

Appendix I. Engineering Cost Estimate

Section 1. Introduction

The cost estimate includes an evaluation of the costs of all elements of the Remedial Design, as well as an engineering cost estimate of the remedy and subsequent operation and maintenance (O&M) at Operable Unit 1, Meyers Landfill Site. The estimate is considered accurate to within plus 15 percent and minus 10 percent. A detailed summary of the remedy and 30 years of O&M is provided in the attached cost tables. Costs include all supplies, materials, equipment, subcontracted services, professional services, and craft labor services needed to implement the design as of January 2009. Craft labor pricing assumes prevailing wage rates to be paid on federally funded construction projects, consistent with the Davis-Bacon Act. Assumed crew sizes and durations are provided per task. It should be noted that multiple tasks may occur simultaneously and the final construction sequencing will be determined prior to implementation of construction, in conjunction with completion of the Remedial Action Work Plan.

Site: OU-1, Meyers Landfill Location: El Dorado County, CA		Description: Final Remedial Design, Multilayer Cap and Cover System, Institutional Controls, Passive LFG Venting, Groundwater and LFG Monitoring, and French Drain Expansion			
CAPITAL COSTS:					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization and demobilization	1	LS	\$133,000	\$133,000	Includes premobilization plans, mobilization and demobilization of all prevailing wage labor and equipment, and establishment of work zones. Includes cost for hauling equipment, office trailer, sanitary facilities, storage facilities, and other project necessities. Craft trade crew of 3 for 10 days.
Site Work					
Clearing and grubbing	11	acre	\$6,364	\$70,000	Includes all prevailing wage labor and equipment for clearing of shrubs and rocks in the work area; 1 acre per day. Prevailing wage crew of 5 for 11 days.
Removal of top 2 feet of existing cover soil in area east and west of sewer	33,400	CY	\$6.45	\$215,500	Cover soil assumed to be 4 feet thick across entire landfill. Remove only top 2 feet to avoid exposing more waste and keep waste from being mixed in with foundation soils; 3,000 cubic yards per day for a total of 33,400 cubic yards. Prevailing wage crew of 10 for 12 days.
Installation of filter fabric fence	1,500	LF	\$6.00	\$9,000	Assumes 2 days to complete silt fence installation. Prevailing wage crew of 3 for 2 days.
Replacement of cover material as foundation layer west of the sewer	35,500	CY	\$5.15	\$183,000	Includes all prevailing wage labor and equipment for replacement of cover material; 3,000 cubic yards per day for a total of 35,500 cubic yards placed. Prevailing wage crew of 9 for 12 days.
Backfilling and grading in area east of sewer	1	LS	\$12,000	\$12,000	Minimal grading for drainage to rough grade area east of sewer area after excavation for drainage. Prevailing wage crew of 4 for 2 days.
Hydroseeding (grass) of area beneath relocated waste	3	acre	\$4,333	\$13,000	Includes all equipment and subcontracted services to revegetate work areas beneath relocated waste. Prevailing wage crew of 3 for 2 days.
Infiltration swale	1	LS	\$183,500	\$183,500	Cut and regrade borrow area (16,700 cubic yards), obtain proper drainage, and reduce slope of vegetative cover. Also, install erosion control materials. Prevailing wage crew of 7 for 15 days.
Replace Access Road					
Fill and grade access road	1	LS	\$36,500	\$36,500	1,100 feet of new road alignment; includes installation of four 12-inch culverts. Includes all prevailing wage labor and equipment. Prevailing wage crew of 7 for 4 days.
Installation of 12-inch road base	1,300	ton	\$40.00	\$52,000	1,100 feet of new road alignment. Install 12 inches of native material compacted to 95%. Includes all prevailing wage labor and equipment. Prevailing wage crew of 7 for 3 days.
Abandonment of Existing Monitoring Wells	1	LS	\$8,300	\$8,300	Assumes abandonment of five wells. Prevailing wage crew of 2 for 2 days.
Waste Relocation	33,900	CY	\$8.41	\$285,250	3,000 cubic yards per day for a total of 33,900 cubic yards. Also includes sewer line breach contingency plan. The contingency plan will establish chain of command, notifications, and emergency actions to be taken if the sewer line is inadvertently cut. These costs also include the cost of having inflatable pipe plugs, bypass pumps, and at least 1,000 feet of pipe on site for diverting sewage should the existing line become breached during excavation. Prevailing wage crew of 15 for 12 days.
Monitoring, Sampling, Testing, and Analysis					
Confirmation sample collection and Laboratory analyses	92	ea	\$1,848	\$170,000	Collect confirmation samples every 1,000 sf over a 92,000-sf area. Includes equipment and analysis of 100 samples for CAM 17 metals, VOCs, PAHs, TPH and organochlorine pesticides. Includes equipment and analysis of 50 samples for dioxins and furans.
Technical memorandum or letter	1	ea	\$4,500	\$4,500	Summary of laboratory results and plan for additional excavation.
Capping					
Foundation layer fine grading	479,000	SY	\$0.16	\$75,600	Foundation layer from on-site cover material. Fine grading of foundation layer and smooth drum rolling to prep for liner install. Prevailing wage crew of 6 for 7 days.
Installation of 60-mil LLDPE geomembrane	479,000	SF	\$0.73	\$350,500	Includes product mobilization, installation costs, testing, and pipe boot installation for two 8-inch gas vents and three 4-inch monitoring wells.
Installation of 12-inch drainage sand layer on 25% slopes (screening on-site material)	3,500	CY	\$14.42	\$50,470	Screening of 1,400 cubic yards of native material per day. Assume 1.1 units of unscreened material yields 1.0 unit of screened material; material installed as it is made. Prevailing wage crew of 7 for 3 days.
Installation of geocomposite layer	479,000	SF	\$1.06	\$508,000	Includes product mobilization and installation.
Installation of 24-inch cover soil layer	35,500	CY	\$8.68	\$308,200	On-site material to be used as cover soil; 35,500 cubic yards cut from borrow area and placed on top of geocomposite at 3,000 cubic yards per day. Prevailing wage crew of 15 for 12 days.
Installation of 12-inch vegetative layer	17,700	CY	\$20.06	\$355,000	Off-site material to be used as vegetative cover amendment to existing on-site material. Assumes a 3-inch-thick layer of organic compost applied and mixed with existing soil. Specific quantity and makeup of soil amendment will be based on agricultural suitability analysis of native soil (pending final seed mix determination); 17,700 cubic yards cut and placed on top of cover soil layer at 3,000 cubic yards per day. Following compaction of first 8 inches loose lift to 6 inches, install Geogrid. Soil amendment done on final loose lift. Prevailing wage crew of 11 for 9 days.
Installation of (2) geogrid layers	801,000	SF	\$0.30	\$241,500	Includes product mobilization and installation. Geogrid installed at 12 inches and 6 inches below final grade in vegetative cover layer. Ten days total done in conjunction with placement with 12-inch vegetative layer.
Hydromulch seeding	15	acre	\$3,000.00	\$45,000	Includes all equipment and subcontracted services to revegetate work areas of the cap. Prevailing wage crew of 3 for 2 days.

