

ENCLOSURE

U. S. NUCLEAR REGULATORY COMMISSION

REGION IV

NRC Inspection Report: 40-8027/90-05

License: SUB-1010

Docket: 40-8027

Licensee: Sequoyah Fuels Corporation (SFC)
P.O. Box 610
Gore, Oklahoma 74435

Facility Name: Sequoyah Facility

Inspection At: Gore, Oklahoma

Inspection Conducted: September 10 through October 8, 1990

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Inspection Summary

Inspection Conducted September 10 through October 8, 1990 (Report 40-8027/90-05)

Areas Inspected: Special, announced inspection of licensee actions regarding the discoveries of uranium-contaminated water in an excavation and in a shallow well in the denitration area at the Gore, Oklahoma, site. The inspection included a review of Management Organization and Controls; Radiation Protection; and Environmental Protection.

Results: Within the areas inspected, three apparent violations were identified as follows:

- o Failure to perform adequate surveys to evaluate the extent of radiation hazards that were present in the excavation as specified in 10 CFR 20.201(b).
- o Failure to report the discovery of uranium-contaminated water within 24 hours as specified in 10 CFR 20.403(b)(4).
- o Failure to provide complete and accurate information to the NRC as specified in 10 CFR 40.9(a).

Three unresolved items were also identified. These were as follows:

- o Six contractor personnel who actually worked in the solvent extraction excavation area may not have received adequate radiation safety training.
- o Failure to clearly delineate the responsibilities for identifying changing conditions during work that might require a modification to a Hazardous Work Permit (HWP) or a new HWP.
- o Routinely, it appears liquids such as from the subfloor process monitor, were pumped directly from the ground into the process without any proper characterizations or evaluation.

The inspectors concluded that the licensee had implemented commitments made to the NRC to allow restart of the solvent extraction (SX) process. The inspectors also concluded that the licensee was progressing toward complying with the requirements of the Order Modifying License issued by the NRC on September 20, 1990. However, the inspectors also identified organizational and communications deficiencies which could result in unacceptable initial responses to events.

DETAILS1. Persons Contacted:

- *Reau Graves, President
- *Jim Mestepey, Senior Vice President
- *Ron Adkisson, Vice President, Business Development
- *Lee Lacey, Vice President, Regulatory Affairs
- *Mike Nichols, Manager, Health, Safety, and Environment
- *Mike Chilton, UF6, Area Manager
- *Carol Couch, Manager, Environment
- *Ken Simeroth, Health Physics Supervisor/Assistant RSO
- Rick Callahan, Health Physics Supervisor
- *Don Knoke, Manager, Facility Laboratory
- *Sam Fryer, Manager, Engineering
- Gary Jackson, Staff Technical Specialist
- *Reggie Cook, Vice President, Administration
- *Bub Kiehn, Engineering Department
- *Sue Smith, Supervisor, Waste Treatment and Solid Waste
- *Richard Parker, Manager, Maintenance
- *Keith Asmussen, General Atomics
- *Kenny Schlag, Hydrologist

*Denotes attendance at exit interview on September 13, 1990

◦Denotes attendance at exit interview on October 1, 1990

•Denotes attendance at exit interview on October 8, 1990

The inspectors also interviewed other site personnel during the course of the inspection.

2. Background

On Wednesday, August 22, 1990, the licensee notified NRC Region IV that uranium contaminated water had been discovered in an open excavation immediately adjacent to the SX building at the Sequoyah Facility near Gore, Oklahoma. The water was discovered while excavating around two underground storage tanks for the purpose of constructing a reinforced concrete vault to encase the tanks. The intent was that the tanks were to remain below grade, but would no longer be regulated as underground storage tanks in accordance with Environmental Protection Agency regulations.

As a result of the August 22 notification, an inspector was dispatched to the site on August 23-24. Based on the information obtained, an NRC Augmented Inspection Team (AIT) was dispatched to the site on August 27, 1990. The findings of the AIT are documented in Inspection

Report 40-8027/90-04, issued on October 11, 1990. That report contains a complete description and chronology of the circumstances concerning the discovery of the contaminated soil and water in the excavation, based on information provided by the licensee. In addition, the licensee provided written commitments to the NRC on August 30, 1990, regarding actions to be taken prior to restart of the SX process. The licensee provided a summary of the actions taken to satisfy the commitments by letter dated September 13, 1990. On September 14, 1990, following the NRC inspection conducted September 10-13 which verified implementation of the licensee's commitments and the receipt of a September 14 letter from NRC authorizing restart, the SX process was restarted. Also on September 14, 1990, NRC began daily onsite inspector coverage at SFC. This coverage began as a result of NRC concerns about the licensee's management effectiveness, in light of the weaknesses identified during the AIT inspection and followup inspections.

On that same day, the licensee began the startup of the facility after the outage. During the startup, the licensee notified the NRC of the existence of a shallow well in the denitration area which had been sampled that morning and indicated high levels of uranium contamination. The Senior Vice President and the Manager, Regulatory Compliance and Quality Assurance (MRC&QA)¹, discussed the existence of this well early in the week of September 3. The well had been installed in the mid 1970's and the licensee routinely used it to pump (presumably) contaminated liquids from under the Main Process Building (MPB) back into the process. Daily analysis of these liquids began on September 14 and averaged about 10 grams/liter (g/l) uranium. A more detailed chronology of the events associated with the discovery of highly contaminated liquids under the MPB, is provided in paragraph 4 of this document.

