

# **SECTION 7 POST-CLOSURE AND INSTITUTIONAL CONTROL**

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## 7.0 POST-CLOSURE AND INSTITUTIONAL CONTROL

The Post-Closure and Institutional Control Plan outline the activities that will occur after closure of the Waste Control Specialists LLC (WCS) LLRW Disposal Facility. Activities conducted during construction, operations, and closure of the facility are designed to ensure that post-closure activities will be kept at a minimum and the ongoing need for active maintenance will not be required. The previous sections (Section 3.0, "Design," Section 4.0, "Construction," Section 5.0, "Operation," and Section 6.0, "Closure") of the License Application (LA) provide the background and data to support this goal. The finished site will have no physical evidence of the previous disposal operations except for the required security fencing, monument markers, and other deterrent markers. The final grading of the Site will promote drainage away from the disposal units while creating final contours that will keep erosion on the Site at a minimum.

The post-closure activities of monitoring will include observations and minor maintenance and repair to ensure the cover's integrity is maintained without failure or compromise as a result of settlement until the license is transferred to the appropriate custodial agencies. Leak detection monitoring will continue on a limited basis in the FWF to ensure that the disposal units are functioning as designed and met the performance objectives. Leachate monitoring and vadose zone monitoring for both the CWF and the FWF will also continue on a limited basis.

Corrective actions are identified and addressed should unlikely, unplanned events that pose a risk to public health and safety occur after decommissioning and closure of the facilities. Corrective measures are planned if migration of radionuclides and chemical constituents indicate that the performance objective may not be met.

### 7.1 Post-Closure

#### 7.1.1 *Maintenance and Repair Plan*

**The applicant shall provide a plan to observe, monitor, and carry out necessary maintenance and repairs at the disposal site until the site closure is complete and the license is transferred by the commission in accordance with 30 TAC §336.721 (relating to Transfer of License to Custodial Agency). [30 TAC §336.720(a)]**

Once the Compact Waste Facility (CWF) and Federal Waste Facility (FWF) are closed according to provisions of the final approved Closure Plan, WCS will carry out necessary monitoring, maintenance, and repairs. WCS will observe and monitor the closed facilities per the Post-Closure Plan (Appendix 7.1.1) to demonstrate that each is performing as required and that reasonable assurance exists that the performance objectives will continue to be met.

The disposal facilities are designed so that active maintenance will not be necessary following closure, as required by 30 TAC 336.727. Active maintenance would involve significant remedial activity to maintain a reasonable assurance that the performance objectives stated in 30 TAC 336.723 will continue to be met. Active maintenance also includes ongoing activities such as the pumping and treatment of water from a disposal unit or one-time measures such as replacement of a disposal unit cover.

The post-closure care period provides a means of ensuring the continued safe and effective function of the disposal facilities following facility closure. WCS will perform passive maintenance activities during the Post-Closure Period. Such activities include surveillance (observation of the disposal site to detect the need for maintenance, evidence of intrusion, and evidence of compliance with all license conditions and regulatory requirements) and post-closure care (repair of fencing, repair or replacement of monitoring equipment, minor additions to soil cover, minor repair of disposal unit covers, and general disposal site upkeep). Some of these activities will also be performed during facility closure as discussed in Section 6.0.

One item of possible concern is the potential for erosion on the finished surface and around the disposal unit. The potential for erosion has been evaluated and is described in Section 2.5.7.1 of the LA. It has been determined that the Site has been either stable or aggrading deposition of sediment (see Appendix 6.4-3 in Appendix 2.6.1). Erosion monitoring is conducted as part of the Structural Performance Monitoring Plan (Appendix 4.4-1) and continues through the post-closure and institutional control periods. Also, the Post-Closure Plan (Appendix 7.1.1), provides plans to observe, monitor, and carry out necessary maintenance and repairs at the disposal site until the license is transferred by TCEQ.

To further ensure that erosion will not be a problem on the disposal site, calculations have been done to aid in the selection and sizing of cover components using the PMP event as a basis. They are included in Appendix 3.0-3.

If post-closure surveillance reveals that portions of the final cover experience excessive subsidence or erosion, investigations will take place to determine the cause of this degradation. The cover will be repaired to the original contours specified in the cover-grading plan. The activities that WCS will conduct during the Post-Closure Period will include those necessary to detect the need for repairs and other remedial actions (see Appendix 7.1.1).

