SCS ENGINEERS







Partial Final Closure and Post-Closure Maintenance Plan

14.4 Acre South Face Slope Area
Central Disposal Site
Sonoma County, California

Prepared for:

Keller Canyon Landfill Company Inc.
901 Bailey Road
Pittsburg, California 94565

Prepared on behalf of:

County of Sonoma Department of Transportation and Public Works

Prepared by:

SCS ENGINEERS
6601 Koll Center Parkway, Suite 140
Pleasanton, California
(925) 426-0080

March 30, 2011
File No. 01210155.00

CERTIFICATION

This report entitled "Partial Final Closure and Post-Closure Maintenance Plan, 14.4-Acre South Face Slope Area, Central Disposal Site, Sonoma County California", dated March 2011 was prepared under my direct supervision in accordance with California Code of Regulations Title 27 Sections 20950, 21769 and 21800.

I hereby certify that the Partial Final Closure and Post-Closure Maintenance Plan Document submitted herein is to the best of my knowledge true, accurate and complete.

March 30, 2011

Date

Joseph J. Miller, P.E., Project Director
California RCE No. 042598

SCS Engineers
6601 Koll Center Parkway, Suite 140
Pleasanton, California 94566
925-426-0080

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LIST OF ACRONYMS AND ABBREVIATIONS

ACB	articulated concrete blocks
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
CARB	California Air Resources Board
CCR	California Code of Regulations
CDS	Central Disposal Site
cfd	cubic feet per day
CFR	Code of Federal Regulations
CNG	compressed natural gas
COC	constituent of concern
COD	chemical oxygen demand
County	County of Sonoma
CPP	corrugated plastic pipe
CQA	construction quality assurance
CSP	corrugated steel pipe
DAR	Delineation Assessment Report
ERP	Emergency Response Plan
ft/ft	feet/foot
GCL	geosynthetic clay liner
GHG	greenhouse gas
gpd	gallons per day
gpm	gallons per minute
HDPE	high density polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
JTD	Joint Technical Document
LCRS	leachate collection and removal system
LEA	Local Enforcement Agency
LEL	lower explosive limit
LF-1	1971-Permitted Landfill at Central Disposal Site
LF-2	East Canyon Expansion at Central Disposal Site
LFG	landfill gas
LFGTE	landfill gas to energy
MPE	maximum probable earthquake
MRP	Monitoring and Reporting Program
MSL	mean sea level
MSW	municipal solid waste
MW	megawatt
OMC	optimum moisture content
PFCPMP	Partial Final Closure and Post-Closure Maintenance Plan
PFPMP	Partial Final Post-Closure Maintenance Plan
PHGA	Peak Horizontal Ground Acceleration
RC	relative compaction
REA	Rock Extraction Area

LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

RWQCB	California Regional Water Quality Control Board, North Coast Region
scfm	standard cubic feet per minute
SCS	SCS Engineers
SWFP	Solid Waste Facility Permit
SWRCB	State Water Resources Control Board
T/PF	Transfer/Processing Facility
TDS	total dissolved solids
tpd	tons per day
US EPA	United States Environmental Protection Agency
USLE	Universal Soil Loss Equation
VOC	volatile organic compound
WDID	Waste Discharge Identification Number
WDR	Waste Discharge Requirement
WQPS	Water Quality Protection Standards

1.0 INTRODUCTION

1.1 BACKGROUND

This Partial Final Closure and Post-closure Maintenance Plan (PFCPMP) has been prepared for the approximate 14.4-acre area in the lower elevations of the Landfill 1 (LF-1) "South Face" area at the Central Disposal Site (CDS). The CDS is an existing Class III Municipal Solid Waste (MSW) landfill located in Sonoma County, California. The CDS is owned by the Sonoma County Department of Transportation and Public Works (County) and has been in operation since 1971.

MSW disposal operations at the CDS were temporarily suspended over the period of October 2005 through August 2010, during which time the County and other jurisdictions in Sonoma County utilized alternate landfill sites to meet their disposal needs. On September 8, 2010, the County resumed MSW disposal operations within previously-constructed, lined waste management units.

The County proposes to construct new waste cells within the currently-permitted refuse disposal boundary areas, resume MSW filling operations in accordance with all applicable regulatory and permit requirements including the daily tonnage limits specified in the existing Solid Waste Facility Permit (SWFP), and implement partial final closure over approximately 14.4 acres (plan area) over a fill slope known as the South Face.

Details on waste management unit classification and siting, proposed new cell design and construction standards, proposed future landfill operating criteria, waste handling provisions, and environmental controls are provided in the companion document prepared by SCS Engineers (SCS) on behalf of the County and entitled: *Amended Joint Technical Document* (JTD), *Central Disposal Site, Sonoma County California*, dated March 2011. The companion Amended JTD also includes a Preliminary Closure and Post-Closure Maintenance Plan for the proposed final landfill configuration at the CDS. At final closure, the proposed landfill footprint will occupy approximately 172.8 acres as specified in the existing SWFP.

The 14.4-acre plan area identified for partial final closure is within the lower elevations of the existing slope on the South Face area of the CDS. The 14.4-acre area has been filled to final grades and no further waste placement is proposed for this area. The County proposes to implement partial final closure of the South Face area in a manner that compliments future site development and operation, as described in the companion Amended JTD. This PFCPMP document provides details on proposed partial final closure and post-closure maintenance activities and was prepared as required by Title 27 of the California Code of Regulations (27 CCR).

1.2 PURPOSE AND SCOPE

This PFCPMP has been prepared for submittal to CalRecycle, the California Regional Water Quality Control Board (RWQCB) North Coast Region, and the Sonoma County Department of Health Services, Environmental Health Division acting as the Local Enforcement Agency (LEA).

Partial final closure entails closure of a discrete waste management unit or area within a disposal site consistent with the approved closure and post-closure maintenance plans as defined by 27 CCR §21090. Final closure plans for partial final closures are to be prepared in accordance with 27 CCR §21800 and contain all required items pursuant to 27 CCR §21790(b)(1) through (b)(8). While Final Closure plans are to be submitted two years prior to the anticipated date of closure, the County has identified this partial final closure for immediate construction contingent on regulatory approval. An expedited partial final closure is proposed to enhance overall environmental protection features at the CDS.

All provisions of this plan are designed toward achievement of the closure performance standards as required by 27 CCR, Division 2, Chapter 3, Subchapter 5, Article 2 and Title 40, §258 (Subtitle D) of the Code of Federal Regulations (CFR). Partial final closure measures proposed herein are also consistent with RWQCB requirements and conditions of approval for a recently-prepared final closure plan for LF-1 (GeoSyntec, 2008; RWQCB 2010).

Implementation of the improvements described in this PFCPMP will ensure that the CDS will be closed in such a manner as to protect the public health, safety, and the environment, and ensure that adequate resources are available to properly accomplish the partial final closure. Per 27 CCR §21820, this PFCPMP also provides cost estimates in current dollars ($2011) for the County to hire a third party to close the slope area in accordance with the design presented herein.

1.3 SITE HISTORY, PERMIT STATUS AND PROPOSED IMPROVEMENTS

1.3.1 Site History

The CDS property encompasses 398.5 acres, which includes two landfill areas: the existing LF-1 (also known as the 1971 Permitted Area), and the partially-constructed East Canyon Expansion Unit known as Landfill 2 (LF-2). MSW disposal operations at LF-1 took place over the period 1971 to 2003. Refuse filling at LF-2 commenced in August 2002 and it is the currently-active landfill area.

LF-1 was filled down-canyon, from north to south, and consists of an upper and lower unit. The upper unit is the original 1971 landfill and the location of the current green/wood waste composting operations. The lower canyon of LF-1, was constructed in 1988, and designed with a clay-lined dendritic leachate collection and recovery system (LCRS). These barriers and liquid capture systems were state of the art practice when installed (Shaw Environmental, 2005). However, LF-1 is considered an unlined, “existing” Class III landfill under current 27 CCR regulatory standards. With the exception of closure, LF-1 is exempt from current liner requirements (RWQCB, 2004). The County must comply with 27 CCR and federal Subtitle D requirements for monitoring and corrective action.

The 14.4-acre area in the lower elevations of the South Face slope was filled to existing grades as part of MSW filling in the lower canyon of LF-1.

LF-2 was originally designed to have four main phases to complete the cell footprint. Phases I and II, which occupy approximately 20 plan area acres, have been constructed and partially

filled. These cells were constructed with engineered alternative composite base liner systems, which were approved by oversight agencies based on demonstration of performance criteria in current 27 CCR and federal Subtitle D regulations at LF-1.

1.3.2 Landfill Permits

The CDS operates under SWFP 49-AA-0001, issued by CalRecycle in September 2005. The SWFP allows 7 day per week operation, and a maximum disposal rate of 2,500 tons per day (tpd). The maximum permitted elevation specified in the SWFP is 565 feet above mean sea level (MSL).

The facility is also subject to Waste Discharge Requirement (WDR) No. R1-2004-0040, issued by the RWQCB, for continued operation and corrective action related to contaminant releases first detected in 1995. The County has since implemented various corrective actions, described in detail in the companion Amended JTD (SCS, 2011). Per the WDRs, the total permitted area for refuse disposal at this time is within the currently-filled approximate 130 acre footprint area.

The CDS is also operated in accordance with the Major Facility Review Permit (Title V Operating Permit) for Facility #A2254, as administered by the Bay Area Air Quality Management District (BAAQMD). The Title V permit specifies requirements for operation of the landfill, landfill gas (LFG) collection and control system, and various on-site combustion devices with potential to affect air quality.

Various landfill leachate extraction and control systems are in place at the CDS, as described herein. Collected leachate is pumped via a force-main pipeline for discharge to the City of Santa Rosa Waste Water Treatment Plant (Subregional Wastewater Reclamation System). Discharge is in accordance with City of Santa Rosa Industrial Waste Discharge Permit No. SR-IW5202, and Waste Discharge Identification Number (WDID) 1SS011652 issued by the RWQCB.

1.3.3 Proposed Future Site Development and Partial Final Closure

The County proposes to construct new waste cells within the currently-permitted refuse disposal boundaries, continue refuse filling in areas where new base liners will be constructed and over wastes previously placed in LF-1 and LF-2, and implement partial final closure in the South Face area of LF-1. Major elements of the project described herein and in the companion Amended JTD include:

- Installation of engineered base liners in previously unfilled floor areas within the LF-2 East Canyon expansion area. This will be undertaken via two discrete construction phases, designated as Phases III and IV (to complement the previously constructed Phase I/II areas of LF-2.

- Installation of an engineered base liner in the previously unfilled floor of what is known as the Rock Extraction Area (REA) of LF-1.

- Refuse filling in areas where new base liners will be constructed and over wastes previously placed in LF-1 and LF-2.

- Partial final closure of the approximate 14.4-acre plan area within the South Face of LF-1, as described in this PFCPMP. This capital improvement project will be undertaken concurrent with construction of the first *new* waste cell in LF-2 (Phase III or IV; refer to companion Amended JTD).

- Proper abandonment/well destruction of groundwater monitoring wells and piezometers located in the footprint of proposed future waste filling activities, and removal of these points from the Monitoring and Reporting Program (MRP) for the CDS. The County has proposed other modifications to the MRP to be more consistent with the statistical methods used to establish Water Quality Protection Standards (WQPS) for groundwater and surface water. These proposed modifications are detailed in the companion Amended JTD.

Details on base liner design, and future landfill phasing and grading plans are provided in the companion Amended JTD (SCS 2011). Per these plans, the waste disposal footprint will be increased from the aggregate 130 acres to 172.8 acres (plan areas). The current SWFP allows filling over the entire 172.8-acre area contingent on revised WDRs allowing construction of new waste cells within that area.

1.4 SUMMARY OF PROPOSED PARTIAL FINAL CLOSURE ACTIVITIES

The CDS facility is seeking partial final closure of the approximate 14.4-acre plan area within the lower elevations of the South Face of LF-1. Partial final closure activities will consist of clearing and grubbing of vegetation in the work area; re-grading of landfill slopes; temporary decommissioning and replacement of existing LFG and leachate extraction well conveyance piping; placement of a final cover system consistent with 27 CCR and RWQCB requirements; installation of drainage and erosion controls; and re-vegetation of the completed fill slopes. Preliminary Design Drawings (Sheet 1 through 6) for the 14.4-acre South Face area partial final closure are presented in ***Appendix A***.

The County intends to conduct the partial closure and new waste cell construction projects concurrently to save costs and expedite the completion of these projects. Permit updating and issuance of new WDRs will also be completed prior to commencement of these construction projects.

As required in 27 CCR § 21780, CalRecycle requirements cross-referencing the contents of this document are provided in ***Appendix B***. A similar index cross-referencing California State Water Resources Control Board (SWRCB) requirements with this PFCPMP is also provided in ***Appendix B*** as required under 27 CCR §21769. These indices are provided to aid the reviewer in establishing that all applicable requirements for the PFCPMP have been addressed. Where applicable, regulatory citations relevant to the various text sections of this PFCPMP are highlighted in *italics* to further aid review.

2.0 GENERAL SITE INFORMATION

2.1 SITE LOCATION

The CDS is located at 500 Mecham Road, in Petaluma. The site is bounded by Mecham Road to the east and Hammel Road to the south and is located at latitude 38 degrees, 18 minutes north and longitude 122 degrees, 45 minutes west. A vicinity map is provided in ***Figure 1***. A site location map is provided in ***Figure 2***. The CDS is located on APN-24-080-19, as identified in the Sonoma County Assessor's Map. A Site Plan is provided in ***Figure 3***.

2.2 FACILITY OWNER/OPERATOR

The CDS is owned by the County. The County is also the legal operator of record, as stated in the SWFP, and will continue to act in the capacity of owner/operator. The owner/operator's business address is as follows:

Sonoma County Department of Public Works and Transportation
2300 County Center Drive Suite B-100
Santa Rosa, California 95403
Telephone: 707-565-2231

From 1971 until October 2005, the County was responsible for day-to-day landfill operations. Disposal operations were temporarily suspended over the period October 2005 through August 2010. Beginning in September, 2010, the County contracted for day-to-day disposal operations with Keller Canyon Landfill Company, Inc., a subsidiary of Republic Services, Inc. The initial term of the operations contract is for two years; there are two 1-year extension options.

2.3 SITE PLAN

27 CCR §21600(b)(1)(B)

2.3.1 Key Site Features

A site plan showing property boundaries, current topography, limits of fill placement, buffer areas, and other key site features is shown in ***Figure 3***. The location of the 14.4-acre area within the South Face of LF-1 and proposed for partial final closure is also shown in ***Figure 3***.

The CDS property encompasses 398.5 acres. Per the conditions of SWFP 49-AA-0001, approximately 172.8 acres (plan area) will be allowed for MSW filling contingent on issuance of revised WDRs. To date, approximately 130 acres (plan area) have been used for MSW disposal. Both the permitted disposal area boundaries and previously filled disposal areas are shown on ***Figure 3***.

Site elevations range from approximately 220 to 675 ft MSL. Current landfill elevations range from approximately 250 to 540 ft MSL at LF-1, and 250 to 340 ft MSL at LF-2. Elevations of the 14.4-acre South Face area of LF-1 range from approximately 250 to 430 ft MSL.

Approximately 11.7 acres of what is known as the REA lie within the existing permitted disposal area. The location of the REA is shown in ***Figure 3***. Under a lease agreement between the County and Stony Point Rock Quarry Inc., approximately 700,000 cubic yards of rock were removed from this area prior to December 2001. The rock, primarily fractured shale and sandstone, was processed and sold by Stony Point Quarry. Soil excavated from the REA was used for daily and intermediate cover at LF-1. The rock extraction project was considered an independent, stand-alone project from the landfill operations. The REA has not been used for MSW disposal as of this date. The County proposes to construct an engineered base liner and other containment features in the REA and utilize it for future MSW filling, as described in the companion Amended JTD (SCS, 2011).

On site soils excavated during construction of LF-2, Phases I and II were placed in a stockpile area located to the west of the 14.4-acre area proposed for partial final closure. The location of the soil stockpile area is shown in ***Figure 3***. Reportedly, as of September 2010, approximately 590,000 bank cubic yards of excavated soil material were placed in the stockpile area. These soil materials have suitable properties for use in daily, intermediate, and final cover construction.