As a result of the September 14 notification and NRC concerns regarding the timeliness and adequacy of corrective actions being taken by the licensee in response to the identified problem, an Order Modifying License was issued on September 20, 1990. The Order specified actions to be taken with regard to the MPB as a result of escalating NRC concerns about the possible migration of contaminated material away from the MPB and the possible contamination of the site in general.

The inspection period covered by this report includes the team inspection conducted by members of the AIT on September 10-13, 1990, and daily

1 The MRC&QA was recently promoted to Vice President, Regulatory Affairs, but at the time of this report still fulfills the position described in the license as MRC&QA since the license amendment has not been approved.

coverage by NRC inspectors from September 14 to October 8, 1990. The purposes of the continuing inspections were as follows:

- (a) Verify the implementation of the commitments made in the licensee's letter of August 30, 1990.
- (b) Review regulatory compliance aspects of events associated with the discovery of contaminated liquids in the SX excavation and the MPB.
- (c) Evaluate licensee progress in complying with the requirements of the Order Modifying License.
- (d) Observe communication among the licensee's managers and departments.
- (e) Observe the effectiveness of the licensee's organizational structure.
- (f) Observe system processes during the startup and routine operation of the facility.
- (g) Review adequacy of the licensee's procedures.

3. AIT Follow-up Inspection

A. Radiation and Industrial Safety

This section addresses health and safety findings concerning the discovery of contaminated water in the SX excavation. The AIT, as documented in NRC Inspection Report 40-8027/90-04, found that the first radiological characterizations of the SX excavation occurred on August 3-4, when air samples were taken. However, despite the fact that personnel in the excavation were sometimes working in yellow-colored water, the Health & Safety (H&S) technicians performed no further radiological evaluations of the potential worker exposure until August 22. Although the Health, Safety and Environment (HS&E), Operations, and Engineering Departments did take water samples that indicated concentrations of uranium above the value equivalent to that specified in 10 CFR 20, Appendix B, Table 1, Column 2, the HS&E department did not evaluate this data with regard to worker safety.

The Manager, Environmental (M,E) indicated to AIT inspectors that she reviewed one lab result that indicated uranium concentrations of approximately 2 g/l uranium. This value was almost four orders of magnitude greater than the environmental action level of .000225 g/l, the level at which the licensee is required by the license to

"investigate and take proper mitigating measures if necessary." This provided the licensee another indicator at which time a more thorough evaluation should have been performed.

In addition, the AIT found that on August 17, the UF6 Area Manager and the MRC&QA discussed the high uranium concentrations in the water. However, the information was not effectively communicated to the Manager, Health, Safety and Environment (MHS&E) so that this data could be properly evaluated and appropriate surveys taken to characterize the worker hazard. Therefore, this provided the licensee yet another opportunity to perform the required thorough evaluation.

The AIT also noted that on August 23, when a Region IV inspector toured the excavation, he observed a yellow precipitate stratified in the soil that was directly beneath the north wall of the SX building. The licensee had not taken direct radiological surveys or obtained soil samples of the yellow precipitate until it was recommended by the inspector.

The fact that personnel were working in yellow-colored water, yellow precipitate was visibly stratified in the soil on a wall of the excavation, and numerous water samples indicated elevated uranium concentrations, should have indicated to the licensee that a potential worker hazard existed. Moreover, various licensee managers were aware of the high levels at different times. The fact that no evaluations and that inadequate radiological surveys were performed to evaluate the potential worker exposure prior to workers entering the SX excavation was identified as an apparent violation of 10 CFR 20.201(b) [40-8027/9005-01].

Because of the concern regarding the failure to evaluate potential radiological hazards to the workers in the SX excavation, the inspectors reviewed the licensee's radiation safety training. An interview with the Training Coordinator and a review of training records indicated that training had been performed and was adequate to satisfy NRC requirements in 10 CFR Part 19. Licensee representatives informed the inspectors that all workers in the SX excavation had received the "eight-hour classroom training." (On November 2, 1990, the licensee reported to the NRC that six contractor personnel may not have received this training). This is an unresolved item pending further review of additional information to be provided by the licensee to NRC (40-8027/9005-04).

During the AIT inspection of August 27-29, licensee representatives informed the inspectors that water from the excavation was routinely

pumped into 55-gallon barrels (drums) starting about August 6, the only exception occurring on August 13, after heavy rains the day before, when the licensee "pumped water to the north ditch." During this follow-up inspection, on September 10-13, the inspectors discovered that on August 13, the licensee actually pumped the water out of the excavation onto the ground and the slope of the terrain would reasonably guide the water to the north ditch. The licensee apparently sampled the soil along the pathway to the north ditch, because it was noted by the inspectors that it was roped off as a controlled area.

Beginning on about August 31, 1990, the licensee undertook specific actions to control the stockpiled soil from the SX excavation. The first phase involved drumming the soil. Once filled, the drums were removed, surveyed, labeled, and placed on a pallet. Equipment operators and drum handlers wore protective clothing, respiratory protection (half face masks), and lapel air samplers. Air samples were continuously obtained with a low volume air sampler. Additionally, air samples were obtained with high volume air samplers. The licensee sometimes sprayed water on the soil pile to keep dust to a minimum during these operations. Equipment and personnel routinely were surveyed for contamination and licensee representatives informed the inspectors that no contamination was found. Urine samples were taken from personnel and analyses available at the time indicated that no uptakes had occurred from these activities.

