

SECTION 2.9

CLOSURE AND POST-CLOSURE CARE PLAN



Introduction

A closure and post-closure care plan has been prepared for the Veolia E.S. Zion Landfill Site 2 East Expansion in accordance with the applicable requirements of 35 Ill. Admin. Code 811. The proposed final landform (refer to Drawing No. D12) and Conceptual Landfill Gas Management System (refer to Drawing No. D14) show the configuration of the Facility after closure of all waste disposal units, including the final topography of constructed areas and the location of planned facility-related structures, that will remain as permanent features after closure.

This plan details the steps necessary for the closure of the landfill in the event of an unplanned, premature closure of the Facility as well as under the planned, routine closure of the Facility. Schedules are provided for both of these scenarios. In addition, the steps to care for the landfill during the post-closure period are described. Cost estimates are presented for closure and post-closure activities. Financial assurance mechanisms are currently in place for the existing facility and will be updated upon permit approval by the IEPA.

As described in greater detail within this Application (refer to Sections 2.3 and 2.6), the landfill will be developed in phases. The final cover system will be constructed over completed sections of the landfill as they are filled to final grade. Because of this phased development, routine or premature closure of the Veolia E.S. Zion Landfill Site 2 East Expansion will not entail capping of the entire disposal area footprint at one time.

The proposed end use of the site will be a natural area of passive open space. This end use will serve to preserve open space. However, the owner is willing to work with the surrounding community to develop an alternative end use, provided that it does not disturb the integrity of the final cover, liner, monitoring systems or other engineered components of the Facility.

The closure plan includes the following benefits:

1. The grade of the final landform sideslopes, coupled with the terrace berms that divert stormwater, will minimize erosion. The side slopes of the final landform will be constructed with a maximum of 3 horizontal to 1 vertical (3H:1V), except where terrace berms are present. Terrace berms will have an outside slope of 2H:1V and an inside sideslope of 4H:1V. The plateau area will be constructed with a minimum grade of 10 percent to prevent ponding of water on top of the landfill.
2. The final landform will be vegetated with suitable grasses to provide erosion protection, establish a diverse grassland habitat and improve the appearance of the final land surface.
3. The engineered final cover system will minimize infiltration of precipitation into the landfill and promote drainage of rain and snow melt from the top of the landfill.
4. The final landform will incorporate terrace berms, benches, and other features to minimize erosion and to convey runoff into the stormwater detention basins. The stormwater management system for the expansion provides similar release rates to existing conditions and has no impact on the stormwater control of downstream areas (refer to Section 2.4).



Closure Requirements

Implementation of the closure plan will ensure that the Veolia E.S. Zion Landfill Site 2 East Expansion is closed and cared for after filling operations have been completed. The operator must perform the following activities to comply with local, state, and federal closure requirements:

1. Close the site in a manner that prevents post-closure release of waste, waste constituents, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface water or to the atmosphere; complements the final land use; and prevents threats to human health or the environment;
2. Maintain drainage ways and swales to pass the runoff from the minimum 100-year, 24-hour precipitation event without scouring or erosion;
3. Close the site in a manner that minimizes the need for further maintenance;
4. Develop and maintain a copy of the closure plan at the site or other approved location;
5. Submit a permit application including a revised closure plan upon:
 - a. Modification of operating plans or site design affecting the closure.
 - b. Modification of the operations of the site that affect the closure including temporary suspension of waste acceptance.
6. Notify the IEPA of closure within 30 days after the final volume of waste is received;
7. Initiate closure in accordance with the closure plan within 30 days after placement of the final lift of waste;
8. Complete the closure plan within 180 days or as otherwise agreed by the IEPA;
9. Submit documentation plan sheets for the closed site to the IEPA upon completion of closure;
10. Submit an affidavit by the operator and by an Illinois Licenced Professional Engineer that the site has been closed in accordance with the closure plan; and
11. Record a notation on the deed to the landfill property or other instrument. A copy of the deed shall be placed in the operating record and the IEPA shall be notified that the notation has been thus recorded.



