WASTE MANAGEMENT

KETTLEMAN HILLS FACILITY
35251 Old Skyline Rd.
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April 14, 2006

EXPRESS MAIL

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Jim Dowdall
Regional Water Quality Control Board
Central Valley Region
1685 E Street
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RE: Modification 2 to Landfill B-19 Closure Plan for Class I Portion

Dear Ms. Cayabyab and Mr. Dowdall:

The Chemical Waste Management, Inc. – Kettleman Hills Facility (KHF) encloses the following document for your review and approval.

> *Modification No. 2 to Landfill Unit B-19 Closure Plan for Class I Portion, Kettleman Hills Facility*, Golder Associates Inc., April 2006.

The previous version of this document was submitted to your agencies on November 28, 2005, for review and approval. A temporary authorization request to implement certain aspects (i.e., slope change) of the closure plan modification was submitted to the Department of Toxic Substances Control (DTSC) on March 13, 2006. There have been many discussions before and after these submittals on the modification to the Landfill B-19 Closure Plan, the proposed bioreactor project, and various nuances to the implementation of a partial closure. The KHF met with the DTSC in Sacramento on March 17, 2006, for a technical review session. Primarily based on that meeting, the KHF has prepared this second modification to the closure plan. Modification No. 2 will be the document for the DTSC to base its decision on the temporary authorization request and the near future Class 3 permit modification request. The Regional Water Quality Control Board should use this enclosed document for a pending request to amend the current Joint Technical Document, allowing the slope change to 3:1 (effective) for the Class II/III landfill, as well as for the closure of the Class I portion of Landfill B-19.

For your reference, the KHF also encloses a summary of the DTSC/KHF comments and the KHF/DTSC responses for the pending closure of the hazardous waste portion of Landfill B-19.

WASTE MANAGEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to [be] *sic* the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If you need more information, please contact either of us at telephone numbers 559.386.6140 (Carol) or 559.386.6121 (Fred).

Sincerely,

/original signed by Carol J. Carollo/

Carol J. Carollo, CHMM
Environmental Compliance Specialist

/original signed by Fred Paap/

Fred Paap
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Enclosures

cc: (all w/enclosures)
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MODIFICATION NO. 2 TO LANDFILL UNIT B-19 CLOSURE PLAN FOR CLASS I PORTION KETTLEMAN HILLS FACILITY

Submitted to:

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5 Copies – Waste Management, Inc.
1 Copy – Golder Associates Inc.

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1.0 INTRODUCTION

1.1 Objectives and Scope

1. This closure plan is submitted as a proposed revision to the previously approved modified closure plan (TRC and RUST Environment & Infrastructure (RUST), 1997) submitted pursuant to Title 22 of the California Code of Regulations (22 CCR) §66264.112. The primary objectives of this revision are to:

    - Provide for closure of the remaining Class I portion of Landfill Unit B-19 (Landfill B-19) at the Kettleman Hills Facility (KHF).
    - Amend the final closure grades of the entire B-19 unit by removing planned placement of Class II/III waste at the southern portion of Landfill B-19 and changing the Class II/III cover slope from 4:1 (horizontal to vertical) [H:V] to 2.5:1 (H:V) between drainage benches (effective 3:1 (H:V) when benches are included).
    - Address the potential impacts of converting a portion of the Class II/III landfill to be operated as a bioreactor unit.
    - Identify a monolithic cover as the cover profile for Class II/III waste.
    - Amend the stability buttress configuration due to a revised waste fill configuration as discussed above.
    - Amend the proposed Class I waste prism closure schedule.
    - Present engineering analysis demonstrating that the landfill, with the proposed amendments, complies with requirements of the state regulations in CCR Titles 22 and 23.

2. The physical modifications to Landfill B-19 are presented on Figures 1-1 and 1-2. Each of the modifications is discussed in more detail in Section 2.0 of this report. Supporting engineering analysis is presented in Section 3.0.

3. Closure of the existing hazardous waste portion of the Landfill B-19 will occur in accordance with 22 CCR Division 4.5, Chapter 14, Article 7, and those requirements of 23 CCR, Division 3, Chapter 15, Article 8 that are applicable to Class I landfills. Full size design plans for the closure of Landfill B-19 are included in Appendix A, for ease of review a reduced size set of plans is included in the Figures section as well. This closure component is referred to herein as the "final cover", see Detail 2 on Sheet C-7. The Class II/III wastes currently being disposed of in the remaining airspace in the Landfill B-19 are isolated from the Class I waste prism by a composite separation liner that also functions as the Class I final cover (for that portion of the waste unit). This closure component is referred to herein as the "separation liner", see Detail 1 on Sheet C-7. The components of the final cover and separation liner were previously approved by the Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB). Construction of the Separation Liner was completed in 2004.

