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River Protection Project Integrated Baseline Risk Assessment

W. A. Kitchen
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Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

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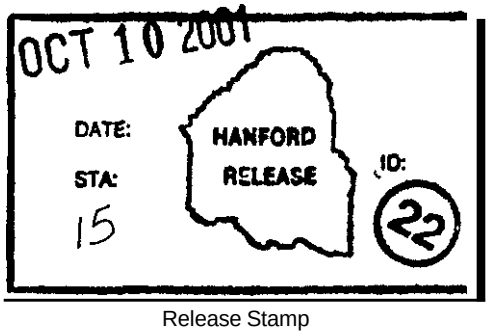
Abstract: The purpose of this report is to present the results of the integrated River Protection Project (RPP) risk analysis in fulfillment of Section C.2(a)(2) of Contract Number DE-AC27-99RL14047, which requires CH2M HILL Hanford Group, Inc. to "Complete and maintain an integrated life-cycle baseline which . . . shall be linked to the WTP contractor baselines."



Chris Kitchen 10/10/01
Release Approval Date

Release Stamp

Approved For Public Release

RPP-8878
Revision 0

River Protect Project Integrated Baseline Risk Assessment

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

CH2MHILL
Hanford Group, Inc.
Richland, Washington

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-99RL14047

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Revision *0*

River Protection Project Integrated Baseline Risk Assessment

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CH2M HILL Hanford Group, Inc.

Date Published
September 2001

Prepared for the U.S. Department of Energy
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TERMS

CHG	CH2M HILL Hanford Group, Inc.
HLW	High Level Waste
ICD	Interface Control Document
IHLW	Immobilized High Level Waste
ILAW	Immobilized Low Activity Waste
LAW	Low Activity Waste
ORP	Office of River Protection
P3	Primavera Project Planner[1]
RPP	River Protection Project
TFC	Tank Farm Contractor
WTP	Waste Treatment Plant
WTPC	Waste Treatment Plant Contractor

[1] **Premavera Project Planner and P3 are registered trademarks of Primavera Systems, Inc., Bala Cynwyd, Pennsylvania.**

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this report is to present the results of the integrated River Protection Project (RPP) risk analysis in fulfillment of the following contract requirement:

> Section C.2 (a) (2) of the CH2M HILL Hanford Group, Inc. (CHG) Extension Contract [DE-AC27-99RL14047] requires CHG to "Complete and maintain an integrated life-cycle baseline which...shall be linked to the WTP contractor baselines."

To perform this required work scope CHG must:

> "(iii) Develop and implement a risk management process, which supports the management and integration activities under the authority of the Contract."

In response to this requirement, CHG performed an assessment of the critical areas contained in the RPP integrated baseline. This document complements the "River Protection Project Integrated Baseline" deliverable provided on August 30, 2001. The analysis centers on the following four RPP mission critical reporting milestones:

- Delivery of 1st Batch of Low Activity Waste (LAW) Feed to the Waste Treatment Plant (WTP)
- Delivery of 1st Batch of High Level Waste (HLW) Feed to the WTP
- Readiness to Receive 1st Immobilized LAW (ILAW) Shipment from the WTP
- Readiness to Receive 1st Immobilized HLW (IHLW) Shipment from the WTP.

1.2 PROCESS OVERVIEW

The risk analysis was performed using the Primavera Project Planner[2] (P3) baseline schedule provided to the Office of River Protection (ORP) on August 30,2001. This schedule included baseline change requests approved through July 15,2001. The analysis was conducted with regard to feed delivery requirements and facility readiness of the Tank Farm Contractor (TFC). Therefore, for the purpose of this assessment, the Waste Treatment Plant Contractor (WTPC) dates are viewed as static dates that will be met and are shown without any schedule variability.

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[2] Primavera Project Planner and P3 are registered trademarks of Primavera Systems, Inc., Bala Cynwyd, Pennsylvania.

The risk analysis addressed both cost and schedule impacts of risks. However, because of a concern for the alignment of the TFC and WTPC interface milestones, the bulk of this document addresses schedule.

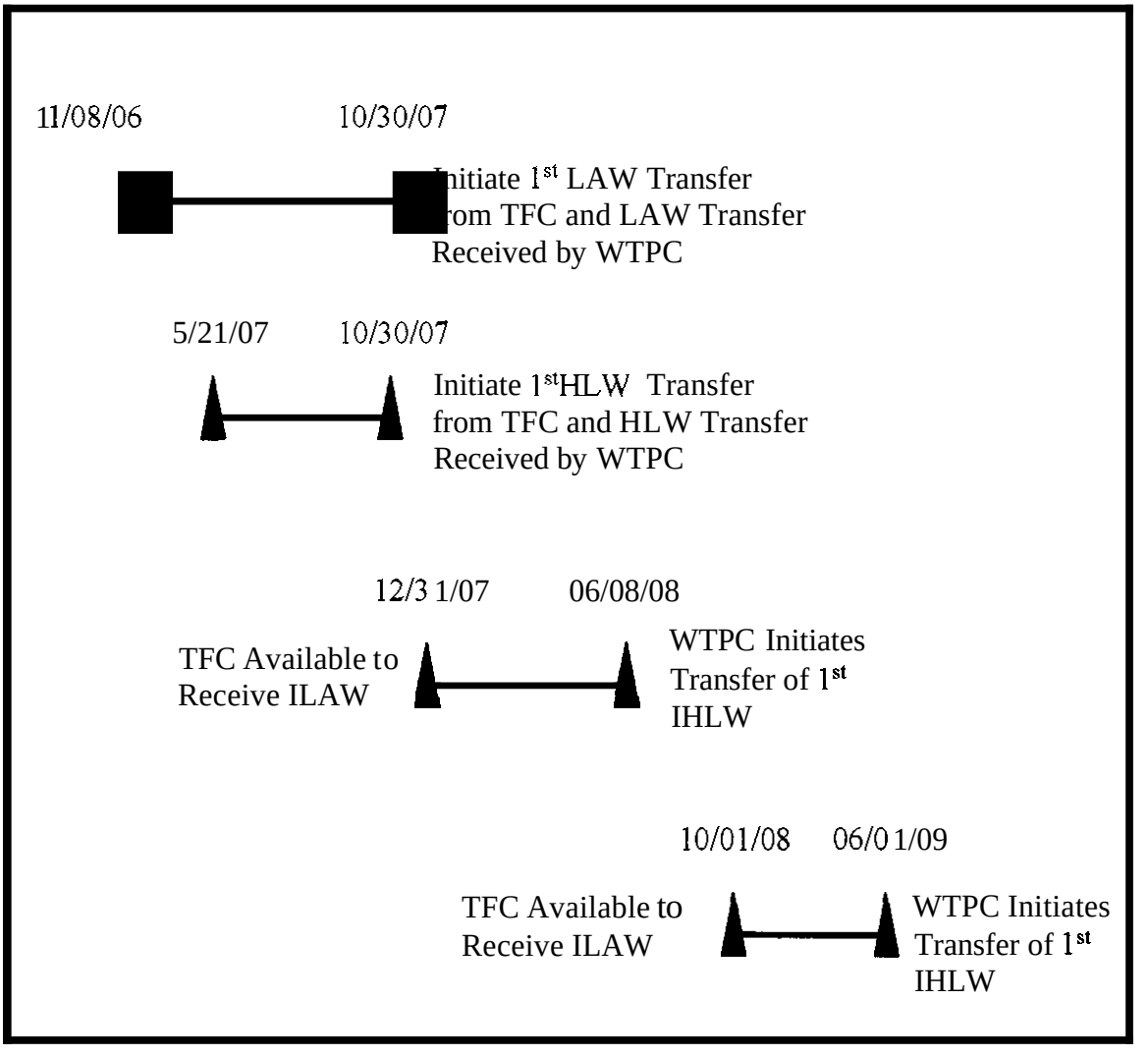
The cost analysis included each of the cost elements in the identified portion of the baseline. The schedule analysis is performed on the critical path, including near-critical path (defined as less than 6 months schedule float), related to the endpoint of interest. By focusing on critical and near-critical path activities, the analysis is optimized while producing virtually identical results to a comprehensive analysis that would have focused on all activities.

The results that pertain to individual projects were reviewed by the appropriate project team (e.g. W-464, "Immobilized High-Level Waste Interim Storage Facility", whose scope is to be ready to accept IHLW product). Their input was used to add credibility to the indicated handling actions and the amount of impact each action would present.

2.0 SUMMARY OF RESULTS

The risk analysis was performed using the lntegrated Mission Schedule **(IMS).** The IMS was developed using P3 schedules from the TFC and the WTP as part of the integrated baseline submittal provided to the ORP on August 30,2001. The analysis focuses on the critical path activities (defined as less than **6** months schedule float) for four major interface delivery points for the project. Each interface point is made up of two parts; the first is being ready to perform the interface activity and the second being the initiation of the activity. Figure 2.1 below illustrates the relative relationship of these interface points.

Figure 2-1. Relative Relationship Between Tank Farm Contractor and Waste Treatment Plant Contractor Interface Points

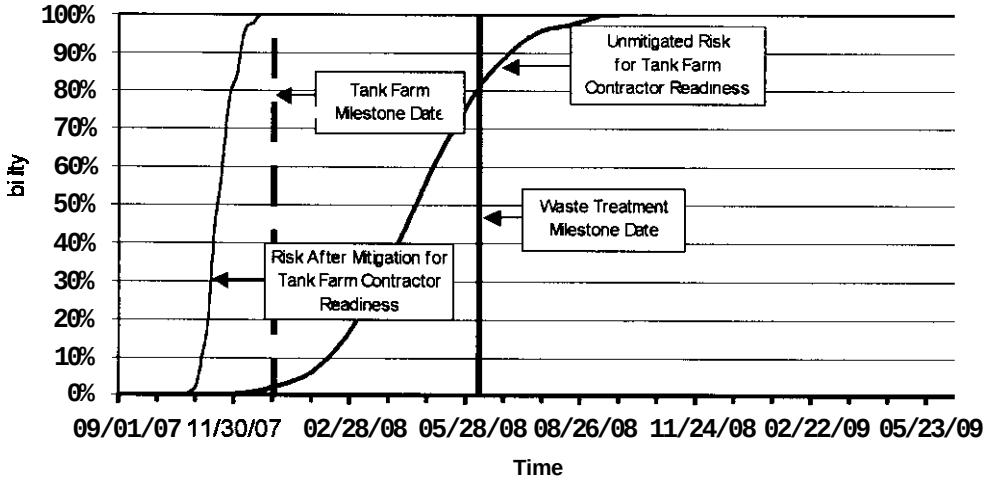


The title of each interface point and the milestone number contained in the Expanded Management Summary Schedule is indicated below:

- Waste Treatment Plant baseline dates were used as reference points for determining uncertainty for the four key interface points.
  - Receive Transfer of 1st Low Activity Waste Feed — Milestone 920
  - Receive Transfer of 1st High Level Waste Feed — Milestone 921
  - Initiate Transfer of 1st Immobilized Low Activity Waste — Milestone 978
  - Initiate Transfer of 1st Immobilized High Level Waste — Milestone 991
- Tank Farm schedule milestones were assessed for overall variability against both Tank Farm Contractor commitments and the Waste Treatment Plant baseline dates.
  - Initiate Transfer of 1st Low Activity Waste Feed — Milestone 225
  - Initiate Transfer of 1st High Level Waste Feed — Milestone 248
  - Available to Receive Immobilized Low Activity Waste — Milestone 19
  - Receive Transfer of 1st Immobilized High Level Waste — Milestone 536

Risk assessment between the two prime contractors is performed from differing perspectives based on historical corporate practices as applied to work on the River Protection Project. The primary difference lies in the assessment of schedule variability and the approach to mitigation. The Waste Treatment Plant Contractor assesses uncertainty in execution and applies contingency dollars to achieve schedule acceleration, if required. The Tank Farm Contractor assesses uncertainty in execution based on individual schedule elements. Both approaches are viable in assessing and managing project risk. This assessment uses an objective analysis of the issues in achieving the Tank Farm Contractor interface objectives and avoids the pitfalls associated with differing contractor approaches to analytically assess sub-project variability. Typical results of this effort are illustrated in Figure 2-2.

Figure 2-2. Probability for End Date Completion Template



The risk analysis addressed both cost and schedule. The primary emphasis is placed on schedule uncertainty to highlight concerns for the integration of Waste Treatment and Tank Farm key interface points. Cost impacts are discussed in relation to the effect of risk mitigation actions. Cost uncertainties for the Tank Farm Contractor were analyzed with and without the implementation of mitigating actions. Employing an eighty percent (80%) confidence factor, the difference in cost represents "Estimated Risk Cost Reduction" in Table 2.1. The impact of delays on the Waste Treatment Plant were not included in this analysis. It is important to note the planned mitigating actions have a significant positive impact on the probability of meeting key interface dates and the estimated cost of the mitigation actions are about one-third of the avoided additional costs.

Table 2-1. Risk Mitigation Action Summary.

	Estimated Cost of Risk Mitigation Actions ($K)	Estimated Risk Cost Reduction ($K)	Estimated Risk Schedule Reduction (Calendar Days)
Delivery of 1st Batch	$940.5	$1,755.5	144
Delivery of 1st Batch	$1,038.9	$2.611.1	198
Readiness to Receive 1st ILAW Shipment from WTP	$242.8	$651.4	192
Readiness to Receive 1st IHLW Shiument	$1,095.0	$4,975.0	182
Total	$3,3 17.2	$9,993.0	N/A

HLW = High-Level Waste
ILAW = Immobilized Low Activity Waste
WTP =Waste Treatment Plant

2.1 HIGHLIGHTS OF THE ANALYSIS:

- The project has positive schedule float (given an 80% confidence factor) in meeting the completion of three of the four key contractor interface points without implementing risk mitigation actions. This analysis provides reasonable assurance of successful interface between the contractors as currently reflected in the baseline schedules.

- Implementation of mitigation actions by the Tank Farm Contractor results in positive schedule float that range from 121 days to 319 days for meeting the key WTPC need dates.

- Without implementing risk mitigation actions the Tank Farm Contractor has negative schedule float (given an 80% confidence factor) in meeting the tank farm schedule milestones established in support of the four key interface points.

- Implementation of mitigation actions for the tank farm schedule milestones, by the Tank Farm Contractor, results in significant improvement in schedule float but does not provide reasonable assurance of meeting the TFC baseline commitments without additional mitigating actions.

- A significant fixed lag exists in the schedules for transfer of feeds to the waste treatment plant. Detailed reviews should be conducted in order to consider selective acceleration of work, deferral of baseline milestones, or other appropriate mitigation actions.

2.2 KEY INTERFACE POINTS ANALYSIS

This section briefly describes the analysis for each of the key interface points.

2.2.1 Delivery of Low Activity Waste Feed to the Waste Treatment Plant

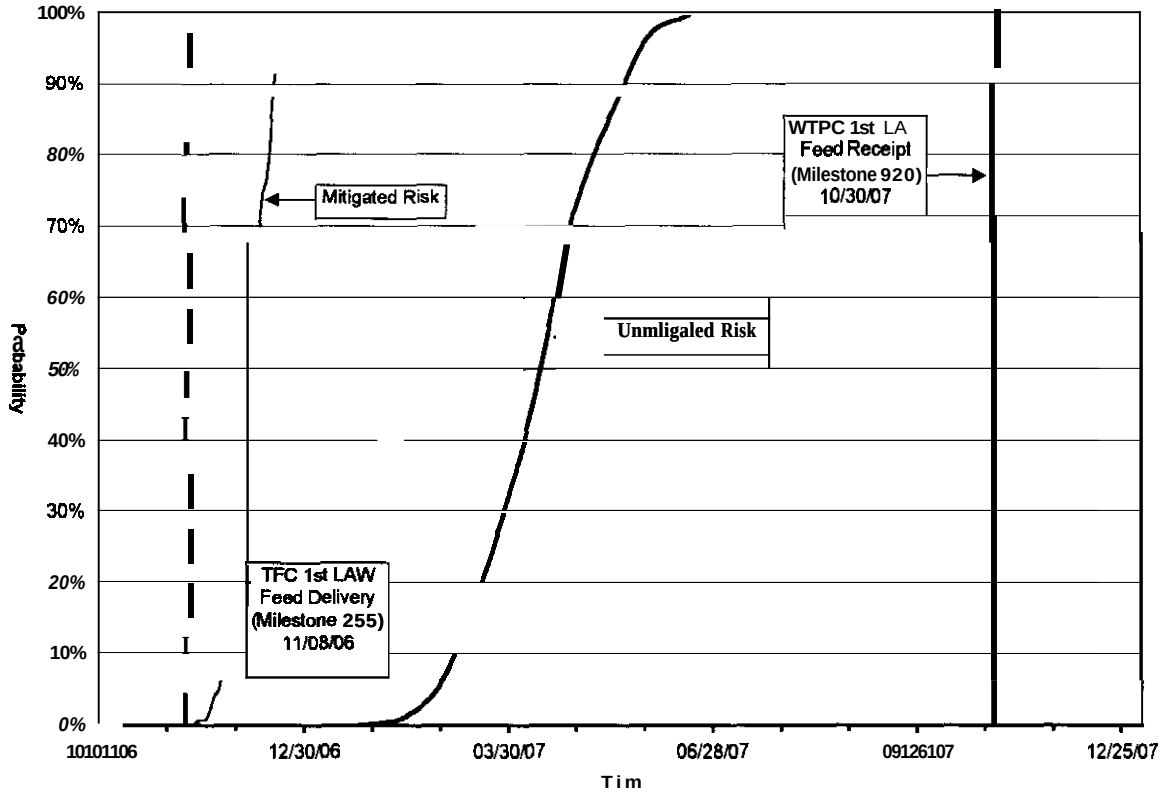
Delivery of the 1st batch of LAW Feed to the Waste Treatment Plant is reflected in the Integrated Mission Schedule as Milestone 225 ("ICD-19B Initiate Transfer 1st LAW Feed Batch"), and is scheduled for November 8,2006. The corresponding Waste Treatment Plant Milestone 920 ("ICD-19B Receive Transfer 1st LAW Feed Batch) is scheduled for October 30, 2007.