Premature Closure

Premature closure is the closure of the site at some point in its operating life before all permitted areas have been filled to capacity. For purposes of this premature closure analysis, the "Assumed Closure Date," as defined by 35 Ill. Admin. Code, Section 811.700, is the date during the next permit term (5 years) in which the costs of premature final closure will be the greatest (i.e. largest area of the landfill that requires final cover during the following 5 years).

The Assumed Closure Date (referred to herein as the "Premature Closure Date") of the Veolia E.S. Zion Landfill Site 2 East Expansion is estimated to be at the end of 2010, when Cells 1 through 7 and portions of 8 are open, for a total required closure acreage of 69.1 acres. Figure 2.9-1 illustrates the premature closure area. Premature closure of the landfill will involve the tasks summarized below.

Equipment Decontamination

Equipment that has been in contact with waste material will be manually cleaned (e.g., trash removal from tracks and undercarriages) and the cleaning residues placed in the landfill at the time of capping. Equipment will be cleaned prior to the placement of final cover materials.

Site Security

A fence or other barriers will have been installed prior to initial operations to restrict access to the site. Gates will be locked, and a sign will be placed near the entrance that states that the Facility is closed.

Stormwater Management

At the time of premature closure, all stormwater management basins (with the exception of terrace berms and downdrains) will have been constructed to accommodate runoff from the developed areas. Ditches will be large enough to pass runoff from the peak 100-year, 24-hour precipitation event without scouring or erosion. This information is demonstrated in Section 2.4, which describes the stormwater management program for the Facility.

The final lifts of waste will be graded so that the final slopes of the landfill require little maintenance and drain runoff away from the cover. Terrace berms and downdrains will be installed as part of the final cover. The final landform will be capable of supporting vegetation and may include terraces, berms, contoured furrows, mulch, and/or erosion blankets to control runoff.





69.1 ACRES

LEGEND

- APPROXIMATE PROPOSED FACILITY BOUNDARY
- APPROXIMATE PROPOSED WASTE EXPANSION AREA
- APPROXIMATE EXISTING PERMITTED SITE 2 LIMIT OF WASTE AREA
-  AREA REQUIRING PREMATURE CLOSURE

**VEOLIA E.S. ZION LANDFILL - SITE 2 EAST
ZION, ILLINOIS**

**FIGURE 2.9-1
PREMATURE CLOSURE**



Shaw Environmental, Inc.

APPROVED BY: DAM PROJ. NO.: 122150 DATE: JUNE 2009

Final Cover Placement

Final cover placement involves the construction of the low permeability and final protective layers (refer to Section 2.3). The final cover system consists of the following components listed from bottom to top:

- 24 inches of compacted low permeability soil with a hydraulic conductivity no greater than 1×10^{-6} cm/sec;
- 40 mil LLDPE geomembrane liner;
- Geocomposite drainage net;
- A minimum of 30 inches of protective soil; and
- 6 inches of soil capable of supporting vegetation.

On the Premature Closure Date, the final cover system will require approximately 223,000 cubic yards of low permeability soil; 3,010,000 square feet of geomembrane liner; 3,010,000 square feet of geocomposite drainage net; and 334,500 cubic yards of protective and vegetation soil.

Testing and documentation will be conducted during placement of final cover to ensure that the cover material is constructed according to the approved plans. A list of the tests and the frequency of testing that will be performed is contained in the Construction Quality Assurance report (Section 2.5 of this application). The CQA report also describes the documentation, reporting and certification procedures that will be followed during closure.

Low Permeability Layer. Soils used for the 2-foot low permeability layer shall be compacted to achieve a maximum hydraulic conductivity of 1×10^{-6} cm/sec. The low permeability layer will serve to minimize the infiltration of precipitation into the landfill and the migration of landfill gas from the landfill following closure. Construction of the low permeability layer will commence no later than 60 days after placement of the final lift of solid waste in accordance with IEPA regulations.

Geomembrane Layer. A 40-mil LLDPE geomembrane layer will be installed in addition to the 2 foot low permeability soil layer. The geomembrane will serve to further minimize the infiltration of precipitation and the migration of landfill gas following closure.

Geocomposite Drainage Net. A geocomposite drainage net will be installed above the geomembrane layer to minimize hydrostatic head within the protective soil layer and promote drainage from the final landform.

