February 2001. The "widespread, ambient contamination" would not be significant if the highly acidic mill wastes had not leached contaminants from the Mancos Shale.

All of the data gathered by DOE point to the mill operations as the main source for both water and contaminants in the terrace system--including most of Terrace West. Unless DOE has data not presented in any of their documents which show otherwise, it is time to stop using irrigation water as an excuse to play down the importance of contamination in Terrace West.

Terrace West Concerns

With this background, I would like to present my current concerns regarding Terrace West at the Shiprock UMTRA site.

Contaminant Plume Migration

The past six years of data indicate that the terrace plume is migrating to the northwest along the area between Shiprock High and 2nd Wash. This is most apparent in wells 0835, 0838, and 0847/1079 and surface location 0934. Well 0835 and surface location 0934 are located near and in 2nd Wash, respectively. This area has seen concentrations of nitrate, selenium, sulfate, and uranium steadily increase since 1998 (Figure 1). The concentrations for each of these parameters now exceed the MCLs, benchmarks, and cleanup goals.

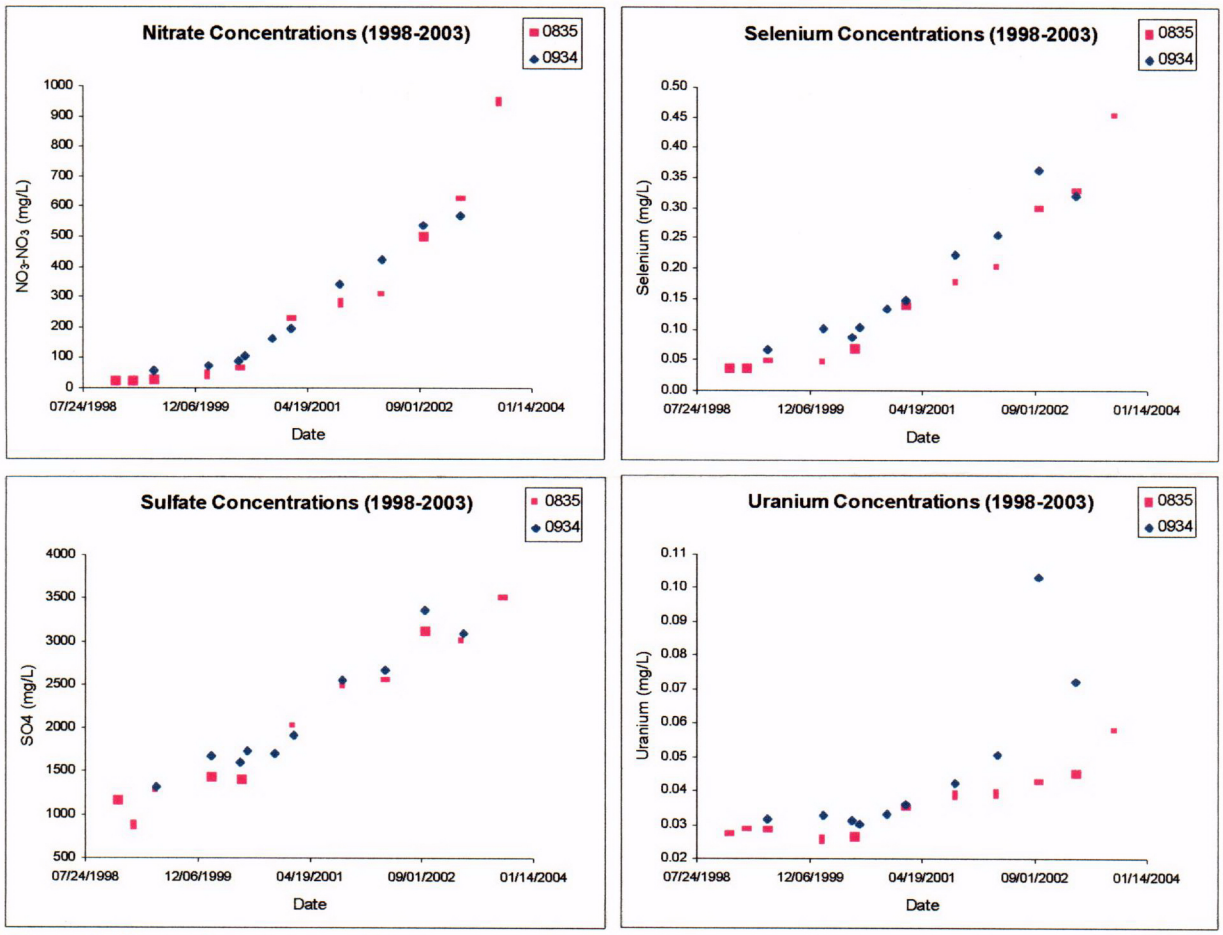

Figure 1. Contaminant concentrations in well 0835 and surface water site 0934 between 1998 and 2003.