4. When the closure construction for the Class I "final cover" is completed (projected for 2006) in the southern portion of Landfill B-19 (see Sheet C-2) and the DTSC and RWQCB have approved the closure construction reports for Landfill B-19, the hazardous waste portion of the unit will be considered closed. At that time, the closure cost estimates for 22 CCR requirements will no longer be necessary for this unit (the closure cost estimates for the Class II/III portion will continue to be maintained in accordance with 27 CCR requirements) and the closure cost estimate for 22 CCR requirements will be adjusted accordingly. The annual post-closure inspections will be conducted. The operational and financial management of Landfill B-19 will be as a partially closed hazardous waste unit (and an active solid waste unit); however, the DTSC retains its authority over the entire

landfill and will be contacted for any changes to the closure of the Class II/III portion of the landfill and approval may be required for changes that may impact the Class I portion of the landfill.

1.2 Site Background

1. KHF is a Class I hazardous waste treatment, storage and disposal facility and a Class II/III disposal facility, owned and operated by Chemical Waste Management Inc. (CWMI) since 1979. As shown in Figure 1-3, KHF is located in unincorporated western Kings County, California approximately 1 mile north of State Route 41 (SR-41), approximately 3.5 air miles southwest of Kettleman City, 6.5 air miles southeast of the city of Avenal, and approximately 2.5 road miles west of Interstate 5 (I-5).

2. KHF is an approximately 1,600-acre site, of which 499 acres are currently permitted for Class I hazardous waste and Toxic Substances Control Act (TSCA)-regulated polycholinated biphenyls (PCB) waste and Class II/III waste operations. KHF is permitted to accept most hazardous wastes as defined by Title 40 of the Code of Federal Regulations (CFR), Part 261, and 22 CCR, Division 4.5 Chapter 11. Hazardous wastes are transported to KHF by truck primarily via I-5 to SR-41. Class II/III waste disposal operations at KHF are limited to Landfill B-19.

1.2.1 History of Landfill B-19

1. Landfill B-19 was permitted as an approximately 43-acre Class I Landfill with approximately seven million cubic yards of total capacity. Landfill B-19 consisted of four phases (IA, IB, II and III). Landfill B-19 was constructed between 1986 and 1989, and began accepting Class I waste in 1987. In 1988, after approximately one million cubic yards of Class I waste had been disposed of in Phase IA, a portion of the waste and primary liner slipped, resulting in a horizontal and vertical movement of the waste prism in Phase IA. While there was movement in the waste prism, the composite liner system contained the waste so that there was no release to the environment.

2. Pursuant to established procedures, various federal, state and local agencies were immediately notified of the waste slippage in Phase IA. Subsequently, the approximately one million cubic yards of Class I hazardous waste in Phase IA was transferred to Phases II and III of Landfill B-19. A temporary cover was placed over the slope and floor of Phase IA to prevent rainwater from entering the remaining liner and leachate collection materials on the floor.

3. Through 1992, approximately three million cubic yards of Class I waste has been disposed in Phases IB, II and III. In 1992, Landfill B-19 was placed into an inactive status by CWMI and Landfill Unit B-18 became the operating Waste Management Unit (WMU) at KHF. In accordance with the DTSC's request, an interim cover comprising a 40-mil flexible membrane liner (FML) was placed over the phases IB, II and III of Landfill B-19.

4. In 1997, CWMI converted Landfill B-19 from a Class I WMU to a Class II designated waste and Class III Municipal Solid Waste (MSW) unit. The final fill configuration was identical to the earlier Class I fill plan, with the exception that the balance of the fill material was Class II/III waste. The Phase IA base liner system was designed in accordance with CCR Title 27. In order to reclaim the remaining airspace in Landfill B-19, a separation liner overlying portions of the Class I waste was designed. The separation liner serves as the closure cover for that Class I waste to prevent the migration of liquids and landfill gas from the MSW into the hazardous waste. As shown on Sheet C-2, the reconstruction of Phase IA and the construction of the first phase of the separation liner occurred in 1998.