The analysis demonstrates a high probability in meeting the Waste Treatment Plant date, but issues with meeting the Tank Farm schedule milestones remain. The high priority risks are identified in the table contained in Figure 3-3:

The baseline currently contains mitigation actions for these risks as well as the other risks identified in the analysis. The estimated cost to mitigate the costs is $940K, which is projected to avoid approximately $1,755K in cost.

The probability curve (refer to Figure 2-3 on the following page) and the supporting tables provide the summary results of the analysis. It is clear additional mitigating actions (acceleration, milestone deferral, etc.) are needed to appropriately address the uncertainty associated with meeting the Tank Farm Contractor milestone date. The primary driver for the continued risk in meeting this milestone is a 500-day lag inserted in the schedule.

Figure 2-3. Probability of End Date Completion for 1st Low Activity Waste Transfer.



Milestone for Waste Treatment Plant LAW Receipt:

Milestone Date (920)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
10/30/07	05/08/07	175	12/15/06	319

Milestone Date (255)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
11/08/06	05/08/07	-181	12/15/06	-37

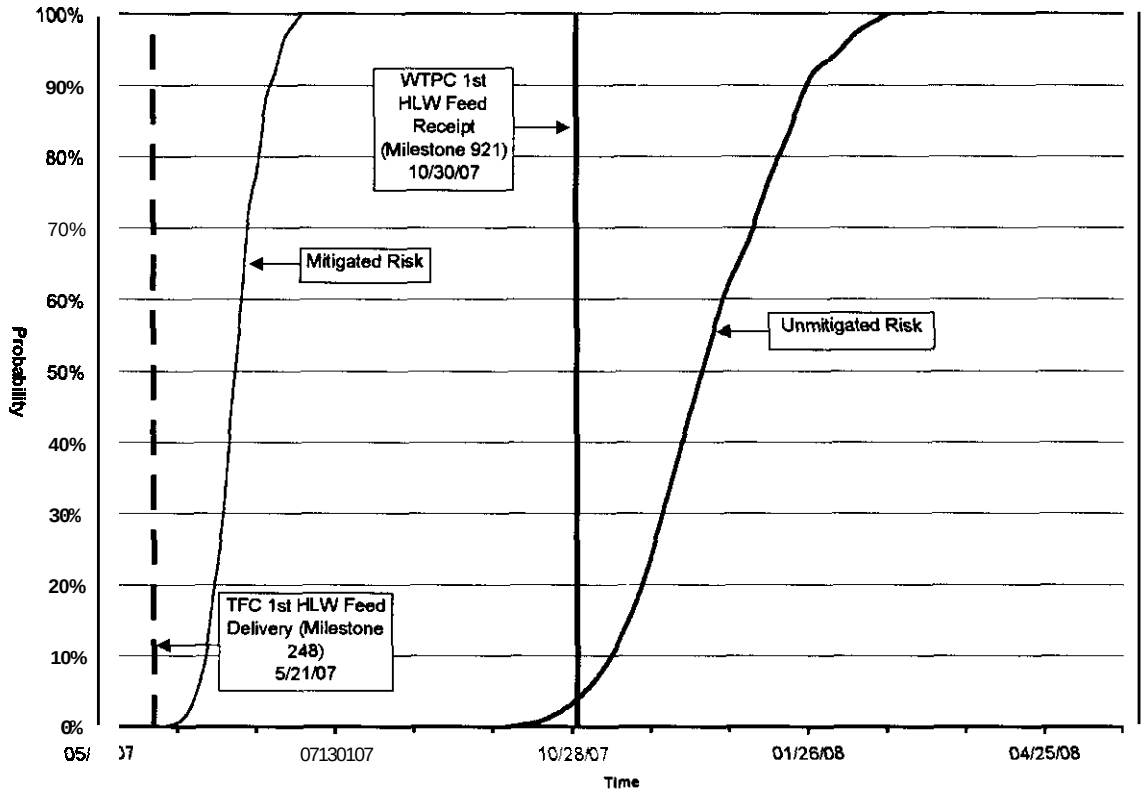
2.2.2 Delivery of HLW Feed to the Waste Treatment Plant

Delivery of the 1st batch of HLW Feed to the Waste Treatment Plant is reflected in the IMS as Milestone 248 ("ICD-20B Initiate Transfer 1st HLW Feed Batch"), scheduled May 21,2007. The corresponding Waste Treatment Plant Milestone 921 ("ICD-20B Receive Transfer 1st HLW Feed Batch) is scheduled for October 30, 2007. The analysis demonstrates a high probability in meeting the Waste Treatment Plant date, if the identified risks (refer to Appendix A) are successfully mitigated. However, issues with meeting the Tank Farm schedule milestones remain. The high priority risks are identified in the table contained in Figure 3-5.

The baseline currently contains mitigation actions for these risks as well as the other risks identified in the analysis. The planned mitigation costs are $1,039K, which is projected to avoid approximately $2,611K in cost.

The probability curve (refer to Figure 2-4 on the following page) and supporting tables provide the summary results of the analysis. It is clear additional mitigating actions (acceleration, milestone deferral, etc.) are needed to appropriately address the uncertainty associated with meeting the Tank Farm Contractor milestone date. The primary driver for the continued risk in meeting this milestone is, once again, the 500-day lag that exists in the schedule.

Figure 2-4. Probability of End Date Completion for 1st High Level Waste Transfer.



Milestone for Waste Treatment Plant HLW Receipt:

Milestone Date (921)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
10/30/07	01/15/08	-77	07/01/07	121

Milestone Date (248)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
05/21/07	01/15/08	-239	07/01/07	-41

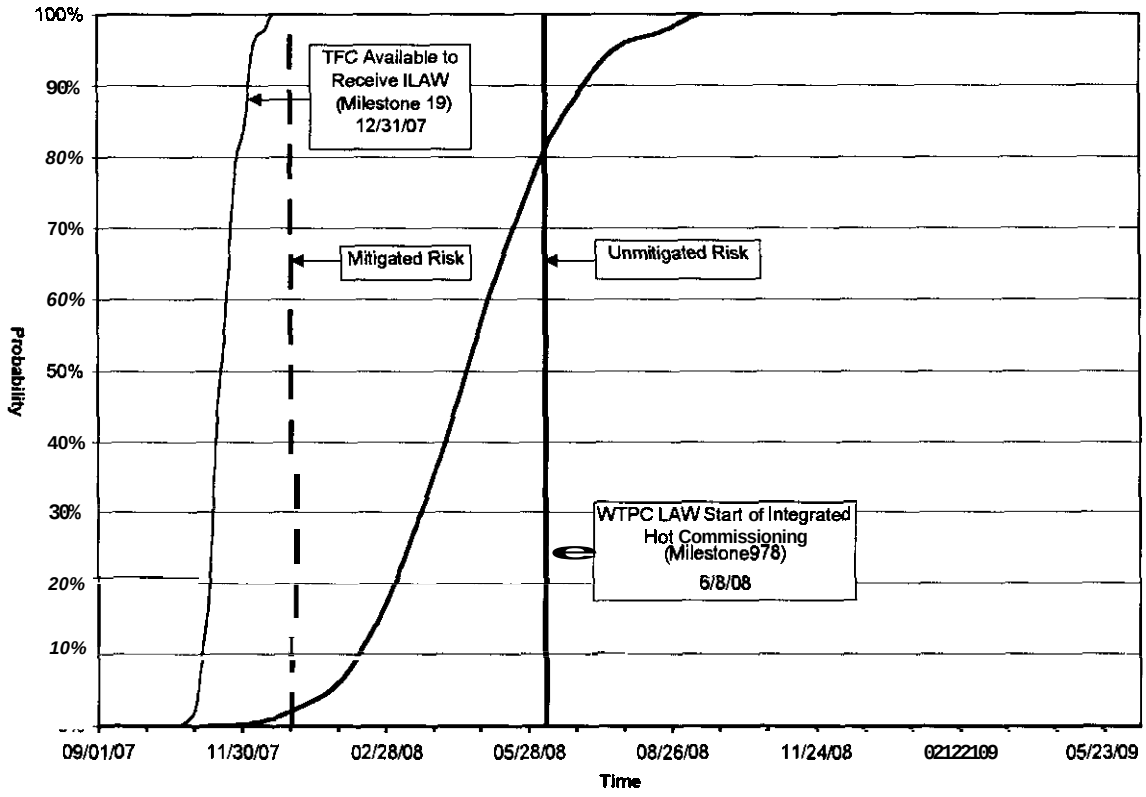
2.2.3 Readiness to Receive ILAW Shipment from the Waste Treatment Plant

Readiness of the TFC for Receipt of the 1st Batch of ILAW Product from the Waste Treatment Plant is reflected in the IMS as Milestone 19 ("Available to Receive ILAW), scheduled December 31, 2007. The corresponding Waste Treatment Plant Milestone 978 ("ICD-15B Initiate Transfer of 1st ILAW Product") is scheduled for June 8, 2008. The analysis demonstrates a high probability in meeting the Waste Treatment Plant date, but issues with meeting the Tank Farm schedule milestones remain. The high priority risks are identified in the table contained in Figure 3-7.

The baseline currently contains mitigation actions for these risks as well as the other risks identified in the analysis. The planned mitigation costs are $243K, which is projected to avoid approximately ***$651K*** in cost.

The probability curve (refer to Figure 2-5 on the following page) and supporting tables provide the summary results of the analysis. Additional mitigating actions (acceleration, milestone deferral, etc.) should not be needed unless there is a requirement to introduce additional float in meeting the Tank Farm Contractor milestone date.

Figure 2-5. Probability of End Date Completion for Immobilized High Level Waste Product.



Milestone for Waste Treatment Plant to Initiate Transfer of 1st ILAW Product:

Milestone Date (978)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
6/08/08	6/06/08	2	11/27/07	194

Milestone for Availability to Receive ILAW from Waste Treatment Plant:

Milestone Date (19)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
12/31/07	6/06/08	-158	11/27/07	**34**

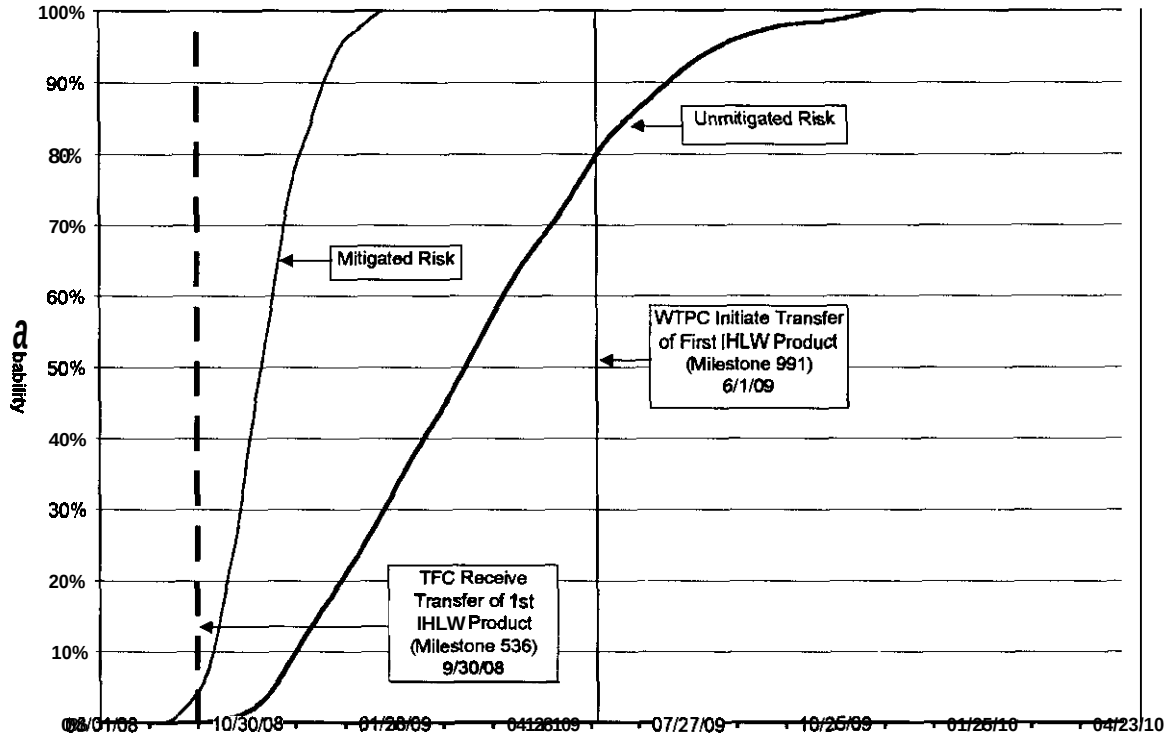
2.2.4 Receive Transfer of MLW Product to the Waste Treatment Plant

Receive Transfer of 1st IHLW product to the Waste Treatment Plant is reflected in the baseline as Milestone 536 (ICD-14B "Receive Transfer of 1st IHLW Product"), scheduled for September 30, 2008. The corresponding Waste Treatment Plant Milestone 991 ("ICD-14B Initiate Transfer of 1st IHLW Product") is scheduled for March 13,2008, however discussions with WTP and ORP indicate that negotiations are planned to modify the date to June 1,2009to account for float introduced by lag storage capability. Accordingly, the June 1, 2009 date was used. The analysis demonstrates a high probability in meeting the Waste Treatment Plant date, but issues with meeting the Tank Farm schedule milestones remain. The high priority risks are identified in the table contained in Figure 3-9

The baseline currently contains mitigation actions for these risks as well as the other risks identified in the analysis. The planned mitigation costs are $1,095K, which is projected to avoid approximately $4,975K in cost.

The probability curve (refer to Figure ***2-6*** on the following page) and supporting tables provide the summary results of the analysis. It is clear additional mitigating actions (acceleration, milestone deferral, etc.) are needed to appropriately address the uncertainty associated with meeting the Tank Farm Contractor milestone date.

Figure 2-6. Probability for End Date Completion for 1st Immobilized Low Activity Waste Product.