The licensee drummed as much contaminated soil as could be drummed before running out of barrels. The licensee estimated that approximately half of the soil pile was contained in about 3000 barrels. The second phase involved moving the remaining soil to the southwest corner of the yellowcake pad. The soil was loaded onto a dump truck driven over to the yellowcake pad, and was unloaded onto a hypalon liner. At the conclusion of this phase, the soil was covered with another hypalon liner. The equipment operator wore protective clothing, a half face mask, and a lapel sampler. The dump truck operator wore protective clothing and a lapel sampler.

Equipment, roadways, and personnel were surveyed for contamination and urine samples were analyzed for potential uptakes. No personnel were contaminated and no uptakes were indicated from the urine samples that had been analyzed. Potentially contaminated equipment was cleaned and surveyed prior to release. The area west of the SX building, where the soil was originally stored, was surveyed and controlled when it was found to be slightly contaminated.

In completing the review of the activities in the SX excavation, the inspectors reviewed the decommissioning records for compliance with 10 CFR 40.36(f). It was noted that only two "events" were included - a January 1990 spill of uranium hexafluoride in the reduction facility, and an August 3, 1990, incident at the reduction facility. The inspectors noted that no records were available in the decommissioning file pertaining to the environmental contamination discovered during SX excavation activities. While the regulation requires that decommissioning records be available, it does not prescribe the time, when the facility is in an operational status, that these records of information, important to the safe and effective decommissioning of the facility, must be available. This is identified as an open item pending further review by the NRC and discussions with the licensee (40-8027/9005-07).

B. Reporting and Notification

This section addresses reporting and notification findings concerning the discovery of contaminated water in the SX excavation. The excavation for the concrete vault began on August 1, 1990. Water was noted in the excavation and a water sample taken on August 1. This result was 0.02 g/l uranium. A sample was also taken on August 4 and the result was reviewed by site personnel on August 7, 1990. The M,E discussed the visible contamination in the excavation with the Senior Vice President (SVP), who was the most senior manager onsite at the time. The SVP concluded that a French drain being constructed around the vault for drainage would be adequate to prevent migration of the contamination. Additional samples were taken on August 6 and 7 by the M,E but the results from these samples were apparently lost and not provided to the M,E until August 23.

On or about August 16, the SVP, who was on travel at the time, directed the UF6 Area Manager to obtain sample results for the water being pumped into drums from the SX excavation. The UF6 Area Manager received and reviewed sample results associated with the drums and the August 6 and 7 samples (five total) taken from the SX excavation by the M,E. All of these sample results were obtained from the process laboratory on August 17.

Of the five sample results, four exceeded the restricted area concentration listed in Part 20 Appendix B, Table 1, Column 2. The UF6 Area Manager discussed the results with the MRC&QA. The discussion focused on whether or not the NRC should be notified, and a call was made to the SVP who was out of town. The MRC&QA advised that the event did not meet reporting criteria under 10 CFR 20.403. The SVP returned to the site on August 20, and a decision was reached

to recommend to the President upon his return to the site that NRC be informed of the elevated sample results. The issue was discussed with the President on August 21. The notification to the NRC was made on August 22.

The licensee's conclusion, that the discovery of the uranium-contaminated water in the vault excavation was not reportable, did not specifically address the criteria listed in 10 CFR 20.403(b). These criteria include potential damage to property in excess of \$7,000. The inspectors concluded that the cost of characterization and remediation of the contamination would easily exceed \$2000, and as such, was reportable under 10 CFR 20.403(b). The failure to report the discovery of the contaminated water within 24 hours was identified as an apparent violation of 10 CFR 20.403(b)(4) [40-8027/9005-02].

C. Organization and Communications Issues

This section discusses weaknesses identified by the inspectors which represent a continuing potential for future communication problems between the licensee's organizational units. The inspectors' review of licensee programs and actions concerning the discovery of the uranium-contaminated water indicated several weaknesses and areas of concern regarding the licensee's organization.

The first weakness identified by the inspectors involved the failure to clearly define organizational responsibilities for site activities which overlap departmental charters. Water samples in the excavation were collected by the HS&E Department, the Operations Department, and the Engineering Department. However, none of the departments had specific responsibility for collection of environmental samples during a nonroutine work activity, and there was no communication between the departments for the purpose of sharing information involving the elevated sample results. The inspectors concluded that sharing of information would have significantly increased the licensee's organizational understanding of the radiological hazards in the SX excavation. (To correct poor communications of laboratory results on environmental samples, a new procedure was to be issued and utilized by October 15, 1990, to define responsibilities and establish a "Chain of Custody/Special Analysis Request" form. This issue will be reviewed in the next inspection period.)

Another failure to clearly define organizational responsibilities involved Hazardous Work Permits (HWPs). HWPs are issued for all nonroutine jobs such as the SX excavation. HWPs are initiated by an operations or maintenance supervisor who describes the job to be

performed and the protective measures to be utilized. By procedure, the HS&E Department role is only concurrence in the HWP because the procedure does not define who is responsible for monitoring any ongoing work to determine whether changing health or safety conditions might warrant modification of the HWP or issuance of a new HWP. The failure to clearly define these responsibilities was identified as a procedural inadequacy and is considered to be an unresolved item pending further NRC review of licensee procedures (40-8027/9005-05).

The second weakness identified by the inspectors involved the observed tension between the Operations and HS&E Departments. This was evident during numerous interviews conducted by the inspectors. The Operations staff indicated that the HS&E staff does not effectively make decisions regarding occupational safety aspects of jobs, which result in unnecessary delays in accomplishing tasks. The HS&E staff indicated that the Operations staff has always done things in this manner and that the involvement of the HS&E staff in work activities is seen by the Operations staff as being intrusive without necessarily increasing safety. The HS&E staff also indicated that its ideas and suggestions were not openly sought or considered by the Operations staff.