5. In 2003, construction drawings were prepared for the second phase of the separation liner. The second phase encompassed the remaining approximately 12 acres of separation liner. As shown on Sheet C-2, the second phase of the separation liner construction was completed in early 2004.

1.2.2. Future Steps In the Closure of Landfill B-19

- Approximately 11 acres of Class I waste remains to be capped with final cover (see Sheet C-2). This remaining area will not be covered with MSW; however, portions will be covered by construction of the soil stability buttress, as shown on the design drawings in Appendix A. Closure of the remaining portions of the Class I landfill and the remaining portions of the stability buttress are scheduled for completion in 2006.

- For the Class II/III portion of Landfill B-19, an evapotranspirative (ET) final cover system is proposed. A preliminary design, including UNSAT-H computer modeling, was prepared and submitted as part of the Joint Technical Document (JTD) (Shaw, April 2006) for the Class II/III portion of the landfill. The preliminary design assumed "typical" on-site soils will be used. The ET cover will consist of an approximately four-foot thick monolithic final cover layer of suitable soils. Suitability of the specific soils for the cover will be completed as part of the final design and/or during construction. Confirmation of the source will include strength testing to confirm stability and hydraulic properties to confirm materials are consistent with the UNSAT-H modeling. Closure of the Class II/III portion of the landfill will be performed in accordance with the requirements and schedule provided in the JTD. A final Closure and Post-closure Maintenance Plan will be submitted to the appropriate agencies in accordance with Title 27 requirements.

- The Class II/III portion of the landfill is planned to continue operations as a bioreactor disposal unit. Based on the nature of the anticipated settlement, disposal operations will fluctuate between B-19 and the proposed B-17 Class II/III landfill to allow for and take advantage of anticipated settlement related to the bioreactor operation. Ultimate closure of the Class II/III portion could be as late as 2015 depending on the continuing rate of settlement. A general description of how the bioreactor will operate is provided in Appendix B (excerpt from JTD [Shaw, April 2006]). Bioreactor operations are expected to continue for several years. These operations will be performed under the jurisdiction of the RWQCB and the Local Enforcement Agency/California Integrated Waste Management Board (LEA/CIWMB).

1.3 Site Description

1.3.1 SITE GEOLOGY AND PHYSIOGRAPHY

1. The area in which the site is located is characterized by generally northwest-trending rolling hills with broad ridges and intervening valleys which generally mimic broad folds in the underlying sedimentary rock strata. Onsite elevations range from approximately 730 feet mean sea level (MSL) at the south end of the active 499-acre waste management area to a high of over 900 feet MSL near the northern end.

2. The KHF is situated on the west flank of the Kettleman Anticline. The facility is underlain by an interbedded sequence of marine and non-marine sediments of the San Joaquin Formation. These sediments consist of an alternating sequence of sandstone, siltstone, and claystone beds, which generally dip 25 to 35 degrees southwestward.

1.3.2 FAULTING AND SEISMICITY

1. The facility is located in a seismically active area of south-central California. The seismicity at KHF was most recently evaluated by William Lettis & Associates, Inc. (Lettis, 1997) to determine the magnitude of potential ground motions at the site during an earthquake event. Seven faults or their segments were identified as potential earthquake sources located within approximately 115 km (71 miles) of the site. The closest seismic sources to the site are segments associated with the Blind Ramp Thrust Fault (recurrence interval between 700 to 3,000 years) present beneath the site at distances between 10 to 27 km (6 to 17 miles). The most active seismic sources are associated with the San Andreas Fault (recurrence interval less than approximately 345 years) located approximately 35 km (22 miles) west of the site.

2. More recently, the seismicity at the KHF was evaluated by Hushmand Associates, Inc. (November 2006) to update the site design earthquake parameters in support of the proposed modifications to Landfill B-19 (i.e., final grading plan and bioreactor)(see Appendix C). A more recent attenuation relationship (e.g., Bozorgnia, Campbell, and Niazi, 1999) was used to determine the peak horizontal ground accelerations (PHGAs), response spectrum, and time histories for the design events.

3. The Blind Ramp Thrust and San Andreas faults produced the highest near-field and far-field ground motions at the KHF, respectively. The ground accelerations for the near-field event are associated with a Magnitude (M) 6.6 event from the Ramp Thrust Kettleman Hills North Dome segment of the Blind Ramp Thrust faults (Hushmand, 2003). The ground accelerations for the far-field event are associated with a M 7.8 event from the San Andreas Slack Canyon-Cajon Pass segment of the San Andreas faults (Hushmand, 2006).

