

APPENDIX I

PARTIAL FINAL CLOSURE AND  
POST-CLOSURE COST ESTIMATES

March 28, 2011  
File No. 01210155.00

## MEMORANDUM

TO: Lochlin Caffey, Republic / Keller Canyon Landfill Inc.  
Susan Klassen, Sonoma County

FROM: Alex Tuveson, SCS Engineers  
Joseph Miller, P.E., SCS Engineers

SUBJECT: ***Partial Final Closure and Post-Closure Maintenance Cost Estimates  
Sonoma County Central Disposal Site***

On behalf of Sonoma County, SCS Engineers (SCS) has prepared partial final closure and post-closure maintenance cost estimates for the Sonoma County Central Disposal Site (CDS). The cost estimates presented in this document pertain to the partial final closure and post-closure maintenance of the 14.4-acre "South Face" area within the Landfill 1 (LF-1) footprint. The partial final cost estimates for have been prepared pursuant to 27CCR §21769(c), §21815, and §21820(a). Partial final cost estimates for post-closure maintenance have been prepared pursuant to 27CCR §21840.

The estimates reflect costs in current dollars (\$2011) for hiring a third party to close the facility and then inspect, monitor and maintain the landfill for a 30-year post-closure period. The closure cost estimates are based on the following:

- Preliminary design and other information contained in the *Amended Joint Technical Document, Central Disposal Site, Sonoma County, California*, prepared by SCS and dated March, 2011.
- Landfill industry unit costs and our experience with closure capital improvements and post-closure monitoring and maintenance. Where applicable, closure construction quantity take-offs were estimated from digitized versions of the partial closure design plans using AutoDesk Civil 3D software.

Estimated capital expenses for the partial final closure of the South Face area are summarized in Table 1. Estimated annual and 30-year total post-closure costs for third-party inspections, monitoring and maintenance are summarized in Table 2.

Worksheets with detailed line-item closure expenses for the 14.4-acre South Face area at the CDS are attached. Key underlying assumptions and other information for preparing the cost estimates are also attached. The estimates shown in Table 2 are based on the assumption that procedures and funding for operation, monitoring and maintenance of existing environmental

Prepared by: ALT  
Checked by: JM

control systems (leachate, landfill gas control) are already in place as part of active landfill operations, and will continue to be funded as part of ongoing programs for the active landfill. The same assumption applies to water quality, air, and LFG monitoring programs which will continue under existing permit conditions for active landfill operations.

## PROFESSIONAL CERTIFICATION

I, Joseph J. Miller, a Civil Engineer, Registration Number 042598, registered in the State of California pursuant to Section 6762 of the Business and Professions Code, hereby certify that I have prepared partial final closure cost estimates pursuant to State regulations pertaining to closure and post-closure maintenance, for the 14.4-acre South Face area within the Landfill 1 footprint at the Sonoma County Central Disposal Site, located in Sonoma County, California.

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

March 28, 2011  
Pleasanton, CA

Date and Place

  
Signature

(Seal)

CE No. 042598



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**TABLE 1. PARTIAL FINAL CLOSURE COSTS  
14.4-ACRE SOUTH FACE SLOPE AREA  
SONOMA COUNTY CENTRAL DISPOSAL SITE**

<b>Item</b>	<b>Estimated Cost (\$2011)</b>
Pre-Field Activities	\$70,000
Final Grading and Cover Placement	\$1,393,250
CQA – Soil and Liner Placement	\$192,000
Revegetation – Hydroseeding	\$48,000
LFG Monitoring and Control System	\$218,550
Leachate Control	\$48,000
Final Drainage	\$180,000
Documentation	\$150,000
Sub-Total	\$2,299,800
20% Contingency	\$460,000
<b>Total</b>	<b>\$2,759,800</b>

**TABLE 2. POST-CLOSURE MAINTENANCE COSTS  
14.4-ACRE SOUTH FACE SLOPE AREA  
SONOMA COUNTY CENTRAL DISPOSAL SITE**

<b>Item</b>	<b>Estimated Cost, \$/Year (\$2011)</b>
Final Cover Maintenance	\$28,300
Drainage System Maintenance	\$9,600
Sub-Total Annual Cost	\$37,900
<b>Total 30-Year Cost</b>	<b>\$1,137,000</b>