Milestone Date (991)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
6/01/09	6/02/09	-1	12/02/08	181

Milestone Date (536)	Schedule No Mitigating Actions	Schedule Float	Schedule With Mitigating Actions	Schedule Float
09/30/08	6/02/09	-244	12/02/08	-62

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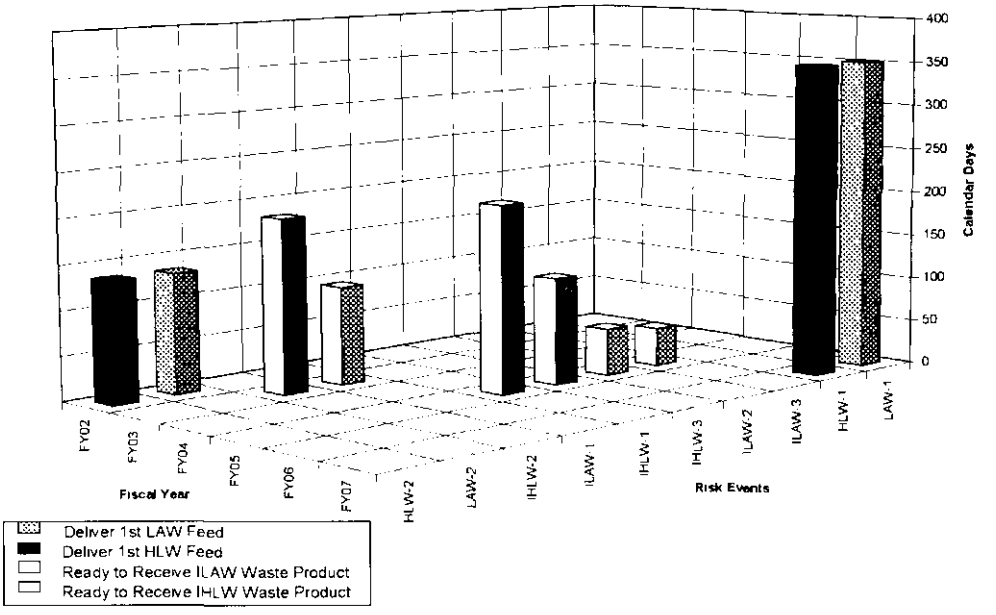
3.0 ASSESSMENT RESULTS

Figure 3-1 portrays the top ten schedule risks identified within the four River Protection Project (RPP) mission critical milestone schedule paths that were analyzed. The figure shows not only the relative risk value of these risks but also when they may occur.

Figure 3-1. Top Ten Schedule Risks (Unmitigated).



Risk Event #	Risk Description
HLW-2	Addition of New Waste to Qualified Tanks Causing Re-Characterization, etc.
LAW-2	Addition of New Waste to Qualified Tanks Causing Re-Characterization, etc.
IHLW-2	Lack of Ecology/WDOE Support for RCRA Part B Completion Schedule
ILAW-1	WDOE Determines Preliminary Design Drawings are Inadequate to Support RCRA Part B Application
IHLW-1	Inadequate Competition for shielded canister transport (SCT) design due to One-of-a-kind Multiple System Acquisition
IHLW-3	Unresolved Organizational and Procedure Interfaces between WTP-CHG and CSB-CHG
ILAW-2	Delays in Procurement of Material & Equipment
ILAW-3	Delayed Construction Due to Impacts of Natural Events on Liner (Sun, Wind, Heat, etc.)
HLW-1	Critical System Drawings Do Not Match RCRA Part B Interim Status
LAW-1	Critical System Drawings Do Not Match RCRA Part B Interim Status

A date was selected from the 80% probability level on the "S" curve and compared to the mission milestone dates. Table 3-1 is a comparison to the Waste Treatment Plant Contractor (WTPC) milestone dates and illustrates the days of float (negative or positive) that unmitigated risk and mitigated risk scenarios would yield. Note that in all cases with mitigated risk, there is positive float between the assessment-calculated dates and the interface need dates.

Table 3-1 Waste Treatment Plant Contractor Interface Dates Versus Analysis Dates

WTPC Interface Milestone (Sequence No., Title, Date	Milestone Date	Schedule No Mitigating Actions	Schedule Float	Schedule with Mitigating Actions	Schedule Float
920 ICD-19B Receive Transfer of 1st LAW Feed Batch	10/30/07	05/08/07	175	12/15/06	319
921: ICD-20B Receive Transfer of 1st HLW Feed Batch.	10/30/07	01/15/08	-77	7/01/07	121
978: ICD-15B Initiate Transfer of 1st ILAW Product.	06/08/08	06/06/08	2	11/27/07	194
991: Initiate Transfer of 1st[1] Immobilized High Level Waste.	06/01/09	06/02/09	-1	12/02/08	181

Table 3-2 is a comparison to the TFC milestone dates and illustrates the days of float (negative or positive) that unmitigated risk and mitigated risk scenarios would yield. Note that in all cases with unmitigated risk, there is negative float between the projected delivery dates and the TFC interface dates, and with mitigated risk issues still remain with the TFC interface dates.

Table 3-2.

TFC Interface Milestone (Sequence No., Title, Date)	Milestone Date	Schedule No Mitigating Actions	Schedule Float	Schedule with Mitigating Actions	Schedule Float
255: ICD-19B, Initiate Transfer of 1st LAW Feed Batch.	11/08/06	05/08/07	-181	12/15/06	-37
248: ICD-20B, Initiate Transfer of 1st HLW Feed Batch.	05/21/07	01/15/08	-239	7/01/07	-41

Table 3-2. Tank Farm Contractor Interface Dates Versus Analysis Dates. (2 sheets)

TFC Interface Milestone (Sequence No., Title, Date)	Milestone Date	Schedule No Mitigating Actions	Schedule Float	Schedule with Mitigating Actions	Schedule Float
19: Available to Receive ILAW	12/3 1/07	06/06/08	-158	11/27/07	3
536: ICD-14B, Receive Transfer of 1st IHLW Product.	09/30/08	06/02/09	-244	12/02/08	-6

3.1 DELIVERY OF INITIAL WASTE FEED TO THE WASTE TREATEMENT PLANT

The TFC schedule logic was developed on the assumption that the tank 241-AP-101 (first LAW delivery) management self-assessment activity would be completed before beginning the similar activity on tank 241-AZ-101 (first HLW delivery). This was done to take advantage of the lessons learned on tank 241-AP-101. As a result, a finish-to-start logic tie was placed between the completion of tank 241-AP-101 management self-assessment and the beginning of the tank 241-AZ-101 management self-assessment. This logic tie causes the activities leading to the management self-assessment on tank 241-AP-101 to become the critical path up to the tank 241-AZ-101 management self-assessment. Therefore, many of the critical path activities for both the LAW and HLW initial feed delivery schedules are common and risks/delays early in the tank 241-AP-101 schedule will impact the tank 241-AZ-101 schedule.

One such delay, in particular, to accommodate inherent budget constraints, consists of a 500-day lag inserted in the tank 241-AP-101 schedule. This has resulted in a shift to the right of both tanks 241-AP-101 and the 241-AZ-101 schedules.

3.1.1 Delivery of 1st Batch of Low-Activity Waste Feed to the Waste Treatment Plant

The endpoint activity selected for the "Delivery of 1st Batch of LAW Feed to W T P risk analysis was the beginning of activity TD15V35B (Xfr Wst: AP101 Feed from AP101 to BNFL, Inc. [sic]), which has a scheduled begin date of November 8, 2006. The scope of activities that lies on the critical (and near critical) paths are those related to the pumping of waste from tank 241-AP-101.

Milestone 225 ("ICD-19B, Initiate Transfer 1st LAW Feed Batch") was selected as the TFC interface milestone. The P3® schedule date for this milestone is November 8, 2006. The

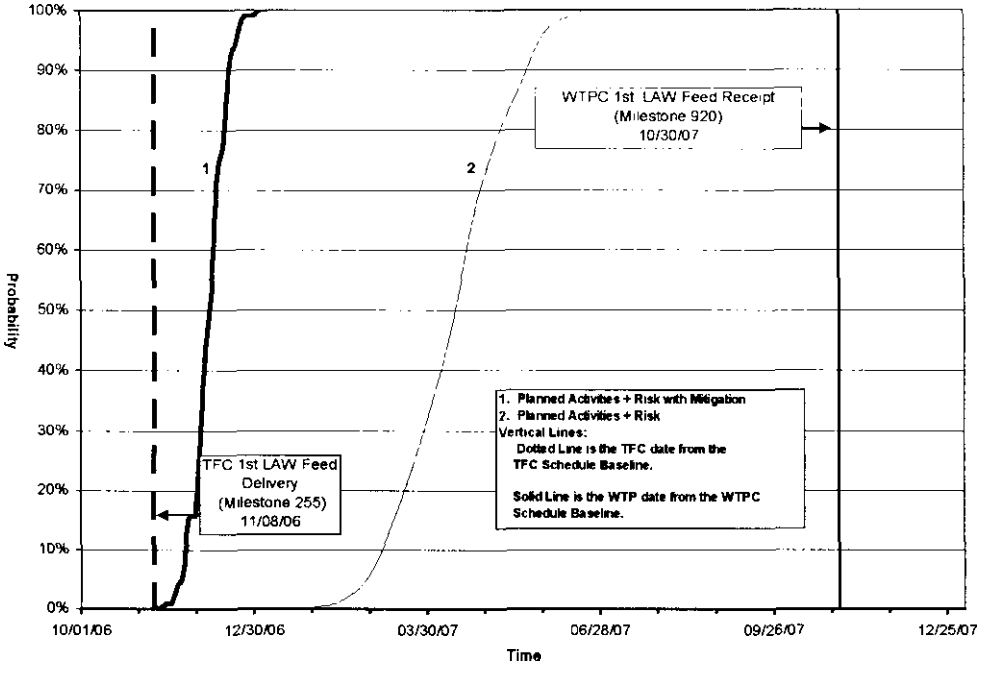
corresponding WTPC interface milestone selected is 920 ("ICD-19B, Receive Transfer 1st LAW Feed Batch"), which has an October 30, 2007 completion date. There are almost 12 months between these two milestones.

It should be noted that the analysis was based upon start of transfer. As a result, any risks that might occur during transfer were not included in the analysis. The transfer is scheduled for eight days. The risks identified during a transfer are line pluggage and pump failure. Line pluggage was not considered likely because of the makeup of the contents of tank 241-AP-101. Pump failure was also considered to be unlikely because the pump will be new, the duration is short, and preventative maintenance activities are planned prior to the transfer.

Figure 3-2 depicts the graphical data that is represented in the following bullets. Results of the risk analysis for the first LAW feed batch delivery indicate the following:

- A high probability exists for the successful transfer of waste to the WTP in time to meet the interface need date.
  - Without risk mitigation, the current first LAW batch delivery profile shows approximately 6 months of positive float to meet the WTP receive waste date.
  - With risk mitigation, the schedule float improves by approximately 5 months to a total of 11 months of positive float.
- Even with risk mitigation, there is a low probability of meeting the TFC first LAW feed delivery date. However, because of the 500-day lag that is currently in the schedule, opportunity exists to significantly improve the TFC's ability to meet this date and should be evaluated for potential optimization.

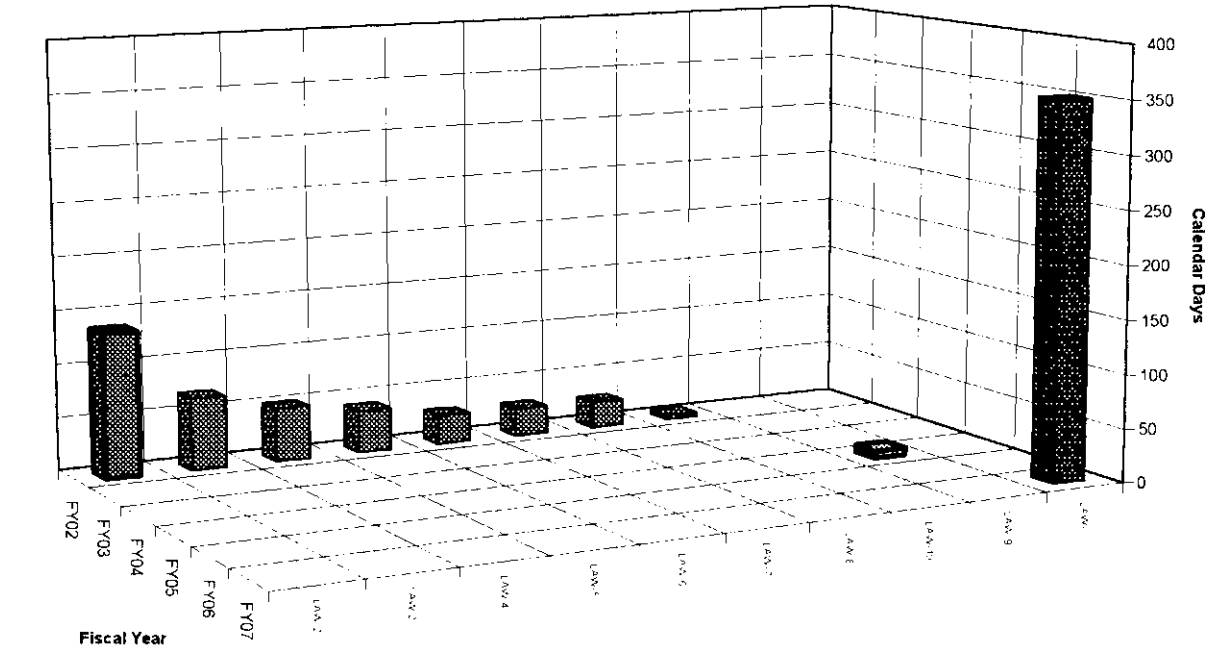
Figure 3-2. Probability of End Date at Completion (Low Activity Waste)



Of the identified top LAW risks (refer to Figure **3-3** on the following page), two appear on the critical path, both of which currently have mitigation planned into the baseline. Only one of these risks (LAW-02) has an appreciable impact on the schedule. This is because of the possible conflict in a need for adding new waste to the 241-AP-101 tank in support of the safe storage mission and the need to provide acceptable waste in support of the "deliver waste" mission. While there is little that can be done to mitigate this risk on the majority of tanks, the project team agreed that the likelihood that this risk would occur on the first tank was mitigated by the increased scrutiny that it is receiving in order to meet the first batch delivery requirement. Because qualification samples have already been taken. this risk could occur anytime and will remain a threat until the waste is transferred in fiscal year 2007.

Figure **3-3,** on the following page, depicts the risks identified in the analysis fiscal year impact. A listing of risks with the associated risk handling actions that have been planned to date is found in Appendix A.

Figure 3-3. Time Phase Schedule Risk Valve Chart (Low-Activity Waste).



Note Risks on the critical path have a bold outline

Risk Event #	Risk Description
LAW-2	Addition of New Waste to Qualified Tanks Causing Re-Characterization, etc.
LAW-3	Master Pump Shutdown Software is Incompatible with Other System Interfaces
LAW-4	DST Farms Electrical System Required Maintenance Not Completed Causing Replacement Actions
LAW-5	Annulus Leak Detection System Maintainability is not Adequate
LAW-6	Unanticipated Cover Block Modifications
LAW-7	Operable Equipment in the AP Tank Farm is not Adequately Maintained, Calibrated, or Functionally Tested
LAW-8	Imposed Unanticipated Infrastructure Construction Requirements for the Caustic Diluent Addition Site
LAW-10	Inadequate Sample Material Available to Obtain Required Dissolution and Dilution Data
LAW-9	Concurrence from DOE on the Assumptions Used in Startup Notification Report is Not Received
LAW-1	Critical System Drawings Do Not Match RCRA Part B Interim Status

3.1.2 Delivery of 1st Batch of High-Level Waste Feed to the Waste Treatment Plant

The endpoint activity selected for the "Delivery of 1st Batch of HLW Feed to WTP' risk analysis was the beginning ofactivity TD16010B (Xfr Wst: 1st Batch AZ-101 to BNFL, Inc. (sic)). which has a scheduled begin date of May 21, 2007. The scope of activities that lie on the critical (and near critical) paths are those through completion of the tank 241-AP-101 management self-assessment and from the tank 241-AZ-101 management self-assessment to the pumping of the tank waste.