Areas outside of the permitted fill boundary within the larger County-owned CDS property include other MSW management facilities (operating under separate permits), ancillary facilities including equipment maintenance and the County administrative buildings. Other MSW management facilities shown on ***Figure 3*** include the public Transfer/Processing Facility (T/PF), Household Toxics Facility, recyclable materials/re-use drop-off area, clean fuel facility, and LFG to energy (LFGTE) facility. Under a separate lease agreement and permit, a green waste compost facility currently operates on the northern portion of LF-1. Additional information on these ancillary facilities is provided in **Section 2.5** below.

A permanent buffer zone, ranging in plan area width from 220 to 1,500 feet, is located on the northern and eastern sides of the Household Toxics Facility and recycling areas (GeoSyntec, 2005). Trees have been planted in these areas to provide visual screening of the northern part of the CDS property. The remaining areas of the buffer zone remain as native open grassland.

2.4 SITE SECURITY AND ACCESS

27 CCR §21600(b)(5)(B), §20520 and §20530

The regulations require landfill owner/operators to discourage unauthorized access by persons or vehicles. The CDS has public and non-public access points at Mecham and Hammel Roads, respectively. The gated, main public site entrance is at Mecham Road (***Figure 3***). From the main entrance, a paved access road leads to the County administrative office and the T/PF entrance. All waste delivery vehicles, including self-haul, packer trucks, roll-offs and commercial vehicles are directed via signs to the T/PF for MSW tipping or recyclable materials/Household Toxics Facility drop off via this main access road. The public and all waste delivery vehicles exit the T/PF and the site via the same paved access road.

Currently, access to the CDS active disposal areas is restricted to open top transfer truck/trailers only, which originate from the Central T/PF (see below) or other in-County transfer stations. The general public and commercial vehicles do not have access to active landfill MSW disposal areas.

A gravel surface road provides site access for utility and service vehicles from Hammel Road. A third gated entrance, located on Hammel Road west of the leachate ponds, was constructed in 1998 to provide access to the REA (then used as a quarry). A fourth entrance on Hammel Road near Mecham Road provides utility and service vehicle access to the underdrain pump stations at LF-2 as well as Sedimentation Ponds Nos. 5 and 6. These entrances may be used by contractors during construction of partial final closure improvements.

Easily visible signs placed at the site entrance identify the site name, owner and operator, which materials are and are not accepted, hours of operation, and general health and safety information. This signage is consistent with requirements in 27 CCR §20520. Internal signs direct customers to the appropriate MSW management facilities including the T/PF, recycling areas, Household Toxics Facility drop-off area, or the green waste compost area.

All public ingress and egress to the T/PF are via the paved access road as described above. Internal haul roads leading to the green waste compost area (which currently overlies an inactive portion of LF-1) have gravel surfacing. Use of paved or gravel roads minimizes the generation of dust and tracking of materials onto Mecham Road and Hammel Road and is consistent with 27 CCR §20540 requirements.

2.5 ANCILLARY FACILITIES

27 CCR §21600(b)(3)(F)

Ancillary facilities related to MSW disposal operations at the CDS include the County administrative office, an equipment maintenance building, surface water sedimentation basins, lined leachate holding ponds, and an LFG flaring station. A plot plan showing these ancillary facilities is provided in ***Figure 3***.

There are other non-landfill facilities or operations within the larger County-owned CDS property associated with MSW management, that currently operate or will operate under separate permits. Brief descriptions of these facilities and operations are listed below.

2.5.1 Transfer/Processing Facility

The T/PF is located on the north side of the main access road, and north of the County administration office (***Figure 3***). The County is in process of separately permitting this facility and adjacent recycling and Household Toxics Facility operations as a large-volume T/PF under the state's tiered solid waste facility permitting program. The T/PF building consists of an approximate 33,900 sq ft steel-frame structure enclosed on three sides. The T/PF is open to the public the same hours as the landfill is permitted to operate (the landfill is closed to the public), and is currently permitted to receive up to 2,500 tpd of MSW.

At the T/PF building, public self-haul vehicles and commercial and franchise hauler collection vehicles are directed to unloading bays. MSW loads are then dumped onto a concrete tip floor. Rubber-tired front-end loaders are used to push refuse from the tipping floor into large-volume top-loading transfer trailers. The transfer trailer vehicle access is from the below-grade loading bays. From there, refuse is transferred to the active face of the CDS landfill, or out-hauled to other alternate permitted disposal sites located outside of Sonoma County.

Records of waste disposal rates at CDS (tons transferred and disposed) are maintained by the County. A certified scale in the loading bays is used to determine tare and net weights of all outbound transfer vehicles, including those destined for the active face of the CDS.

2.5.2 Household Toxics Facility

A Household Toxics Facility collection center is located north of the main access road and east of the T/PF building (***Figure 3***), in the overall T/PF improvement area. The facility serves as a drop-off point where the general public and qualified small quantity commercial generators can deliver the hazardous materials. The materials are temporarily stored at the Household Toxics Facility building and then transported to other facilities for recycling, treatment, or disposal. The location of the facility makes it convenient for customers to drop off their materials on their way to the T/PF. This reduces the potential for disposal of hazardous materials at the CDS or other out-of-county landfills.

2.5.3 Recycle / Re-Use Area

A public drop-off area for recyclable materials is located adjacent to the T/PF building. It consists of an upper level public tipping area, separated from a lower level by a "Z-wall" retaining structure. Customers drop their recyclable materials into bins on the lower level. The T/PF and recycle area site operator has access to the lower level and replaces the bins when full. The recycling/re-use facility also includes a waste oil recycling building at the southeast corner of the overall T/PF improvement area

2.5.4 Compost Operations

The Central Compost Site, a green waste composting facility, is operated within a 35-acre area on the northern top deck area of LF-1 (***Figure 3***). The facility operates under SWFP No. 49-AA-0260 issued by CalRecycle. The County is the permit holder; the firm Sonoma Compost operates the facility under a lease agreement with the County.

The Central Compost Site is permitted to be open to the public 7 days per week between the hours of 7:00 a.m. and 4:00 p.m. Due to budget constraints, the compost facility has temporarily limited operating hours between 7:00 a.m. and 3:00 p.m., Monday through Saturday. The facility is permitted to receive and process up to 623 tpd of untreated wood debris, yard debris, agricultural waste and food waste. These materials are processed through a tub grinder to reduce volume, and then placed in windrow-type aerobic compost piles. The windrows are located on a concrete pad. The finished compost product is sold as a soil amendment.

Customers with clean green and wood waste debris enter the facility via the main paved entrance for the CDS, and then proceed to the Compost Site via an internal gravel access road. The permit specifies a traffic limit of 206 vehicles per day.

The Central Compost Site operating permit has specific conditions for material intake, tub grinder operation, stockpile dimensions, water runoff, odor, vector, noise, and litter controls. These conditions are enforced by the RWQCB and LEA as applicable.

The Central Compost Site location overlies landfilled wastes within LF-1. However, the 14.4-acre partial final closure area in the South Face of LF-1 is physically separated from these operations and no conflicts are anticipated for the partial final closure project.

2.5.5 Landfill Gas-to-Energy and Clean Fuel Facilities

An LFG collection and control system has been installed at the CDS. The LFG system is operated in accordance with 27 CCR requirements for subsurface combustible gas migration control, BAAQMD regulations, and a federal Title V operating permit. The extraction system consists of a network of LFG vertical wells and horizontal collectors installed in LF-1 and LF-2 fill areas.

The gas is collected by vacuum blowers and routed via above- and below-grade piping systems to an 8.0 megawatt (MW) capacity LFGTE facility. The LFGTE location is shown in ***Figure 3***. The power plant consists of 10 internal combustion engine-generator sets, rated for a cumulative fuel intake of up to 4 million cubic feet per day (cfd) of LFG. This capacity is equivalent to approximately 2,800 standard cubic feet per minute (scfm). Electric power generated at the LFGTE is used to power many of the on-site facilities but the majority of electricity produced is sold to the Power and Water Resources Pooling Authority, of which Sonoma County is a participant. During engine downtime (for scheduled or unscheduled maintenance), LFG is routed to an enclosed ground flare for thermal gas destruction.

In 2007, the County constructed a pilot-scale compressed natural gas (CNG) fueling facility. This clean fuel facility uses membrane technology to convert LFG to CNG fuel for County-owned transit vehicles. The facility can process up to 100 scfm of LFG. The CNG facility operates as a closed loop system where all by-product gases are re-circulated and thermally destroyed in the LFGTE engines or the LFG flare.

2.5.6 Metals Recycling

A metals sorting/baling operation is conducted by a private operator under contract to the County in a designated area on the top deck of LF-1 (***Figure 3***). A diesel-powered baler is used to compress large-volume scrap metal items into bales that are then hauled off-site to metal recycling facilities. A grapple-crane integrally mounted to the baler unit feeds scrap materials into the compression chamber. This crane is also used to direct-load bales onto trucks for off-site hauling.

3.0 ENVIRONMENTAL SETTING

3.1 SITE TOPOGRAPHY

The CDS property is located in the northern California Coast Ranges, in an area of Sonoma County that is characterized by rolling hills and open range land. A northwest-southeast trending ridge line extends along the eastern and northern portions of the property that separates surface water drainage basins to the north and south. Ground surface elevations along this ridge line range from approximately 545 to 655 feet above MSL. Ground surface elevations along the southern CDS property boundary range from approximately 195 feet to 265 feet above MSL (RMC GeoScience, 2002).

Numerous small intermittent south-southwest flowing creeks drain the hills around the property and discharge into Stemple Creek. Stemple Creek is located approximately 1,000 feet south of the CDS southern property.

3.1.1 Pre-Disposal Topography

A site plan showing pre-disposal topography is presented in ***Figure 4***. This plan was prepared as part of a previous study using photogrammetric methods based on 1968 aerial photographs of the site (RMC GeoScience, 2002).

3.1.2 Current Topography

The Site Plan presented on ***Figure 3*** depicts the most recent aerial topography of the existing landfill and pre-disposal topography of the expansion areas, as of 2007.

3.1.3 Proposed Final Grades

The proposed contours for the South Face LF-1 development are shown on the Phase I Partial Final Closure sheets presented in ***Appendix A***. Proposed contours for final closure of the entire site are presented in ***Figure 5***. The design of the final grading plan for the entire site is controlled by the surrounding topography, the existing limits of the refuse fill, refuse and soil consolidation and settlement considerations, slope stability requirements, minimum surface gradients required to adequately drain the completed fill, drainage requirements for the stormwater drainage control facilities, and aesthetics. These design considerations are described in detail in the companion Amended JTD and Preliminary Final Closure Plan (SCS 2011).

3.2 GEOLOGY AND UNDERLYING SOILS

3.2.1 Regional Geology

27 CCR §20240(d), §21600(b)(4)(A) and §21750(f)

The CDS is located in the Coast Ranges geomorphologic province. This province is characterized by northwest-trending ridges and valleys that parallel major folds and strike-slip faults. Sonoma County consists of two structural blocks: the Santa Rosa Block and the Sebastopol Block. The CDS is located within the eastern margin of the Sebastopol Block, which

is bounded to the east by the Tolay fault and to the west by the San Andreas Fault (Woodward-Clyde Consultants, 1997).

The following geologic units (from oldest to youngest) are present in the region: the Franciscan Complex, the Sonoma Volcanics, the Petaluma Formation, the Wilson Grove Formation, and alluvial/colluvial deposits. Each geologic unit is discussed in detail below. A regional geologic map is provided as ***Figure 6***.

3.2.2 Franciscan Complex

The Franciscan Complex dates to between Late Jurassic and Late Cretaceous (165 to 65 million years ago). The Franciscan is the basement unit in the region. The unit is characterized as deformed, uplifted, and eroded marine sandstones and shales mixed with chert and mafic igneous rock. This unit formed as an accretionary prism in a subduction zone, which led to the intense folding and faulting, along with a varying degree of low-grade metamorphism. Typically, the Franciscan is relatively impermeable, with most, if not all, groundwater occurring in open fractures.

3.2.3 Sonoma Volcanics

The Sonoma Volcanics are Late Miocene to Pliocene in age (7.1 to 5.5 million years old) and consist of basalt, dacite, and andesite flows with interlayered rhyolite and ash flows (Fox, 1983). The Sonoma Volcanics are in erosional contact with the underlying Franciscan. Exposures in the region of this group are somewhat limited, typically occurring as erosional remnants that lie on the Franciscan basement.

3.2.4 Petaluma Formation

The Petaluma Formation consists of beds and lenses of poorly consolidated claystone, shale, siltstone, sandstone, and conglomerate with local interbeds of tuff or volcanic ash and diatomite. This geologic unit is located northeast of the Tolay Fault.

3.2.5 Wilson Grove Formation

The Wilson Grove Formation is Late Miocene to Pliocene age (11.2 to 1.6 million years old) (Wagner and Bortugno, 1982; Bedrossian, 1981). This formation is a near-shore marine sandstone that is characterized as consisting of massive sands and minor amounts of gravel and tuff (Fox, 1983). The lower portion of this formation contains an extensive pumaceous tuff layer that is relatively impermeable (Bedrossian, 1981). The total thickness is estimated to be 500 feet (Fox, 1983).

3.2.6 Alluvial/Colluvial Deposits

Quaternary alluvial and colluvial deposits are discontinuously present throughout the region. The alluvial deposits typically consist of layers of silt and clay with isolated lenses of sand and gravel (Huffman and Armstrong, 1980). The alluvial sediments are deposited along streams and creeks, and therefore, parallel those geomorphologic features.

The colluvial deposits form where bedrock is weathered; the sediment is transported down a slope, and accumulates at the base of the slope and in swales. Colluvial deposits can contain clay and silt, but can also contain larger fragmented rock that has eroded from the adjacent slope. Similar to colluvium, landslide deposits are common in the region. Landslide deposits differ in that they are typically larger erosion events that occur during a rapid timeframe. Landslide deposits are also limited to the base of slopes and swales. Site-specific geologic conditions, including landslide potential, are described below.

3.2.7 Site Geology

The CDS property is composed of three canyons: the east, central, and west canyons. Refuse filling has been confined to the central and east canyon areas. As is typical for the region, the canyons consist of bedrock canyon walls and alluvial/colluvial valleys. The Franciscan Complex, Wilson Grove Group, Sonoma Volcanics, and alluvium/colluvium are the geologic units present at the site. The Dunham Fault and a small unnamed fault pass through the southwest portion of the site. The locations of the geologic units and features are presented in ***Figure 7***.

The Franciscan Complex underlies the fill areas, and is present over the majority of the site. Boring logs from this unit indicate that massively bedded sandstone, shale, and metavolcanic lithologies exist. Boring logs also indicate that the northern portion of the site is underlain by a cemented sandstone and the southern area is underlain by a cemented shale and siltstone. Fractures are abundant in this unit, with open fracture occurring near the surface and filled fractures occurring at greater depths. The fractures vary in strike between northwest and northeast (GeoSyntec, 2005).

The Wilson Grove Formation is present along the northern and southern portions of the site, but outside of the fill areas. The formation is mapped as poorly consolidated deposits of pebbly, coarse sand, and tuff breccia to a white/tan siltstone with pebbles (EMCON/OWT, 2005).

The Sonoma Volcanics are located in a small area on the western portion of the CDS property. The unit is present between the Dunham and unnamed faults. Wells or exploratory borings have not been installed in this unit, so a more detailed description than the regional description of this unit is not available.

Alluvium and colluvium deposits are currenly present south of each fill area and to the east of LF-2. Prior to landfill development, the alluvium and colluvium deposits extended along the central and eastern canyon floors, but were excavated prior to waste placement in LF-1 and LF-2. The soils on site are within the Steinbeck-Los Osos association, which consist of the Steinbeck Loam, Los Osos Clay Loam, and Cotati Fine Sandy Loam. These soils are characterized as typically well-drained with low plasticity. Boring logs from the site indicate the alluvium and colluvium deposits are primarily silts and clays with minor sand and gravel content. Futhermore, GeoSyntec (2004) mapped the REA and found no evidence of the existence of large or deep bedrock landslides. Pre-existing earthflows and colluvium that could have been a landslide source were also removed. Cross-sections from LF-1 are provided in ***Figure 8***. Cross-sections of the 14.4-acre South Face partial final closure area are presented in ***Appendix A***.

