

§20950. SWRCB - General Closure and Post-Closure Maintenance Standards Applicable to Waste Management Units (Units) for Solid Waste.
(C15: §2580) [Note: For landfills, see also §21790 et seq.]

(a) **General.**

(1) **Applicability** — Dischargers who are implementing final closure of a new or existing classified solid waste management unit (Unit) or are implementing complete final closure of a portion of a solid waste landfill [incremental closure under §21090(b)(1)(D)] shall comply with the provisions of this article. The discharger shall carry out both mandatory closure (under §22190) and normal closure (e.g., at the end of the active life of the Unit) in accordance with a closure and post-closure plan (under §21769) which the RWQCB finds meets all applicable requirements that section and of this Subchapter, including but not limited to applicable performance standards under &(a)(2). For the purposes of the RWQCB, the final closure plan the discharger submits under this section constitutes an amendment to the report of waste discharge (under §21750). If a portion of a Unit was completely closed in accordance with an approved closure plan by November 27, 1984, the cover over the closed portion does not need to be modified to conform to the SWRCB's additional closure requirements in these regulations, unless monitoring data indicate impairment of beneficial uses of ground water. Classified Units shall be closed according to an approved closure and post closure maintenance plan which provides for continued compliance with the applicable SWRCB-promulgated standards for waste containment and precipitation and drainage controls in Article 4, Subchapter 2, Chapter 3 of this subdivision (§20310 et seq.), and the monitoring program requirements in Article 5, Subchapter 2, Chapter 3 of this subdivision (§20380 et seq.), throughout the closure period and the post closure maintenance period. Relative to the applicable SWRCB-promulgated requirements of this title, the post closure maintenance period shall extend as long as the wastes pose a threat to water quality; for Units concurrently regulated by the RWQCB and by other state agencies (including the agents of such agencies), the RWQCB's finding that the waste in the Unit no longer poses a threat to water quality shall release the discharger only from the need to comply with the SWRCB-promulgated portions of this title, for that Unit. For land treatment facilities, relative only to the applicable SWRCB-promulgated requirements of this title, the post-closure maintenance period shall extend until treatment is complete.

(2) **Performance Standards** — The performance standards applicable to closure of a Unit and, for Units that are not clean-closed, to post-closure maintenance at the Unit are as follows:

(A) **Unit Closed as a Landfill** — for landfills that are not clean-closed and for waste piles and surface impoundments that are closed as a landfill:

1. **Closure** — for landfills and for waste piles and surface impoundments closed as landfills, the goal of closure, including but not limited to the installation of a final cover, is to minimize the infiltration of water into the waste, thereby

minimizing the production of leachate and gas. For such Units, after closure, the final cover constitutes the Unit's principal waste containment feature; and

2. **Post-Closure Maintenance** — the goal of post-closure maintenance at such Units is to assure that the Unit continues to comply with the performance standard of &(a)(2)(A)1. until such time as the waste in the Unit no longer constitutes a potential threat to water quality;

(B) **Unit Clean-Closed** — for Units that are clean-closed, the goal of closure is to physically remove all waste and contaminated materials from the Unit and from its underlying and surrounding environs, such that the waste in the Unit no longer poses a threat to water quality. Successful completion of clean-closure eliminates the need for any post-closure maintenance period and removes the Unit from being subject to the SWRCB-promulgated requirements of this subdivision; and

(C) **LTUs** — for land treatment units (**LTUs**):

1. **Closure** — the goal of closure is to initiate the post-closure maintenance period;

2. **Post-Closure Maintenance** — the goal of post-closure maintenance is to continue Unit operations, without discharging additional waste to the Unit, in a manner which maximizes the degradation rate of the waste remaining within the treatment zone.

(b) **Closure Supervision** — Closure shall be under the direct supervision of a registered civil engineer or a certified engineering geologist.

(c) **Unit Type** — Class II Units and Class III landfills shall be closed in accordance with one of the following options:

- (1) **landfill**: pursuant to §21090;
- (2) **surface impoundment**: pursuant to §21400;
- (3) **waste pile**: pursuant to §21410; or
- (4) **land treatment**: pursuant to §21420.

(d) **Surveying Monuments** — Closed Units shall be provided with at least two permanent monuments installed by a licensed land surveyor or a registered civil engineer, from which the location and elevation of wastes, containment structures, and monitoring facilities can be determined throughout the post closure maintenance period.

(e) **Vegetation** — For landfills and for waste piles and surface impoundments that are closed as landfills, all vegetation for the closed Unit's vegetative cover layer shall meet the requirements of §21090(a)(3)(A)1. [in cases where the Unit does not utilize the mechanically erosion resistant layer of §21090(a)(3)(A)2.].

