WASTE MANAGEMENT & RADIATION CONTROL

Utah Division of Waste Management & Radiation Control
Solid Waste Management Program

Mailing Address
P.O. Box 144880
Salt Lake City, Utah 84114-4880

Office Location
195 North 1950 West
Salt Lake City, Utah 84116

Phone (801) 536-0200
Fax (801) 536-0222
www.deq.utah.gov

Closure and Post-Closure Procedures

Guidance

1.0 Introduction

Portions of the following document have been drawn from similar documents provided by many states. One particular source was closure and post-closure care guidance documents from the Wyoming Department of Environmental Quality. The information in this document has been adapted to the most current rules and policies of the Utah Division of Waste Management and Radiation Control. Other documents that are available to assist in planning and carrying out the closure and post-closure activities at landfills include: *Activities on Closed Landfills*, *Preparation of Solid Waste Facility Closure and Post-Closure Plans*, and *Preparation of Solid Waste Facility Closure and Post-Closure Cost Estimates*. These documents can be found on the Division's Web page at www.hazardouswaste.utah.gov/.

This guidance is not a rule. It has been prepared to give the reader information, in plain language, about how the Division of Waste Management and Radiation Control expects to interpret Rule UAC R315-302-3. In the event questions arise regarding the matters discussed in this guidance, the text of the rule will govern. Alternative approaches may be appropriate for certifying completion of closure and post-closure care. The Director of the Division of Waste Management and Radiation Control will review requests for alternative approaches on a case-by-case basis in accordance with Utah Administrative Code R315-302-3.

The purposes of this document are three-fold:

- Describe the closure and post-closure activities and process for solid waste landfills;
- Define the performance criteria used by the Director to evaluate the adequacy of closure and post-closure activities; and
- Outline the information that will be needed to demonstrate that the landfill has stabilized and post-closure care can be terminated.

Closure is the process a landfill goes through after it stops receiving waste, i.e. placing of final cover and required erosion control features. The goal of the closure process is to design and construct a final cover system that minimizes water infiltration into the waste. To minimize infiltration the final cover system should provide optimal rates of evapotranspiration, promote run-

off, sustain vegetation, and prevent erosion. The final cover is something that is to last for the foreseeable future and should provide infiltration protection with little or no maintenance. Closure of a landfill is the beginning of the process that includes post-closure care and eventual termination of post-closure care or final closure where the landfill has reached stable state and does not require further maintenance. However, final closure approval from the Director does not relieve the owner of the landfill of liability for any damage and the requirement to correct any damage caused by contamination resulting from the disposal of solid waste, no matter when that contamination occurs.

Post-closure is the period of time needed to allow a landfill to reach the point at which the landfill has stabilized. During the post-closure period, the closed landfill is monitored on a routine basis to insure that the final cover system, monitoring system and other landfill components are functioning as intended. In addition, monitoring activities that were in place during the period the landfill was open, such as ground water monitoring, leachate collection and gas monitoring, are continued. These activities will provide warnings of ground water contamination or the migration of landfill gases. Monitoring activities that were not conducted during the active life of the landfill; such as gas monitoring at landfills that were exempt from gas monitoring during the operating life, and leachate monitoring, may have to be added during the post-closure care period. These additional monitoring activities may be needed to provide the data necessary to show that the landfill has stabilized.

2.0 Closure

Facility closure plans are submitted as part of the permitting process. Many closure plans are submitted as general documents during the early life of the facility. These general plans often show the closure as using the standard design. Although closure is far in the future for many facilities the closure design must be included in the permit application so financial assurance can be determined.

As the time for closure approaches, closure plans should be reviewed and the closure design that will be implemented should be submitted to the Division for review. If the closure design is changed from the design that is part of the current permit, a permit modification will be required. Modified closure plans must be submitted in advance of the expected closure date to allow sufficient time for the review process and for public comment if a modification of the permit is required.

As the time for closure approaches the owner or operator must submit detailed design and QA/QC documents that will be used to assure that the closure meets the requirements of the rule and the approved design. These documents must be approved by the Director. Detailed design and QA/QC documents are required prior to all cell and facility closures.