Although not as dramatically, wells 0838 and 0847/1079 near the high school have also been increasing over time (Figure 2). In these wells, sulfate concentrations have varied over the past six years, but the general trend is upward. Concentrations for sulfate are currently near the benchmark of 2000 mg/L. Nitrate and selenium were relatively stable until about three years ago, but they have both sharply increased since 2001. This change appears to coincide with the cessation of farming in the area where the new Dine College campus is being built. Both nitrate and selenium are now significantly greater than the MCLs. Uranium concentrations have slightly increased over the past six years, but they have not exceeded the MCL in either well to date.

In addition to the aforementioned contaminant increases, Terrace West wells 0832 (east of the Helium Lateral Canal siphon mouth) and 0839 (south of the US 64/US 491 intersection) have also seen increasing contamination. Nitrate, selenium, sulfate, and uranium have each increased in well 0832 over the past six years. Current concentrations range from 300%-600% higher than those collected in 1998, which were already either above or near the MCLs/benchmarks. The uranium concentration in well 0839 has shown the most significant increase, with the latest concentration measuring 0.691 mg/L.

C01

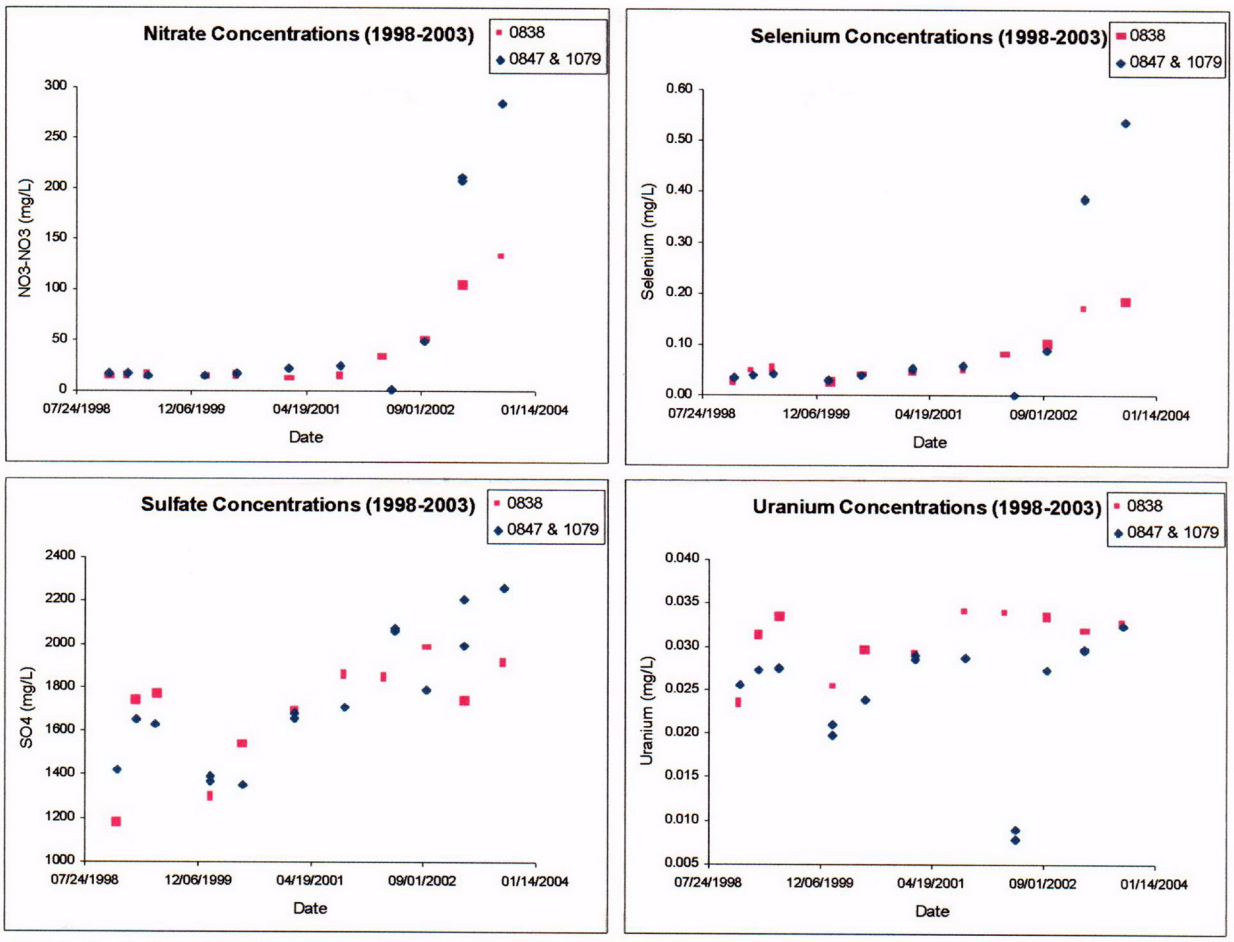

Figure 2. Contaminant concentrations in wells 0838 and 0847/1079 between 1998 and 2003.