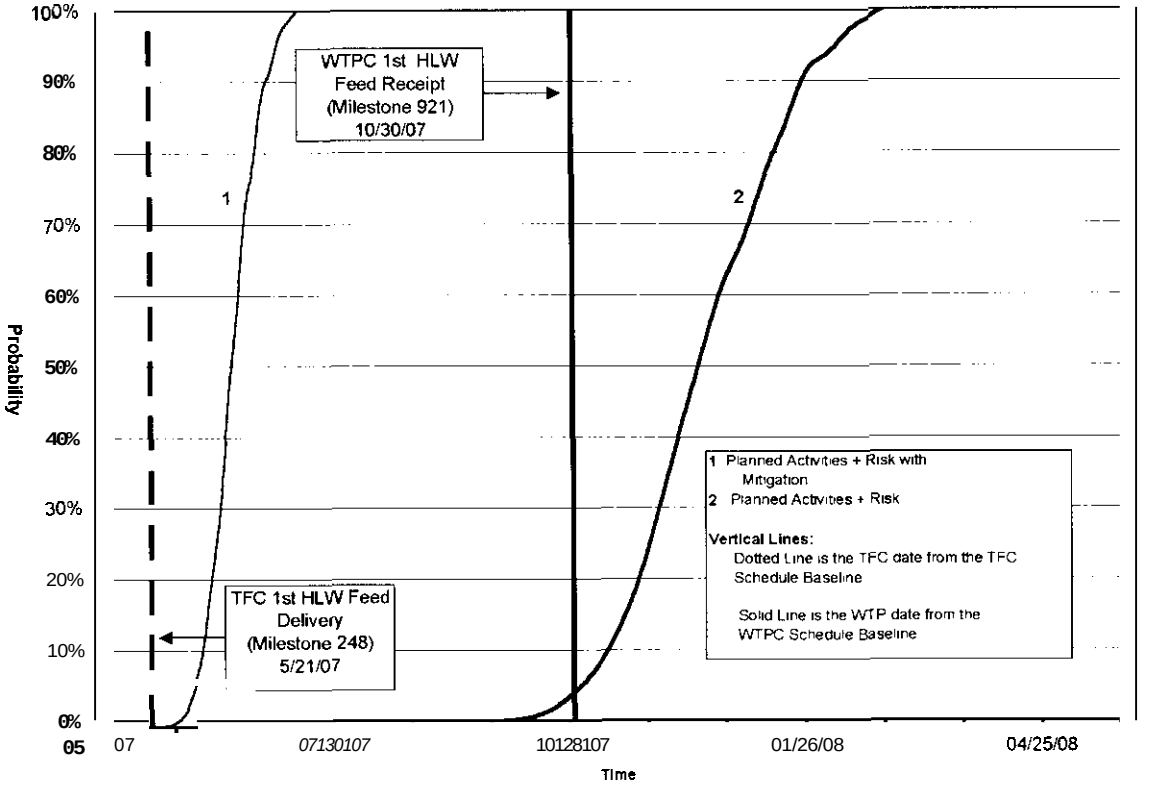
Milestone 248 ("ICD-20B, Initiate Transfer 1st HLW Feed Batch') was selected as the TFC interface milestone. The P3® schedule date for this milestone is May 21, 2007. The corresponding WTPC interface milestone selected is 921 ("ICD-19B, Receive Transfer 1st HLW Feed Batch"), which has an October 30, 2007 completion date. There are approximately 6 months of float between these milestones.

It should be noted that the analysis also was based upon start of transfer. As a result, any risks that might occur during transfer were not included in the analysis. As with the tank 241-AP-I01 analysis, mitigation of these risks have been initiated to minimize risk impact.

Figure 3-4 depicts the graphical data that is represented in the following bullets. Results of the risk analysis for the first HLW feed batch delivery indicate the following:

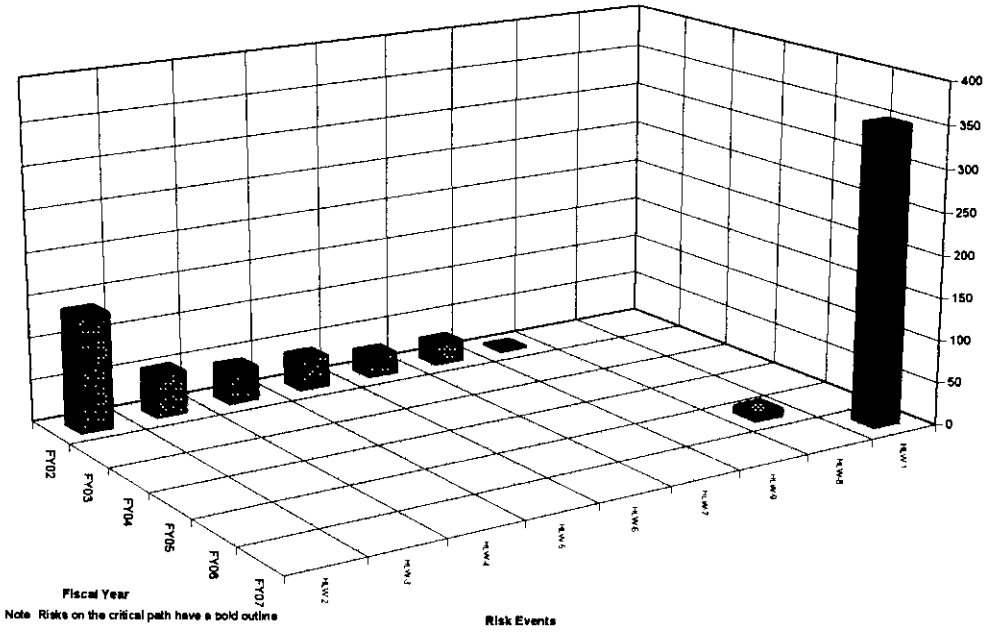
- Without risk mitigation, there is a low probability for meeting the WTP need date for HLW feed batch delivery.
- With risk mitigation, there is a high probability for meeting the WTP need date for HLW feed batch delivery with approximately 3 months of positive float.
- Even with risk mitigation, there is a low probability for meeting the TFC first HLW feed delivery. At 80% probability, approximately 41 days of negative float would be in the schedule.
- As with the LAW feed delivery, a 500-day lag that is currently in the schedule presents a prime opportunity to significantly improve the TFC's ability to meet this date.
- Another potential opportunity for optimizing the ability to meet the TFC first HLW feed delivery date is to evaluate the potential to separate the schedule logic link between tanks 241-AP-101 and 241-AZ-101 management self-assessments. This may result in improvements for this date while not impacting the TFC first LAW feed delivery date.

Figure 3-4. Probability of End Date at Completion (High-Level Waste).



Of the identified top HLW risks (refer to Figure 3-5 on the following page), two appear on the critical path, both of which currently have mitigation activities planned into the baseline. These risks are similar to those identified in the first LAW delivery analysis. The risk that there may be a need to add waste to a tank that has been qualified for transfer has an appreciable impact on the schedule. However, as in the previous analysis, the project team agreed that the likelihood that this risk would occur on the first tank was mitigated by the increased scrutiny that it is receiving in order to meet the first batch delivery requirement. Because qualification samples have been taken, this risk could occur anytime and will remain a threat until the waste is transferred in fiscal year 2008. A listing of risks with the associated risk handling actions that have been planned to date is found in Appendix A.

Figure 3-5. Time Phased Schedule **Risk** Value Chart (High-Level Waste)



Risk Event #	Risk Description
HLW-2	Addition of New Waste to Qualified Tanks Causing Re-Characterization, etc.
HLW-3	DST Farms Electrical System Required Maintenance Not Completed Causing Replacement Actions
HLW-4	Annulus Leak Detection System Maintainability is not Adequate
HLW-5	Functionality of Tank Farm Components and Subsystems for System Readiness Activities is not Verified
HLW-6	Operable Equipment in the AZ Tank Tarm is not Adequately Maintained, Calibrated, or Functionally Tested
HLW-7	Imposed Unanticipated Construction Requirements for Existing Equipment and Infrastructure in Support of the Caustic Diluent Additon System
HLW-9	Operations Planning during Waste Transfers does not Provide for Internal Transfers from Small Secondary Tanks
HLW-8	Concurrence from DOE on the Assumptions Used in Startup Notification Report is Not Received
HLW-1	Critical System Drawings Do Not Match RCRA Part B Interim Status

3.2 READINESS TO RECEIVE IMMOBILIZED WASTE PRODUCTS

The mission critical reporting milestone paths for the receipt of immobilized waste products are comprised of line item project activities (Project W-520, ***Immobilized Low Activity Waste Disposal Facility,*** for ILAW and Project W-464 ***Immobilized High Level Waste Interim Storage Facility,*** for IHLW). Though the contract period does not extend through "readiness to receive waste product," the analysis included the activities through these milestones.

3.2.1 Readiness to Receive 1st Immobilized Low-Activity Waste Shipment from the Waste Treatment Plant

The endpoint activity selected for the "Readiness to Receive 1st Batch of LAW from WTP risk analysis was end of activity TL47075A0A ("M-90-10: CD-4 Initial Hot Operations W-520"), which has a scheduled completion date of December 31, 2007. The scope of activities that lie on the critical (and near critical) path are those related to the Project W-520 activities, from Disposal Facility Data Package Creation and Transportation Criteria to the disposal site being "Available to Receive ILAW."

Milestone 19 ("Available to Receive ILAW) was selected as the TFC interface milestone. The P3® schedule date for this milestone is also December 31, 2007. The corresponding WTPC interface milestone selected is 978 ("ICD-15B Initiate Transfer of 1st ILAW Product"), which has a June 8, 2008 completion date. There is approximately **5** months between these milestones.

Figure 3-6 depicts the graphical data that is represented in the following bullets. Results of the risk analysis for the readiness to receive the first ILAW product indicate the following:

- Without risk mitigation, there is a high probability (~80%) for meeting the WTP need date for receiving the first ILAW product with 2 days of positive float.
- With risk mitigation, there is a high probability for meeting the WTP need date for receiving the first ILAW product, including 194 days of positive float.
- Without risk mitigation, there is a low (<5%) probability **for** meeting the TFC readiness to receive first ILAW shipment date. At 80% probability, approximately 158 days of negative float would be in the schedule.
- With risk mitigation, there is a high probability (>95%) of meeting the TFC readiness to receive first ILAW shipment date.

All of the identified ILAW risks are on the critical path. These risks, unmitigated, have an impact on the schedule. As seen in Figure 3-6, risk mitigation activities substantially reduces the negative impact to the schedule.

Figure 3-6. Probability of End Date at Completion (Immobilized Low Activity Waste)

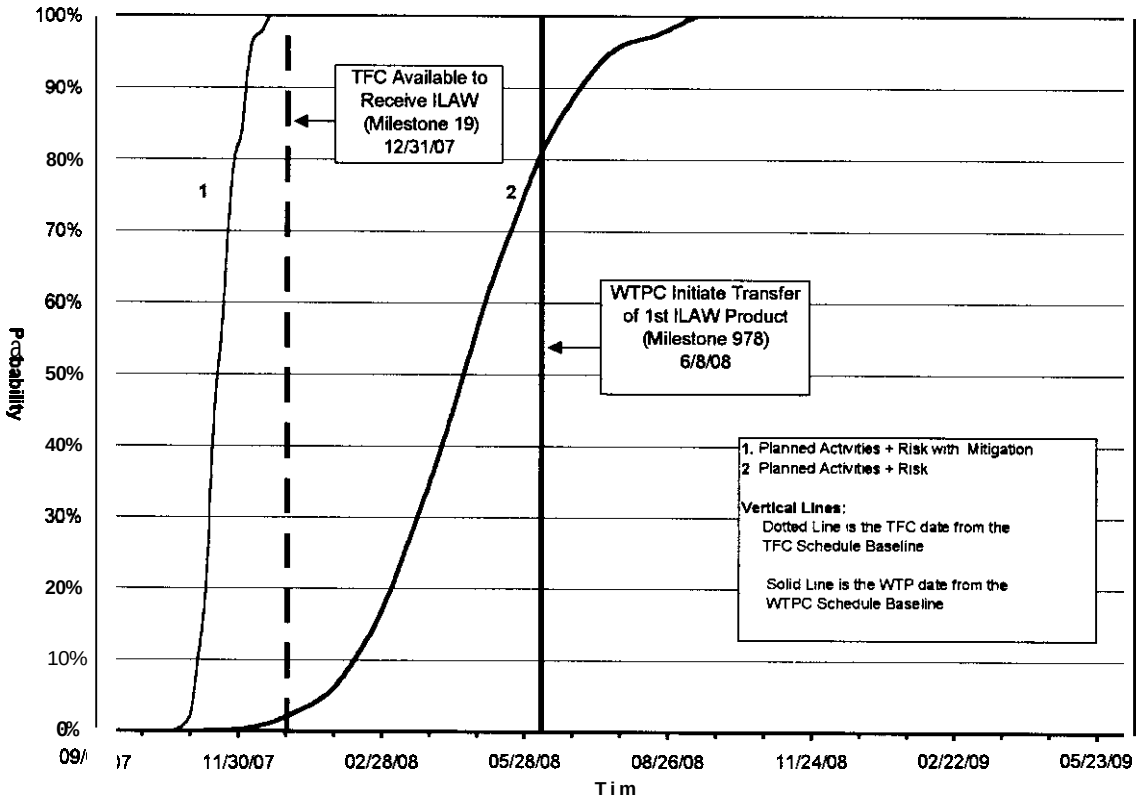
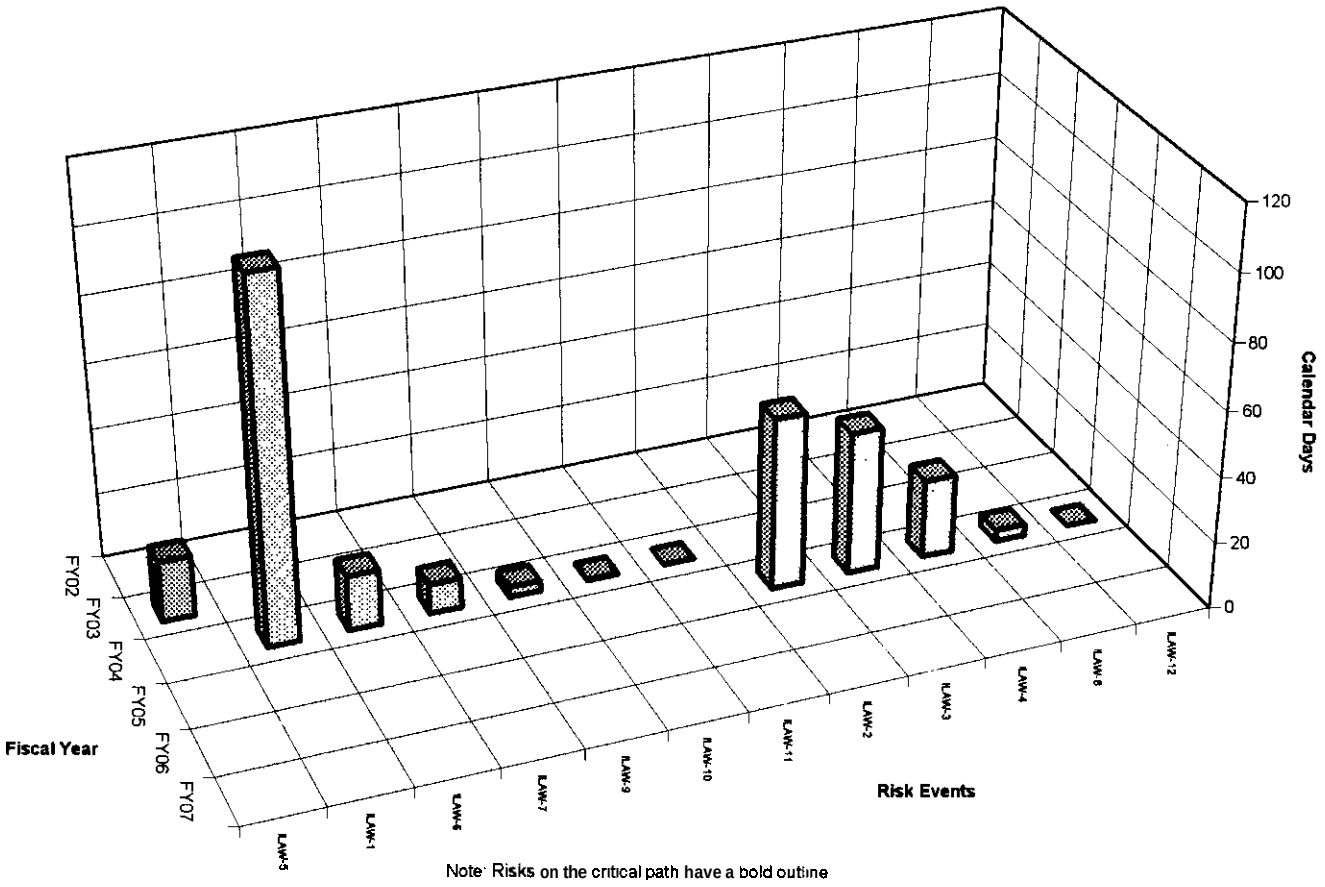


Figure 3-7 (on the following page) depicts the risks identified in the analysis by fiscal year impact. A listing of risks with the associated risk handling actions that have been planned to date is found in Appendix A.