3.3 REGIONAL FAULTS AND SEISMICITY

3.3.1 Faults and Earthquake Ground Motions

27CCR §20240(d)

Regional faults include the Tolay Fault, Dunham Fault, Bloomfield Fault, and Americano Fault (***Figure 6***). Of these faults, the Americano, Bloomfield, and Tolay Faults are potentially active, although there is no evidence of Holocene movement (GeoSyntec, 2005).

Other regional active faults further from the site include the Rodgers Creek (5.7 miles from site), San Andreas (15 miles), Maacama (15.5 miles), West Napa (20 miles), Hayward (27 miles), Green Valley (28 miles), and Concord Faults (36 miles). Of these faults, the Rodgers-Heraldsburg Fault is considered the governing seismic event for the site. According to the *Draft Preliminary Report, East Canyon Expansion, Central Landfill* (GeoSyntec, 1995), the Rodgers-Heraldsburg Fault is a strike-slip fault; has a moment magnitude of 7.0 Richter scale; estimated to be capable of producing a maximum probable earthquake (MPE) of 6.75 magnitude; and will produce a Peak Horizontal Ground Acceleration (PHGA) of 0.32 g from a MPE.

The Dunham Fault and a minor unnamed fault are present along the southwestern portion of the property. The Dunham Fault has been extensively studied (Cardwell, 1958; Hallenbeck and Associates, 1988; Huntingdon-Herzog and Associates, 1993; Woodward-Clyde Consultants, 1997; and GeoLogic Associates, 2002). The Dunham Fault separates the Franciscan Complex to the northeast from the Wilson Grove Formation to the southwest. The Dunham Fault is characterized as a four-mile long, northwesterly trending normal fault. A trench investigation by GeoLogic Associates (2002) indicated that movement along this fault has not occurred within the last 11,000 years, and therefore, the fault is considered inactive. The unnamed fault was discovered during a fault investigation by Huntingdon-Herzog and Associates (1993), and was identified as inactive due to the lack of recent movement. In addition, a fault in the East Canyon is identified in the WDRs Order No. R1-2004-0040 and by Huntingdon-Herzog and Associates (1993). However, during LF-2 construction, no evidence of this fault was identified in the canyon or on the side walls. EMCON/OWT (2005) indicated that the presence of this fault is questionable.

RMC Geoscience reviewed seismic activity data to evaluate whether measurable seismic activity may have occurred within or near the REA or previously identified unnamed fault at the northern end of the CDS property. This assessment was updated using data maintained by the Northern Earthquake Data Center to identify earthquakes with magnitudes greater than 1 that occurred between years 1900 and 2010 within approximately 5 kilometers of the landfill. The results of this evaluation show no historic seismic activity or micro-seismic activity has been recorded within the landfill boundaries. Results of this study, including mapping of seismic events, are provided in the companion Amended JTD (SCS, 2011).

3.4 SURFACE WATER HYDROLOGY

27 CCR §21600(b)(4)(A) and §21750

The CDS lies within the Bodega Hydrologic Unit, which is within the Estero San Antonio Hydrologic Area (Woodward Clyde Consultants, 1997). This unit is isolated from the adjacent Santa Rosa and Petaluma Basins by the foothills of the Roblar de la Miseria (GeoSyntec, 1995).

The CDS property is composed of three north-south trending canyons. Typical to the regional topography, each canyon is separated from the adjacent canyon by a ridge. The ridges provide surface water barriers, so that runoff flows from the ridge tops, down the slopes towards the canyon axis, and down topography along the canyon axis. At the site, prior to waste placement, each canyon drained southward, towards an ephemeral tributary to Stemple Creek. Presently, stormwater that comes in contact with the waste units is directed towards the sedimentation ponds south of the central and east canyons (***Figure 3***). Surface water in the western canyon that does not come into contact with the waste unit is diverted via berms away from the landfill to diversion ditches and culverts, and then to one of six sediment ponds. In addition, ridges are present along the eastern and northern portions of the property, which serve as surface water divides that hydrologically separate the site from adjacent areas.

Springs and seeps have been well-documented in this region. Typically, springs occur as surface water (precipitation) that infiltrates into the bedrock, is transported along fracture planes, and then is discharged along the canyon walls where the fractures intersect the ground surface. None of the 413 major springs identified in the region are located within a one-mile radius of the site (EMCON/OWT, 2005). However, several minor springs and seeps were documented prior to landfill development along the canyon walls (Terratech, 1970). Terratech (1970) estimated the flow from the springs in the central canyon to range between 0.2 to 0.7 gallons per minute (gpm), and identified the majority of the springs occurred along the eastern wall of the central canyon. Work conducted by Huntingdon-Herzog Associates (1993) estimated the flow rate for the east canyon springs to be between 3 and 25 gpm during April, and less than 0.1 gpm during July. They also estimated flow rates in the west canyon to range between less than 1 gpm to approximately 17 gpm in April to dry conditions in July and August.

A water balance study performed by RMC Geoscience (2005) estimated the groundwater infiltration rate to LF-1. It was concluded that because of the geologic similarity between LF-1 and LF-2, groundwater capture from the underdrain system at LF-2 provided the most reasonable means of estimating groundwater flows from springs at the CDS. Based on data for the period September 2002 through February 2005, it was estimated that the site groundwater infiltration rate ranged between 4,000 and 5,000 gallons per acre per month (RMC Geoscience, 2005). Subsequent data provided by the County (2010) for the period July 2005 through June 2010 indicates the infiltration rate averaged 5,400 gallons per acre per month.

Because the site is essentially hydrologically isolated from adjacent areas, and the springs are recharged from precipitation infiltration, the County has installed several control measures to decrease the infiltration rate and to overcome the recharge that does occur. In LF-1, a four to five foot interim cover has been placed to reduce the precipitation infiltration rate. This is demonstrated by the near elimination of leachate seeps along the landfill side slopes (EMCON/OWT, 2005). The County has also installed leachate extraction wells to control water that infiltrates outside of the LF-1 cover area. These extraction wells pump the groundwater and leachate to the leachate holding ponds south of the fill areas. Further details on measures to control liquids infiltration into the LF-1 area are provided in **Section 4.2** of this PFCPMP.

Proposed new waste cells at the CDS include an engineered capillary break/underdrain system to isolate wastes from groundwater. Details are provided in the companion Amended JTD (SCS 2011).

3.5 GROUNDWATER HYDROLOGY

27 CCR §21600(b)(4)(A)

3.5.1 Groundwater Occurrence

The Franciscan Complex makes up the regional aquifer system at the site. The Wilson Grove Formation, Sonoma Volcanics, and alluvium/colluvium are discontinuously present at the site. Each geologic unit is described below with respect to groundwater occurrence.

3.5.1.1 Franciscan Complex

Due to the variable compositional nature of this unit, hydrogeologic parameters and groundwater quality tend to vary greatly with distance. In general, this unit is characterized by low permeability, low well yields, and variable water levels. Groundwater typically occurs in open fractures. Boring logs from within this unit indicated that the fractures tend to be open at shallow depths and open fractures are rarely observed deeper than 70-80 feet below ground surface (bgs) (GeoSyntec, 2005). Therefore, since this unit is present over much of the site and the open fractures are shallow, groundwater tends to occur at shallow depths with downward vertical groundwater movement inhibited by filled fractures at depth. Groundwater typically occurs at depths ranging between approximately 0 feet bgs (ground surface) to 75 feet bgs. Most of the groundwater monitoring wells and piezometers at the site are screened within this unit.

3.5.1.2 Sonoma Volcanics

No wells are located within the Sonoma Volcanics at the site. Groundwater occurrence within this unit in Sonoma County is reportedly highly variable and unpredictable, with dry holes and variable well yields (EMCON/OWT, 2005).

3.5.1.3 Wilson Grove Formation

Regionally, the Wilson Grove Formation is the principal aquifer unit (Taber, 1987). This unit is reported to have higher permeabilities than the Franciscan. Water derived from this unit is reported to be of excellent quality, and wells are reported to have moderate to high yields (Taber, 1987). Typically, supply wells for domestic and agricultural use in the region are screened within this unit due to its excellent water quality and higher well yields. No wells are screened in this unit at the CDS facility.

3.5.1.4 Alluvium/Colluvium

Due to the variable and discontinuous nature of the alluvium/colluvium, these deposits do not represent a major source of groundwater in the region. Typically, these units have low permeabilities and low well yields, but can be higher where wells are screened within the isolated coarser grained materials (Woodward-Clyde Consultants, 1997). Because the alluvial/colluvial deposits are thin, groundwater occurrence tends to be shallow, typically occurring between 0 feet bgs (ground surface) to 12 feet bgs. Several of the on-site monitoring wells are screened within these deposits.

3.5.2 Groundwater Flow

As indicated above, groundwater primarily occurs in the open fractures of the Franciscan Complex. However, groundwater elevation data and potentiometric surface maps indicate that groundwater flow tends to follow topography, with the overall flow direction to the south-southeast, which is parallel to the axes of the canyons. The groundwater gradient during the First Quarter 2010 monitoring report was approximately 0.13 feet per foot (ft/ft) under LF-1 (Pacific Geoscience, 2010a).

The vertical groundwater gradient and flow direction was evaluated by EMCON/OWT (2005) using monthly water level data collected through June 2005 from paired wells installed in the LF-1 eastern area (monitoring wells TMW-14 and TMW-15; TMW-14 and TMW-16; TMW-10 and TMW-17; and F-33 and F-34). Those wells evaluated indicated a strong upward gradient is present throughout the year. The upward hydraulic gradient has been estimated to be between 0.06 and 0.2 ft/ft (Huntingdon-Herzog Associates, 1993). The conclusion that the aquifer is under an upward hydraulic gradient is an important finding; this gradient reportedly minimizes downward migration of leachate and potential groundwater contamination from the unlined LF-1 (Shaw, 2005).

Aquifer testing was conducted by Pacific Geoscience in 2005 as part of their Delineation Assessment Report (DAR). Slug tests were performed to estimate hydraulic conductivities in wells screened in the Franciscan Complex. East of LF-1, hydraulic conductivities ranged between $1.95x10^{-8}$ to $8.38x10^{-6}$ feet/second, with an average conductivity of $3.15x10^{-7}$ feet/second. This study found that the bedrock in the ridgeline between LF-1 and LF-2 had a very low conductivity, indicating the limited ability of groundwater to move eastward through the Franciscan bedrock from LF-1. Slug tests performed south of LF-1, near well F-10, indicate hydraulic conductivities range between $1.74x10^{-8}$ and $2.46x10^{-4}$ feet/second, with an average conductivity of $3.10x10^{-6}$ feet/second. Slug test performed near Leachate Pond 1 also indicate a low conductivity, but at a narrower range, between $1.55x10^{-6}$ and $1.56x10^{-5}$ feet/second. Slug tests performed within the REA indicate a wide range of conductivity values, ranging between $6.57x10^{-7}$ and $9.9x10^{-4}$ feet/second.

3.5.3 Groundwater Quality

The groundwater on-site can be summarized as consisting of a variety of different water types with no trends or correlations to stratigraphic or structural features. Overall, the groundwater on site is generally characterized as bicarbonate-rich, with varying percentages of sodium, calcium, and magnesium. No significant trends in groundwater chemistry are apparent with respect to depth or spatial location, and there is no distinction between groundwater chemistry between shallow and deep monitoring wells.

Comprehensive detection and corrective action water quality monitoring programs are in effect at the CDS, in accordance with the facility WDRs. Details are provided in **Section 5.1.2** of this PFCPMP.

3.6 SURROUNDING LAND AND GROUNDWATER USE

3.6.1 Zoning

27 CCR §21750

According to the County, the CDS is zoned as "public facilities", which is the designation given to land utilized by the County. Adjacent parcels to the site are zoned as "land extensive agricultural", which designates the property for agricultural use. A plot plan showing land uses and zoning for properties within 1,000 feet of the facility boundary is shown in ***Figure 9***.

3.6.2 Land Use

27 CCR §21600(b)(4)(A) and §21750

According to the County of Sonoma General Plan, the site is designated for "Public/Quasi-Public" land uses. Land surrounding the site is designated for agricultural use and is currently used for grazing. Land uses within 1,000 feet of the facility boundary are shown in ***Figure 9***.

Within a one-mile radius of the site, land uses include rural residential and agricultural operations, such as dairy and cattle ranches, and grazing lands (GeoSyntec, 2005). The nearest residential subdivision, Happy Acres, is located approximately 0.5 mile northeast of the site. The next nearest residential subdivisions are located in the City of Cotati, approximately three miles northeast of the site.

The nearest residence (associated with the Gray View Ranch) is approximately 600 feet north of the site. In addition to the Gray View Ranch, the Bloom Ranch is also located north of the site. To the south, residences are located approximately 800 feet from the southern boundary. The Button Ranch is located approximately 0.5 mile west of the site. The Diamond M. Dairy, which includes several residences, is located approximately 500 feet southwest of the site's boundary. The County owns the property to the east of the site and leases it for grazing purposes.

3.6.3 Groundwater Use

27 CCR §21600(b)(4)(A)

The WDRs (RWQCB, 2004) identify the regional groundwater use as both domestic and agricultural. In the region, groundwater is primarily pumped from wells screened within the Wilson Grove Formation, which is the principal water-bearing unit in the region. Groundwater from this unit is reportedly of excellent quality and wells screened within this unit typically have moderate to high yields.

The Franciscan Complex and alluvial aquifers, to a lesser degree, are utilized for groundwater purposes. Wells within these units typically have variable yields, and are mostly used for agricultural purposes.

3.6.4 Domestic Well Survey

A domestic well survey was not performed as part of this PFCPMP since the site has been extensively researched. Groundwater well locations as identified in previous domestic well surveys are shown in ***Figure 6*** (Woodward-Clyde Consultants, 1997).

South of the landfill and Hammel Road, domestic and agricultural wells are present that range in depths between 11 and 220 feet bgs (Taber, 1987). Based on these depths and location, the wells are likely screened in either alluvium or the Wilson Grove Formation. For the wells where data is available, yields tend to be low, ranging from less than one gallon per minute (gpm) to approximately 58 gpm (Woodward-Clyde Consultants, 1997).

North of the landfill, near Stony Point Road (approximately one mile north), a privately-owned water utility supply well is located that supplies water to some of the residences in the Happy Acres subdivision. The well was drilled in 1957 and is 397 feet deep. The Happy Acres water system includes the deep well, concrete water storage tanks, booster pumps, and a distribution system. The residences not connected to this water supply system have individual groundwater wells.

Two County-owned supply wells are located north of the landfill, near Stony Point Road. Both wells are utilized by the landfill for dust control, fire protection, domestic uses and for composting process water. The wells are 242 and 302 feet deep, and are capable of supplying 41,000 gallon per day (gpd) during the dry season.

A well near the entrance of the Stony Point Quarry, on Stony Point Road (approximately 1.5 miles from the landfill) supplies water to the quarry. No information is available on the depth of this well, but it reportedly supplies between 3,000 and 5,000 gpd to the quarry.

4.0 EXISTING ENVIRONMENTAL CONTAINMENT AND CONTROL SYSTEMS

A number of detailed site studies, design evaluations and other reports have been prepared for the CDS since it was developed in the 1970s. The following descriptions of existing landfill containment systems are adapted from previous work, including that by GeoSyntec (2005), RMC Geoscience (2002), and Shaw Environmental, Inc. (2005).

The existing barriers and leachate management systems for LF-1, described below, will remain operational as partial final closure of the 14.4-acre portion of the South Face area occurs, new waste cells are constructed, and refuse filling proceeds at the CDS.

4.1 1971 PERMITTED AREA (LF-1) LANDFILL DEVELOPMENT

Prior to site development in 1971, the original topography of the former Central Canyon area (now LF-1) was characterized by a southeasterly-trending valley that formed a south to southeasterly tributary to Stemple Creek. A pre-development topographic map is provided in ***Figure 4***.

Waste placement in LF-1 commenced in 1971. Wastes have been placed over the entire Central Canyon with the exception of the REA. Site development reportedly progressed by cut-and-fill methods that included excavating the upper several feet of the canyon, compacting the exposed subgrade or locally placing and compacting clay to form a discontinuous base liner, installing a subdrain collector system and barriers, followed by waste placement in sequential layers. As filling progressed, daily and intermediate soil cover was obtained from adjacent on-site slopes. The upper portion of the disposal area (current site of Sonoma Compost operation) was filled during the period 1971 through mid-1988.