The Director must be notified 60 days in advance of the projected final receipt of waste. This rule is found in Utah Administrative Code (UAC) R315-302-3(4)(a). If the owner or operator wants to implement the pre-approved closure and post-closure plan as written, and all design and QA/QC documents have been approved, the owner or operator can simply submit the 60 day notice to the

Director indicating that operations are scheduled to be terminated and that the pre-approved closure and post-closure plan will be implemented.

If the closure is for the entire site the Director will terminate the operating permit and issue a post-closure permit following completion of the closure activities. If the closure is for a cell at the site the post-closure requirements will be added to the existing permit. It should be noted that post-closure permits are valid for the life of the post-closure care period.

Typical closure activities may include, but are not limited to, notifying the landfill users of the closure; constructing a final cover, including the impermeable layer and the protective cover; placing topsoil; seeding; constructing surface water diversion systems; fencing; surveying; and placing a notice on the deed. The specific closure activities and associated specifications should be well defined in the design and closure plan submitted as part of the permit application and the detailed design drawings and QA/QC documents submitted for Director approval prior to closure. Post-closure details are submitted in the permit application and are included in the facility permit, if the closure is one or more cells at the facility, or in the post-closure permit if the entire facility is closing.

The closure process must begin within 30 days of the date on which a facility or cell ceases to receive waste, and must be completed within 180 days. Cells that are to idle for a period of time must be covered with an intermediate cover and do not need to be closed.

Requests for additional time to complete closure will be considered by the Director if the owner or operator can demonstrate that the unclosed facility will not pose a threat to human health or the environment. In the case of an extension of the time allowed to close, the owner or operator may be required to apply an intermediate cover as required by R315-303-4(4)(g).

The owner or operator should be advised that any environmental monitoring program specified in the permit must be continued during the closure process.

The following table shows each closure requirement and whether that requirement applies to cell closure, facility closure or both.

Requirement	Deed Notice	Posted Notification	Final Cover	Final Map	Seeding	Survey	Water Diversion	Engineer Certification
Cell Closure			X	X	X		X	X
Final Closure	X	X	X	X	X	X	X	X

3.0 Closure Demonstration

In order to proceed with post-closure care activities, the owner or operator must demonstrate that the site has been properly closed. Within 90 day of completion of all specified closure activities, the owner or operator is required to submit as-built documents detailing the closure. In addition to

the as-built documents, the rules require submittal of several other documents. Also good operating practice and good community relations may require other actions.

3.1 Deed Notice

The owner or operator should provide a copy of the notice or deed instrument that has been filed with the county clerk's office, and the date of filing. The deed notice should contain a metes and bounds description of the facility boundaries, and descriptions of the wastes disposed, the environmental monitoring system, the surface water diversion system, and the final cover system, as applicable. The deed notice should also contain a requirement to notify the Director if disturbance of the site is anticipated. Appendix A contains an example of wording that can be used on a deed notice. This deed notice is done at closure of the facility not for individual cells.

3.2 Posted Notification

The public should be notified well in advance of the closure of any landfill. Notices may contain the closure date and instructions on the location of the new site that citizens can use for disposal. Advance notice will provide a much smother transition to the new facility and will result is less illegal dumping at the old site.

3.3 Final Cover (Soil)

For Class IIIb, IVb, and VI landfills that require soil cover only, the owner or operator must provide verification that the required thickness was achieved over the waste and that the site is properly graded. The verification should also indicate that all areas of the closure plan were followed and completed. Various survey techniques or digging random potholes over the site, at a frequency indicated in the permit, and measuring the depth of the cover soils will provide verification that the cover has been properly placed. All measurements taken on the as-placed final cover must show at least the depth of soil required by the permit. Closure plans and QA/QC documents for Class IIIb, IVb, and VI landfills can be rather simple but must provide for complete documentation that the cover was placed as intended by the rules and the closure plan.

All final covers should incorporate some method to easily determine that the required soil cover thickness continues to be present through the post-closure period. This may be accomplished by placing colored markers at a specified depth under the cover. This will allow the inspector to determine that the proper cover thickness is maintained through the post-closure care period without disturbing the cover to make measurements.

3.4 Final Cover (Alternative)

Landfills that have an approved alternative final cover must verify that the soil that is placed meets the specific requirements set in the approval of the alternative design. The verification, as set out in the QA/QC plan, should also indicate that all areas of the closure plan were followed and completed. Various survey techniques or digging random potholes over the site, at a frequency indicated in the permit, and measuring the depth of the cover soils will provide verification that the

required cover thickness has been achieved. The locations of soil borings, test pits, and field tests should be identified on a plot plan that is the same scale as the final contour map.