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CAPITAL COSTS (continued):					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Capping (continued)					
Perimeter LFG Monitoring Probes					
Installation LFG monitoring probes	1	LS	\$28,500	\$28,500	Includes all equipment and subcontracted services to install six probes (3 days). Sample collection to occur immediately following installation of probes.
Passive LFG Venting					
Installation of passive gas vents	1	LS	\$127,000	\$127,000	Includes passive vent to 75 percent of waste depth, 1 per acre, for a total of 10 vents. Drillers install 10 wells through the completed foundation layer, while crew trenches and pipes together all 10 wells into two risers. Risers enclosed in chain-link fence. Prevailing wage crew of 9 for 10 days.
French Drain Expansion	1	LS	\$96,500	\$96,500	Install 750 feet of french drain. Prevailing wage crew of 5 for 5 days.
Concrete-Lined Channels	1	LS	\$309,700	\$309,700	Includes all equipment and subcontracted services to install concrete lined channels. 10 days for installation.
After Action Report	1	LS	\$19,000	\$19,000	Includes labor and reproduction.
SUBTOTAL				\$3,890,520	
Contingency	15%			\$583,578	0% scope + 15% bid
SUBTOTAL				\$4,474,098	
Project Management	9%			\$398,700	Includes project management during all phases of construction, regulatory interface, permitting, and crew per diems.
Construction Management	13%			\$587,000	Includes construction management, quality control, surveying, geotechnical testing, and quality control testing.
SUBTOTAL					
Institutional Controls	1	LS	\$40,500	\$40,500	Forest Plan amendment, legal description for ARIC, and legal fees. Includes reproduction.
TOTAL CAPITAL CONSTRUCTION COSTS:				\$5,500,298	
Inspections and Maintenance					
Quarterly Inspections	4	events/year	\$ 300	\$ 1,200	Quarterly inspections to evaluate the integrity of all cover elements, the drainage control system, and the stormwater system. Inspections to be conducted in conjunction with performance monitoring of the LFG system. LUC inspection will be conducted once per year during one of the inspection events.
Final cover and vegetation maintenance	2	events/year	\$ 7,800	\$ 15,600	Maintenance for the first 2 years after cap completion, which is assumed to require more effort than the following years of maintenance. This maintenance includes 3 days of on-site work on cap and vegetation maintenance. Includes labor, material, and equipment.
Monthly Performance Monitoring					
LFG system	12	months	\$ 1,700	\$ 20,400	Monthly sampling of the cap LFG system (two passive vents) to establish a baseline and determine seasonal fluctuations. Assumes no report.
Quarterly Performance Monitoring					
Perimeter LFG system	4	events/year	\$ 9,500	\$ 38,000	To be conducted concurrently with every 3rd month of monthly LFG system monitoring.
SUBTOTAL				\$75,200	
Contingency	25%			\$ 18,800	10% scope + 15% bid
SUBTOTAL				\$94,000	
Project Management	6%			\$6,850	
Technical Support	5%			\$5,300	
TOTAL ANNUAL O&M COSTS:				\$106,150	Years 1 and 2
Inspections and Maintenance					
Quarterly Inspections	4	events/year	\$ 300	\$ 1,200	Quarterly inspections to evaluate the integrity of all cover elements, the drainage control system, and the stormwater system. Inspections to be conducted in conjunction with performance monitoring of the LFG system. LUC inspection will be conducted once per year during one of the inspection events.
Final cover and vegetation maintenance	2	events/year	\$ 6,900	\$ 13,800	This maintenance includes 2 days of light on-site work on cap and vegetation maintenance. Includes labor, material, and equipment. Following the first 2 years, maintenance is anticipated to be less frequent and less intensive.