WCS will coordinate with the TCEQ and the U.S. Department of Energy (DOE) to determine the times at which WCS will prepare and submit applications to terminate its disposal licenses and Treatment, Storage, and Disposal (TSD) permit and to transfer responsibility for the closed and stabilized facilities to the designated custodial agency (CA). For the CWF, this time might occur as soon as five years after completion of closure activities, but will only occur when confidence exists that the facility characteristics and performance have stabilized and that the facility will continue to satisfy performance objectives.

For the FWF, WCS will comply with regulations applicable to the hazardous waste TSD facilities as well as to those applicable to the management of an LLRW disposal facility. Hazardous waste regulations provide that post-closure monitoring and maintenance may continue for 30 years beyond facility closure. In this case also, WCS will coordinate with TCEQ and the U.S. DOE to determine the time at which WCS will prepare and submit applications to transfer responsibility to the DOE.

WCS will continue surveillance and post-closure care activities until responsibility for the Site and facilities is transferred to the designated CAs. As long as the facility continues to perform as required, the level of surveillance and maintenance activities will decrease with time, but could be revised any time unacceptable conditions are observed. However, for cost estimation and financial assurance reasons, the costs of conducting post-closure surveillance and post-closure

care activities are assumed to remain constant from facility closure to the end of the Post-Closure Period. This post-closure cost estimate is summarized in Section 7.1.3.

Descriptions of the plans for carrying out surveillance and post-closure care activities for the WCS LLRW Disposal Facility are presented in the paragraphs that follow and more fully discussed in Appendix 7.1.1, "Post-Closure Plan."

Appendix 7.1.1, "Post-Closure Plan," defines the radiological and chemical waste characteristics and provides for database tracking and analysis. Early warning release features are described in the plan, which include hypothetical accident scenarios and a corrective action program. This plan provides details for observation and monitoring of the closed facilities to demonstrate that each is performing as required and that the performance objectives will continue to be met. The post-closure activities are estimated to span up to a 30-year time frame for the FWF and five years for the CWF.

The plan includes post closure monitoring that includes:

- Surveillance monitoring
  - Periodic walkover inspections
  - Land surveys
  - Interpretation of surveillance results
- Structural monitoring
  - Settlement monitoring
  - In-situ sensors (strain gauges)
  - Vadose zone monitoring
- Infiltration monitoring
  - Leak detection monitoring
  - Groundwater monitoring

**Post-Closure Care** – Whereas monitoring activities have the purpose of identifying the need for maintenance or repair, post-closure care provides this needed support. Post-closure care consists of simple maintenance activities that would be carried out at any conventional facility, regardless of its characteristics or past activities. Post-closure care activities do not constitute active maintenance as defined in 30 TAC 336.2 and include such activities as repairing fences, repairing or replacing monitoring equipment, reestablishing vegetation, addressing minor subsidence or erosion, making minor repairs to disposal unit covers, and generally maintaining the grounds of the disposal site by mowing grass and removing deep-rooted vegetation.

The staff, equipment, and supplies required to enable post-closure care activities are so small and relatively infrequent that they will be provided by an outside professional organization under contract to WCS. The level of effort needed to conduct these activities decreases as the intensity of surveillance and post-closure care activities decrease. A typical surveillance campaign will require crews of two persons each and appropriate management and administrative support.

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Post-closure care equipment requirements are likewise small. Required equipment will be provided by a contractor may include:

- Front-end loader with backhoe
- Four-wheel-drive pickup truck
- Small tractor with implements
- Flatbed truck with dump bed
- Hand and power tools

Supplies will include those necessary to allow minor backfilling, stabilization, fencing, and plumbing activities with appropriate administrative and management support.

**Preparation for License Transfer to Custodial Agency** – A major objective of the post-closure activities will be to develop information to demonstrate that the facility continues to satisfy performance objectives and that responsibility for the closed facilities can be safely transferred to the designated custodial agencies. In accordance with 30 TAC §336.721, the license may be transferred when TCEQ finds that:

- The closure of the disposal site has been made in accordance with the WCS’ disposal site closure plan, as amended and approved as part of the license.
- Reasonable assurance has been provided by WCS that the performance objectives of 30 TAC §336 are met.
- Any funds and necessary records for care shall be transferred to the CA.
- The post-closure monitoring program is operational for implementation by the CA.
- The custodial agencies are prepared to assume responsibility and ensure that the institutional requirements found necessary under 30 TAC§336.715(7) will be met.