4. PHGAs of 0.57g and 0.21g were estimated for the near-field and far-field events, respectively. The calculated PHGA of 0.57g corresponds to an average return period of approximately 1,000 years (Hushmand, 2006).

5. No evidence of fault rupture hazard is known to exist at the project site. Landfill B-19 is not located within or near an Alquist-Priolo Special Studies Zone (Hart, 1992).

6. Although faults have been identified within 0.9 km (3,000 feet) of KHF, seismic evaluations of the site have not uncovered evidence to suggest that the faults have been displaced during Holocene time (Roger Foott Associates, Inc., 1990).

1.3.3 GROUND WATER

1. Ground water occurs beneath the site in saturated sandstone beds, or water-bearing zones (WBZs), which range in thickness from less than 5 to more than 60 feet, and which are isolated hydraulically from one another by intervening siltstone and claystone intervals. The depth to ground water in the sandstone WBZs ranges from about 300 to greater than 500 feet, with an average depth of about 450 feet. The dissolved solids content of the ground water is relatively high and the yield from monitoring and test wells is low. Therefore, the ground water is unsuitable for most purposes.

2. Data collected from monitoring wells around the site and from various hydrogeologic studies have indicated that the ground water level is well below the depth of any excavations for Landfill B-19 (EMCON Associates, 1985; revised 1986). In addition, no perched water zones were encountered during the excavation of any of the landfill phases. The ground water level is estimated to be approximately 300 feet below the ground surface in the area of Landfill B-19 (Golder Associates, Inc. 1991).

1.3.4 CLIMATE

1. 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.

2. As reported in Bulletin No. 881 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.

3. Based on the Western Regional Climate Center (WRCC) 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 occurred 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. The 24-hour Probable Maximum Precipitation (PMP) calculated with the Log-Pearson Type III distribution is 7.4 inches (RWQCB, 1989). The PMP is used for all stormwater calculations.

4. As reported in NOAA National Weather Service 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 is lowest in December (1.85 inches) and highest in July (16.57 inches).

5. The wind conditions at the KHF are mostly calm (0-5.5 mph), and winds originate predominantly from the north-northwest.

1.4 Regulatory Requirements

1. Table 1-1 lists the information requirements of the DTSC and RWQCB for the modified closure plan.

2. California is an RCRA authorized state and therefore meet or exceed the requirements of Title 40 of the Code of Federal Regulations (CFR). The numbering format of the California Hazardous Waste

Regulations are similar to (i.e. prefixed by 66) the federal regulations allowing for a quick cross reference. An example of where the CCR is more restrictive than the CFR is found comparing 22CCR §66264.19 to 40CFR §264.19. The CCR requires the CQA officer to be a registered Civil Engineer where CFR requires only a registered engineer. By meeting the requirements of CCR, the site also complies with the requirements of CFR.

2.0 MODIFIED CLOSURE PLAN COMPONENTS

2.1 Overview of the Modified Closure Plan

1. Design drawings for the modified closure plan are provided in Appendix A. Construction of the separation liner has been completed to the proposed revised limits of Class II/III waste. Partial closure reports were submitted to the DTSC for their review. The remaining southern portion of the Class I waste (approximately 11 acres) will not be covered with Class II/III waste and will therefore be closed in accordance with the approved Class I final cover design. The Class I final cover presented in this plan is designed to accommodate this revised Class II/III waste configuration.

2. As shown in Figure 1-1 and 1-2, the proposed revision to the final closure configuration reduces the footprint of the Class II/III waste. Consequently, the limits of the separation liner are reduced while the limits of the Class I final cover (not underlain by Class II/III wastes) are increased. The respective components of each system were previously approved by DTSC and RWQCB and remain unchanged. Additionally, the perimeter stability buttress was modified to address the proposed changes in the final closure configuration and conversion of a portion of the Class II/III landfill into a bioreactor.

3. Closure of the Class I landfill will be complete when the final cover, consisting of the separation liner and final cover, over the Class I waste prism is certified as complete. Phasing and scheduling for these installations are addressed in Section 2.5.

2.2 Modified Cover Components

1. As shown on Sheet C-2, the separation liner covers the north half of the Class I waste prism. The separation liner cross section is shown in Detail 1 on Sheet C-7 of the Design Drawings. The separation liner system consists of the following components, from bottom to top:

    - A two-foot thick low-permeability foundation layer ($k < 1x10^{-5}$ cm/sec) layer;
    - A 60-mil textured (both sides) high density polyethylene (HDPE) geomembrane;
    - A geocomposite drainage layer; and
    - A two-foot thick operations layer.