As a result of these perceptions by the members of the Operations and HS&E staffs, communication between the departments appeared to be strained and minimal; accordingly, the departments have grown increasingly isolated. This isolation represents a major weakness which needs to be remedied to assure that all site activities are performed in a manner which adequately balances production considerations with occupational safety and environmental considerations. Because of the potential adverse health and safety implications of this second weakness, this weakness was reviewed on a daily basis by the onsite inspectors.

D. Verification of Licensee Commitments

In the letter to NRC dated August 30, 1990, the licensee committed to (1) provide NRC with sufficient information to ensure floor and slump integrity to ensure that current operations do not contribute to licensed material beneath the SX building, (2) adequately characterize the quantity and location of licensed material under or around the SX building, (3) identify and check all potential migration pathways away from the SX building, and (4) properly control and maintain contaminated soil and water from the excavation activities. In addition, the licensee committed to have an independent review of its entire response to this situation.

In a letter dated September 13, 1990, the President informed NRC management of the completion of these commitments. Specifically, the licensee had assured sump and floor integrity, adequately characterized the quantity and locations of licensed material under and around the SX building, identified and checked potential pathways for migration of licensed material away from the SX building, and had properly controlled contaminated soil and water. In the letter, the President also committed to investigate "other locations where similar contamination conditions may exist, after having prepared a standard operating procedure designed to properly address such activities."

The President also noted that the independent party review had been completed and the written report was forthcoming. He further stated that the licensee had already responded to one of the recommendations by issuing a letter to all employees stressing "the importance of improved communications and the need to raise . . . important observations, so that they can be properly investigated and appropriate followup action taken."

In the same letter, the President committed to establishing "effective immediately" an Interim Compliance Oversight Team (ICOT) to also assess the performance of the health, safety and environment, quality assurance, and regulatory compliance managers and staff. In the letter, the President stated that if after a week or so of duty, the ICOT provides written confirmation of satisfactory performance and expresses confidence that it will continue, the President "will confer with (the Regional Administrator, Region IV) and recommend that their continuous duty function be changed to periodic visits on a decreasing frequency."

Finally, in the September 13 letter, the licensee recognized the need for additional human resources in the areas of health physics, environmental, and quality assurance, and that the authorization for hiring additional employees had been granted.

The inspection team verified that the commitments in the August 30 letter had been satisfied and, at the conclusion of the inspection, recommended to NRC management that NRC concur with restart of the facility.

Based on the AIT inspection follow-up and the licensee's letter of September 13, NRC management verbally concurred on restart of the facility on the afternoon of September 13.

On September 14, 1990, NRC responded to the licensee's September 13 letter. NRC acknowledged the additional commitments contained in the licensee's letter of September 13 and stated the commitments "will satisfactorily provide adequate assurance that the concerns which stem from the licensee's handling of the events of the past few weeks will not provide an undue risk . . . before we have completed all our evaluative activities and had the opportunity to fully assess our findings. We, therefore, concur in your decision to proceed with a restart of the (SX) process."

4. Events Related to the Issuance of the Order Modifying License

A. Initial Licensee Response to the Identification of Contamination Under the Main Process Building

On Thursday, September 13, after concurring on restart, NRC implemented daily inspector coverage at SFC. The first inspector arrived onsite on Friday, September 14, 1990. On September 14, the licensee reported to NRC Region IV the existence of a standpipe penetrating through the floor in the MPB from which they had routinely pumped liquids from under the MPB back into the process. The standpipe is located between the No. 1 and No. 4 denitrator supports (immediately adjacent to the boildown area). The licensee believed the pipe was installed in approximately 1976 by the previous owner. The pipe was 70 inches in depth and a pump with piping was installed into the standpipe to provide a means from which liquids under the building could be recovered.² A sample taken that morning from the monitor indicated a uranium concentration of 6.2 g/l and a pH of 3.1. Later inspectors discovered that recovered liquids were not pumped directly back to the process, but that recovered liquids were actually pumped to the boil down sump and, once filled, the sump was pumped back to the digestion process. Interviews with licensee personnel indicated that a "couple of gallons" had been pumped out of the subfloor process monitor approximately once per shift for years. There were no records documenting the existence of the subfloor process monitor, nor was the operation of the pump governed by procedures. The fact that liquids can be pumped from the ground without proper characterization or evaluation is considered to be an unresolved item pending further NRC review (40-8027/9005-06).

2 This standpipe, pump, and piping configuration was referred to by the licensee until October 11, 1990, as the "subfloor process monitor".

The fact that this subfloor process monitor was not documented in the decommissioning records even though it has existed for an extended period of time is considered to be part of the open item identified in paragraph 3.A pending further NRC review (40-8027/9005-07).

The MRC&QA stated to the inspector that the subfloor process monitor had been installed to recover low pH liquids that leaked to the ground from the digesters and subsequently had shorted out some underground electrical lines. He also stated that he had learned of this approximately 2 weeks prior to informing NRC when, on August 31, a retired licensee employee informed him of it during a casual conversation at a local restaurant. The MRC&QA further stated that he had discussed this with the SVP sometime during the following week. The MRC&QA stated that the SVP was already aware of the existence of the monitor, and that they decided to investigate it further after addressing the issues related to the SX building.

