Executive Summary

The Problem: Tank Farms Operated Outside of the DOE Authorization Basis

In January 1995, WHC began conducting operations in the Tank Farms which did not conform to a "Justification for Continued Operations" (JCO) which had been approved by EM-1. The JCO had been instituted because of an unreviewed safety question (USQ) regarding uncertainties in the Tank Farms criticality safety analysis. WHC believed that a subsequent EM-1 memorandum closing the USQ had lifted the restrictions of the JCO, but they overlooked the requirement for a formal change to their authorization basis document before proceeding. Despite a number of meetings and considerable dialogue over an eight month period, neither EM nor RL understood that WHC was conducting operations without the JCO restrictions. This occurred even though WHC tried to explain the fact to EM and RL.

During a meeting on September 11, 1995, DOE finally understood that WHC was operating outside of its authorization basis. WHC senior management stopped all operations which had been restricted by the JCO, and RL approved a change to the authorization basis removing the JCO restrictions. However, EM
did not agree that RL had authority to lift the JCO restrictions and contended that RL had not adequately considered some open technical issues. As of October 10, 1995, EM, RL and WHC were working toward an understanding of what operations were currently authorized, what the technical basis was for the operations, and who possessed authority to authorize certain operations.

On October 4, 1995, the Director of the Tank Operations Division requested that RL PAD perform a cause analysis and lessons learned assessment of this problem. This assessment was conducted and the results are presented in this report.

The Root Cause: No Process for Managing the Authorization Basis

The assessment team found that the root cause of this problem is that there is no Site process for managing the authorization basis. As a result, relative roles and responsibilities among WHC, RL and EM have not been clearly established. While a number of judgement errors contributed to the problem, the process for managing the authorization basis is so confusing and so poorly defined that problems of this nature are inevitable. In fact, if this cause is not corrected soon, the problem can be expected to recur elsewhere.

Contributing Causes:

- The necessity for adhering to the authorization basis was not fully recognized, either in WHC or in RL.
- There was confusion regarding which documents actually constituted the authorization basis.
- Communications among EM, WHC, and RL were ineffective.
- RL did not assign personnel who could participate effectively in resolution of the criticality issue.
- Delegation of approval authority for safety documentation from EM was unclear.
- There was no defined process within RL TWRS for reassigning responsibility for activities.

Most Significant Recommendations:

- RL should create and document a Site-wide process for management of the authorization basis. This should be described generically enough that it can be applied at any Site facility, but with sufficient detail that organizations using the process do not need to create their own procedures.

- All RL Assistant Managers and Directors responsible for nuclear facilities should review their authorization bases to assure that:
  - They are properly approved.
  - They are visible to everyone who needs to apply their requirements.
  - They are being properly maintained.
  - The requirements are being followed.
• All RL and WHC managers responsible for nuclear facilities should assure that authorization bases are being properly changed before allowing any operations which cannot be conducted in accordance with the existing authorization. They should assure that necessary changes are not being deferred until the annual update.

• RL TWRS and WHC should review together exactly what documents constitute the authorization basis for the Tank Farms. The results of this review should be formalized. Both RL TWRS and WHC should then instruct all cognizant personnel in the application of the authorization basis.

• All RL Assistant Managers and Directors responsible for nuclear facilities should be formally trained on the purpose and management of the authorization basis.

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Background and Scope

On September 11, 1995, the Tank Operations Division of RL found that WHC had been operating the Tank Farms using criticality operating limits which had not been fully authorized by RL. RL had notified WHC in writing that RL intended to relax some existing restrictions imposed by a formal "Justification for Continued Operation" (JCO) document. However, it had not subsequently approved a change to the authorization basis document implementing the relaxed requirements. Some personnel within WHC had misinterpreted the written notification as direct authorization to relax the JCO restrictions and intended to submit to DOE a change request to the authorization basis in a routine update.

On September 11, 1995, it became clear to both RL and EM that WHC was operating outside the requirements of the authorization basis. The Director, Tank Operations Division, then requested that PAD conduct an assessment of what had occurred in order to find ways to prevent this type of problem from recurring. In a memorandum dated October 4, 1995, the Tank Operations Division Director specified the scope of the assessment. This memorandum stated that the assessment was to evaluate the process used to control the authorization basis with respect to the criticality unreviewed safety question, and to include WHC and RL TWRS organizations within its scope. The assessment team was also to interview personnel from EM to get their perspective on what occurred. The memorandum did not call for examining technical issues because those were being evaluated separately.

As the assessment team began its work, there were continuing events related to this issue. The assessment team decided that it could best fulfill its charter by limiting its evaluation to what occurred before October 10, 1995.

The assessment team was led by David H. Brown of PAD. Michael Collopy, PAD, Dr. Chung-King Liu, PAD, and Dr. Sidney Altschuler, QSH participated as team members. Mark Jackson, QSH, provided valuable insight regarding the existing process for managing the authorization basis.
Facts Determined During the Assessment

USQ Identified in 1992

On April 30, 1992, DOE declared a USQ with respect to criticality in the Tank Farms. The basis for the USQ was the lack of a technical basis for considering that the probability of a criticality accident was incredible. In response to the USQ, operations restrictions were imposed in the form of a JCO. The JCO allowed many operations to continue, but it restricted activities such as some transfers of plutonium-bearing waste and some saltwell pumping.

EM formally classified the criticality safety issue as a Priority 2 issue. This helped allocate resources so that Priority 1 issues (such as the flammable gas USQ) could receive appropriate attention. The classification of Priority 2 was a management decision based on the recommendation of a group of technical experts. The experts concluded that the probability of a criticality accident during storage was very low, despite the need for a more complete analysis.

At the time, the Tank Farms had not yet developed an authorization basis as described in DOE Order 5480.21, "Unreviewed Safety Questions." In the absence of a valid safety analysis report, the order required WHC to identify the group of documents which it considered constituted the "safety basis" for the Tank Farms. This was done and submitted to DOE in a document called the "Interim Safety Basis" (ISB). The ISB incorporated some text from the JCO and included the entire JCO by reference. In a letter to WHC, RL approved ISB Chapter 6, "Requirements," as the authorization basis - WHC's license to operate the Tank Farms. In a November 1993 memorandum, RL informed EM that it had done this. WHC was to use the ISB to define the operations boundary for the Tank Farms until a safety analysis report could be developed in accordance with DOE Order 5480.23, "Safety Analysis Reports."