The frequencies of various surveillance and environmental monitoring activities planned during the Post-Closure Period are summarized in Table 7.1.1-1.

**Table 7.1.1-1. Summary of Surveillance and Environmental Monitoring Activities During Post-Closure Period**

| Activity                                    | Phase I<br>Years<br>1-2 | Phase II<br>Years<br>3-5* | Phase III<br>Years 6-15 |                          | Phase IV<br>Years<br>16-30** |
|---|-------------------------|---------------------------|-------------------------|--------------------------|------------------------------|
|   |                         |                           | YEARS<br>6-10           | YEARS<br>11-15           |                              |
| Walk-over inspections and Down-slope survey | Monthly                 | Quarterly                 | Annual                  | Annual                   | Quintennial                  |
| Land and settlement monitor surveys         | Annual                  | Annual                    | Annual                  | Quintennial <sup>1</sup> | Quintennial <sup>1</sup>     |
| Leak detection monitoring                   | Monthly                 | Quarterly <sup>2</sup>    | Semiannual <sup>2</sup> | Semiannual <sup>2</sup>  | Quintennial                  |
| Erosion monitoring                          | Quarterly               | Quarterly                 | Quarterly               | Quarterly                | Quarterly                    |
| Vadose zone monitoring                      | Quarterly               | Quarterly                 | Quarterly               | Quarterly                | Quarterly                    |

**Table 7.1.1-1. Summary of Surveillance and Environmental Monitoring Activities  
During Post-Closure Period**

| Activity  | Phase I<br>Years<br>1-2  | Phase II<br>Years<br>3-5* | Phase III<br>Years 6-15  |                          | Phase IV<br>Years<br>16-30** |
|---|--------------------------|---------------------------|--------------------------|--------------------------|------------------------------|
|   |                          |                           | YEARS<br>6-10            | YEARS<br>11-15           |                              |
| Maintenance of leak detection monitoring system             | As needed <sup>3</sup>   | As needed <sup>3</sup>    | As needed <sup>3</sup>   | As needed <sup>3</sup>   | As needed <sup>3</sup>       |
| Operation of leachate collection system                     | As needed <sup>1,4</sup> | As needed <sup>1,4</sup>  | As needed <sup>1,4</sup> | As needed <sup>1,4</sup> | As needed <sup>1,4</sup>     |
| Post-operational monitoring program                         | Annual                   | Annual                    | Annual                   | Annual                   | Annual                       |
| Maintenance of groundwater well network                     | As needed                | As needed                 | As needed                | As needed                | As needed                    |
| Interpretation of surveillance results and formal reporting | Annual                   | Annual                    | Annual                   | Annual                   | Annual                       |
| Periodic final cover repair                                 | As needed                | As needed                 | As needed                | As needed                | As needed                    |

Minimum frequency may be modified at any time if unexpected conditions are noted

1 – Until the license and permit are terminated and/or responsibility transferred to the CA.

2 – As long as liquid levels in sumps remain below pump operating levels for at least two consecutive monitoring periods.

3 – Until RCRA permit is terminated.

4 – Prior to termination of the license and RCRA permit, leachate collection systems will be operated to minimize the head on the bottom liner until leachate is no longer detected.

\* – End of CWF Planned Post-Closure Period

\*\* – End of CWF Planned Post-Closure Period

### **7.1.2 Mixed Waste Compliance**

**If the applicant intends to dispose of mixed waste, the applicant shall demonstrate, after final closure, plans for compliance with all post-closure requirements contained in 30 TAC §335.174, including maintenance and monitoring throughout the post-closure care period. [30 TAC §335.174]**

Since WCS intends to dispose of mixed waste at the FWF under a TSD permit issued by TCEQ, WCS will comply with all post-closure requirements contained in 30 TAC §335.174, including maintenance and monitoring throughout a planned 30-year post-closure care period. Upon closure of any FWF cell, WCS will cover the cell with a sequence of layers of cover materials starting with the red bed clay leveling fill layer to protect disposed waste from direct exposure to weather.