Filling then proceeded in the lower canyon, generally south of what is now the compost area. Reportedly, the lower portion of the LF-1 was lined as the fill progressed down-canyon. The valley bottom was graded at slopes ranging from 7 to 15 percent and lined with 1 foot of clay with a hydraulic conductivity of 1×10^{-6} cm/sec. The liner was reportedly installed in accordance with California regulatory requirements in effect at the time (GeoSyntec, 2005).

4.2 LEACHATE MANAGEMENT SYSTEMS

4.2.1 LF-1 Leachate Collection Systems

Leachate collection and management systems in the LF-1 area of the CDS include a liquids collection system, a series of subsurface barriers, a covered and lined storage impoundment (Leachate Pond 1), and a lined storage impoundment (Leachate Pond 2). Principal collection systems include bottom subdrains, perimeter french drains, and vertical extraction wells, described as follows:

Subsurface barriers. Three cutoff barriers were constructed across the original central canyon; one at a mid-level area, and two downgradient from all disposal site operations. The barriers are constructed of compacted clay having a hydraulic conductivity of 1 x 10^{-6} cm/sec or less, and are keyed into the Franciscan Formation. The first barrier was constructed at the separation point between the upper and lower units of LF-1. The remaining two barriers were constructed at the toe of LF-1.

The two barriers constructed at the toe of LF-1 are referred to as the primary and secondary groundwater barrier systems. These systems were installed to intercept groundwater in the shallow alluvial/colluvial deposits at the southern toe of LF-1 and to prevent offsite migration. In general, both systems were constructed by excavating an interceptor trench across the width (i.e. perpendicular) of the canyon drainage channel. The excavations were reported to extend into competent bedrock. The interceptor trenches were backfilled with compacted clay.

The primary barrier was constructed in two phases. The initial phase was constructed in 1971 as part of initial development of LF-1. The total depth of the barrier system extended approximately 20 to 25 feet below the channel flow line. The final base and top elevations of the completed barrier were approximately 190 and 215 ft MSL, respectively. The second phase of construction was implemented in 1989 to accommodate expansion of refuse placement operations in the southern footprint of LF-1. This phase involved increasing the height of the barrier to a final grade elevation of approximately 250 ft MSL.

Construction of the secondary barrier was conducted in 1988. The primary purpose of this system was to provide containment protection for Leachate Pond No. 1. The system was intended to provide secondary protection against the possibility of impacted groundwater leaving the site. Excavation for the secondary barrier extended approximately 23 feet below the channel flow line. The final base and top elevations of the completed barrier, at the channel axis, were approximately 187 and 210 ft MSL, respectively.

French drains. Several leachate interceptor drains and/or pits were installed during the course of landfill operations to address leachate seepage at portions of the perimeter of the landfill footprint, at slope benches and other locations. These french drains convey the intercepted leachate by gravity flow to the storage impoundment.

Vertical leachate extraction wells. A network of 89 leachate and dual leachate-gas extraction wells have been installed throughout the LF-1 footprint area. The wells extend into the underlying fill and are equipped with pneumatic or electric pumps for leachate removal. Pump discharge (leachate) is conveyed to on-site leachate ponds via high density polyethylene (HDPE) conveyance lines.

Groundwater barrier. A groundwater barrier system was installed along the southern portion of the property in 1988. This consists of a compacted clay barrier that extends across the entire length of the central canyon drainage channel. The barrier is keyed into competent Franciscan bedrock along its base and eastern flank. The barrier system was installed as a safety precaution to intercept any leachate that may not be intercepted by the other barrier systems (GeoSyntec, 2005).

In summary, various leachate barriers and collection systems were installed as the LF-1 fill area was developed down-canyon. These have been judged to be state-of-the practice when installed (Shaw Environmental Inc., 2005); however these systems were not installed to present day standards. This is typical of pre-Subtitle D landfill construction. Thus LF-1 is considered an unlined, pre-regulations landfill (RWQCB, 2004).

A Site Conceptual Model was prepared to illustrate these barrier concepts (Shaw Environmental Inc., 2005). Schematic cross sections of LF-1 illustrating the above barriers and leachate controls are provided in the Site Conceptual Model in ***Appendix C***.

Conveyance line. An 8-inch diameter HDPE pipe is installed in the perimeter roadway on the eastern side of LF-1. This pipeline conveys collected liquids from the perimeter french drain system described above to the leachate ponds.

4.2.2 Leachate Presence at LF-1

At the unlined LF-1 area of the CDS, leachate volumes in the waste are also influenced by groundwater infiltration and upwelling. Extensive studies have been performed to assess the presence and mechanisms for leachate generation and migration potential (RMC Geoscience, 2002, 2011; Shaw Environmental Inc. 2005). Key findings applicable to design and partial final closure of the 14.-4-acre area of the South Face at LF-1, and design and operation of future waste disposal cells at the CDS include the following:

- Leachate appears as perched zones within the upper portion of LF-1 and as a continuous zone of saturation in the lower portion of the refuse. The saturated thickness of refuse in LF-1 has varied up to 100 feet above the cell floor based on piezometers and leachate well readings in that cell.

- Upwelling groundwater, manifested by springs present in the Central Canyon area, was present prior to LF-1 development.

- Net groundwater flow at LF-1 appears to be from the underlying Franciscan Formation bedrock to the refuse (inward gradient) and the potential for leachate migration from the fill to bedrock is limited.

- Groundwater inflow has been attributed to the majority of leachate generation in LF-1. The remainder is attributed to storm water infiltration through existing intermediate cover, and to a lesser extent, surface water flow into the LF-1 fill. Surface water infiltration will be reduced by placement of a final cover system.

- In 2002, the leachate volume in the LF-1 fill area was estimated at 140,000,000 to 150,000,000 gallons (RMC Geoscience, 2002). This was done using AutoCAD software to calculate volume between the measured leachate surface(s) in LF-1 and the pre-development landfill surface. Leachate volumes have been reduced since then as a result of ongoing corrective action programs at the CDS as described below.

As part of the Site Conceptual Model (Shaw Environmental Inc., 2005), cross-sections of LF-1 were prepared to show schematic mechanisms for groundwater inflow and potential leachate migration. These illustrations are provided in ***Appendix C***. Again, based on this model, the

upward groundwater gradient was believed to minimize deeper migration of leachate from the unlined LF-1 refuse mass into the underlying formation. This is evidenced by results of historic groundwater monitoring, which show only limited evidence of volatile organic compounds (VOCs) and leachate influence in groundwater at wells downgradient of LF-1 (Pacific Geoscience, 2010a, 2010b).

Various leachate extraction and control systems are in place to draw down leachate in the LF-1 refuse mass, as part of original cell construction or in response to WDR No. R1-2004-0040 for corrective action. Gravity-drain collection systems were installed at the CDS as the site was developed down-canyon in LF-1. These include bottom gravity-drainage systems, perimeter french drains, collector mains, sumps and pump system as described above.

A water balance was performed that showed the volume of leachate in LF-1 (leachate storage) was decreasing by approximately 2.0 million gallons per year in response to County extraction efforts (RMC GeoScience, 2011). **Continued operation of these leachate management systems, in particular the leachate extraction system, is critical to long-term environmental management at the CDS.** The proposed partial final closure measures for the 14.4-acre area in the lower elevation of the South Face have been developed to allow continued leachate and LFG extraction.

4.2.3 Leachate Storage and Disposal

The County maintains records of leachate removal from the various systems described above. Based on data for the period 2000 through 2010, leachate removal rates from LF-1 french drains and sumps averages 28,640 gpd. Liquid removal from extraction wells averages 20,940 gpd. Total leachate removal from the LF-1 refuse prism has averaged 49,580 gpd (equivalent to 34 gpm). These totals are based on County data for fiscal years (July through June) for the above period (Sonoma County 2010).

All leachate removed from LF-1 is pumped from the lower sump, flows by gravity from the french drains, or is pumped from the vertical wells to the ground surface where it flows by gravity to the primary lined and covered surface impoundment (Leachate Pond 1, see ***Figure 3***). A second lined impoundment (Leachate Pond 2) is available for backup storage when Leachate Pond 1 is near capacity or undergoing maintenance. The piping and pumping systems at both leachate ponds allow pond contents to be transferred between ponds.

The leachate ponds have a combined capacity of 4.7 million gallons and were constructed as Class II surface impoundments in accordance with 23 CCR, Chapter 15 requirements, now included in 27 CCR §20365 (GeoSyntec, 2005). Both impoundments are double-lined leachate ponds. Leachate Pond 1 has a steel-frame metal roof over its entire footprint area. Leachate Pond 1 was constructed in 1988 as a soil-based liner system, and was retrofitted in 2001 with an upper synthetic liner system. Leachate Pond 2 has a geosynthetic based liner system. The pond liners were constructed as follows (barrier layers from bottom to top):

- Leachate Pond 1 (capacity 1.8 million gallons):
    - 2-ft thick layer of imported clay with permeability of 1 x 10^{-8} cm/sec, placed over prepared subgrade.

- 1- to 1.5-ft thick layer of permeable drain rock.
- Second 2-ft thick layer of imported clay with permeability of 1 x 10^{-8} cm/sec.
- 80-mil textured geomembrane (secondary barrier).
- 200-mil thick geonet leachate collection and removal layer.
- 80-mil thick electrically conductive membrane (primary barrier).

- Leachate Pond 2 (capacity 2.9 million gallons):
  - Groundwater underdrain system consisting of a geocomposite drain net, geonet and filter geotextile.
  - Geosynthetic clay liner (GCL) as the secondary containment component.
  - 60-mil thick HDPE secondary geomembrane liner.
  - An LCRS (including geonet, sump riser pipe, granular material and cushion geotextile).
  - 60-mil thick HDPE primary geomembrane liner.

Leachate is pumped from the ponds via force-main pipeline for discharge to the City of Santa Rosa Waste Water Treatment Plant (Subregional Water Reclamation System). Discharge is in accordance with City of Santa Rosa Industrial Waste Discharge Permit No. SR-IW5202. The permit does not specify a daily discharge volume limit. The leachate conveyance system also has a permit under WDID # 1SSO11652 issued by the RWQCB, under general WDR Order No. 2006-0003-DWQ. The County operates the force-main conveyance system under a separate Sewer Management System Plan.

4.3 LFG COLLECTION AND CONTROL SYSTEM

An LFG collection and control system has been in operation at the CDS since 1987. The LFG system is operated, monitored and maintained in accordance with the following regulatory requirements:

- 27 CCR requirements for subsurface combustible gas migration control and monitoring.
- Major Facility Review Permit (Title V Operating Permit) for Facility #A2254 and BAAQMD Regulation 8, Rule 34 requirements.
- 17 CCR §95464 et seq., known as the AB 32 Landfill Methane Rule. This rule, enforced by the California Air Resources Board (CARB), was adopted in 2010 and provides standards for operation and monitoring of LFG control systems to enhance methane capture. Methane is considered a primary greenhouse gas (GHG).
- United States Environmental Protection Agency (US EPA) Greenhouse Gas Reporting Rule, adopted in 2009. This rule requires landfill owners to record and report information annually on waste disposal rates and LFG control device flow metering.

The LFG extraction system at the CDS has regularly undergone various expansions since initial installation in 1987, and currently consists of a network of 137 vertical extraction wells and 16 horizontal gas collectors installed throughout the LF-1 and LF-2 refuse fill areas. The majority of vertical wells installed in LF-1 are equipped for dual leachate and gas extraction. The LFG is collected by vacuum blowers and routed via above and below-grade header piping systems to the 8.0 MW capacity LFG-fueled electric power generation facility. Electric power generated at the LFGTE plant is sold to the local utility. During LFGTE engine downtime for scheduled or unscheduled maintenance, LFG is routed to an enclosed ground flare for thermal gas destruction. The flare was installed in October 2010. The LFG collection and control system layout is shown in ***Figure 10***, and in ***Appendix A***, Sheet 2.

The LFGTE plant and flare are sized to handle LFG flows of 2,800 and 1,500 scfm, respectively. The combined capacity is 4,300 scfm. For year 2010, the LFG deliveries to these devices averaged 2,120 scfm. All LFG flow rates above are normalized to 50 percent methane by volume. Results of LFG modeling (SCS, 2011) show that within the 20-year expected life cycle of the new flare, gas capture will not exceed the combined capacity of the LFGTE plant and flare.

LFG liquid condensate that forms in collection piping flows by gravity to low points (condensate traps) in the main header piping. The condensate in the traps is then conveyed via HDPE piping and discharged at either of the two on-site leachate storage ponds. Condensate produced at the LFGTE facility is also conveyed via leachate piping to the leachate ponds. The condensate is mixed with leachate in the ponds and pumped via force-main for treatment and disposal at the City of Santa Rosa Waste Water Treatment Plant.

5.0 ENVIRONMENTAL MONITORING SYSTEMS

Water quality monitoring at the CDS is currently performed pursuant to the requirements of MRP No. R1-2004-0040 issued by the RWQCB in June 2004. The MRP stipulates monitoring, sampling and reporting requirements for groundwater, surface water, leachate, and landfill gas. A site plan depicting both current and proposed water quality monitoring locations is provided in ***Figure 11***.

5.1 WATER QUALITY MONITORING

5.1.1 Water Quality Protection Standards

27 CCR §20390

27 CCR §*20390* requires the establishment of WQPS for each waste management unit. The WQPS consist of a list of constituents of concern (COCs), the concentration limits, points of compliance, and all monitoring points. WQPS have been established using statistical and non-statistical evaluations of water quality monitoring data, and are reported in accordance with requirements of the MRP.

5.1.2 Existing Water Quality Monitoring Programs

27 CCR 20385, §20395, §20415 and §20430

MRP Order No. R-1-2004-0040 specifies detection monitoring programs for groundwater, leachate, surface water, and the unsaturated zone, and corrective action programs for groundwater, leachate, LF-2 underdrain discharge, and the unsaturated zone.

5.1.2.1 Groundwater Monitoring

Monitoring Points of Compliance. The CDS currently has 21 groundwater wells used for monitoring LF-1 and 13 wells used for monitoring LF-2 (***Figure 11***). The wells are screened in the alluvial, shallow-zone Franciscan formation, or deep-zone Franciscan formations. The wells are designated as detection monitoring wells (background, downgradient, and point of compliance), or corrective action wells according to the MRP.

Monitoring Parameters. The detection monitoring wells are monitored quarterly for field parameters (depth to water, pH, temperature, dissolved oxygen, and specific conductance), and sampled for general minerals, total dissolved solids (TDS), nitrogen, and VOCs. Sampling for metals is conducted annually and every five years for designated COC parameters. COCs are as specified in federal Subtitle D, Appendix II and SWRCB Resolution 93-62. The corrective action wells are monitored and sampled on a quarterly basis for the parameters described above, and annually for COCs.

Other monitoring points. There are six groundwater monitoring wells (F-20, F-35, LP-1, WV-1, WV-2, and WV-3) and 40 groundwater and leachate piezometers that were installed as part of previous site investigations. These monitoring points are not listed in the MRP but are voluntarily tested by the County for liquid levels to evaluate site-wide groundwater flow conditions. Locations of these monitoring points are shown in ***Figure 11.***

5.1.2.2 Surface Water Monitoring

A detection monitoring program is in effect for surface water monitoring at the CDS. There are three surface water monitoring locations, designated SW-1, SW-6, and SW-7, that are unnamed tributaries that flow into Stemple Creek, and one background location, designated "Ditch". The surface water locations SW-1, SW-6, and SW-7 are sampled at the property boundary. Surface water monitoring locations are shown in ***Figure 11***.

Surface water monitoring begins with the first surface water runoff in the fall of each year, and continues monthly until surface runoff ceases in the dry season. In accordance with the MRP, after each sampling event an intra-sample point assessment is made if a statistically or non-statistically significant increase over the WQPS for each sample has occurred.

5.1.2.3 Leachate Monitoring

Leachate monitoring under MRP Order No. R1-2004-0040 consists of daily measurement of freeboard in the leachate ponds, monthly observations of the presence of liquids in LCRS sumps, and flow measurements of the LF-2 underdrain discharge. Monitoring of field parameters, and sampling for TDS, general minerals, chemical oxygen demand (COD), metals, sulfates and VOCs is performed on a quarterly basis at designated leachate extraction wells/sumps, LCRS sumps, and the two leachate ponds. Samples are collected annually for specified COCs. The County monitors the disposal site surfaces weekly for the presence of seeps.