Figure 3-7. Time-Phased Schedule Risk Value Chart. (Immobilized Low Activity Waste)



Risk Event #	Risk Description
ILAW-5	Excessive AB Comments from the Review Process
ILAW-1	WDOE Determines Preliminary Design Drawings are Inadequate to Support RCRA Part B Application
ILAW-6	Imposed Unanticipated Requirement for Vadose Zone Monitoring System
ILAW-7	Anticipated Cost Allowance for Minimum Trench Construction Competition is Exceeded
ILAW-9	Unanticipated Requirement for Additional Monitoring Wells
ILAW-10	Software Development takes Longer than Anticipated
ILAW-11	Additional Crane Operator Shielding is Required
ILAW-2	Delays in Procurement of Material & Equipment
ILAW-3	Delayed Construction Due to Impacts of Natural Events on Liner (Sun, Wind, Heat, etc.)
ILAW-4	Higher than Anticipated Site Contamination Levels or the Presence of Buried Equipment or Artifacts
ILAW-8	Oil Price Increases Pose Unanticipated Increase in Cost for Materials Manufanuring
ILAW-12	Unanticipated Requirement for 200 East Tank Farm Electrical Upgrades to Satisfy Project Needs

3.2.2 Readiness to Receive 1st Immobilized High-Level Waste Shipment from the Waste Treatment Plant

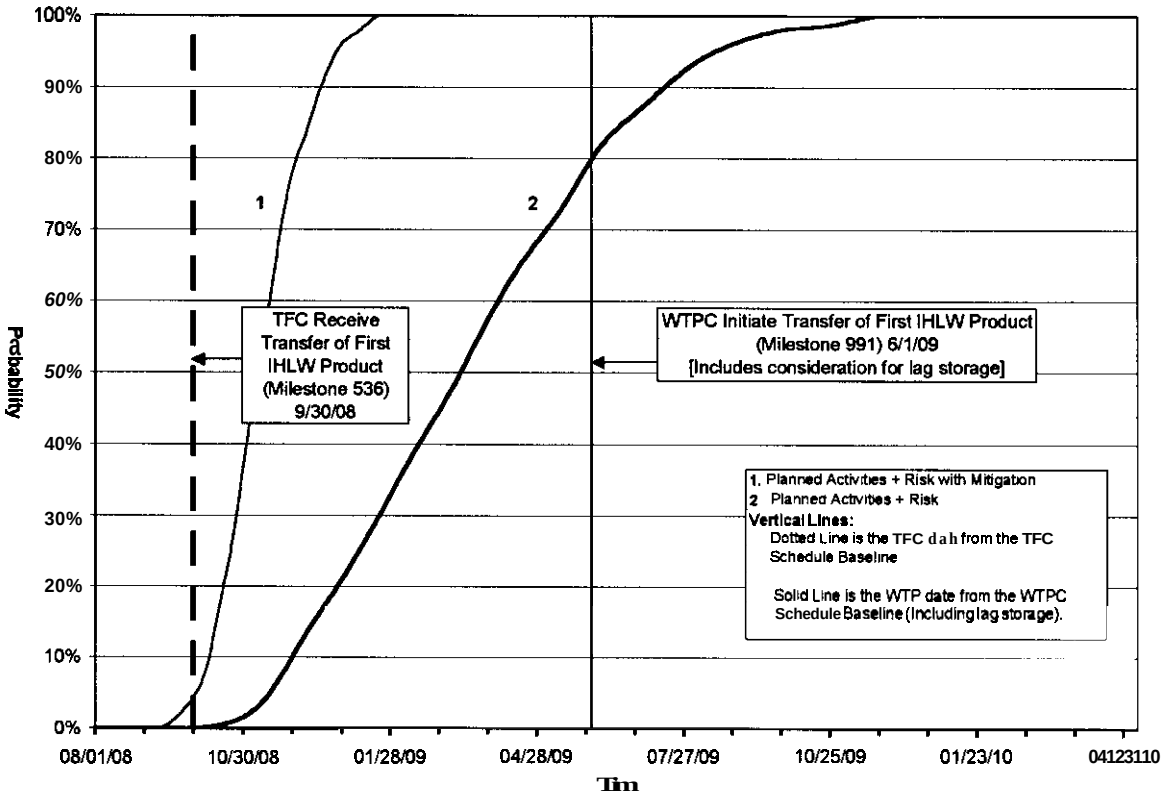
The endpoint activity selected for the "Readiness to Receive 1st Batch of IHLW from W T P risk analysis was end of activity TH45025A5A (M-90-11: Comp W-464 Construction (including Startup)), which has a scheduled completion date of September 30,2008. The scope of activities that lie on the critical (and near critical) path are those related to the Project W-464 activities, from Preliminary Design to Completion of Construction and Startup.

Milestone 536 ("ICD-14B, Receive Transfer 1st IHLW Product") was selected as the TFC interface milestone. The P3® schedule date for this milestone is September 30, 2008. The corresponding WTPC interface milestone selected is 991 ("ICD 14B Initiate Transfer of 1st IHLW Product" [24590-WTP-ICD-MG-01-0 14, ***Interface Control Documentfor Immobilized High-Level Waste]),*** which has a June 1, 2009 completion date. There is approximately 8 months between these milestones.

Figure 3-8 depicts the graphical data that is represented in the following bullets. Results of the risk analysis for the readiness to receive the first IHLW product indicate the following:

- Without risk mitigation, there is a high probability (–80%) for meeting the WTP need date for receiving the first IHLW product with 1 day of negative float.
- With risk mitigation, there is a high probability for meeting the WTP need date for receiving the first IHLW product, including 181 days of positive float.
- Without risk mitigation, there is a low (<5%) probability for meeting the TFC readiness to receive first IHLW shipment date. At 80% probability, approximately 244 days of negative float would be in the schedule.
- With risk mitigation, there still is a low probability (<5%) of meeting the TFC readiness to receive first IHLW shipment date. At 80% probability, approximately 62 days of negative float would be in the schedule.
  - The schedule of activities for Project W-464 contains fiscal year budgeting constraints that may inhibit such things as the ability to effectively procure items.
  - A special case risk analysis was performed with the fiscal year budget constraints removed. This analysis resulted in an improvement of approximately 5 months of schedule acceleration, and greater assurance of meeting the need dates.

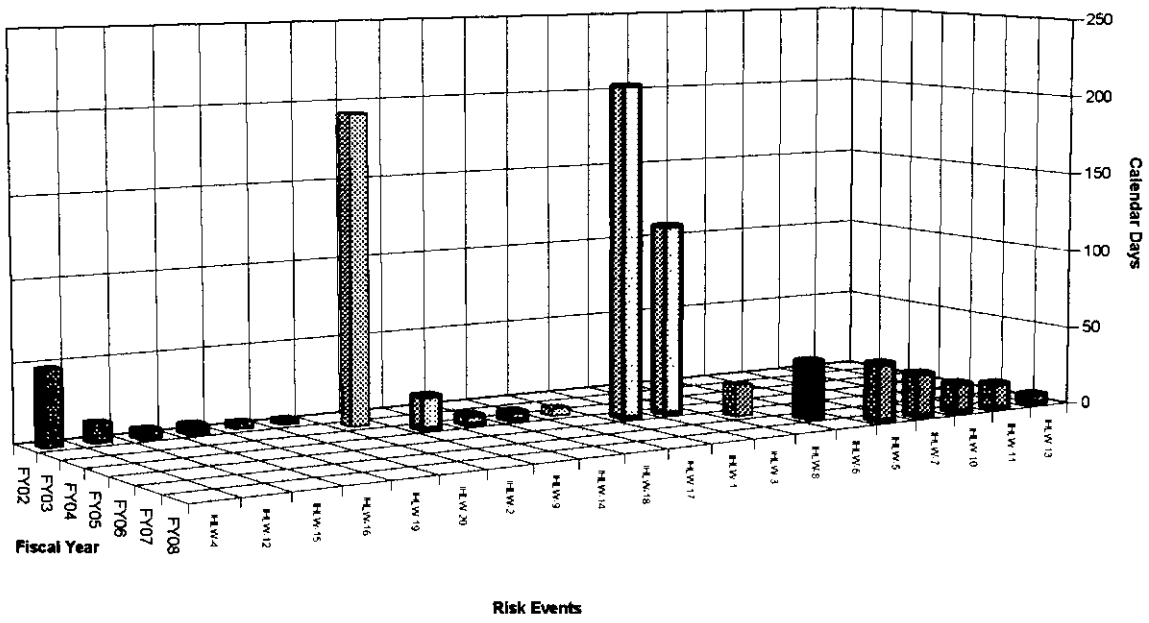
Figure 3-8. Probability of End Date at Completion (Immobilized High-Level Waste)



Three of the identified **IHLW** risks are listed on this report's top ten risks. These risks, unmitigated, have a substantial impact on the schedule. As seen in Figure **3-8** risk mitigation activities greatly improve the negative impact to the schedule.

Figure **3-9,** on the following page, depicts the risks identified in the analysis by fiscal year impact. A listing of risks with the associated risk handling actions that have been planned to date is found in Appendix **A.**

Figure 3-9. Time Phased Schedule Risk Value (Immobilized High-Level Waste).



Note Risks on the critical path have a bold outline

Risk Event #	Risk Description
IHLW-4	Late Discovery that Safety and Authorization Basis Documentation is Incomplete
IHLW-12	Review Comments on the FSAR Documents Cause Major Analysis Rework
IHLW-15	Decision that CSB AB Cannot Be Amended Causing Need for New AB Documentation
IHLW-16	Changes in Site Security Designate Roads as Public Causing Extensive W-464 Plan Revisions
IHLW-19	Emerging Safety Analysis Report Requirements Changed During Definitive Design
IHLW-20	Late Changes to Facility Safety Class Requirements
IHLW-2	Lack of Ecology/WDOE Support for RCRA Part B Completion Schedule
IHLW-9	New Requirements Emerge during Definitive Design
IHLW-14	Canister/Waste Properties and Specifications are Revised Causing Extensive Rework of Calculations
IHLW-18	Unanticipated Security and Access Requirements are Imposed
IHLW-17	The Shielded Canister Transport Design is found to be Incompatible with the CSB Design and Operability
IHLW-1	Inadequate Competition for shielded canister transport (SCT) design due to One-of-a-kind Multiple System Acquisition
IHLW-3	Unresolved Organizational and Procedure Interfaces between WTP-CHG and CSB-CHG
IHLW-8	Authorization for Long-Lead Procurements are Delayed
IHLW-6	Legal Challenges to RCRA Part B Delay Startup
IHLW-5	CSB Ventilation Deviations not Accepted in Timely Fashion
IHLW-7	Readiness to Proceed is Unsatisfactory for ORR.
IHLW-10	CD-4 Approval is Moved from ORP to DOE-HQ
IHLW-11	CSB Operations Staff is Inadequate to Support HLW Storage and Operation
IHLW-13	TSR and Administrative Controls Impose Unanticipated Operating Requirements

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4.0 ASSUMPTIONS

4.1 ASSUMPTIONS AND CONSTRAINTS

The following assumptions were made with regard to the risk analysis. They are provided to give context to the analysis results.

4.1.1 External Influences

External forces can introduce risks that have potentially large impacts on the project (e.g. a shift in regulatory strategy, U.S. Department of Energy (DOE) directed budget changes, etc.). These risks often have a small likelihood of occurrence but usually carry large consequences. However, they are outside the scope and control of the contractor. These risks are identified and passed on *to* the appropriate parties but their likelihood of occurrence and consequences are not considered in this analysis.

4.1.2 Waste Treatment Plant Contractor Interface Milestone Dates

Although the WTPC **is** incentivized to improve the schedule, this report assumes no schedule acceleration and the identified dates are firm. If acceleration of the WTP dates occurs, they will require communication and integration with the TFC.

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5.0 DEFINITIONS

5.1.1 Critical Path

The schedule risk analysis was performed on the critical path and near-critical activities for each of the identified reporting milestones. The critical path was determined by selecting the end activity of concern and identifying activities leading to that end-point, which have less than 60 days of float. Near-critical path activities were identified as those having less than ***6*** months of float. Including these near critical paths is necessary in the analysis to account for risks that occur in these near critical paths, which could cause one of these paths to become the critical path and alter the analysis results.

5.1.2 Crosscutting Risks

Some risks apply to more than one area of the baseline. These risks are known as "crosscutting" risks. When a crosscutting risk is identified, it can often be resolved once by a single handling action rather than by conducting multiple (redundant) actions resulting in increased cost. The impact of a crosscutting risk may vary from one area of work to another. Accordingly, a crosscutting risk may appear in one critical path analysis but not in another.

5.1.3 Monte Carlo Analysis

Risk analysis is performed by identifying a range of consequences for each risk (rather than a single point estimate) and performing a Monte Carlo simulation to produce a range of possible outputs. The Monte Carlo simulation technique provides a credible method of simulating the project cost and schedule when individual distributions are used. The process is based on random sampling of the probability distributions that make up the schedule or cost model. Each probability distribution is sampled in a manner that reproduces the distribution's shape. The distribution of the values calculated for key milestones and total project costs reflect the probability of the values that may occur.

5.1.4 Risk Value

Risk value is the unit of measure in risk analysis. It is a product of the likelihood of occurrence of the risk and the consequence of the risk if it occurs. **For** example, if a risk event were identified to have a ***25%*** probability of occurrence and a consequence (independent of the likelihood) of ***6*** months, the risk value would be determined to be 1.5 months ***(25%*** of ***6*** months).

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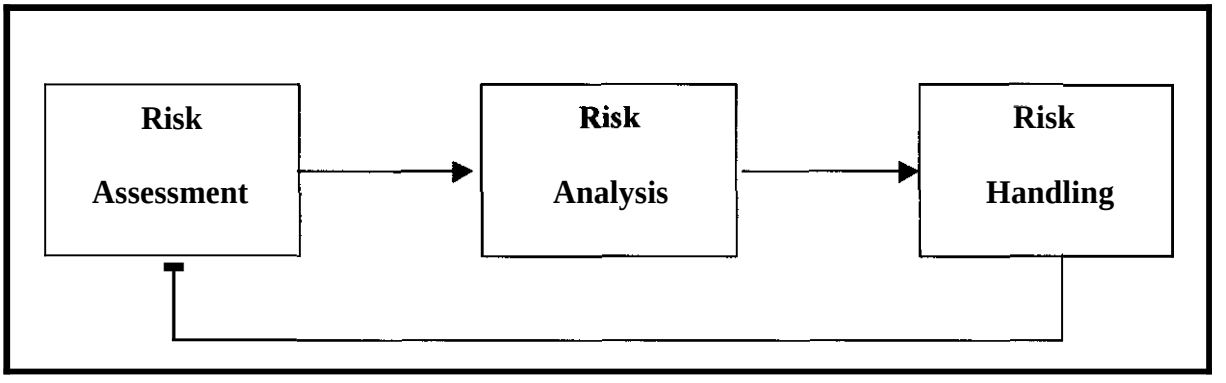
6.0 BACKGROUND

Risk management is one of many tools that can (and should) be used by a project manager to assist in successful management of a project. The risk management process consists of three phases: risk assessment, risk analysis, and risk handling. The process is iterative, with a feedback loop that can be reentered anywhere along the process as shown in Figure 6-1.

Figure 6-1. Risk Management Process.



Risk assessment is used to identify and quantify the uncertainties within a project. Sources of uncertainty are: inadequate scope definition, estimating variability or error, and risk.

Risk analysis consists of performing mathematical and statistical evaluations of the data obtained during the risk assessment and identifying methods for handling identified risks. For ease of discussion, risk analysis is often used to describe both the assessment and the analysis phases.

Risk handling consists of the steps taken to integrate handling actions with key program management documents, such as the work breakdown structure, and to inject proposed tasks into work planning. As part of the program planning, handling action status is periodically monitored until closure is complete. This document reports the results of the risk analysis on the integrated baseline and is therefore limited to a discussion of risk assessment and risk analysis.

One of the key advantages of risk management is the early identification and consideration of possible problems that may occur allowing the manager to take actions *a priori* to reduce or eliminate those problems.

6.1 ROLE OF RISK ANALYSIS

As one of many tools, risk analysis provides data valuable for use in the management of the project and its risks. Because risk analysis data are based upon estimates of future events (which may or may not occur); results are subjective and should be considered in conjunction with other project data and status indicators.

6.1.1 What **Risk** Analysis Can Do

Risk analysis provides information regarding possible areas of weakness **or** limitation in the current project planning. It allows the development of contingency estimates and prioritization of risks based upon the likelihood and consequences of the identified risks. Because consequences are pro-rated based on likelihood, the overall allowance for risk is less than the costs of the identified risks. However, not all risks will occur, thus the scaled risk allowance represents the estimated contingency to cover those risks that do occur. Risk analysis also provides consideration of identified weaknesses in advance of their occurrence, allowing proactive planning of actions or response procedures. It supplies information relating to the cost of liability versus impact of risk to aid in determining which actions to authorize and fund.