By the time of final closure of the FWF, a final cover system will be constructed as described in Section 3.5. This cover system satisfies all requirements of a cover system applicable to a RCRA landfill disposal unit including:

- Provide long-term minimization of migration of liquids through the closed landfill
- Minimize the need for active maintenance

- Promote drainage while minimizing the potential for cover erosion or abrasion
- Accommodate settlement and subsidence so that the cover's integrity is maintained
- Have a permeability less than or equal to the permeability of the bottom liner system or natural subsoils

After final closure of the FWF, WCS will comply with all post-closure requirements contained in 40 Code of Federal Regulations §§264.117 through 264.120, including maintenance and monitoring throughout the post-closure care period. WCS has assumed that post-closure surveillance and care will be required for 30 years following FWF closure under these regulations. WCS will:

- Maintain the integrity and effectiveness of the final cover, and make repairs to the cap as necessary to address the effects of settling, subsidence, erosion, or other events (refer to Application Sections 3.4 and 3.5).
- Operate the leachate collection system until leachate is no longer detected (refer to Section 3.6).
- Maintain and monitor the leak detection system and comply with applicable leak detection system requirements (refer to Sections 3.1.2 and 3.6).
- Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements (refer to Section 5.7).
- Prevent run-on and runoff from eroding or otherwise damaging the final cover (refer to Section 3.6 and Appendix 3.0-3),
- Protect and maintain surveyed benchmarks used in complying with 40 CFR §264.309 (refer to Drawing C0.07 in Appendix 3.0-2).

WCS' plans to maintain and monitor the Site throughout the post-closure care period are discussed in Sections 7.1.1 and 7.2.1 of this document. The site closure plan and cover design are discussed in Sections 6.0 and 3.0, respectively. The comprehensive post-closure plan in Appendix 7.1.1 of the application includes activities that pertain to the operation of the leak detection system, the leachate collection system and the groundwater monitoring system. These activities along with others are also updated in the cost estimates.

### ***7.1.3 Post-Closure Cost Estimate***

**The applicant shall provide a cost estimate associated with the post closure care requirements of this section.**

The costs of post-closure activities for the WCS disposal facilities have been estimated using conservative but reasonable assumptions. WCS has assumed, for the purpose of estimating costs only, that the level of surveillance and maintenance activities will remain constant throughout the Post-Closure Period. Post-closure costs are estimated for a period of 5 years for the CWF and for a period of 30 years for the FWF. It was assumed that an independent contractor would perform all of the work. Post-closure activities and cost components include the following:

- General support
- Conducting and documenting periodic walkover inspections and down-slope surveys
- Collecting and preparing periodic environmental samples

- Monitoring conditions at erosion pins
- Analyzing environmental samples at off-site laboratories
- Interpreting sample analysis data
- Monitoring, pumping, and treating leachate from disposal units
- Collecting and interpreting meteorological data
- Collecting and interpreting infiltration data
- Conducting periodic land survey of facilities and settlement monitors
- Preparing annual reports
- Providing contractor management oversight
- Routine maintenance
- Providing CA oversight
- Providing overhead and profit (O&P) on labor of 55.5 percent and on materials and subcontracts of 10 percent.
- Providing the contingency allowance (10 percent of subtotal costs)
- Allowing for the escalation of costs from 2005 to 2007 (5.12 percent of subtotal costs)

The detailed estimate of post-closure costs, expressed in 2007 dollars, for the CWF and FWF is provided in Appendix 7.1.3. These estimated annual post-closure costs total about \$1.7 million per year and will be updated for current dollars prior to the receipt of waste.

## 7.2 Monitoring and Institutional Control

This section provides a description of the Institutional Control Monitoring Program, including radioactive and chemical characteristics, and plan for taking corrective measures if migration of radionuclides or chemical constituents is suspected.