Protective Soil Layer. A protective layer consisting of a minimum of 36 inches of soil materials will be placed over the geocomposite. The uppermost six inches will consist of soil capable of supporting vegetation. This layer will protect the underlying geocomposite, geomembrane and cohesive soil layers from root penetration and frost.

Vegetation. After the protective layer has been placed, a vegetative cover growth will be planted to minimize wind and water erosion. The final vegetation will consist of a hardy blend of grasses suitable for the climate and site conditions. Seed will typically be incorporated into the upper surface of the protective soil layer using a disk or harrow or by using hydroseeding techniques. The seed mixture selected will be amenable to the soil quality/thickness, slopes



and moisture/climatological conditions that exist without the need for continued maintenance and with minimal potential for root penetration into the geocomposite and low permeability liner system. Fertilizer, lime, and mulch may be used as necessary to establish proper growth of the seed.

Structures Constructed Over the Unit

Currently, no structures are proposed to be built over the waste disposal area. In the event such structures are necessary for landfill operations, they will be designed to be compatible with the land use and to vent landfill gas from the interior. Such structures will be located and designed so that they do not interfere with operations or negatively impact the integrity of the final cover system.

Landfill Gas Monitoring

At the time of premature closure, a landfill gas monitoring system will have already been installed with the progression of cell development. No additional below ground landfill gas probes will need to be installed. Refer to Section 2.3 for a complete description of the landfill gas management program and to Drawing No. D14 for the proposed location of landfill gas monitoring probes.

Groundwater Monitoring

At the time of premature closure, the proposed groundwater monitoring wells will have been installed as part of the progression of landfill development. Therefore, no additional groundwater monitoring wells will need to be installed in the event of premature closure. Refer to Section 2.8 for a complete description of the groundwater monitoring plan and to Drawing No. D22 for the proposed location of the groundwater monitoring wells.

Certification of Closure

A Professional Engineer will certify to the IEPA that closure has been completed in accordance with this closure plan and the CQA program. Plan sheets for the closed site will be attached to the certification.

Documentation

A plat of the completed site will be filed with the appropriate land recording authority. A Professional Land Surveyor will prepare and file this plat. A record of notation on the deed to the landfill property or other appropriate instrument in such a way that potential purchasers will be notified in perpetuity that 1) the land has been used as a landfill facility, and 2) its use is restricted pursuant to 35 Ill. Admin. Code, Section 811.111(d). The owner or operator shall notify the IEPA that the notation has been recorded and a copy has been placed in the operating record.

Schedule for Premature Closure

It is anticipated that, given favorable conditions, the above tasks can be accomplished within 180 days as shown in the schedule contained in Table 2.9-1. The closure activity will begin no later than 30 days after the landfill receives the final receipt of waste.



TABLE 2.9-1
ESTIMATED TIME REQUIRED FOR CLOSURE
(MONTHS)

Task	Month #1	Month #2	Month #3	Month #4	Month #5	Month #6
1. Determination that Premature Closure is Necessary/ Notify Agency	■					
2. Equipment Decontamination	■					
4. Low Permeability Cover (24 inches)	■					
5. Geomembrane and Geocomposite Placement		■				
6. Protective Cover (36 inches)		■				
7. Grading			■			
8. Vegetation			■			
9. Certification of Closure			■			

Note: Estimated times assume favorable weather conditions.

Temporary Suspension of Operations

Although temporary suspension of operations is not expected to occur at the Facility, the following steps will be completed in such an event.

- Daily cover will be applied over the active face. If operations are suspended for more than 60 days, a one (1) foot layer of intermediate cover will be applied to the filled area. The intermediate cover will be graded to drain runoff and to minimize ponding and infiltration of water.
- Cracks, rills, gullies, and depressions will be repaired to prevent access to the solid waste by vectors, and to minimize ponding and infiltration of water.
- Areas not at final elevation will be graded to provide positive surface water control, and intermediate cover will then be applied.
- The condition of surface water control features will be checked and repaired if required.
- Temporary slopes will be protected from erosion by use of temporary seeding, terraces, erosion control mats, etc. as required.
- The leachate collection system will continue to be operated. Routine inspections will ensure that the leachate collection system is maintained and the leachate storage tank is emptied as needed.
- The facility, including roads, fences, and signs, will be inspected on a routine basis. Any problems will be repaired immediately.
- The groundwater monitoring wells will be sampled as required by the IEPA permit. During sampling events, the groundwater monitoring wells will be inspected for any damage.
- The Facility's landfill gas extraction/collection system will be inspected and operated as required by the IEPA permit conditions.
- Unauthorized access to the Facility will be strictly prohibited. Gates will be locked.
- The Facility will post signs to inform users that the Facility is temporarily not accepting waste.
- If the temporary closure is in excess of 30 days, the IEPA will be notified.
- Records will be kept as outlined in the Record Keeping section contained in Section 2.6 of this application.