Under the corrective action program, monitoring of leachate drawdown in LF-1, as measured from leachate piezometers, is performed on a monthly basis. Contour maps showing leachate levels are prepared, along with summaries of pumping rates from individual leachate extraction points. Locations of LF-1 leachate extraction wells are shown in ***Figure 12*** and in ***Appendix A***, Sheet 2.

5.2 LFG MONITORING

An LFG monitoring program is undertaken at the CDS in accordance with 27 CCR §20920 requirements. The monitoring is performed to ensure that combustible gases generated at the disposal facility are controlled as follows:

- The concentration of methane in air does not exceed 1.25 percent by volume in on-site structures (compost trailer, operator's trailer, and T/PF scale houses). This concentration is equivalent to 25 percent of the lower explosive limit (LEL) for methane gas.

- The concentration of methane gas migrating from the disposal facility does not exceed 5 percent by volume, or 100 percent LEL in soils at the facility boundary.

A network of 16 perimeter LFG monitoring probes has been installed in soils at the CDS facility boundary. The probes reportedly comply with 27 CCR construction standards for landfill perimeter monitoring. These probes are tested on a quarterly basis for subsurface pressures, and methane, carbon dioxide, oxygen concentrations using field instruments. LFG monitoring probe locations are shown in ***Figure 10***.

The interior spaces of the above on-site structures (scale houses, contractor trailers) are tested for combustible gas accumulations on a quarterly basis using field instruments capable of detecting methane gas in the LEL range. Monitoring for combustible gas is also performed in subsurface utility vaults adjacent to the County administrative office on a quarterly basis.

Results of monitoring are submitted to the County LEA and CalRecycle in quarterly reports. Based on monitoring results for 2010, combustible gas levels at all probes and buildings have remained below the regulatory thresholds and the site is in compliance with 27 CCR requirements for combustible gas migration control (Pacific GeoScience, 2010b).

The County will continue the current LFG monitoring program while the CDS remains open for MSW disposal, and during the post-closure monitoring period as required by regulation. No changes to the LFG monitoring program are proposed.

5.3 PROPOSED WATER QUALITY SAMPLING AND ANALYSIS PLAN SUMMARY

27 CCR §20385, §20395, §20400 and *§20415*

In concert with the proposed partial final closure of the 14.4-acres in the lower elevation of the LF-1 South Slope, the County proposes to install engineered base liners and resume MSW filling in other areas of the CDS. The companion Amended JTD (SCS, 2011) provides details on new cell siting, design, MSW filling operations and other technical information required for the RWQCB to issue WDRs for these proposed landfill operations.

As part of the JTD submittal and approval process, the County has proposed a modified Sampling and Analysis Plan for the continued monitoring of ground water, surface water, leachate and the unsaturated zone. This plan is proposed in anticipation of new WDRs from the North Coast RWQCB. One reason for the proposed modifications is that proper abandonment/well decommissioning of groundwater monitoring wells and piezometers located in the footprint of proposed waste filling activities will be required, and removal of these monitoring points from the MRP will be necessary.

Other modifications to the current MRP have been recommended so that they are more consistent with the statistical methods used to establish the WQPS criteria for groundwater and surface water, or to reflect conclusions based on historic data. They include re-designation, addition or removal of points of compliance, and modifications to sampling frequency and suites of analytical tests. These proposed modifications are based on a thorough evaluation of monitoring data collected since 2004 under the current MRP, plus historic data dating back over one decade (Pacific GeoScience, 2011). The intent is to streamline the programs to continue to provide for earliest possible detection of releases from waste units and thorough evaluation of the effectiveness of corrective action measures while eliminating data redundancy.

Details on the proposed Sampling and Analysis Plan to be considered for a revised MRP, including technical rationale for modifications, are provided in ***Appendix D***. This proposed plan was submitted with the companion Amended JTD for agency review (SCS, 2011).

The County has and shall maintain water quality monitoring programs that are appropriate for detection monitoring and corrective action, and that comply with Subchapter 3, Chapter 3 Subdivision 1, Division 2 of 27 CCR.

6.0 PARTIAL FINAL CLOSURE PLAN

27 CCR §21120, §21769, and *§21800*

Final closure plans describe closure activities including an implementation schedule. The following subsections describe proposed partial final closure activities for the 14.4-acre plan area within the South Face of LF-1.

The purpose of this PFCPMP is to ensure that this slope area at the CDS is closed in a manner to reduce impacts to health and safety, and to assure the integrity of the final cover and environmental control systems.

Pursuant to 27 CCR §21180(a), any areas where final cover is placed prior to closure of the entire landfill shall be maintained in accordance with the approved post-closure maintenance plan, but the thirty year post-closure monitoring period shall not commence until closure of the entire landfill is complete.

This PFCPMP is based on currently-proposed site development and operation plans for the CDS, as well as the previously-approved *2008 Final Closure and Postclosure Maintenance Plan (GeoSyntec, 2008)* and Amended JTD (SCS, 2011). The closure activities described in this PFCPMP are specific and limited to the closure of 14.4 acres of the South Face slope area of LF-1. That is, this PFCPMP will not replace the site-wide preliminary final closure plan presented in the companion, Amended JTD. The 14.4-acre area identified for partial final closure is at final grades. That is, no additional refuse placement is proposed in this area.

6.1 PARTIAL FINAL CLOSURE AREA

The area designated for partial final closure is approximately 14.4 acres within the lower elevations of the South Face slope of LF-1 (***Figure 3***). While LF-1 was constructed with a clay liner, it is considered an unlined, pre-regulations landfill. LF-1 was constructed in phases: an upper unlined canyon fill and a lower vertical expansion area, constructed with a clay lined dendritic LCRS (refer to **Sections 4.1** and **4.2** of this PFCPCMP for details). Current elevations of LF-1 range from 260 to 540 feet MSL. The proposed partial final closure area is within the lower vertical expansion area, at the toe of the South Face slope. This area has been designated for partial final closure as no further refuse filling will occur on the lower elevations of the South Face slope area.

The closure of the LF-1 South Face shall be performed under the direct supervision of a registered civil engineer or a certified geologist pursuant to 27 CCR §20950(b). Initial construction of the final cover system and any later repair work shall be carried out in accordance with an approved construction quality assurance (CQA) plan pursuant to 27 CCR §21090(b)(1)(E). The CQA Plan developed for preliminary closure and submitted in the companion Amended JTD (SCS, 2011) is contained in ***Appendix E***. A CQA plan specific to the LF-1 South Face area will be submitted when plans and specifications are required prior to closure activities.

This proposed closure sequence is consistent with the proposed sequence in the Preliminary Closure and Post-Closure Maintenance Plan Section of the previously submitted Amended JTD (SCS, 2011).

6.1.1 Location Map

27 CCR §21790(b)(2)

A South Face specific location map is provided in ***Appendix A*** which depicts the limits of the partial final closure. A Site Location Map is presented in ***Figure 2***. The location of structures within 1,000-feet of the property boundary is shown on ***Figure 9***, Land Use Map.

6.2 MAXIMUM CLOSURE AREA

27 CCR §21790(b)(6)

The regulations require an estimate of the maximum extent of the landfill that will require closure at any one time during the active life of the landfill.

The existing SWFP allows filling over the entire 172.8-acre permitted fill area of the CDS, contingent on issuance of new WDRs allowing construction of new cells in LF-2 and the REA. The County proposes to implement partial final closure of the 14.4 acre area in the South Face slope of LF-1 concurrent with construction of the first new cell in LF-2. Assuming all approvals and permits are issued, the CDS will remain active following partial final closure of the 14.4-acre area.

Given the above, the maximum remaining area requiring final cover during the active life of the landfill would be 158.4 acres (plan area). This excludes the partial final closure of the 14.4-acre area.

6.3 PARTIAL FINAL CLOSURE DATE

The partial final closure is proposed for the 14.4-acre area in the South Face slope of LF-1. A Preliminary Closure and Post-Closure Maintenance Plan was previously submitted as part of the Amended JTD (SCS, 2011). While final closure plans are to be submitted two years prior to the anticipated date of closure, the County proposes that the work be undertaken as soon as practical following regulatory approval of the previously submitted Amended JTD (SCS, 2011). It is intended that the partial final closure project be undertaken concurrently with construction of the first new base liner to allow continued landfill operations. Assuming agency approval of the Amended JTD and this PFCPMP by fall 2011, the County anticipates final design, bid process, and contractor selection can be completed to allow partial final closure construction during the summer 2012 season.

6.4 CLOSURE IMPLEMENTATION

27 CCR §21790(b)(8)

The sequence of closure for the 14.4-acre LF-1 South Face area will be in accordance with the Preliminary Final Closure Plan and Post-closure Maintenance Plan and WDRs. Steps to be taken are as follows:

- Prepare the PFCPMP and obtain regulatory approvals.
- Prepare construction plans and specifications.
- Place final cover consistent with the approved PFCPMP.
- Construct or modify existing environmental control systems including LFG and leachate extraction wells and LFG, condensate and leachate piping systems.
- Establish or modify internal access roads.
- Install final drainage structures (oversizde drains, diversion berms, swales and ditches, outlet energy dispersion aprons, etc.).
- Establish vegetative cover.
- Prepare the as-built topographic map for the 14.4-acre LF-1 South Face area by field survey or aerial topographic survey, or both.
- Perform post-closure maintenance and monitoring for the closed area.

6.4.1 Removal of Landfill Structures

27 CCR §21137

Site structures not deemed essential for closure construction or post-closure maintenance will be dismantled and removed in accordance with 27 CCR §21137. As the proposed final closure is a partial final closure and the CDS will remain active, the existing structures will remain.

6.4.2 Decommissioning of Environmental Control Systems

27 CCR §21137

At this time, there are no plans to permanently decommission any of the environmental control systems at the CDS as part of partial final closure of the 14.4-acre area within the South Face of LF-1. Temporary disconnection of LFG and leachate extraction wells in the slope area will be required as part of final cover placement; however replacement piping will be installed to allow continued long-term operation of these extraction points. If deemed necessary, any decommissioning of boreholes, LFG wells, leachate wells, ground water monitoring wells, or piezometers will be conducted in accordance with the appropriate regulatory agency requirements.

6.4.3 Final Cover and Grading

27 CCR §21790(b)(8)(B), §21140, and §21142

This section describes the proposed final grading contours for partial final closure of the 14.4-acre area within the South Face slope of LF-1. This area within the lower elevations of LF-1 has been filled to final grades and no further waste placement is proposed. However, some re-grading will be required to meet requirements for partial final closure of this area.

In accordance with 27 CCR §21090(b) and §21142, the final grading will be designed, graded, and maintained to reduce impacts to health and safety to control vectors, fire, odor, litter, LFG migration, prevent ponding, and accommodate anticipated future settlement. Construction will promote lateral run-off of surface water which will minimize the effects of settlement. Access roads will be used to maintain the final cover area and environmental control systems throughout the post-closure maintenance period.

The final grading plan (***Appendix A, Sheet 3***) shows the partial final closure area to the maximum elevation of approximately 430 feet above MSL. In general, the final closure area is the southern side slope of LF-1 which has been constructed at 3:1 grades and with benches typically at intervals of 50 vertical feet or less. The partial final closure cover will be constructed on the existing landfill side slopes and will be designed with an overall gradient to match the existing side slope grades. The partial final closure cover will also be constructed to tie-in to proposed final grades for build-out of the CDS (***Figure 5***). The benches will be constructed 15-feet wide to allow continued vehicle and equipment access. The existing vertical alignment for the benches will remain at approximately 40 to 50 foot intervals. This will allow continued utility vehicle access to existing LFG and leachate extraction wells for operation and maintenance purposes. The benches/access roadways will be graded inward at approximately two percent to collect and convey stormwater along inner swales (rough grading will provide an outward gradient as a subgrade for the HDPE liner system; compacted soils will be placed above the liner and cut to provide the inward road gradient). The drainage swales will have an overall gradient typically between one and three percent in order to convey storm water to the bench down drain inlets and/or perimeter drainage channels. Minor filling and shaping of the proposed final contours may be constructed to maintain gradients and promote lateral run-off of precipitation based on actual field conditions.

6.4.3.1 Minimum Design Standards

27 CCR §21090 and 40 CFR §258.60

The minimum cover standards under California regulatory requirements are described in 27 CCR, § 21090 and include the following (from bottom to top):

- A foundation layer with a minimum two-foot thick layer of approved soil placed in contact with refuse. This layer shall be constructed of appropriate engineering fill which will provide a relatively unyielding surface to place and compact the low-hydraulic-conductivity layer.

- A low-hydraulic-conductivity layer consisting of a one-foot thick layer of clean soil containing no waste or leachate placed over the foundation layer. The low-hydraulic-conductivity soils shall be placed on top of the foundation layer soils and compacted to attain a hydraulic conductivity of either of 1×10^{-6} cm/sec or the hydraulic conductivity of the bottom liner system or underlying natural geologic materials, whichever is less.

- An erosion resistant layer consisting of a minimum of one-foot thick layer of soil containing no waste or leachate placed on top of all portions of the low-hydraulic-conductivity layer. Vegetation is to be replanted, as needed, to provide effective erosion resistance. In addition the final cover should be designed to allow minimum maintenance requirements. Final grading shall be designed to prevent ponding, provide for slopes of at least three percent (a lesser slope may be allowed if surface drainage is diverted) and minimize surface erosion by water and wind including surface drainage courses.

The minimum cover standards for Federal Regulatory Requirements are described in the closure criteria of 40 CFR, Subpart F, § 258.60. Federal requirements include the following:

- A cover with a permeability less than or equal to the hydraulic conductivity of any bottom liner system or natural sub-soils present, or a permeability no greater than $1x10^{-5}$ cm/sec, whichever is less.

- An infiltration layer with a minimum depth of 18-inches of earthen material and an erosion resistant layer that of at least six-inches of earthen material that is capable of sustaining native plant growth.

6.4.3.2 Alternative Cover Systems

Alternative cover designs can be allowed if the RWQCB finds that the design will continue to isolate the refuse at least as well as the prescriptive cover standards of 21090(a)(1-3). In general flexibility in final cover design criteria are allowed for an alternative final cover design on the basis of an implied performance standard whereby surface-water infiltration through the final cover is less than the liquid flux through the bottom liner.

6.4.3.3 Proposed Final Cover Design

Several factors were taken into consideration in determining the cover design for partial final closure at the CDS, including the geometry of the existing landfill, proposed fill sequencing plans as described in the companion Amended JTD (SCS 2011) and tie-ins to existing grades, climatic conditions, potential landfill settlement, available cover materials, erosion protection, vegetative growth, and end use at closure. It was determined that an alternative final cover that surpasses the minimum state and federal requirements would be the most appropriate design for the CDS. This alternative was approved by the RWQCB with modifications (RWQCB, 2010) for a previously-prepared final closure plan (GeoSyntec, 2008).

A typical cross-section of the proposed final cover system for LF-1 and the 14.4-acre South Face area within LF-1 is shown in ***Figure 8*** and in ***Appendix A,*** Sheet 5. The final cover system will consist of (from bottom to top):

- A minimum 2-ft thick soil foundation layer;

- 60-mil HDPE barrier,

- Geocomposite drainage net;

- 18-inch thick soil vegative layer.

The 60-mil HDPE barrier will eliminate the potential for significant infiltration of moisture into the landfill, and will control and contain LFG surface emissions. A 60-mil HDPE liner is proposed in lieu of the previously-specified 40-mil liner to be consistent with RWQCB requirements (2010). An 18-inch thick vegetative layer is proposed for superior long-term barrier protection.

The alternative final cover configuration has been designed to ensure the containment of waste materials, minimize the infiltration of water from rain, provide a vegetative cover of native shrubs and grasses, prevent exposure of people and animals to waste, limit LFG emissions, minimize odor, control fires, and provide pleasant aesthetics.

6.4.3.3.1 Construction Considerations

Foundation Layer. Intermediate cover materials have been placed over LF-1. A field investigation to evaluate the characteristics of the intermediate cover at LF-1 was undertaken in 2008. Reportedly, cover thickness varies from 2 to 18 feet across LF-1, and these materials have suitable properties as foundation material for final cover systems with relative compaction of a minimum of 90 percent (GeoSyntec, 2008).