3.4 Final Cover (Engineered Containment System)

If the facility has an engineered containment system (all final covers that have a specified permeability are considered to be engineered systems), the owner or operator should provide a copy of the construction QA/QC reports, field notes, and as-built drawings.

The owner or operator should provide verification of in place permeability testing that demonstrates the compacted soil layer meets the required permeability. The owner or operator should also provide verification that the protective cover layer and the topsoil layer have been placed at the required thickness. In addition, the results of field permeability, moisture, and density testing should be provided to verify that the required construction specifications have been met. The locations of soil borings, test pits, and field tests should be identified on a plot plan that is the same scale as the final contour map.

3.5 Final Contour Map

An as-built final contour map should be provided. The final contour map should be provided at a scale of 200 feet (or less) to the inch with maximum five (5) foot contour intervals and contain a north arrow, written and bar scales, references to design details, original drawing and revision dates, and a specific drawing title and number. The final contour map should identify facility boundaries, monitoring wells, permanent surface water structures, settlement markers, erosion markers, waste disposal unit boundaries, final cover system boundaries, and any post-closure surface features or structures.

When the final cover system is surveyed, it may be useful to establish the location and elevation of several points on the final cover system to allow for monitoring of settlement during the post-closure period.

3.6 Seeding

The owner or operator should provide a complete description of reclamation activities, including the dates on which activities were completed. This description may include, but should not be limited to the methods and rates at which soil amendments, fertilizer, seed, and mulch were applied. Seed mixtures should be verified with copies of seed bag tags.

3.7 Surveyed Corners

If not previously submitted, the owner or operator should provide a plat and legal description that identifies all corners with permanent survey caps.

3.8 Surface Water Diversion

The location, design, or construction of the surface water diversion system should be included in the as-built maps, cross-sections, and construction details provided.

3.9 Other Activities

The owner or operator should provide a detailed description of any other activities related to closure such as fencing, posting, etc.

3.10 Professional Engineer Certification

For all Class I and II landfills; Class IIIa, IVa, and VI landfills, and most Class V landfills the owner or operator must provide a closure certification statement that is signed, dated and stamped by a professional engineer who is licensed by the State of Utah. This statement must confirm that the provisions of the closure plan have been carried out and that the facility has been closed in compliance with the closure design as approved by the Director. See Appendix B for an example. Additional information or statements may be provided at the discretion of the professional engineer.

4.0 Director Evaluation of Closure Demonstrations

The Director will determine if the information provided is complete and adequate. If the demonstration is incomplete or inadequate, the Director will notify the owner or operator. When all of the required documentation is provided and approved, the Director may schedule a closure inspection to evaluate and verify the completion of closure activities. Once the site has been properly closed and closure activities documented, the Director will notify the owner or operator in writing that closure has been approved and that the post-closure period can begin. If no other areas remain to be closed at the landfill site, the owner or operator may be relieved of the closure portion of the financial assurance for the facility. If relieved of the closure portion of the financial assurance, any financial assurance mechanisms that are in place for closure will be promptly released. Financial assurance that is in place for post-closure care will not be released.

The focus of the Director's review of the closure demonstration is to determine if the approved closure plan has been implemented and if it complies with the applicable closure standards. The focus of the closure inspection is to verify that the information provided in the closure demonstration is representative of the conditions at the site.

5.0 Post-Closure Process

The post-closure period begins once the Director notifies an owner or operator in writing that facility closure has been approved. Post-closure care continues until the landfill has stabilized and the Director has released the owner and operator from post-closure care requirements. For the

purposes of establishing financial assurance the post-closure care period is set at period of 30 years. This period can be extended or shortened based on proof of stability or lack of proof. Owners or operators can petition the Director to terminate the post-closure period when they can demonstrate that the landfill has been stabilized. A petition must be accompanied by relevant information that will demonstrate that the facility has stabilized. Although a post-closure period of 30 years is used to calculate financial assurance, the post-closure care period may extend far past this date. An important thing to note, as required in rule UAC R315-302-3(5), the landfill must be determined to have stabilized before post-closure can end. If stabilization does not occur in 30 years the post-closure care period will be extended.