### 7.2.1 *Environmental Monitoring Program Description*

**The applicant shall provide a description of the long-term environmental monitoring programs, including radioactive and chemical characteristics, and plan for taking corrective measures if migration of radionuclides or chemical constituents is indicated. TH&SC §401.112(a)(6), (11) & (17) & 30 TAC §336.708(a)(10)]**

WCS will maintain a long-term environmental monitoring program in compliance with its licenses and permits during the 5-year Post-Closure Period for the CWF and the 30-year Post-Closure Period for the FWF. Once the WCS license is terminated and the CWF and the FWF are transferred to their respective custodial agency, the custodial agency will be responsible to carry out the remaining required long-term monitoring activities. This monitoring program will be capable of providing early warning of releases of radionuclides and chemical constituents before they leave the disposal site boundary.

The objectives of post-operational monitoring are to:

- Ensure that the closed disposal units continue to meet performance objectives. This objective will be met through site surveillance and media sampling.
- Provide data to support long-term impact evaluations. The results from continued and focused media sampling will enable analyses to confirm predictions of disposal site performance, as necessary.
- Provide records for review. The records from post-operational monitoring serve to document site closure information and to provide required information for public consideration.
- Address surface drainage and erosion control, geotechnical stability, and post-operational environmental monitoring.
- Include all activities required to carry out the necessary maintenance, surveillance, testing and engineering required to demonstrate that the Site will meet all performance objectives during the Institutional Control Period and in to the long term.

**Post-Operational Monitoring** – Planned post-operational monitoring locations and parameters are identified in the addendum to Appendix 2.10.1-2, “Radiological Environmental Monitoring Program,” Appendix 2.10.2-2, “Non-Radiological Environmental Monitoring Program”, Section 6.3 of Appendix 2.6.1, “Geology Report”, Appendix 4.4-1 “Structural Performance Monitoring Plan”, and Appendix 7.2.2, “Institutional Control Plan” (see figure 4.4-1-1 in Appendix 4.4-1). The post-operational environmental monitoring program will be conducted by WCS during the Post-Closure Period and the responsible custodial agency during institutional control for the purpose of assessing impacts the closed facility may have on the environment and for demonstrating that both radioactive and non-radioactive materials are controlled for the long term.

**Physical Surveillance** – Physical surveillance will be conducted periodically during the post-closure and institutional control periods. The Site will be physically inspected for needed maintenance and repairs performed to maintain integrity of the cover. This includes inspection of remaining facilities, fences, landfill cap and monitoring for erosion by water or wind.

As described in Section 7.1.1, WCS will maintain surveillance over and provide post-closure care of the closed site and facilities during the Post-Closure Period to determine whether the Site and facilities are performing as designed and whether active maintenance is required. Appendix 7.2.2 contains more information on the surveillance activities that will occur during the Institutional Control Period.

**Database Tracking and Data Analysis** – WCS will continue to use the database system it developed and used during operations throughout the Post-Closure Period. Moreover, these data and all associated records will be maintained as required following closure. This approach to record keeping will ensure that all information relevant to the performance of the Site and facilities will be retained and available as required to support continuing review and evaluation.

WCS will periodically review and verify all environmental data collected under the various stages of its monitoring programs. The purposes of such review will be to identify the need for changes, whether involving revisions to the monitoring programs or corrective actions to address unacceptable or undesirable conditions. Data verification will ensure the accuracy of the results

and may include re-calculation of the results, comparison of the results from replicate samples, review of quality control used for sampling, other analyses, and/or comparison to other parametric analyses. Following verification, the significance of the sample results usually will be assessed to determine the need for corrective action.

As data are collected, WCS will perform trend analyses and report findings to the TCEQ, as required. Trend analyses will consist of statistical evaluations of subsets of the data to determine the extent to which the data are within the background/baseline population. The trend analysis also will include interpretation of the data and analyses based on a standard environmental statistical approach. All data collected by WCS mentioned above will be transferred to the custodial agency.

**Corrective Action** – If, during the Institutional Control Period, a substantive failure (e.g., liner or cover system breach) or release of material is encountered, the custodial agency will prepare corrective action plan that will specifically address the deficiency. Additional information is provided in Appendix 7.3.2, “Early Warning and Corrective Action Plan.”

When entering the Post-Closure Period, it is planned that WCS will have a minimum of 35 years of site and facility performance data. This will include approximately 20 years of data on the performance of the first disposal cells that were closed during the operational period (see Section 6.1.1).