Cognizant EM personnel told the assessment team that they accepted RL's approval of the ISB. However, they still intended to retain approval authority over a contemplated later version of the ISB which would precede the actual safety analysis report. This is discussed later in this report.

Later, WHC issued a set of "Interim Operating Safety Requirements" (IOSRs). These were to specify operating restrictions until a set of Technical Safety Requirements could be developed and issued in accordance with DOE Order 5480.22, "Technical Safety Requirements." Technical Safety Requirements, when developed, are to be specifically approved by DOE. The IOSRs stated that the requirements of the JCO were applicable for as long as the criticality USQ remained in effect. This created a later inconsistency because it appeared to authorize relaxing the JCO restrictions as soon as the USQ was closed. In other words, the IOSR would authorize operating without the JCO restrictions, while the approved section of the authorization basis still called for the JCO restrictions.

The IOSRs were not explicitly approved by DOE as part of the authorization basis. Several knowledgeable individuals in RL TWRS told the assessment team that from an approval standpoint, the IOSRs were considered to be "closely related" to Chapter 6 of the ISB. This was because Chapter 6 of the ISB made reference to them. The assessment team noted that there are RL approval signatures on the WHC engineering change notices incorporating the new IOSRs.

Arrangement of JCO and ISB Unusual
The JCO is a tool which is recognized in the commercial nuclear industry but is not explicitly defined in DOE Orders. In this case, it was also used differently than in the commercial industry because its requirements were incorporated directly into the ISB - the authorization basis document. Conventionally, the JCO is a separate document from the authorization basis and can be imposed and withdrawn without the need for changing the authorization basis. A JCO would be imposed promptly after a USQ is identified and would be automatically withdrawn when the USQ was closed.

The only explicit DOE reference to a JCO process that the assessment team could find was a 1992 memorandum from NE-70. This memorandum described JCOs as being rather loosely tied to USQs. It did not state that the operating restrictions of a JCO would necessarily be lifted when a USQ was closed. The memorandum did not provide any direction regarding JCOs; it simply discussed how some DOE sites use them. While this was an internal DOE memorandum, the assessment team obtained it from WHC.

**USQ Closed**

WHC prepared a "safety assessment" to provide the technical basis for closing the USQ. This was identified as WHC-SD-SARR-003. It specifically addressed safe storage; it did not address retrieval and other future activities with the waste. The safety assessment concluded that the tanks were subcritical by a large margin and would remain so for storage operations. The criticality problem was particularly thorny because a complete safety analysis required a much better understanding of the tank contents than was currently available. In fact, a complete characterization of the tank contents was probably not technically feasible. This was because of the heterogenous nature of the tank contents and the variability of the concentration of plutonium, poisons, moderators, and reflectors.

From the time that the USQ was identified, EM-36 established a criticality safety review committee of scientists from across the nation to oversee resolution of the criticality issue. The committee met periodically and reviewed WHC technical documents. In particular, they reviewed the safety assessment and, through consensus, concurred that it adequately resolved the criticality USQ for safe storage of tank waste. The assessment team was told that all members of the safety review committee agreed that the probability of an accident was low. However, at least one member expressed reservations about the document's adequacy to demonstrate that the margin of safety was as large as it claimed. This individual had recommended that the existing data be further refined before the USQ was closed. He had also recommended that a definitive "path forward" should be established before the USQ was closed.

On March 7, 1994, RL proposed to HQ that the USQ be closed on the basis of the safety assessment. In a memorandum dated March 17, 1994, EM-1 closed the criticality USQ, citing the WHC safety assessment. In the memorandum, EM-1 included a recommendation that the Tank Farm authorization basis be amended to include the safety assessment, as well as the operational safety requirements (OSRs) that would be based on the safety assessment. The assessment team was told that this was only posed as a recommendation because RL had been delegated approval authority and had approved chapter 6 of the ISB as the authorization basis.

The memorandum also stated that the JCO would remain in effect until WHC had completed four actions:

- Prepared criticality safety evaluation reports (CSERs) for single shell and double shell tanks,
Prepared criticality prevention specifications (CPSs),

Prepared criticality operating procedures, and

Conducted operator training for the revised operating procedures.

It also stated that, even though the USQ was closed, the criticality safety issue was not resolved. Final resolution required completion of the upgrade activities described in an upgrade plan developed in 1992. The upgrade plan addressed activities beyond safe storage, such as retrieval.

EM-36 personnel told the assessment team that they did not intend this memorandum to actually lift the JCO. Their expectation was that WHC would complete the four items, then formally request that the JCO be lifted. Meanwhile, the safety review committee would be reviewing WHC criticality safety implementation documents for adequacy.

RL then sent a letter of direction to WHC forwarding the memorandum. From this letter, WHC concluded that they were authorized to lift the JCO once they had completed the four actions. WHC reached this conclusion this because the letter did not state that any further authorization by DOE was required. In the past, letters addressed to WHC with similar language had not required them to seek further authorization to proceed with an action. While the EM memorandum recommended that the ISB be changed, the RL letter explicitly directed WHC to submit an ISB change to RL for approval.

**WHC Begins Operating Without JCO Restrictions**

WHC completed all of the actions required by the March 31 letter for the East Tank Farms in December 1994. On January 14, 1995, WHC began transferring some plutonium-bearing waste from PUREX to the East Tank Farms. These were transfers of a type which had not been allowed under the JCO. WHC did not formally notify DOE (either RL or EM) that they had done this. WHC performed a "USQ screening" to see that the new operation was allowed by the authorization basis, but overlooked the JCO restrictions which were still in the ISB. By March 1995, WHC was no longer following the JCO restrictions in the West Tank Farms as well.

The assessment team discussed this transition with the individuals who had been the operations managers for both the East Tank Farms and West Tank Farms at the time the transition occurred. Neither recalled having discussed it with anyone from DOE. The individual who had been operations manager for East Tank Farms said that he did not believe that this was the type of situation that he would have discussed with DOE.

**Implementation Status Discussed in Periodic Meetings**

After the USQ was closed, the criticality safety review committee continued to meet to review implementation of the SARR-003 requirements. WHC provided draft CSERs and CPSs and the committee returned comments back to WHC on them.