    The liner system was specifically designed to provide for separation of the Class I and Class II/III wastes, considering: (1) requirements for static and seismic stability; (2) minimizing infiltration of water or Class II/III leachate; (3) minimizing landfill gas migration (e.g., from Class III municipal solid waste) into the Class I waste prism; and (4) protecting the FML and drainage layer from equipment operations of the overlying Class II/III fill activities. Section 3.2.2 addresses the engineering equivalence of this type of cover compared to the Class I waste cover that is currently permitted for the remaining hazardous waste portion of Landfill B-19 and other hazardous waste disposal units.

2. As shown on Sheet C-2, the southern areas of the Class I waste prism, not covered with the Class II/III separation liner, will have a final cover system as shown in Detail 2 on Sheet C-7 of the Design Drawings. This final cover system consists of the following components, from bottom to top:

    - A 1-foot thick foundation layer;
    - A 1-foot thick low-permeability foundation layer ($k < 1x10^{-5}$ cm/sec);
    - A 40-mil thick textured (both sides) HDPE geomembrane;

- A geotextile drainage layer; and
- A minimum 2.5-foot thick vegetative layer.

The separation liner and final cover configurations were previously approved by the DTSC in the site's Part B permit renewal as well as the previous modified closure plan. The RWQCB approved the separation liner and final cover configurations with the original Joint Technical Document for the Class II/III landfill.

3. The soil and geosynthetic components of the cover system will be constructed using industry standard guidelines and specifications. A Construction Quality Assurance (CQA) program meeting the requirements of 22 CCR § 66264.19 will be implemented during construction and implementation will be under the direction of a California registered professional Civil Engineer. The CQA Plan and Technical Specifications used for the 2006 Buttress Construction are included as Appendix D. As part of the CQA program, borrow source testing will be conducted to confirm soil and Geosynthetic liner materials meet or exceed the strength values used in the stability analysis.

4. The existing temporary cover over the Class I waste prism is anticipated to include a minimum of 2-foot of compacted soil below an existing 40-mil HDPE geomembrane. Prior to construction of the final cover liner system, the interim geomembrane cover will be removed and disposed in Landfill B-18. The thickness of the foundation layer will be confirmed through hand excavation of test pits by qualified personnel. Additionally, the permeability of the top one-foot of soil (in areas where no more soil is to be placed) underlying the HDPE geomembrane will be confirmed to be less than $1x10^{-5}$cm/s. The hydraulic conductivity will be determined in the laboratory on relatively undisturbed samples obtained from the foundation layer. Samples will typically be collected using 3-inch diameter Shelby tubes. The in-place soil layer will be integrated into the final cover liner, with additional soil ($k<1x10^{-5}$cm/s) added where necessary to achieve the minimum 2-foot thickness.

5. Additional soils for construction of the cover systems will either be excavated onsite or imported. The KHF contains sufficient onsite soils to complete the closure, although these soils may require processing to meet the permeability requirements. Soil materials obtained from the Landfill B-17 borrow area have been consistent with the design criteria established in the technical documents. Additional testing will be conducted in accordance with the specifications and CQA Plan. For example, during 2004/2005 construction projects, borrow soils have typically been classified as sandy lean clay with the following properties:

   - USCS Classification: low-plasticity clay (CL)
   - Maximum Density (ASTM D1557):100 to 123 pcf with an average of 110 pcf (39 tests)
   - Optimum Moisture (ASTM D1557): 12% to 17% with an average of 15% (39 tests)
   - Gradation (ASTM D422): 99% passing #4 Sieve, 56% passing #200 Sieve (24 tests)
   - Atterberg Limits (ASTM D4318): Plastic Limit 32 to 52, Liquid Limit 14 to 16 (3 tests)
   - Shear Strength (various) greater than 33 degrees and 100 psf cohesion (12 direct shear tests and 14 Cone Penetration Tests).

2.3 Surface Water Drainage System

1. The existing surface water drainage system at KHF is designed to accommodate flows from the Probable Maximum Precipitation (PMP) event as required by CCR Title 22. Collector ditches and swales are installed around the perimeter of each Class I hazardous WMU, including Landfill B-19. This system prevents run-on and run-off from eroding or otherwise damaging the final cover.