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OPERATION, MAINTENANCE, AND MONITORING COSTS (YEARS 3 THROUGH 5) <i>(continued)</i>						
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES	
Quarterly Performance Monitoring						
LFG system	4	quarter	\$ 11,200	\$ 44,800	Quarterly sampling of the entire LFG system (cap and perimeter). Quarterly performance monitoring to be conducted in conjunction with the quarterly inspections.	
SUBTOTAL				\$59,800		
Contingency	25%			\$ 14,950	10% scope + 15% bid	
SUBTOTAL				\$74,750		
Project Management	6%			\$4,600		
Technical Support	5%			\$3,600		
TOTAL ANNUAL O&M COSTS:				\$82,950	Years 3 through 5	
OPERATION, MAINTENANCE, AND MONITORING COSTS (YEARS 6 THROUGH 30)						
Inspections and Maintenance						
Quarterly Inspections	4	events/year	\$ 300	\$ 1,200	Quarterly inspections to evaluate the integrity of all cover elements, the drainage control system, and the stormwater system. Inspections to be conducted in conjunction with performance monitoring of the LFG system. LUC inspection will be conducted once per year during one of the inspection events as well.	
Final cover and vegetation maintenance	2	events/year	\$ 6,900	\$ 13,800	This maintenance includes 2 days of light on-site work on cap and vegetation maintenance. Includes labor, material, and equipment. Following the first 2 years, maintenance is anticipated to be less frequent and less intensive.	
Semiannual Performance Monitoring						
LFG system	2	events/year	\$ 11,200	\$ 22,400	Semiannual sampling of the entire LFG system (cap and perimeter) for the subsequent 25 years.	
SUBTOTAL				\$15,000		
Contingency	25%			\$ 3,750	10% scope + 15% bid	
SUBTOTAL				\$18,750		
Project Management	25%			\$4,600		
Technical Support	19%			\$3,600		
TOTAL ANNUAL O&M COSTS:				\$26,950	Years 6 through 30	
PERIODIC COSTS						
Five-Year Review Report	5	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 5. Modeling and maps to be prepared at the end of Year 5. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.
Stormwater Monitoring	5	1	LS	\$ 1,950	\$ 1,950	Costs for out of sequence stormwater monitoring inspection triggered by a major storm event (as defined by TRPA).
SUBTOTAL (YEAR 5)					\$ 47,150	
Five-Year Review Report	10	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 10. Modeling and maps to be prepared at the end of Year 10. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.
Emergency Response	10	1	LS	\$ 3,550	\$ 3,550	Assumes no major repair required following emergency event. Includes landfill inspection after major earthquake, storm, explosion, or fire that may exceed site design that could require emergency response actions. Also includes testing and recommendations. Assumes emergency response event every 10 years.
Stormwater Monitoring	10	1	LS	\$ 1,950	\$ 1,950	Costs for out of sequence stormwater monitoring inspection, triggered by a major storm event, as defined by TRPA.
Regulatory Compliance	10	1	LS	\$ 6,500	\$ 6,500	Allowance for resolving potential violations of institutional controls. Assumes one violation to be resolved every 10 years.
SUBTOTAL (YEAR 10)					\$ 57,200	
Five-Year Review Report	15	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 15. Modeling and maps to be prepared at the end of Year 15. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.