During these meetings, WHC discussed lifting the JCO restrictions with EM. A representative of EM-36 was at Hanford on December 14, 1994, and WHC personnel told the assessment team that they discussed their plans with him.
The WHC criticality safety representative for the Tank Farms (criticality representative) told the EM-36 representative that WHC intended to "implement the procedures" as soon as they met the requirements of the USQ closure letter. Neither the EM-36 representative nor the other criticality safety committee members who were present connected the statement that WHC would be "implementing the procedures" with the idea that they would actually conduct operations previously restricted by the JCO.

The criticality safety review committee met in Richland again on the following dates:

- January 18, 1995
- April 11, 1995
- June 13, 1995
- September 11-12, 1995

The April meeting was unproductive because it was not adequately announced beforehand, and neither WHC nor RL were appropriately represented. After the meeting, draft minutes were developed which discussed the expectation that the JCO would remain in place until analyses, limits, controls, procedures and training were complete. The need for a change to the ISB was also addressed. However, the minutes were never formalized. EM personnel said that the meeting minutes were distributed, but personnel in WHC or RL interviewed by the assessment team said that they did not see them.

The issue of lifting the JCO was discussed in each meeting. During the January and June meetings, WHC and the EM representative discussed the matter but still did not seem to understand each other. The WHC criticality representative believed he had communicated that WHC was no longer observing the JCO, while the EM-36 representative believed that WHC was simply making preparations to operate without the restrictions. While RL was represented at each of these meetings, its role was described to the assessment team by several observers as passive. (Except for the June meeting, RL was represented at each meeting by the cognizant RL team leader. In June, the cognizant RL team leader was ill, but a general support services contractor (GSSC) employee attended.)

An EM memorandum documented the results of the June meeting of the criticality safety review committee and was distributed to RL and WHC. It described a "path forward" for resolving the criticality issues and specified actions for WHC to accomplish so that EM-1 could determine the adequacy of measures necessary to lift the JCO. WHC personnel told the assessment team that they believed they had been clear during the meeting that they were not following the JCO, and were puzzled by the memo. They attributed the treatment of the issue in the meeting minutes to the EM representative's personality, and did not consider the meeting minutes to be direction to them. They also believed that their existing written authorization allowed them to continue what they were doing. WHC wrote back to RL acknowledging what was said in the minutes about DOE approval to lift the JCO restrictions, but without saying that they were already operating without the JCO restrictions.

Several individuals closely involved with the criticality issue told the assessment team that they had not received minutes for any criticality safety review committee meetings prior to the June 1995 meeting. They said that this had hindered communications between WHC, RL, and the committee. EM representatives said that there had been minutes, but they had been sometimes informally distributed.

**ISB Change Drafted, Not Submitted**

From the time that the USQ was closed, WHC engineering and safety analysis personnel recognized that
a change to the ISB to remove reference to the JCO was required. However, they believed that this could be done during a periodic update of the ISB. Periodic updates are performed annually to correct minor errors and acknowledge configuration changes that do not have safety significance.

Sometime in April or May 1995, the manager of WHC TWRS Plant Engineering recognized that a change to the ISB was required but had not been made. He discussed this with the WHC criticality representative and they found that a change had already been prepared by the safety analysis organization. Safety analysis believed that the change could be made at the annual update, but the Plant Engineering Manager directed that it be submitted promptly. However, he did not follow up on this until June, when he was about to be transferred to a new position. At that time he found that the change request had still not been submitted to RL, and he again directed that this be done. The change request was finally hand carried to DOE on July 13, 1995. (Due to a minor correspondence control problem, the letter was dated August 7, 1995.)

The assessment team discussed why working level personnel had not processed the change promptly with both WHC working level and management personnel. The assessment team was told that people working on safety documents were accustomed to processing documents "piecemeal," and this detracted from a sense of urgency about making this particular change. By "piecemeal," they said that they meant that safety documents were usually focused on a particular high profile operation. This letter was not focused on any particular job, and the requirement to make the ISB change seemed to be routine.

When the cognizant RL TWRS team leader received the ISB change request, he called EM and discussed it with the EM-36 representative. The EM-36 representative told the team leader that RL should not approve the change until an audit had been conducted to assure that the prerequisite actions had been properly completed. The team leader told the assessment team that he was relatively new in his position and did not know how to obtain the resources to perform an audit. He was busy with some Priority 1 issues and did not give the letter attention until September 11 when the JCO issue was finally clarified. Also, the team leader did not realize that WHC was already conducting operations using the limits of the ISB change.

**Problem Recognized**

During a meeting of the criticality safety review committee on September 11, 1995, RL and EM finally realized that WHC was not following the restrictions of the JCO despite the expectation that only EM-1 could relax the JCO restrictions. It also became clear that WHC was operating to requirements different than those specified in the authorization basis (chapter 6 of the ISB) since the ISB still specified the JCO requirements. In fact, EM was not ready to lift the JCO because some members of the criticality safety review committee still had technical issues with WHC's implementing documents. Specifically, they had reviewed CSER and CPS documents and found that they did not conform to SARR-003.

When the EM-36 representative returned to HQ, he reported the problem to EM management. They considered providing written direction to RL, but decided instead to manage the issue informally.

When the problem became clear to the cognizant RL team leader, he notified the Director of the Tank Operations Division and the Deputy Assistant Manager for RL TWRS. (All three of these individuals told the assessment team that they had no knowledge that there was a problem with the authorization basis or with lifting the JCO restrictions before the September 11 meeting.) The team leader then contacted WHC and directed that they comply with the JCO. However, this meant stopping transfers and
stopping some saltwell pumping operations. After discussing this with WHC middle management, the team leader concluded that it would be less safe to stop these operations, and withdrew his direction. Rather than stop operations, WHC middle management had proposed prompt approval of the ISB change deleting the JCO.

On September 12, the cognizant RL team leader discussed the issue with his management, informing them of his actions. He then called the EM-36 representative at HQ and told him that RL’s intention was to approve the ISB change and allow WHC to continue operations. The EM-36 representative disagreed with this plan, primarily because he believed it would justify WHC’s actions that created the situation. He also considered that RL did not have the authority to approve changes to the ISB which would have the effect of lifting JCO.

Despite the EM-36 representative's position, RL TWRS management decided to proceed with approving the ISB change. However, when the change was reviewed technically, RL found errors in it. In particular, the RL reviewers noted that an editorial error led to lifting the restrictions of another JCO. On September 19, the change request was returned to WHC with a request that it be reviewed and revised.