The MRC&QA stated that, after listening to NRC's exit briefing on September 13, he pursued this issue first thing on the morning of September 14, with the SVP. The SVP had a water sample taken and immediately analyzed. After notifying the President of the existence of the subfloor process monitor and of the water sample results, the MRC&QA notified Region IV. The licensee then set up a log to document the characterization of the liquids that were recovered from the subfloor process monitor.

NRC was concerned about the recent identification of contamination under the MPB because: (1) the MPB might have extensive contamination underneath it, not unlike the SX building; (2) the MPB is a much larger building, parts of which process greater concentrations of uranium than the SX building; (3) the subsurface characteristics under the MPB were not known with the same degree of certainty as they were around the SX building; (4) the MPB forms the southeast corner of the restricted area boundary and licensed material could have migrated south or east of the building (to the unrestricted area) where there are no monitoring wells; and (5) the MPB is much larger than the SX building and underground support structures, such as piers, could penetrate through the shale layer, providing a direct pathway for ground water contamination.

The NRC was also concerned about the timing of this report of contamination under the MPB because: (1) there was a significant NRC presence onsite dealing with the issue of environmental contamination; (2) there were similarities between the environmental contamination under the SX building and the potential contamination under the MPB; and (3) the letter from the President to all employees

stressed the need to raise important observations for appropriate review. Each of these items should have prompted the MRC&QA and SVP to take action. However, both the MRC&QA and the SVP did not act for approximately 2 weeks before investigating this important finding and informing NRC.

The NRC was further concerned because of the lack of internal communication exhibited in this discovery. The MHS&E and the M.E, the individuals responsible for ensuring environmental contamination is controlled, first heard about the subfloor process monitor just prior to the notification to NRC. They had not been included in the discussions 2 weeks prior, nor had they been informed immediately in the morning before the liquids were sampled. NRC also noted that the licensee began to start up the plant a few hours prior to informing NRC of the subfloor process monitor.

Licensee activities on Friday, September 14, appeared to be confined to plant startup and planning activities for characterization of onsite soil and water contamination particularly in and around the MPB. The licensee also began planning for trenching activities to place collars/sumps along underground utilities to prevent migration to the northwest away from the building. In planning activities, the licensee expected that radiological safety considerations for trenching operations were to be based on soil sample analysis. The health and safety requirements for personnel involved in trenching operations were to involve protective clothing, label air samples, high volume air samplers, contamination surveys, and increased bioassay frequency for certain activities. By late that afternoon, the licensee decided to wait until Monday, September 17 before trenching a concrete conduit line running between the MPB near the standpipe to the cooling tower (running north northeast of the MPB).

The licensee presumed that material around the MPB would migrate in the direction of the cooling tower, towards the middle of the site, and the trenching appeared to be the licensee's main concern. Licensee management was also concerned about the facility employees because many had been working long hours and most weekends since the beginning of the outage on July 31. Therefore, licensee management decided to wait until the following Monday to begin further characterization activities.

B. Events Leading to the Issuance of the Order Modifying License

The Engineering Department began detailed visual inspections of the floors and sumps throughout the facility the week of September 17, with the greatest emphasis on the digestion and boildown areas of the

MPB. In the digestion and boildown areas, several visible weld defects, as well as suspect welds, were identified. The licensee implemented a rewelding program to correct identified defects. At the new (RCC) evaporator, the stainless steel sump was found to be separated from the concrete, allowing liquids access to the concrete foundation. This is the subject of an ongoing review by the licensee.

The licensee was taking action to develop a list of past practices that might indicate similar problems in other areas of the plant. The licensee was also developing comprehensive plans to characterize the site, of which the MPB characterization would be a subset. However, the licensee did not appear to be focusing on the MPB issue, but rather on the overall site. The licensee did not appear to have the same sense of urgency as the NRC regarding the environmental contamination and the potential migration concerns involving the MPB.

By mid-week, it appeared to the NRI that the licensee had not yet aggressively undertaken actions to characterize the underground contamination around the MPB nor to keep process liquids off the floor in the digestion and the boildown areas. This was of special concern to NRC since the geology under the MPB was not known with adequate assurance and therefore, the geohydrology was not fully understood (as described in more detail on page 13). Further, the MPB was closer to the unrestricted area. Although from the information currently available it appears unlikely that material would migrate offsite even if it migrated outside of the restricted area, the licensee could not provide adequate assurance that the contamination was appropriately controlled. As a result of these concerns, on September 20, 1990, NRC issued the Order Modifying License. The Order required the licensee to perform the following within 27 days:

- (1) Ensure MPB floor integrity, minimizing process liquids on the floors.
- (2) Characterize the quantity and location of licensed material under and outside the MPB.
- (3) Identify all potential pathways for migration beneath and beyond the MPB.
- (4) Examine present and past monitoring well dates for evidence of licensed material from the MPB, determining whether the present and past monitoring well program has been adequate.

- (5) Determine whether licensed material has been released beyond the restricted area by migration from the MPB, and
- (6) Develop a plan to identify and characterize other locations on the licensee's property where past or present operations have resulted in contaminating the environment.

C. Activities In Response to the Order Modifying License

1. Overview of Licensee Actions

This section discusses the plans and actions initiated by the licensee, after the Order was issued, to comply with the Order. The plans included core borings and the installation of monitor wells, utility trenchings around the MPB to intercept potential migration pathways, sump and floor inspections in the MPB and eventually all buildings, minimizing liquids on the floors, corings through the MPB floor, reviews of previous monitoring well data, evaluation of the adequacy of the monitoring well program, and a characterization of the entire site. Due to demands for drilling rigs in the Oklahoma area, the licensee had difficulty locating an available rig that was capable of drilling the types and depths of wells necessary for an adequate groundwater characterization.