The existing intermediate cover of a 14.4-acre area on the south slope of LF-1 will be incorporated into the foundation layer to provide a minimum thickness of 24 inches. No additional waste will be placed in this area in the future. The top 6 to 12 inches of the existing intermediate cover will be stripped to remove surface vegetation, proof-rolled, scarified and re-compacted. Subsequent 6- to 12-inch thick lifts will then be placed and compacted to provide a total 24-inch minimum thickness foundation layer to provide a stable surface for placement of the 60-mil HDPE barrier. Additional soils needed to complete the 24-inch minimum thickness foundation layer will be obtained from the existing on-site soil stockpile. Typical relative compaction (RC) ranges between 90 to 92 percent of the maximum dry density and moisture contents within ±3 percent of the optimum moisture content (OMC) determined in accordance with ASTM D 1557 will be required. These requirements were established to meet the slope stability conditions (***Appendix F***) and material properties of the on-site soil.

Vegetative Layer *(27 CCR §21090(a)(3)*). A minimum 18-inch thick vegetative soil layer capable of sustaining native grass growth is proposed in the LF-1 South Face area in lieu of the minimum 12 inches previously approved by the RWQCB (2010). In our experience, the 18-inch cover provides superior erosion resistance and barrier protection and is more suited for post-closure maintenance activities. An 18-inch thick vegetative layer is more practical and does not require low-ground pressure equipment for normal maintenance activities, LFG well drilling, or other necessary post-closure maintenance. Soils needed to complete the 18-inch minimum thickness vegetative layer will be obtained from the existing on-site soil stockpile.

Access Roads. Internal access roads within the lower elevations of the LF-1 South Face area will be used by utility vehicles for landfill maintenance as well as monitoring and sampling. Additionally, access roads in this area will be used by heavy equipment during future construction activities in both the LF-1 and LF-2 areas. Water trucks, soil transporting equipment, and other heavy machinery may frequently be utilizing the access roads present in the South Face area during construction activities. After installation of the final cover system, access roads will be completed to the necessary grades to allow a suitable foundation and to provide adequate drainage. Woven geotextile will be placed over the access roads with a minimum 6-inch thick compacted Class II aggregate base placed over the geotextile. This will serve to protect the underlying geomembrane components of the final cover system. During the course of routine inspections and maintenance, as well as during site construction activities, the access roads will be inspected for signs of excessive wear, settlement, ponding, and excessive displacement of the Class II aggregate base material and underlying layers. Access road design details are presented in ***Appendix A***, Sheet 5.

6.4.3.3.2 Infiltration Analysis

An analysis of infiltration was performed using the HELP model (***Appendix G***). The estimated infiltration rate for the final cover systems in the South Face area of LF-1 is 0.32 cubic feet/acre-year (2.4 gal/acre-year). The approximate surface area of the South Face at closure will be 16 acres (slope area). Thus the expected annual infiltration through the final cover will be less than 40 gallons per year, which is negligible.

6.4.4 Drainage and Erosion Control

27 CCR §21790(b)(8)(D) and §20365

27 CCR, §20365 specifies that waste management units and containment structures shall be designed and constructed to limit, to the greatest extent possible, ponding, infiltration, erosion, slope failure, washout, and overtopping under a 100-year, 24-hour precipitation event. The final permanent stormwater diversion and control facilities (***Appendix A,*** Sheets 3 and 5) are designed to accommodate a calculated 100-year, 24-hour storm event.

Surface water for the partial final fill topography will be controlled by channeled ditches, pipelines, drainage benches, debris basins and interim drainage structures. The drainage facilities have been designed to control peak runoff flows based on rainfall intensity, soil characteristics, land use patterns, acreage, and hydraulic characteristics of the drainage area.

All stormwater conveyance features for the 14.4-acre partial final closure area have been designed to maintain a positive drainage slope after settlement is complete. The proposed final grading and cover configuration design for the 14.4 acres of the South Face slope area of LF-1 includes other measures to protect slopes and minimize erosion. They include reduction of run-on water velocity by minimizing the length of final slopes to 50 feet vertical or less, and installation of benches with drainage structures to trap sediments on slope faces. Rip-rap or geotextile nets will be employed in drainage ditches and at surface water discharge points. This will provide for rapid removal of stormwater. Design will assure no excessive velocities will occur, as this would cause erosion of the final cover. Permanent drainage benches and ditches constructed will be lined or seeded for a dense vegetation cover to minimize erosion.

In addition to the rapid diversion of water into lined channels and pipes, vegetated side slopes will reduce flow velocity on the cover surfaces of the landfill as well as binding the soil to prevent erosion. Revegetation of completed fill slopes with native grasses will be completed via hydroseeding. The vegetation on slopes will minimize erosion of the landfill cover.

6.4.5 Erosion and Soil Loss Calculations

Erosion and soil loss calculations were performed for the site using the Universal Soil Loss Equation (USLE) developed by the National Resources Conservation Service. The equation applies to sheet and rill erosion and does not account for soil losses due to gullying. The USLE does not include the effects of soil redeposition.

The erosion and soil loss calculation methods, input assumptions and results are presented in ***Appendix H***. The results show that the amount of soil loss is expected to be 1.45 tons per acre per year which is less than the 2 tons per acre per year recommended by the US EPA.

6.4.6 Environmental Control System Improvements

Partial final closure construction activities on the 14.4-acre South Face of LF-1 will include the placement of soils and compost material for the foundation and vegetative layers. A 60-mil HDPE and geocomposite drainage net liner will also be placed in the South Face closure area. LFG and leachate extraction systems will need to be temporarily taken off-line during these construction activities. LFG and leachate extraction well heads may need to be extended, or replaced if necessary. Existing LFG and leachate extraction well casings will be fitted with pre-fabricated HDPE membrane boots, welded to the HDPE geomembrane, to allow for settlement.

To the extent possible, existing LFG and leachate conveyance will be re-used following cover construction. However, replacement of LFG and leachate piping may need to occur based on observed conditions of the piping. The necessity for extension of LFG and leachate wells, replacement of well heads, and replacement of piping will be assessed by a field survey prior to commencement of construction activities.

6.4.7 Site Security

27 CCR §21600(b)(8)(A), §21135 and §21180

The landfill operations at other areas of the CDS will remain active as the partial final closure construction activities occur. 27 CCR §21135(b) provides exemption of sites that are undertaking partial final closure from the Final Closure Site Security provisions. The site security provisions as outlined in **Section 2.4** will remain in effect for the operating period of the CDS. The provisions of 27 CCR §21135 and §21180 will be met upon the final closure of CDS.

6.5 STABILITY ANALYSES

27 CCR §21090(a)(6, §21145 and §21750(f)(5)

27 CCR §21145 requires that landfill operators ensure the integrity of final slopes under both static and dynamic conditions to protect public health and safety and to prevent damage to postclosure land uses, roads and LFG and leachate control systems, and prevent explosure to waste. Stability analyses were performed for the final slopes in the 14.4-acre area in the South Face slope in accordance with the closure requirements listed in 27 CCR §21090 and 21750(f)(5).

6.5.1 Methods of Analysis

A stability analysis was performed by SCS based on the facility design elements and site-specific geologic site conditions presented herein. The analysis was done in anticipation of proposed site development plans as outlined in the companion Amended JTD (SCS, 2011). The following were analyzed: (1) new cell excavation (cut) slopes in the native geologic formations, for proposed filling in LF-2; and (2) final landfill slopes. The latter analyses are applicable to partial final closure of the 14.4-acre area in the South Face slope area of LF-1. Our work included:

- Review of previous site investigations, fault studies and seismic hazard assessments, and stability analyses by others.

- Perform analyses to confirm whether design accelerations used in previous stability analyses are suitable for current design, considering the response spectra in the 0.5 to 1.0 second range.

- Obtain soil and geosynthetic material samples for final cover components as specified in containment system design herein, and submit those samples for laboratory analysis of physical and strength properties and interface testing. Bulk samples of on-site soils to be used in the foundation and vegetative layers of the final cover were obtained from on-site stockpiles at the CDS in December 2010. Geosynthetic material samples were obtained from manufacturers.

- Evaluate and select critical landfill cross sections, using conservative assumptions regarding potential failure surfaces. A critical section across the lower elevations of the South Face of LF-1 was chosen for analysis.

- Identify representative one-dimensional columns for evaluation of site seismic response.

- Perform pseudo-static analyses using the computer program PCSTABL5M.

- Perform seismic deformation analyses using methods identified by Bray et al (1998).

6.5.2 Fault Assessment and Design Accelerations

The model input data included seismic information, which is detailed in previous investigations by others (GeoSyntec 2004, 2005, 2008). These seismic design analyses have been based on the MPE occurring on the Healdsburg-Rogers Creek fault. Earthquake induced hazards at the CDS would be dominated by an MPE magnitude 6.75 event with an estimated peak horizontal ground acceleration (PHGA) of 0.32 g.

An analysis to confirm that the above acceleration is suitable for use in the current design, considering the response spectra of 0.5 to 1.0 seconds was performed as part of our work (RMC Geoscience, 2011). This analysis indicates results of the previous seismic hazard assessments are conservative and should be suitable for design of CDS containment features. The PHGA of 0.32 has been used in our evaluation.

Previous hazard evaluations were based on attenuation relationships developed in 1997 that have since been updated. The new relationships are collectively referred to as Next Generation Attenuation (NGA) relationships. In general, use of NGA relationships results in relatively lower PHGAs at most northern California landfill sites (RMC Geoscience, 2011). We therefore consider the use of the PHGA of 0.32 as a basis of stability analyses to be conservative.

6.5.3 Results of Stability Analysis

Analysis of global and veneer stability for the proposed final slopes are provided in ***Appendix F.*** The critical section for the 14.4-acre partial final closure area is identified as Section 201 in ***Appendix F***.

For the critical section, the results for veneer stability show that under static conditions the factor of safety is 2.39. This exceeds the regulatory threshold of 1.5 for the proposed final cover system grading configuration and profile.

Under seismic conditions, the estimated permanent deformation for the critical section in the South Face slope area is negligible. Deformations in final cover systems of up to 12 inches have been deemed acceptable by the U.S. EPA (2005) and the North Coast RWQCB (2010).

The FS under seepage conditions resulting from a 100-year, 24-hour storm event is 1.11. This FS is acceptable for storm conditions.

Based on the slope conditions analyzed for veneer slope stabilities and the assumptions in the evaluations, it is concluded that the veneer slope section analyzed for the final cover design presented herein is considered stable under static, seismic, and seepage conditions. The new cell and proposed containment structures including final cover meet the requirements of 27 CCR §20240(d) and §20370 for ground motions.

6.6 SETTLEMENT ANALYSES

In general, settlement that occurs in landfills where waste has been compacted in place and covered is due to consolidation and/or anaerobic decomposition. Consolidation is the settlement of waste over time as it becomes dense due to the weight of overlying refuse and cover and anaerobic decomposition of organic components of the waste. Gradual settlement occurs in landfills over a long period of time. The rate and magnitude of settlement varies with many factors including the age, depth, and composition of refuse.

Waste settlement analyses were performed for LF-1 under current grades. Only secondary settlement due to the self weight of waste was considered in this analysis (i.e., caused by the decomposition of the underlying existing waste during the 30-year post-closure period). The calculated total settlement of LF-1 ranges between 0- to 29-feet over the 30-year post-closure period. Based on settlements observed for sites with similar geometry and MSW filling history, SCS estimates waste settlement in the lower slope area of the South Face of LF-1 is expected to range between approximately 0 to 6 feet over the 30-year post-closure period.

The analyses indicate that positive drainage of the final cover will be maintained after settlement and that the geosynthetics will be able to accommodate the effects of differential settlements. Therefore, the analysis indicates that the final cover system would perform satisfactorily under anticipated settlements of waste. A more detailed description of the settlement analyses for the entire site can be found in the previously submitted Amended JTD (SCS, 2011).

6.7 SURVEYS AND FINAL TOPOGRAPHY

27 CCR §20950(d) and §21090(e)(1)

In order to monitor the future settlement of the landfill, survey monuments will be installed on the landfill in accordance with 27 CCR §20950 (d). Typical design for these monuments consists of a galvanized pipe, two-inches in diameter and 18 inches in length placed in blocks of concrete, 12 inches in diameter by nine inches in depth. A nail and tag will be placed in the center of each monument for identification. An optional monument design may be utilized, as appropriate.

Two permanent monuments will be placed in the 14.4-acre area of the South Slope in accordance with 27 CCR§20950(d) to provide both horizontal and vertical control points to allow monitoring of settlement of the final fill contours during the post-closure maintenance period.

An aerial photographic survey of the site will be performed and provided to the RWQCB, LEA and CalRecycle upon completion of closure activities in accordance with 27 CCR §21090(e)(1). The settlement monuments will be surveyed upon completion of all closure construction activities. Additionally, in accordance with 27 CCR, §21090(e)(2) requirements, the County will prepare an iso-settlement map of the entire permitted site every five years throughout the post-closure maintenance period.

6.8 CONSTRUCTION QUALITY ASSURANCE

27 CCR §21600(b)(8)(C), §20323 and §20324

Construction of the final cover system will be carried out in accordance with a CQA plan certified by a registered professional civil engineer or certified engineering geologist. The CQA Plan shall specify:

- CQA personnel qualifications, responsibility, and lines of authority.
- Inspection, monitoring and testing methods to verify that the final cover system and drainage features are undertaken in accordance with approved design plans and specifications, accepted engineering practice, and regulatory requirements.
- Laboratory testing requirements for soil and synthetic cover components.
- Recordkeeping and reporting provisions.

A preliminary CQA Plan developed for closure of the entire site is provided in ***Appendix E***. A CQA Plan specific to the LF-1 South Face closure area will be submitted to the oversight agencies at least 180 days prior to construction of the discrete partial final cover system for the 14.4-acre area in the South Face. The CQA Plan will be approved by the agencies prior to commencement of partial final closure work.

6.9 RECORD KEEPING

Closure construction will be conducted under the supervision of a CQA Officer who will be a registered civil engineer in the State California. The CQA Officer will direct and certify closure reports for submission to CalRecycle, RWQCB, the LEA, and the Sonoma County Recorder's office, in accordance with 27 CCR §21170 and 21880. Reporting will contain, at minimum, the following:

- Description of the closure activities and significant events.
- Construction record drawings.
- Test results.

- Date of closure construction completion.
- Description and discussion of all deviations from the approved closure plan
- Topographic map.
- Location and telephone number where the closure plan and emergency response plan can be obtained.
- Drawings, specifications, and approved revisions.

The reports will contain a certification that the information presented is accurate to the best of the CQA officer's knowledge.

6.10 PARTIAL FINAL CLOSURE SCHEDULE

27 CCR §21800(c)

It is intended that the partial final closure project be undertaken concurrently with construction of the first new base liner to allow continued landfill operations as proposed in the Amended JTD (SCS, 2011). Assuming agency approval of the Amended JTD and this PFCMP by fall 2011, the County anticipates final design, bid process, and contractor selection can be completed to allow partial final closure construction during the summer 2012 season.

7.0 PARTIAL FINAL POST-CLOSURE MAINTENANCE PLAN

This section presents a Partial Final Post-closure Maintenance Plan (PFPMP) for the approximate 14.4-acre plan area within the lower elevations of the existing South Face slope of LF-1, and has been prepared in accordance with applicable requirements of 27 CCR, Chapters 3 and 4, and 40 CFR §258.61. The purpose of this PFPMP is to ensure that the environmental control and containment systems in this slope area are properly monitored and maintained to minimize impacts to public health and safety, and the environment.

Pursuant to 27 CCR §21180(a), any areas where final cover is placed prior to the closure of the entire landfill shall be maintained in accordance with the approved post-closure maintenance plan, but the thirty year post-closure monitoring period shall not commence until closure of the entire landfill is complete.

Post-closure maintenance activities for the partial final closure of the 14.4-acre area within the South Face of LF-1 will consist of: LFG and leachate control system inspections and maintenance, final cover inspection and maintenance, settlement monitoring and maintenance, access road maintenance, and surface water drainage control system monitoring and maintenance. These activities are currently performed under the active operation of the landfill, and will continue as such until the entire site commences the thirty-year post-closure care period. As described by 27 CCR§ 21840, the objective is to provide basis for estimating costs for a third party to maintain, monitor, and inspect the closed landfill area in accordance with applicable requirements and approved PFPMP.

The post-closure monitoring and maintenance activities described in this PFPMP are specific and limited to the closure of the 14.4-acre South Face area of LF-1. Existing water quality and LFG monitoring programs at the CDS, as described in Section 5 herein, will continue to be performed as part of ongoing programs for the active landfill.

7.1 POST-CLOSURE MAINTENANCE PERIOD

27 CCR §21180(a)

The CDS shall be maintained and monitored for a period not less than thirty years after final site closure. Any areas where final cover is placed prior to the closure of the entire landfill shall be maintained in accordance with the approved post-closure maintenance plan, but the thirty year post-closure monitoring period shall not commence until closure of the entire landfill is complete.

7.2 INSPECTION AND MAINTENANCE PROGRAM

27 CCR §21090(c) and §21180

This section describes the inspection and maintenance procedures and methods to be implemented following closure of the 14.4-acre area within the South Face at LF-1. These procedures will be used for the final cover, surface water management system, leachate management system, and LFG management system.

General post-closure duties throughout the post-closure maintenance period are described in 27 CCR §21090(c). The operator shall perform the inspection and maintenance activities to assure the structural integrity and effectiveness of all containment structures of the closed unit. Specifically, the operator shall continue to operate the LCRS as long as leachate is generated and detected, maintain the monitoring systems and monitor the ground water, surface water, and the unsaturated zone, prevent erosion and related damage of the final cover due to drainage, and protect and maintain surveyed monuments.

The 14.4-acre South Face area at the CDS will be periodically inspected, maintained and repaired, as necessary. Inspection of the closed areas of the CDS will be performed by the owner or owner's representative to ensure that all post-closure requirements have been met.

7.2.1 Final Cover and Grading

27 CCR §21090(a)(4) and §21769(c)(2)(H)

The purpose of the completed final cover is to minimize stormwater infiltration into and through the closed landfill, minimize the venting of gas generated in the waste mass, isolate the buried wastes from the surface, promote drainage, minimize erosion or abrasion of the cover, and accommodate settlement and subsidence so that cover integrity is maintained.

The primary purpose of the final cover maintenance procedures is to maintain the integrity of the completed final cover over the long-term and to provide maintenance, scheduling and documentation so that materials and maintenance practices are consistent with the final cover design specifications. Quarterly visual inspections of the final cover will include identification of erosion and settlement problems. A County Site Engineer, or as designated by the County, will be responsible for documenting the location and extent of any repairs.

7.2.1.1 Inspection Procedures

All personnel with access to the site will be trained to identify any surface cracking, ponding on benches, or unusual surface conditions and report those observations to the Landfill Operations Supervisor or County Site Engineer who will record the information in the site logbook at the time it is observed. At minimum, inspections of the cover will be made on a quarterly basis by walking a grid of the closed area site to visually observe the following:

- Evidence of erosion.
- Areas where vegetation has died off.
- Visible depressions.
- Ponded water (limited to benches on completed slopes).
- Evidence of odor.
- Exposed refuse.
- Evidence of cracks.
- Differential settlement and subsidence.
- Slope failure.
- Leachate seeps.
- Areas where underlying layers of the cover are exposed.
- Areas damaged by equipment operation.

In addition to routine inspections conducted on a quarterly basis, the site will be inspected following any major storm event, seismic event or natural disaster for improper operation and resultant effects on the surrounding final cover. County personnel or a qualified contractor will perform the above mentioned visual inspection. A formal report of findings will be presented to the Site Engineer.

7.2.1.2 Final Cover Maintenance Procedures

The proposed final cover designed for partial final closure of the 14.4-acre South Face area of LF-1 at the CDS consists of (from bottom to top): 24-inch foundation layer, 60-mil HDPE barrier, geocomposite drainage net, and 18-inch thick vegative layer (***Appendix A,*** Sheet 5). All final cover repair and/or reconstruction activities shall be conducted in a manner to maintain the integrity of the as-built final cover system. Repair of fill materials should be performed in eighteen-inch vegetative or lower layers as necessary with the procedures utilized during the original final cover construction. Final cover repairs will be required for the following:

- Elective penetration through the final cover associated with installation or maintenance of LFG or leachate extraction components.
- Settlement related ponding or drainage interruptions that interfere with the conveyance of discharge of surface waters from the closed landfill surface or benches.
- Surface erosion associated with intense rains.
- Local slumping on slopes resulting from intense rainfall.
- Vertical and near vertical cracking of cover soils as a result of landfill settlement.

Final cover repair activities will be conducted and documented as specified in the CQA Plan, included as part of ***Appendix E***. A registered engineer or certified engineering geologist will inspect and certify repairs to the final cover.

7.2.2 Elective Penetration

Elective penetration of the final cover associated with installation or maintenance of gas and/or leachate monitoring system components should be avoided whenever possible. If intrusion into or through the cover cannot be avoided, the cover sections should be reconstructed to the original design geometry. All earth work should be completed in accordance with the procedures contained in the specifications for final closure, which would be similar to those in the CQA Plan (***Appendix E***). As the final cover system includes a geocomposite drainage layer and an HDPE liner, any penetrations through the liner will be fitted with a prefabricated geomembrane boot which will prevent infiltration through the interface.

All final cover repair and/or reconstruction activities shall be conducted in a manner directed to maintain the integrity of the as-built final cover system. Repair of soil fill materials should be performed in six to eight-inch lifts consistent with construction procedures from the original partial final cover construction.

For removal of the final cover for the purpose of elective intrusion, the geocomposite drainage material, and the geomembrane of the final cover system shall be cut to dimensions exceeding those of the excavation by at least 12-inches. The edges of the cut geosynthetics shall be temporarily protected using plywood sheets or other appropriate materials (e.g., scrap geomembrane) during the excavation. Once the excavation and repair of the foundation layer has been completed, new pieces of geocomposite drainage material and geomembrane shall be used to replace the cut out area. The geosynthetic material and installation shall conform to the requirements of the final cover construction specifications and drawings. The geomembrane shall be fitted with prefabricated boots where penetrations are required (e.g., for LFG or leachate extraction wells). The boots shall be approved by the final cover performance officer or his designated representative. Repairs of the geomembrane shall be subjected to CQA testing in accordance with the CQA Plan for construction of the final cover.

Excavation of the final cover should be initiated only after receiving approval from a County Site Engineer, and appropriate regulatory agencies as needed, and should be conducted under the full-time observation of the Site Engineer or County designee.

7.2.3 Ponding, Drainage Interruptions and Surface Erosion

Sags, ponding, surface erosion, or other settlement features, which could interfere with the function and integrity of the geocomposite drainage layer and geomembrane, will be repaired as needed.

As the 14.4-acre partial final closure area configuration is graded with 3:1 slopes (H:V), any ponding would be limited to bench roads. Areas where sags and ponding due to non-uniform displacement below the geocomposite drainage material and geomembrane adversely affect roadway grades will be repaired by excavating the vegetative layer or roadway improvements to the geocomposite drainage material, cutting and removing the geocomposite drainage material and the geomembrane, and rebuilding grades by placing additional foundation soil. Once the grades have been re- established, new pieces of geomembrane, and geocomposite drainage material shall be used to replace the cut out area. Reconstruction materials and practices will be consistent with those utilized during final cover system construction.

7.2.4 Vegetation

27 CCR §21090(a)(5)(B)

Maintaining sufficient vegetation over the surface of the landfill is an integral component in maintaining adequate erosion protection. The vegetative cover will support non-irrigated native grasses. Per 27 CCR §21090(a)(5)(B) the County will moderate the use of water for initial establishment of vegetation following seeding.

7.2.4.1 Vegetation Inspection Procedures

The vegetation will be inspected for landfill surface coverage and stress indications. The causes of these irregularities or deficiencies shall be ascertained at the time of environmental monitoring wherever possible. Landscape monitoring parameters also include soil quality control, rodent control, and a reseeding program, if necessary. Corrective action will be taken to remedy observed deficiencies. Inspections of the vegetative (erosion control) layer will be conducted in

conjunction with the final cover inspections. A County Site Engineer or designee shall be responsible for documenting and monitoring the following inspection procedures:

1) Personnel or contractors with access to the site will be trained to observe any landfill surface cracking, liquid ponding, or unusual landfill surface conditions and report to the County Site Engineer immediately.
2) The vegetative layer of the landfill will be visually inspected by a County representative trained in inspection procedures and a report of findings will be prepared.
3) The vegetative layer of the landfill will be visually inspected by a County representative trained in inspection procedures following unusual events such as landfill fires and a report of findings will be prepared following any such unusual event.
4) The landscaping and temporary irrigation system (if used) will be inspected for landfill surface coverage and stress indications, such as stunted growth, discolorations, and dead or dying plant material. The causes of these irregularities shall be ascertained at the time of environmental monitoring whenever possible. Landscaping monitoring and maintenance parameters also include weed control, reseeding, fire control, and rodent control.
5) The temporary irrigation system (if required) shall be monitored routinely to facilitate efficiency and proper operation of equipment. Temporary irrigation system inspections shall include checks of the sprinkler or bubbler heads, irrigation lateral and main lines, control valves, pressure relief valves, pressure regulating valves, air relief valves, and pumps. The operation of the irrigation control station will be monitored as well.

7.2.4.2 Vegetation Maintenance and Repair Procedures

Maintenance of the vegetative layer, the landscaping, and any temporary irrigation system will be conducted by Sonoma County or qualified contractor personnel. Maintenance efforts are expected to be greatest during the vegetation establishment period and are projected to lessen thereafter. The inspection schedule after the establishment period is expected to decrease accordingly.

It is anticipated that the 18-inches thick vegetative (erosion control) layer will require periodic maintenance throughout the post-closure maintenance period. The conditions that may contribute to the need for maintenance of the vegetative layer correspond to those outlined for final cover maintenance and include the following:

1) Elective intrusion into or through the vegetative erosion associated with maintenance of the LFG control system or leachate extraction system.
2) Sags related to settlement which may interfere with the controlled runoff of surface waters from the closed landfill surface.
3) Surface erosion as a result of high runoff velocities associated with intense rains or a malfunctioning temporary irrigation system.
4) Vertical cracking of the vegetative layer as a result of landfill differential settlement.

5) Local surficial slumping on slopes resulting from intense seasonal rainfall, a malfunctioning temporary irrigation system, or seismic loading.

Repairs to the vegetative layer will be performed in a manner consistent with the original vegetative layer construction procedures. Clean fill, taken from an existing on-site soil stockpile, will be placed in loose lifts of 6 to 8-inches in thickness to re-establish grades to appropriate elevations, as necessary.

7.2.5 Drainage and Erosion Control Structures

Post-closure maintenance of the surface-water management system is intended to ensure adequate performance of the system. Therefore, the inspection and maintenance programs for the surface-water management system will continue to be implemented until and throughout the post-closure maintenance period. The inspection and maintenance programs outlined below provide a comprehensive set of procedures to monitor and maintain the integrity of the partial closure of the 14.4-acre area within the South Face slope of LF-1 as necessary until and during the post-closure maintenance period.

Control of runoff, erosion and sediment will be accomplished through the use of drainage ditches, channels and culverts, temporary diversion dikes, straw bale barriers, temporary and permanent seeding, and sediment ponds. Flow from the developed areas and adjacent properties will be intercepted by the channels and routed to the sediment ponds. The ponds will act as combination storm-water management basins. The channels may be subject to siltation and must be periodically maintained. Erosion will be controlled through use of temporary and permanent seeding of landfill slopes.

7.2.5.1 Drainage and Erosion Inspection Procedures

Bench Channels. The benches will be constructed 15-feet wide to allow vehicle access. The existing vertical alignment will remain at 50 foot intervals or less. The benches/access roadways will be graded inward at approximately two percent to collect and convey stormwater along inner swales. The drainage swales will have an overall gradient generally between one and three percent in order to convey storm water to the bench down drain inlets and/or perimeter drainage channels.

Inspection of the bench drains and bench channels will be required during the rainy season after each major storm. Benches will also be inspected during the summer, and necessary repairs will be made prior to the next rainy season. Bench inspections will include checking for erosion ruts, settlement cracks, and proper grading to verify the integrity of the bench channels and culverts.

Culverts. The use of culverts will be used to convey stormwater at the CDS. Typically, the culverts will be comprised of HDPE plastic pipe. The culvert system serves two functions: (i) it conveys surface-water runoff from the top deck drains; and (ii) collects runoff from the bench drains.

A visual inspection of each culvert will be conducted to identify any of the following deficiencies: joint separation; invert failure; structural failure; perforations; and presence of silt and/or debris.

An inspection report should include a detailed description and approximate location of deficiencies. Corrective measures taken to remedy each deficiency shall also be described in the inspection report.

Downdrains. The downdrain conveys storm flow from the top deck and bench drains into a perimeter drainage channel. The storm drains traversing down the surface of the landfill slopes will be comprised of lined ditches, including articulated concrete blocks (ACB) and/or HDPE pipe networks. These downdrains are constructed on the exterior face of the finished slopes. An inlet apron will be constructed of concrete or grouted rip-rap around each inlet to serve as a nonerodible approach for deck and bench runoff.

A visual inspection of each downdrain will be conducted to identify any of the following deficiencies: joint separation; invert failure; structural failure; and presence of silt and/or debris.

An inspection report shall be prepared following each inspection giving a detailed description and approximate location of deficiencies. Corrective measures taken to remedy each deficiency shall also be described in the inspection report.

Perimeter Channels. Larger perimeter drainage channels will not be necessary in the South Face area of LF-1; however, storm water conveyed from the South Face area will eventually need to be routed to larger drainage structures. Drainage structures along the perimeter of the landfill will consist of reinforced concrete trapezoidal channels. A visual inspection of each perimeter channel will be conducted to identify any of the following deficiencies: joint separation; invert failure; structural failure; and presence of silt and/or debris.

An inspection report shall be prepared following each inspection giving a detailed description and approximate location of deficiencies. Corrective measures taken to remedy each deficiency shall also be described in the inspection report.

7.2.5.2 Drainage and Erosion Maintenance Procedures

Bench maintenance will consist of erosion control along the toe of the slope and re-grading of areas, which have been subjected to differential settlement. Re-grading will control potential ponding and help maintain drainage into the inlet structures. A grader, dozer, and compactor will be utilized to grade the benches, repair erosion ruts, and maintain the integrity and compaction of the final cover system. In areas where landfill settlement affects the bench grades, additional vegetative layer soil cover material will be placed and compacted to reestablish positive drainage, as needed.

Maintenance activities will include, as necessary, drainage channel and downchute repairs, pumping of sedimentation ponds, removal of silt and debris along drainage channels and in sedimentation ponds, repair and replacement of erosion and sediment controls (e.g., silt fences, straw bales, rip-rap), and grading of the final cover erosion layer.

Typical culvert, downdrain and perimeter channel corrective measures for deficiencies include the following:

1) For joint separation: use wider CSP band couplers with mastic or pumped grout; and attach patches with self-drilling/self-tapping screws or welds.
2) For invert failure: replace piping; and rotate pipe 180 degrees and patch as required.
3) For structural failure: reinstall pipe anchor supports; and replace section of drain.
4) For clogging by silt/debris: use vacuum pumps to clear extensively clogged culverts; or use a waterjet spray to force debris out of the drain; or for smaller amounts of debris, use a bucket line; or use a fire hose to flush out debris.

Access to the buried section of the culvert under each bench can be gained through the removable inlet grate. Mirrors can then be lowered into this section and, with sufficient lighting, a visual inspection can be conducted. The pipe fittings at the upper end of the exposed portion of each culvert can also be removed for inspection and cleaning.

Small amounts of silt and debris may be removed by buckets or fire hose flushing. Extensive clogging may require either vacuum pump or waterjet spray. A vacuum pump may be used to remove sediment from pipes and can be mounted on a vehicle. Typically vacuum pump systems can remove stones, leaves, litter, and sediment deposits.

A waterjet spray can be used to clear debris from the culvert system. Waterjet equipment is usually mounted on a self-contained vehicle with a high-pressure pump and a 200-300 gallon water supply. A 3-inch flexible hose line with a metal nozzle that directs jets of water out in front is used to loosen debris in pipes or trenches. The nozzle can also emit umbrella-like jets of water at a reverse angle, which propels the nozzle forward as well as blasting debris backward. As the hose line is reeled in, the jetting action forces the debris downstream where it is removed by the vacuum pump equipment. The typical length of hose is approximately 200-feet.