At this time, the team leader was aware that there were outstanding technical comments on the WHC implementing documents. In his judgement, these were issues that could be cleared up later because WHC was already using the implementing documents. He therefore believed that it didn't matter whether the JCO was in place or not.

On September 18, 1995, the acting Deputy Assistant Secretary, EM-30, discussed the problem with RL TWRS senior management. As a result of this discussion, RL TWRS wrote to EM-30, documenting the fact that the ISB had not been updated to reflect removal of the JCO restrictions, and stating the RL conclusion that no actual safety problem resulted from the error. The memo did not address any other issues.

**DNFSB Concerned**

From September 19, the Hanford Defense Nuclear Facilities Safety Board (DNFSB) representative followed activity on the criticality issue and met with both RL and WHC management on several occasions. On September 21, he met with the WHC level 1 manager responsible for the Tank Farms to find out WHC’s intentions. Soon after this meeting WHC senior management ordered that JCO-restricted operations be stopped, even though RL middle management was willing to allow them to proceed. On September 22, the DNFSB representative met with mid- and senior level RL and WHC management. He met separately with the RL Operations Office Manager. Interest on the part of the DNFSB representative appears to have contributed significantly to focusing senior RL and WHC management attention on the issue.

**ISB Change Approved**

WHC submitted the revised ISB change request on September 21. It was reviewed by RL and approved on September 22. The letter approving the change was signed by the RL Operations Office Manager.

**No Occurrence Report Issued**

At the time the assessment team began its field work, it noted that no occurrence report had been issued.
The team discussed this with the Tank Operations Division, who prompted WHC to submit one. The occurrence was classified as an off-normal event and addressed the fact that the Tank Farms authorization basis had not been changed to reflect removal of the JCO requirements.

**Continuing Controversy**

In authorizing the change to the ISB, RL approved lifting the restrictions of the JCO. Chapter 6 of the ISB (the authorization basis) had been originally approved by RL, and RL considered that it had authority to make changes to it. The EM-36 representative, on the other hand, had already taken the position that only EM-1 could lift the JCO restrictions. Personnel from EM-36 informally expressed their opinion that WHC should return to the JCO restrictions, but this was not stated as a formal EM position. They also believed that RL TWRS had not adequately evaluated the outstanding technical issues before obtaining approval of the ISB change. In a memorandum dated September 27, 1995, the cognizant EM team leader outlined the authority issue and requested that RL provide its position regarding approval authority for lifting the JCO. It stopped short of stating that RL did not have this authority.

In a letter dated October 10, 1995, RL directed WHC to observe new limits on Tank Farm operations. The limits were not to be lifted until authorized by the Operations Office Manager. The limits addressed several items from the original JCO with regard to plutonium concentration in transferred waste and total plutonium content. The letter also prohibited WHC from using cadmium concentration for determination of criticality safety. WHC had used cadmium poison in making safety calculations for several transfers, but this method had not been evaluated in any approved safety documents.

In addition to the technical requirements, WHC was directed to conduct a "lessons learned" review of the management system problems that had led to the issue. In an interview, the WHC Director of Safety and Technical Integration said that he was directing two teams of reputable people to assess two areas:

- The process for controlling the authorization basis, and
- The technical adequacy of Safety Assessment SARR-003.

As of this writing, the controversy was not resolved. However, final resolution of the technical issues is beyond the scope of this assessment.

**WHC Believes They Did Not Operate Outside the Authorization Basis**

Even though they were not following JCO restrictions contained in chapter 6 of the ISB, several WHC managers told the assessment team that they did not believe that they actually operated outside of the authorization basis. They considered that the DOE letter closing the USQ authorized lifting the JCO restrictions and therefore became part of the authorization basis. WHC then viewed the problem as being a configuration management (document control) error, since they were late in following through with the formality of changing the ISB. Some RL personnel told the assessment team that they agreed with this view.

DOE Order 5480.21 addresses the situation in which subsequent DOE direction will modify an approved authorization basis document. It requires that either:
The text of the authorization basis document must be changed to directly incorporate the new direction, or

The letter describing the change must be incorporated into the authorization basis document as an addendum.

The order does not recognize the new direction as part of the authorization basis until after one of these two actions has been completed.

**Transfer of Responsibility Within RL TWRS Informal**

Until the completion of the safety assessment, responsibility for resolution of the criticality USQ lay with the TWRS Tank Safety Analysis Division. The issue was managed by an individual whom TWRS management considered to be appropriately qualified. However, in September 1993, this individual was assigned other duties and never returned to the criticality issue. He eventually left RL. After September 1993, no individual contributor was specifically assigned to follow the issue.

In January 1995, RL TWRS began to move responsibility for the criticality issue from the Tank Safety Analysis Division to the Tank Operations Division. There was no defined process within TWRS for transferring responsibilities of this nature, and TWRS personnel told the assessment team that the transfer was carried out very informally. Again, no RL individual contributor was assigned to follow the issue. The issue was followed by a GSSC employee, but correspondence and issues management was handled by a team leader in the Tank Operations Division.

The assessment team discussed with the cognizant team leader the fact that no individual contributor was assigned to follow the criticality issue. He said that he had six individuals on his team, but only one had the qualifications and experience to be effective with the assignment. He also said that the one capable individual was badly overloaded with other duties, and so he decided to follow the issue himself. The team leader added that no one on his team was qualified in the area of criticality control. He did have a GSSC technical assistant who followed the issue, but he also was not specifically qualified on the subject of criticality.

The problem was compounded by the fact that the cognizant team leader was relatively new to RL, having arrived in June 1994. While he did not have any training in criticality, he did have previous training and experience in the management of authorization bases.

**RL TWRS Procedure Control Weak**

The assessment team reviewed the administrative processes used to control RL Tank Operations Division activities and found that they were quite weak. There were several procedures which addressed day-to-day activities but none which addressed the problems which led to this assessment. Specifically, there were no procedures governing:

- Transfer of program areas of responsibility among divisions, or
- Management of the authorization basis.