The first step taken by the licensee to investigate the extent of contamination under the MPB was to core through the MPB floor in the digestion area on Saturday, September 22. In preparation, the licensee welded a pipe to the stainless steel floor, then drilled a hole (inside the pipe) through the stainless steel. The pipe provided a way to drill into the floor and not allow liquids that were on the floor to add to the inventory of material under the building. Between the stainless steel floor and the concrete foundation, the licensee found approximately 70-90 gallons of process liquids that were pumped out. Later the following week, they cored through the concrete foundation and sampled the relatively dry soil under the foundation at that point.

The licensee located a drill rig and began drilling operations on Monday, September 24. The licensee planned to start by drilling five wells around the MPB. However, elevated levels were discovered in a borehole to the southeast of the MPB. This was the first indication that the shale layer beneath the MPB was not as previously believed. As indicated earlier, no monitoring wells had been installed to the south and east of the

facility and migration of material to these areas was an obvious concern. However, particularly since the building was close to the restricted area, NRC was concerned about migration and prompted the licensee to investigate that area more thoroughly. Throughout the week, several boreholes were drilled and several monitoring wells were developed in an attempt to characterize any potential groundwater problems. The licensee also began attempting to sample soil in pipeways leading away from the MPB in the unrestricted area (south side of MPB). This initial effort consisted of employees trying to dig down in areas, designated by the Engineering Department, with posthole diggers. However, the ground was too hard for the posthole diggers, and the next day the licensee began this effort with backhoes.

Trenching activities were undertaken to obtain soil samples. This had to be closely coordinated with the Engineering Department to locate lines and identify high voltage conduit. Despite the close coordination, the licensee severed a fire main during the week of September 24. However, the fire mains are designed such that that area could be serviced by another line in case of fire. Throughout this time the licensee was operating at about 50 percent of capacity. Licensee management indicated that the "A" line was not operated until an enclosure could be built around it that would be made part of the building ventilation. This was to contain possible leaks from this recently replaced component. In addition, the digestion and boildown areas were limited to approximately 50 percent capacity. The licensee had experienced overflows in the past and did not want employees inspecting/welding the floors with the potential for heated nitric acid solutions overflowing from the tanks. Finally, manpower was limited due to activities responding to the Order.

Industrial safety practices during the licensee's activities at this time appeared adequate. Corings through the concrete floor were performed with a slow-speed water-cooled drill. Water was vacuumed up continuously during these activities so that there would be no puddling nor splashing. A high volume air sample and lapel samples indicated no airborne problems. Workers wore protective clothing, gloves, goggles, and boots. All personnel associated with drilling operations wore hard hats, disposable protective coveralls, boots, gloves, half masks for drillers, dust masks for sample handlers, and lapel samplers.

2. Environmental Assessment

This section discusses licensee progress in responding to the environmental protection aspects of the Order. In response to the Order, the licensee implemented a discovery program that had as its objective determining (1) the quantity, location, and extent of migration of licensed material under and adjacent to the main process building, (2) the pathways for contaminant migration, (3) if past or present ground-water monitoring data and the associated monitoring program were sufficient to determine migration of contaminants from the site, (4) whether licensed material is or has migrated from the site, and (5) property locations where environmental contamination may have taken place.

The licensee has implemented a drilling and sampling program that is aimed at determining the quantity and location, as well as migration, of licensed materials at the site. The program involved drilling soil borings through the various stratigraphic units. A typical hole was about 20 feet deep, and was logged and sampled on 1-foot increments. Upon completion of the drilling activities, the hole was plugged over its entire length with cement.

Following the plugging, the stratigraphic log was interpreted and a drill hole was advanced to within a foot of the base of the shale. In this hole, a 2-inch diameter casing was cemented in place to be utilized for ground-water monitoring. Adjacent to the shale well, a deeper well was drilled into the underlying sandstone. This well will be utilized for ground-water monitoring of the underlying sandstone unit. The nested nature of these wells will provide ground-water monitoring in the two major geologic units at the same location.

The monitor wells in combination with numerous shallow excavations adjacent to buried utilities, have resulted in an adequate number of exploratory locations around the MPB. The data from these points indicates that the preferred path of contaminant migration is within the backfill material utilized as bedding for underground utilities. There is a natural hydraulic conduit from the various process buildings, by way of foundation aggregate, into these utility trenches. The preliminary data collected by the licensee indicates that there is also some contaminated water that has migrated into the shale unit that underlies the entire site. Due to the minimal

hydraulic conductivity of this unit, migration of contaminated water within it is a slow process. Similarly, any corrective action to recover such waters will be a low yielding exercise.

The licensee's ground-water monitoring program was reviewed to determine if it could be expected to detect migration from the site. The ground-water monitoring program that was in place, prior to the discovery program recently instituted by the licensee, had no ground-water monitoring wells on the eastern half of the property. Therefore, it was incapable of determining seepage migration in this direction. The wells on the western half of the property were reviewed to determine their adequacy for ground-water monitoring. Each well was evaluated based upon supporting stratigraphic records and well completion data. This review indicated that unreliable data are available for the majority of the monitoring wells because the well completion details are generally insufficient to determine the zone that is being monitored.

There are two exceptions to this generalization. These are properly completed ground-water monitoring wells adjacent to the lined ammonium nitrate storage ponds, as well as those recently completed wells located on the southeast side of pond 2. Therefore, although the licensee is monitoring the wells specified in their license for the appropriate parameters on the required frequency, most of the data resulting from this program is unreliable and may be misleading.