The owner or operator should be advised that any environmental monitoring program conducted at the landfill must be continued during the post-closure period. owners or operators can petition the Director to terminate any monitoring activity prior to termination of post-closure care, if it can be demonstrated that the particular process being monitored has stabilized. Owners or operators should also be aware that additional monitoring and testing may be necessary to demonstrate that the cell or site has stabilized.

6.0 Petitions to Terminate the Post-Closure Care Period

In general, the post-closure care period cannot end until all existing landfill systems can be shut down or maintenance of the systems is no longer required and monitoring activities can cease without causing an adverse impact to the environment. At a minimum, the Division recommends that a petition to terminate the post-closure period should include the following documentation:

6.1 Ground Water Monitoring Data

Owners or operators should provide a detailed analysis of all available ground water monitoring data collected during the active life, closure process, and post-closure period. Analysis of the data may utilize graphical and/or statistical methods. Copies of all groundwater data should be provided in both paper and electronic formats, if possible.

The purpose of this analysis is to demonstrate that ground water is not being impacted by the closed landfill. If impacts to ground water are detected, additional monitoring or corrective action may be necessary. No facility that has current ground water monitoring data that indicates that ground water has been impacted can be removed from post-closure care. Facilities that have impacted ground water but have returned to detection monitoring should continue detection monitoring for several years (five or more) before they can petition to end post-closure care, provided other measurement areas have stabilized.

6.2 Methane Monitoring Data

The owner or operator should provide a detailed analysis (graphical or statistical) of all available methane monitoring data. Unless the permit specifies otherwise, the Division recommends that this analysis include at least the last 12 consecutive months of methane monitoring data or the last 3 consecutive years of quarterly methane monitoring data. Data analysis should identify any

increasing or decreasing trends. All methane data should be provided in both paper and electronic formats, if possible.

Methane monitoring data that consists of measurements at or above the surface do not provide evidence that the landfill has stabilized. It is the experience of the Division that these measurements performed on active landfills do not show any methane detection. Methane monitoring wells at the perimeter of the waste and wells in the waste will provide data that can be used to demonstrate stability.

6.3 Gas Collection

Facilities with gas collection systems must provide detailed data and analysis showing the trend of gas generation in the landfill cell or site.

6.4 Leachate Monitoring Data

If a facility has a leachate collection system, the owner or operator must conduct leachate sampling at a frequency of semiannually for a period of at least five years prior to any request to terminate the post-closure care period. Owners of operators should provide a detailed description of the quantity and quality of leachate that has been generated during the period that leachate has been monitored. Leachate must be analyzed for each of the parameters listed in UAC R315-308-4.

6.5 Post-Closure Inspection Reports

A summary of all of the owner's or operator's post-closure inspection reports should be provided to demonstrate that the site has been inspected on a regular basis to evaluate the integrity and stability of the final cover and surface water diversion systems. UAC R315-310-4(2)(e)(ii) contains the requirements for inspection frequency at all landfills. Inspection frequency, as required by the rules, is the minimum. Each landfill owner or operator should inspect the closed site at a frequency that will assure that the cover is properly maintained and the other landfill systems are working properly. If post-closure inspections of the facility identify problems that require maintenance or repair, these problems and associated remedies should be discussed in detail.

The quality of the vegetative cover may be demonstrated by comparing photographs of the reclaimed areas to photographs of adjacent undisturbed areas. It is recommended that photos be provided for at least the last five (5) years of the post-closure period.

Inspections by a state or federal vegetation specialist may also be used to demonstrate the quality of the vegetative cover.

The purpose of these reports and photos is to demonstrate that the waste within the landfill has stabilized and that the cover over the waste will not require further maintenance or repairs. If the waste has not stabilized (i.e., waste decomposition is causing problems with establishment of vegetative cover or drainage), continued monitoring of the final cover system will be necessary. Likewise, if the final cover system or surface water diversion system shows an ongoing need for repairs due to erosion or poor vegetative growth, post-closure care must continue.

6.6 Periodic Settlement Measurements

Owners or operators should be able to demonstrate that settlement has not created irregularities in the final cover surface that would increase potential for the percolation of moisture into the waste, or increase the potential for erosion. The owner or operator should also be able to demonstrate that additional settlement will not occur or that it will not be significant enough to create problems.