WCS will establish investigation and action limits based on results gathered during the operational and closure periods. The comparison of post-closure sampling results and trend analyses to these action limits will determine the need for a corrective action plan. Additional information regarding the establishment of investigation and action limits and responses is provided in Appendix 2.10.1-2.

### ***7.2.2 Physical Access to Site Following Transfer***

**The applicant shall provide a plan on how the custodial agency shall carry out an institutional control program to physically control access to the disposal site following transfer of control of the disposal site from the disposal site operator. The institutional control program shall also include, but not be limited to, carrying out an environmental monitoring program at the disposal site, periodic surveillance, minor custodial care, and other requirements as determined by the commission or executive director, and administration of funds to cover the costs for these activities. The period of institutional control shall be determined by the commission but may not be relied upon for more than 100 years following transfer of control of the disposal site to the custodial agency. [30 TAC §336.734(b)]**

WCS has prepared a plan to assist the CA in meeting its responsibilities to maintain and manage the Site and closed facilities following transfer of responsibility at the end of the Post-Closure Period. This plan is included in the LA as Appendix 7.2.2, “Institutional Control Plan.” The frequencies of various surveillance and environmental monitoring activity planned during the Institutional Control Period are summarized in Table 7.2.2-1.

**Table 7.2.2-1. Summary of Surveillance and Environmental Monitoring Activities During Institutional Control Period**

| Activity  | Monitoring Frequency During Institutional Control <sup>1</sup> |              |
|---|--|--------------|
|   | Years 1-20   | Years 21-100 |
| Walk-over inspections                                       | Quintennial  | Decennial    |
| Land and settlement monitor surveys                         | Quintennial  | Decennial    |
| Erosion monitoring  | Quintennial  | Decennial    |
| Vadose zone monitoring                                      | Quintennial  | Decennial    |
| Post-operational monitoring program                         | Quintennial  | Decennial    |
| Maintenance of groundwater well network                     | As needed  | As needed    |
| Interpretation of surveillance results and formal reporting | Quintennial  | Decennial    |
| Periodic final cover repair                                 | As needed  | As needed    |

1 – Minimum frequency of any activity may be modified at any time if unexpected conditions are observed

### **7.2.3 Cost Estimate for Institutional Control**

**The applicant shall provide a cost estimate for institutional control including: perpetual surveillance, monitoring, required maintenance, and other care of the disposal site. The amount of funds necessary to provide perpetual care during the institutional control period shall be based upon a real annual rate of interest, above inflation, of 2%. [30 TAC §336.737(a)]**

The Texas legislature established the Radiation and Perpetual Care Fund for the purpose of providing operating funds during the Institutional Control Period. Activities carried out during institutional control include those mentioned and described above and do not involve ongoing active maintenance activities. The fund must be adequate to support all institutional control activities.

WCS has assumed, for the purpose of estimating costs only, that the level of surveillance and maintenance activities will remain constant throughout the Institutional Control Period. Therefore the level of each activity included in the cost estimate remains constant at the year 1 through 20 rate shown in Table 7.2.2-1. Institutional Control Period activities and cost components include the same activities as those during the Post-Closure Period, namely:

- General support
- Conducting and documenting periodic walkover inspections and landfill area surveys
- Collecting and preparing periodic environmental samples
- Monitoring conditions at erosion pins
- Analyzing environmental samples at off-site laboratories
- Erosion monitoring
- Vadose zone monitoring

- Interpreting sample analysis data
- Collecting and interpreting meteorological data
- Conducting periodic land survey of facilities and settlement monitors
- Preparing annual reports
- Providing contractor management oversight
- Routine maintenance
- Providing custodial agency oversight
- Providing overhead and profit (O&P) on labor of 55.5 percent and on materials and subcontracts of 10 percent.
- Providing the contingency allowance (10 percent of subtotal costs)
- Allowing for the escalation of costs from 2005 to 2007 (5.12 percent of subtotal costs)

The detailed estimates of costs for institutional control activities in support of both the CWF and FWF, expressed in 2007 dollars, are presented in Appendix 7.2.3, “CWF/FWF Institutional Control Cost Estimate,” and will be updated to current year dollars prior to the receipt of waste. This estimate provides the assumptions and details of elements used in defining the costs during institutional control of both facilities. These estimated annual institutional control costs total about \$727,000 per year.