The assessment team also reviewed administrative procedures applicable to the RL TWRS organization
as a whole. It found that a set of procedures governing management of the authorization basis had been prepared several years ago, and that a few people still referred to them. The procedures described processes in enough detail to explicitly address items like JCOs. However, they were written with a certain understanding about the arrangement of authority between EM and RL which did not exist at the time of this problem. These procedures did not appear to have any meaningful standing within the TWRS organization, even though some individuals followed them. This conclusion was based on the following:

- All signed copies of approved procedures had been removed from the work area.
- Electronic versions of approved and draft procedures were commingled on the network file server. When asked by the assessment team, TWRS personnel were unable to distinguish between draft and approved procedures.
- The Director of the Program Integration Division told the assessment team that previous TWRS management had not supported the procedures.

No RL Process for Management of the Safety Basis

The assessment team looked for processes which described the management of the authorization basis for RL. It also looked for defined roles, responsibilities, accountability and authority among RL, WHC, and EM.

While there was a reasonably well developed set of procedures within WHC, there was no overall DOE directive governing this process. DOE Order 5480.21, "Unreviewed Safety Questions," and DOE Order 5480.23, "Safety Analysis Reports," described the process for compiling existing safety documentation to a "safety basis," with subsequent DOE approval of an "authorization basis." However, no DOE Order specifically addressed the JCO document. On the other hand, section 10.d of DOE 5480.21 required the contractor to submit a completed safety evaluation prior to removing any operational restrictions. It appeared to the assessment team that the context might fit the situation of the JCO for the criticality USQ. SARR-003 would be the safety evaluation which is required before removing operational restrictions.

Section 9 of DOE 5480.21 gives EM-1 the authority to "establish the authorization level" for each facility under his responsibility. This has been interpreted to mean that EM can delegate approval authority for various types of safety documents. It appears to mean that, if he chooses, EM-1 can delegate authority to the Operations Office to approve the authorization basis, but retain authority to approve lifting the JCO.

EM Delegating Approval Authority to RL

For the past several years it has been DOE policy to move more and more authority from HQ to the field. DOE Order 5480.19 authorizes EM-1 to delegate approval authority for authorization bases, and several EM-1 memoranda discuss a delegation process. These were:


In summary, these memoranda stated that EM would delegate authority to the field when field elements had demonstrated their technical capability to review safety documents. In addition to demonstrating the technical capability, field elements would have to show that they had an infrastructure to control reviews and conduct oversight of the authorization process. RL never demonstrated the necessary capability, but EM did delegate some, then withdraw some approval authority.

**Status of Delegation of Approval Authority Confusing**

Both EM and RL personnel agreed with the assessment team that the status of delegation was confusing. The August 8, 1994 memorandum granted broad authority to approve safety documents for hazard category 2 and 3 nuclear facilities, but the November 4, 1994 memorandum withdrew some of that authority. For example, it stated that EM-1 would approve the authorization basis documentation for the high level waste tanks at Hanford. It also stated that authorization may be withdrawn for other facilities on a case-by-case basis.

In trying to understand the status of delegation, the assessment team asked the cognizant EM team leader why the November 4 memorandum said that EM-1 would approve the Tank Farms authorization basis after he had already allowed RL to approve chapter 6 of the ISB as the authorization basis. He replied that the December 9, 1993 memo referred to the "Level 0 ISB," but future approvals applied to the "Level 1 ISB" and the eventual final safety analysis report. He explained that the Level 0 ISB was the document currently approved by RL and that the Level 1 ISB had not been completed. He said that the basis for the Level 1 ISB would be formed by the document that WHC referred to as the "Accelerated Safety Analysis" (ASA). (The ASA is still being developed by WHC.) The assessment team could not have discerned this without assistance.

The assessment team also noted that the status of approval of the Tank Farms authorization basis was still unclear. The December 9, 1993 memorandum stated that EM-1 and EH-1 planned "to accept the Interim Safety Basis (ISB) and its implementing procedures based on [RL's] review and approval." After RL notified EM-1 that it had approved chapter 6 of the ISB as the authorization basis, EM did not provide any notification that it had accepted the ISB.

**Authority Over the JCO Unclear to WHC and RL**

Because the JCO had been incorporated into the ISB, and because RL was subsequently granted approval authority over the ISB, it appeared to RL that authority to lift the JCO now lay with RL. Personnel at EM, however, believed that EM-1 retained that authority. The EM-36 representative told the assessment team that since EM-1 had approved the JCO in 1992, only EM-1 could relax these
restrictions. However, RL TWRS managers acted on their deduction that authority over the JCO had been delegated to them. This was because the JCO had been incorporated into the ISB and EM had then granted RL approval authority over the ISB. Prior to the June 1995 criticality safety review committee meeting minutes, there was no formal correspondence between EM, RL, and WHC regarding authority over the JCO.
Cause Analysis

1. Causes

1. Summary of Causes

The assessment team used the Management and Oversight Risk Tree (MORT) fault tree analysis as well as event and causal factors analysis to develop conclusions from the facts. These analytical techniques were used to judge the adequacy of management systems to prevent this type of problem. Parenthetical statements directly following both root and contributing causes correlate with the MORT chart.

The root cause was: There is no clearly defined process for managing the authorization basis. Relative roles and responsibilities of RL, WHC, and EM have not been clearly established. (Management systems implementation - Directives less than adequate)

Contributing causes were:

- The necessity for adhering to the authorization basis is not fully recognized, either in WHC or in RL. (Line responsibility less than adequate)

- There is confusion regarding which documents actually constitute the authorization basis. (Management system factors - Directives less than adequate)

- Communications among EM, WHC, and RL were ineffective. (Communications less than adequate)

- RL did not assign personnel who could participate effectively in resolution of the criticality issue. (Personnel selection less than adequate)

- Delegation of approval authority for safety documentation from EM is unclear. (Management system factors - directives less than adequate)

- There is no defined process within RL TWRS for reassigning responsibility for activities. (Management system factors - policy less than adequate)

2. Root Cause

1. There is no clearly defined process for managing the authorization basis. Relative roles and responsibilities within and between RL, WHC, and EM have not been clearly established. (MORT: Management systems implementation - Directives less than adequate)

There is no procedure, instruction, or other directive which establishes a Site-wide process for developing and administering the authorization basis. There are DOE orders providing high level requirements, and there are established procedures within WHC describing the relative roles and responsibilities of different WHC organizations. However, there is no practical description of how the validity of the
authorization basis is established and how it is approved and maintained. Such a
description would necessarily address the relative roles of WHC and RL.
Furthermore, there is no process which describes the JCO and how it is administered.