Access roads for maintenance will be provided on the decks to reduce interference with any surface flows. It is important that maintenance vehicles utilize access roads and benches whenever possible to reduce surface rutting that could interfere with normal drainage patterns.
For open channels and sedimentation ponds, the following corrective measures can be taken for deficiencies identified during the inspection:

1) For cracking: construction of expansion/control joints; and placement of sealants such as epoxy resins, asphaltic material, thermoplastics or silicones.
2) For settlement: grouting injection; or removal of modular concrete blocks; and/or completion of replacement with subgrade work.

7.2.6 LCRS

27 CCR §21160(c and d)

During the closure/post-closure maintenance period for the 14.4-acre area within the South Face slope, the owner/operator shall ensure that leachate collection and control is managed to prevent public contact and controls vector, nuisance, and odors.

The leachate management system within the 14.4-acre area within the South Face slope of LF-1 consists of 15 leachate or dual leachate/LFG extraction wells, down-hole pneumatic pumps, and collection piping. Well and piping locations are shown in ***Appendix A***, Sheet 2.

Any leachate generated during the post-closure maintenance period will be conveyed to on-site leachate evaporation/storage ponds (Leachate Pond Nos. 1 and 2, ***Figure 3***), and then convenyed via a force-main pipeline for discharge at the City of Santa Rosa Waste Water Treatment Plant. Both the quantity and quality of leachate shall be monitored.

As this is a partial final closure and CDS will remain active, the frequency of monitoring and testing to be performed will continue as described in the current monitoring and reporting program.

7.2.6.1 LCRS Inspection Procedures

A visual inspection of the South Face leachate extraction wells, collector mains, and pump systems will be made by qualified County personnel or contracted maintenance crews. If repairs to the system are required, the necessary personnel will be notified. The focus of the inspections will be on the LCRS pumping equipment and leachate evaporation/detention ponds.

The following items will be included in the visual inspection:

- Motor/pump pneumatic controls and valving.
- Compressors for proper operation.
- Float switch for proper calibration.
- Leachate piping for evidence of any pipe leakage.
- Valve inspection for damage and leak.
- Discharge piping for clogging or buildup of particulate matter on pipe walls.

7.2.6.2 LCRS Maintenance Procedures

Based on the results of the inspection activities, repairs and/or replacement of components of the LCRS components will be made as necessary. Identified worn or malfunctioning elements of the South Face LCRS will be repaired or replaced, as appropriate. The repair will be performed by qualified County personnel or as designated. Pumps that do not function properly will be repaired or replaced.

The County maintains spare LCRS pumps and routinely removes the operable pumps, and replaces them with a full-serviced pump. This work is done as part of ongoing maintenance of existing controls at the CDS, and will be continued during the post-closure maintenance period.

On an annual basis, leachate ponds LP-1 and LP-2 are cleaned of sediment, visually inspected and repaired as needed. This practice will be continued during the post-closure maintenance period. If solids are present in the ponds, they will be removed and dried and disposed of as appropriate depending on chemical test results.

7.2.7 LFG Extraction System

27 CCR §21830(b)(6)

The LFG extraction system in the South Face area of LF-1 is composed of the 29 gas extraction wells and associated header piping (***Appendix A***, Sheet 2). The system will be inspected and maintained until and throughout the thirty-year post-closure period or as long as gas continues to be detected at levels requiring control.

7.2.7.1 LFG Extraction System Inspection Procedures

The LFG management system will be inspected with a focus on well head assemblies, pipeline couplings, connections, pipeline leaks (which may be indicated by a gas odor, hissing sounds, elevated gas concentrations in surface air samples or elevated oxygen readings in the collection system), pipeline breakage, cracking, abnormalities, or deformations. Regular inspections of the blower/flare station will also be performed to ensure adequate and safe operation.

The LFG collection system maintenance procedures will include provisions for minimizing the probability of elevated subsurface temperatures. These elevated subsurface temperatures are caused by LFG combustion, which may result from excessive oxygen intake. The abundance of oxygen usually occurs from the application of excess vacuum to a portion of the LFG collection system. The elevated subsurface temperatures can jeopardize the integrity of the LFG collection system, create unpredictable LFG generation rates, and cause rapid and/or uneven refuse settlement. In addition, monitoring data will be reviewed for suction losses, which may indicate collection system leaks, and for combustion efficiency. Based on the results of the inspections, repairs and/or replacement of components of the active LFG extraction system can be made as necessary.

7.2.7.2 LFG Extraction System Maintenance Procedures

Placement of a final cover system with HDPE liner component greatly reduces the ability of oxygen intrusion to occur. Well head monitoring of the LFG temperature and composition serves as an indicator of elevated subsurface temperatures. Well head readings with methane contents below 40 percent (by volume), temperatures at or above the 120 to 130°F range, or oxygen contents greater than 4 to 5 percent indicate possible excessive oxygen intrusion and elevated subsurface temperatures.

Routine inspection and maintenance of the LFG extraction system will continue to be performed as part of active landfill operations and include adjustment to valves, testing of well pressures, checking for gas leakage at the well head, and checking the integrity of well penetrations through the final cover. Surface repairs will be conducted in accordance with the final cover repair procedures. Gas well head flows can be reduced or completely shut off by valve adjustments to reduce oxygen intrusion and therefore lower subsurface temperatures.

Cracked, broken, or malfunctioning portions of the LFG collection system will be repaired upon detection in accordance with industry standards. LFG well repairs are dependent on the nature and extent of damages to the LFG collection system and may include removal and replacement of solid-wall sections of polyethylene pipe, soil backfill, bentonite grout, and/or geomembrane boots. If it is determined that LFG wells are damaged beyond repair, they will be abandoned

and/or re-drilled. Repairs to the LFG headers may include removal and replacement of damaged header pipe. These repair activities will be conducted in compliance with applicable BAAQMD and CalRecycle regulations.

7.2.7.3 LFG Monitoring System Inspection Procedures

The LFG monitoring system consists of LFG monitoring probes installed along the CDS perimeter. Monitoring for combustible gas migration is performed on a quarterly basis as described in **Section 5** of this document. Visual inspections of the LFG monitoring probes will continue to be performed as part of ongoing programs for the active landfill operation. Results of LFG monitoring will be reported to the LEA as required under 27 CCR §21830.

7.2.7.4 LFG Condensate Piping Inspection and Maintenance Procedures

The LFG condensate pneumatic and liquid discharge piping components in the LF-1 South Face area will be inspected monthly, in conjunction with the monthly inspections of the LFG collection system. Gas condensate piping will be visually inspected for leaks or breakage, and condensate pumps will be checked for proper operation. Detection of odor and evidence of condensate or minor spills are indicators of the malfunctioning of the LFG condensate management system.

Maintenance and repairs to the LFG condensate piping will be made upon detection. The continuous operation of the LFG collection system and the condensate system is a BAAQMD operating permit requirement. Cracked, broken, or malfunctioning portions of the LFG condensate management system will be repaired in accordance with industry standards.

7.2.8 Groundwater Monitoring System

27 CCR §20380(a)

As this is a partial closure and CDS will remain active, the frequency of groundwater monitoring and testing to be performed will continue as required under WDR No. R1-2004-0040, or new WDRs issued by the RWQCB.

7.2.9 LFG Monitoring and Control Systems

27 CCR §21160(a) and §21180

State regulations require maintaining and operating the gas monitoring system during the thirty-year post-closure maintenance care period. As this is a partial closure and CDS will remain active, the frequency of LFG extraction and monitoring system inspections and repairs will continue as per current active landfill operations until the time of complete site closure and the commencement of the thirty-year post-closure maintenance period.

The LFG management system is a vital environmental control system at the CDS. The corresponding inspection and maintenance program includes maintenance requirements for pipe breakage due to landfill settlement and pipe blockage due to the formation of gas condensate, as well as management of the LFG condensate.

7.3 EMERGENCY RESPONSE PLAN

27 CCR §21769(c), §21830(b)(1), §21130(a) and §21132

An Emergency Response Plan (ERP) is a document that identifies occurrences beyond site design that may endanger public health or the environment and the resulting procedures to minimize these hazards. The current ERP for the entire CDS facility, referred to as the Book of Plans by the County, is provided in companion Amended JTD (SCS, 2011). The County Book of Plans document includes several separate elements: a Business Plan, Contingency Plan, Dust Control Plan, Emergency Response and Evacuation Plan, Fire Prevention Plan, Respiratory Protection Plan, Load Checking Plan, and a Spill Prevention, Containment and Countermeasure Plan. The current Book of Plans will remain in effect as part of ongoing landfill operations.

Per 27 CCR §21132, the emergency response plan, has previously been submitted to the LEA and RWQCB for review (GeoSyntec, 2008). The Book of Plans provided in the companion Amended JTD (SCS, 2011) contains recent updates to the County's Load Checking and Spill Prevention, Containment and Countermeasure Plans. Future updates to the Book of Plans will be provided to the RWQCB, LEA and CalRecycle as appropriate.

7.4 POST-CLOSURE CONTACTS

27 CCR §21830(b)(2)

As the CDS will remain active after the completion of the partial final closure activities of the South Face area of LF-1. The current safety and emergency contacts will be used for the post-closure contacts for this area. The current contacts are:

Owner /Operator Contact:

County of Sonoma
Department of Transportation and Public Works
Office Phone: (707) 565-2231
Address: 2300 County Center Drive, Suite B-100, Santa Rosa, CA 95403

Deputy Director, Department of Transportation and Public Works
Office Phone: (707) 565-2440
Address: 2300 County Center Drive, Suite B-100, Santa Rosa, CA 95403

Site Engineer, Department of Transportation and Public Works
Office Phone: (707) 565-7950
Address: 500 Mecham Road, Petaluma CA 94952

Regulatory Contacts:

Sonoma County Department of Health Services
Office Phone: (707) 565-6560
Address: 475 Aviation Blvd, Suite 220 Santa Rosa, CA 95403

North Coast Regional Water Quality Control Board
Office Phone: (707) 576-2220
Address: 5550 Skylane Blvd, Suite A, Santa Rosa, CA 95403

Fire District Contact:

Rancho Adobe Fire District
Emergency: 911
Business: (707) 795-6011
Address: 11000 Main Street, P. O. Box 1029, Penngrove, CA 94951

Alarm Company Contacts:

ADT
Phone: (800) 669-5454
Monitors: Landfill Gas Cogeneration Power Plant

Dean Security/Monitored by Americom Central Stations
Phone: (800) 387-8802
Monitors: All Other Alarms (County Administration Building)

The LEA will be notified if any of the emergency contacts cannot be reached. The emergency contact information is posted at the operations headquarters building, all fee gate buildings, and the equipment operators building.

7.5 POST-CLOSURE LAND USE

27 CCR §21830(b)(3)

As stated above, the CDS facility is currently proposing to expand waste disposal areas at the site. Partial final closure of the South Face of LF-1 would occur as regulatory approval is achieved. Currently, there have been no specific proposals for use after complete closure of the entire site. As the closure the 14.4-acre area of the South Face is generally on exterior side slopes, there are no practical uses of the area while the CDS remains active. The area will be monitored and maintained in the closed condition. Bench roads on the South Face will be used as haul roads for soil transport, and for access to leachate and gas wells.

Other non-landfill facilities within the larger County-owned CDS property associated with MSW management will remain operational during the post-closure maintenance period, under separate permits. These facilities include the T/PF, Household Toxics Facility, Recycle/Re-Use Area, and LFGTE plant.

7.6 CHANGE OF OWNERSHIP

27 CCR §21200

If a change in ownership occurs prior to or during the post-closure maintenance period, the County will notify the new owner concerning the existence of the conditions, regulatory standards and requirements relating to post-closure maintenance of the CDS, and signed agreements that are in place to assure continuous compliance. The owner will notify the LEA the change in title within thirty days and shall provide the name, firm, mailing address, and telephone number of the new owner.

Per 27 CCR §21630(a), owners and/or operators of a facility who plan to sell, encumber, transfer or convey the ownership or operation of the facility or land to a new owner or operator, or who plan to change their address shall notify the LEA and CalRecycle 45 days prior to the anticipated transfer.

7.7 POST-CLOSURE SETTLEMENT AND SURVEYING

27 CCR §21090(e)(2)

As the CDS will remain active after the completion of the partial final closure activities of the South Face area of LF-1, the process to prepare and submit the five-year iso-settlement map will begin once the site is under the thirty-year post closure maintenance period. Once the entire site is closed, a photogrammetric survey of the site will be made. Using this survey, a base topographic map will be produced at a scale of 1-inch to 200-feet (i.e., 1: 2400) and at a maximum contour interval of 2-feet. Subsequently, an aerial photographic survey will be completed every five years throughout the thirty-year post-closure maintenance period. These updates will be used to allow analysis of the changes in elevation between consecutive aerial surveys of the landfill. The iso-settlement maps will be submitted to the CalRecycle, RWQCB, and the LEA.

8.0 PARTIAL FINAL CLOSURE AND POST-CLOSURE MAINTENANCE COST ESTIMATES

8.1 PARTIAL FINAL CLOSURE COST ESTIMATES

27CCR §21820(a) and §22207

Cost estimates were prepared for the partial final closure of the 14.4-acre area within the South Face of LF-1 in accordance with the above regulations. These regulations require an estimate, in current dollars ($2011) of the cost of hiring a third party to close the landfill area in accordance with the PFCPCMP.

The partial final closure cost estimate was prepared under the oversight of a registered civil engineer. The closure cost is primarily attributed to the construction of the final cover layers of the 14.4-acre partial closure of the South Face area of LF-1. The cost estimates are summarized in ***Table 1*** and reflect current landfill industry unit costs, use of prevailing wage labor rates, and SCS's best engineering judgment based on our understanding of site conditions. Details on the partial final closure capital cost estimate, including worksheets and key underlying assumptions are provided in ***Appendix I***.

Table 1. Partial Final Closure Cost Estimate

Item	Estimated Cost ($2011)
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
Total	**$2,759,800**

8.2 PARTIAL FINAL POST-CLOSURE MAINTENANCE COST ESTIMATE

27CCR §21830(b)(8) and *§21840*

State regulations require written costs of hiring a third party to perform post-closure maintenance of the closed landfill unit.

As this is a partial final closure of 14.4 acres of the South Face of LF-1, the post-closure activities are specific and limited to this area. Pursuant to 27 CCR §21180(a), any areas where final cover is placed prior to the closure of the entire landfill shall be maintained in accordance with the approved post-closure maintenance plan, but the thirty year monitoring period shall not commence until closure of the entire landfill is complete.

Annual post-closure maintenance costs for the 14.4-acre area within the South Face slope area of LF-1 Details on the inspection, monitoring and maintenance expenses for the landfill post-closure period including worksheets and key underlying assumptions are provided in ***Appendix I***.

Table 2. Post-Closure Monitoring and Maintenance Cost Estimate

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

The estimates shown in ***Table 2*** are based on the assumption that procedures and funding for operation, monitoring and maintenance of existing environmental control systems 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 landfill operation.

8.3 FINANCIAL ASSURANCE MECHANISM

27 CCR §22210 and §22212

Federal and state regulations require that the owner demonstrate the availability of financial resources to conduct closure and post-closure maintenance activities. Financial responsibility is essential for providing long-term assurance that the site will be closed and maintained during the thirty-year post-closure period in a manner that protects public health and safety, and the environment from pollution due to disposal of solid waste at the CDS. As the thirty year monitoring period shall not commence until closure of the entire landfill is complete, the partial final closure of the South Face area needs to continue to assure financial resources.

The mechanism for financial assurance being used by the County is an Enterprise Fund and Pledge of Revenue. Future payments will be made in accordance with 27 CCR Section 22225. Appropriate documentation will be submitted by the County to regulatory agencies, as appropriate, under separate cover letter. At the time of this document the County has adequate funds available for this program.

8.4 SCHEDULE FOR DISBURSEMENT OF FUNDS

27 CCR §21800(d)

It is intended that the partial final closure project be undertaken concurrently with construction of the first new base liner to allow continued landfill operations as proposed in the Amended JTD (SCS, 2011). Assuming agency approval of the Amended JTD and this PFCMP by fall 2011, the County anticipates final design, bid process, and contractor selection can be completed to allow partial final closure construction during the summer 2012 season.

Funds for the capital project will be disbursed in accordance with the terms of the construction contract including those for progress payments to the general contractor. It is anticipated that these progress payments will be made over the period June through December, 2012, and accounting for typical invoicing and approval processes of contractor invoices.

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