(f) **Closure/Post-Closure Financial Assurance** — The RWQCB shall require the discharger to establish an irrevocable fund (or to provide other means) for closure and post-closure maintenance (see Articles 1 & 2 of Chapter 6 of this subdivision) to ensure closure and post closure maintenance of each classified Unit in accordance with an approved plan. *[Note: corrective action financial assurance standards continue to apply throughout closure and post-closure maintenance {see §20380(b) & §22222.}]* For landfills required by the CIWMB to have financial assurance mechanisms under Chapter 6, the RWQCB shall assist the CIWMB:

(1) by verifying the amount of coverage proposed by the discharger to meet applicable SWRCB-promulgated requirements of this subdivision [*Note: the CIWMB is responsible for the review, approval, and management of the financial assurance mechanisms for such Units*]; and

(2) by participating in the CIWMB's periodic review of the adequacy of financial assurance mechanisms, and in any enforcement action that such review reveals, as necessary.

NOTE: Authority cited: Section 1058, Water Code. Reference: Section 13172, Water Code; Section 43103, Public Resources Code.

§21090. SWRCB - Closure and Post-Closure Maintenance Requirements for Solid Waste Landfills. (C15: §2581 // T14: §17777, §17779) [**Note: For SWRCB's final cover performance standard, see §20950(a)(2)(A); for related CIWMB requirements, see §21790 et seq.**]

(a) **Final Cover Requirements** — Final cover slopes shall not be steeper than a horizontal to vertical ratio of one and three quarters to one, and shall have a minimum of one fifteen-foot wide bench for every fifty feet of vertical height. Designs having any slopes steeper than a horizontal to vertical ratio of three to one, or having a geosynthetic component [under ¶(a)(2)], shall have these aspects of their design specifically supported in the slope stability report required under §21750(f)(5). The RWQCB can require flatter slopes or more benches where necessary to ensure preservation of the integrity of the final cover under static and dynamic conditions. The cost estimate, under §21769, for the final cover shall include a description of the type and estimated volume (or amount, as appropriate) of material needed for each component of the final cover based upon the assumption that all materials will need to be purchased; if on-site materials are to be used, the submittal shall include test results confirming the availability of such on-site materials and their suitability for such use. The RWQCB can allow any alternative final cover design that it finds will continue to isolate the waste in the Unit from precipitation and irrigation waters at least as well as would a final cover built in accordance with applicable prescriptive standards under ¶(a)(1-3).

(1) **Foundation Layer** — Closed landfills shall be provided with not less than two feet of appropriate materials as a foundation layer for the final cover. These materials may be soil, contaminated soil, incinerator ash, or other waste materials, provided that such materials have appropriate engineering properties to be used for a foundation layer. The foundation layer shall be compacted to the maximum density obtainable at optimum moisture content using methods that are in accordance with accepted civil engineering practice. A lesser thickness may be allowed for Units if the RWQCB finds that differential settlement of waste, and ultimate land use will not affect the structural integrity of the final cover.

(2) **Low-Hydraulic-Conductivity Layer** — In order to protect water quality by minimizing the generation of leachate and landfill gas, closed landfills shall be provided with a low-hydraulic-conductivity (or low through-flow rate) layer consisting of not less than one foot of soil containing no waste or leachate, that is placed on top of the foundation layer and compacted to attain an hydraulic conductivity of either 1×10^{-6} cm/sec (i.e., 1 ft/yr) or less, or equal to the hydraulic

conductivity of any bottom liner system or underlying natural geologic materials, whichever is less permeable, or another design which provides a correspondingly low through-flow rate throughout the post-closure maintenance period. Hydraulic conductivity determinations for cover materials shall be as specified in Article 4, Subchapter 2, Chapter 3 of this subdivision [§20310 et seq.], but using water as the permeant, and shall be appended to the closure and post-closure maintenance report. For landfills or portions thereof in which the final cover is installed after July 18, 1997, as part of the final closure plan for the Unit, the discharger shall provide a plan, as necessary [see ¶(a)(4)], for protecting the low-hydraulic-conductivity layer from foreseeable sources of damage that could impair its ability to prevent the throughflow of water (*e.g., desiccation, burrowing rodents, or heavy equipment damage*).

(3) **Erosion-Resistant Layer** — The low-hydraulic-conductivity layer of ¶(a)(2) shall be directly overlain by an erosion-resistant layer, as follows.