As with post-closure inspection reports, periodic surveying of the final cover system can be used to demonstrate that the waste within the landfill has stabilized. It is recommended that temporary elevation points be established at closure and surveyed throughout the post-closure period to allow evaluation of trends in settlement. As an alternative, the elevations and grades of the entire site at the end of the post-closure period can be compared to the elevations and grades at closure. This alternative approach is not recommended because it only provides an indication of the total amount of settlement that has occurred, and it may not be adequate to demonstrate that additional settlement is not occurring.

6.7 Drainage Control Systems

Owners or operators must be able to demonstrate that abandonment of the drainage control systems on the landfill site can be done without compromising the cover system.

6.8 Final Disposition of Environmental Monitoring System

If ground water monitoring and methane monitoring wells are to be plugged and abandoned at the end of the post-closure care period, plugging and abandonment must be completed in compliance with the provisions of UAC R655-4-12.

If the monitoring wells are not going to be plugged and abandoned, the owner or operator should provide a justification and a discussion of the planned use of the monitoring wells.

6.9 Professional Engineer Certification

Owners or operators must provide a post-closure certification statement signed, dated, and stamped by a professional engineer licensed by the State of Utah. This statement must confirm that post-closure care has been completed in compliance with the post-closure plan and in a manner protective of human health and the environment. See Appendix C for an example. Additional information or statements may be provided at the discretion of the professional engineer. All submittals to the Director must be made by the owner or operator and signed by a person as described in UAC R315-310-2(4).

7.0 Review of Petitions to Terminate the Post-Closure Period

Within 60 days of receipt of a petition to terminate the post-closure period, the Director will conduct a review to determine if the information provided is complete and adequate. If the petition is incomplete or inadequate, the owner or operator will be notified. The Director may deny or

qualify approval of the petition to terminate the post-closure period in cases where the supporting documentation is of poor quality, incomplete or inconclusive. When all of the required documentation have been provided and approved a final inspection to evaluate and verify the completion of post-closure activities may be scheduled. Once the site has been properly stabilized and documented, the Director will notify the owner or operator in writing that completion of the post-closure period has been approved and that the closure permit has been terminated. At this point, the Director will also notify the owner or operator that there is no longer a requirement to maintain financial assurance for post-closure care of the facility. Any financial assurance mechanisms that are in place for this purpose will be promptly released.

7.0 Performance Criteria for Termination of Post-Closure Care

The following performance criteria will be used by the Director to evaluate a petition to terminate the post-closure period and conclude that a landfill has stabilized and will be protective of human health and the environment without further care or monitoring.

In lieu of releasing the owner or operator from all post-closure care activities, the Director may reduce or discontinue one or more of the post-closure care monitoring requirements. In this case the post-closure care permit will be modified. A modification of this type is considered a major modification and will require public comment.

7.1 Ground Water

No facility that is in assessment monitoring or corrective action can be released from post-closure care. All parameters listed in UAC R315-308-4 and any parameters detected from the list found in UAC R315-308-5 must be at or below background. These performance criteria should be met for a minimum of five consecutive years prior to a request to terminate post-closure care. Ground water data should demonstrate that there are no increasing trends in the concentrations of constituents resulting from landfilling activities. Statistical or graphical analysis of the data should be used to identify significant increasing trends and show that no trends are present in the data set.

7.2 Landfill Gas

Methane monitoring must indicate that methane generation is decreasing. The methane concentration must be below 25% of the LEL at all monitoring points. Methane monitoring must be conducted in wells that are placed adjacent to the landfill cell. Alternatively, a methane monitoring probe can be place in the waste below the cover and readings taken from this probe. Readings from the wells or probes must be below 25% of the LEL for a period of 12 regular consecutive monitoring events. Statistical or graphical analysis of the data should be used to identify significant increasing trends. These performance criteria should be met for a minimum of 12 regular consecutive monitoring events prior to a request to terminate post-closure care. Monitoring events should occur no more frequently than monthly, but no less frequently than quarterly.

Facilities with gas collection systems must provide detailed data showing that the level of gas generation is low enough that the system can be shut down without creating a hazard.