The data accumulated by the licensee indicates that licensed material has migrated outside of the restricted area boundary. Ground-water data from monitor wells installed near the southwest corner of the main process building indicate elevated uranium concentrations. A similar migration path is known to exist in a northwesterly direction. In both of these locations, sufficient data has not yet been developed to determine the extent of migration. Similarly, sufficient stratigraphical work has not been completed to determine the preferred directions of ground-water flow.

Although the licensee is monitoring the ground-water wells in compliance with current license conditions, more recent information and investigations indicate that the monitoring network is not properly designed to determine the extent of ground-water contamination. Several of the monitoring voids will be filled with the installation of wells associated with

the current discovery program. The licensee's response to the Order will include an evaluation of the adequacy of the current monitor well system.

The licensee has also begun to formulate a plan to determine other site locations, structures, and features that could be or may have been contributing to environmental contamination. The plan involves an assessment of all site impoundments to evaluate their potential for ground-water contamination. Similarly, site drainage associated with runoff from known contaminated locations within the restricted areas will be assessed. In addition to these areas, several buried features need to be assessed. These features include, but are not limited to, the fluoride sludge burial areas, soil from the 1986 release, and the contaminated equipment burial area. Several of these buried features are located outside of the restricted area boundary. A plan for evaluating all environmental impacts from site activities will be included in the response to the Order.

5. Facility Operations

A. Plant Tours

During a plant tour on Saturday, September 15, an NRC inspector observed an operator taking a sample of four different points in the process in the SX building. Three of the sample points had some kind of catch basin underneath them. However, the fourth sample line had no catch basin, and the operator drained the fluid onto the floor before taking the sample.

The inspector also observed that leaks in pipe welds, some valves, and other such components had caused some puddling of liquids on the floor in various areas in the SX building. Buckets under sample lines that were supposed to catch leaking solutions had overflowed onto the floor. In addition, the north-side sump had overflowed and the floor immediately adjacent to the sump had standing liquids on it. The inspector further noted that the same was true in the digestion area sump.

The next night the inspector again observed operations in the SX building. Operators were draining process solution out of the No. 1 Uranil Nitrate Hydrate (UNH) tank into the sumps, even though the sumps had overflowed. The south sump had overflowed to the point that a large puddle, up to about 10 feet away from the sump, had formed as the operators continued to drain process liquids into it. When the inspector inquired as to when the sump would be drained, the

operator stated that after the task was completed, it would be drained. A manually operated sump pump was eventually used to pump these liquids to a holding tank, and then the liquids were pumped back into the process.

Additionally, puddles of process liquids were on the floor in the SX building, digestion area, and boildown area. The inspector estimated that approximately half the surface area in the digestion area floor had free standing liquids. Licensee representatives stated that it was normal to have liquids on the floor during startup, because they could not recirculate them into the process until after the plant was operating.

On Friday, September 21, the Interim Compliance Oversight Team (ICOT) team leader left the site and returned home without the licensee or the team leader first conferring with the Region IV Administrator or his designee. This appeared to conflict with the licensee's statements in their letter to NRC dated September 13, 1990. Although there may have been circumstances requiring the team leader's attention, the licensee did not satisfy their commitment and confer with the Regional Administrator or his designee. Discussions between NRC and the licensee and the ICOT team leader regarding this issue occurred and ICOT coverage appeared adequate afterwards.

B. NRC Notifications

1. Raffinate Sludge Concentration Building Sump

On September 22, the licensee notified NRC that when a sump in the raffinate sludge concentration building was inspected, it was found that this sump was also leaking. This was a relatively new concrete sump which apparently cracked as a result of poor quality control during construction. Therefore, the licensee shut down the process and reported the leaking sump in compliance with 10 CFR 20.403(b). The licensee planned to repair the sump as soon as manpower was available.

2. Unusual Event

On Thursday, September 27 at 2:30 p.m. an unusual event was declared when a worker was sprayed with process liquids in the digestion area. An engineer inspecting floors happened to be in the area when a valve stem failed. He was sprayed with a liquid that was hot, highly acidic (1-1.5 molar nitric acid), and had a high uranium concentration (450 g/l uranium). A second worker in the area guided him to an emergency shower and began dousing

him in water. After a few minutes he was taken to the company nurse and then immediately transported to an offsite clinic for examination. Since he was still slightly contaminated, a H&S technician followed him to the clinic where appropriate radiation controls were implemented. The worker returned to the plant approximately 1.5 hours later and stated that he was fine.

Immediately after stopping the spill, the licensee began cleanup efforts. Employees immediately began spraying the walls and floors with a high pressure water spray. This high pressure spray resulted in elevated airborne levels and workers in the area were required to wear respirators for a short time until levels dropped. All personnel who were in the area at that time were required to provide urine samples. Results indicated no individuals involved in cleanup exceeded any of the licensee's action levels.

The licensee's investigation indicated that a valve stem made from monel had recently been installed on the discharge side of a pump on the No. 1 Adjuster. It was known by the Operations and Maintenance departments that monel components should not be used in acidic environments such as digestion, because the monel cannot withstand the environment, which generally results in component failure within 1-2 weeks. The monel stem had been installed only 6 days prior to failure.

The Manager, Maintenance informed the inspector that there are other specific processes where specific metals cannot be used. For example, the inspector was informed that carbon steel can be used in certain portions of the hydrogen-fluoride system and not others. When the inspector asked if there were procedural controls that restricted the use of these certain metals from those processes, the inspector was referred to Procedure G-012, "Control of Critical Materials."