(A) Closed landfills shall be provided with an uppermost cover layer consisting of either:

1. **Erosion-Resistance Via a Vegetative Layer** — a vegetative layer consisting of not less than one foot of soil which:

- a. contains no waste (including leachate);
- b. is placed on top of all portions of the low-hydraulic-conductivity layer described in ¶(a)(2);
- c. is capable of sustaining native, or other suitable, plant growth;
- d. is initially planted — and is later replanted as needed to provide effective erosion resistance — with native or other suitable vegetation having a rooting depth not exceeding the depth to the top of the low-hydraulic-conductivity layer described in ¶(a)(2). For any proposed vegetative cover, the discharger shall propose a species mix which harmonizes with the proposed post-closure land use, and which requires as little long-term maintenance as feasible by virtue of its tolerance of the vegetative layer's soil conditions (*e.g., the presence of landfill gas*), its resistant to foreseeable adverse environmental factors (*e.g., climate, disease, and pests*), its rapidity of germination and growth, its persistence and ease of self-propagation, its high percentage of surface coverage (sufficient to prevent surface erosion), and its minimal need for irrigation and maintenance; and
- e. by virtue of its composition, its maintained vegetation density, and its finished-and-maintained grade, will be resistant to foreseeable erosion effects by wind-scour, raindrop impact, and runoff; or

2. **Mechanically Erosion-Resistant Layer** — an erosion- and ultraviolet light-resistant layer which, by virtue of its composition and finished-and-maintained grade, resists foreseeable erosion effects by wind-scour, raindrop impact, and runoff (*e.g., a 1-foot thick layer of cobbles, the interstices of which are filled with gravel*).

(B) The discharger shall maintain all components of the erosion-resistant layer throughout the post-closure maintenance period, and, if closed after July 18, 1997, shall implement such maintenance in accordance with an approved Cover-Integrity Monitoring and Maintenance Program, pursuant to ¶(a)(4).

(4) **Cover Maintenance Plan & Annual Cost Estimate** — The final cover shall be designed and constructed to function with the minimum maintenance possible. For landfills and for other Units closed as landfills, if the closure occurs after July 18, 1997, the preliminary and final closure and post-closure maintenance plan shall incorporate a cover-integrity monitoring and maintenance program which includes at least the following components. The annualized post-closure maintenance plan cost analysis [of §21769(c)] shall include an itemized estimate of the annual cost of each component:

(A) **Periodic Leak Search** — a schedule for carrying out periodic monitoring of the integrity of the low-hydraulic-conductivity layer, including a method for effectively identifying and repairing breaches in that layer *[for example and where allowed, by temporarily discontinuing active gas extraction and using surface gas probes or inserted soil gas probes to identify locations where landfill gas is emerging]*;

(B) **Periodic Identification of Other Problem Areas** — a schedule for periodically identifying and addressing other cover problems, including at least:

1. areas of the vegetative cover, if any, requiring replanting;
2. eroded portions of the erosion-resistant layer requiring regrading, repair, or (for areas where the problem persistently reoccurs) increased erosion resistance;
3. eroded portions of the low-hydraulic-conductivity layer needing repair or replacement;
4. areas lacking free drainage;
5. areas damaged by equipment operation;
6. [Reserved]; and
7. localized areas identified in the iso-settlement survey [of ¶(e)(2)] as having sustained repeated or severe differential settlement.

(C) **Prompt Cover Repair** — a plan for repairing, in a timely manner, any breach or other cover problem discovered pursuant to ¶(a)(4)(A or B). For any repairs of the low-hydraulic-conductivity layer, this plan shall either contain a Construction Quality Assurance (**CQA**) plan [under §21710(a)(5)], or shall accomplish this goal through the incorporation-by-reference of appropriate portions of an approved CQA plan; and

(D) **Vegetation Maintenance** — for a final cover utilizing a vegetated erosion resistant layer [under ¶(a)(3)(A)1.], a plan for maintaining this vegetative cover, including fertilization, irrigation, elimination of species that violate the rooting depth limit [of ¶(a)(3)(A)1.d.], replanting, and irrigation system maintenance.

(5) **Discharges of Liquids to Covers.**

(A) **Leachate and Gas Condensate** — The discharge of leachate, gas condensate, or other waste liquids to any final-covered portion of an MSW landfill is subject to the restrictions under §20200(d). *[Note: see also 1) definitions of “leachate” and “landfill gas condensate” in §20164, and 2) §20705(f), re: daily and intermediate cover.]*

(B) **Other Liquids** — The discharger shall moderate the application rate of liquids discharged to the cover for dust control, irrigation of the vegetative layer, or other non-disposal purpose in a manner that minimizes the potential for

throughflow to the underlying waste. The RWQCB can establish cover throughflow monitoring requirements (*e.g., via intermittent tensiometer measurements of the cover*) to ensure compliance with this requirement.