Routine Closure

Routine final closure will occur when all disposal areas have been filled to permitted grades. It is assumed that the last two cells (Cells 9 and 10) will require final cover under routine closure conditions. These cells a combined area of approximately 29.4 acres, as shown on Figure 2.9-2. A total of 117.8 acres of final cover will be placed at the Veolia E.S. Zion Landfill Site 2 East Expansion throughout its operating life.

The procedures described in the premature closure plan will be followed except as noted below:

Stormwater Management

Remaining stormwater management features, such as terrace berms and downchutes, will be constructed as part of final cover placement. The stormwater management system is designed to pass the peak 100-year, 24-hour precipitation event without scouring or erosion after closure. Provisions for run-off and run-on are included in the Stormwater Management Plan, contained within Section 2.4 of this application.

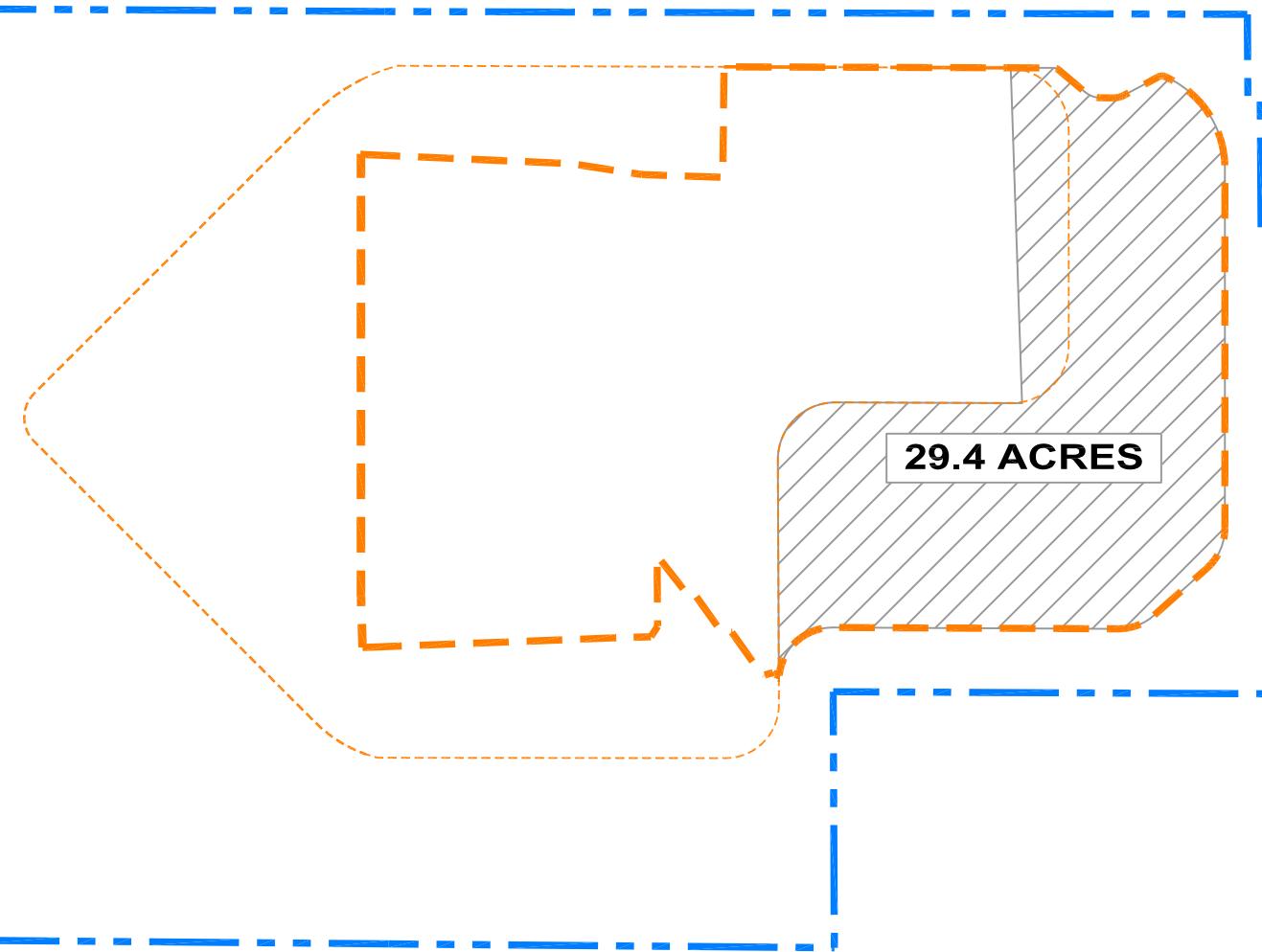
Final Cover Placement

An area of approximately 29.4 acres will require final cover under routine closure. Construction of the low permeability layer will be commence no later than 60 days after placement of the final lift of solid waste. The final protective layer will be placed as soon as possible thereafter to prevent desiccation, cracking, freezing or other damage to the low permeability layer.

Certification of Closure

Both the Operator and a Professional Engineer will certify to the IEPA that closure has been completed in accordance with this closure plan and the CQA program. Plan sheets for the closed site will be attached to the certification.





LEGEND

- APPROXIMATE PROPOSED FACILITY BOUNDARY
- APPROXIMATE PROPOSED WASTE EXPANSION AREA
- APPROXIMATE EXISTING PERMITTED SITE 2 LIMIT OF WASTE AREA
- // AREA REQUIRING ROUTINE CLOSURE

VEOLIA E.S. ZION LANDFILL - SITE 2 EAST
ZION, ILLINOIS

FIGURE 2.9-2
ROUTINE CLOSURE



Shaw Environmental, Inc.

APPROVED BY: DAM PROJ. NO.: 122150 DATE: JUNE 2009

Post-Closure Care Requirements

The post-closure care plan describes the steps to monitor and maintain the Veolia E.S. Zion Landfill Site 2 East Expansion throughout the post-closure period. This post-closure care plan is based upon the regulatory requirement to maintain and monitor the site for a 30-year period following closure or until the IEPA determines the site no longer poses a threat to the environment. The Veolia E.S. Zion Landfill Site 2 East Expansion will meet the following regulatory requirements for post-closure care.