7.3 Leachate

If a facility has a leachate collection system, monitoring data should demonstrate that leachate is not being generated (and therefore does not have to be removed from the system). If leachate is generated, it must be analyzed for each of the parameters listed in UAC R315-308-4. All parameters detected must be at or below the ground water protection standard. It should be noted that the required levels are not a statistical measure but an absolute. No detection can be above the ground water protection standard for the past 10 sampling events. Leachate sampling can occur no more frequently that quarterly.

7.4 Settlement

Inspection and maintenance records or periodic settlement measurements should demonstrate that the waste decomposition and associated settlement has not occurred during the period between inspections. This performance criterion should be met for a minimum of five consecutive years prior to a request to terminate post-closure care.

7.5 Vegetation

The vegetative cover should be well established and comparable to adjacent, undisturbed areas with respect to the percentage of ground cover.

These performance criteria should be met by the end of the post-closure period and be based on conditions during the late spring or early summer (June or July).

7.6 Cover System

Inspection and maintenance records should demonstrate that the final cover system has not required maintenance or repairs to correct problems such as ponded water or erosion. This performance criterion should be met for a minimum of five consecutive years prior to a request to terminate post-closure care.

7.7 Surface Water System

Inspection and maintenance records should demonstrate that the surface water diversion system has not required maintenance or repairs to correct problems such as ponded water or erosion. This performance criterion should be met for a minimum of five consecutive years.

If control structures are required to prevent erosion of the final cover the site cannot be considered for suspension of this portion of post-closure care.

When all other areas of the landfill have stabilized the Director may reduce the post-closure care program to cover only the maintenance of the drainage control system or any other system requiring ongoing maintenance.

7.8 Other Issues

The post-closure documentation should demonstrate that there are no features or aspects of the facility that could pose a threat to human health or the environment if post-closure care is terminated.

8.0 Liability Beyond the End of the Post-Closure Period

Landfill owners and operators have a duty to prevent releases from their landfills, including releases that occur after the end of the post-closure period. Owners and operators must correct any problems that occur even after post-closure care has ended (UAC R315-301-6).

Closure and post-closure requirements are intended to prevent releases from closed landfills. However, in the event that a contaminant release occurs following the termination of post-closure care activities, past compliance with the closure and post-closure requirements does not relieve the owners and operators from the duty to take corrective action as necessary to protect human health and the environment.

Landfill owners and operators should also be aware that closure and post-closure certification under this program does not control potential liability to third parties resulting from releases which occur during the operating life, closure period, post-closure period, or any time thereafter.

For the reasons cited above, it is recommended that landfill owners maintain a minimal inspection and monitoring program once the facility has complied with the closure and post-closure regulatory program in the *Utah Solid Waste Permitting and Management Rules.*

9.0 Further Information

Further information can be obtained from the Division of Waste Management and Radiation Control's website at www.hazardouswaste.utah.gov. Comments and suggestions for improvements are always appreciated.

Appendix A

Sample Deed Notice

The following property, known as [insert facility name], [insert permit number], has been used by [insert owner's or operator's name] for the disposal of solid waste: [insert metes and bounds description].

The types of wastes disposed include [insert description].

The environmental monitoring system at this site includes [insert description].

The surface water control system at this site includes [insert description].

The final cover system at this site includes [insert description].

Disturbance or excavation of these wastes, the environmental monitoring system, the surface water control system or the final cover system should be avoided. The Utah Department of Environmental Quality, Division of Solid and Hazardous Waste must be contacted prior to any excavation or other activity that may disturb this site.

Appendix B

Sample Professional Engineer's Certification of Closure

I certify that the provisions of the approved closure plan, signed [insert date], and closure permit, signed [insert date], for the [insert facility name], [insert permit number], have been carried out and that the facility has been closed in compliance with the closure standards specified in the design.

PE Seal, Signature and Date:

Appendix C

Sample Professional Engineer's Certification of Post-Closure Care

I certify that post-closure care of the [insert facility name], [insert permit number], has been completed in compliance with the approved closure plan, signed [insert date], and closure permit, signed [insert date], and that the facility has been stabilized in a manner protective of human health and the environment. This certification is based, in part, on my review of the post-closure inspection reports and the environmental monitoring data for this facility. This certification is also based, in part, on my inspection of this facility on [insert date]. My inspection of this facility included the vegetative cover, final cover system, surface water diversion system, and permanent survey monuments.

PE Seal, Signature and Date: