JOINT TECHNICAL DOCUMENT
MSW LANDFILL B-19, KETTLEMAN HILLS FACILITY
KINGS COUNTY, CALIFORNIA

VOLUME 1 OF 2

June 2016
Prepared for:

Chemical Waste Management, Inc.
35251 Old Skyline Road
Kettleman City, California 93239

Original prepared by:

Shaw™ EMCON/OWT, Inc.
1326 North Market Boulevard
Sacramento, California 95834-1912

Project No.: 833760.02000000

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PROFESSIONAL ENGINEERING CERTIFICATION

This revision to the JTD was prepared under the supervision and direction of the undersigned. This report was prepared consistent with current and generally accepted geologic and environmental consulting principles and practices that are within the limitations provide herein.

Scott Sumner, P.E.
Engineering Manager, RCE 49769

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1.0 Introduction

1.1 Purpose

The purpose of this document is to describe the design and operation of a portion of the Chemical Waste Management, Inc. (CWMI), Kettleman Hills Facility (KHF); Landfill B-19 for disposal of Class II designated waste and Class III municipal solid waste (MSW). Approximately half of the total footprint of Landfill B-19 has received Class I hazardous waste. Beginning in 1998, the capacity that remained in the Unit was permitted to receive Class II/III waste. The KHF is located at 35251 Old Skyline Road, Kettleman City, Kings County, California, as shown on Figure 1. This document has been prepared as a JTDamendment to the Joint Technical Document (JTD), datedApril 2016; to reflect the decommissioning of the Landfill B-19 Bioreactor, and to provide the following proposed updates:

August 2013 Updates (renew the Solid Waste Facility Permit 16-AA-0021 for an additional five years of operation)

- Updated text to reflect the renaming of the CIWMB to CalRecycle.
- Updated text on expected closure date, remaining capacity, waste in place, etc.
- Updated text on construction and operation of the landfill gas collection and control system (flare).
- Updated text on adoption of WDR R5-2006-0122 for KHF non-hazardous operations.
- Updated Closure/Post-Closure Cost Estimates.
- Other minor wording changes to reflect current operations.

June 2016 Updates

- Updated text and monitoring requirements to reflect the decommissioning of the Landfill B-19 Bioreactor.

This report is prepared as a JTD consistent with the requirements of Title 27 of the California Code of Regulations (CCR). CCR Title 27 allows the preparation of a JTD for proposed Class II and Class III landfills to be used by public agencies with permitting authority for Class II and Class III landfills.

Because the amendments of this JTD does not include any changes to volumetric capacity, net permitted capacity available for waste disposal, daily and intermediate cover, and final cover, if included in the total capacity given, or attach topographic maps, including the delineation of the site property boundary and the disposal area used for the volumetric calculations and the date of survey, it was not necessary to have this amendment of the JTD certified by a registered civil engineer or registered geologist as per 27 CCR 21600(b)((3)(B).

The information contained in this document is intended to address, in an integrated manner, the concerns of several public agencies, including:

- Kings County Department of Public Health, Division of Environmental Health Services as the California Department of Resources Recycling and Recovery (CalRecycle) Local Enforcement Agency (LEA).
- CalRecycle.
- State Water Resources Control Board (SWRCB).
- Regional Water Quality Control Board (RWQCB).
- Department of Toxic Substances Control (DTSC).

The names of other regulatory agencies with permitting authority for the development and operation of the KHF Landfill B-19 are included in Section 2.0 of this document.

As of September 15, 2014 the Landfill B19 Bioreactor RD&D Project was terminated. Landfill B-19 is permitted to operate as a Class II/III Landfill. The Kings County Dept. of Public Health (KCDPH), Central Valley Regional Water Quality Board (RWQCB), and CalRecycle, provided approval letters for KHF's for a 5 year delay of closure request in letters dated August 4, 2014, September 15, 2014 and November 12, 2014 respectively. Select monitoring and reporting activities for the Landfill B19 Bioreactor RD&D Project will be discontinued.

Prior to September 15, 2014, the Class II/III bioreactor disposal activities at the KHF operated within the currently permitted Class II/III waste footprint and proposed contours of Landfill B-19. In general, the vertical extent of the unit will not be altered from that as defined in the 2001 JTD. Figure 2 shows the proposed final grading plan for Landfill B-19, including the bioreactor unit footprint. The Class II/III waste footprint is comprised of a bioreactor unit, to which liquids and high liquid content wastes are added as a beneficial use to enhance waste decomposition, and a "control unit" to which liquids and high liquid content wastes are not added. Figure 3 shows a cross-section of Landfill B-19, presenting the approximate configuration of the bioreactor and control units.

The total footprint for Class II/III waste was reduced by 11 acres from approximately 40.4 acres, as defined in the 2001 JTD, to approximately 29 acres. This reduction reduced the amount of Class II/III waste that was to be landfilled over the in-place Class I waste at the southern end of Landfill B-19. The 11 acres removed from the footprint received final cover in conformance with regulations governing Class I disposal facilities contained in Title 22 CCR in December 2006.

It was anticipated that the Class II/III portion of Landfill B-19 would continue to operate as a bioreactor under RD&D for all three 3-year renewals, for a total of twelve years, to September 2020. The revised timeline of activities is as follows:

ACTIVITY	EXPECTED COMPLETION DATE
Cessation of the bioreactor, September 2014, add the addition of the approved 5 year delay of closure request	2019
Filling the remaining airspace to final grade taking approximately two years	2021
Construction of the closure cap approximately one year	2022
Anticipated closure date of the Class II/III portion of Landfill B-19	September 2022

KHF no longer accepts off-site liquids to B-19 and has ceased re-circulating B-17's non-hazardous condensate and leachate into Landfill B-19.

1.2 Organization of this Document

This JTD is organized to integrate and update the technical information related to the design and operational issues associated with the increase in daily tonnage, addition of Saturday hours, and the former operation of a bioreactor. The JTD contains the following chapters:

- Chapter 2 presents an overview of regulatory requirements associated with the design and operation for the facility, including those related to the former conversion of a portion of Landfill B-19 to a bioreactor. Copies of the current permitting documents are in Appendix A. Appendix B contains information on how the former bioreactor addressed Research Demonstration and Development (RD&D) regulations and permit requirements, pursuant to 27 CCR Section 20070 and 21595.

- Chapter 3 describes the facility's location, use, and capacity.

- Chapter 4 summarizes geology, climatology and water resources related to Landfill B-19.

- Chapter 5 details the disposal site design for the conversion of a portion of Landfill B-19 to the former bioreactor and provides information required within a Design Report per 27 CCR 21760. The drawings for the proposed Landfill B-19 design follow the figures at the end of this JTD. The supporting design engineering analyses and calculations for the proposed Landfill B-19 are included in Appendix C.

- Chapter 6 specifies disposal site improvements associated with Landfill B-19.

- Chapter 7 identifies Class II/III standard disposal operations and former bioreactor operations for Landfill B-19. This chapter includes information required in an Operations Plan in accordance with 27 CCR 21760.

- Chapter 8 describes site controls for management of liquids, leachate, landfill gas (LFG), and potential nuisances (e.g., dust, vectors, etc.), to include conversion of a portion of Landfill B-19 to the former bioreactor.

- Chapter 9 describes environmental monitoring requirements associated with the former operation of a portion of Landfill B-19 as a bioreactor.

- Chapter 10 identifies the Class II/III record keeping and reporting procedures for Landfill B-19.

- Chapter 11 presents preliminary closure and post-closure plans for Landfill B-19.

2.0 Regulatory Requirements

The United States Environmental Protection Agency (USEPA) is the Federal agency regulating MSW landfills under Title 40 Code of Federal Regulations (CFR), Parts 257 and 258, commonly referred to as the Subtitle D regulations. Title 40 CFR allows USEPA to "authorize" a state to implement Subtitle D regulations. California has been deemed an "authorized" state, and solid waste is regulated in California under Title 27 of the CCR, which combines the previous requirements of CCR Titles 14 and 23. The state program has been determined by USEPA to be equivalent to the Subtitle D provisions. The LEA for the State program, under the authority of the Public Resource Code (PRC) Sections 40055(b), 43020, and 43021, is the Kings County Department of Public Health's Division of Environmental Health Services. CalRecycle and the LEA regulate MSW landfills pursuant to Title 27 provisions. Waste discharges that could affect water quality are regulated pursuant to Title 27 provisions by the SWRCB and its various Regional Water Quality Control Boards (RWQCB) under the authority of Sections 13172 and 13190 of the California Water Code.

The former acceptance of liquids and high liquid content waste disposed into the now de-commissioned bioreactor with a broader pH, the increased frequency of pH monitoring of Class II/III leachate, mentioning landfill B-17 and the underlying Tulare formation, updating the KHF staffing numbers, adjusting the required equipment for B-19 operations, and clarifying the Class II/III recirculation procedures involved approvals and regulatory oversight by local, regional and state agencies. The CalRecycle and the LEA performed the approval of the Report of Facility Information amendments to this Joint technical Document.

2.1 Permits, Approvals and Regulatory Oversight

The KHF is regulated by a number of agencies, and the proposed project has been approved under the California Environmental Quality Act (CEQA) and will require various approvals and permits from local, regional, and state agencies, as described below.

2.1.1 CEQA Compliance

Compliance with the California Environmental Quality Act (CEQA) is required for projects where approvals and permits from local and State agencies are needed. The Kings County Planning Agency is the lead agency to process discretionary actions for the proposed project, which includes amending the current Conditional Use Permit for the site allowing Landfill B-19 to accept 2,000 TPD of Class II and III waste, to accept waste on Saturdays, and to allow the former bioreactor operation. CWMI no longer accepts off-site liquids to the B-19 Bioreactor as of September 2014.

In August 2003, it was determined by the Kings County Planning Agency that a Subsequent Environmental Impact Report (SEIR) was appropriate to comply with CEQA. A SEIR would build upon and utilize existing information contained in past CEQA documents prepared for the KHF, including Class II/III solid waste disposal in Landfill B-19. These past CEQA documents include:

- Draft Environmental Impact Report: Chemical Waste Management, Inc., Kettleman Hills Hazardous Waste Facility, prepared by CH_2M Hill, for Kings County Planning Agency, (July 1985).
- Final Environmental Impact Report: Chemical Waste Management, Inc., Kettleman Hills Hazardous Waste Treatment, Storage, and Disposal Facility, for Kings County Planning Agency, Hanford, California. Prepared by CH_2M Hill, (October 1985).
- Draft Subsequent Environmental Impact Report: Municipal Solid Waste Disposal Project, Kettleman Hills Facility, Chemical Waste Management, Inc. (State Clearinghouse No. 97042028), Prepared by TRC Environmental Solutions, Inc. for Kings County Planning Department, Hanford, California, July 1997.
- Final Subsequent Environmental Impact Report, Municipal Solid Waste Disposal Project, Kettleman Hills Facility, Chemical Waste Management, Inc. (State Clearinghouse No. 97042028), Prepared by TRC Environmental Solutions, Inc. for Kings County Planning Agency, Hanford, California, November 1997.
- Addendum to Final Subsequent Environmental Impact Report, Municipal Solid Waste Disposal Project, Kettleman Hills Facility, Chemical Waste Management, Inc. (State Clearinghouse No. 97042028), Prepared by TRC for Kings County Health Department, Division of Environmental Health Services and Kings County Planning Agency, Hanford, California, February 26, 2001.

The following SEIR documents were prepared to include the bioreactor project described in this JTD:

- Draft Subsequent Environmental Impact Report, B-19 Landfill Bioreactor Project, Kettleman Hills Facility, Chemical Waste Management, Inc. (State Clearinghouse No. 2003091023), Prepared by CH_2M Hill for Kings County Planning Agency, November 2004.
- Final Subsequent Environmental Impact Report, B-19 Landfill Bioreactor Project, Kettleman Hills Facility, Chemical Waste Management, Inc. (State Clearinghouse No.2003091023), Prepared by CH_2M Hill for Kings County Planning Agency, May 2005.

These CEQA documents provide an environmental documentation overview of the KHF and provide relevant environmental impact analyses for this project. Specific impact areas of concern for the proposed project were identified as traffic, air quality, and bioreactor-specific concerns relating to Landfill B-19.

The Kings County Planning Commission certified the Final SEIR, dated May 2005, on June 6, 2005. A copy of the Notice of Determination for this CEQA review is in Appendix A.

2.1.2 Solid Waste Facility Permit (SWFP)

Issuance and enforcement of the SWFP for Landfill B-19 requires approval by the Kings County Department of Public Health, Division of Environmental Health Services, and the LEA, which will issue the SWFP after concurrence from CalRecycle. The LEA's primary considerations in recommending issuance, modification, or revision of a permit are preventing environmental damage and enforcing long-term environmental protection in compliance with the California Government Code, Section 66796.33(a). The SWFP defines the operation of the disposal site, including identifying and quantifying the types and amounts of wastes received, the load-checking procedures that disposed waste undergoes, waste placement procedures, and nuisance control programs. In addition, the SWFP designates the conditions, prohibitions, and specifications under which the site must operate. The original SWFP, Number 16-AA-0021, for Landfill B-19 was issued on July 8, 1998. An amendment to the SWFP was approved in March 2001 to increase the allowable daily disposal capacity from 800 TPD of Class II/III MSW and 600 TPD of Class II Designated Waste to a combined total of 1,400 TPD. Class II wastes were limited to 600 TPD. Revision of the SWFP number 16-AA-0021 for Landfill B-19, to include bioreactor operations, the daily Class II/III disposal tonnage increase to 2,000 TPD, and Saturday disposal hours, was approved by the LEA on October 1, 2008. The LEA approves the revised SWFP after concurrence from CalRecycle. As noted in 2.0, the regulations that provide authority for approval of the proposed bioreactor unit operations by the LEA, CalRecycle and State Waste Board were approved by CalRecycle on June 14, 2005 and were codified in Sections 20070 and 21595 of Title 27, CCR. A copy of the current SWFP is in Appendix A. A five year permit review was completed for Landfill B-19, dated June 12, 2015 by the LEA that addressed the cessation of bioreactor operations,

2.1.3 Waste Discharge Requirements (WDR)

The RWQCB is one of multiple agencies responsible for enforcing Title 27 requirements. The RWQCB regulates disposal sites with respect to the wastes that may be received, and the protection that must be provided to waters of the state. Site-specific requirements for Landfill

B-19 are designated by WDRs No. R5-2006-0122 for the KHF, which include the operation of Landfill B-19 for the disposal of Class II designated waste and Class III municipal solid waste.

The WDRs were revised in 2015 to address the cessation of bioreactor operations, A copy of the WDR R5-2006-0122 and Monitoring and Reporting Program are located in Appendix A.

2.1.4 San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD)

Air quality and site emissions are regulated by the SJVUAPCD. In particular, the SJVUAPCD is concerned with dust levels created by landfill operations, emissions of Landfill Gas (LFG) generated by waste decomposition, and emissions from LFG control systems.

The KHF is currently operating under SJVUAPCD permits for its facility waste operation. The KHF Permit to Operate pursuant to Title V (Part 70) of the Clean Air Act for the site was issued on December 31, 2002. This includes compliance with New Source Performance Standards (NSPS) (40 CFR 60 Subpart WWW) and other applicable SJVUAPCD rules. The Title V Permit applies to sources for the entire KHF site including Landfill B-19 as a MSW landfill.

CWMI installed a LFG control system for the bioreactor and control units. Installation of the LFG control system was under an Authority to Construct and Permit to Operate issued by the SJVUAPCD.

2.1.5 California Department of Toxic Substances Control (DTSC)

The DTSC implement oversight responsibilities associated with the Class I waste that was placed in Landfill B-19 prior to the unit being converted to a Class II/III facility in 1998. The DTSC reviewed the proposed bioreactor project as it related to the Class I portion of the landfill and the interaction between the bioreactor unit operations with the Class I waste previously disposed of in Landfill B-19. This review was performed under authority contained in Title 22, CCR pursuant to Hazardous Waste Facility Permit No. 02-SAC-03 for hazardous waste operations at the KHF, including the final closure of Landfill B-19.

3.0 Facility Overview

3.1 Introduction

The bioreactor was operated under a research, development, and demonstration (RD&D) permit that expires every three years. The RD&D permit was renewed on 13 September 2011. CWMI allowed the permit to expire on September 15, 2014 and has discontinued bioreactor operations. It was anticipated that the Class II/III portion of Landfill B-19 would continue to operate as a bioreactor under RD&D for all three 3-year renewals, for a total of twelve years, to September 2020. The revised timeline of activities is as follows:

- The cessation of the bioreactor on September 2014 and the addition of the approved 5 year delay of closure request has a completion date of 2019.
- Filling the remaining airspace to final grade, taking approximately two years, to 2021.
- Construction of the closure cap, taking approximately one year, to 2022.
- Anticipated closure date of the Class II/III portion of Landfill B-19 prior to September 2022.

The following Sections are retained for historical information.

3.1.1 Bioreactor Landfill Definition and Purpose

There is continued interest in developing technology to improve the disposal of municipal solid waste. The USEPA and California EPA have expressed interest in landfill bioreactor technology. A landfill bioreactor can be defined as a Subtitle D landfill or landfill cell where liquid is added in a controlled fashion into the waste mass in order to accelerate and enhance anaerobic biostabilization of the waste.

The purpose and environmental advantages of bioreactor landfills include:

1) An alternate method of disposal for liquid and high-moisture-content waste,

2) Waste stabilization and reduction in long-term risk to the environment,

3) Increased disposal capacity due to increased settlement of the waste and 4) enhanced waste decomposition rates that can shorten the period of landfill gas generation.

There are two basic types of bioreactors: **anaerobic** and **aerobic**. Anaerobic bioreactors use liquids and high-moisture-content waste to increase the moisture content of the in-place waste. Liquids can consist of leachate or offsite sources of wastewater. Aerobic bioreactors add an additional step of injecting air into the landfills immediately after waste placement. The temporary injection of air expedites digestion of food waste and enhances future degradation of the remaining waste. Landfill unit B-19 operates as an anaerobic bioreactor.

The most significant environmental interest in employing bioreactor technology concerns the reduced long-term maintenance and environmental risk compared to “dry entombment” landfills. Dry entombment extends or possibly halts the digestion process because outside moisture is eliminated. Therefore, environmental risk and maintenance is extended when dry entombment is employed.

3.1.2 Landfill B-19 Bioreactor Unit

The KHF is an existing Class I hazardous waste treatment, storage and disposal facility, and Class II/III solid waste disposal facility, owned by Chemical Waste Management, Inc., and operated by CWMI. In 1998, CWMI converted the remaining capacity of the existing Landfill B-19 Class I hazardous waste management unit (WMU) to a Class II designated waste and Class III MSW landfill. The conversion of Landfill B-19 provides additional disposal capacity for MSW generated by Kings Waste and Recycling Authority (KWRA) sources, as well as other jurisdictions, following approval of operating permits.

Landfill B-19 contains approximately three million cubic yards (mcy) of Class I materials placed through 1992. This waste material is located in the southern portion of the cell and is physically separated from the Class II/Class III waste by a barrier “separation” liner. Disposal of Class II/III waste began in November 1998 in the northern portion of Landfill B-19. As of April 2013, approximately 3.4[1] mcy of Class II/III waste have been disposed within Landfill B-19.

CWMI discontinued bioreactor operations on September 15, 2014. The bioreactor cell did operate in the permitted Class II/III disposal area prior to September 2014. Figure 2 shows the footprint and final grading plan for the bioreactor and control units. Figure 3 shows the relation of the disposal areas in cross-section. The area that currently has in-place hazardous waste is physically separated from the Class II/III waste disposal operations by a separation liner. The majority of the Class II/III waste that exists or will be placed over the existing hazardous waste will not be operated as a bioreactor. This area will continue to be operated according to typical “dry tomb” methods and act as a control unit to compare the waste degradation and settlement

[1] In-place waste quantity estimate is based on calculations using aerial topographic mapping dated April 23, 2013.

properties from traditional landfilling practices (i.e., no outside moisture introduction) to the degradation properties in the adjacent bioreactor cell. The remainder of the Class II/III disposal area will be operated as a bioreactor.

In order to operate a bioreactor, additional moisture must be introduced into the waste to accelerate the biodegradation. When the bioreactor was in operation at the KHF, the sources of proposed additional moisture from offsite were delivered by trucks and would typically contain materials such as biosolids, oil field brine, wastewater and food processing liquids primarily from Kern, Kings, Fresno, and Tulare Counties. All leachate that is collected in the within Landfill B 19 of the Class II/III area is reintroduced into Landfill B 19. No leachate from any of the Class I disposal area will be used within Landfill B 19. Installation of a landfill gas collection and control system for the B-19 Class II/III area resulted in the generation of landfill gas condensate. Similar to the leachate, the condensate is reintroduced intoLandfill B 19.

The bioreactor cell in Landfill B-19 was being used as a means to test Anaerobic Landfill Bioreactor Technology. CWMI added various offsite liquids and high liquid content waste to raise the moisture content of the bioreactor unit in order to increase the degradation rate of the dry entombed material. Liquids and high liquid content waste from offsite were added on the top-deck area either at the working face or into surface galleries.. Liquids were injected into vertical wells. Sludges and liquid waste streams high in solids were targeted for the working face trenches and top deck galleries to avoid plugging of the infiltration trenches and wells.

3.2 Site Location and Access

The KHF is located at 35251 Old Skyline Road, Kettleman City, Kings County, California, in the Kettleman Hills, which border the west side of the San Joaquin Valley (as shown on Figure 1). The KHF is situated in a rural area. The nearest occupied residence to the KHF is approximately 3.5 air miles to the northeast near Kettleman City. The two major transportation arteries leading to the KHF are Interstate 5 (I-5) and State Route 41 (SR-41). The main entrance, and only public access point, to the site access road is located approximately 2.6 road miles west of I-5 on SR-41. Other entrance gates (as shown on Figure 4) to the facility are locked and restricted to use by site personnel.

The two population centers nearest to the KHF are Kettleman City and the City of Avenal, located approximately 3.5 and 6.5 air miles, respectively, from the site. Emergency services such as law enforcement, fire protection, ambulance, and emergency medical response are available from these locations. A commercial activity center (e.g., gasoline stations, fast-food restaurants) is located on State Route 41, just east of I-5 and approximately 3.5 air miles from the site.

3.2.1 Access Signs

The CWMI facility is not open to the public. The facility has the following signs posted:

- A large easily visible sign is posted at the entrance to the facility from SR 41, which indicates facility name and operator name.
- Prior to the guardhouse, there is an easily visible sign indicating the name of the site operator, the operator's address, telephone number, and hours of operation, and a statement "This facility is not open for general public disposal". On the side of the guardhouse is a sign stating that radioactive waste is not acceptable for the Class III landfill, and a Proposition 65 warning sign.
- Once inside the facility, there are easily visible road signs that direct traffic to the active face of the Landfills.
- There are also warning signs and other features for site security to restrict access. These are described in Section 7.8.

3.2.2 Legal Description

The legal description of the KHF is North Latitude 35° 57' 50" and West Longitude 120° 00' 35". The property owned by CWMI at the KHF totals approximately 1,600 acres and includes all of Section 3, T23S, R18E, M.D.B.&M. (Assessor Parcel Nos. 03833001, 03833019 and 03833020), all of Section 34, T22S, R18E, M.D.B.&M. (Assessor Parcel Nos. 03832015, 03832020, and 3832021), and the Eastern half of Section 33, T22S, R18E, M.D.B.&M. (Assessor Parcel No. 03831005).

Disposal of Class II/III will continue to occur within Landfill B-19 which is legally described as all that portion of the South one-half of Section 34, Township 22 South, Range 18 East, Mount Diablo Base and Meridian and the Northeast one-quarter of Section 3, Township 23 South, Range 18 East, according to the Official Plats thereof, and being more particularly described as follows:

- COMMENCING at the South one-quarter corner of said Section 34; thence S89°12'36"E, along the South line of the Southeast one-quarter of said Section 34, a distance of 56.74 feet to the TRUE POINT OF BEGINNING; thence S05°06'36"E, a distance of 142.63 feet; thence S00°56'46"W, a distance of 487.61 feet; thence along a curve to the Southeast, concave to the Northeast, having a central angle of 93°27'21", a radius of 50.00 feet and an arc length of 81.56 feet; thence N87°29'25"E, a distance of 888.33 feet; thence along a curve to the Northeast, concave to the

Northwest, having a central angle of 55°58'22", a radius of 50.00 feet and an arc length of 48.85 feet; thence N31°31'03E, a distance of 550.07 feet; thence N05°01'07"E, a distance of 69.47 feet; thence along a curve to the Northwest, concave to the Southwest, having a central angle of 36°48'38", a radius of 100.00 feet and an arc length of 64.25 feet to a point on the South line of the Southeast one-quarter of said Section 34 from which the Southeast one-quarter of said Section 34 bears S89°12'36"E, 1,293.26 feet distant; thence continuing along said curve to the Northeast, concave to the Northwest, having a central angle of 11°55'11", a radius of 100.00 feet and an arc length of 20.80 feet; thence N43°42'42"W, a distance of 1,768.38 feet; thence S47°13'52"W, a distance of 319.56 feet; thence S19°43'58"W a distance of 289.27 feet; thence S25°09'55"E, a distance of 674.81 feet; thence S05°06'36"E, a distance of 177.90 feet to a point on the South line of the Southeast one-quarter of said Section 34, said point being the TRUE POINT OF BEGINNING.

3.3 Site Plan Description

A site plan showing the KHF property boundary, facility improvements, and land use zoning (General Agriculture: AG-40) is provided on Figure 4. The topography of the site is characterized by low, northwest-trending broad ridges, with elevations exceeding 1,000 feet, southeast draining ephemeral streams that empty into the San Joaquin Valley and southwest draining ephemeral streams that drain into the Kettleman Plain. The topography for Landfill B-19 is shown on Drawing 3.

Landfill B-19 is comprised of approximately 29 acres that currently or will receive Class II/III solid waste fill. The current topography surrounding Landfill B-19 ranges from an elevation of 840 feet above mean sea level in the northwest corner, to an elevation of 765 feet above mean sea level in the southeast corner. As part of the Class I hazardous waste disposal operations, Landfill B-19 was excavated to a depth of approximately 30 to 90 feet below grade. At closure, the proposed Landfill B-19 would have a maximum depth of waste of approximately 200 feet, and would have a top deck elevation of approximately 945 feet above mean sea level.

3.4 Anticipated Vehicular Traffic

Traffic to the KHF associated with Class II/III waste disposal operations at Landfill B-19 will primarily include site personnel vehicles, transfer trucks and dump trucks delivering waste. MSW processed through the KWRA Materials Recovery Facility and Transfer Station (MRF/TS) will be transported to the KHF in transfer trucks. Class II/Class III waste from other jurisdictions and service districts in Kings County that are not members of KWRA may arrive in packer trucks or similar vehicles. Waste from outside of Kings County would arrive in transfer trucks, roll-off container trucks, end dump trucks, packer trucks, or similar vehicles. The KHF will accept soil daily cover delivered in end dump trucks or similar vehicles. In the past, to promote bioreactor operations, the KHF accepted liquids and high liquid content waste delivered in tanker trucks, typically with a 5,000 gallon capacity, or similar vehicles. A total of 168 trucks are permitted to enter the site and deliver waste each operating day.

3.5 Waste Type and Volume

Landfill B-19 can accept Class III non-hazardous solid waste, Class II designated waste, inert, and non-hazardous liquid as defined below. The anticipated solid waste inflow rate is expected to range from 1,400 to 2,000 TPD with the maximum daily permit limit of 2,000 tons.

In February 2009, KHF opened Landfill B-17. Currently, all Class II/III waste is being disposed of in Landfill B-17.. This may change as needed, since both Landfill B-17 and Landfill B-19 are permitted to dispose of Class II/III waste. .

KHF will accept up to 800 TPD of contaminated soils to be used for beneficial purposes and other waste materials approved for Alternative Daily Cover (ADC).. These materials will be accepted in addition to the 2,000 TPD of solid waste.

The anticipated annual volumes of Class II/III waste to be disposed until the facility reaches final grades are listed in Section 3.8, *Anticipated Waste Volumes and Site Life Projection*.

3.5.1 Class III Wastes

3.5.1.1 General

Landfill B-19 can receive Class III nonhazardous solid wastes which consist of putrescible and non-putrescible solid, and semi-solid, including: garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semi-solid wastes, and other discarded waste (whether of solid or semi-solid consistency); provided that such wastes do not contain material which are classified as hazardous wastes in accordance with CCR Title 22.

The general make-up of Class III wastes received at proposed Landfill B-19 can consist primarily of residential/commercial wastes, with a very small portion of industrial waste. These wastes may also include non-hazardous treated medical wastes per Section 117695 of the California Health and Safety Code, and wastes classified as inert wastes per Section 20230 of Title 27 CCR. Dead animals will be accepted and managed in compliance with the requirements defined by the Kings County Department of Public Health, Division of Environmental Health Services. Information on special handling procedures for dead animals can be found in Section 7.3.3.4.

3.5.1.2 Treated Medical Waste

Treated medical waste is considered to be solid waste per Section 20880 of Title 27 of the CCR; therefore, treated medical waste will be accepted for disposal. Treated medical waste will be profiled in accordance with site procedures.

In the event that untreated medical waste is received at the landfill, the LEA will be notified and proper arrangements for removal, storage, and treatment will be coordinated.

3.5.2 Class II Designated Wastes

3.5.2.1 General

Wastes meeting the definition of "designated waste" per Section 13173 of the California Water Code currently are and will be acceptable for disposal and/or beneficial use or cover material in Landfill B-19.

These designated wastes include:

- Ash from burning of fossil fuels, biomass and other combustible materials,
- Auto shredder waste,
- Baghouse and scrubber wastes from air pollution control devices,
- Catalyst from petroleum refining and chemical plant processes,
- Cement kiln dust and other cementitious materials,
- Dewatered sludge from treatment of industrial process water,
- Dewatered tannery sludge,
- Drilling mud from drilling of gas and oil wells,
- Refractory from industrial furnaces, kilns and ovens,
- Sand from sandblasting,
- Sand from foundry casting,
- Slag from coal gasification,
- Tailings from the extraction, beneficiation and processing of ores and minerals,
- Soil/sediment/spoils contaminated with petroleum hydrocarbons, metals, and/or other organics/inorganics,
- Construction, demolition and debris waste,

- Treated wood waste,
- Geothermal drilling waste, and
- Other designated wastes.

3.5.2.2 Class II Waste Stream Evaluation Procedures

Refer to Section 7.4.3.1 for detailed Class II waste stream evaluation procedures.

3.5.2.3 Class II and III Materials to be Used as Cover Material

The following Class II and III wastes are proposed for beneficial use as either cover soils or alternative daily cover (ADC):

- Dewatered sewage sludge,
- Treated auto shredder waste,
- Processed construction and demolition wastes,
- Shredded tires,
- Ash and cement kiln dust materials,
- Contaminated sediment,
- Foundry sands,
- Energy resource exploration and production wastes,
- Processed Green Material,
- Sludge and Sludge-Derived Materials,
- Compost Materials,
- Chipped rubber tires, and
- Soil contaminated with petroleum hydrocarbons (<50 ppm VOCs), metals, and/or other organics/inorganics.

3.6 Liquids and High Liquid Content Waste to Promote Bioreactor Conditions

In order to operate a bioreactor, additional moisture was introduced into the waste to accelerate the degradation process. The sources of moisture were recirculated leachate, non-hazardous liquids and high-moisture-content waste from off-site sources. These wastes were delivered by trucks and included biosolids, oil field brine, treated and untreated wastewater, beverage waste, decasing liquids, winery waste, cannery wastes, and food processing liquids.

A bioreactor requires careful selection of liquids to maintain the anaerobic process. Acidic or caustic conditions can slow or stop the process. Ideally, liquid waste with a pH between 5 and 9 should be added to the bioreactor. However, liquid waste with a pH between 3 and 11 can be accepted as long as the leachate pH does not trend towards 5.5. Following is a discussion of liquid acceptance criteria to promote anaerobic bioreactor conditions.

3.6.1 Liquid Acceptance Criteria

The RD&D rule allows for the addition of waste to landfills that do not pass the paint filter test. A permit under the RD&D rule to bring in outside commercial liquids and sludge's to provide nutrients and needed moisture is necessary in Bioreactor landfills. These liquids are needed if the treatment cells are ever going to get to optimum moisture in a timely basis and cover enough area to impact the operations of the entire unit.

Care must be taken that the system will be in compliance with all environmental regulations and that the received waste stream will not have an adverse effect on the biology within the landfill before accepting and adding outside liquid or sludge. The waste stream(s) will be profiled just like any other special waste and supporting analytical should be kept on file to prove that it is not a hazardous waste. Waste streams that could have an adverse effect of the long-term biology of the methane cycle, odor, and air emissions will be further evaluated or handled appropriately, as follows.

3.6.1.1 Methane Production Disruptors

At least two major mechanisms exist that can cause the disruption of methane production: wastes that cause rapid fermentation that results in a large drop in pH inhibiting methane-producing organisms and wastes that inhibit methane production by inhibiting or killing the bacteria.

Wastes Causing Rapid Fermentation

Waste streams that contain:

- More than 20% sugar by weight, or
- COD's greater than 400,000 mg/l, or
- Canning wastes having large amounts of natural sugar and organic acids will be added carefully so as not to drop the landfill mass below a pH of 5.5. Examples of these types of wastes include honey, beverages, corn syrup, or corn syrup laden products.

Under the current program, monitoring for leachate pH is no longer required. In the past the leachate pH was monitored quarterly.

3.6.2 Siloxane Producing Wastes

Waste streams from cosmetic manufacturers that contain significant amount of siloxanes may be avoided, as they will affect the potential end use of the gas generated. Although energy recovery is not planned at this time, it may be considered in the future. Landfill gas with high levels of siloxanes can cause damage in reciprocating engine applications for producing energy. During the combustion process, siloxane deposits occur on cylinder heads and walls causing excessive wear and can degrade combustion.

3.6.3 Odor Causing Waste Streams

In the past odorous waste streams wereinfiltrated (injected) in to the waste mass in vertical injection wells, trenches, or infiltration galleries. These wastes were spread on the working face.

Waste streams containing any appreciable amount of sulfates were generally avoided. Acceptance of liquid waste streams containing sulfates were only undertaken if the concentration was under 1,000 ppm.

3.6.4 Waste Streams That May Create Potential Air Emissions:

Waste streams with VOC's will not necessarily have a direct impact on the biodegradation process. However, because the San Joaquin Valley air basin is non-attainment for ozone, liquid waste streams and sludges with volatile organic compounds were subjected to the permitting requirements of the SJVUAPCD to control emissions. Therefore, limits on VOC related wastes and tracking mechanisms were developed through the SJVUAPCD.

3.7 Site Capacity

Provided below is a summary of the estimated total site Class II/III capacity, including the bioreactor operations:

- Total Volume: 3.99 mcy of gross capacity including final cover,
- Net Disposal Volume: 3.82 mcy of capacity (solid waste and daily cover),
- Final Cover Volume Amount: 170,000 cubic yards,

Detailed calculations of site capacity are included in Appendix C (Attachment 1).

3.8 Anticipated Waste Volumes and Site Life Projection

The bioreactor increased the tonnage capacity of Landfill B-19, compared to “dry cell” operations, due to the creation of additional operational airspace as the landfill settled more rapidly during the active bioreactor unit operations period. It is anticipated that the density of the waste in the bioreactor unit prior to closure, of both existing waste and future waste, will increase from an average of 1,350 lbs/cy to 1,620 lbs./cy, based on an anticipated ultimate 20 percent increase in density. CWMI will continue to survey the settlement plates on an annual basis to track the progress of the settlement rates.

The projected site waste disposal volumes and utilization for both the bioreactor and control cells within Landfill B-19, are summarized in Table 3-1. The projections, using the assumed average 20 percent increase in density for all waste capacity in the bioreactor, indicate that final grades would initially be reached in March 2008. However, the situation will be more complex. First, filling to final grades does not provide an adequate area for the injection system and infiltration galleries, or the maneuvering of trucks and equipment. Second, settlement from waste decomposition requires the periodic addition of waste lifts. For the Landfill B-19 bioreactor, KHF diverted the Class II/III waste stream to Landfill B-17, prior to reaching final grades. At this “interim grade”, the bioreactor continues to receive liquids. It was anticipated that the Class II/III portion of Landfill B-19 would continue to operate as a bioreactor under RD&D for all three 3-year renewals, for a total of twelve years, to September 2020. Due to the earlier cessation of the bioreactor, September 2014, the addition of the approved 5 year delay of closure request and filling the remaining airspace to final grade, approximately two years, followed by construction of the closure cap, approximately one year, making the anticipated closure of the Class II/III portion of Landfill B-19 approximately September, 2022. CWMI no longer accepts off-site liquids to B-19 and has ceased re-circulating B-17’s non-hazardous condensate and leachate into Landfill B-19.

TABLE 3-1
REMAINING CAPACITY

	Total Landfill B-19 Remaining Capacity (bcy) (waste and cover)
Year	
2016	319,255
2015	305,380
2014	303,125
2013	292,345

The tonnage capacity of the landfill is based on ultimately achieving an average anticipated density of 1,620 lbs/cy in the bioreactor unit. The density achieved may vary around this estimate based on actual landfill conditions and the efficacy of the bioreactor operations. Table 3-2 shows a range of densities that a bioreactor unit can create and when final grades would initially be attained at that density. Calculations that are the basis for the estimates in Table 3-2 are provided in Appendix C, Attachment 1[2].

TABLE 3-2
EFFECT OF BIOREACTOR DENSITY ON SITE LIFE AND TONNAGE TO ACHIEVE FINAL GRADE

Bioreactor Density	Lower	Assumed	Higher
Increase over Control Unit	10%	20%	30%
Ave. Bioreactor Unit Density (lbs/CY)	1,485	1,620	1,755
Total Tonnage Capacity	2,776,175	2,964,988	3,153,801
Additional Tonnage Capacity	-188,813	0	188,813
Month of Additional Capacity	-4	0	4
Final Grade Achieved	November 2007	March 2008	July 2008

The site life of Landfill B-19 was increased by bioreactor operations. If the bioreactor operation was not implemented, the tonnage capacity of the landfill would be reduced from the estimated 2.97 million tons to 2.59 million tons. This reduction of approximately 380,000 tons would be a loss of nine months of capacity at the proposed annual disposal rate of 519,950 tons per year.

In addition, CWMI intends to continue solid waste fill operations after interim and/or final grades are initially obtained in order to take advantage of the increase in airspace obtained from the more rapid settlement of the bioreactor unit both before and after interim and/or final grades would initially be achieved. CWMI will monitor settlement of the bioreactor unit and confer with regulatory agencies on when solid waste filling operation should be stopped and final cover installed.

3.9 End Use of Site

The post-closure land use of the site will be compatible with the surrounding land uses and zoning. As currently planned, the site will be maintained as a non-irrigated open space. The vegetative soil layer of the final cover will provide sufficient soil depth for propagation of locally common grasses and moisture storage. Due to the historical use of Landfill B-19 as a Class I facility; the future site use will be restricted in accordance with the appropriate deed restrictions.

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2 Tables C.1-2, 1-3 and 1-4.

4.0 Environmental Setting

4.1 General Setting

The KHF is located in the Kettleman Hills, which border the west side of the San Joaquin Valley in western Kings County. The KHF is situated in a rural area, with adjacent land used for oil and gas production, and cattle grazing. Because of the remote location, rugged topography, low annual precipitation, and absence of surface water and commercially usable groundwater, the Kettleman Hills area is largely uninhabited.

The predominant land use in Kings County is agriculture, including fruit and nut orchards, vineyards, pastures, dairies, livestock ranches, poultry farms and field crops. The agricultural areas of the county are sparsely developed, with scattered residences, mostly associated with agricultural activities. Residential, commercial, and industrial land uses are concentrated in and around four incorporated cities, three unincorporated rural communities, and the Lemoore Naval Air Station. The four incorporated cities are Avenal, Corcoran, Hanford, and Lemoore, and the three rural communities are Armona, Kettleman City and Stratford. Other major land uses in the county include oil and gas production, and state prisons in Avenal, and Corcoran.

4.2 Climate

In general, the climate at the KHF is characterized by hot, dry summers, and cool winters with modest amounts of rainfall. The regional meteorology is influenced by a semi-permanent subtropical high-pressure belt in the Pacific. The Pacific high moves northward and southward seasonally, thereby allowing storms into the valley during the winter and resulting in hot, dry weather in the summer.

4.2.1 Temperature

As reported in Bulletin No. 81 of the U.S. Department of Commerce/National Oceanic and Atmospheric Administration (NOAA) (1992), the daily temperatures from 1961 to 1990, recorded at the Kettleman Climatological Station, ranged from a mean low of 38.6°F (in January) to a mean high of 98.5° F (in July), with an annual normal temperature of 65.2°F. The Kettleman Climatological Station (station number 4536, latitude 36° 04'N, longitude 120° 05'W, elevation 508 feet above mean sea level) is located approximately 8.5 miles north-northwest of the KHF.

4.2.2 Precipitation

Based on the Western Regional Climate Center database, the mean annual precipitation at the Kettleman Climatological Station between 1948 and 2001 was 6.56 inches. The maximum annual precipitation of 14.92 inches was recorded in 1998. The mean monthly precipitation was lowest in July (0.01 inches) and highest in January (1.42 inches). The maximum one-month precipitation of 5.76 inches occurred in January 1995.

4.2.3 Evaporation

As reported in NOAA National Weather Services Report No. 34, between 1949 and 1978, the mean annual evaporation recorded at the Kettleman City Climatological Station was 102.1 inches. Average monthly evaporation was lowest in December (1.85 inches) and highest in July (16.57 inches).

4.2.4 Wind Conditions

The wind conditions at the KHF are mostly calm (0-5.5 mph), and winds originate predominantly from the north-northwest. Between 1984 and 1987, the Western Regional Climate Center recorded the information used to generate the wind rose (shown in Figure 5) for the Lemoore Climatological Station. The Lemoore Climatological Station (latitude 36°20'N, longitude 119°57'W, elevation 240 feet mean sea level) is located approximately 20 miles north of the KHF.

4.3 Geology

4.3.1 Regional Geology

The KHF is located within the Coast Range Geomorphic Province, a region characterized topographically by a series of alternating, northwest trending valleys and highlands. This regional topography generally mimics the underlying geologic structure, which is dominated by a series of large-scale, northwest trending folds. Topographically high areas, such as the Kettleman Hills, generally correspond to structural highs (domes and anticlines), and topographically low areas correspond to structural lows (basins and synclines). The KHF is located on the western flank of the Kettleman Hills Anticline.

Sedimentary bedrock units exposed in the vicinity of the KHF include, from youngest to oldest, the Tulare Formation (Pleistocene), the San Joaquin Formation (Pliocene) and Etchegoin-Jacalitos Formations (Pliocene). In this area, these formations have a combined thickness of approximately two miles. Recent alluvial deposits are locally present above the Tulare and San Joaquin formations (EMCON, 1986).

4.3.2 Site Geology

The sedimentary bedrock units, which underlie the KHF, dip west at 25 to 35 degrees. Three different geologic formations outcrop at or near the facility, with the San Joaquin and Tulare Formation outcropping beneath existing KHF waste disposal units (RWQCB, 1986). Formational materials of the San Joaquin and Tulare Formations underlie landfill unit B-17 consisting of surficial deposits of residual soil, alluvium and colluvium, and localized fill (URS, 2003).

In the vicinity of the facility, the San Joaquin Formation consists of alternating layers of sandstone, shale and claystone. Previous investigations have identified thirteen main sandstone units, each of which is effectively separated from adjacent sandstone units by thick beds of shale or claystone. The sandstone units range up to 60 feet thick and, in most instances, are laterally continuous beneath the facility. Due to the dipping nature of the sedimentary bedrock, the sandstone units outcrop in roughly linear bands extending from southeast to northwest across the facility.

4.3.3 Geologic Materials/Soils

Thirteen major sandstone formations underlie the permitted area of the Facility. The five units which underlie Landfill B-19 include the: Neverita A, Neverita B, Tuffaceous A, Tuffaceous B, and Mya A (Drawing 1; Einarson, Fowler & Watson, 1996). The soils at the facility are derived from weathering of sandstone and shale. They are classified by the U.S. Soil Conservation Service as Kettleman Loam and Kettleman-Cantua complex, and consist of loam, coarse loam, and occasional gravelly sandy loam. These soils are well drained and have moderate permeabilities. Refer to Sections 4.3 and 4.4 for more description of the geologic materials, soils and hydrogeology of the KHF site.

4.3.4 Faulting and Seismicity

RUST E&I evaluated the seismicity at the KHF in July 1997 to determine the magnitude of potential ground motions at the site during an earthquake event (See Preliminary Stability Evaluation contained in 1998 JTD, as Appendix J). A more recent evaluation and summary of the site seismicity by Hushmand Associates, Incorporated (HAI), is contained in a Slope Stability Evaluation report in Appendix D (November 2003, See Section 2 of report). This more recent evaluation of the site seismicity was performed to update the site design parameters for the Maximum Credible Earthquake (MCE) including: peak historical ground acceleration, response spectrum, selected ground motion time histories and information on site faulting. The HAI report provided similar results to the 1997 Rust E&I study.

A map showing the active and potentially active faults in the area of the KHF is shown in Figure 6. No evidence of fault rupture hazard is known to exist at the project site. The KHF Landfill B-19 is not located within or near an Alquist-Priolo Special Studies Zone (Hart, 1992). Although faults have been identified within 3,000 feet of the KHF, seismic evaluations of the site have not uncovered evidence to suggest that the faults have been displaced during Holocene time (EMCON, 1988). The evidence suggests that movement on nearby faults last occurred during the early stages of deformation of the Kettleman Hills, during the Pliocene age.

Applicable regulations prohibit Class I and Class II landfills within 200 feet of an active (Holocene age) fault. Applicable landfill regulations prohibit Class III landfills on an active (Holocene age) fault. Based on past detailed geotechnical studies conducted as part of the permitting and design of the existing permitted Class I hazardous waste operations at the site, the KHF in general, and Landfill B-19 specifically, are not located within 200 feet of an active fault. The faults mapped in the northeastern corner of the KHF have not been active during the last 11,000 years. These faults have been studied in detail. Studies included tracing faults laterally until they were overlain by Holocene sediment and/or geomorphic surfaces interpreted to be older than Holocene (Dames & Moore, 1986). These intersections were evaluated for evidence of Holocene fault activity by field mapping, trenching, and aerial photograph analysis. No evidence of Holocene displacement was found. The detailed fault studies referenced in this analysis were previously used to demonstrate to the DTSC and the RWQCB that there are no active faults within 200 feet of Landfill B-19. Such demonstration was required for permitting the existing approved hazardous waste disposal operations.

4.4 Water Resources

4.4.1 Surface Water Hydrology

No natural surface water bodies are located on, or adjacent to the KHF that could be affected by a release from Landfill B-19. The closest surface water is the California Aqueduct, which is approximately 3.5 air miles east of the site. The site is not within the limits of any known floodplain, as defined by the Federal Emergency Management Agency (FEMA) (see Figure 4), or in an area having significant quantities of surface water, or wetlands (LSA-Preliminary Jurisdictional Analysis, 1997).

All storm water runoff is diverted away from the WMUs at the KHF. Temporary and final cap systems divert water from the inactive units, and surface drainage systems divert water from the active units into temporary storage basins. Surface water drainage around the perimeter of Landfill B-19 flows to the southeast, ultimately, into the East Retention Basin.

4.4.2 Groundwater Hydrogeology[3]

Groundwater occurs beneath the site in saturated sandstone beds, or water-bearing zones (WBZs), which are isolated hydraulically from one another by intervening siltstone and claystone intervals designated as low permeability zones. The site nomenclature for the generally unconsolidated sandstone beds has been derived primarily from the paleontological indicators for each stratum. The 13 major sandstone beds at the site are listed from oldest to youngest as Cascajo A, Neverita A, Neverita B, Tuffaceous A, Tuffaceous B, Mya A, Mya C/D, Mya E, Pecten A, Pecten B, Trachycardium A (Sand No. 10), Trachycardium B (Sand No. 8), and Acila A. First encountered groundwater in these sandstone beds occurs at depths ranging from approximately 300 to 520 feet below ground surface. Significant variations in groundwater elevations between adjacent sandstone units attest to the hydraulic isolation of the site WBZs.

In general terms, the hydrogeologic system at the KHF can be characterized by: (1) stratigraphically confined and restricted flow paths, (2) small ambient gradients that are primarily along strike to the southeast and in the updip direction (SEC, 1992), (3) apparent low or stagnant horizontal groundwater velocities, and (4) geographic and hydraulic isolation from regional groundwater resources. Apparent groundwater velocities for the site are generally in the range of 0 to 10 feet per year, directed laterally to the southeast along strike within the individual WBZs.

4.4.3 Permeability of Underlying Strata

The permeability of the strata underlying the KHF was determined in previous studies using pump tests, laboratory core tests, and packer tests (EMCON, 1986). Permeability values for the strata underlying the KHF vary in a range of six orders of magnitude. As previously established, the sandstone units have permeabilities on the order of $1x10^{-3}$ to $1x10^{-4}$ cm/sec while the claystone units have lower values of $1x10^{-6}$ to $1x10^{-8}$ cm/sec.

In the *Hydrogeologic Characterization, Kettleman Hills Facility, Kings County, California* (1986), EMCON Associates considered (for practical purposes) the permeability to be the same as hydraulic conductivity because permeability is a most important factor in determining how fast groundwater travels through a rock unit.

4.4.4 Water Quality and Water Usage

Natural background water quality in the San Joaquin Formation is considered poor. There are no wells within 1-mile of the property boundary of the KHF. Total dissolved solids (TDS)

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3 Site-Specific Groundwater Monitoring Plan, GeoSyntec Consultants, May 2001.

concentrations range from 1,550 to greater than 20,000 parts per million[4]. On March 25, 1988, the RWQCB adopted Resolution 88-051, which determined that groundwater contained in the San Joaquin, Etchegoin, and Jacalitos formations, within ½ mile of the KHF are not a potential source of drinking water. Resolution 89-155 issued for the KHF on August 11, 1989, by the RWQCB included Resolution 88-051 and further stated that the San Joaquin, Etchegoin, and Jacalitos formations were not a municipal or domestic supply of drinking water.

[4] Site-Specific Groundwater Monitoring Plan, GeoSyntec Consultants, May 2001.

5.0 Disposal Site Design

This chapter of the JTD describes the engineering design plans for the conversion of the Class II/III portion of Landfill B-19 that included the now de-commissioned bioreactor unit. It includes information required in a Design Report, in accordance with Title 27 CCR Section 21760. Design drawings for Landfill B-19, including control systems details and fill sequencing plans, are at the end of this JTD. The detailed calculations and engineering analysis to support the various elements of the site design are included in Appendix C.

5.1 Design Elements and Plans

5.1.1 Site Plan/Facility Layout

The Site Map included on Drawing 2 depicts the following: the approximate legal property limits of the KHF, the limits of existing and proposed final limits of Landfill B-19, existing topography as of June 23, 2004, and the locations of existing ancillary facilities such as the site entrances, office buildings, maintenance facility, scale house, and storm water retention ponds. A description of the ancillary facilities is in Section 6.1.

5.1.2 Soil Availability

Locations of remaining on-site borrow areas and stockpiles to be used for completion of Landfill B-19 are indicated on the Site Map (Drawing 2). It is estimated that approximately 4.0 million cubic yards of soil was available from the borrow areas shown[5].

Based on historical topographic mapping and the design presented in this JTD, completion of Landfill B-19, from June 2004, will require the total estimated volume of soil shown below though is subject to change as the closure completion dates get closer

Daily and Intermediate Cover: (Assumed 1.90 million cubic yards (cy) of net Class II/III, airspace capacity remaining, using a 4:1 waste to soil ratio)[1]	380,000 cy
Final Cover Soil (Class II/III): (3.0 feet of soil cover 30 acres)[2]	160,000 cy
Final Cover Soil: (Class I) (3.5 feet of soil covering 12 acres)[3]	70,000 cy
Earthfill in addition to cover listed above (buttress)	815,000 cy
TOTAL SOIL REQUIRED FOR LANDFILL B-19	1,425,000 CY

1. A 4:1 waste to soil ratio is considered conservative because Landfill B-19 uses tarps for daily cover.

2. Using Class II/III area and a correction factor to account for final cover slopes.

3. Using Class I area and a correction factor to account for final cover slopes.

[5] Based on information from WM, May, 2005

The bioreactor operations were not expected to significantly alter the soil requirements for Landfill B-19. Based on the above analysis, the site has adequate soils available for the proposed cover and earth fill requirements.

Additionally, waste materials may be transported to the site for beneficial use as daily cover if they are determined to be acceptable based on the requirements of the site's WDRs and air permits, thus reducing the need for on-site soil. Upon their acceptance, these cover materials will be transported to Landfill B-19 and stockpiled or directly applied.

5.1.3 Liner System

Landfill B-19 was initially constructed in 1986 for disposal of Class I waste. Based on this initial use, Landfill B-19 was constructed with primary and secondary composite liner systems, as shown on Drawings at the end of this JTD. The use of Landfill B-19 for disposal of Class I wastes commenced at the northern end of the unit in 1987. In March 1988, movement of the waste placed in this northern portion occurred. Class I wastes were removed from this area and placed in the southern portion of Landfill B-19 in 1989. Final reports documenting the causes for the waste movement were completed in 1991. To date, approximately three million cubic yards of Class I waste materials have been placed in the southern portion of the unit. Class I materials have not been accepted in Landfill B-19 since 1992.

In 1998, to prepare Landfill B-19 for the disposal of Class II and Class III waste, consistent with appropriate technology and engineering practices, the liner system described in this section was approved and has been constructed[6]. A lined moisture barrier was constructed along the earthfill buttress on the east side of the landfill.

The Landfill B-19 liner was designed to meet or exceed the requirements set forth in Title 27 CCR Sections 20310, and 20320 and federal requirements included in 40 CFR, Part 257 and 258 for protection of underlying soil and groundwater resources. RWQCB Order No. 93-62, implementing Subtitle D regulations, requires MSW landfills to have a composite liner consisting of a two (2) foot-thick low-permeability soil layer, having a maximum permeability of 1×10^{-7} cm/sec, overlain by a flexible membrane liner (geomembrane), or an approved alternative design. Because Landfill B-19 was initially constructed for the disposal of Class I hazardous waste, the liner system, composed of primary and secondary liner systems, exceeds the Subtitle D requirements. This dual containment liner and LCRS system minimizes the potential for impacts to groundwater from the waste in Landfill B-19.

5.1.3.1 Primary Base Liner System

The existing primary liner system located on the base of Landfill B-19, as shown on Drawing 8, consists of the following components (from top to bottom):

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[6] Taken from JTD, Landfill B-19, Revision 2, March 2001, by TRC

- 2-foot operations layer of soil, or acceptable Class II soils.
- 12-ounce nonwoven geotextile, which functions as a filter/separator below the operations layer.
- 1-foot thick granular drainage layer.
- 16-ounce non-woven geotextile fabric to protect the primary HDPE liner from puncture by the drainage materials.
- 60-mil textured HDPE membrane liner.
- 2-foot thick clay liner with permeability less than or equal to 1×10^{-7} cm/sec.

5.1.3.2 Secondary Base Liner System

The existing composite secondary liner system located on the base of Landfill B-19, as shown on Drawing 8, consists of the following components (from top to bottom):

- 16-ounce nonwoven geotextile, which functions as a filter/separator below the primary clay liner.
- 1-foot thick granular drainage layer.
- 16-ounce nonwoven geotextile to protect the HDPE liner from puncture by the drainage materials.
- 60-mil smooth HDPE geomembrane liner.
- 3.5-foot thick clay liner with permeability less than or equal to 1×10^{-7} cm/sec.
- Vadose zone monitoring trench along landfill centerline.
- Subgrade of native earth materials.

5.1.3.3 Side Slope Liner System

The side slope liner system for the Class II/III disposal area includes the following components (from top to bottom):

- 2-foot thick operations layer of general soil material or acceptable Class II soils.
- Geocomposite drainage layer consisting of geonet with nonwoven geotextile thermally bonded to both sides.
- 80-mil textured HDPE geomembrane liner (textured on bottom, smooth on top). [Smooth top surface liner design employed to reduce stress on liner material due to refuse settlement over time].
- 3.5-foot thick (existing) clay layer.

- Subgrade of native earth material.

To construct the side slope liner system, components of the original Class I primary and secondary side slope liner above the secondary clay layer were removed and subsequently replaced as listed above. Defects in the clay liner were repaired by backfilling cracks or voids with bentonite-admixed soils.

5.1.3.4 Barrier "Separation" Liner System

A composite barrier liner system separates the existing Class I hazardous waste from the Class II/III waste placed on top of the existing Class I waste. This liner system also serves as the final cover system for this Class I area. The composite barrier liner system, as shown on Drawing 8, consists of the following components (from top to bottom):

- 2-foot thick operations layer of soil, or acceptable Class II soils.
- Geocomposite drainage layer consisting of geonet with nonwoven geotextile thermally bonded to both sides.
- 60-mil textured HDPE geomembrane liner.
- 2-foot thick low-permeability foundation layer with permeability less than or equal to 1×10^{-5} cm/sec.

This separation liner was extended in segments to support Class II/III waste filling, and was completed in January 2004. This separation liner system will contain Class II/III waste placed in the control unit and a small portion of the bioreactor unit.

5.1.4 Bioreactor Liner Considerations

5.1.4.1 Effects of Bioreactor Temperature and Chemistry on Liner Life

One of the principal purposes of bioreactors is to accelerate the biodegradation of waste. The microbial processes generate heat in both standard and bioreactor landfills. The accelerated biodegradation process generates increased heat that is not quickly dissipated. Typical temperatures within the waste mass of standard landfills range from 25 to 40 degrees C (77 to 104 degrees F), and bioreactors from 50 to 65 degrees C (122 to 149 degrees F). The heat is eventually transmitted to the liner system by either convection or leachate draining into the leachate collection and removal system (LCRS). However, as biodegradation ceases, heat generation ceases and is gradually dissipated.

Leachate is defined as liquids that infiltrate through the landfill. The waste is in the process of degradation and various constituents leach from the waste. The actual chemical make-up varies, depending on the types of waste the landfill has accepted. One principal property of leachate is pH. Typical leachate pH of municipal waste landfills ranges from 6 to 8[7].

5.1.4.2 Effects Caused by Liner Temperatures

The initial temperatures of liner systems are usually based upon the resident temperature of the underlying soil formation. As waste is placed in the landfill and the biodegradation proceeds, heat is transferred to the liner system and dissipated in the underlying soil formation. Figure A, in Appendix C, Attachment 8 shows a plot of temperature versus time for a "wet cell" bioreactor landfill unit located in eastern Pennsylvania[8]. The initial temperatures represent the underlying soil formation followed by a gradual heating caused by degradation of the waste. As the biodegradation process is complete, the temperatures will dissipate and return to the initial temperatures. Figure B in Appendix C, Attachment 8 also shows a plot of a "dry cell" at this landfill. The dry cell shows a similar rise in temperature caused by an increase in the biodegradation process over time.

The short-term impacts of temperature on high-density polyethylene (HDPE) liners have been studied for many years. The USEPA 9090 Method test is used to estimate the impact that exposure of leachate to liners will have. Liner specimens are incubated in leachate at temperatures of 50 degrees C (122 degrees F). After aging, the material properties (tensile strength, tear strength, and puncture) are tested. Studies have demonstrated that elevated temperature impacts on HDPE liner properties are negligible.

With regard to the maximum temperatures in bioreactor landfills, the measured maximum temperature of the liner at the Yolo County, California bioreactor demonstration project in 2001 was 34 degrees C (93 degrees F). This maximum liner temperature condition has continued at the Yolo County Central Landfill site through later full-scale bioreactor operations at the facility[9]. The maximum liner temperature measured at the aforementioned bioreactor in eastern Pennsylvania was 43 degrees C (109 degrees F). The maximum temperature for the dry cell at this landfill was 38 degrees C (100 degrees F). These examples are below the 50 degrees C (122 degree F) incubation temperature used in the USEPA 9090 test method.

It should be noted that rapid waste stabilization would *decrease* the post-closure period for the proposed Landfill B-19 bioreactor. The required duration of long-term performance of the geomembrane for the proposed bioreactor should be reduced because, as the waste stabilizes, the leachate is expected to become benign.

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7 Based on information from John Workman, Waste Management, Inc.
8 Based on information from John Workman, Waste Management, Inc.
9 Data from January 2001 to June 2003; based on email from Ramin Yazdani, Yolo County, to Roger Green, Senior Scientist, Waste Management, Inc., November 24, 2004.

Comparison of the Landfill B-19 LFG generation rates for the baseline conditions without a bioreactor to the proposed bioreactor operations is a good indicator of the more rapid stabilization of waste. Based on a comparison of the baseline and bioreactor average LFG generation rates curves presented in Appendix C, Attachment 3, Part 1, the proposed bioreactor generation rate will fall below that of the baseline conditions in the year 2025 (107 Vs 117scfm). By the year 2045, the bioreactor LFG generation rate will be only 10 percent of the dry cell baseline conditions. This indicates that the elevated temperatures in the bioreactor will be a temporary condition and the bioreactor will result in more stable conditions quicker, and likely lower liner temperature conditions much sooner than current operational conditions without moisture addition. Since waste biodegradation is a short-term process in a bioreactor, liner temperatures will return to the underlying soil formation temperatures. Therefore, long term impacts on HDPE liner due to bioreactor operations is expected to be minimal.

Based on the fact that the lining system is already installed and completely covered with waste, it was determined not to be practical to install devices that would allow CWMI to monitor the changing liner temperatures based on bioreactor implementation. For significant heat to be generated within the underlying Class I waste from the proposed bioreactor operations above, a significant amount of leachate would have to penetrate the separation liner and interact with a large quantity of waste that is reactive with water. The original B-19 Class I portion of the landfill received only minor amounts of reactive waste that was packaged in labpacks (small containers packed with absorbent material within a larger container). Therefore, only minor amounts of heat are expected, which should not impact the separation liner or Class I liner.

5.1.4.3 Effects Caused by Leachate Chemistry

As discussed above, the types of waste and the waste biodegradation process control the chemistry of the leachate. Current information indicates the pH of bioreactors is within the same range as a standard landfill, i.e., from 6 to 8. USEPA 9090 tests with municipal solid waste leachate have shown that liner properties are not impacted by pH in this range. The average annual pH of leachate from the primary LCRS for the Class II/III portion of landfill B-19, measured between 1998 and 2004, was between 6.54 to 7.06[10]. Measurements from all leachate systems within Landfill B-19, including the Class I LCRS sumps, were from 6.34 to 7.78 over that period.

Table C9, in Appendix C, Attachment 9, presents the pH and inorganic and organic constituent test results from leachate removed from the Class II/III area LCRS in Landfill B-19. The leachate contains inorganic constituents and very low levels of organic constituents. The

[10] Landfill B-19 leachate data spreadsheet from CWMI, provided June 30, 2005.

concentration of these constituents has been demonstrated to not affect the integrity or long-term performance of liner materials. The chemical makeup of the leachate did not significantly change due to bioreactor operations.

5.1.5 Leachate Collection and Removal System (LCRS)

Landfill B-19 is equipped with a primary LCRS in accordance with Title 27 CCR Section 20340 requirements, as well as a secondary LCRS and a vadose zone monitoring system, to protect groundwater quality. See Drawing 5 for the liner system limits and leachate sump location. Liner and LCRS design details are shown on Drawing 8.

Section 5.2.5 describes calculations regarding the leachate capacity of the existing primary composite liner and leachate collection and removal system for the bioreactor and control units. Calculations were performed to model the estimated head on the existing liner system that includes proposed liquid and high liquid content waste additions to the discontinued bioreactor unit. The results demonstrate the leachate level will be less than the one (1) foot head limitation stipulated in regulations.

5.1.5.1 Primary Leachate Collection and Recirculation

The purpose of the primary LCRS is to collect and quickly transmit leachate to sumps, where it can be efficiently removed and maintain leachate levels on the primary liner to a depth of one (1) foot or less.

The main components of the primary leachate collection system on the landfill floor consist of the following (from top to bottom):

- A 12-ounce nonwoven geotextile, which functions as a filter/separator from operations layer soils.
- A one (1) foot thick granular drainage layer constructed of inert material that will not react with leachate. A 6-inch diameter perforated HDPE pipe was placed within the one (1) foot granular layer along the center flow line of the landfill floor to increase the overall transmissivity of the LCRS.

On the landfill side slopes and areas overlying existing Class I waste, the primary leachate collection system consists of a geocomposite drainage layer, covered with a two (2) foot layer of protective soils.

A major component of the primary LCRS described above is the collection sump located in the bottom of the proposed bioreactor unit. This sump is a five- (5) foot deep triangular sump with 10-foot long sides constructed below the grade of the primary liner. The sideslopes and floor slopes of Landfill B-19 are designed to facilitate the flow of any leachate toward the collection sump. After collecting in the primary sump, accumulated liquid is removed by pumping through a side slope riser pipe shown on Drawing 5 (B-19-1A).

Leachate within the control unit that is produced on the north and west sides of the Class II/III refuse fill will generally flow directly to the sump (shared by both the control and bioreactor units) by traveling on top of the separation liner through a geocomposite that is connected to the primary LCRS within the bioreactor unit. Leachate within the control unit that is produced on the west side of the Class II/III refuse fill area will drain through a geocomposite drainage layer to the west toe of slope. At the east toe of slope in the control unit, a gravel LCRS and perforated transmission pipe has recently been constructed to collect this leachate and transfer it to the north. At the north, termination of this gallery the transmission pipe is connected to an existing LCRS transmission pipe that drains directly to the bioreactor area sump. Drawing 5 presents the existing base grades for the Class II/III waste disposal area, the east side LCRS configuration, and the first stage of berm construction along the east side that will eventually form the toe buttress.

The existing sump installed in the bioreactor unit was designed with an estimated capacity that is twice the anticipated leachate volumes of Landfill B-19 that would be generated during "dry tomb" conditions (Calculations were provided in 1998 JTD, summarized in Appendix E, Table 2 therein). The 1998 calculations reference a second sump. However, this sump was to be located on the 11 acres of the Class II/III disposal area at the south of Landfill B-19 that has been eliminated, since Class II/III waste will not be placed there.

The theoretical HELP computer model analysis in the 1998 JTD estimated a maximum of 72,388 gallons per year of leachate generation, to occur in Phase 2 with 80 foot of waste thickness. Actual leachate generation measured by removals from the LCRS has been far less. Excluding the 34,740 gallons removed in November 1998 (when the LCRS was constructed and was significantly open prior to waste being in place), between 1990 and the end of 2002, the maximum leachate collected was 24,762 gallons in 1999 dropping to a low of 2,960 gallons in 2002 (during Phase 2)[11]. This appears to indicate that the dry waste conditions and the actual "dry tomb" operational controls have produced far less leachate than the HELP model design criteria predicted.

The past addition of liquids and high liquid content waste to the bioreactor unit, in addition to recirculation of leachate, introduced higher leachate flows in the bioreactor unit LCRS than current conditions. Calculations estimating the function of the LCRS in the bioreactor unit are described in Section 5.2.5 and Appendix C, Attachment 6. The calculations indicate that the

[11] Based on records of monthly leachate pumped, provided by Paul Turek in November 2003, CWMI

existing LCRS will maintain the head over the base liner at seven (7) inches or less. The calculations also indicated that the leachate head will be contained within the geocomposite drainage layer of the separation liner, and therefore not exceed the thickness of the drainage layer. This is based on the assumptions that recharge rates from leachate recirculation and the addition of liquids to the bioreactor unit will not and have not exceeded 10,000 gallons-per-acre-per-day (gpad) and other assumptions noted in the LCRS calculations.