1. Maintain a written post-closure care plan at the site or other approved location.
2. Implement the post-closure care plan upon completion of closure.
3. Treat, remove, or dispose of waste or waste residues within 30 days of the receipt of the final volume of waste.
4. Remove equipment and structures unnecessary for post-closure land use unless otherwise authorized by a permit.
5. Continue post-closure care activities (inspections; cover maintenance; groundwater monitoring; leachate and gas monitoring, collection and disposal) of the site in accordance with regulatory requirements.

Maintenance and Inspection

The purpose of the maintenance program is to ensure the ongoing functioning of engineered features during the post-closure care period. A visual inspection of the Veolia E.S. Zion Landfill Facility will be performed on a routine basis. A written record of the inspection will be completed and maintained. The inspector will assess the condition and the need for repair of final cover, vegetation, fencing, monitoring points and drainage structures. As required by current regulations, quarterly inspections will continue for a minimum of five years after closure, at which point the frequency of inspections may be reduced to annual inspections. Annual inspections will be continued for the remainder of post-closure or until the conditions specified in this closure plan are satisfied. If any deficiencies are identified during the inspections, an assessment and remedial action plan will be implemented.

Final Cover

Although following the CQA program will ensure that the final cover is constructed and performs according to design, differential settlement caused by the non-uniform characteristics of waste could potentially result in areas of ponding or erosion on the completed landfill. If this occurs, steps will be taken to repair the problem. Any area where ponding occurs or where erosion cuts six inches or deeper will be promptly replaced, repaired or filled to maintain the integrity of the final cover system. It is expected that recently capped areas will require the most maintenance. Over time, the landfill will stabilize such that little, if any, maintenance will ultimately be required.