6.1.2 What Risk Analysis Cannot Do

As stated above, **risk** analysis relies heavily upon prediction of future events and its objectivity is limited. Accordingly, risk analysis cannot provide information or consideration of risks that may occur, but have not been identified (a.k.a. "unknown unknowns").

Risk analysis is performed using statistical assessment methods. Individual risk allocations, scaled by the likelihood of occurrence are combined with scaled allocations of other risks to generate a composite risk allowance. Although an allocation is made for each risk, the analysis cannot predict which risks will occur. Because the risk allowance is a statistical composite, if some risks no longer remain viable, the allocation derived from them cannot be released as "unused."

6.2 DESCRIPTION **OF** RISK DATA

This section provides a short description of the data used and developed during the risk analysis Separate detailed data are on file and maintained in the CHG Planning and Integration Risk Management Office. Data referred to or used in this report are noted.

6.2.1 Input Data

The following is a description of the different types of input data.

6.2.1.1 Baseline Information

Schedule mappings of the critical paths and cost data were derived from the P3® schedules and used as input in the analysis.

6.2.1.2 Uncertainty Data

Uncertainty data is a data matrix that documents uncertainty rankings in scope definition, technology challenges, and interface complexity. These data provide a starting point for the risk analysis that relates these rankings to scope definition, estimating error and risk as discussed in Section ***6.0***.

6.2.2 Tabular Data

The following is a description of the various tabular data

6.2.2.1 Work Scope Variability

A data matrix, by work breakdown structure, identifying the planned budget and schedule with estimating variability calculations using historic DOE variability ranges. These are inputs for the analysis.

6.2.2.2 Decision, Assumption, and Risk Crosswalk

A table arranged to indicate the relationships between a top-level decision to assumptions to risks. This is for risk management purposes and does not affect the analysis calculations.

6.2.2.3 Risk Data Matrices

A set of risk event items that identify and quantify each risk event (unmitigated), each risk event's handling action and costs, and each risk event with mitigation.

6.2.3 Graphical Results

The following is a description of the various types of graphical results

6.2.3.1 Schedule-Cost Risk Value Distribution

A graphical representation of schedule risk values plotted side-by-side with the budget risk values of each risk event. The risk values are calculated before handling action(s). This graphic is an output of the risk analysis.

6.2.3.2 Schedule Risk Value Distribution

A graphical representation of unmitigated schedule risk value plotted beside the mitigated schedule risk value (i.e., assuming handling actions are successful) for each risk event. This graphic shows the risk events in order of decreasing risk value. (There is a similar graphic for cost risk value.)

6.2.3.3 Probability *of* End Date at Completion

This graphic is also known as the Cumulative Risk Distribution and as the "S" curve graph (referring to the shape of the curve(s) on the graph). Because this is an output of the risk analysis and this graphic is found in this report, a more detailed description is given.

The S-curves are graphical representations of possible outcomes in terms of probability versus time for schedule risk. The curves have the "S" shape of a cumulative distribution. The S-curve provides a plot of the milestone completion date cumulative probability curve. The reader should interpret the "S" curve in the following manner: "Given successful completion of the project, at 80% probability (for example) the end date will be xx/xx/xx or earlier."

For this risk analysis there are two "S" curves and two vertical lines on each graph. The first curve (labeled **"1"** on the graph) represents the schedule variability for the planned activities plus mitigated risk. Curve two (labeled **"2"** on the graph), represents the planned activities including unmitigated risks. The difference between curves 1 and **2** represents the reduction in risk impact assuming successful completion of handling action activities. (There is a similar graphic for cost that is not in this report.) The two vertical lines, one solid, the other dashed, represent the WTP and TFC interface milestones, respectively.

6.2.3.4 Time-Phased Schedule Risk Value Chart

This graphic is a three dimensional bar chart. It is found in this report. It depicts the identified risk event (unmitigated) along one axis, time (when the risks may first occur) along another axis, and magnitude of risk value along the vertical axis. This chart provides the reader with an understanding of which unmitigated risk events are of greatest concern and when their impact may be felt. This allows resources to be directed on near term issues as well as on developing long-term plans for "big-hitters." This graphic is produced for each of the four mission critical areas and also to show a composite of the top ten risks from the four mission critical areas. The reader will notice that the risk events have been sorted by fiscal year and in descending order by risk value.

7.0 METHODOLOGY AND APPROACH

The risk analysis is based upon identification and evaluation of project uncertainty (scope definition, estimating error or variability, and risks). To understand the uncertainty, the following methodology is used to gather the risk data and applied in the following manner:

- Identification of scope and evaluation of variability of estimates within the scope baseline.
- Identification and assessment of sources of additional cost/schedule impacts because of risk.
- Planning actions to handle risks.

7.1 SCOPE VALIDATION AND ESTIMATE VARIABILITY EVALUATION

During scope validation, the project scope is identified, as are the project boundaries and interfaces to provide a common understanding of the project objective and the activities that are planned to accomplish that objective.

The team then evaluates and documents the uncertainties associated with scope, technology, and interfaces. They examine the cost/schedule estimating information and the risk analyst uses the examined information to prepare an activity variability matrix. The data in this matrix quantifies the portion of uncertainty because of variability in the cost or schedule estimate (separate from uncertainty because of risk).

7.2 RISK IDENTIFICATION AND ASSESSMENT

The team reviews existing risk data from previous risk analyses to determine whether the identified information is still applicable and to close out superceded items.

At the beginning of the analysis, the team sets a risk threshold which provides an "initial" filter for determining if a risk warrants further study. Risks that initially fall below this line are set aside and excluded from the analysis.

Risks above the established risk threshold receive an evaluation by the team to determine the likelihood of occurrence and the consequences of the risk, should it occur (independent of likelihood).

7.2.1.1 Risk Handling Action Planning

The objective in handling action planning is to decide how each risk is handled. Mitigation actions identify the approach necessary to perform the mitigation. Based upon initial results, the team selects the risks with the greatest potential effect on the project, develops risk handling

action plans, and estimates the cost/schedule impacts of the proposed actions. This information is then used as backup to appropriate cost, schedule, and scope change documentation.

Based on the assumption that the handling action plan is successful, the team re-evaluates the risk likelihood and consequences of each "mitigated or residual risk. With this data, and the original risk data, the risk analyst generates "return-on-investment" type data to help determine whether or not each handling action plan is cost effective. At the end of this exercise, the risk analyst completes the analysis and prepares the final report.

8.0 IMPACTS FROM OTHER RISKS

A process of monitoring and responding to critical risks has been instituted in the RPP. **A** Critical Risk Management List is maintained within the Office of River Protection Risk Management office. Tables 8-1 and 8-2 illustrate the criteria used for determining the likelihood and consequence values of each identified risk for the TFC and the RPP, respectively. Risks with a "high" or "very high" risk value as identified in Table 8-3 are communicated to the Office of River Protection on a monthly basis. These risks are evaluated to identify if external (outside contractor) assistance is required in the management of these risks or if they are appropriately placed as risks internal to the contractor.

Table 8-1. Tank Farm Contractor Internal Critical Risk Value Criteria

Unmitigated Likelihood (L)		Unmitigated Consequences (C)		
Category	Range (%)	Category	cost ($ Millions)	Schedule Impact (Months)
Very Likely	L ≥ 75	Very High	C ≥ 5.0	C ≥ 12
Likely	50 ≤ L < 75	High	1.0 ≤ C < 5.0	6 ≤ C < 12
Marginal	25 ≤ L < 50	Medium	0.5 ≤ C < 1.0	3 ≤ C < 6
nlikely	5 ≤ L < 25	ery Low	0.25 ≤ C < 0.5	2 I C < 3
ery Unlikely	L < 5	ery Low	C < 0.25	C < 2

Table 8-2. River Protection Project Critical Risk Value Criteria

Unmitigated Likelihood (L)		Unmitigated Consequences (C)		
Category	Range (%)	Category	cost ($ Millions)	Schedule Impact (Months)
VERY LIKELY	L ≥ 75	**VERYHIGH**	C ≥ 200	C ≥ 12
Likely	50 I L < 75	High	50 ≤ C < 200	6 ≤ C < 12
Marginal	25 ≤ L < 50	Medium	20 ≤ C < 50	3 ≤ C < 6
Unlikely	5 ≤ L < 25	ow	10 ≤ C < 20	2 ≤ C < 3
Very Unlikely	L < 5	Very Low	C < 10	C < 2

Table 8-3. Common Critical Risk Value Grid

Unmitigated Likelihood (L)	Unmitigated Consequences (C)				
	Very Low	Low	Medium	High	Very High
Very Likely	Medium	High	High	Very High	Very High
Likely	Low	Medium	High	High	Very High
Marginal	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Very Unlikely	Very Low	Low	Low	Low	Medium

Some critical risks may indirectly impact the progress of work described in this document. For example, if a critical risk occurred, the mitigation action or control response may impose work restrictions in other work areas. Appendices B and C show the risks currently identified as critical by the TFC and WTPC. Future enhancements have been identified to maintain the status of critical risks on the Hanford Site web page for easier reference.

9.0 PLANNED FUTURE RISK MANAGEMENT ACTIVITIES

As indicated in Table 9-1, 20 risk assessments were completed in fiscal year 2001 at the request of project managers. Using this as an indicator, one can see that the risk management process has moved forward considerably since the last integrated baseline risk assessment completed August 4, 2000.

Table 9-1. Fiscal Year 2001 Risk Assessment Log

	Title or Project	Time Frame
1	Project W-464	September 01
2	AP Tank Farm	January-01
3	AY/AZ Tank Farm	January-01
4	AP Tank Farm (updated)	April-01
5	AY/AZ Tank Farm (updated)	April-01
6	AN Tank Farm Risk Assessments	May-01
7	AW Tank Farm Risk Assessments	May-01
8	SY Tank Farm	May-01
9	Project W523, Single Shell Tank Waste Retrieval Systems	April-01
10	S-112, Saltcake Resolution Project	August-01
11	Project W-211/W-521 Initial Tank Retrieval Systems	July-01
12	SST Interim Stabilization	November-01
13	Project W-520 Waste Feed Delivery Systems	September-01
14	Project W-314 Tank Farm Restoration and Safe Operations	December-01
15	Transfer LAW to WTP Contractor – tank 241-AP-101	September-01
16	Transfer HLW to WTP Contractor – tank 241-AZ-101	September-01
17	Accept IHLW product	September-01
18	Accept ILAW product	September-01
19	PBI 1.0, 1-A Risk Analysis	March-01
20	BCR RPP-116 Qualitative Risk	June-01

As the schedule from the WTPC matures and is utilized by the ICD teams, risk assessments will be applied at the interface points to indicate the probability of success at these important junctures. The greater detail in the schedules will also allow greater rigor to be instilled in the integrated baseline risk assessment that will be performed again in one year.

Because most of the projects have employed a risk assessment, closer monitoring of the mitigation actions will be conducted and follow-on assessments will be performed where major scope changes have occurred or the project has matured and greater detail is available to conduct more accurate risk analyses.

From a programmatic view, risk analyses will be conducted formally on larger baseline changes and qualitatively on smaller changes. Risk data will also be reviewed and aligned with technical issues and assumptions within a web-based database and risks will be identified within the six major work breakdown structure categories of store, retrieve, treat, dispose, close and manage. Risk handling action tasks will also be identified by a P3® identification number to facilitate tracking and monitoring of risk mitigation work.

10.0 REFERENCES

DE-AC27-99RL 14047, 2001, *CH2M HILL Hanford Group, Inc. Contract,* U.S. Department of Energy, Office of River Protection, Richland, Washington.

24590-WTP-ICD-MG-01-014 Rev. A, 2001, ***Interface Control Document for Immobilized High-Level Waste,*** CH2M HILL Hanford Group, Inc., Richland, Washington.

24590-WTP-ICD-MG-01-015, Rev A, 2001, ***Interface Control Document for Immobilized Low-Activity Waste,*** CH2M HILL Hanford Group, Inc., Richland, Washington.

24590-WTP-ICD-MG-01-019, Rev A, 2001, ***Interface Control Document for Low-Acfivity Waste Feed,*** CH2M HILL Hanford Group, Inc., Richland, Washington.

24590-WTP-ICD-MG-01-020, Rev A, 2001, ***Interface Control Document for High-Level Waste Feed,*** CH2M HILL Hanford Group, Inc., Richland, Washington.

Resource Conservation and Recovery Act of 1976, as amended.

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RISKS AND PLANNED HANDLING ACTIONS

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
LAW-1	If critical system drawings and/or installed equipment (performed under RCRA Part B Interim Status) are rejected because of Final Status, then the corrections will cause major cost and schedule impacts.	1. Restart unit mgr's meetings 2. Identify submit critical system drawings 3. Perform gap analysis between existing Part B and regulations 4. Prepare RCRA reqs. procedure 5. Seek IQRPE certification 6. Revise permit application
LAW-2	If waste is added to qualified tanks, then requalification may be required resulting in major impacts to budget and schedule.	1. Monitor and control tank waste additions.
LAW-3	If interfaces to the MPS installed by other projects are not compatible, then software compatibility issues will result.	1. Control Project PICD. 2. Hold MPS integration meetings, increase communications with Project W211 & W521.
LAW-4	If required maintenance for the DST Farms electrical systems are not implemented, then replacement may be required resulting in cost increases and schedule delays.	1. Modify PM for Electrical System. 2. Remove loads from System. 3. Procure additional equipment.
LAW-5	If the annulus leak detection system maintainability is not adequate, then replacement of the leak detection system will be required resulting in cost increases and schedule delays.	1. Perform modifications prior to beginning of transfer.
LAW-6	If cover block modifications are required, then project costs will increase. (This will become a problem if the 60hp pump is to be used, because it is un-scoped work.)	1. Monitor design process.
LAW-7	If the operable equipment in the AP tank farm is not maintained in a calibrated and functionally tested condition, then noncompliance issues or unplanned increases in work scope may occur impacting current budget and schedule.	1. Implement, maintain and upgrade reliability-centered maintenance program through life cycle as feeder tanks (out to '15). DST Program:
LAW-8	If construction of the CDAS requires removal and/or relocation of some established equipment and infrastructure, then design upgrades may be required as locations change causing major impacts to cost and schedule.	1. Perform Tank Farm walkdown 2. Conduct drawing research 3. X.-ray facilities/equipment, as required

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
LAW-9	If Startup Notification Report concurrence on assumptions from DOE are not valid, then a delay in Startup Notification Report approval may impact the readiness review level and start date which can impact project schedule and cost.	1. Turn in SNR and tech description early 2. Already planning to do highest level of readiness
LAW-10	If there is inadequate sample material available to obtain the required dissolution and dilution data (including Compatibility Report), then an additional sample will have to be obtained resulting in increased cost and schedule delays.	1. No way to mitigate this risk. If data is not accepted then a re-sampling will occur via a BCR.
HLW-1	If critical system drawings and/or installed equipment (performed under RCRA Part B Interim Status) are rejected because of Final Status, then the corrections will cause major cost and schedule impacts.	1. Restart unit mgr's meetings 2. Identify submit critical system drawings 3. Perform gap analysis between existing Part B and regulations 4. Prepare RCRA reqs. procedure 5. Seek IQRPE certification 6. Revise permit application
HLW-2	If waste is added to qualified tanks, then requalification may be required resulting in major impacts to budget and schedule.	1. Calculate combined waste compositions. 2. Mix waste to ensure compliance with waste feed envelope.
HLW-3	If required maintenance for the DST Farms electrical systems are not implemented, then replacement may be required resulting in cost increases and schedule delays.	1. Modify PM for Electrical System. 2. Remove loads from System. 3. Procure additional equipment.
HLW-4	If the annulus leak detection system maintainability is not adequate, then replacement of the leak detection system will be required resulting in cost increases and schedule delays.	1. Perform modifications prior to beginning of transfer.
HLW-5	If the functionality of tank farm components and subsystems required for system readiness activities is not verified, then events may occur that are within acceptable guidance rendering transfer paths out-of-service and causing impacts to budget and schedule.	1. Perform MSA

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
HLW-6	If the operable equipment in the AZ tank farm is not maintained in a calibrated and functionally tested condition, then noncompliance issues or unplanned increases in work scope may occur impacting current budget and schedule.	1. Implement, maintain and upgrade reliability-centered maintenance program through life cycle as feeder tanks (out to '15).
HLW-7	If construction of the CDAS requires removal and/or relocation of some established equipment and infrastructure because all existing infrastructure has not been identified, then design upgrades may be required as locations change causing major impacts to cost and schedule.	1. Perform Tank Farm walkdown 2. Conduct drawing research 3. X-ray facilities/equipment, as required
HLW-8	If Startup Notification Report concurrence on assumptions from DOE are not valid, then a delay in Startup Notification Report approval may impact the readiness review level and start date which can impact project schedule and cost.	1. Turn in SNR and tech description early 2. Already planning to do highest level of readiness
HLW-9	If operations planning during waste transfers does not provide for internal transfers from small secondary tanks, such as the 151-AZ catch tank which supports 702-AZ operation, then successive waste transfers to WTP may be delayed causing major impacts to budget and schedule.	1. Transfer to Project W-525
ILAW-1	If WDOE determines Preliminary Design drawings are inadequate to support Part B application, delaying construction start and extending project management time, then more communication w/ WDOE would increase cost and schedule.	1. The critical drawings will be determined early and presented to WDOE.
ILAW-2	If there are procurement delays, then extensions in schedule may impact total project cost and schedule.	1. Identify long lead items. 2. Interface with vendors to determine duration of procurement cycles.
ILAW-3	If natural events delay the installation of the liner, then major impacts to project costs and schedule may occur.	1. Adjust the construction schedule.