## **7.3 Corrective Action**

### **7.3.1 *Unplanned Events***

**The applicant shall address (e.g. modeling) unplanned events that pose a risk to public health and safety that may occur after the decommissioning and closure of the compact waste disposal facility or federal facility waste disposal facility. [30 TAC §336.738(a)]**

The process of identifying and considering “. . . unplanned events that pose a risk to public health, safety, and the environment that may occur after the decommissioning and closure of the . . . waste disposal facility . . .” is described in detail in Section 7 of Appendix 7.3.2. Unplanned events that pose the required risk must include the release of radioactive material to the atmosphere, surface soils, sediments, flora, fauna, surface water, or groundwater.

Releases to the atmosphere, surface water, surface soils, sediments, flora, and fauna can only occur if the all components of the cover system fail. Furthermore, releases to the groundwater can only occur if all of those components plus the shotcrete floor and the clay liner also fail. In the FWF-CDU and CWF, some number of canisters would also have to fail for releases to occur via the groundwater pathway. The probability of each canister failing within 300 years is no greater than 0.01, as discussed in Appendix 3.4-1 of this LA.

While the failure of the cover system might conceivably be attributed to a single initiating failure, no reasonable single initiating failure can be postulated that would also cause failure of the two floor components. Similarly, although the failure of the two floor components might conceivably be attributed to a single initiating failure, no reasonable single initiating failure can be postulated that would also cause failure of the first four components listed above.

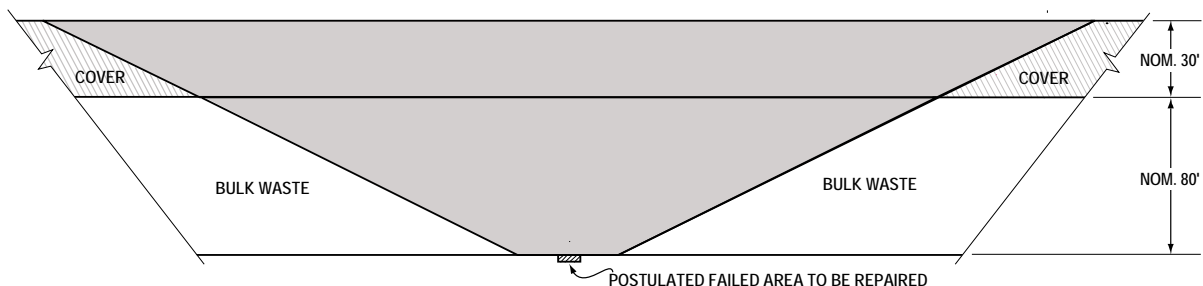
Under the NRC's design philosophy, such multiple independent failures need not be considered. WCS has, however, assumed the hypothetical multiple independent failures of all six independent components listed above for the sole purpose of stating an objective basis for inferring required levels of corrective action financial assurances. Moreover, as described in Section 7.5 of Appendix 7.3.2, even allowing the independent failures of both the cover system and the clay liner, WCS has ensured that the impact would be limited and within acceptable limits allowed by Texas rule.

The approach to identifying the corrective actions that should be quantitatively evaluated is similar to the approach to identifying accidents that are quantitatively evaluated (refer to Appendix 8.0-3 of this LA). It involves postulating a wide range of release scenarios for each environmental media by which radionuclides might be released from the proposed disposal facility. This is done in Section 7.3 of Appendix 7.3.2. Once identified, the list of hypothetical release scenarios was screened to identify those cases whose corrective action costs appear to be greatest. Refer (refer to Section 7.4 of Appendix 7.3.2 for this evaluation). This condensed list of release scenarios was then evaluated to identify that case whose corrective action cost would be greatest. This is done in Section 7.5 of this appendix.

The location of the failed portion of the clay liner is determined with the Vadose Zone Monitoring and Location System that is specified in Appendix 4.2.3 of this LA (Specification 31 02 00). Both the lateral and longitudinal extents of the hypothetical clay liner failure is limited by QA/QC procedures that provide assurance that each lot of Liner (no greater than 2,000 square feet in area) is correctly constructed, satisfies applicable specifications, and will perform as required.

The hypothetical nature of the failure lies in the assumption that some unnamed, undetected defect might occur during construction that would lead to the postulated failure of a single 2000-square-foot liner lot. That hypothetical failed portion of the clay liner lot is defined by the width of the drainage swale and its corresponding length. Given that the width of each drainage swale is no greater than nominally 50 feet, the length of the failed liner lot is no greater than nominally 40 feet.

WCS identified failure of the shotcrete floor and clay liner at the center of the FWF-NCDU as the hypothetical release scenario that would require corrective action with greatest costs. A schematic cross section showing the failure of the clay liner is presented in Figure 7.3.1-1



**Figure 7.3.1-1. Depiction of Excavation Required to Repair Postulated Failed Area at Center of FWF-NCDU**

### **7.3.2 Corrective Measures**

**The applicant shall provide a plan for taking corrective measures if migration of radionuclides and chemical constituents would indicate that the performance objectives of 30 TAC §336.723 may not be met. [30 TAC §336.731(d)]**

The details of realistic corrective measures that might actually be implemented will depend upon the failures observed and the details of what actions must be taken. Based on the ways the disposal system may fail (Section 7.3.1 above), corrective measures that might be employed have been identified and evaluated. Reasonable corrective measures include the following:

- Regrade and reconstruct to remedy excessive erosion.
- Remove and reconstruct portions of the Performance Cover.
- Remove and reconstruct portions of the Performance Cover and retrieve waste packages in the upper waste lifts within a failed disposal cell.
- Remove and reconstruct portions of the Performance Cover and retrieve all waste packages within a failed disposal cell.
- Remove and treat leachate from the leachate collection system for an extended time period.
- Pump and treat contaminated groundwater.

Because the characteristics of potential corrective measures differ so dramatically, a detailed Corrective Measures Plan can only be prepared when the specific needed corrective measure is known. In general terms, however, each Corrective Measures Plan will consist of the following major activities and phases:

- Identification, Characterization, and Assessment: Initial discovery and actions taken to confirm and quantify the presence and extent of a substantive failure.
- Identification and Evaluation of Candidate Corrective Measures: Review of corrective measures that would be effective in responding to the failed condition and associated life cycle costs.
- Selection of Preferred Corrective Action: Consideration of influential factors associated with each candidate corrective measure, weighing of the relative importance of counteracting effects, and determination of an optimal corrective measure.
- Corrective Measure Planning: Detailed design and planning of the corrective measure project.
- Corrective Measure Project Mobilization, Construction, and Operation.
- Corrective Measure Project Monitoring.
- Corrective Measure Project Decommissioning and Demobilization.
- Corrective Measure Project Documentation and Reporting.

Additional information is provided in Appendix 7.3.2, “Early Warning and Corrective Action Plan.”

### **7.3.3 Corrective Action Cost Estimate**

**The applicant shall provide a cost estimate for corrective action associated with public health and safety issues described in Section 7.3.1 of this application and with performance objective issues described in Section 7.3.2 of this application. [30 TAC §336.738]**

The costs to conduct corrective actions will strongly depend on the nature of the corrective actions. WCS characterized and estimated the costs of a reasonable worst-case scenario, consisting of a major failure in the emplacement trench. Fundamental assumptions and constraints to this corrective action are the following:

- Contamination beyond allowable limits is observed in the leachate collection system of a single FWF-NCDU cell following FWF final closure but within the Post-Closure Period or increased vadose zone moisture is detected during the Institutional Control Period .
- No indication exists of excessive contamination existing outside the bounds of the failed portion of the disposal cell.
- Materials beneath the bottom layer of canisters and the bottom of the leachate collection system is assumed contaminated.
- No more than 6 inches of red bed clay beneath the vadose zone monitoring system is contaminated and must be excavated.
- No groundwater contamination is observed and no groundwater remediation is required.

The estimated costs are based on the major activities required to accomplish the hypothesized corrective action in Section 7.3.1. Details of this cost estimate are presented in Appendix 7.3.3.

WCS has estimated the costs to conduct a range of corrective action campaigns. Most of the campaigns resulted in cost estimates of less than \$20 million. Based on the scenario described in Section 7.3.1 and elaborated in Section 7 of Appendix 7.3.2, WCS estimated the costs of the hypothetical corrective action to be about \$22 million. Details of the cost of this corrective action are given in the corrective action cost estimate (Appendix 7.3.3).