ATTACHMENT 1

PARTIAL FINAL CLOSURE AND  
POST-CLOSURE COST ESTIMATE WORKSHEETS

14.4-ACRE SOUTH FACE SLOPE AREA  
SONOMA COUNTY CENTRAL DISPOSAL SITE

**Partial Final Closure Cost Estimates - Sonoma Central Disposal Site**  
**14.4-Acre South Face Area**

**Mar-11**

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<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Quantity</u>	<u>Cost</u>	
<b>1</b>	<b>Pre-Field Activities</b>				<b>\$</b>	<b>70,000</b>
1a	Mobilization and Demobilization	LS	50,000	1	\$	50,000
1b	Surveying	LS	20,000	1	\$	20,000
<b>2</b>	<b>Final Cover</b>				<b>\$</b>	<b>1,393,250</b>
2a	Final Grading, Scarifying, and Recompaction	AC	3,000	16	\$	48,000
2b	Foundation Layer (1 ft)	CY	4.50	25,500	\$	114,750
2c	60-mil HDPE	SF	0.70	688,000	\$	481,600
2d	Geo-composite drain layer	SF	0.80	688,000	\$	550,400
2e	Wellbore Seals	EA	500.00	34	\$	17,000
2f	Vegetative Layer (1.5 ft)	CY	4.00	38,250	\$	153,000
2g	Gravel all-weather bench roads	CY	30.00	950	\$	28,500
<b>3</b>	<b>CQA - Soil and Liner Placement</b>	AC	12,000	16	\$	192,000
<b>4</b>	<b>Revegetation - hydroseeding</b>	AC	3,000	16	\$	48,000
<b>5</b>	<b>Landfill Gas Monitoring and Control System</b>				<b>\$</b>	<b>218,550</b>
5a	Replacement Gas Extraction Wells	EA	11,000	3	\$	33,000
5b	Install Header Pipe	LF	21.00	5,800	\$	121,800
5c	Header Pipe Road Crossings	LF	50.00	175	\$	8,750
5d	Concrete Anchor Blocks	EA	250.00	120	\$	30,000
5e	Engineering and permitting	LS	25,000	1	\$	25,000

Partial Final Closure Cost Estimates - Sonoma Central Disposal Site

14.4-Acre South Face Area

Mar-11

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<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Quantity</u>	<u>Cost</u>
<b>6</b>	<b>Leachate Control</b>				<b>\$ 48,000</b>
6a	Replacement Leachate Extraction Wells	EA	16,500	1	\$ 16,500
6b	Piping	LF	5	6,300	\$ 31,500
<b>7</b>	<b>Final Drainage</b>				<b>\$ 180,000</b>
7a	Drop Inlet Structures	EA	5,000	5	\$ 25,000
7b	Downchutes	LF	50	750	\$ 37,500
7c	Bench V-ditch w/ erosion mat Typ I & II	LF	25.00	4,000	\$ 100,000
7d	Bench V-ditch w/ erosion mat Typ III, IV & V	LF	35.00	500	\$ 17,500
<b>8</b>	<b>Documentation</b>				<b>\$ 150,000</b>
8a	Final Closure Plan and CQA Documents	LS	30,000	1	\$ 30,000
8b	Design Plans and Specifications	LS	100,000	1	\$ 100,000
8c	Final Survey - Aerial Topo	LS	20,000	1	\$ 20,000
<b>SUBTOTAL</b>					<b>\$ 2,299,800</b>
20% CONTINGENCY					<b>\$ 460,000</b>
<b>TOTAL</b>					<b>\$ 2,759,800</b>



Post-Closure Cost Estimates - Sonoma Central Disposal Site  
14.4-Acre South Face Area