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
ILAW-4	If site contamination quantities or buried equipment incidences are higher than expected at the storage facility construction site, then cleanup efforts may increase total project cost and schedule.	1. Execute pre-operational monitoring plan.
ILAW-5	If the AB review processes produces a large number of comments to be incorporated, then project cost and schedule may increase.	1. Allow additional time for review process. 2. Gather dedicated review team. 3. Control review process 4. Submit draft documents early.
ILAW-6	If vadose zone monitoring systems are required under the trenches, then project design would change and construction costs and schedule may be impacted.	1. Determine contacts. 2. Determine the requirements for vadose zone monitoring.
ILAW-7	If there is a lack of competition for trench construction, then total project cost and schedule may increase.	Assume the Risk.
ILAW-8	If oil prices increase such that the cost of project materials increases, then total project cost and schedule may increase.	Assume the Risk.
ILAW-9	If additional monitoring wells are required, the additional scope may increase total project cost and schedule.	1. Enlist the state early on in the life of the project to help develop a monitoring plan.
[illegible]	If software development causes a delay to the baseline, then an incomplete disposal operation system and delay in startup may severely impact the overall cost and schedule of the disposal facility.	Assume the Risk.
[illegible]	If additional shielding on the crane is required to protect the operator from radiation exposure, then project cost may be impacted due to increased equipment procurement costs.	Assume the Risk.
ILAW-12	If it is determined that the electrical systems in the 200 east area need upgraded to satisfy project needs, then the cost of new wiring and electrical equipment may negatively affect overall project cost.	1. Investigate current conditions around the construction site

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
IHLW-1	If the SCT acquisition does not have a competitive nature (since the design, development, and construction of the SCT requires the use of multiple systems, and is a one-of-a-kind), then the project will have increased cost and possible schedule delays.	1. Perform a market survey. 2. Plan to use Sav. River design as much as possible. 3. Select appropriate Contract process. 4. Place full-time engineer to oversee. 5. Perform a full factory acceptance test. 6. Hire vendor support. 7. Perform acceptance inspection.
IHLW-2	If the work for the RCRA Part B schedule is not supported by Ecology/DOE, then there will be delays to Start/Up and Construction Activities.	1. Assist ORP/Ecology with privatization on Part B Permits. 2. Request Ecology to grant interim status.
IHLW-3	If Procedures and Operations Interfaces are not resolved within the given schedule, then delays may occur in the Project.	1. Document decision requirements resolution schedule in the WTP and CSB ICDs, makes notification of issue well in advance.
IHLW-4	If the Safety Documentation/Authorization Basis is incomplete and the inadequacy is not discovered until the final stages of the safety documentation development, then the safety documentation will not support activities or operations required to provide interim storage of IHLW.	Assume the risk.
IHLW-5	If W464 cannot startup w/o clearing the deviations of the Ventilation System at CSB, then W464 will be unable to get approval for using CSB vaults 2&3 causing an increase in budget and schedule.	Assume the risk.
IHLW-6	If the RCRA Part B is not approved and is legally challenged, then there will be delays to the W-464 Schedule.	Assume the risk.
IHLW-7	If the DOE identifies that readiness to proceed (based on the quality, complexity, and severity of pre-start items) has not been satisfied for the ORR, then schedule delays will ensue causing additional recertification.	Assume the risk.
IHLW-8	If authorization for long-lead procurements is delayed, then cost and schedule impacts will result.	Assume the risk.

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
IHLW-9	If additional requirements result from design review after design starts, then cost and schedule impacts may result.	Assume the risk.
IHLW-10	If the CD-4 approval Authority is moved back to DOE-HQ level, then the schedule will be delayed.	Assume the risk.
IHLW-11	If the CSB operations staff are unable to support the IHLW storage operation, then testing and training may be delayed.	Assume the risk.
IHLW-12	If comments on the FSAR safety documents provided by reviewers impact the accident analyses, safety margin, equipment classification, or characteristics, then major re-work of the safety analysis may occur resulting in schedule delays.	Assume the risk.
IHLW-13	If TSRs and Administrative Controls impose operating requirements that result in modifications to equipment or procedures, then cost and schedule impacts will result.	Assume the risk.
IHLW-14	If the properties of canister or waste are revised (i.e., canister characteristics, lifting flange configuration, heat load, source terms, etc...), then calculations and design may change resulting in cost and schedule impacts.	Assume the risk.
IHLW-15	If the CSB AB cannot be amended and a stand-alone AB must be created, then a separate AB must be developed and implemented resulting in cost and schedule impacts.	Assume the risk.
IHLW-16	If Site Security strategy changes and makes transport roads public, then changes to the W-464 plan will result.	Assume the risk.
IHLW-17	If SCT concept/design is determined to be incompatible with the CSB design (deck design, fire hazards, operability), then a different method must be used, resulting in schedule delays and cost impacts.	Assume the risk.
IHLW-18	If security and access requirements impact the productivity levels of the contractor, then schedule delays to W-464 could result.	Assume the risk.

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RISKS AND PLANNED HANDLING ACTIONS

Risk ID. No.	Risk Statement	Handling Action Tasks
IHLW-19	If safety evaluation is performed during the detailed design phase requiring changes to previously contracted long-lead procurement, then procurement changes could be necessary resulting in cost and schedule impacts.	Assume the risk.
IHLW-20	If safety-class is changed (enhanced safety required), then modifications to facility design could result.	Assume the risk.
IHLW-21	If new facility or extension to CSB for records is imposed, then cost and schedule will be impacted to accommodate design and construction of the records facility.	1. Determine existing bldg location of storage.
IHLW-22	If a stand-alone SAR needs to be developed, then impacts to budget will result.	1. Update to the existing CSB SAR is a part of the scope of the project, therefore the handling activities for this risk are to update the current CSB SAR.
IHLW-23	If, during the safety analysis, it is determined that all bottom impact absorbers will be initially required and must be procured as part of W-464, the cost will be transferred from Ops to W-464. (Accident = canister drop in non-impact absorbed hole)	1. Perform Study to determine the need for impact absorbers. 2. Identify and implement Administrative Control to mitigate the identified risk.
IHLW-24	Revision of the Hanford Air Operating Permit is required, impacting cost and schedule. If sealed source exemption is granted, then there will need to be a NOC revision.	Assume the risk.
IHLW-25	If the scope is not clearly defined for the NEPA, then additional documentation would need to be developed for the EIS.	Assume the risk.

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
ACTIVE INTERNAL RISKS		
CR-011	If unplanned radiological exposures or releases occur while contaminated equipment is being removed, then installation of retrieval equipment and subsequent feed delivery operations may be delayed.	CONTROL: 1. Use "mock-up" training at the Cold Test Facility to allow practicing the activities in normal and off-normal situations (contract to be placed). 2. Survey existing structures for contamination to support design, construction, and maintenance in accordance with ALARA principles (covered by specific construction project TBRs, TBRs 160.A43 & 160.A99 were used). 3. Prepare and validate procedures early for replacement of equipment under high radiation and off-normal conditions. Prepare the work packages (covered by specific construction project TBRs, TBRs 160.A43 & 160.A99 were used). 4. Ensure LLCE handling equipment is available and maintained when needed. [BCR moved this scope to 2002] 5. Improved EWP, Senior Supervisor Watch added to routines, and application of ISMS principles. [On-going]

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
CR-032	If scheduled workload for the 222S laboratory is such that it exceeds the laboratory's ability to meet TFC's analytical analysis during waste retrieval activities, then the turnaround time and cost of analytical services may increase or services may not be available.	CONTROL: 1. Ensure funding is provided for hiring and training of new staff, sufficient to meet demand (TBR 100.124). [Pending] 2. Evaluate WTPC contract for requirements to utilize 222S and/or WSCF labs (TBR 150.B29). [In discussion] 3. Investigate the possibility of establishing a subcontract with the 222S laboratory. 4. Evaluate use of outside laboratory capability (including possible WTP capability). 5. Investigate options to upgrade the 222S laboratory.
CR-047	If the AZ-101 suspension of particles or suspended particles settle out faster than permissible, then less HLW solids would be delivered than planned which would impact cost and schedule.	CONTROL: 1. Evaluate results of 101-AZ process tests (TBR 110.090) and identify any follow-on actions. Note: The risks associated with tank mixing are being evaluated for appropriate mitigation actions in accordance with RPP-MP-607. A White Paper entitled, "Path Forward for HLW Solid Feed Delivery to WTP" will be completed by 10/01/2001 that will indicate additional recommended follow-on mitigation actions. 2. Evaluate auxiliary mixing options, i.e. Flygt mixers (TBR 150.726). 3. Ensure back-up/contingency wastes are available for feed transfer (TBR 150.B22).

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
CR-064	A. C-104: If the retrieval system fails to cost-effectively retrieve C-104 sludge wastes in support of minimum order quantity during Phase 1, then alternate technologies and/or a backup waste feed source may be required to meet waste feed delivery requirements to the Waste Treatment Plant and other milestones and commitments under the TPA. B. S-102: If the retrieval system fails to cost effectively retrieve S-102 mixed saltcake/sludge wastes, then alternate technologies will have to be identified and demonstrated with resultant impacts on the ability to meet the TPA milestones and commitments. C. S-112: If the retrieval system fails to cost effectively retrieve S-112 saltcake wastes, then alternate technologies will	CONTROL: 1. Evaluate performance of C-106 Sluicing project (TBR 270.610, 290.J61, 270.650). 2a. AGAs to evaluate alternate retrieval technologies, e.g. dry retrieval, limited volume sluicing (TBR 270.610. AGA completed, Decision is required). 2b. Reinstate hard heel retrieval technology demonstration (TBR 280.105). 2c. Demonstrate other retrieval technologies. (TBR 280.305) A. C-104: · Mockup and cold testing of based robotic crawler system. · Incorporate lessons learned from ORNL and include deployment of articulated mast with directed nozzles in conjunction with crawler-based confined sluicing system. · Prepare an alternate CHG generated retrieval system design in parallel with testing of LATA robotic crawler-based confined sluicing system in case the system fails to retrieve sufficient quantity of waste.

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
	have to be identified and demonstrated with resultant impacts on the ability to meet the TPA milestones and commitments.	B. S-102: · Lessons learned from use of the AEAT power fluidics system in support of waste retrieval at ORNL GAAT tanks. · Cold testing of AEAT system at AEAT headquarters in Charlotte, North Carolina during fiscal year 2001 to evaluate effective cleaning radius and other operational aspects. · Parallel demonstration of the Russian pulsating mixing and pumping system at the Russian technology demonstration center as an alternative to the AEAT power fluidics system. C. S-112: · Lessons learned from bench-scale testing of saltcake dissolution processes using similar wastes from other S-Farm tanks. · Initial retrieval system deployment and testing in U-107 in support of ongoing interim stabilization efforts to get an early indication of retrieval system performance. Including demonstration of topographical mapping system to monitor saltcake dissolution progress. · Collection of waste samples from S-112 and laboratory testing to investigate saltcake

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		dissolution process optimization. 3. Prepare second retrieval campaign (TBR 290.J61)
CR-065	In general, if drawings are not maintained and configuration controlled, then risks of the following nature will occur: -- If as-built drawings for underground or non-accessible systems are not correct, then delays in design, construction and turnover phases may occur, when unexpected configurations are encountered. -- If the drawings and documentation are not verified, upgraded, labeled and provided, then rework due to incorrect data may result causing additional costs and delays.	CONTROL: 1. Continue the Operations As-Building Project to develop Operational P&IDs, incorporate ECNs, and perform field verification of plant essential H-2 drawings as defined on the Tank Farm (on-going). Essential Drawing Plan (TBRs 390.Z41, 390.N41, 390.Y41, 390.W41, and 390.P41). (on-going plus additional enhancements identified in the Performance Enhancement Plan). 2. Require projects to plan for and include funding for ECN incorporation and field verification activities for those drawings not covered under the Operations As-Building Project (TBRs 710.730, 330.010, 440.010, and 440.040). Newly revised IP-0842-XIII-1.1, "Construction Management" and IP-0842-XIII-3.5, "Operational Acceptance" now covers this action. Additional initiatives in PEP, Objective 3.3 also enhance this area. 3. Require projects to reconcile project drawings with plant drawings prior to ORR (TBR 160.A43 was used as representative of costs). Newly revised IP-0842-XIII-1.1, "Construction Management", IP-0842-XIII-3.5, "Operational Acceptance", and IP-0842-XIII-3.4, "Integration of Readiness Activities in the

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
	-- If future upgrades and modifications are not planned for the 241-AY and 241-AZ technical baseline documentation and installed hardware, then outdated documentation and information may cause increases to budget and schedule.	Project Life Cycle" now covers this action. PEP Item 3.3.1.9 also addresses this item. 4. Provider for verification of drawings as a part of work planning packages. New Systems Engineer process enhances this strategy as well as PEP Objective 3.3 and 3.4.
CR-066	In general, if concurrent construction activities over-use available resources, then risks of the following nature will occur: A. If concurrent construction of TFC and WTC Projects over constrains available resources, then there will be cost and schedule delays. B. If Tank Farm support is not available as needed to support field work tasks, and then the completion date of this task will be impacted.	CONTROL: 1. Develop an Integrated Staffing Plan identified need in crafts, engineers, operators, and health physics technicians. (Hickerson) 2. Install various methods of recruiting to be performed. [Advertise on the Internet, Attend Job Fairs, Implement a rotational engineer program, Utilize personnel from other Site contractors, Integrate field work planning such as integrated project schedule, Hire appropriate staff, and Identify existing resources within TFC.] (Hickerson) 3. Enhance integrated resource planning and estimating process that will provide HP/I P the

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Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		tools to forecast needs. (Williamson)
	C. If construction activities for the tank farms and for the projects are not compared and coordinated, concurrent construction activities may interfere resulting in major cost and schedule impacts.	4. Enhanced coordinated work planning and scheduling that integrates all tank farm work activities. [Being developed]
	D. If there is an inadequate supply of manpower to support capital projects, such as W-314, then these projects and any concurrent projects will be delayed and cost and schedule impacts may occur.	
CR-070	In general, if DST tank space and tank integrity become an issue, then risks of the following nature will occur:	CONTROL:
		1. Provide feedback from Tank Farm walkdown/surveys to support validation of Technical Baseline requirements (TBRs 120.A03, 120.A15, 120.A07, 120.A11, 120.A15, 120.A23 in FY01).
	-- If a DST fails, then there may be reduced tank space availability and replanning of tank sequencing, resulting in additional costs and schedule delays.	2. Conduct and complete RAM analysis (TBR 120.025).
		3. Perform DST Caustic Addition per ORP-19 (includes restoration of annulus ventilation flow to

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TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
	-- If the requirements for DST space are significantly greater than currently forecast, then sufficient tank volume may not be available to stage waste in support of WTC process requirements or maintain committed reserve/emergency capacity. -- If excessive corrosion of tank walls reduces the expected life of the tanks and/or place the tanks out-of-service, then alternative transfer schedules and technologies may have to be developed resulting in major impacts to retrieval cost and schedule.	AY-101, replacement of AN-107 corrosion probe, Ultra Sonic Testing Crawler procurement, development of DST chemistry surveillance program, & verification sampling of AY-101, AY-102, AN-102, and AN-107). 4. Develop & fund a comprehensive maintenance & spare parts program (TBR 130.B05 and 130.B10). 5. Implement Reliability Centered Maintenance, perform condition assessment evaluations for AW, AP, AY, and SY tank farms, Update MEL, and provide O&M Strategy, etc per ORP-09 6. Perform DST Integrity Assessment Reports (project plan, integrity testing, and reporting) per ORP-10. 7. Convened panel of technical experts which verified direction and recommended strategy expansion. 8. Annulus videos of all 28 tanks by end of 2002.