Apparently it is not RL policy to provide this type of instruction. Recently a
procedure governing administration of the authorization basis was canceled and
development of a companion procedure was terminated.

The assessment team considers that lack of a defined process has created a
vulnerability for all Site facilities which are required to maintain an authorization
basis. Without such a process, problems of the type discussed in this report can be
expected to recur.

3. Contributing Causes

1. **The necessity for adhering to the authorization basis is not fully recognized,
either in WHC or in RL.** (MORT: Line responsibility less than adequate)

When WHC concluded that they had the authority to lift the JCO restrictions, some
personnel at the individual contributor level recognized that a change to the
authorization basis was required. (This need appears to have been overlooked by
WHC management and RL personnel.) However, none of them recognized that
changing the authorization basis was a prerequisite for conducting operations without
the JCO restrictions. They believed that making the change during the annual update
would be acceptable.

Later, when plant engineering management became aware that the authorization basis
had not been changed, an order was given to have it changed promptly. However, the
problem was not considered significant enough to warrant close management
attention. Operations was not notified and no occurrence report was submitted.

It was not clear to the assessment team if anyone from RL TWRS was aware of the
problem during early 1995, but when it became clear on September 11 that WHC was
operating outside of the authorization basis, RL management did not immediately
recognize the significance of the problem. It was not until the DNFSB representative
expressed his concern over the matter that management attention was truly focused on
the issue.

But even after management attention was focused on the issue, no occurrence report
was prepared until the assessment team prompted the Tank Operations Division to
have WHC submit one. Also, WHC management continued to maintain that they had
not operated outside of the authorization basis; they had simply made a document
control error. These factors point to a conclusion that neither WHC nor RL is treating
chapter 6 of the ISB (the approved authorization basis) as the fundamental license for
WHC to operate the Tank Farms.

2. **There is confusion regarding which documents actually constitute the
authorization basis.** (MORT: Management system factors - Directives less than
adequate)

WHC believed that the RL letter closing the USQ provided authorization to lift the JCO restrictions and automatically became part of the authorization basis. The assessment team concluded that this view was incorrect and creates additional vulnerability.

- This view is incorrect because DOE Order 5480.21 specifically requires letters and other documents modifying the authorization basis to be formally incorporated into the authorization basis document.
- This view creates vulnerability because personnel using the authorization basis may not have access to all of the letters and other documents which modify the authorization basis document.

The authorization basis document must be both visible and controlled in order to have any value. If the document does not reflect the complete authorization basis, personnel could make errors in the application of safety requirements.

Another problem stems from the fact that the IOSRs were not subject to the same review and approval process as the ISB. The IOSRs strongly indicated that the JCO restrictions were automatically lifted as soon as the USQ was closed. Therefore, as soon as the IOSRs allowed lifting the JCO restrictions, the IOSRs conflicted with chapter 6 of the ISB - the authorization basis document. (The assessment team acknowledges that it is speculative to believe that a more rigorous review and approval process for the IOSRs would have necessarily led to complete coordination between chapter 6 of the ISB and the IOSRs. However, this is the process which is relied upon to assure that this coordination exists.)

3. Communications among EM, WHC, and RL were ineffective. (MORT: Communications less than adequate)

The assessment team concluded that the letter which WHC received from DOE closing the USQ did not require WHC to obtain further authorization before lifting the JCO restrictions. Since this was an EM expectation, it should have been stated in the letter. WHC has received many letters from DOE specifying prerequisite actions for some approved item where no additional approval was expected. WHC had no reason to believe that this letter was different. (There was still a requirement to obtain a formal change to the authorization basis to remove the JCO restrictions.)

While it is true that EM-1 approved the original JCO, the JCO was made part of the authorization basis in accordance with DOE Order 5480.21. EM-1 then delegated authority over the authorization basis to RL. EM did not successfully communicate to RL and WHC that, even though RL was authorized to approve the authorization basis, EM would still reserve the right to approve lifting the JCO restrictions.

Beginning in December 1994, WHC attempted to tell the criticality safety review committee that they were beginning to operate without the JCO restrictions, but no
one understood what they were saying. In the WHC vernacular, the phrase "we are implementing the procedures" meant that WHC was conducting operations to the relaxed limits, but personnel on the committee thought it meant that they were only preparing to conduct operations. This communications failure persisted for eight months, despite several meetings.

When WHC saw the meeting minutes from the June 13 meeting, they were frustrated with the EM-36 representative. They believed that they had adequately stated their position and actions, but that the EM-36 representative was disregarding what they were telling him. They simply continued what they were doing because they did not know what else to do. They were confident that their actions were justified because they believed that the letter closing the USQ provided written authorization to proceed with operations. The meeting minutes did not constitute direction.

RL was not aware that some technical comments needed to be resolved before the JCO restrictions were lifted. This led to premature approval of the authorization basis change.

Minutes of the criticality safety review committee were not formally distributed for several meetings. Appropriately distributed minutes for the December and January meetings might have clarified the issue sooner.

4. **RL did not assign personnel who could participate effectively in resolution of the criticality issue. (MORT: Personnel selection less than adequate)**

As early as September 1993, RL TWRS did not have any individual contributor assigned to follow the criticality issue. The issue was followed first by a team leader in the Tank Safety Analysis division, and later by a team leader in the Tank Operations Division. The team leaders did not have time to be fully engaged on the issues and were consequently ineffective.

It did not appear to the assessment team that the Tank Operations Division had an individual contributor on its staff who was technically knowledgeable of criticality issues. One person who was at least knowledgeable of the safety basis was too overloaded to be able to effectively follow the issue.

5. **Delegation of approval authority for safety documentation from EM is unclear. (MORT: Management system factors - directives less than adequate)**

The assessment team noted that there were at least four different memoranda from EM discussing delegation of safety document approval authority to RL. These were sometimes inconsistent, and there was general agreement that the status of approval authority is unclear. After discussing this with both RL and EM personnel, the assessment team concluded that many RL managers perceive that more authority has been delegated than EM intended.