The purpose statement in the procedure stated that it established "the method for control of special materials and critical spare parts to ensure their proper identification" (to warehouse stock items), and applied to the receipt and identification (with stock numbers and color-coding) of special materials and critical spare parts. However, it did not appear to address the specific issue of preventing the use of specific metals in certain processes, so the inspector again asked the Manager, Maintenance to check the procedures once more to see if this issue was addressed in any other procedure.

Immediately prior to the exit, the Manager, Maintenance stated that he could not locate any, nor knew of any procedures addressing the restriction of specific metals from certain areas in the process.

Even though the licensee's September 28, 1990, report to the NRC indicated that the . . . "Sequoyah Facility has procedures to prevent such use," no such procedures, in fact, existed. This failure to provide complete and accurate information to the NRC in the September 28, 1990, report is an apparent violation of 10 CFR 40.9(a) [40-8027/9005-03].

As part of their corrective actions the licensee reviewed all work orders for the previous 2 months in the parts of the plant where metal restrictions should have existed and verified that no incorrect metals had been used. Also, personnel were informed of the occurrence, and warehouse and maintenance procedures were to be reviewed.

The licensee formally notified the NRC on Friday, September 28, 1990, of this event per 10 CFR 20.403(b) because the event threatened to cause an exposure to an individual in excess of 10 CFR 20.403(b)(1). Although the licensee began collecting urine for analysis, the licensee planned to make no initial estimation of worker intake until prompted by NRC. Subsequent urinalyses indicated an estimated whole body dose of approximately 2 millirems, and an intake equivalent to approximately 4 MPC-hours. Due to concerns about the potential for heavy metal poisoning, the licensee contacted their physician consultant for further medical follow-up.

C. South Yellowcake Sump

On October 4, 1990, NRC was informed of the fact that the licensee had discovered elevated uranium levels in the south yellowcake sump, located outside the restricted area fence. The licensee planned to extend the fence to encompass the sump, and is still evaluating this issue.

D. SX Building Rupture Disk

On October 5, 1990, the licensee informed the NRC that in an effort to keep liquids off the floor, a drain line had been installed from a rupture disk to the sump. The line contained several bends that restricted flow. When the rupture disk blew out, the liquid backed up in the line and the pressure directed it through a vent onto the

roof. The contamination was apparently minor and confined to the roof and gutters, and the licensee implemented cleanup actions immediately.

6. In-Office Reviews of Licensee Reports

Starting on September 26, 1990, the licensee had begun sending NRC daily reports on their progress to comply with the Order. The first report noted a high water sample result taken out of a borehole southeast of the MPB. The report further stated that water sample results from boreholes were "inherently unreliable" because of the potential for contamination on the ground surface to contaminate the water sample.

NRC noted that the characterization of contamination around the SX building depended, to a large degree, on data obtained from boreholes. NRC was concerned about the apparent conflict that data obtained from boreholes was unacceptable for SX characterizations but was "inherently unreliable" for MPB characterizations. However, NRC does realize that high water sample results from boreholes do not necessarily indicate ground-water contamination, and that low water sample results from the boreholes around the SX building provided a preliminary indication that no ground-water contamination had occurred in those borehole locations.

On September 28, 1990, the licensee sent NRC a copy of the independent review of licensee actions during the excavation activities of August 1990. The consultant reviewed NRC Reporting Requirements, the licensee's Project Management, Cultural Problems Related to Responsiveness, Immediate and Short Term Corrective Actions, and Implementation of Root Cause Analyses. He identified many problem areas and recommended solutions to correct them. The licensee accepted his recommendations and is in the process of implementing these recommendations.

In discussing the topic of communications with the general public, the consultant felt that NRC's announcement where the value "35,000 times . . ." was used damaged the licensee's image. The NRC agrees that it is difficult to accurately characterize and quantify these concentrations, but the fact remains that the licensee failed to recognize the significance of 8 g/l uranium in seepage into the excavation.

7. Exit Briefing

A. Exit on September 13, 1990

The inspectors exited with the licensee after the AIT follow-up inspection was completed. They reviewed their findings and discussed

NRC's concerns about the ability of the licensee to respond to an event, based on the identified weaknesses observed as a result of the SX contamination issue.

The NRC emphasized that the misplaced laboratory results (August 6-7 water samples) that were not seen by the responsible individuals for taking action until August 17 and August 23, and the placement of the floor of the vault over known levels of contamination was of concern. The licensee responded that a procedure was being developed to ensure that responsibilities for performing water samples and obtaining water sample results were clearly defined.

B. Exit on October 1, 1990

The NRC expressed concern that some licensee managers may have been too concerned with starting the plant without realizing the similarity between environmental contamination under the SX building and the subfloor process monitor.

The NRC also expressed concerns for some of the licensee procedures, including the apparent failure of procedures to address communications among the various organizations. The NRC inspector acknowledged that the licensee was in the process of addressing the communications issue at the time of the exit.

Furthermore, the inspectors discussed the lack of a sense of urgency in taking prompt aggressive action to characterize the extent of environmental contamination under the MPB. The licensee responded that it did view the MPB characterization with urgency; however, time was necessary for the organization to respond.

C. Exit on October 8, 1990

The inspector exited with the licensee on October 8, 1990, and discussed the status of the ground-water discovery program. The inspector indicated that the program contained a sufficient level of detail to adequately characterize the areas adjacent to the MPB. He also stated that a similar level of detail would be necessary for the program being developed to characterize the remainder of the site. The licensee stated that a discovery program for other areas of suspected contamination was in the planning stage.