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PERIODIC COSTS (continued)

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL (YEAR 15)					\$ 45,200	
Five-Year Review Report	20	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 20. Modeling and maps to be prepared at the end of Year 20. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.
Emergency Response	20	1	LS	\$ 47,750	\$ 47,750	Costs for major repairs such as checking liner, concrete repair, resetting culvert, reinstalling LFG enclosure, etc., following emergency event. Includes landfill inspection after major earthquake, storm, explosion, or fire that may exceed site design that could require emergency response actions. Also includes testing and recommendations. Assumes emergency response event every 20 years.
Regulatory Compliance	20	1	LS	\$ 6,500	\$ 6,500	Allowance for resolving potential violations of institutional controls. Assumes one violation to be resolved every 10 years.
SUBTOTAL (YEAR 20)					\$ 99,450	
Five-Year Review Report	25	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 25. Modeling and maps to be prepared at the end of Year 25. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.
SUBTOTAL (YEAR 25)					\$ 45,200	
Five-Year Review Report	30	1	LS	\$ 45,200	\$ 45,200	Preparation of one report at the end of Year 25. Modeling and maps to be prepared at the end of Year 25. Also includes landfill status reports for applicable regulatory agencies and LUC plan updates.
Emergency Response	30	1	LS	\$ 3,550	\$ 3,550	Assumes no major repair required following emergency event. Includes landfill inspection after major earthquake, storm, explosion, or fire that may exceed site design that could require emergency response actions. Also includes testing and recommendations. Assumes emergency response event every 10 years.
Regulatory Compliance	30	1	LS	\$ 6,500	\$ 6,500	Allowance for resolving potential violations of institutional controls. Assumes one violation to be resolved every 10 years.
SUBTOTAL (YEAR 30)					\$ 55,250	

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.8%)	PRESENT VALUE
Capital Cost	0	\$5,500,298	\$5,402,008	1.000	\$ 5,500,298
Annual O&M Cost	1-2	\$ 212,300	\$106,150	0.960	\$ 203,705
Annual O&M Cost	3-5	\$ 248,850	\$82,950	0.896	\$ 222,882
Annual O&M Cost	6-30	\$ 673,750	\$26,950	0.620	\$ 418,023
Periodic Cost	5	\$ 47,150	\$ 47,150	0.871	\$ 41,069
Periodic Cost	10	\$ 57,200	\$ 57,200	0.759	\$ 43,398
Periodic Cost	15	\$ 45,200	\$ 45,200	0.661	\$ 29,870
Periodic Cost	20	\$ 99,450	\$ 99,450	0.576	\$ 57,246
Periodic Cost	25	\$ 3,550	\$ 45,200	0.501	\$ 22,663
Periodic Cost	30	\$ 55,250	\$ 55,250	0.437	\$ 24,129
		\$6,942,998			\$6,563,282

TOTAL PRESENT VALUE OF SELECTED REMEDY **\$6,563,282**

Notes:

1. Source: Office of Management and Budget, 2008. OMB Circular No. A-94. January. Online at: <http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html>.

ARIC = area requiring institutional controls

CAM = California Assessment Manual

CY = cubic yards

ea = each

LF = linear feet

LFG = landfill gas

LLDPE = linear low-density polyethylene liner

LS = lump sum

LUC = land use control

O&M = operation and maintenance

OM&M = operation, maintenance, and monitoring

OU = Operable Unit

SF = square feet

SY = square yard

TRPA = Tahoe Regional Planning Agency