Mar-11

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<u>Item</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Quantity</u>	<u>Cost</u>	
<b>1 Final Cover Maintenance</b>					<b>\$ 28,300</b>
1a Inspect Final Cover	YR	3,000	2	\$ 6,000	
1b Final Cover Repairs	AC-YR	350	16	\$ 5,600	
1c Liner Repairs	YR	55,000	1/5	\$ 11,000	
1d Wellbore Seal Replacement	YR	170,000	1/30	\$ 5,700	
<b>2 Drainage System Maintenance</b>					<b>\$ 9,600</b>
2a Inspect Drainage System	YR	1,500	2	\$ 3,000	
2b Drainage System Repairs	LF-YR	0.35	4,500	\$ 1,600	
2c Detention Basin Cleanouts	YR	5,000	1	\$ 5,000	
<b>SUBTOTAL ANNUAL COST</b>					<b>\$ 37,900</b>
<b>TOTAL 30-YEAR COST</b>					<b>\$ 1,137,000</b>

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<u>Item</u>	<u>Comment</u>
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**Closure Costs**

General	Closure area - 14.4 acres (plan); 15.8 acres (slope). Labor costs reflect prevailing wage.
1a	Mobilization and Demobilization. Unit cost based on approximately 2% of capital cost.
1b	Preliminary surveying based on recent industry data for aerial topographic plan and ground controls.
2a	Final Grading. Area estimated via AutoCAD take-off from final grading plan. 3D area estimated by multiplying plan view area by 1.1.
2b	Foundation Layer. Cubic yardage estimated based on area as calculated above. Final cover profile includes 2 feet of foundation soils. Assume 1-ft layer will have already been placed as intermediate cover prior to closure. Unit cost is for placement, grading and compaction of stockpiled soils or from West Canyon borrow area.
2c	Synthetic membrane (HDPE). Area estimated via AutoCAD take-off from final grading plan. Unit cost for HDPE purchase, delivery, tax and installation based on recent industry data.
2d	Geocomposite drain net area. Area estimated via AutoCAD take-off from final grading plan. Unit cost for drain net purchase, delivery and installation based on recent landfill industry data.
2e	Wellbore Seals. Assume each LFG and leachate extraction well will be equipped with a wellbore seal. Unit cost for wellbore seals based on SCS experience with similar projects.
2f	Vegetative Soil Layer. Area estimated via AutoCAD take-off from final grading plan. 3D area estimated by multiplying plan view area by 1.1. Final cover profile includes 1.5 feet of vegetative soils. Unit cost is for placement, grading and compaction of previously-stockpiled soils.
2g	Gravel area. Estimated for placement on all-weather access roads at 15-feet wide. Assume place 0.5-feet thick as road base on all site access roads. Assume 3,400 lineal feet of roadway, based on final grading plan. Gravel purchase, delivery and placement cost based on SCS experience with similar projects. (15ft*0.5ft*3,400ft/[27cu. yd./cu. ft] = 950cu. yd.)
3	Construction quality assurance (CQA). Unit cost includes CQA inspections, as well as field and laboratory testing for soils and geosynthetics. Unit cost based on SCS experience with similar projects.
4	Revegetation. Unit cost based on vendor quote provided in the Final Closure and Postclosure Maintenance Plans for the Sonoma County Central Disposal Site by Geosyntec Consultants 2008.

**BACKUP INFORMATION AND ASSUMPTIONS FOR PARTIAL FINAL CLOSURE COST ESTIMATE  
SONOMA CENTRAL DISPOSAL SITE (14.4-ACRE SOUTH FACE)**