Vegetation

Areas of the cover system that are repaired will be re-vegetated. Reworked surfaces and areas with failed vegetation in excess of 100 square feet will be re-vegetated as required. An average of two percent of the site is assumed to require re-vegetation during the initial years of the post-closure care period, a decreasing amount thereafter.



The site will be mowed at least once per year. Mowing will allow greater visibility of the site during site inspections.

Drainage Control

The stormwater management system has been designed to pass the peak 100-year, 24-hour precipitation event without scouring or erosion. Routine inspections of stormwater management structures such as the drainage ditches and detention basins will identify areas requiring repair, and riprap or other lining material will be replaced as needed. The stormwater basin will be dredged as necessary during the post-closure care period to remove accumulated sediments.

Landfill Gas Monitoring and Collection

Upon closure, landfill gas monitoring equipment will be in place. If the perimeter landfill gas probes become damaged during post-closure, they will be repaired or replaced. These probes are anticipated to require very little maintenance.

Using portable field instruments, the concentration and pressure of the following parameters will be monitored:

- methane;
- pressure;
- nitrogen (balance gas);
- oxygen; and
- carbon dioxide.

Sampling of landfill gas monitoring devices will occur on an annual basis (as per current IEPA regulations) for a minimum of five years after closure. Monitoring beyond the minimum 30 year period may be discontinued if both of the following conditions have been met for one year:

- The concentration of methane is less than five percent of the lower explosive limit in air for four consecutive quarters at all monitoring points outside the unit;
- Monitoring points within the unit indicate that methane is no longer being produced in quantities that would result in migration from the unit and exceed the regulatory standards.

Groundwater Monitoring

The groundwater monitoring wells will be sampled for a minimum of 30 years after closure. At the time of routine closure, the landfill will have 48 monitoring wells installed. The wells will be monitored per IEPA regulations. Monitoring results will be reported to the IEPA and groundwater monitoring records will be maintained at the landfill office or other approved location.

Leachate Management

Leachate samples will be collected from 9 extraction points and tested per IEPA regulations and as required by the approved off-site treatment facility. Test results will be submitted to the IEPA.

The leachate collection system will be operated and maintained for 30 years after closure of the Facility, or for a period determined by the IEPA to sufficiently protect public health and the



environment. The leachate collection, transfer, and storage systems will be inspected routinely. Observed damage or deficiencies will be repaired as soon as practicable after detection.

Record Keeping

Records of inspections conducted during the post-closure period and copies of groundwater/leachate/landfill gas monitoring results will be maintained at the landfill office or other approved location. The records will indicate the date, test location, test results and any remedial action taken, if necessary.

Security

Fencing, gates and other required security measures will be inspected and maintained during the post-closure period to prevent any unauthorized access to the Facility.

Cost Estimates

The following cost estimates have been prepared in accordance with the applicable requirements of 35 Ill. Admin. Code, Part 811. The closure cost estimate includes the following itemized costs: 1) the cost of applying final cover to the closure area; 2) the cost to complete runoff control structures; 3) the cost of equipment decontamination; and, 4) the cost of certification of closure. The post-closure care cost estimate includes the itemized costs of carrying out the activities described in the post-closure care plan.

The closure cost estimate (Table 2.9-2) assumes that closure is initiated on the Premature Closure Date, when closure costs will be highest. The post-closure care cost estimate (Table 2.9-3) is based on routine final closure, when annual post-closure costs will be highest. These estimates reflect current third party costs, and assume the IEPA will contract for all closure and post-closure care work. A summary of required financial assurance is provided in Table 2.9-4.

The cost estimates have not been reduced by any allowance for the salvage value of equipment or the resale value of land or landfill gas, nor has a discount rate been applied. These estimates will be revised whenever a change in area of the landfill that is active, the closure plan or post-closure care plan is modified.