6. **There is no defined process within RL TWRS for reassigning responsibility for activities. (MORT: Management system factors - Policy less than adequate)**
The Tank Safety Analysis Division began transferring responsibility for the criticality issue to the Tank Operations Division in early 1995. The process extended over a three month period and, by all accounts, was informally managed. When the transition was complete, the Tank Operations Division team leader did not believe that he had an adequate grasp of the issues and conditions that he had received.

2. Discussion of Causal Sequence

1. Analysis: Conditions

The following conditions prevailed during the period of consideration:

- There was no defined Site process governing management of the authorization basis.
- Roles, responsibilities, authorities, and accountabilities for management of the authorization basis were poorly defined.
- There was no RL individual contributor assigned to follow the criticality issue.
- There was no defined process for transferring major responsibilities within RL TWRS.
- The criticality safety issue was classified as a priority 2 issue. RL TWRS personnel were focusing most of their attention on Priority 1 issues.
- RL was passive during activities to resolve criticality issues.
- Communications among EM, RL, and WHC regarding management of the JCO were often informal.
- Roles and responsibilities were not clearly defined between the RL Tank Safety Division and the Tank Operations Division.
- Direction from EM regarding local approval authority was changing and poorly described.

2. Analysis: Causal Sequence

1. The criticality USQ was identified, and a JCO was approved by EM-1. Later, RL approved chapter 6 of the ISB as the authorization basis. The JCO requirements were incorporated into the authorization basis, contrary to commercial industry practice.

   While the concept of a process like the JCO is referred to in DOE Orders, there is no defined process for managing JCO's.

   EM-1 had approved the JCO, but authority for subsequent approval of the ISB (which served as the interim authorization basis and included the JCO) was delegated to RL.
This created the appearance that authority over the JCO had also been delegated to RL.

EM formed the criticality safety review committee to provide technical oversight for the process of resolving the criticality issue.

- **Root Cause:** There is no clearly defined process for managing the authorization basis.
- **Contributing Cause:** Delegation of approval authority from EM is unclear.

2. The RL TWRS individual following the criticality issue took on other duties. He stopped participating effectively in September 1993 and eventually left RL. No other individual contributors were assigned to either manage or follow progress on the issue.

   There was a difference in perception on relative roles between the Tank Safety Division and the Tank Operations Division. Tank Safety perceived that they were helping operations resolve the criticality issue, but Tank Operations believed Tank Safety was responsible for achieving resolutions.

   - **Contributing Cause:** RL did not assign personnel who could participate effectively in resolution of the criticality issue.

3. The IOSRs were issued and included a statement which indicated that the JCO restrictions would be lifted as soon as the USQ was closed. However, the IOSRs were not subject to the same review and approval process as the ISB.

   WHC and RL submitted the safety assessment to EM and requested closure of the USQ. There was consensus within the criticality safety review committee that the document justified closure of the USQ. EM then closed the USQ.

   The EM memorandum closing the USQ included requirements that WHC was to satisfy before the restrictions of the JCO could be relaxed. EM intended that RL and WHC would request that EM-1 relax the JCO restrictions after completing the requirements. However, this was not stated in the letter. It does not appear that there was any discussion of the intent of this letter until much later.

   RL provided the direction of the EM memo to WHC in the form of direction, but without clarification.

   - **Contributing Cause:** Communications among EM, WHC and RL were ineffective.

   - **Contributing Cause:** Delegation of approval authority for safety documentation from EM was unclear.

4. WHC was completing the actions required by the EM memorandum which closed the USQ. In a December 1994 meeting, the WHC criticality representative told the EM-
36 representative that WHC would be "implementing their new procedures".

Beginning January 14, 1995, WHC conducted transfers and began other operations using procedures which did not include the JCO restrictions. WHC management and operations personnel did not recognize the need to obtain a change to the ISB before proceeding.

A few days later, in a meeting of the criticality safety review committee, the WHC criticality safety representative told the EM-36 representative that WHC had "implemented the procedures". The EM-36 representative apparently did not make the connection between "implementing the procedures" and conducting operations without the JCO restrictions. He cautioned the WHC criticality representative that EM-1 was the authority for lifting the JCO restrictions.

WHC did not believe that they needed any further approval to proceed because:

- The letter closing the USQ said nothing about further approval to lift the JCO restrictions.
- It appeared that EM had delegated authority over the JCO to RL.
- WHC believed that the memorandum closing the USQ automatically became part of the authorization basis.

Apparently WHC operations did not notify RL TWRS Tank Operations Division when they began operations without the JCO restrictions. A notification was not required, but could be considered a matter of courtesy.

Additionally, WHC operations did not recognize that by implementing the new procedures they were operating outside of the authorization basis.

- Root Cause: There is no clearly defined Site-wide process for managing the authorization basis.
- Contributing Cause: The necessity for adhering to the authorization basis was not fully recognized, either in WHC or in RL.
- Contributing Cause: There was confusion regarding which documents actually constitute the authorization basis.
- Contributing Cause: Communications among EM, WHC, and RL were ineffective.

5. Because the USQ was closed, the Tank Safety Analysis Division began to pass responsibility for management of criticality issues to the Tank Operations Division. However, there were no individual contributors in either division assigned to either manage or follow the issue. Because there were no individual contributors involved, team leader understanding of the issues and status was more sketchy than it would
otherwise have been.

There was no defined process for transferring responsibility for major projects or programs within TWRS. As a result, the transfer was handled very informally and occurred over a period of about three months.

- **Contributing Cause:** RL did not assign personnel who could participate effectively in resolution of the criticality issue.

- **Contributing Cause:** There was no defined process within RL TWRS for reassigning responsibility for activities.

6. When the USQ was closed, personnel within the WHC safety analysis organization and plant engineering recognized the need for a change to the authorization basis. A change request was prepared, but was not routed through management for submittal to RL. Plant engineering management recognized that the Tank Farms was being operated outside of the authorization basis document, but did not recognize the conduct of operations implications of the situation. This occurred for the following reasons:

- Technical personnel believed that the nature of the change was such that it could be made during the annual update.

- Technical personnel believed that previous safety documents had been processed piecemeal. This detracted from a sense of urgency about making the change. They did not recognize that having the ISB approved by DOE meant that there should now be additional discipline applied to managing the authorization basis.

- Management did not follow up to assure that the ISB was properly and promptly changed. (This should have been done before the JCO restrictions were relaxed). Like the technical personnel, they did not recognize that DOE approval of the ISB meant that additional discipline was being applied to management of the authorization basis.