Exposure Risk

Contaminant increases in Terrace West are a concern because several potential opportunities exist for exposure in this area. Potential exposure points in and down gradient from the migrating plume are as follows:

- Wells 0848 and 0847 are the only known water supply wells in the terrace that were completed in the alluvial aquifer. Both are located on the high school campus. Neither well is currently in use. Recent discussions with maintenance staff indicated that there are no current plans to use these wells, but they have not been plugged.

- Dine College planted a fruit orchard northwest of the elementary school two to three years ago. Irrigation water currently comes from the Helium Lateral Canal. The concern with this site is whether or not the trees will tap into the groundwater and concentrate contaminants in the fruit.

- An active corral is located in 2nd Wash. The main channel of this wash flows right down the middle of the corral, providing drinking water to the livestock when it is flowing.

C02

- Several livestock ponds exist in the area between US 64 and the canal that returns water to the distributary channel of the San Juan River. Sampling at surface site 0942 already indicates elevated contaminant levels during the non-irrigation season.

- The distributary channel upgradient from irrigation return flows is used by local livestock and wildlife. This portion of the channel is fed only by seeps in the vicinity of surface location 0934 when the San Juan River is not elevated.

As the contaminated mill water moves further west/northwest, the risks to potential receptors will increase. A forthcoming report by Mr. Breckenridge details how this increased risk may already be evident. Using the latest sampling data and the risk assessment method utilized in the SOWP, he shows that the risk to an ecological receptor is now high for the seeps near the distributary channel.

The GCAP states that a reevaluation of actions for Terrace West will occur two years after extraction has begun in Terrace East if monitoring suggests that a problem exists. Monitoring indicates that a problem may exist already. DOE is required to protect human health and the environment for the duration of the remediation program. In order to meet this requirement, DOE cannot wait another year-and-a-half to begin thinking about taking actions in Terrace West--especially considering the delays that may occur due to budgetary planning.

Supplemental Standards

As required in 40 CFR 192.22, DOE needs to "periodically inform the Environmental Protection Agency of both general and individual determinations under the provisions of [the supplemental standards] section." To my knowledge, US EPA has never been informed of the decisions made regarding the management of Terrace West water and the application of supplemental standards to these waters. Given the increased concentrations in Terrace West, I have contacted US EPA regarding the application of supplemental standards in this area. They are currently determining what their role can be in this situation.

An issue raised in my discussions with US EPA is that the supplemental standards have never been defined. As I have noted in previous comments on this site, 40 CFR 192.22 states that the alternate remedial action taken to meet supplemental standards must come as close to meeting the otherwise applicable standard provided in 40 CFR 192.02(c)(3) as is reasonably achievable. Leaving a large amount of highly contaminated groundwater in the terrace would likely not meet this requirement--especially if this groundwater is moving toward potential human and wildlife receptors.

Sampling Schedule

My last concern about the Terrace West area is related to the sampling schedule. At the November 2003 meeting, there was talk about changing the timing of the sampling events at the Shiprock site. I would strongly oppose this because the spring sample is collected just prior to the onset of irrigation and the late summer sample is collected just prior to the end of the irrigation season. These represent the driest and wettest periods for those areas influenced by irrigation water. For most of the terrace, this does not matter. However, for the area near the

leading edge of the plume, these time periods are key. If the sample time is changed, we would not see how high the concentrations are getting in the area influenced by irrigation. This could lead to a false impression that remediation is occurring at the site.

General Shiprock UMTRA Site Concerns

Other general concerns that I have about the Shiprock site are as follows:

- US Fish and Wildlife needs to be consulted regarding the lack of protection in both Bob Lee and Many Devils Washes. The interim actions taken in these channels need to be maintained until the seeps have been dried up. US Fish and Wildlife also needs to be informed of the increased contaminant concentrations detected in the distributary channel to determine if interim actions need to be taken in that area.

- Three sites were dropped in favor of new sites located nearby. This was done without sampling the new and old sites concurrently to determine if the new site was similar to the old. This is most important for the downstream surface water site on the San Juan River because the new site is a shoreline grab on the opposite side of the river from both the old sample site and the UMTRA site.

- Additional work was recently completed in Many Devils Wash near the East Fork without consulting Navajo EPA. It is not clear if this work was in compliance with sections 401 and/or 404 of the Federal Clean Water Act. Please consult with my office before any future activities occur in any of the waterbodies surrounding the UMTRA site.

I hope that we can work together to address these concerns at the Shiprock site in the near future. If you have any questions regarding this letter, please feel free to contact me at 505-368-1037. Thank you.

Sincerely,

Stephen A. Austin
Senior Hydrologist
Navajo EPA Water Quality/NNPDES Program

cc R. Bush, DOE
W. VonTill, NRC
R. Lessler, US EPA
S. Etsitty, NNEPA
S. D. Misra, NNEPA
R. MacRae, USFWS
M. Roanhorse, Navajo UMTRA
L. Breckenridge, SRK