(6) **Stability Analysis** — For any portions of the final cover installed after July 18, 1997, for which the RWQCB has not approved a slope and foundation stability report on or before that date, the discharger shall meet the requirements of §21750(f)(5).

(b) **Grading Requirements.**

(1) **Prevent Ponding, Erosion, and Run-On.**

(A) **General** — The final drainage plan shall be included as part of the approved final closure plan for the Unit. In spite of differential settlement, the final cover of closed landfills (including waste piles and surface impoundments closed as landfills) shall be designed, graded, and maintained to prevent ponding and to prevent soil erosion due to high run-off velocities. Except as provided in ¶(b)(1)(B), all portions of the final cover shall have a slope of at least three percent. [*Note: for additional requirements concerning final grading, see §21142.*]

(B) **Flatter Areas** — The RWQCB can allow portions of the final cover to be built with slopes of less than three percent if the discharger proposes an effective system for diverting surface drainage from laterally-adjacent areas and preventing ponding in the allowed flatter portion. Analyses submitted in support of such a proposal shall take into account the design storm intensity for the Unit [under §20365].

(C) **Qualified Professional** — The final grading design shall be designed and approved by a registered civil engineer or certified engineering geologist to meet the performance standards of ¶(b)(1)(A and B), taking into consideration pertinent natural and constructed topographic features (including any related to the proposed post-closure land use), and climate.

(D) **Prompt Incremental Closure** — This paragraph applies unless the RWQCB has approved, as part of the final closure plan, a waiting period (for installation of the final cover) not to exceed five years after the date a portion of the landfill reaches final elevation, in order to avoid subjecting the final cover to potential damage from the high rate of differential settlement that so often occurs during the first few years following the final receipt of waste. To the extent feasible, based on site-specific factors, the complete closure, including final grading and installation of the final cover, for each portion of the landfill shall be implemented as soon as possible after that portion reaches final elevation. [*For additional related requirements, see ¶(d), §21110, §21120.*]

(E) **CQA** — After July 18, 1997, both the initial construction of the final cover and any later repair work that involves the cover's low-hydraulic-conductivity layer [of ¶(a)(2)] shall be carried out in accordance with an approved CQA plan [see §20323 & §20324].

(2) **Steeper-Sloped Portions** — Areas with slopes greater than ten percent, areas having surface drainage courses, and areas subject to erosion by water or wind shall be protected from erosion or shall be designed and constructed to prevent erosion.

(3) **Precipitation & Drainage Plan** — The final closure plan for the Unit shall incorporate a precipitation and drainage control plan for the closed landfill, and shall meet the requirements of §20365.

(c) **General Post-Closure Duties** — Throughout the post closure maintenance period, the discharger shall:

- (1) maintain the structural integrity and effectiveness of all containment structures, and maintain the final cover as necessary to correct the effects of settlement or other adverse factors;
- (2) continue to operate the leachate collection and removal system as long as leachate is generated and detected;
- (3) maintain monitoring systems and monitor the ground water, surface water, and the unsaturated zone in accordance with applicable requirements of Article 1, Subchapter 3, Chapter 3, Subdivision 1 (§20380 et seq.);
- (4) prevent erosion and related damage of the final cover due to drainage; and
- (5) protect and maintain surveyed monuments [installed under §20950(d)].

(d) **Landfill Closure Deadline** — For landfill Units subject to the CIWMB-promulgated provisions of this division, any closure deadline extensions the discharger proposes to the EA (under §21110) shall be effective only after concurrence by the RWQCB.

(e) **Final Cover Surveys.**

This subsection [i.e., through ¶(e)(3)] applies only to landfills, or portions thereof, that are final-closed after July 18, 1997.