When WHC Plant Engineering management recognized that the ISB change had been prepared but not submitted, technical personnel were directed to make the change. However, there was no management followup for several months and the change was not submitted in the mean time.

- **Root Cause:** There is no clearly defined Site-wide process for managing the authorization basis.

- **Contributing Cause:** The necessity for adhering to the authorization basis was not fully recognized, either in WHC or in RL.

7. When the authorization basis change request got to the cognizant RL team leader he contacted the EM-36 representative. The EM-36 representative said that the change
request should not be processed until RL had conducted an audit to assure that the requirements of the EM-1 memorandum had been satisfied. The team leader was unsure of how to obtain resources for an audit and was caught up in priority 1 issues. He also did not understand that WHC was already operating without the JCO restrictions. He took no action on the change request until after the seriousness of the authorization basis issue had been recognized.

- **Contributing Cause: RL did not assign personnel who could participate effectively in resolution of the criticality issue.**

8. The criticality safety review committee met in Richland on June 13, 1995. The subject of "implementing the procedures" and EM-1 approval for relaxing the JCO was again discussed between WHC and the EM-36 representative. Again, the EM-36 representative did not recognize that WHC was already operating with the JCO restrictions relaxed.

Following the meeting EM provided meeting minutes which explicitly referred to an expectation that EM-1 would lift the JCO restrictions. However, WHC had already been operating without the restrictions for six months and believed that they had communicated this fact to EM.

Despite the expectation in the meeting minutes, WHC had no explicit direction stating that they needed further approval from DOE to lift the JCO restrictions. Also, the IOSRs, which were accepted with the ISB by RL, stated that the JCO restrictions were removed as soon as the USQ was closed. Frustrated by seeming obstinance on the part of the EM-36 representative, they simply proceeded with operations.

During this meeting, the cognizant RL team leader was absent due to illness, although a GSSC assistant was present.

- **Contributing Cause: Communications among EM, WHC, and RL were ineffective.**

- **Contributing Cause: RL did not assign personnel who could participate effectively in resolution of the criticality issue.**

9. During the September 11, 1995 meeting of the criticality safety review committee, EM, RL, and WHC came to an understanding that WHC was not following the restrictions of the JCO. The EM-36 representative reported this to EM management who initially decided to resolve the issue with RL informally.

The cognizant RL team leader also notified all levels of TWRS management of the problem and contacted WHC Tank Farms middle management. He at first directed that all operations affected by the JCO be stopped, but WHC told him that they considered stopping would create a situation that was less safe. They proposed to the team leader to instead expedite approval of the ISB change. The team leader agreed with this and notified his management.
The team leader began a review of the ISB change, but WHC senior management decided that stopping operations was the safest thing to do. When the RL review found errors in the change request these were corrected by WHC.

RL TWRS then obtained approval from the Operations Office Manager for the change. However, there were several problems with this:

- EM (or at least some personnel within EM) considered that EM-1 was the only authority for lifting the JCO restrictions.
- There were unresolved technical comments on the criticality prevention specifications and criticality safety evaluation reports.

The assessment team believes that these problems were not considered carefully enough before the change was submitted for approval.

EM-36 was notified of the RL action and expressed concern over it.

WHC maintained that they had only made a document control error, indicating that they did not recognize chapter 6 of the ISB and other documents explicitly referenced by chapter 6 of the ISB as their fundamental license to operate the Tank Farms.

- **Root Cause:** There is no clearly defined Site-wide process for managing the authorization basis.
- **Contributing Cause:** Delegation of approval authority for safety documentation from EM was unclear.
- **The necessity for adhering to the authorization basis was not fully recognized, either in WHC or in RL.**

10. As of October 10, 1995, the matter was unresolved, but RL, EM, and WHC Management were actively seeking resolution.
**Recommendations**

1. RL should create and document a process for management of the authorization basis. This should be described generically enough that it can be applied at any Hanford facility, but with sufficient detail that organizations using the process do not have to create their own procedures. An accountability system should assure that:

   - The process is actually created, and
   - The process is effectively implemented.

2. All RL Assistant Managers and Directors responsible for nuclear facilities should review their authorization bases to assure that:

   - They were properly approved,
   - They are visible to everyone who needs to apply their requirements, and
   - They are being properly maintained.

   Their requirements are being properly followed.

   These managers must assure that they understand what level of authorization is required for their facility, and they must assure that EM agrees with their understanding.

3. All RL Assistant Managers and Directors responsible for nuclear facilities should be formally trained on the purpose and management of the authorization basis.

4. All RL Assistant Managers and Directors responsible for nuclear facilities should assure that authorization bases are being changed before allowing operations which cannot be conducted in accordance with the existing authorization. They should assure that necessary changes are not being deferred until the annual update.

5. WHC should assure that all managers of nuclear facilities and personnel involved in the management of authorization bases are aware of the requirement to change their authorization basis before proceeding with operations outside of the existing authorization.

6. RL TWRS and WHC should review together exactly what documents constitute the authorization basis for the Tank Farms. The results of this review should be formalized. Both RL TWRS and WHC should then instruct all cognizant personnel in the application of the authorization basis.

7. RL TWRS should include in its current reorganization an effort to assure that technically qualified personnel are assigned to follow and/or manage all outstanding issues.

8. RL TWRS should review the approval status of the IOSRs and assure that they are properly approved by DOE. Because they are referenced by Chapter 6 of the ISB, they are part of the
authorization basis and must be controlled as such. RL TWRS should discontinue the practice of allowing individual contributors to sign WHC safety documents, such as the IOSRs.

9. TWRS should establish a formal process for passing responsibilities from one division to another.

10. RL ESH should continue its ongoing work to resolve with EM the exact status of authorization delegation.

11. RL management and WHC management should remind personnel attending formal meetings that they should obtain minutes of those meetings. Meeting sponsors are responsible for issuing minutes.
Signatures

David H. Brown, PAD [signed 11-03-95]
Lead Assessor

Michael T. Collopy, PAD [signed 11-03-95]
Assessor, Cause Analyst

Chung-King Liu, PhD, PAD [signed 11-03-95]
Assessor

Sidney J. Altschuler, EngScD, PE, QSH [signed 11-03-95]
Assessor
### Appendix A

**List of Personnel Interviewed**

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<tr>
<th>Name</th>
<th>Organization</th>
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