Based on the calculation findings that leachate flow, and resulting hydraulic head, will be contained within the 250 mil (0.25 inches) thick geocomposite drainage layer of the separation liner, the leachate hydraulic head on the separation liner is not expected to be a significant potential source for leakage through the separation liner. In addition, slope stability is not expected to be a concern regarding the separation liner under these conditions.

5.1.5.2 Secondary Leachate Collection System

The purpose of the secondary leachate collection system is to monitor performance of the primary liner system and remove any liquids that may accumulate. Liquids that are expected to occur will be from consolidation of clay located in the primary liner or leachate that may penetrate the primary liner. The secondary leachate collection system on the landfill floor consists of the nonwoven geotextile, a high permeability granular layer, and a geocomposite drainage layer similar to the primary leachate collection system. No secondary LCRS is present on the sideslopes. Details of the secondary leachate collection system are shown on Drawing 8.

The separation liner is underlain by a Class I disposal unit. The base of the Class I unit is constructed with a double composite liner system that will collect any leachate that may penetrate the separation liner.

5.1.5.3 Gas Collection From Leachate Collection System

In order to further control potential landfill gas emissions, the primary LCRS riser pipe is connected to a vacuum line routed to the LFG control system. This connection point is shown on Drawing C-3, at the end of Appendix C, Attachment 3 – Part 2 (Denoted as Detail 2). The vacuum line to the leachate riser is equipped with a valve to control vacuum pressure and a sampling port.

5.1.6 Vadose Zone Monitoring System

The vadose zone monitoring system is a secondary detection system to monitor performance of the entire liner system. The system is comprised of a fifteen (15) foot wide trench situated beneath the center flow line of the landfill floor. This trench is lined with an 80-mil HDPE and contains a one (1) foot thick layer of drainage gravel wrapped in 16-ounce non-woven geotextile.

CWMI understands that Finding 52 of the current WDR indicates the thickness of the gravel in the unsaturated zone monitoring trench beneath the B-19 lining system is 2-feet deep; however, based on a review of as-built drawings, it appears when the new B-19 primary liner was built, it was built over the existing former Class I secondary liner and vadose zone trench. Based on a review of the as-built documents, the trench appears to be only 1-foot deep.

The vadose zone is accessed by an eight- (8-) inch diameter HDPE side slope riser pipe. Within the granular drainage media of the vadose zone, the riser is a stainless steel perforated pipe wrapped with two (2) layers of geonet.

The riser system is utilized to monitor for and sample any liquids, which enter the vadose zone collection system. Details of the vadose zone monitoring system are shown on Drawing 8 (Detail 1).

5.1.7 Landfill Development Phasing

The Landfill B-19 Class II/III waste disposal area will be filled in four primary phases. The phasing sequence has been updated to reflect the revised final grading plan and current status of current filling. The revised phasing sequence is shown on Drawing 6.

Phase SW-1 (as identified in the previous JTD, Rust E&I and TRC) represents the initial cell construction and filling. This sequence is not shown on Drawing 6 and was completed in 2000.

Phase 2 represents the completion of the separation liner construction in accordance with the proposed final grading plans. This construction was completed in 2004 and is currently being filled over with Class II/III waste. The earthen buttress is constructed along the east side of the landfill as waste is placed in the landfill. The fill configuration for Phase 2 presents the fill configuration of site topography, as of June 23, 2004.

Phase 3 represents the implementation of the bioreactor. The bioreactor and control areas were filled concurrently and the earthen buttress construction was completed. A gas collection system and flare was installed to control surface emissions and odors. The final cover was constructed for the 11 acres of Class I landfill that was exposed.

Phase 4, the final phase, will eventually bring the landfill to final grades. Liquids will continue to be added to the bioreactor portion of the landfill until settlement ends, or the waste will not absorb liquids any longer, or the 12 year RD&D permitting expires. Additional solid waste lifts will be added during this period to maintain the proposed final grades. After the landfill waste degradation and settlement has decreased beyond a level approved by regulatory agencies, final cover will be placed.

Table 5-1 summarizes the approximate airspace, tonnage statistics, and approximate lives for the previous phase SW-1 and phases 2 through 4 shown on Drawing 6. Following is a discussion of landfill phasing that has taken place to date and as proposed for future operations.

TABLE 5-1
LANDFILL B-19 CLASS II/III WASTE PHASING SUMMARY

Phase	Airspace	Waste Density[1,2,3]	Disposed Tonnage	Cumulative Tonnage	Year of Completion	Years Capacity
1	403,000	1,200	241,800	241,800	August 2000	1.8
2	1,531,320	1,350	1,033,641	1,275,441	June 2004	3.9
3	844,053	1,350	569,736	1,845,177	February 2006	1.6
4	1,054,755	See Note 3	1,119,811	2,964,988	TBD[4]	
Totals	3,833,128	1,547	2,964,988			

1. CWMI tracks waste density per cubic yard of total airspace consumed (including cover soil) versus the tonnage landfilled in that airspace. The average waste density for Phases is estimated above.

2. Waste density for Phase 3 assumes the average density shown primarily for dry cell operations, including initial implementation of the bioreactor.

3. Waste density during Phase 4 will be increased by the settlement of all four phases due to settlement of the bioreactor zone. This is expected to result in the average density noted for the entire B-19 airspace ("Total"). This is based on an assumed average density per CY, prior to closure, of 1,350 lbs/CY for the control unit and 1,620 lbs./CY for the bioreactor unit airspace.

4. The duration of this period is not known at this time and will continue until waste degradation and settlement has occurred to a level approved by regulatory agencies.

5.1.8 Final Grading Plan

The proposed final grading plan for Landfill B-19 includes a maximum waste elevation of 945 feet at the center of the top deck, which is sloped at five percent. The top deck joins the perimeter side slopes, which are sloped at 2.5 horizontal to 1 vertical (2.5:1), producing an effective slope of 3:1 with the benches provided. The final grading plan is presented on Drawing 4.

5.1.9 Final Cover Components

An evapotranspirative (ET) final cover system will be used for the entire landfill area that has received Class II/III waste. A description of the system is contained in Section 11, *Preliminary Closure and Post-closure Maintenance Plan;* Section 11.4, *Final Cover, Grading and Drainage*.

5.1.10 Surface Water Management Design

A surface water management system has been designed for the revised grading plan. The system design must:

- Accommodate flows from the 1,000-year return frequency, 24-hour duration storm pursuant to 27 CCR 20320 and 20365.

- Maintain adequate drainage on surfaces of the waste fill pursuant to 27 CCR 20650.

- Be capable of controlling the probable maximum precipitation (PMP) event (10.3 inches for KHF). This is required because the Landfill B-19 is a Class I hazardous waste management unit.

- Limit to the greatest extent possible any ponding, infiltration, inundation, erosion slope failure, washout, and overtopping.

The design details of the drainage control systems are revised to reflect the changes in the final grading plan. The design of these drainage features is shown in plan view on Drawing 4, and in the associated details on Drawings 9, 10 and 11. A description of the drainage system, and design calculations are included in Attachment 2 of Appendix C.

Drainage from the top deck of the landfill will flow to a drainage control berm, which will convey flows to overside drains that convey flows to the ditches along the main access road, or on benches on the landfill (Drawing 9). These overside drains will convey flows from ditches along benches, or the main access road on the final face, to ditches on lower benches or the existing perimeter drainage ditch. The flows from the perimeter drainage ditch empty into the East Retention Basin (See Figure 3 within the Storm Water Management Plan).

The overside drains will be constructed of corrugated pipe as noted on Drawing 4. The drainage ditches with estimated flow velocities of 5 feet per second (fps) or less will be lined with grass or erosion control matting. Drainage ditches and channels with greater than 5 fps flow velocities will be lined with concrete or equivalent protective material for protection against erosion. Cross-drains on landfill benches and access roads will be metal or plastic corrugated pipe with minimum pipe cover for vehicular traffic.

The drainage features described above will be constructed in stages as the landfill reaches final grades. Temporary storm water control practices will be used for phased development of the landfill. Grading will allow storm water, which falls on the cover that has not been in contact with waste, to flow to drainage ditches or to collect such that it can be pumped to the drainage ditch system. Soil berms may be used to control runoff/run-on from active areas and areas without intermediate cover.

CWMI maintains a Storm Water Management Plan[12] and SWPPP in compliance with regulatory requirements in CCR Titles 22 and 23. The latest revision of this plan defines the requirements for specific drainage controls for surface run-on and run-off for Landfill B-19 as well as the entire site.

[12] Latest revision is dated October 23, 2009.

5.1.11 Landfill Gas Management System

Landfill gas (LFG) is produced by the anaerobic decomposition of organic matter. The rate of LFG generation depends on several site-specific factors such as amount of moisture present, composition of waste, temperature, age of waste, pH, and rate of filling. The dry climate of the San Joaquin Valley reduces the amount of moisture in landfills and slows the gas generation rate. The addition of liquids and high-moisture-content waste will rapidly increase the gas generation rate. Therefore, implementation of the bioreactor unit required installation of a LFG control system.

Landfill B-19 is also subject to the requirements specified in 40 CFR 60, Subpart WWW. As required, KHF submitted annual NMOC Emission Rate Reports from 1999 through 2006, which included NSPS Tier 2 testing and report, submitted in May 2003. The LFG collection and control system design plan was submitted in November 2005, and the installation of a gas collection and control system was completed and the flare was ignited on May 22, 2007.

The LFG system for Landfill B-19 consists of vertical extraction wells, collection header pipes, and a gas flare with a condensate handling facility. Additionally, based on the potential for LFG migration in the drainage layer of the leachate collection and removal system, a connection to the Phase 1A LCRS riser pipe was installed to collect landfill gas, which occurs within the leachate collection system. The collection system was installed in both the bioreactor and control units. The vertical extraction wells will be extended as the landfill reaches final grades. The gas collection system layout is depicted on Drawing C-3 at the end of Appendix C, Attachment 3, Part 2. Appendix C, Attachment 3, Part 2, contains a Design Plan for the gas collection and control system prepared by GC Environmental, Inc., including the basis for design for the collection piping, condensate management components and a flare. A summary of LFG production and collection estimates is contained in Section 5.2.8. Further information on LFG control is in Section 8.2. A description of the LFG collection system-monitoring program is provided in Section 9.2.

5.1.12 Liquid Injection System

Uniform distribution of liquids is important for a bioreactor to operate efficiently. Off-site liquids, leachate, and condensate were added to the discontinued bioreactor by several means including direct application at the working face and/or into infiltration galleries located at the top of the landfill. Liquids werealso added to the bioreactor using a tank and piping system to inject the liquids into vertical injection wells and/or horizontal injection pipes installed in the waste. These were also used for the re-injection of leachate and LFG condensate extracted from the B-19 landfill.

Other than direct application at the working face, surface application was accomplished through the use of infiltration galleries. A typical infiltration gallery is shown on Drawing B3. These can be placed on the top deck of the landfill at both interim and final elevations, with an appropriate offset from the landfill sideslope. Liquids and high-moisture-content wastes that are delivered in trucks may discharge directly to the infiltration galleries, the working face or into tanks where the liquid will be distributed based on available capacity of all infiltration systems. This design layout is based on WM experience with other bioreactor landfill sites. A gallery will be decommissioned or refurbished once the infiltration slows showing that the pore space is clogged.

The liquid injection system primarily includes vertical injection wells, similar to vertical LFG collection wells. The liquids injection system is used to inject solids-free liquid wastes as well as to distribute leachate collected from the LCRS and to distribute LFG condensate into the lower portions of the landfill. The leachate and liquid control systems are discussed in more detail in Section 8.1. Since the B-19 landfill is practically filled to its final elevations, horizontal injection trenches were not used. However, as a reference, the typical horizontal injection trench design is shown on attached Drawings B1 and B2.

5.1.13 Representative Cross-Sections

Representative cross sections of the site are shown on Drawing 7. Each cross section illustrates conceptual limits of fill phases, the approximate limit between the bioreactor and control unit, fill slopes, excavated slopes, excavated areas (if any), previous Class I waste placement, liner and final cover locations.

5.1.14 Design Details

Landfill design details are shown on the Drawings at the end of this report. These details demonstrate the specific design elements regarding Landfill B-19 liner systems, leachate collection system, liquid injection systems, access roads, final cover, and landfill drainage systems. Additional gas collection system plans and details are provided in the LFG Design Plan report, included in Part 2 of Attachment 3 to Appendix C.

5.2 Design Calculations

5.2.1 Remaining Waste Capacity

The total estimated gross airspace, net airspace, and cover volumes were presented in Section 3.7. Design calculations for these figures are in Appendix C, Attachment 1.

The remaining net airspace capacity as of April 23, 2013 was approximately 0.3 million cubic yards. This number was calculated using the remaining gross capacity from the topographic mapping to final grades and subtracting the final cover soil volume (for 29 acres of footprint to be filled to final grades to receive final cover). The calculations of these volumes are in Appendix C, Attachment 1.

5.2.2 Stability Evaluation

For implementation of the bioreactor unit in Landfill B-19, Hushmand Associates, Inc., (HAI) prepared a *Slope Stability Analysis for Cell Redesign and Bioreactor Evaluation*, November 2003, to analyze static and seismic stability for the design of both the bioreactor and control units. This included fill slopes, bottom/sideslopes, and Class II designated waste and Class III MSW fill separation liners located adjacent to, and overlying existing Class I hazardous waste. This Slope Stability Evaluation report is in Appendix D. EMCON/OWT, Inc. has reviewed and agrees with the methodology of the slope stability analysis; and we have relied on the results of the slope stability analysis provided and certified by Hushmand Associates, Inc., in the compilation of the plans included in this JTD.

5.2.2.1 Regulatory Requirements

Requirements for the stability analyses of the Class II/III landfill are contained in Section 20370 and Section 21750 (f) (5) of Title 27 CCR. Section 21750 (f) (5) of Title 27 calls for *"A stability analysis, including a determination of the expected peak ground acceleration at the Unit associated with the maximum credible earthquake (for Class II WMUs) or the maximum probable earthquake (for Class III landfill). This stability analysis shall be included as part of the ROWD (or JTD) for the proposed Unit, and an updated stability analysis (if the original analysis no longer reflects the conditions at the Unit) shall be included as part of the final closure and post-closure maintenance plan. The methodology used in the stability analysis shall consider regional and local seismic conditions and faulting..."*

"(A) The stability analysis shall ensure the integrity of the Unit, including its foundation, final slopes, and containment systems under both static and dynamic conditions throughout the Unit 's life, closure period, and post-closure maintenance period..."

"(C) The stability analysis shall be prepared by a registered civil engineer or certified engineering geologist. Except as otherwise provided in paragraph (f)(5)(D), the report must indicate a factor of safety for the critical slope of at least 1. 5 under dynamic conditions..."

"D) In lieu of achieving a factor of safety of 1.5 under dynamic conditions, pursuant to paragraph (f)(5)(C), the discharger can utilize a more rigorous analytical method that provides a quantified estimate of the magnitude of movement. In this case, the report shall demonstrate

that this amount of movement can be accommodated without jeopardizing the integrity of the Unit's foundation or the structures which control leachate, surface drainage, erosion, or gas."

The existing Class I landfill at Landfill B-19 has been designed in accordance with applicable regulations in CCR Titles 22 and 23 and specific conditions in the site hazardous waste facility permit. CCR Titles 22 and 23 require consideration of the MCE for Class I Landfills, The Class II/III landfill at Landfill B-19 was designed to meet the applicable regulations in CCR Title 27 (Rust E & I, 1997). CCR Title 27, as explained in detail above, requires consideration of the MCE for Class II, and consideration of the Maximum Probable Earthquake (MPE) for Class III landfills. The MCE is defined by California Geological Survey (CGS) as "the maximum earthquake that appears capable of occurring under the presently known tectonic framework." MPE is defined by CGS as "the maximum earthquake likely to occur during a 100-year interval." By definition, for the same set of faults, the MCE will result in a larger earthquake. Thus, in order to maintain the integrity of the existing closed Class I system, for stability evaluations of Landfill B-19, the MCE is used as the design earthquake and is evaluated for faults determined to produce potentially damaging ground motions at the site. Near- and far-field seismic events are evaluated to assure that both higher intensity and lower intensity earthquakes are considered. Near-field events at the CWMI site generate shorter duration, higher intensity, and higher frequency ground shaking compared to far-field earthquakes that result in longer duration but lower intensity and lower frequency ground shaking.

For seismic stability, the present practice is to estimate landfill slope displacements for design earthquakes, using a Newmark equivalent method (Newmark, 1965), and demonstrate that they are below an allowable value that maintains the integrity of the landfill. Current engineering practice is to allow a maximum seismically induced permanent slope displacement of six to twelve inches to correspond to acceptable performance for well-designed liner systems. Class I landfills at the KHF are designed for the maximum allowable displacement of six inches, which is also used in the design of the Class II/III Landfill B-19 in this report.

5.2.2.2 Site Design Criteria

The design criteria used for the slope stability evaluation (Appendix D) involved research of previous studies of the CWMI site. A detailed discussion of the site geology, faulting, and seismicity is presented in the 1997 Rust E&I, Inc. report. Additionally, deterministic and probabilistic seismic hazard evaluations of the site were performed by RUST E&I and William Lettis & Associates, Inc. (WLA), which are presented in the 1997 Rust E&I Report. Representative design ground motions were also developed for seismic displacement analysis of the landfill slopes (Rust E&I, 1997). As stated in the 1997 RUST E&I Report, the 1997 ground motion evaluations and selected design earthquake acceleration time histories were reviewed and evaluated by CIWMB, SWRCB, DTSC, and Dr. Les Harder of Department of Water Resources (DWR) and were approved for seismic stability evaluation of Landfill B-19. A recent evaluation of the site seismicity to update the site design earthquake parameters for the MCE, (peak horizontal ground acceleration [PHGA], response spectrum, and selected ground motion time histories), based on more recent attenuation relations (e.g., Bozorgnia, Campbell, and Niazi, 1999) and information on the site faulting, provided results similar to the 1997 RUST E&I study. The following summarizes the results of the 1997 site seismicity evaluation:

- The closest seismic sources to the site are segments of the blind Ramp Thrust that is present beneath the site at distances of 10 to 27 km, while the most active sources are associated with the San Andreas Fault zone at 35 km closest distance.
- No evidence of fault rupture hazard is known to exist at the project site (i.e., within 200 feet of Landfill B-19).
- The Ramp Thrust Kettleman Hills North Dome segment (Magnitude [M] 6.6) of the blind Ramp Thrust faults and the San Andreas Slack Canyon-Cajon Pass segment (M 7.8) will produce the highest near-field and far-field ground motions at the site, respectively. The MCE's associated with these faults were selected as the site design events.
- The deterministic values of PHGAs for the near-field and far-field design events were estimated as 0.57g and 0.21g, respectively. The calculated PHGA of 0.57g approximately corresponds to an average return period of 1,000 years.
- One "distant" (far-field) and three "local" (near-field) earthquake records were selected and scaled to correspond to the design peak horizontal accelerations in rock as design input motions. These records have a peak acceleration, frequency content, and duration representative of the expected earthquake motions at the site. The selected records were:

    1. The Caltech A-1 synthetic acceleration time history simulating an M 8+ earthquake on the San Andreas Fault scaled to peak amplitude 0.21g.
    2. The Seed-Hayward synthetic acceleration time history simulating an M~seven earthquake to approximate the near-field MCE. Both peak amplitude and frequency content of this record were scaled to approximately match the site design PHGA and response spectrum.
    3. The Castaic Old Ridge Route, sedimentary rock outcrop, Ch 1 (90 deg Component) acceleration record from the 1994 (M_W = 6.7) Northridge, California earthquake scaled to a peak amplitude of 0.57g.
    4. The Pacoima-Kagel Canyon, sedimentary rock outcrop, Ch 3 (360 deg Component) acceleration record from the 1994 (M_W = 6.7) Northridge, California earthquake scaled to a peak amplitude of 0.57g.

These four records present conservative estimates of input ground motions at the landfill site. Input motions were selected to match site design ground motion and the following parameters as closely as possible:

- Magnitude of the design earthquake;
- Distance of the source to the recording station;
- Recorded peak acceleration versus the site design peak acceleration;
- Local site geology of the recording station; and
- Characteristics of the earthquake source, particularly the type of fault displacement in the event.

The selected records were used as input motion in two-dimensional seismic response analysis of the landfill, which provided average acceleration time history of a potential sliding mass in seismic deformation analysis of landfill slopes (see HAI Report- Sections 3.6, 3.7, and Appendix C).

Details of the site design earthquake parameters derivation, including figures illustrating time histories of the selected acceleration records and a comparison of their response spectra with the site design response spectrum are provided in the 1997 Rust E & I report (Figures 30 through 33). These figures are also presented in Appendix A of the HAI report (Appendix D) for reference and use in seismic slope displacement evaluations presented here.

The potential for liquefaction occurrence in the area of the proposed landfill expansion is considered very low or non-existent. The materials below the proposed landfill expansion area are classified primarily as Tertiary sedimentary rocks, which are not susceptible to liquefaction. Groundwater at the site is also deeper than 50 feet. Therefore, based on the site subsurface geology, the potential for liquefaction at the site is nonexistent.

Similarly, the potential for seismically induced settlement of the landfill foundation materials was estimated to be negligible based on the subsurface geology and cemented nature of the bedrock. The site foundation materials are classified primarily as the Tertiary sedimentary rocks, which are not susceptible to seismically induced settlement.

5.2.2.3 Stability Evaluation Results

Based on the analysis presented in the Stability Evaluation Report prepared by HAI (Appendix D), the calculated values of the static factor of safety and seismically induced permanent displacements in the waste prism and along the liner systems for the postulated design earthquake events meet the regulatory criteria in Section 5.2.2.1. This is based on the following conclusions:

- The computed static factors of safety for the sections analyzed were higher than 1.5.
- The analyses indicate that the proposed landfill design (new fill plan geometry and conversion of part of Landfill B-19 to a bioreactor unit) results in stable conditions under both static and seismic conditions according to applicable regulations.
- The computed maximum displacements along the liner system during the near-field MCE event are on the order of six inches.
- The computed maximum displacements along the liner system during the far-field MCE event are on the order of one inch.
- Maximum seismically induced permanent displacement within the waste prism in the cover/gas collection systems is about eight inches.

5.2.3 Settlement Analysis

Total settlement consists of three components; foundation, Class II/III, and Class I. Each component of settlement has the potential to impact landfill performance. The following sections discuss each component of settlement.

Total settlement will include settlement in the post-closure period. Settlement during the post-closure maintenance period will be monitored in accordance with requirements of Title 27 CCR 21090. The minimum slope of three percent for the final grades is designed to accommodate proper drainage with anticipated future settlement and maintenance. Preliminary settlement calculations are included in Attachment 4 of Appendix C. The settlement determined by the analyses should be considered as an order of magnitude estimate due to the general variation and lack of control over various factors or processes, which affect settlement of waste fill.

As most primary settlement is anticipated to occur during the site's operating life, the main consideration for post-closure grades will be secondary settlement of the Class II/III waste and existing Class I fill. Additionally, some minor uniform long-term consolidation of the bedrock and liner system is anticipated to occur. The final grades for Landfill B-19 (Drawing 4) range between 2.5H: 1V along the perimeter slopes to approximately 3 percent along the top deck of the cell. These grades have been designed to accommodate anticipated settlement and still maintain positive drainage off the landfill area.

Evaluation of the anticipated component parts of the overall settlement is summarized in the following subsections, and described in Attachment 4 of Appendix C.

5.2.3.1 Foundation Settlement

Foundation settlement is the result of clay liner and subgrade consolidation. Excessive total or differential settlement of the subgrade could impact the integrity of the liner system.

The waste filling proposed over Landfill B-19 is similar to the one used in the original Landfill B-19 design. A cross-section from south to north (Drawing 7) shows

- An earthfill buttress,
- An area with no additional Class II/III waste over Class I waste (revised final cover),
- Class II/III waste over Class I waste in a control unit,
- Class II/III waste over a limited section of Class I waste in a bioreactor, and
- Class II/III waste in a bioreactor over the base liner system.

Since the fill configuration over the entire Landfill B-19 is similar to that used in the previous site design, the Golder foundation settlement analysis is applicable. Consolidation of the bedrock and liner system was evaluated by Golder Associates Inc. (Golder Associates, 1991) for continued Class I operations in Landfill B-19. The Golder analyses determined that the bedrock beneath Landfill B-19 was fairly incompressible and foundation settlement would be approximately 0.25 foot for bedrock. Any foundation settlement anticipated would be fairly uniform and would not create differential settlement that could affect the integrity of the Class I or Class II/III liners.

The slope stability evaluation (HAI - Appendix D) for the bioreactor landfill configuration found that the potential for seismically induced settlement of the landfill foundation materials was estimated to be negligible based on the subsurface geology. The foundation materials are primarily Tertiary sedimentary rocks, which are not susceptible to seismically induced settlement.

5.2.3.2 Class II/III Waste Fill Settlement

Settlement created by a bioreactor is created by increased overburden and biological degradation. The bioreactor unit was retrofitted (for existing waste placed prior to the bioreactor project) to introduce liquids and high liquid content waste to increase the moisture content of the waste in order to increase the rate of decomposition over the active life of Landfill B-19. The increased rate of decomposition is estimated by CWMI to increase the Class II/III waste density factor by 20 percent in the bioreactor prior to closure, or from an estimated 1,350 lbs./Cubic Yard (CY) to 1,620 lbs./CY of airspace. The evaluation of the Class II/III waste fill settlement in Attachment

3, Appendix C was performed to check for grade reversals of the proposed Class II/III final cover grades and for elongation of the final cover. The analysis included analysis during the 30-year post-closure period. This included combined settlement analysis for both the Class II/III waste and underlying Class I waste. The result indicated settlement ranging from 8.6 feet to 46.6 feet along a cross-section of the landfill. The settlement over the post-closure period is expected to be a logarithmic function that will decay over time. The analysis predicted that slope reversals should not occur. The analysis predicted elongation to a maximum of 0.31 percent along the final cover, which should not compromise the integrity of the proposed Class II/III, ET final cover.

5.2.3.3 Class I Waste Fill Settlement

Settlement of the Class I waste was analyzed to determine the total and differential movement of the separation liner and final cover. Excessive settlement could reduce or reverse the slope of the Class II/III leachate collection system on the separation liner and create leachate heads in excess of 12 in. Elongation along these systems, as a result of differential settlement, was also analyzed to check the integrity of the geosynthetic components in these systems would not be compromised. The evaluation of the Class I waste fill settlement is in Attachment 3, Appendix C.

Evaluation of potential settlement of the Class I waste was assumed to consist of two components. The first component is the primary settlement of the Class I waste due to the overburden pressure from the Class II/III waste and the final cover, and the other component is the secondary settlement of the Class I waste that would occur including the post-closure period. The results indicated settlement for the Class I area ranging from a minimum of 3.2 feet to a maximum 12.1 feet along a cross-section of the landfill. The analyses predicted that slope reversals should not occur along the separation liner or final cover. The slope along the existing separation liner after the estimated effects of settlement ranges from 3 to 29 percent. The post-settlement slopes analyzed for the proposed Class I final cover range from 0.79 to 18 percent. The analysis for the Class I final cover area having a post-settlement slope of 0.79 percent indicated a reduction from initial conditions of 3.85 percent. This is potentially close to grade reversal considering the sensitivity of the analysis. This flatter area is within the area to receive buttress fill. Therefore, the design of the Class I final cover includes provisions that the soil foundation component has at least a five (5) percent slope prior to placement of the remainder of the final cover (including the HDPE membrane and drainage layer) in order to maintain positive drainage slope as the Class I waste settles.

The analysis of elongation along the separation liner and Class I final cover predicted elongation along two segments at a maximum of 0.10 percent, which should not compromise the integrity of the proposed Class I waste separation liner or final cover system.

5.2.4 Leachate Pipe Integrity

Leachate pipes transmit liquids from the collection system to the sumps. The bioreactor will increase vertical loading on the pipes by about 20 percent due to higher unit weight of the waste. Calculations were performed to check the integrity of existing LCRS pipe under the proposed bioreactor loading conditions.

The existing LCRS pipes consist of 6-inch diameter SDR 15.5 HDPE pipes. A pipe section subjected to the maximum waste height was checked for ring deflection, pipe buckling, wall crushing, and circumferential strain. The analyses were performed in accordance with the Geosynthetic Research Institute (GRI) report entitled “Finite Element Analysis of Plastic Behavior in Leachate Collection and Removal System”, GRI Report #12, by Wilson-Fahmy and Koerner (1994).

The pipe loading calculations are presented in Appendix C, Attachment 5. The calculations show that the existing pipe should be adequate under expected loading conditions.

5.2.5 Leachate Generation and Collection System Calculations

The discontinued bioreactor was expected to increase the leachate generated and collected in the primary leachate collection system. The leachate collection system must maintain less than 1 ft of head for all operating conditions. This section contains analysis of leachate generation and liquid management for the bioreactor unit to evaluate the adequacy of the existing primary liner LCRS to support the proposed bioreactor conditions. The existing LCRS is described in Section 5.1.5. The proposed function of the LCRS for the bioreactor unit is discussed in Section 8.1. Calculations regarding the adequacy of the LCRS are in Appendix C, Attachment 6. Analysis for the proposed bioreactor operation was performed for the existing LCRS on the Class II/III primary base liner system and the drainage layer of the existing separation liner over the Class I waste, which flows to the Class II/III primary base liner LCRS.

Leachate generation is a function of the quantity of liquids added to the waste and how they are added. The best method for predicting leachate generation is empirically derived data collected from previous bioreactor operations. For the discontinued bioreactor the LCRS calculations were based on major worst case assumptions that the “recharge” rate for the bioreactor unit will be a maximum of 10,000 gallons per acre per day (gpad) during the active stage of the landfill, and the effective permeability of the rock in the drainage layer is 0.3 cm./sec[13]. Actual conditions in the landfill and LCRS will be complex as channeling of liquid occurs. The actual achievable recharge rate will vary considerably over the landfill and over time. It is believed that the maximum of 10,000 gpad used in the LCRS calculations is conservative and roughly twice the recharge rate that is expected based on other bioreactor projects performed by WM[14].

The calculations for the LCRS of the base liner system, using HELP computer model analysis, include stormwater infiltration based on site climatic conditions plus two cases of recharge rates at 3,000 and 10,000 gpad to account for bioreactor liquid additions. It is possible that infiltration of liquid through the waste mass will be limited to 3,000 to 5,000 gpad, thus limiting the actual flow to the LCRS below this amount. The calculations for the conservative 10,000-gpad-recharge condition indicated that the maximum hydraulic head on the primary base liner system is estimated to be approximately seven inches. This is less than the maximum of 12 inches allowed by Title 27, CCR.

The separation liner installed over the north Class I refuse slope drains leachate that is generated over this slope to the base of the Class II/III gravel leachate collection layer. The incorporation of bioreactor operations over the separation liner will increase the anticipated leachate flow within the Class II/III waste disposal area of Landfill B-19. The geocomposite drainage layer over the separation liner will need to convey this additional flow. To determine the adequacy of this layer to transmit the increased leachate flow, an analysis of the maximum flow rate the geocomposite can carry was performed. The analysis relied on equations for geocomposite flow developed by Giroud, Zornberg and Zhao (2000) and factor of safety values recommended by the Geosynthetic Research Institute, GRI Standard GC-8 (2001).

Similar to the analysis for the base liner system, two flow rates of 3,000 gpad and 10,000 gpad, based on assumed bioreactor recharge rates, were analyzed. The geocomposite over the separation liner will convey the actual recharge rates based on reducing the maximum flow rate for (1) potential intrusion of above lying geotextile material into the pore space of the drainage net, (2) potential chemical clogging (3) potential biological clogging and (4) potential for long term creep. An additional flow reduction was also made to account for a global factor of safety; see Appendix C, LCRS Calculations.

The calculations indicated that head should not build up in excess of the thickness of the geocomposite drainage layer at recharge rates of 3,000 gpad and 10,000 gpad. These

13 The hydraulic conductivity used in the analysis (0.3 cm/sec) was derived by reducing the as-built tested hydraulic conductivity (provided by CWMI) by 95 percent to account for variation in rock permeability and potential clogging over time.

14 Expected rates are 3,000 to 5,000 gpad for waste placed at 1,350 lbs./cy; based on telephone conversation with Gary Hater, WM, April 21, 2004.

calculations were performed at slopes of 26 and 5 percent, based on the configuration of the separation liner. Based on Waste Management's experience with bioreactor operations, it has been empirically determined that the liquid recharge rate for waste is between 3,000 to 5,000 gpad. Applications of liquid above these values could create perching of liquid and head in the bioreactor unit and injection systems. In the unlikely event that a recharge rate greater than 10,000 gpad was attained, it would likely be a temporary condition or from localized voids or spots where unusual fill space conditions exist.

5.2.6 Surface Water Drainage System Calculations

The design and plans for the surface drainage system is described in Section 5.1.10. The calculations supporting this design are in Appendix C, Attachment 2.

5.2.7 Soil Loss Analysis

USEPA recommends two tons per acre per year of soil loss as the maximum allowable for hazardous (Class I) waste landfill final covers. The soil loss analysis was calculated for the final grading plan shown on Drawing 4. Because the landfill included a bioreactor (discontinued), it is assumed that the settlement will progress at a quicker rate than a typical landfill, and the final slopes analyzed are assumed to be at a 3:1 ratio (2.5:1 side slopes that will flatten as waste decomposes and settles prior to and after placement of final cover). The results indicate a maximum calculated erosion rate for the critical slope of 2.0 tons/acre/year. It should be noted that all soil loss due to stormwater erosion from daily and intermediate cover during operations, and from final cover, would be contained in the on-site drainage system. Soil from erosion of cover from Landfill B-19 could be reclaimed from the on-site stormwater basin and reused on-site as cover soil or for other operational or post-closure maintenance soil needs. A copy of the soil loss analysis is included in Attachment 7 of Appendix C.

5.2.8 Gas Production Estimate

LFG is a product of the natural decomposition of organic material disposed in landfills. Successfully designing and modifying a system to manage this gas requires knowledge of the generation process. The most critical steps in the design or expansion of a gas management system is determining the volume of gas, which is expected to be generated during each phase of landfill operation, and the peak gas production.

A LFG generation summary and modeling calculations, performed by EMCON/OWT in February 2004, are provided in Part 1 of Attachment 3 to Appendix C[15]. This analysis includes the following:

- Generation and recovery calculations and a generation curve for "Baseline" conditions. (Baseline conditions represent current "dry cell" conditions for the entire Landfill B-19 at the current 1,400 TPD limit for Class II/III waste acceptance).
- Generation and recovery calculations and generation curve for the control unit.
- Generation and recovery calculations and generation curve for the bioreactor unit.
- A calculation of the composite generation from the combined bioreactor and control unit (Assuming the proposed 2,000 TPD disposal limit); followed by a "Composite" curve that represents the average generation from the combined bioreactor and control units.

The LFG control system is installed in both the bioreactor and control units as part of an integrated system to control LFG from the Class II/III waste in Landfill B-19. The estimated LFG generation curve for the composite of the bioreactor and control units is shown in Figure 7. The modeling used as the basis for Figure 7 was performed utilizing EMCON/OWT Inc. proprietary LFG Model (Version 6.1), which includes the USEPA Clean Air Act Model to estimate the LFG generation rate from the major landfill areas over time. The LFG model has been used for several years and is considered a standard tool for the estimation of LFG generation potential. The memorandum in Part 1 of Attachment 3 to Appendix C summarizes the model assumptions and results. The gas generation for the bioreactor unit is based on calibration of the EMCON/OWT model, using laboratory testing by CWMI of the Biochemical Methane Potential (BMP) of samples taken from existing waste in Landfill B-19. The model inputs are shown on summary sheets at the beginning of each of the model calculation sheets for the bioreactor and control units. The upper limit of the LFG generation curve for the composite of the bioreactor and control units yielded a peak generation of 2,225 scfm. Baseline conditions, modeled assuming current tonnage limits and dry cell conditions, provided a predicted upper limit of 162 scfm of LFG generation.

A LFG production estimate for the proposed bioreactor is also contained in the Design Plan by GC Environmental, Inc. prepared in November 2005, contained in Part 2 of Attachment 3 to

[15] The EMCON/OWT modeling was performed in February 2004 as a preliminary tool for estimating LFG generation on a conceptual level. Waste acceptance rates assumed at that time were higher than actual tonnage for years 2004 to the present, and the results should therefore be considered somewhat conservative in estimating peak generation.

Appendix C. The design plan, which includes a preliminary design of the LFG system, is based on design criteria to accommodate 2,500 scfm of LFG[16].

16 Page 8 of GC Environmental, Inc., Design Plan report, November 2005.

6.0 Disposal Site Improvements

6.1 Existing Ancillary Facilities

Existing facilities, such as administrative offices and equipment maintenance buildings that are currently used to support waste processing and disposal operations at the KHF are used to support the proposed Class II/III disposal operations and beneficial use of liquids and high liquid content waste additions to Landfill B-19. These structures are shown on Drawing 2. A facility identification sign is located adjacent to the KHF access road near the entrance gate. The sign indicates the name of the facility operator. The guardhouse is located within the site boundary approximately one mile northwest of State Route 41.

The ancillary facilities at the CWMI facility include:

- Guard House
- Administration Buildings
- Receiving/Laboratory and Scales – for the processing of incoming loads
- Employee Lunchroom/Locker Room/Showers
- Maintenance Shop– for the repair and maintenance of site equipment
- Equipment Shop – for the repair and maintenance of site vehicles

6.2 LFG Flare

An enclosed LFG flare station and related gas control equipment was constructed near Landfill B-19, and became operational on May 22, 2007 as required to meet the NSPS requirements as detailed in section 8.2.1 of this JTD. Additionally, the GCCS was operational prior to implementation of bioreactor operations in Landfill B-19.

The gas flare is located within a fenced area near Landfill B-19, as shown on Drawing C-3 (end of Part 2 of Attachment 3 to Appendix C). The flare was selected to accommodate a peak of 2,500 scfm of LFG removed from the collection system. The layout of the LFG control system is shown on Drawing C-3. The flare consists of a gas burner within a steel shroud, which fully contains the gas flame when/if the flare is operated to design capacity. Two condensate storage tanks are located near the flare station, one each for B19 and B17. Condensate can be accumulated from the main header during collection of LFG and can be stored in these tanks. Collected condensate will be recirculated within its respective active landfill area or disposed of in an approved alternative manner.

7.0 Operations

7.1 Hours of Operation

Landfill B-19 is scheduled to operate to accept waste from 8:00 a.m. to 6:00 p.m. Monday through Saturday with the exception of the following holidays:

- New Year's Day
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving Day
- Christmas Day

Site operations, excluding the acceptance of waste material (e.g., stockpiling of daily cover, preparation of tipping area, grading of service roads, placement of daily cover) at Landfill B-19 may occur before 8:00 a.m. and after 6:00 p.m. Nighttime site operations will be conducted with permanent and/or portable lighting.

7.2 Personnel

7.2.1 Typical Numbers and Qualifications

Current operations at the entire KHF are supported by a work force ranging from approximately 25 to 50 people. This supports all WMU operations and administration, which includes the operation of Landfill B-19. In the past Landfill B-19 accepted liquid waste for bioreactor operations. Under this scenario the bioreactor only required one bioreactor operator. Table 7-1 lists the approximate number of qualified personnel, listed by position and duties, assigned to operate and maintain the Landfill B-19 in compliance with state minimum standards. It should be noted that these numbers are typical operating staff for Landfill B-19, and operators are rotated between Landfill B-19 and other WMUs. Staff from other units is available to augment the typical number of staff to operate Landfill B-19, as needed for specific tasks.

TABLE 7-1
OPERATING PERSONNEL FOR LANDFILL B-19

Number	Position	Duties
1	District Manager	Monitors and directs daily work activities. Carries out and enforces safety policies. Supervises the working face, develops operational plans including employee work schedules.
1	Lead Operator	Operates equipment, carries out safety policies as they pertain to the working area. Investigates and reports all accidents, incidents or injuries within the

Number	Position	Duties
		area of supervision as directed. Assists the District Manager, as needed.
3 to 6	Operators	Operate equipment in the disposal area. This involves operation of one or two dozers, one or two compactors, one water truck, and one or two quarry-dumps (with one excavator).
1 to 4	Laborer(s)/Spotter(s)	Performs litter control and other site maintenance, direct traffic in the working area (depends on wind conditions).
1	Scale Operator	Operates scales and provides administrative assistance (one scale used for Landfill B-19, and typically two operators for scale house for hazardous waste units).
1	Mechanic Foreman	Oversees/performs routine maintenance and repairs on-site equipment (One person shared for entire KHF, services Landfill B-19 needs).
1	LFG Technician	To perform monitoring and maintenance of environmental control systems, including: LFG control system.
1	EMD Lead	To perform monitoring/inspections of environmental control systems, including: LCRS, flare, condensate and leachate injection systems.

7.2.2 Training

CWMI maintains a formal training plan in compliance with hazardous waste regulatory requirements in CCR Title 22. This training plan also provides that personnel are trained in compliance with Section 20610 in CCR Title 27. Records of training will be maintained as part of the site's operating record.

General CWMI policy requires that qualified persons with proven experience train landfill personnel. Personnel training and orientation are accomplished during the day-to-day work regimen, with a new employee being supervised by one who is skilled in the tasks of the particular position. Safety procedures and potential hazards are stressed in an initial training session using a variety of training tools, e.g., environmental, health, and safety training videos, slideshows, and discussion, as well as issuance of appropriate personal protection equipment (PPE) for new employees. As a further safeguard, new employees are prohibited from operating potentially dangerous equipment until the appropriate training has been completed.

Adequate operations personnel will be cross-trained to provide back-up resources for landfill operations.

Annual training for KHF employees typically includes emergency response, hazard communication, injury prevention and various health and safety training topics (including back safety, hearing conservation, heat stress, lockout/tag out awareness, and site safety policies). First Aid/ CPR training is provided for designated KHF staff as required. In addition, operations employees at the KHF are trained in special/hazardous waste identification and heavy equipment operation.

As required by the particular job function and/or location, employees are trained to wear high visibility outerwear, hard hats, hearing protection, safety glasses, dust masks and respirators for personal safety. Personnel are also required to wear safety shoes and gloves, as applicable.

7.2.3 Supervision

Site supervision is conducted by qualified personnel to ensure the safe and efficient management of site operations, as well as compliance with applicable regulatory requirements and permit conditions. At a minimum, one lead person will be on-site, or available, during operations.

The lead will report directly to the District Manager as illustrated in Figure 8. Figure 8 gives the organizational structure for the overall management of the site.

7.2.4 Emergency Contact List

CWMI maintains a Contingency Plan in compliance with hazardous waste regulatory requirements in CCR Title 22. The latest revision of this plan will define the requirements for response to emergencies on-site. An Emergency Contact list with current telephone numbers is included in this plan.

The initial emergency contact for the KHF is the guardhouse, phone number (559) 386-6125. The KHF guardhouse staff is on duty 24 hours per day, seven days per week, 365 days per year. The guardhouse staff has immediate access to emergency contacts and phone numbers for the following:

- Emergency Coordinator, District Manager, and other KHF staff.
- Kings County Department of Public Health, Division of Environmental Health Services.

In accordance with 27 CCR Section 20615, current telephone numbers of the KHF staff are maintained in the administration office at the KHF, and/or by an answering service. Updates of this emergency contact list will be made as required.

7.3 Equipment

7.3.1 Typical Equipment Requirements

Based on Landfill B-19 operations, the typical equipment required for construction and site maintenance are as follows:

- One Dozer: For pushing, compacting, grading and covering refuse, for walking-in slopes, and general earthwork. (Note: an additional dozer may be used, as needed).
- One Compactor: For compacting and covering waste. (Note: an additional compactor may be used, as needed).
- One Quarry-dump: For hauling soils, and cover operations. (Note: KHF uses two quarry-dumps and one excavator for all WMU operations, which include service to Landfill B-19).
- One Water Truck: For dust control, moisture conditioning and application to the bioreactor unit, and fire suppression. (*Note*: KHF may use two water trucks and one water wagon in combination for all WMUs, including Landfill B-19).

As the waste stream fluctuates, more or less equipment may be required to continue site operations in compliance with applicable regulations. The equipment may also be used to assist in operations of the Class I facility.

7.3.2 Standby Equipment

The equipment described in Section 7.2.1 is adequate to provide that current operations will not be hampered during routine equipment maintenance or major repairs. However, in the event that additional equipment is needed, CWMI has compiled a list of local operators and contractors who can provide additional assistance. Rental equipment is available from Quinn Caterpillar Rentals, with facilities in Corcoran, Fresno, and Bakersfield, and the site has a reciprocal agreement with other Waste Management facilities for standby equipment. The telephone numbers for Quinn Caterpillar rental yards and or/equivalent suppliers are maintained by operations personnel. Equipment can usually be obtained from these sources within 24 hours for emergencies or unplanned occurrences.

7.3.3 Equipment Preventive Maintenance

All operating equipment is maintained in general accordance with the manufacturer’s recommendations, and with CWMI’s preventative maintenance program. Minor repair and routine maintenance is generally performed at the KHF by site personnel to assure proper equipment operation. In addition, all testing, monitoring and stationary equipment are maintained and inspected regularly to ensure availability. Major repair work may be performed off-site by a contractor. Emergency field repairs are performed within the site boundary as necessary. Used lubricants and coolants are stored on-site for pick-up by licensed recyclers. Spent filters may be drained and recycled, or drained, crushed and disposed in the active Class I disposal area. CWMI will maintain equipment maintenance records on-site.

7.4 Waste and Cover Materials Placement

Approximately 213,000 cy of soil is required to provide daily cover operations and provide final cover, as of April 23, 2013. This figure is based on an estimate of required daily, intermediate, and final cover quantities for the Class II/III fill area. Sufficient quantities of daily, intermediate and final cover materials are available at permitted borrow sites at the KHF and with ADC as appropriate. The cover soils will satisfy the cover requirements of 14 CCR 17216 and 27 CCR Sections 20680, 20164, and 20700 for controlling vectors, fire, water infiltration, erosion and preventing unsightliness. This soil is planned to be obtained from permitted borrow sites at the KHF.

7.4.1 Unloading

Each waste-transporting vehicle entering the KHF is required to provide the facility with the appropriate paperwork (e.g., trip ticket, bill of lading, non-hazardous waste manifest). KHF reviews the provided paperwork to verify the waste hauler (i.e., waste hauler matches the transporter listed on the paperwork, the type of vehicle is consistent with the type of waste being hauled), and to identify the source, or origin of the waste being hauled. The source, or origin, of the waste may be identified by a profile number or by the actual generating location listed on the paperwork. Personnel at the entrance complex utilize this information to verify whether the waste has been approved for acceptance at the KHF. Additionally, KHF personnel verify the waste type and the approved management method, and then direct the vehicle to the appropriate Class II designated waste or Class III MSW unloading area at Landfill B-19.

All trucks hauling Class II designated waste, or Class III MSW are normally weighed at the entrance complex at the time of arrival. Upon departing, each truck is either weighed to obtain a tare weight, or has an established Predetermined Tare Weight as per 4 CCR Section 4420, et seq.

Traffic is confined to designated unloading area(s). The majority of the vehicles from the MRF/TS are familiar with landfill operations. Traffic cones, or other appropriate demarcations, are used to designate primary routes to the working face or other unloading areas.

7.4.2 Spreading and Compacting

Compactors and dozers push and spread the refuse in layers approximately two (2) feet thick, compacting the waste with an adequate number of passes (i.e., normally a minimum of three passes), and providing an even slope from which to operate. The refuse fill is placed in lifts approximately 12 to 20 feet thick with typical interior slopes of approximately three to four horizontal to one vertical (3:1 to 4:1). The exterior final grade side-slopes are placed at a 3:1 slope. The typical active working face for each day is comprised of one lift, approximately 200 feet wide, however multiple working disposal faces will be utilized if incoming tonnages or other operational constraints require.

7.4.3 Wastes Requiring Special Handling Procedures

Wastes received by the KHF, which require special handling, are listed below along with a description of handling procedures.

7.4.3.1 Class II Wastes

Class II waste streams will be subject to the following evaluation steps:

- Obtaining data from the generator on the waste stream characteristics, physical properties and constituent concentrations prior to acceptance on-site,
- Issuing a unique identifying profile for the waste stream which will be used to identify it on-site and reference it to the information provided by the generator,
- Providing the transporter direction on where to proceed on-site and how to coordinate unloading of waste.

7.4.3.2 Biosolid Wastes

Biosolid waste streams can be landfilled or utilized as an ADC. Management of biosolid wastes are conducted to avoid nuisance odor complaints and, during wet weather conditions, to avoid contaminated run-off.

7.4.3.3 Treated Wood Waste

Treated wood waste streams are reviewed and approved similar to Class II procedures, noted above. Information on the size, volume and packaging of the treated wood waste are obtained to assure unloading and disposal can be conducted safely on-site with available protective equipment and material handling equipment.

7.4.3.4 Dead Animals

Dead animals received incidental to the solid waste stream are managed with the solid waste per the requirements for the solid waste. Dead animals received separate from the solid waste stream require advance notification in order to: 1) notify the LEA, and 2) prepare a disposal location. Dead animals received separate from the solid waste stream will be covered within the time limit specified by the LEA and have a minimum of one foot of compacted soil cover.

7.4.3.5 Class II and III Wastes to be Used as Cover or ADC

Class II wastes to be used as cover or ADC are subject to the same evaluation process given under Section 7.4.3.1. These materials are stockpiled separately, if necessary, and managed to avoid contaminated run-off during wet weather. In addition, the following special handling will be used:

Treated Auto Shredder Waste

> When treated auto shredder waste is utilized as an ADC, it is placed close to the active face to facilitate application that day, or stockpiled. The treated auto shredder waste stockpile area is posted with sign(s) to designate the correct unloading location. When utilized as an ADC, the treated auto shredder waste typically is spread over the active face with a dozer and track-walked into place.

Biosolid Wastes

> When biosolid waste is utilized as an ADC, it is placed close to the active face to facilitate application that day, or stockpiled. The biosolid waste stockpile area is posted with sign(s) to designate the correct unloading location. When utilized as an ADC, the biosolid waste typically is spread over the active face with a dozer and track-walked into place.

7.4.3.6 Liquids and High Liquid Content Waste for the Discontinued Bioreactor Unit

Liquid and high liquid content waste were either stored in tanks temporarily or added directly to the bioreactor portion of the landfill. A detailed description of the liquid control and management system is described in Section 8.1, *Leachate and Liquid Control Systems* and Section 9.5, *Bioreactor and Leachate Monitoring*.

7.4.3.7 Dust Generating Wastes

Waste that could produce significant levels of dust (e.g., ash) are managed to minimize dust generation. Methods used to prevent dust generation include wetting of materials and scheduling unloading to avoid high wind conditions.

7.4.4 Daily Cover

The advancing refuse face is covered daily with a minimum 6-inch thickness of compacted earthen material to control vectors, fires, odors, blowing litter, and scavenging. Cover material is available from on-site borrow areas or designated stockpile areas. During each operating day, sufficient material to cover the exposed working face is transported by landfill equipment to the working face.

Pursuant to 27 CCR 20690(b), ADC may be used instead of soil cover, including geosynthetic fabric, foam products, processed green material, and other materials allowed by 27 CCR without a demonstration project. In addition, Class II designated soils suitable for disposal in Landfill B-

19 are also used as a source of daily cover material. The Class II designated soils are stockpiled as cover material near the working face at Landfill B-19.

7.4.5 Intermediate Cover

If no additional waste materials are to be placed over the surface of the advancing lift within 180 days, the top and side slopes of the lift are covered with additional soil to create a 12-inch compacted thickness of intermediate soil cover. If the previous daily cover application was at least 12 inches thick, then additional cover is not applied. As discussed in the previous section, intermediate cover soil will be obtained from on-site borrow areas.

7.4.6 Final Cover

An evapotranspirative (ET) final cover system is approved for the entire landfill area that has received Class II/III waste. A description of the ET final cover system is contained in Section 11.4, Preliminary Closure and Post-closure Maintenance Plan, *Final Cover, Grading and Drainage*.

7.5 Salvaging and Volume Reduction

No salvaging at the working face is permitted.

7.6 Hazardous Waste Screening Program

The KHF implements a Hazardous Waste Screening Program to prevent disposal of prohibited RCRA-regulated hazardous wastes and TSCA-regulated PCB wastes in Landfill B-19. The Hazardous Waste Screening program, in accordance with 40 CFR Part 258, Subpart C, and 27 CCR Section 20870, includes at a minimum:

- Measures to notify Class II and Class III landfill customers of acceptable and unacceptable wastes.
- Random visual inspections of incoming loads that have not been pre-screened or approved through the Special Waste Program.
- A designated staging area for temporary storage of unacceptable materials discovered in incoming loads. This staging area is located within the landfill footprint and moved depending upon the location of the active face. The following criteria is used to locate/manage this staging area:
    - ➢ It is temporarily located in a well-marked area away from inbound/outbound traffic.

- Materials are identified, labeled, repackaged, and properly stored on-site pending disposal or off-site transfer on a frequency meeting all regulatory requirements.

- Maintenance of any inspection records.

- Training of KHF personnel to recognize prohibited hazardous wastes and PCB wastes.

- Notification to the Director of DTSC or its delegated agent, the LEA, and the RWQCB of prohibited hazardous waste or PCB waste discovered at the Class II/III landfill.

The steps described in the Special Waste Program, in the following section, ensure that incoming loads do not contain RCRA-regulated hazardous waste, or TSCA-regulated PCB wastes; therefore, random inspections of incoming loads, that have not been pre-screened or approved through the Special Waste Program, as identified in 27 CCR Section 20870(1), are not necessary.

7.7 Special Waste Program

The Special Waste Program used at the KHF incorporates federal, state, local and Waste Management, Inc. requirements, as well as KHF's site-specific permit requirements. The Special Waste Program requires tracking of all special waste materials through the special waste profile process, and an employee-training program for the identification of special wastes. The profile process for special wastes acts as a pre-screening process, which prevents unacceptable wastes from being disposed of in Landfill B-19. During the waste profile approval process, the customer is notified of acceptable and unacceptable wastes.

7.8 Health and Safety

7.8.1 Safety Equipment

First aid supplies are maintained on-site. Hard hats, eye protection, coveralls, gloves, high visibility outerwear, ear protection, and safety shoes are required and provided to site personnel as appropriate. Fire extinguishers are available on-site. Ongoing practices at the site, including training site personnel in safe operating procedures and compliance with operating provisions, ensure that proper safety procedures and equipment are utilized.

7.8.2 Sanitary Facilities

The site has adequate sanitary facilities for employees and visitors. Permanent facilities are located at the administrative office, operations and maintenance buildings, employee locker rooms, and other locations. Portable toilets may be located throughout the facility, and will be serviced weekly.

7.8.3 Potable Water Supply

Potable water is supplied to the KHF via pipelines from the City of Avenal and a private well located near Kettleman City. Water can also be obtained by truck from both the City of Avenal and the Kettleman City Community Services District. Bottled water is also used for drinking water on-site.

Domestic water usage at the KHF is approximately 5,000 gallons per day (gpd) for the current workforce. Total water usage projected for construction, operations and domestic uses is estimated at 100,000 to 500,000 gpd[17] which is similar to volumes used at the KHF for existing on-site operations, including periodic construction activities.

7.8.4 Communications

Telephones are available on-site at the administrative offices, maintenance facility, and the scale house. On-site personnel communication is accomplished with cell phones and mobile radios.

7.8.5 Lighting

As previously discussed in Section 7.1, night operations are illuminated with existing permanent pole-mounted lighting located along the Landfill B-19 perimeter or portable lighting.

7.9 Security

The KHF has in-place security provisions that are intended to prevent unknowing entry, and minimize the possibility of unauthorized entry, of persons or livestock into active waste management areas. The KHF is not open to the general public, and entry is limited to authorized personnel and waste haulers. Additionally, the remote location and isolation of the KHF further minimize the potential for public encroachment.

7.9.1 Access Control

Security is provided at the KHF twenty-four hours (24) per day, seven (7) days per week, through the combined use of CWMI personnel and a contracted security service. The main gate at the entrance complex is the only public access point into the active facility. A security guard stationed at the main gate limits site entry to approved trucks, facility personnel, and authorized

[17] Draft Subsequent Environmental Impact Report, B-19 Landfill Bioreactor Project, Kettleman Hills Facility, Chemical Waste Management, Inc., November 2004.

visitors. During the hours the KHF is closed, a security guard is maintained at the facility. For additional site access control measures, see the “Barriers” section below.

7.9.2 Barriers

The active waste management area (555 acres) is surrounded by a six- (6-) foot high chain link fence. A second fence, comprised of three strands of barbed wire on steel posts, surrounds the perimeter of CWMI’s property (approximately 1,600 acres). Additionally, fencing extends along both sides of CWMI’s right-of-way to the gate at State Route 41. The gates that access the active waste management areas are locked when not in use. Gate keys are available to facility managers and supervisors.

7.10 Financial Assurances Operating Liability

Chapter 6, Division 2, Article 3 of Title 27, CCR requires operators of disposal facilities to demonstrate adequate financial ability to compensate third parties for bodily injury and property damage caused by facility operation prior to closure. An operator of one or more disposal facilities must demonstrate financial responsibility for compensating third parties for bodily injury and property damage caused by any accidental occurrences, including exposures to pollution.

CWMI maintains a financial mechanism for operating liability to satisfy this requirement. Proof of this financial assurance is submitted annually to the LEA.

8.0 Disposal Site Controls

8.1 Leachate and Liquid Control Systems

Prior to September 2014 Landfill B-19 operated with a bioreactor and control unit. Liquids and high moisture content waste were added to the bioreactor portion while the control unit operated in the traditional "dry-tomb" method.

Leachate is formed by the drainage of liquids through or from waste. Leachate generation in the control unit emanates from the moisture content of the incoming waste, from natural biodegradation of the waste, and from rainfall that infiltrates into the waste either at the time of disposal or through the daily or intermediate covers. The amount of leachate generated in the control unit is primarily related to the following factors:

- The KHF is located in a semi-arid climate, limiting the amount of rainfall that can percolate into the waste prism.
- Daily cover and intermediate cover will reduce the amount of rainfall that can percolate into the waste prism.
- Class II designated waste and Class III MSW disposed of at the site is relatively dry (i.e., estimated moisture content of 8 to 20 percent).

The Class II/III portion of landfill B-19 contains one leachate collection sump located beneath the area of the landfill to be operated as a bioreactor. Leachate within the control unit will flow to the sump and commingle with leachate from within the bioreactor unit.

When the bioreactor was in operation the amount of leachate generated in the bioreactor unit was greater than the amount generated in the control unit because of the liquid and high liquid content wastes added to the bioreactor unit. These liquids were added to promote anaerobic bioreactor conditions.

The existing LCRS system, described in Section 5.1.5, was installed during the initial construction of Landfill B-19. Although recirculation of leachate is allowed under regulations, previous to bioreactor operations CMWI disposed of leachate in on-site surface impoundments. However, in order to provide an additional source of liquids to the bioreactor unit, leachate collected in the Class II/III LCRS was recirculated to the bioreactor unit. The control systems for leachate and liquids management are therefore discussed jointly, below.

Figure 9 is a schematic that shows the liquid and leachate management system for Landfill B-19 in conjunction with the now discontinued bioreactor unit. The liquid injection system conceptual plan is also shown on Drawing B1. Following is a discussion of the elements shown on Figure 9:

1. LCRS Drainage Layer - This existing drainage layer is comprised of 12 inches of gravel. Flow rates for this element are discussed above. The maximum expected flow from the LCRS drainage layer is approximately 10,000 gpad based on LCRS HELP Model calculations in Appendix C, Attachment 6. This unit flow rate would result in a maximum of approximately 182,300 gpd from the LCRS, assuming this maximum generation rate is from the entire 18 acres of the bioreactor footprint.

2. LCRS Pipe Flows - The constraining capacity of the LCRS collection pipe system is the flow through the sump gravel. This capacity is estimated at approximately 220,000 gpd[18], which is well above the maximum anticipated system flow requirement.

3. LCRS Sump – The system currently has a 50-gallon-per-minute (gpm) sump pump that is required intermittently to pump leachate that accumulates in the primary LCRS sump. The bioreactor is expected to gradually increase the amount leachate generated and collected in the sump. An automated pumping system with float activation of the LCRS sump pump is installed. This system is set to provide automatic activation of the sump pump to maintain the hydraulic head on the liner system at less than 12 inches. The system also has a remote alarm to indicate if the system is not functioning adequately to maintain the hydraulic head. The expected maximum daily flow of 182,300-gpd into the sump equates to approximately 130 gpm. The pump will be sized to maintain a head less than 12 inches above the liner system. The sump pump must be capable of pumping leachate from the bottom of the sump (approx. elevation 730 to the elevation of the leachate collection tank located at the top of the LCRS riser[19] (approx. elevation 835).

4. LCRS Riser – The existing LCRS riser is a 24-inch diameter HDPE pipe. This has adequate capacity to accommodate pumps on the order of 500 gpm, if required.

5. Leachate Collection Tank – The existing tank is a 5,000-gallon polyethylene storage tank with secondary containment. Prior to implementing bioreactor operations, this tank is equipped with a float system to trigger pumping of liquids to the liquid storage tank on the top deck of the landfill. This pumping system is equipped with an alarm to warn if the pumping system is not functioning adequately to maintain the head in the tanks at an adequate limit. As a contingency measure, a backup pump is available. In addition, if the leachate tank is full and leachate must be pumped from the LCRS sump at a rate in excess of the pumping rate to the liquid storage tanks (#8, below), as a contingency, the excess leachate

[18] See calculations in Appendix C, Attachment 6, Attachment B; 222,648 gallons per day.

[19] The existing 5,000-gallon leachate collection tank is currently at approximately elev. 795. It will be relocated to the final grades shown on Drawing 4.

can be pumped to tanker trucks and disposed of in on-site evaporation ponds. The on-site evaporation ponds are adequately designed to accept Class II/III leachate, as they are used to evaporate leachate from the Class, I landfill units on-site.

6. Pump - The pump installed from the leachate collection tank to the leachate storage tanks at the top of the landfill is sized with a functional flow rate greater than the functional flow rate of the LCRS sump pump. The pump from the leachate collection tank is sized to operate at a head of at least 150 feet (current tank elevation of 795 and maximum landfill grade of 945).

7. Pipe from Leachate Collection Tank to Leachate Storage Tanks – This pipe is designed to accommodate the flow rates and pressures of the pumping system.

8. Liquid Storage Tanks – The liquid storage tanks are placed on the top deck of the landfill to accommodate temporary storage of liquids and high moisture content waste delivered by trucks [9d], if required. The deliveries from trucks are limited to 170,000 gallons based on a 34-truck limit with 5,000-gallon payloads. The liquid storage tanks are portable and placed at strategic locations to support filling by delivery trucks and recirculated leachate/condensate and outflow to injection trenches, galleries and vertical wells. The tanks are designed with valved and/or pump connections to provide out-flow pumping of liquids to the working face, gravity[20] out-flow of liquids to the liquid injection galleries [9c], and to pump out to injection trenches [9b] and vertical leachate injection wells [9e]. Condensate from the LFG control system is also pumped to the liquid storage tanks.

9. Liquid Injections - These include flows from direct discharge of liquids and high liquid content waste directly from trucks to the working face and infiltration galleries [9a]. Injection from the liquids storage tanks is primarily to the vertical and horizontal injection wells [9e], but may also be made to the working face [9b] and the injection galleries [9c]. Injection of liquids to the galleries and injection wells may be facilitated by installation of pipe headers from the liquid storage tanks. The headers are balanced by valves at each well or injection gallery.

10. Flux Of Liquids Into The Waste And Out To The LCRS Drainage Layer – As the waste is brought to field capacity, leachate is formed as it migrates through the waste to the LCRS. The daily maximum liquid delivery rate of 170,000 gallons per day is roughly the amount estimated to bring 2,000 TPD from an assumed initial moisture content of 20% up to field capacity. The flow of leachate in the waste and LCRS is discussed in more detail in the LCRS calculations in Appendix C, Attachment 6.

[20] It was correctly anticipated that the gravity head from the leachate storage tanks is adequate to provide flows to the horizontal leachate pipes in the injection galleries. The pressure is controlled with a regulator so that flows at the injection pipes are adequate but do not over pressurize the system as to cause leachate seeps. In addition, the leachate injection pipes are supplied with valves and pressure regulators. A pump will be added to the supply line only if required to maintain adequate balanced pressure over the injection well system.

8.2 LFG Control

The decomposition of organic waste deposited in a landfill generates LFG, which consists primarily of methane and carbon dioxide, with traces of various other compounds. In concentrations between five (5) and fifteen (15) percent by volume in air, methane is flammable at ambient pressure and temperature. The five (5) percent methane level is referred to as the lower explosive limit (LEL). If methane concentrations exceed five (5) percent in air and a suitable ignition source is present, a fire or explosion may result. LFG seeks the path of least resistance to vent to the atmosphere. It will readily move through cracks, permeable backfill material, open pipes or conduits, and permeable soils above, adjacent to, or beneath decaying waste. It can migrate to, and accumulate in, unventilated structures and can displace air and pose a threat of asphyxiation. Public health and safety may be endangered if LFG migrates into buildings and structures, and accumulates to combustible or health-risk levels.

LFG emissions will be minimized by the composite liner, and by placing daily, intermediate, and final cover on the refuse fill areas. Consistent with the County's conditions of approval for the site and the NSPS and SJVUAPCD requirements, a LFG control system was installed at Landfill B-19. Specific elements of the conceptual design for a proposed LFG control system are described below. The design plans are presented in Section 5.1.11.

8.2.1 Regulatory Requirements

Federal and state regulations (27 CCR Section 20919) have established monitoring and control standards for LFG, requiring that methane concentrations must remain below 25 percent by volume of the LEL (1.25 percent by volume or 12,500 parts per million by volume [ppmv] for methane) in structures and below the LEL (5 percent by volume or 50,000 ppmv) in the soil at the facility property boundary.

The NSPS (40 CFR Subpart 60 WWW) of the Federal Clean Air Act (CAA) requires control of LFG at sites that are designed to contain 2.76 million tons or more with estimated emissions of non-methane organic compounds (NMOC) greater than 55 tons per year. The design for Landfill B-19 contained in the 2001 RDSI was expected to contain 3.5 million tons of refuse. Based on the assumption that Class II wastes will not contribute to LFG production, approximately 2.8 (80 percent) million tons of decomposable waste was expected to be composed of in Landfill B-19, making Landfill B-19 subject to the NSPS. As required, KHF submitted annual NMOC Emission Rate Reports from 1999 through 2006, which included NSPS Tier 2 testing and report, submitted in May 2003. The LFG collection and control system design plan was submitted in November 2005, and the installation of a gas collection and control system was completed and the flare was ignited on May 22, 2007.

8.2.2 Gas Collection System

LFG is drawn from the landfill through gas collectors and conveyed via pipelines and centrifugal blowers or fan to a flare, where gas combustion occurs. The design of the LFG control system was described in Section 5.1.11. A summary of the LFG production and collection estimate is in Section 5.2.8. The LFG collection system includes LFG blowers or fan, an enclosed LFG burning flare, piping and control valves, and an electrical control system. It is anticipated that LFG emissions will be minimized by the composite liner, and by the placement of daily, intermediate and final cover on the disposal area. A conceptual layout of a proposed LFG control system is shown on Drawing C-3, at the end of Part 2 of Appendix C, Attachment 3. The LFG collection system controls off-site migration and prevents excessive air intrusion. This preliminary layout was refined in final design documents, for approval by regulatory agencies to obtain the Authority to Construct from the SJVUAPCD, prior to installation of the system.

8.3 Nuisance Control

8.3.1 Fire Control

Fire protection of landfill equipment and vehicles is provided by portable fire extinguishers. Additional fire protection measures for vehicles and equipment include frequent removal of debris and dust from undercarriages and engine compartments, and inspecting for and repairing any oil or fuel leaks. Smoking is prohibited near the landfill working face and fuel storage areas. Charged fire extinguishers are kept at the maintenance area, scale house, site vehicles, and other administrative buildings to extinguish any minor fire and to maintain personnel safety.

The KHF Contingency Plan is maintained as necessary in conjunction with the Kings County Fire Department and the LEA to address Class II and Class III waste disposal activities. This plan defines duties and responsibilities of the parties, as well as appropriate telephone numbers. All materials and supplies stored on-site are identified as to their risk of fire. Firebreaks are maintained on-site, and all access roads and construction areas are kept free of dry brush and vegetation. In the event of a wild fire near the site, landfill operations will be stopped if necessary.

Proper compaction and placement of cover soil and/or alternative daily cover minimize the exposure of waste to ignition sources. Other fire suppression measures include:

- Soil for use in smothering fires is maintained where it can be readily transported to the working face with on-site heavy equipment.
- Fire protection systems are maintained on-site. These include a 250,000-gallon water storage tank, a fire engine, water trucks, heavy equipment and fire extinguishers. The

water supplying the storage tank is supplied to the KHF via pipelines from the City of Avenal and a private well located near Kettleman City. Water can also be obtained by truck from both the City of Avenal and the Kettleman City Community Services District.

- The water trucks, which are used for controlling dust and other landfill operations, are equipped with hoses that can be used to extinguish fires. There is also a water wagon equipped with a nozzle.
- Emergency procedures, which include instructions for handling fires, are maintained on-site as part of the KHF Contingency Plan, and training is provided to appropriate employees.

In the unlikely event of a subsurface fire, daily and intermediate cover would prevent spreading within the waste prism. A subsurface fire could not occur without oxygen. If such a fire were to occur, the gas control system would be adjusted to reduce vacuum pressure and, thereby, further reduce the potential for oxygen inflow. Other methods to extinguish landfill fires also are available, such as injection of inert gas (e.g., nitrogen). For these reasons, the impact of a subsurface fire would be less than significant.

8.3.2 Dust and Odor Control

Dust and odor are controlled by:

- Proper maintenance of haul roads (grading and watering).
- Frequent application of fine water spray or dust palliatives in areas where conditions may cause the formation of fugitive dust, such as soil-covered work areas, excavation areas, and soil stockpile areas.
- Timely placement of intermediate and final soil cover over refuse fill areas.
- Applications of water to intermediate soil cover when conditions might cause recurrent problems with fugitive dust.
- Planting and maintenance of vegetative cover on completed fill slopes.
- Installing track-out controls at the transition of paved roads to dirt roads that provide access to Landfill B-19, to reduce dust.
- Daily and intermediate cover applied on the refuse, periodically during the day and at the end of each working day, will keep odors at acceptable levels.
- Operation of the landfill gas control system to reduce odor levels.

8.3.3 Vector and Bird Control

Vectors and birds are controlled at Landfill B-19 by keeping the active face small and compact, and by applying daily cover. This minimizes the potential for birds feeding at the site, the emergence of flies from eggs present in household wastes, and development of rodent habitat. The site is visually inspected on a regular basis to determine if a vector problem exists. If it is determined that a vector problem exists, pest control specialists will be contacted and the vector control program will be modified to ensure that adequate control measures are implemented.

No airports are located within five (5) miles of Landfill B-19; therefore, birds attracted to the landfill are not likely to present an aviation hazard. In the event that birds become a nuisance at the site, appropriate bird control measures will be utilized.

8.3.4 Litter Control

Preventive measures to minimize litter include:

- Properly compacting and covering the refuse daily.
- Routine inspection and, as needed, clean-up of the site and surrounding area to ensure that the ongoing cleanup program is effective in collecting any litter that may have escaped.

In the event of strong winds, the active working face is kept to a minimum and dust control and litter cleanup efforts intensified. Landfill personnel patrol the, the operational area, and the landfill perimeter daily (the time it takes to complete litter cleanup is dependent upon the magnitude of the litter accumulation) to pick up any accumulated litter.

8.3.5 Noise Control

Noise from site equipment is suppressed by maintaining equipment in proper working order, including mufflers. As required, landfill workers wear protective equipment that reduces noise exposure to levels within Cal-OSHA standards. Customers do not remain on-site for long periods of time, and therefore are not adversely impacted by Landfill B-19 noise levels.

8.4 Landfill Drainage and Erosion Control

The surface water drainage plan for Landfill B-19 is shown on Drawing 4 and drainage system details are shown on Drawings 9, 10, and 11. The design of the surface water drainage control system is described in Section 5.1.10.

Erosion control measures incorporated in the site design include the following:

- Collecting and controlling runoff, diverting it away from erosion prone areas.
- Intermediate and final landfill slopes with drainage benches at intervals designed to control slope runoff velocities and volumes.
- Vegetating surfaces that are at final grade, as part of final closure.

8.5 Traffic Control

Traffic is directed from the KHF entrance to the active area of the landfill via site access roads and signs. Internal KHF access roads are constructed to minimize traffic congestion. Roads are capable of withstanding 80,000 pound gross vehicle weights. The minimum road width is 24 feet, with a maximum grade of 12 percent. An access road, negotiable by loaded collection vehicles is provided from the entrance to the active face. The access road was designed, constructed and is maintained to minimize potential erosion, and to allow orderly ingress and egress of vehicular traffic when the facility is in operation, and during inclement weather. Normally, the landfill heavy equipment operator directs traffic on the active face. As necessary, a trained alternate individual is assigned to the landfill to direct vehicles for unloading.

In addition to on-site traffic control measures for operations, the KHF tracks and records the number of waste transport trucks that go to Landfill B-19, based on the origin of waste and the assumed route of truck travel. If the number of waste transport trucks going through Kettleman City approached a maximum allowable limit of 86 round-trips per day, some trucks will be rerouted to maintain the number of trucks below this limit[21]. This information will be maintained in the operating record and be available for review by the LEA.

[21] Transportation and Traffic Mitigation Measure 1, Draft Subsequent Environmental Impact Report, Kings County Planning Agency, November 2004.

9.0 Environmental Monitoring

The following sections contain a description of the various categories of environmental monitoring that are required to be categorically described in JTDs followed by a summary of the integrated approach to monitoring the bioreactor unit operations.

9.1 Ground Water and Vadose Zone Monitoring[22]

The KHF has an extensive network of groundwater monitoring wells in place. The groundwater-monitoring network is depicted on Figure 10. Monitoring devices that serve Landfill B-19 are also shown on Drawing 3.

On November 16, 2006 the California Regional Water Quality Control Board (RWQCB) adopted Waste Discharge Requirements R5-2006-0122 which covers Class II/III Landfill B-19 Bioreactor and Control Unit, and Class II/III Landfill B-17.

9.1.1 Landfill B-19 Detection Monitoring Well Network

The wells associated with the non-hazardous waste phase of Landfill B-19 include K-69 and K-70. The monitoring locations for Landfill B-19 are shown on Drawing 3, and Figure 10.

9.1.1.1 Background Water Quality

An extensive groundwater monitoring system has been used to monitor groundwater at the site for approximately 30 years. The KHF and the RWQCB have worked closely to establish a monitoring program for applicable COCs contained in WDR R5-2006-0122. Background water quality was established for COCs and parameters associated with Class I/II/III waste disposal activities. The KHF submits semiannual groundwater monitoring reports to the RWQCB. Sampling efforts (under 27 CCR Section 20423(b)) beginning in the second quarter of 1997 were performed and completed for groundwater wells associated with Landfill B-19 to obtain background water quality data for the monitoring parameters associated with Class II/Class III solid waste disposal at Landfill B-19. No new groundwater monitoring wells, over those specified in WDR R5-2006-0122, were proposed for Landfill B-19 in connection with the bioreactor operations because the existing footprint and containment system for Landfill B-19 did not change from current conditions. The background water quality program is maintained in compliance with the RWQCB requirements.

[22] First, Quarter 2005 Groundwater and Unsaturated Zone Monitoring Report, Kettleman Hills Facility.

9.1.2 Corrective Action Monitoring Well Network

The facility currently has no areas in corrective action related to disposal of Class II/III wastes in Landfill B-19.

9.1.3 Water Level Monitoring

As of August 2013, the KHF water level monitoring network includes 48 monitoring points. These monitoring points are installed in the eleven (11) WBZs, which are monitored as part of the groundwater monitoring program, plus seven (7) additional water bearing zones that are monitored for water levels only.

There are several monitoring points associated with Landfill B-19 that provide water level data for use in monitoring gradients and flow directions for each WBZ. Information regarding the construction of each monitoring well is maintained at the KHF.

9.1.4 Vadose Zone Monitoring

A composite liner that includes a primary and secondary LCRS, and vadose zone monitoring system underlies landfill B-19. Monitoring of fluids within or beneath the liner system provides for the earliest possible detection of a release. A description of the LCRS and vadose zone monitoring system can be found in Sections 5.1.5 and 5.1.6, respectively.

9.1.5 Corrective Action Financial Assurance

Section 22220, Title 27 CCR requires operators of disposal facilities to demonstrate the availability of financial resources to conduct corrective action activities as required under Article 1, Subchapter 3, Chapter 3 (section 20380, et seq.). The corrective action cost estimate for a reasonably foreseeable release has been updated to 2016 costs (AMEC, 2016) and is included in Appendix H. CWMI has secured the required financial mechanism for corrective action to remediate a potential release from Landfill B-19. Proof of this coverage has been submitted to the RWQCB.

9.2 LFG Monitoring

LFG monitoring probes were installed in accordance with Title 27 Sections 20921 and 20925, which requires LFG monitoring probes to be installed on 1,000-foot centers along the landfill perimeter (at or near the facility property boundary unless alternate spacing is approved by the LEA). The actual location of the probes is shown on Drawing 3.

LFG probes are monitored quarterly by trained landfill personnel using a hand-held gas detection instrument. Five on-site structures, located along strike from potential gas migration pathways, are monitored quarterly. Monitoring results are submitted quarterly to the LEA.

In addition to monitoring of perimeter LFG probes, the LFG control system is monitored in accordance with a program that meets SJVUAPCD and other regulatory requirements. This includes monitoring of performance of the control system, and routine surface sampling to document compliance. The program also includes provisions for corrective action, as needed to maintain compliance with applicable regulations and SJVUAPCD requirements.

9.3 Ambient Air Monitoring

Instantaneous surface monitoring is conducted on Landfill B-19 as required by the SJVUAPCD and NSPS regulations.

9.4 Surface Water Monitoring

No bodies of surface water currently exist near the KHF that will be affected by discharges from Landfill B-19. All storm water run-off is currently diverted away from Landfill B-19 into the East Retention Basin. Stormwater is then evaporated, used for dust control, or disposed of by an alternate approved manner.

KHF maintains a Stormwater Management Plan that describes the stormwater drainage and diversion system with respect to waste units, roads, and support structures. The current plan is consistent with the proposed stormwater management practices for the bioreactor operation in Landfill B-19. The facility also maintains a Storm Water Pollution and Prevention Plan (SWPPP) per the requirements of the General Industrial Storm Water Permit issued by the State Water Resources Control Board. The current SWPPP was revised onMarch, 2016.

9.5 Bioreactor and Leachate Monitoring

9.5.1 Bioreactor Unit Monitoring

Below is a summary of specific items that were or still monitored for the anaerobic bioreactor unit in Landfill B-19. The management of leachate, liquids and high liquid content waste to be recirculated or injected into the bioreactor unit is described in Section 8.1.

> *Incoming Waste to Bioreactor (*decommissioned*)* – The volumes of solid waste disposed of in the bioreactor and control units was tracked, based on scale records. This data is used to determine the in-place waste density in both units, based on comparison to annual aerial topographic mapping of the site. The composition of the waste and liquid waste for bioreactor use was monitored and tracked based on weight

and type (based on source information by truck). The volume of liquids previously directed to the bioreactor unit was determined, as needed, by converting weight (tons) at the gate to volume (gallons) using specific gravity data as provided by the waste generator. If specific gravity is not available, a specific gravity of 1.2 will be used for any required conversions.

Liquid and High Liquid Content Waste Injection System- The volume of liquid and high liquid content waste that were added to the bioreactor was tracked in one of two ways.

1. High liquid content wastes, disposed directly by truck to either the working face or into the injection galleries, is tracked at the landfill entrance by tonnage and the total volume of liquids is calculated by converting from weight to volume using an appropriate specific gravity. As indicated above, in the absence of a generator provided specific gravity, a specific gravity of 1.2 will be used.

2. Liquid wastes (very low solids content) injected into the bioreactor using the tank, piping and injection system is tracked through use of a flow meter(s) at the discharge side of the holding tank(s). Additionally, the volumes added to the injection well headers or vertical injection wells is recorded in terms of injection location, volume, and pressure in the injection well header system (if applicable). Each injection well is numbered and equipped with an inline flow meter, pressure gauge and valve so that flow volumes can be regulated, adjusted, monitored, and recorded during operations. Operations staff also view the injection area for detected seepage and adjust the system or take corrective action, as needed. Impacts from rainy weather is noted.

Leachate Extraction and Recirculation – Leachates arerecirculated to the decommissioned bioreactor as described in Section 8.1. The monitoring of the bioreactor operations will still include the following (also see Section 9.5):

- Depth of Leachate in the LCRS Sump: The depth of leachate in the LCRS is monitored by a continuous electronic digital readout monitoring and recording system. The system is manually checked and recorded daily by operational and/or EMD staff. This system is equipped with a remote automated alarm to indicate if the system is functioning properly and if the depth of leachate approaches a pre-specified level. The monitoring by staff includes a check that the automated alarm system is functioning properly.

- Volume Extracted from the LCRS Sump: Measure by flow meter on both the LCRS sump pump and the pump from the surface leachate collection tank to the liquid storage tank on the landfill face (See elements #3 and #6, Figure 9).

- Composition: This is monitored, based on the WDR. KHF has the option to also monitor the composition of the leachate more frequently for other indicator parameters that are expected to increase with increased recirculation over time, such as nitrogen.

Gas Extraction- The LFG extraction system is another method for monitoring the effectiveness of the increase in the rate of waste degradation as a result of the addition of liquid and high liquid content waste. Individual wells and the LFG system as a whole is monitored for gas flow rate, composition, and temperature.

Settlement – The settlement of Landfill B-19 is monitored using annual aerial topographic mapping prior to closure. In addition to these annual aerial topographic surveys, four settlement plates are installed on the Class II/III portion of the landfill. The settlement plates are equipped with a survey rod or similar vertical pole that can be extended or added to as filling occurs. One was placed on the Control Unit area and three on the Bioreactor Unit area in areas where the optimum settlement would be anticipated (deeper depths of refuse mass). These are surveyed at least annually and the information is correlated with aerial topographic mapping to evaluate the rate of settlement.

The evaluation of the rate of settlement and establishment of final grades will be the primary factors in determining when to commence closure of the landfill. Monitoring of settlement during the post-closure period is described in Section 11.8.5.

Additional information on operation and monitoring of the bioreactor operations is presented in Appendix B.

9.5.2 Leachate Monitoring

The quantity of leachate extracted from the leachate collection sumps and pumping systems for the Class II/III and Class I portions of the landfill is recorded at least weekly to evaluate leachate production and fluctuations. The leachate is sampled and analyzed by a California-certified laboratory at the frequency and for constituents specified by the RWQCB in the WDR. The analytical results are reported as required in the WDR. In addition, KHF biennially (every two years) has the leachate stored in the leachate tank analyzed to determine its characteristics. That information is used to determine whether the leachate may continue to be recirculated in landfill B-19 if non-hazardous, or must be disposed of in another appropriate manner. Similar to leachate extracted from the LCRSs that support the hazardous waste units, if the leachate stored in the leachate tank is deemed hazardous, it will be disposed of in an appropriate manner, which is typically to one of the permitted lined surface impoundments at the KHF.

Specific procedures, in the event of pump failures, are in-place to assure that backup pumps can be installed in the time frame needed to maintain compliance. The operation of the bioreactor unit requires that leachate sump levels are monitored to ensure that the depth of liquid over the base liner system does not exceed 1.0 foot as required by Title 27, CCR and the WDRs. The automated pumping system in the LCRS sump maintains the required level. This system is also monitored periodically by measuring the leachate levels in removal sumps and collection tanks to maintain the required level. Quantities of leachate generated in the Class I portion of the landfill are monitored. An abrupt and prolonged increase in leachate quantity could indicate a breach in the separation liner and infiltration of leachate from the bioreactor. Quantity trends and quality of the leachate can be evaluated to determine the source of the leachate.

9.5.3 Leachate Recirculation and Disposal

Currently, KHF personnel check the LCRS sump for Class II/III wastes in Landfill B-19 daily for the occurrence and level of leachate. When leachate amounts reach action levels, it is automatically pumped to a tank and when the holding tank reaches a predetermined level, the leachate is automatically pumped back into Landfill B-19. If the automatic pumping system is not working properly or is down for service, liquids can be removed by manually by using a vacuum truck or equivalent and taken to Landfill B-19 or to one of the KHF surface impoundments for disposal.

It is expected that leachate collected in the LCRS for the bioreactor unit will occur in greater quantities and more regularly than the current "dry cell" landfill operations. Therefore, KHF automated the leachate removal and recirculation systems for the bioreactor unit, as described in 8.1. This includes addition of the liquids management system and recirculation of leachate to the bioreactor unit. Monitoring of the system includes monitoring of the automated systems to assure that the pumps in both the LCRS sump and leachate collection tank are functioning and maintaining the required levels. The current method of discharging leachate to on-site surface impoundments will be a potential contingency measure should problems arise where the liquids management system for Landfill B-19 cannot maintain the required head in the LCRS sump. Should this condition arise, liquid and high liquid content waste additions will be stopped until the system is stabilized in order to maintain the required conditions.

9.5.4 Documentation

Records of leachate level monitoring, leachate volumes removed from sumps, leachate volumes re-injected to the bioreactor unit, analytical data, and leachate system construction plans are maintained in the KHF operating record.

9.6 Non-Water Corrective Action Plan

CCR 27 Section 22101 requires the preparation of a non-water release corrective action cost estimate. The cost estimate is prepared to provide financial assurance in the event of non-water related damage occurs to the final cover. The non-water corrective actions include costs related to possible six causal events: earthquake, high precipitation, flooding, tsunamis, seiche, and fire. The cost estimate for the non-water release corrective action (Golder Associates, 2016) is provided in Appendix H.

10.0 Disposal Site Records and Reporting Procedures

10.1 Operating Record

In accordance with 27 CCR Section 20510, the landfill owner/operator must establish and maintain required information in an operating record. This information includes: documentation of weights or volumes of materials accepted; excavation that may affect safe operation of the site or cause damage to adjoining properties; a daily log of unusual occurrences; personnel training as required in Section 20610; and written notification to the LEA, local health agency and fire authority of contact information for the operator or responsible party as required in Section 20615. In addition to this information, the operating record contains copies of all records and reports, which are filed by the operator pursuant to the site permits and regulatory requirements.

10.2 Weight/Volume Record

In accordance with 27 CCR Section 20510(a), KHF maintains records of the weights or volumes of refuse accepted for disposal. For incoming transfer trucks which have already been weighed, a copy of the weight ticket is collected from the driver and maintained at the KHF. Other incoming vehicles are weighed and the site maintains daily records, which includes the following information:

- Number and/or type(s) of vehicle(s)
- Time and date at facility
- Load ticket number
- Origin of waste delivery truck (See Section 7.3.1)
- Load weight (accurate to within 10 percent)

Trucks delivering liquids and high liquid content waste to the bioreactor unit for beneficial use are accounted for according to the information above, and also for the approximate gallons of deliveries and methods of deposition.

On an annual basis, weight/volume records are used along with topographic survey data to determine the rate of site filling, and to update the remaining site capacity and site life estimates. These records are maintained at the KHF administrative offices and are available for inspection upon request.

10.3 Subsurface Records

The site operator will maintain subsurface records of the landfill subgrade and other site developments. The following records will be maintained in the site operating record pursuant to 40 CFR 258.29 and 27 CCR Section 20510(b):

- Observation logs from exploratory borings, monitoring wells, test pits, etc., are included in the various site geologic and hydrogeologic study reports.
- Boring logs for wells, piezometers, and probes installed for environmental monitoring.
- Groundwater information such as depth to groundwater, velocity and direction of flow is included in the groundwater monitoring reports.

Excavation activities related to Landfill B-19 are not anticipated to affect the safe and proper operation of the landfill or cause damage to adjoining properties. In the event of any impacts, records will be established and maintained documenting the occurrence.

10.4 Special Occurrences

In accordance with 27 CCR Section 20510(c), the site operator maintains a daily log book or file of special occurrences associated with Class II and Class III waste activities at the facility. Examples of special occurrences include fires, landslides, earthquake damage, unusual and sudden settlement, injury and property damage accidents, explosions, flooding, and other unusual occurrences.

The LEA requires a daily entry for each operating day in this record with the signature or initials of designated site personnel. In the event of a special occurrence, a description of the occurrence is entered into the record along with the signature or initials of site personnel. Site personnel are responsible for filing subsequent reports to the appropriate agencies within designated time limits to meet all other reporting requirements.

In addition, CWMI maintains a Contingency Plan (last revised June 2003) in compliance with hazardous waste regulatory requirements in Title 22, CCR. This plan describes procedures for reporting all emergencies, including special occurrences associated with Class II/Class III solid waste activities defined as emergencies.

10.5 Operator Information Records

The site operator will notify the Enforcement Agency, local health agency (same as the Enforcement Agency for this facility), and fire authority, in writing, of any changes to the names, addresses, and telephone numbers of the operator or responsible party at the site. A copy of the written notification will be placed in the operating record.

10.6 Inspection of Records

Site records are maintained on-site. Records are available for inspection as requested by authorized representatives of the enforcement agency, the local health agency, and the CalRecycle, during normal business hours.

11.0 Preliminary Closure and Post-closure Maintenance Plan

Landfill B-19 is a Class I hazardous waste management unit that has been converted to a Class II/III solid waste landfill. Therefore, closure requirements for both Title 22 and Title 27 of the CCR apply to this landfill. A portion of the Class II/III landfill overlays existing Class I waste. The composite liner that separates the Class I and Class II/III portion of the landfill also serves as the final cover for the Class I waste. The revised footprint required an additional portion of Class I final cover on the south end of the landfill. An evapotranspirative (ET) final cover system is planned for the Class II/III portion of the landfill.

11.1 Location Maps

The KHF is a waste disposal facility with 555 acres permitted to dispose of Class I, II or III wastes in specifically defined WMU areas. The property boundary is about 1,600 acres. Landfill B-19 was an inactive Class I WMU, that was permitted in 1998 to receive only Class II and III waste as described elsewhere in this JTD.

The following figures and drawings show information for Landfill B-19, required to be in Preliminary Closure Plans pursuant to 27 CCR Sections 21790(b) (2) and (b)(4).

- Figure 1, Vicinity and Location Map – Shows the general location of the facility.
- Figure 4, Topographic Map of Surrounding Area – Shows the limits of the permitted Class I unit at the KHF, the property boundary, the entrance road to the KHF, an area corresponding to a 2,000 foot offset from the property boundary, access gates along the perimeter fence for the permitted area, and structures within the area encompassing 2,000 feet from the facility property (No off-site structures are within 1,000 feet of the property boundary).
- Drawing 2, Site Map – Shows the topography of the site as of June 23, 2004; the perimeter fence for the permitted facility area, the ancillary facilities, and the access road for Landfill B-19.
- Drawing 3, Existing Conditions, June 23, 2004 - Shows the existing topographic conditions as of June 23, 2004; the proposed areas for the bioreactor and control units within Landfill B-19, the locations of LFG and groundwater monitoring devices for Landfill B-19, and the location of existing LCRS extraction risers.
- Drawing 4, proposed Revised Final Grading and Drainage Map – Shows the proposed final grading and drainage control features for Landfill B-19, proposed LCRS extraction risers, final access and drainage benches, and drainage and erosion control features.

- Drawing 5, Base Grades Class II/III Refuse Fill– Shows the existing LCRS for the Class II/III waste disposal area and base grades for the existing Class II/III footprint liner system.
- Drawing C-3, LFG System Layout (at the end of Part 2 to Attachment 3 of Appendix C)– Shows the layout of the LFG control systems.

11.2 Post-closure Land Uses

The post-closure land use of the site, which is described in Section 3.9, will be compatible with the surrounding land uses and zoning. The site is currently planned to be maintained as non-irrigated open space. The ET final cover system will provide sufficient soil depth for propagation of locally common grasses.

Security provisions during the active life of the facility are discussed in Section 7.8. Warning signs posted during the active life of the facility will remain in place during the closure and post-closure periods. In addition, the security fence that surrounds the CWMI property and the fence surrounding the active waste management area will remain in place during the closure and post-closure periods. The gates will be locked and site entry will be limited to authorized personnel.

11.3 Maximum Area to Require Closure

Landfill B-19 has a total of approximately 40.4 acres of waste disposal footprint. This includes both Class I and Class II/III disposal areas. The Class II/III bioreactor and control unit footprints are 18.3 acres and 11.0 acres, respectively, for a total footprint of approximately 29 acres of Class II/III disposal area to require closure, pursuant to Title 27, CCR (See Drawing 4). This is the maximum extent of the Class II/III disposal area that will require closure at any given time.

There is approximately 26.7 acres of footprint area in Landfill B-19 that received Class I waste. All 26.7 acres of the Class I area was closed with a final cover and earthfill buttress to complete closure in December 2006. The phasing to complete filling of Landfill B-19 with Class II/III waste prior to closure is discussed in Section 5.1.7.

11.4 Final Cover, Grading, and Drainage

11.4.1 Final Cover of Class II/III Disposal Area

An ET final cover system is proposed for the entire landfill area that will receive Class II/III waste. The ET final cover over the control and bioreactor unit areas is proposed as an engineered alternative to the prescriptive standard defined in Title 27, CCR, which is allowed under 21090 (a), provided that it *"will continue to isolate the waste in the Unit from* *precipitation and irrigation waters at least as well as a final cover built in accordance with prescriptive standards under (a)(1-3).”*

ET soil cover systems are typically used in arid and semi-arid climates, such as the climate at the KHF. The system relies on evapotranspiration of moisture from the final cover. The properties of the soil are designed such that moisture from storm events is stored in the final cover soil, which is subsequently removed by evaporation, as well as via transpiration by the cover vegetation. ET cover systems have several advantages over prescriptive final cover systems (i.e., low-permeability barrier layers) as they are less susceptible to damage from differential settlements, less prone to desiccation cracking, and can be easily maintained by regrading to promote drainage and replacement of soil lost to erosion without concern for more difficult repair of barrier layers. In addition, ET soil cover systems are designed with common vegetation, which is easier to maintain without concern for vegetation damage of prescriptive final cover low-permeability layers.

The report on preliminary design for the ET final cover system is presented in Appendix E. According to the preliminary design, the ET cover will consist of a four-foot thick monolithic final cover layer of suitable soils. The assessment in the preliminary design report of test data on samples from several on-site borrow sources indicates that on-site soils consisting of *fine sand with some clay* (PA-2) and *low plasticity sandy clay* (PA-4) are likely to be suitable for the ET final cover. Because of high plasticity index, on-site soils representative of the other three samples (SFPC-1, PA-1, and PA-3) are not likely to be suitable for ET final cover. Based on this preliminary testing data, it appears that there is more than adequate on-site borrow soil suitable for ET final cover construction. Therefore, CWMI proposes to selectively use on-site soils for the ET final cover. The design for the ET cover will be finalized based on laboratory testing of the actual soil to be used for the ET cover. The ET final cover soil used should meet or exceed the criteria described in the report on preliminary design in Appendix E. The construction quality assurance guidance document that includes earthfill for final cover is presented in Appendix F.

The proposed ET final cover system is expected to provide equivalent or greater slope stability under static conditions and during the design seismic event (the MCE) than a prescriptive final cover system that includes a flexible membrane liner. CWMI will provide a slope stability analysis of the ET final cover system as part of the final closure and plan prior to construction, based on future testing of the soils to be used for construction of the ET final cover.

It is proposed that one foot of on-site soils meeting the final cover criteria will be placed as interim cover on the final lift of Class II/III waste, except for the designated infiltration areas. After significant settlement of the bioreactor has occurred, as agreed by regulatory agencies and discussed in Section 11.6, the ET final cover system will be placed in accordance with an approved construction quality assurance plan. A Final Closure Plan that includes a final design report for the ET cover, and construction documents, specifications, and a construction quality assurance plan will be submitted to the RWQCB for approval prior to construction of the ET final cover. The soil cover will be vegetated with locally common plant species to promote evapotranspiration and inhibit erosion. See Drawing 10 for the final cover cross-section design.

Placement of the remaining three feet of final cover soil over the bottom one foot of interim cover will require approximately 160,000 CY of soil. Processing of on-site soils will be performed, if required. The soil availability and quantities for final cover as well as other cover soil are described in Section 5.1.2.

11.4.2 Final Cover of Class I Disposal Area

There is approximately 26.7 acres of footprint area in Landfill B-19 that received Class I waste. All 26.7 acres of the Class I area was closed with a final cover and earthfill buttress to complete closure in December 2006. The final cover for the Class I area that did not receive additional Class II/III waste overfill (approximately 11-acre footprint) met Class I standards as defined in the WDR. This final cover system is comprised of the following components from the surface down:

- 30- inch vegetated soil layer
- geotextile drainage layer
- 40-mil HDPE textured geomembrane
- 1-foot foundation layer compacted to a hydraulic conductivity of less than 1 x 10^{-5} cm/sec
- 1-foot intermediate cover layer

This final cover system for the Class I area is shown on Drawings 4, 5 and 7.

11.4.3 Final Grading

The final grading and drainage plan is shown on Drawing 4. The plan is described in Section 5.1.8.

11.4.4 Settlement

Settlement calculations were presented in Section 5.2.3. The calculations indicate that adequate slopes will be maintained to provide for drainage of Landfill B-19 during the closure and post-closure period. Should ponding or drainage problems occur, maintenance measures described in 11.8 would be followed to correct deficiencies.

11.4.5 Drainage and Erosion Control

The design plans and calculations for the drainage system for Landfill B-19 are in Sections 5.1.10 and 5.2.6, respectively. Soil loss analysis calculations for the final cover system are in Section 5.2.7.

11.5 LFG Monitoring and Control Systems

The LFG monitoring system and program is described in Section 9.2. The LFG collection and management system design is described in Section 5.1.11. The system design is based on the calculations of the LFG production estimate described in Section 5.2.8. The layout of the LFG collection and perimeter gas migration monitoring systems are depicted on Drawing C-3 (at the end of Part 2 to Attachment 3 of Appendix C).

11.6 Estimated Closure Date and Closure Schedule

Landfill B-19 will be developed and filled in the incremental stages illustrated in the Phasing Plans found on Drawing 6 and discussed in Sections 5.1.7. Landfill operations may occur in both the bioreactor and control units simultaneously.

Closure and placement of final cover for Landfill B-19 involves both the control unit and bioreactor units of the Class II/III waste fill. The proposed ET final cover system will be placed over the control unit within 180 days after that area initially achieves final grades. The area of Class I waste at the south end of the landfill completed final cover in December 2006. This final cover system for this area conformed to Class I landfill standards contained in 22 CCR.

Section 3.8 contains calculations regarding the time period for filling operations to achieve final grades. The estimated date for continuous landfilling operations to initially achieve final grades is approximately September 2021. However, the situation will be more complex. First, filling to final grades does not provide an adequate area for the injection system and infiltration galleries, or the maneuvering of trucks and equipment. Second, settlement from waste decomposition requires the periodic addition of waste lifts. For the Landfill B-19 bioreactor, KHF anticipates diversion of the MSW waste stream to a new landfill, now in the permitting stages, prior to reaching final grades. After reaching this “interim grade”, the bioreactor will continue to receive liquids, with periodic additions of waste lifts. CWMI intends to place 1-foot of interim cover over the bioreactor portion (except in the designated infiltration areas) of Landfill B-19 at an interim grade or when final grades are initially achieved, and continue bioreactor operations by the addition of liquid waste and liquids through the injection system and infiltration galleries on the landfill top deck[23], and the addition of solid waste. Solid waste lifts will be added periodically to the landfill to maintain interim and/or final grades utilizing the airspace gained by settlement. Settlement stakes will be installed after the final grades are initially achieved to monitor the rate of settlement.

Based on monitoring and review of settlement stakes and annual aerial topographic surveys, CWMI will confer with regulatory agencies regarding whether the settlement rate bioreactor conditions have subsided to a level such that closure of the Class II/III area to solid waste fill operations will be undertaken. Closure of the bioreactor unit to solid waste landfilling and of infiltration galleries on the landfill top deck will involve placement of final cover and drainage systems. After closure of this area to solid waste filling, CWMI will continue to monitor leachate and liquid waste injection systems in consultation with regulatory agencies since the addition of outside liquids and liquid waste to the bioreactor has stopped.

The closure of the Class II/III waste disposal area will be according to requirements of 27 CCR. According to 27 CCR Section 21110, the site operator is required to begin implementing the closure schedule within 30 days after receiving the final shipment of waste. Final cover will be placed in accordance with the closure schedule to be contained in the final closure and post-closure maintenance plan approved by the RWQCB, LEA, and the CalRecycle. Incremental closure and post-closure maintenance plans will be submitted for the control unit and bioreactor units in accordance with the schedule discussed above. These final closure and post-closure maintenance plans will be submitted to the RWQCB, LEA, and the CalRecycle, two years before any final closure activities, and will include a construction quality assurance program, construction plans, and the ET final cover installation specifications. Specific provisions for closure and post-closure maintenance of the bioreactor unit regarding sequential closure of solid waste and liquid waste operations will be developed. The ET final cover construction will be conducted under the supervision of a registered civil engineer. The RWQCB will be notified at least 180 days before the beginning of any closure activities, and within 30 days after their completion.

[23] Because bioreactor operations using liquid additions will start in 2006 at the earliest, optimal bioreactor operations may not yet be achieved by the time final landfill grades are achieved.

11.7 Site Security, Decommissioning of Environmental Control Systems, and Structure Removal

11.7.1 Site Security

The KHF will continue to operate after Landfill B-19 is closed. Security at the site upon closure will continue to be provided as described in Section 7.8. Because Landfill B-19 is not open to the public, signage requirements of 27 CCR Section 21135 do not apply.

11.7.2 Decommissioning of Environmental Control Systems

It is anticipated that all environmental control systems will remain in place upon closure and during the post-closure maintenance period until it is demonstrated that landfill by-products such as leachate and LFG pose no threat to the environment. This demonstration will be to the satisfaction of the appropriate regulatory agencies, and will be presented in the form of a written report.

Environmental control systems are anticipated to be decommissioned during, or at completion of the post-closure maintenance period. The environmental control systems will either be abandoned in place or be dismantled and disposed of on-site or at another authorized solid waste disposal site. Well abandonment techniques for decommissioning the groundwater monitoring system will be consistent with the procedures prescribed in the California Well Standards, Bulletin 74-90, and supplement to Bulletin 74-81 (DWR, January 1990) or equivalent document applicable at the time of decommissioning. Underground pipe components of the leachate control system and the LFG monitoring and control system will be cut off at the surface, capped, and buried to minimize the disturbance of the landfill final cover. Aboveground components will be dismantled, decontaminated, and salvaged for reuse or discarded in a permitted, active waste disposal unit on-site or off-site. Transportation and disposal of dismantled and salvaged materials will be consistent with federal, state, and local laws and accomplished in a manner that prevents the introduction of LFG condensate, leachate, or waste constituents into the environment. Materials intended for reuse will be appropriately cleaned prior to reuse on-site or transport and reuse off-site.

11.7.3 Structure Removal

No structures are to be removed at closure or during the post-closure maintenance period for Landfill B-19. The KHF will continue to operate other permitted waste management units. However, if it is determined upon approval by appropriate regulatory agencies, that the flare station is no longer needed, the flare station will be removed in a cost-effective manner following the procedures to be developed and included in the final closure and post-closure maintenance plans. The flare station will either be disposed at another disposal unit or facility, or recycled for use at another waste management unit on-site or off-site.

11.8 Post-closure Maintenance Plan

The post-closure maintenance plan is intended to describe the proposed activities that will be carried out by the landfill operator during the 30-year post-closure period.

The current leachate, groundwater, surface water and gas monitoring programs shall be continued throughout the 30-year post-closure period or a different period if the wastes pose a threat to public health and safety, or to the environment. These monitoring activities will serve to either document that the site is environmentally secure or identify the need for remedial work. Any proposed modifications to these programs (monitoring at lesser frequency, instituting remedial action, etc.) shall be presented to the appropriate regulatory agencies for approval.

This section of the report, except where specifically noted, applies to all phases of closure planned. This post-closure maintenance plan will be implemented as necessary to meet the requirements of 27 CCR Sections 20950, 21090, 21180, 22212 (a), and 22222.

11.8.1 Leachate Monitoring

Landfill B-19 will be monitored for leachate depth as discussed in Section 9.5.2. This monitoring frequency will be maintained during post-closure until the leachate generation rate decreases to a rate, which justifies less frequent monitoring. The RWQCB will be notified by CWMI of any requested modification to the monitoring frequency. Such request will be implemented as approved by the RWQCB. Leachate control as discussed in Section 8.1 will be maintained as long as leachate is generated and detected.

11.8.2 Groundwater Monitoring

The groundwater-monitoring network described in Section 9.1 of this report, will continue to be utilized to monitor the groundwater underlying Landfill B-19. The current Monitoring and Reporting program issued by the RWQCB will continue to be implemented until such time it is modified, replaced, or discontinued as agreed with the RWQCB. Groundwater monitoring will be maintained until leachate is no longer being produced or no longer poses a threat to water quality.

11.8.3 Gas Monitoring and Collection

The LFG monitoring and collection system will be operated and maintained to control off-site gas migration and surface emissions. The preliminary design for the proposed collection system is described in Section 8.2 and Part 2 of Attachment 3 to Appendix C. Collected gas will be combusted in the gas flare constructed on the KHF property. Gas condensate will be collected and managed by one of the following methods, as approved by the RWQCB:

- Flared
- On-site evaporation
- Reinjection into the bioreactor unit and recirculated with leachate
- On and Off-site disposal

Gas monitoring activities, as described in Section 9.2 of this report, will be conducted as required by the SJVUAPCD regulations and Title 27 CCR. Perimeter gas probe monitoring will be conducted semi-annually, or as required by the LEA, during the post-closure period until it is determined that a less frequent monitoring schedule is appropriate.

Gas monitoring of on-site structures will be implemented until such time it is determined that gas generation no longer poses a threat to these structures.

11.8.4 Post-closure Maintenance and Inspection

Landfill B-19 will be inspected as required by Title 27, CCR and as indicated in the Post-closure Maintenance Plan, to determine the condition of the final cover, drainage control facilities, vegetative cover, gas monitoring and collection systems, and groundwater monitoring network. During these inspections, observations will be made and recorded in order to identify areas of the closure cover, supporting facilities, and environmental control systems that require maintenance. Possible issues that may be identified during inspection are leachate seeps, eroded final cover soil, inadequate vegetative cover, ponding of water, final cover settlement, and removal of sediment from drainage structures. Issues identified during inspections will be addressed in the appropriate manner and timeframe warranted.

The grading of the final cover has been designed to account for the anticipated settlement and to maintain a sufficient gradient to allow drainage to the landfill perimeter. Settlement of the final cover caused by subsidence of the underlying waste will be corrected by filling the resulting low spots with soil and re-establishing vegetative cover.

Erosion of the final cover will be corrected by replacing displaced soil and re-establishing vegetative cover. Drainage will be reviewed to determine if additional or modified structures would more fully address the erosion problems.

The drainage control system will be inspected annually prior to the rainy season. Deficient conditions, such as sediment deposits and areas of potential water ponding will be identified and corrected prior to rain events. Through proper inspection and maintenance, it is not expected that any special arrangements will be required for the disposal of liquids accumulated in the drainage control system. Existing and proposed groundwater monitoring well network and any additional wells, which may be installed prior to the full closure of the facility, with proper inspection and maintenance, should be sufficient for the post-closure maintenance period.

The perimeter gas monitoring probes, and any additional probes which may be installed during the active life of Landfill B-19, are expected to be sufficient for the post-closure maintenance period.

11.8.5 Iso-Settlement Map

In accordance with 27 CCR Section 21142, an aerial photographic survey will be made of the entire site every five (5) years throughout the post-closure period in order to update the original topographic map produced at the time of closure. From this information, an iso-settlement map with a contour interval of two feet will be produced showing the changes in elevation between consecutive aerial surveys of the closure area. The KHF may request permission from the LEA and CalRecycle to reduce the frequency of aerial photographic surveys and iso-settlement maps during the post-closure period based on actual settlement observations. Any such request will be based on settlement effects observed during the post-closure period and the volume, depth, and age of the underlying waste fill.

11.8.6 Monitoring Performance of ET Final Cover System

Installation of the ET final cover system will include installation of a pan lysimeter, moisture probes or other type of monitoring system beneath or within the final cover of the landfill in order to monitor the performance of the ET final cover system. A specific design and monitoring program proposal will be included in the final closure plan. This will allow for consideration of systems based on future advancements in technology.

11.9 Preliminary Closure and Post-closure Maintenance Cost Estimates and Financial Mechanism

11.9.1 Preliminary Closure Cost Estimate

Based on the requirements of 27 CCR Section 21820 and the proposed cover design presented herein, the preliminary cost estimate for closure is presented in Appendix G. Total closure costs for Landfill B-19 are estimated at $. 1,973,861. This estimate represents the cost of closing the entire Class II/III footprint of the landfill. This is the point in the active life when the extent and the manner of the operation make closure the most expensive. This "worst case" closure is based on the maximum area requiring closure at any time, which is approximately 29 acres. The cost estimate shown in Table 1 of Appendix G reflects costs in 2016 dollars.

11.9.2 Preliminary Post-closure Maintenance Cost Estimate

A preliminary post-closure maintenance cost estimate has been prepared per 27 CCR Section 21840 and is presented in Table 2 of Appendix G. Per 27 CCR Section 21865, the estimate will be amended for design or operational changes, a change in the anticipated closure date, a change in the approved financial mechanism, or at a minimum, annually to adjust for inflation.

Total post-closure maintenance costs for Landfill B-19 are estimated at $. 9,364,694 (2016 dollars). This estimate is based on the following: the annual cost to maintain and monitor the environmental control systems during the post-closure period which will be equal to the present annual cost, and revegetation costs (assuming approximately one acre will require revegetation each year). The preliminary post-closure maintenance cost estimate is obtained by multiplying the annual maintenance cost estimate by 30 years (per 27 CCR Section 21840). Subtitle D requires the post-closure maintenance cost estimate to be calculated by multiplying the annual cost in present value dollars by 30 years.

11.9.3 Closure and Post-closure Financial Mechanisms

In accordance with Title 27 CCR, Division 2, Chapter 6, Subchapter 3, Article 1, the financial mechanisms to assure financial responsibility for funding the closure costs have been secured and have been submitted to the appropriate agencies.

12.0 References

Note: References used for Appendix contents are in the corresponding appendix document.

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APPENDIX A

PERMITTING DOCUMENTS

APPENDIX B

COMPLIANCE WITH RD&D REGULATIONS

APPENDIX C

DISPOSAL SITE DESIGN CALCULATIONS AND ENGINEERING ANALYSES

Attachments:

1. Volume and Site Life Calculations
2. Surface Drainage Analysis
3. Landfill Gas Information

   Part 1 - LFG Generation Modeling, Shaw- EMCON/OWT, Inc., February 2004

   Part 2 - LFG Collection and Control System Design Report for Landfill B-19, by GC Environmental, Inc., November 2005
4. Settlement Analysis
5. LCRS Pipe Integrity Check
6. LCRS Calculations
7. Final Cover Erosion Soil Loss Calculations
8. Information on Bioreactor Liner Temperatures
9. Landfill B-19 Class II/III Waste Leachate Testing Results

ATTACHMENT 1

VOLUME AND SITE LIFE CALCULATIONS

ATTACHMENT 2

SURFACE DRAINAGE ANALYSIS

ATTACHMENT 3

LFG INFORMATION
FOR LANDFILL B-19

PART 1

LFG GENERATION MODELING

By: Shaw – EMCON/OWT, Inc.

PART 2

LFG COLLECTION AND CONTROL SYSTEM DESIGN REPORT FOR LANDFILL B-19

By: GC Environmental, Inc.

ATTACHMENT 4

SETTLEMENT ANALYSIS

ATTACHMENT 5

LCRS PIPE INTEGRITY CHECK

ATTACHMENT 6

LCRS CALCULATIONS

ATTACHMENT 7

FINAL COVER EROSION SOIL LOSS CALCULATIONS

ATTACHMENT 8

INFORMATION ON LINER TEMPERATURES

ATTACHMENT 9

LANDFILL B-19 CLASS II/III WASTE LEACHATE TESTING RESULTS

APPENDIX D

SLOPE STABILITY EVALUATION

APPENDIX E

PRELIMINARY DESIGN EVAPOTRANSPIRATIVE FINAL COVER

APPENDIX F

QUALITY ASSURANCE GUIDANCE DOCUMENT
FOR THE INSTALLATION OF LINING SYSTEMS

APPENDIX G

CLOSURE AND POST-CLOSURE MAINTENANCE COST ESTIMATES

APPENDIX H

CORRECTIVE ACTION PLANS AND COST ESTIMATES