Financial Assurance

Financial assurance will be provided in accordance with IEPA regulations to ensure that sufficient money is available to complete landfill closure and post-closure care. The amount of financial assurance that is required at any time is based on the landfill area which has been granted operating authorization and, of that area, how much final cover and other closure work remains to be constructed and approved by the IEPA. The IEPA reviews and must approve all cost estimates prior to issuing operating authorization for new landfill cells. State regulations require that financial assurance be posted prior to waste acceptance (typically requested prior to the issuance of operating permits) for new landfill cells or whenever the closure/post-closure care cost estimates increases. Further, the IEPA currently requires annual updates to the closure/post-closure cost estimates to account for inflation and other increases.



Table 2.9-2
Premature Closure Cost Estimate
Veolia ES Zion Landfill

Premature Closure Cost Estimate				
Item	Unit	Quantity	Unit Cost	Total
Mobilizations	LS	1	\$46,843	\$46,843
Clay Cover	CY	222,963	\$4.74	\$1,056,845
Geomembrane	SF	3,009,996	\$0.36	\$1,083,599
Geocomposite	SF	3,009,996	\$0.35	\$1,053,499
Protective Soil	CY	278,703	\$4.16	\$1,159,404
Topsoil	CY	55,741	\$5.27	\$293,755
Surface Water Management	LS	1	\$31,580	\$31,580
Seeding	Acre	69.1	\$1,263	\$87,273
Gas Wells	Lin ft.	900	\$89.48	\$80,532
Gas Laterals	Lin ft.	1,380	\$29.48	\$40,682
CQA	LS	69.1	\$10,527	\$727,416
Total (in 2009 Dollars)				\$5,661,428

Table 2.9-3
Post-Closure Care Cost Estimate
Veolia ES Zion Landfill

Post-Closure Cost Estimate				
Item	Unit	Quantity	Unit Cost	Annual Cost
Inspections	LS	4	\$749	\$2,996
Monitoring				
17 Quarterly Groundwater Wells				
Sampling	Samples	68	\$130	\$8,840
List G1	Samples	34	\$109	\$3,706
List G1 and G2	Samples	34	\$354	\$12,036
31 Semi-Annual Groundwater Wells				
Semi-Annual Sampling	Samples	62	\$130	\$8,060
List G1 and G2	Samples	62	\$354	\$21,948
Gas				
Probes	Hour	4	\$40.84	\$163
Quarterly Surface Scan	Each	4	\$2,342	\$9,368
Leachate				
Sampling	Each	3	\$125	\$375
Leachate Level Measurements	Each	24	\$25	\$600
List L2	Each	2	\$1,224	\$2,448
List L3	Each	1	\$554	\$554
Storm Water	Each	12	\$179	\$2,148
Maintenance				
Final Cover	Hour	60	\$237	\$14,220
Vegetation repair	Acre	2.5	\$1,421	\$3,553
Mowing	Acre	131	\$46.86	\$6,139
Leachate System	LS	1	\$14,053	\$14,053
Miscellaneous Repairs	LS	1	\$20,527	\$20,527
Gas Extraction System	LS	1	\$3,473	\$3,473
Operation				
Leachate Disposal	Gallons	1,500,000	\$0.0359	\$53,850
Gas/Leachate Extraction System	LS	1	\$20,527	\$20,527
Sedimentation Basin Cleaning	LS	1	\$7,895	\$7,895
Leachate System Cleaning	LS	0.25	\$4,105	\$1,026
Snow Removal	LS	1	\$9,369	\$9,369
Reporting /Record Keeping	LS	1	\$17,632	\$17,632
Total Annual Cost (2009 Dollars)				\$245,506
Decommissioning Costs				
Well and Probe Decommissioning		80 wells x \$589/well =		\$47,120
Gas System Decommissioning		Estimated Lump Sum =		\$237,373
Total Decommissioning Cost (2009 Dollars)				\$284,493

Table 2.9-4
Summary of Required Financial Assurance
Veolia ES Zion Landfill

Premature Closure				
Total Closure (2009 Dollars)				\$ 5,661,428
Decommissioning				
Total Decommissioning (2009 Dollars)				\$ 284,493
Post-Closure Care				
Component	Unit Cost	Unit	Quantity	Cost
Total Post-Closure Care (2009 Dollars)	\$ 245,506	Lump Sum	30	\$ 7,365,180
Total (in 2009 Dollars) =				\$ 13,311,101