**Mar-11**

**SCS ENGINEERS**

<b><u>Item</u></b>	<b><u>Comment</u></b>
5a	Replace LFG Wells. Assume 10 percent of LFG extraction wells in South Face area of LF-1 will need to be replaced upon final closure. Cost and quantity based on SCS experience with similar projects. Assume typical well length of 100 feet installed at \$110/lf.
5b	Gas header / pipeline cost. Assume complete header system replacement will be needed. Approximately 5,500 lineal feet of HDPE piping. Assume 5 percent of additional length due to snaking of HDPE piping will be required for expansion. 5,800 lineal feet of 4 to 8-inch diameter above grade header (@ \$21/lf).
5d	Header Pipe Road Crossings. Complete 7 HDPE pipe road crossings at 25 lineal feet each. Unit cost based on SCS experience with similar projects.
5d	Concrete Anchor Blocks. Assume anchor blocks to be placed at 50 foot intervals for securing HDPE header piping. Unit cost based on SCS experience with similar projects.
5e	Engineering and permitting. Cost based on SCS experience with similar projects.
6a	Leachate Well Replacement. Assume approximately 10 percent of leachate extraction wells in South Face area of LF-1 will need to be replaced upon final closure. Cost and quantity based on SCS experience with similar projects. Assume typical well length of 150 feet installed at \$110/lf.
6b	Leachate Piping. Assume complete leachate collection piping system replacement to occur. Assume 6,300 lineal feet of 2-inch diameter liquid and 2-inch diameter air lines installed above grade or in common trench (@ \$5/lf)
7a	Drainage - drop inlet structures. Determined from final grading plan drawings. Unit cost based on industry data.
7b	Drainage - downdrains. Preliminary design provides for CMP or HDPE downdrains with discharge to v-ditches or detention basins. Length determined via take off from final grading plan.
7c	Drainage - bench and perimeter v-ditches. Assume earthen v-ditch with erosion control mat on bench roads or around perimeter. V-ditch length determined via AutoCAD take off from final grading plan. Only bench roads within limits of waste used to determine total v-ditch length. Unit cost based on average cost for Type I and Type II v-ditch construction.
7d	Drainage - bench and perimeter v-ditches. Assume earthen v-ditch with erosion control mat on bench roads or around perimeter. V-ditch length determined via AutoCAD take off from final grading plan. Only bench roads within limits of waste used to determine total v-ditch length. Unit cost based on average cost for Type III, IV, and V v-ditch construction.
8a	Documentation - final closure plan and CQA documents.

**BACKUP INFORMATION AND ASSUMPTIONS FOR PARTIAL FINAL CLOSURE COST ESTIMATE  
SONOMA CENTRAL DISPOSAL SITE (14.4-ACRE SOUTH FACE)**

**Mar-11**

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<b><u>Item</u></b>	<b><u>Comment</u></b>
8b	Documentation - design plans and specifications (construction documents). Assume engineering fees based on SCS experience with similar projects.
8c	Documentation - aerial survey. Assume aerial survey at \$20,000.

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<u>Item</u>	<u>Comment</u>
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**Post-Closure Maintenance Costs**

1	Irrigation. Landfill to be seeded with native grasses and no irrigation system is planned.
1a	Site inspections. The final cover will be inspected on a semi-annual basis with reports issued to Sonoma County. Cost for inspection and reporting estimated at \$3,000/event. Excludes liner repairs.
1b	Cover maintenance - fertilizing. Final grading area is 16 acres (slope area). Assume average \$350/acre-year expense for minor repairs (regrading and replacement of vegetative soil cover) and fertilizing. Unit costs based on SCS experience.
1c	Liner Repairs. Assume 6 capital projects over 30 year maintenance period (1 project every 5 years). Liner repairs assumed to be approximately 0.5 acre each. Repair cost assumed to be \$110,000/acre based on line-item unit costs for foundation soil, 60-mil HDPE, geocomposite drain layer, and vegetative layer placement as listed under "Item 2" in Closure Cost Estimate. Annual cost = \$55,000
1d	Wellbore Seal Replacement. Assume each LFG and leachate well within South Face of LF-1 will require replacement 1 time within 30-year post-closure period. 34 LFG and leachate wells are present within area. Unit cost of \$5,000 per replacement per well based on SCS experience (\$5,000*34 = \$170,000).
2a	Drainage System Inspection. The drainage system will be inspected on a semi-annual basis with any reports issued to Sonoma County. Cost for inspection and reporting estimated at \$1,500/event.
2b	Drainage channels. Assume maintenance to include removal of silt and debris, maintaining connections and anchors of oversize drains, and re-vegetation of grass lined ditches. Unit costs based on industry average and SCS experience. Channel lengths based on AutoCAD take off of final grading plan. Only bench roads within limits of waste used to determine total v-ditch length.
2c	Sedimentation basin maintenance. Each of 5 permanent basins will be cleaned out every two years. Use loader, dump truck and operator(s) at \$2,000/day, 5-day project (\$10,000 every 2 years). Annual cost is \$5,000.