(1) **Initial Survey and Map** — For a closed landfill (including a surface impoundments or waste pile closed as a landfill), upon completion of all closure activities for the Unit [or portion thereof, pursuant to ¶(b)(1)(D)], the discharger shall conduct an aerial photographic survey [or alternative survey under ¶(e)(3)] of the closed portions of the Unit and of its immediate surrounding area, including at least the surveying monuments [of §20950(d)]. The data so obtained shall be used to produce [or to augment, in the case of incremental closure under ¶(b)(1)(D)] a topographic map of the site at a scale and contour interval sufficient to depict the as-closed topography of each portion of the Unit, and to allow the early identification of any differential settlement, pursuant to ¶(e)(2). For landfills undergoing incremental closure [under ¶(b)(1)(D)], the survey for each closed portion of the landfill shall be carried out immediately following completion of closure activities for that portion of the landfill; such data shall be used to create or augment a map showing the closure date and as-closed topography of each portion of the Unit. The map produced pursuant to this paragraph shall act as a base-line against which to measure the total settlement, through time, of all portions of the final cover since the date when that landfill, or portion thereof, was closed. Upon completion of this topographic map (or, in the case of incremental closure, of each revision thereof), the discharger shall submit a copy to the RWQCB, the CIWMB, and the EA.

(2) **Five-Yearly Iso-Settlement Map** — At least every five years after completing closure of the landfill [or of the last remaining portion, for landfills undergoing incremental closure under ¶(b)(1)(D)], the discharger shall produce and submit to the RWQCB an iso-settlement map accurately depicting the

estimated total change in elevation of each portion of the final cover's low-hydraulic-conductivity layer. Therefore, for each portion of the landfill, this map shall show the total lowering of the surface elevation of the final cover, relative to the baseline topographic map [of ¶(e)(1)], and shall indicate all areas where visually noticeable differential settlement [noted under ¶(e)(4)] may have been obscured by grading operations. The map shall be drawn to the same scale and contour interval as the topographic map under ¶(e)(1), but showing the current topography of the final cover and featuring overprinted isopleths indicating the total settlement to-date. The RWQCB shall apply the requirements of this paragraph only to a closed landfill which the RWQCB finds is likely to undergo differential settlement of such magnitude as to impair either the Unit's containment features (e.g., final cover) or the free drainage of surface flow. *[Note: The RWQCB's choosing to forego requiring iso-settlement mapping for the purpose of water quality protection does not preclude the CIWMB/EA from requiring such mapping for other purposes (e.g., structural integrity considerations regarding a building sited on top of the closed landfill); see §21142(b).]*

(3) **Alternative Surveying Techniques** — The RWQCB can approve the use of any alternative technique (to an aerial survey) for producing the maps required by ¶(e)(1 & 2), so long as the maps so produced meet the performance standards of ¶(e)(1 & 2).

(4) **Tracking Differential Settlement** — Prior to conducting periodic grading operations on the closed landfill [under ¶(b)(1)(A)], the discharger shall note on a map of the landfill the approximate location and outline of any areas where differential settlement is visually obvious. Each five-yearly iteration of the iso-settlement map [under ¶(e)(2)] shall show all areas where differential settlement has been noted (under this paragraph) since the previous map submittal, and shall highlight areas of repeated or severe differential settlement. Map notations and delineations made pursuant to this paragraph need not be surveyed, so long as all areas where differential settlement was visually identifiable prior to regrading can be relocated. Such notation and delineation shall be made by, or under the supervision of, a registered civil engineer or registered geologist.

(f) **Optional Clean-Closure** — Notwithstanding any other SWRCB-promulgated closure or post-closure maintenance requirement in this subdivision, a discharger proposing to clean-close a landfill shall submit a clean-closure plan meeting the requirements of this subsection. *[Note: see also CIWMB's additional landfill clean-closure requirements under §21810.]* The purpose of clean-closure is to render the landfill (including all surrounding environs contaminated by waste released from the landfill) no longer capable of posing a threat to water quality. The purpose of a clean-closure plan is to propose a series of actions, including an accurate estimate of the cost of each such action, that will meet the requirements of this paragraph. Upon the RWQCB's finding that the discharger has successfully completed clean-closure under this paragraph, the landfill shall no longer be subject to the SWRCB-promulgated requirements of this title. Nevertheless, if the RWQCB finds that the discharger's attempt to clean-close the landfill does not meet the requirements of this subsection, the discharger

shall close the landfill and carry out post-closure maintenance in the same manner as though the discharger had not attempted clean-closure. For the purpose of this paragraph, the discharger shall have successfully clean-closed a landfill only if:

- (1) all waste materials, contaminated components of the containment system, and affected geologic materials — including soils and rock beneath and surrounding the Unit, and ground water polluted by a release from the Unit — are either removed and discharged to an appropriate Unit or treated to the extent that the RWQCB finds they no longer pose a threat to water quality; and
- (2) all remaining containment features are inspected for contamination and, if contaminated, discharged in accordance with ¶(f)(1).

NOTE: Authority cited: Section 1058, Water Code. Reference: Section 13172, Water Code; Section 43103, Public Resources Code.