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TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		9. UT on DSTs.
CR-083	If design pressure necessary to maintain particle suspension during waste transfer exceeds current design and installed transfer system capability, then an alternative transfer system may be required resulting in cost and schedule increase.	CONTROL: 1. Perform a study to resolve the design pressure issue. 2. Make a decision based on findings of the study. 3. If decision results in changes to the transfer system, then input those into the design efforts. 4. Procured/Installed 1,000 psi pipe.
CR-084	If an SST has significant leakage during storage, then overall TFC baseline strategy may have to be reconsidered (including possible tank sequencing adjustments).	CONTROL: 1. Strategize on potential responses to tank leak scenarios. 2. Continue to interim stabilize tanks. 3. Do not add to SST (followed since 1980).
EVOLVING INTERFACE ISSUES TO BE CONSIDERED FOR RISK		
EI-01	If CHG's sampling program continues as is, there is the potential for expending resources and accepting risk for activities that may not be necessary.	**Control:**

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TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
	Alternatively, if CHG sampling activities are postponed until a clear definition of requirements is known there is the risk of losing sampling expertise, program momentum and schedule slippage.	**1. Complete HT/SC study. [WTP action]** **2. List schedule tank samples consistent with the Baseline. [WTP action]**
EI-02	If the final waste transfer system configuration is not adopted, then the design, procurement and construction activities will proceed with the risk of future change.	All parties have met and are working specific actions to clarify the design parameters. BCR RPP-01-116 is being evaluated for potentially splitting out non-interface actions from interface items so cost reductions may be applied to the baseline without impact to interfacing elements. The Interface Change Form (ICF) indicating technical acceptance of proposal identified in BCR-RPP-116 has been approved by WTP, TFC, and ORP. This risk will not show on subsequent risk lists.
EI-03	If the amount of water and the quality of water supplied to the WTP is inadequate then additional cost and schedule will be needed to upgrade infrastructure.	Control: 1. Request regulatory waiver with the state has been requested to allow intersecting waste transfer lines to operate when water is being delivered. 2. Conduct detailed briefings with water purveyor on the engineered measures of installed system. 3. PHMC to calculate peak and normal water rates for raw and potable water. 4. BNI to calculate worst case and normal water rate usage. 5. CHG estimate water budget based on BNI calculations.

B-10

APPENDIX

TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
EI-04	If the electrical needs for the WTP are higher than initially estimated, the costs will have to be added to the baseline and would further impact CHG's ability to complete super-stretch work.	Assume: 1. WTP completes an update of electrical usage profile. 2. Depending on #1 answer, a BCR will have to be generated to update baseline. 3. Depending on #1 answer, an optimization study may be requested to reduce electrical needs.
OTHER EVOLVING RISKS		
E-03	If long lead equipment (e.g., PUREX connectors and wrenches) is not available to support construction, then completion of construction and startup may be delayed.	Verify the validity of this risk item to see if it really exists and to what extent. This risk was identified during the recently completed DST/WFD Project Risk Assessment. The risk will be further evaluated and a risk mitigation plan may be developed in accordance with RPP-MP-607.
E-08	If the cross-site transfer from SY-101 does not occur then there will not be sufficient tank space to receive S-112 waste to facilitate the technology demonstration project for salt cake dissolution.	1. A VE study was conducted and identified a potential 2-year acceleration and potential cost savings of $18.6M. As a result, this risk will be re-evaluated after project is re-baselined. 2. Complete a Risk Analysis to quantify the magnitude of this risk (083001). Note: The Risk

B-11

APPENDIX B

TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		Analysis was completed and the Risk Value was LOW. Therefore, removed from Critical Risk but retained as project risk to monitor.
E-09	If commencement of field activities with existing procured and installed equipment is not permitted in a timely fashion with ORP approval of the SER, then major cost and schedule impacts may occur.	Handling Actions: CHG to work with DOE-ORP prior to, and during the development of Authorization Basis Amendments to ensure that there are no surprises once an AB Amendment is submitted. Note: This will require collaboration between CHG and ORP to avoid.
E-10	If regulators do not accept the expected performance of the S-112 saltcake dissolution technology (i.e. retrieval of the water soluble contents), then the project will have to employ an alternative technology severely impacting the budget and schedule of the S-112 saltcake dissolution retrieval project.	Control: 1. Negotiate acceptance criteria with regulators. 2. Develop a plan to apply power fluidics based on S-102 efforts. 1. Complete U-107 demonstration. 2. Perform core sampling and dissolution studies. 3. Trade study to look at more pumping potential.

B-12

APPENDIX B

TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		4. Waste properties modeling and fluid dynamics (PNNL). 5. Pump qualification and testing.
E-11	If the SSC's, which define S-112 WRS scope and are provided by interfacing projects (I.e., W-211, W-314, Interim Stabilization), are not available to support the S-112 WRS operational need dates, then there will be adverse cost and schedule impacts to S-112 WRS.	Assume
E-12	If the existing retrieval technology is unable to retrieve a portion of the waste based on waste form, tank conditions, and/or requirements at a rate acceptable to DOE, then the S-112 saltcake dissolution project would have to deploy additional saltwell pumps causing an increase in cost and schedule.	Control: 1. U-107 demonstration completion. 2. Perform core sampling and dissolution studies. 3. Trade study to look at more pumping potential. 4. Waste properties modeling and fluid dynamics (PNNL). 5. Pump qualification and testing.
E-13	If the proposed method for measuring toxic releases to the environment from tank S-112 is unacceptable to the regulatory organizations, then a new LDMM technology would need to be developed severely	Control: 1. Negotiate with regulators to exclude "x-tank technologies" from this project.

B-13

APPENDIX B

TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
	impacting the budget and schedule of the S-112 saltcake dissolution retrieval project.	
E-14	If critical system drawings and/or installed equipment (performed under RCRA Interim Status) are rejected for Final Status permitting, then the corrections and modifications will cause major cost and schedule impacts.	Control: 1. Restart unit managers meetings 2. Identify and/or develop, and submit critical system drawings. 3. Perform gap analysis between existing Part B and regulations 4. Prepare RCRA reqs. And procedure 5. Update Part B, as needed, and work w/ Ecology to permit the DST System.
E-15	If interfaces to the MPS installed by other projects are not compatible, then software compatibility issues will result.	Control: 1. Control project Piping, Instrument, and Control Diagrams. 2. Hold MPS integration meetings, increase communications with projects W-211 and W-521.
E-16	If waste is added to qualified tanks, then requalification may be required resulting in major impacts to budget and schedule	Control: 1. Monitor and control tank waste additions

APPENDIX B

TANK FARM CONTRACTOR CRITICAL RISK LIST

Note: References to TBR numbers will be changed to WBS or baseline activity numbers by November 30, 2001.

Contractor Risk ID No	Risk Statement	Mitigation Strategy/ Approach
		2. Perform Waste Compatibility Assessments. 3. Mix waste to ensure compliance with waste feed envelope.
E-17	If removal of the failed transfer pump in Tank AW-101 is required before operation of the mixer pump, then there will be schedule delay and cost increases.	Control: 1. Perform engineering evaluation to determine if there is an impact from running the mixer pump.

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APPENDIX C

WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

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APPENDIX C

WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
BNI-BOF-04	Event: Emerging project needs generate additional requirements for BOF (such as chemical preparation needs, offloading facilities, etc.) Risk: Continued R&T and design effort identifies requirements for BOF		CONTROL: Project team will identify requirements early
BNI-HLW-01	Event: Feed diverter valve failure (redundant but not maintainable), Risk: If both fail, have throughput issue (reduction in capacity)		CONTROL: Changing the design to provide access to valves for replacement or accept production rate reduction by elimination of the diverter valve and accepting dilution
BNI-HLW-02	Event: Pulse jet agitator/fluidic nozzle plugging (dark cell), lack of representative samples, Risk: Inability to mix, sample, & transfer slurries; does not suspend SBS solids		CONTROL: Conduct R&T (including pilot sample), hire BNFL / AEA as consultant, trade studies to evaluate (e.g.: alternative sampling systems, provide redundancy)
BNI-HLW-09	Event: Parallel preparation of safety analysis, R&T, permitting, and design, Risk: Significant design impacts to meet emerging requirements		CONTROL: ISMS cycles, R&T prioritization, SAR prioritization, regulator involvement and buy -in
BNI-HLW-12	Event: Loss of pressure control in melter , Risk: Contamination of melter cell and crane		CONTROL: Develop pilot melter pressure control schemes and ensure design has robust pressure control capabilities
BNI-HLW-21	Event: Lack of redundancy throughout HLW Risk: Single failures / outage for maint. will impact throughput.		CONTROL: Design for maintainability in selected locations
BNI-HLW-30	Event: Interfaces between Duratek and project not well defined such as Startup of melter (i.e.- FRIT addition, heater removal, etc.) ,Vibration during melter handling (< 0.01G current requirement) Risk: Missing scope, redesigns, Delays in startup,		CONTROL: Develop a detailed melter start-up, handling, and operating instructions

APPENDIX C

WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
	Damage to new melter. etc.		
BNI-HLW-31	Event: first-of-a-kind power supply for the specific melter. Risk: Premature melter failure		CONTROL: Ensure facility power consumptions requirement are not driving to an unproven design. Design a prototype as needed to demonstrate proof of principle.
BNI-HLW-33	Event: Pilot is 1/3 scale (melter and off-gas systems) Risk: Scale up gives unexpected results		CONTROL: Run comprehensive scale tests. Design margins in melter and melter support equipment to allow for turn-up and turn-down.
BNI-HLW-48	Event: Melter fails with a greater amount of glass than WDOE approves of, Risk: No method for disposition		CONTROL: Develop strategy with WDOE for disposition of failed equipment. Design temporary holding location into the facility.
BNI-HLW-51	Event: Number of SC and SS systems is greater than expected, Risk: Increased effort of procurement, receipt, inspection, and installation		CONTROL: Ensure ES&H participates in design development early in the project
BNI-ICD-01	Event: RAW water supply and quality is inadequate for facility needs (200 vs. 875 gpm), Risk: Limit production, cooling tower makeup and blowdown (tied to water quality issues) contractual number vs. ability to supply 875gpm, Check pretreat risk data		CONTROL: Design will continue to develop the design until the actual uses of raw water are known. Ensure sufficient supply is available (management function)
BNI-LAW-01	Event: Large number of glass formers, Risk: Mishandle (e.g. put chemical in the wrong hopper) formers in glass former handling area and wrong feed to the melter		CONTROL: Sample the blended glass formers in the blend tank

APPENDIX C

WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
BNI-LAW-04	Event: Number of SC and SS systems is greater than expected, Risk: Increased effort of procurement, receipt, inspection, and installation		CONTROL: Ensure ES&H participates in design development early in the project
BNI-LAW-10	Event: Melter pressure control may be inadequate, Risk: Loss of confinement and pressurization		CONTROL: Develop pilot melter pressure control schemes and ensure design has ropbust pressure control capabilities
BNI-LAW-11	Event: Melter development and scale up results are not compatible with commissioning requirements, Risk: Will not meet contract requirements		CONTROL: Run comprehensive scale tests. Design margins in melter and melter support equipment to allow for turn-up and turn-down.
BNI-LAW-12	Event: Melter fails with more than acceptable levels of glass. Risk: Presently no agreement with WDOE for disposal		CONTROL: Develop strategy with WDOE for disposition of failed equipment. Design temporary holding location into the facility
BNI-LAW-16	Event: Increased sulfate concentration in feed, Halides and sulfate buildup to unacceptable levels in melter feed, Sulfate analytical method accuracy is not sufficient, Unable to develop reliable phase separated sulfate detection system, Risk: Reduced melter life		CONTROL: Modify the design, including operations, to blend the feed. Perform additional R&T testing and feed characterization, flow sheet and engineering analysis and continued glass development to understand effect of sulfate, verification and validation, evaluate opportunities to purge sulfate from the system.
BNI-LAW-17	Event: Frequent bubbler failure (Design has1/2 bubbler every month change out), Risk: Bubbler is changed out		CONTROL: Continue R&T testing. Develop alternative designs that reduce change out or make change out much quicker with fewer impacts (ALARA, radwaste, etc.)
BNI-LAW-22	Event: Common off gas system serving all three melters creates coupled melter pressure control and vessel vent systems. Risk: Instability, loss of processing time, melter pressurization, impact air permits, increased operational cost.		CONTROL: Evaluate decoupling of the off gas systems

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WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
BNI-LAW-30	Event: Cooling rate for ILAW package is overestimated (room cools to the atmosphere). Package does not cool at the calculated rate, Cesium offgassing from hot canisters during changeout within 12 hours, Risk: Lag storage requirements in product storage line will be insufficient.		CONTROL: Evaluate design to determine storage requirements, R&T to verify cooling rates through testing. Check the calculations
BNI-LAW-31	Event: IR Level Detection System does not work (since it is very hot). , Risk: Level cannot be determined and the container can be overfilled or underfilled.		CONTROL: Continue R&T on detectors
BNI-LAW-39	Event: Failure of agitator in feed tanks and tank contents settle to a compact mass, Risk: Difficult to restart agitator or remove agitator. Increased downtime		CONTROL: Design system to prevent solids from settling
BNI-LAW-60	Event: Parallel preparation of safety analysis, R&T, permitting, and design, Risk: Significant design impacts to meet emerging requirements		CONTROL: ISMS cycles, R&T prioritization, SAR prioritization, regulator involvement and buy -in
BNI-PT-03	Event: No analysis method for entrained solids (those which accompany a LAW transfer) in feed stream before entering the plant, Risk: criticality event		CONTROL: Develop a method for characterization of incoming stream. Tank farm operator and WTP operator will agree criticality safety for each batch transfer
BNI-PT-13	Event: Component fails and cannot be repaired. The components are: Evapr Recirc pump, Evapr Reboiler, Evapr Condenser, Evapr Deentrainment pad, ion exchange valve(failure due to life cycle operation), Filter cartridge units can not be maintained. , Risk: Operations stop.		CONTROL: Select a design basis based on a RAM analysis Complete such redesign as indicated by the study outcomes.

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WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
BNI-PT-25	Event: Design Input is insufficient in resin performance, Resin heat transfer characteristics/delta T from core out differ from that used in the design., Risk: Resin performance is unacceptable and affects plant sizing.		CONTROL: Undertake an R&T program to acquire resin performance data and demonstrate throughput potential.
BNI-PT-48	Event: Ultrafilters are used to treat the waste stream, Risk: Filters fail due to 1) undersize 2) breakthrough 3) plugging		CONTROL: R&T will investigate filter performance and develop filter enhancement techniques. Develop changes to the design.
BNI-PT-60	Event: Leaks go undetected beyond WAC-173-303 requirements, and current leak detection design will not work. , Risk: Potential spread of contamination and exposure to personnel, and W Dept of Ecology will not give permit		CONTROL: Redesign leak detection system to meet requirements
BNI-PT-61	Event: A flasking cask drops, Risk Release of contamination in C-2 operating area (general operating area with one external boundary to the front of the building)		CONTROL: Design to evaluate flask drop path and reduce potential impact to equipment in path
BNI-PT-62	Event: High solids recirc pump has a poor layout and the pump may not perform, Risk: Unable to recirc and transfer material		CONTROL: Redesign the layout and provide a flushing capability
BNI-PT-64	Event: Vessel ventilation HEPA will accumulate radioactivity higher than contact-handling permits, Risk: Unacceptable personnel exposure		CONTROL: Alternative analysis has identified a preferred design approach
BNI-PT-65	Event: C-2 ventilation is unfiltered and gets exposed to radioactivity, Risk: release of radioactivity to the outside; system is not permitted by WDOE		CONTROL: Determine requirements with WDOE and redesign as needed

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WASTE TREATMENT PLANT CONTRACTOR CRITICAL RISK LIST

Contractor Risk ID No	Risk Statement	Risk Value	Mitigation Strategy/ Approach
BNI-PT-67	Event: Large components require maintenance and need to be removed, Risk: No material handling /maintenance provisions exist for large components		CONTROL: Develop design and implement to accommodate replacement of large components
BNI-PT-71	Event: Number of SC and SS systems is greater than expected, Risk: Increased effort of procurement, receipt, inspection, and installation		CONTROL: Ensure ES&H participates in design development early in the project
BNI-PT-73	Event: Parallel preparation of safety analysis, R&T, permitting, and design, Risk: Significant design impacts to meet emerging requirements		CONTROL: ISMS cycles, R&T prioritization, SAR prioritization, regulator involvement and buy -in