2. A Storm Water Management Plan (IT, 2000) for the Class I WMUs at KHF was previously submitted to the DTSC and RWQCB. This plan shows existing and planned drainage features that will receive flow from and convey flow around the Landfill B-19 area. CWMI inspects the site for ponding water and erosion during the rainy season, with adjustments made as necessary, including, but not limited to, regrading, pumping, temporary berms, or installation of drainage pipes and culverts. Engineering analysis for Landfill B-19 is discussed in Section 3.2.4.

3. The separation liner and final cover are both designed to prevent ponding of liquids and provide long-term minimization of liquids infiltrating through the Class I waste. The surface water runoff will be directed to perimeter storm water drainage channels by means of diversion berms, downdrains, and channels as shown on Sheet C-9. The perimeter drainage channels convey the collected water to the East Retention Basin, which can be seen on Sheet C-9 of the Design Drawings.

4. Any runoff that comes in contact with the Class II/III waste will be managed as leachate and not returned to the surface water management system.

2.4 Special Control Systems

2.4.1 LEACHATE COLLECTION AND REMOVAL SYSTEM

1. Landfill B-19 has four (4) leachate collection sumps. Each sump has a primary, secondary and vadose monitoring location. The Phase 1A sump collects leachate from the Class II/III landfill. The Phase 1B, 2 and 3 sumps collect leachate from the Class I wastes. The Phase 1A sump has collected as much as 25,000 gallons in 1999 to as little as 3,000 gallons in 2002. Since buildout of the Class II/III separation liner in early 2004, the Phase 1A sump has collected approximately 10,000 to 20,000 gallons per year. The Class I sumps remove less than 1,000 gallons per year.

2. The leachate collection system for each unit is generally comprised of a one-foot thick granular drainage layer on the base grades (i.e. less than 3% slope) and geocomposite drainage layer on slopes (i.e. greater than 3% slope). The geocomposite is a highly transmissive layer which has equivalent flow capacity to the one foot granular layer.

3. Approximately 18.3 acres of the 30-acre Class II/III WMU in Landfill B-19 is proposed to be converted to a bioreactor; the remaining 11.0 acres of the Class II/III WMU, which are located over the separation liner, will be a control unit and remain a traditional "dry" landfill. Four acres of the bioreactor will be over the Class I separation liner. Liquid and high moisture content wastes, such as recirculated leachate, waste water, biosolids (to include sewage sludge), food processing liquids and oil field brine, will be injected into the Class II/III waste through either horizontal injection galleries or vertical wells spaced throughout the waste mass. As indicated in the JTD (Shaw, April 2006), up to approximately 60 gallons of liquid per cubic yard of waste must be injected to maintain the optimal moisture content for the bioreactor operation, resulting in up to a net volume of 170,000 gallons per day (gpd) of liquids added to the waste mass. The expected leachate generation rate for the control unit, which is subject to waste decomposition and storm water infiltration only, should be consistent with the historic measurements which are less than those predicated by RUST (1997).

4. The leachate collection and removal system (LCRS) for the Class II/III WMU is designed to maintain less than 1-ft. of leachate over the liner system. The design capacity of the LCRS is approximately 260,000 gpd assuming a leachate depth of 1-foot (RUST 1997). The proposed conversion of the Class II/III WMU to a bioreactor would result in an estimated peak leachate generation rate of 182,000 gpd, which is comprised of both the bioreactor operation liquids and infiltration from storm water. The resulting leachate depth over the base liner system is estimated not to exceed

approximately 6.5 inches (Shaw, 2005). The depth of leachate over the separation liner will be contained within the 0.25-inch geocomposite layer. The leachate head on the separation liner is not expected to be a significant potential source of leakage through the separation liner (Shaw, 2006).

5. Based on the results of these evaluations, it was concluded that the existing LCRS for the Class II/III WMU is capable of handling the additional liquids generated by the proposed bioreactor (Shaw, 2006). Furthermore, a majority of the separation liner, which is located in the control unit, should not be exposed to the increased liquids volume. The four-acre segment of the separation liner located within the proposed bioreactor limits has a slope of approximately 3H:1V and contains a drainage layer (geocomposite) that is similar to the drainage layer incorporated for the sideslopes in the Class II/III WMU.

6. The amount of leachate expected to be generated in the control unit is limited due to the following factors:

    - KHF is located in a semi-arid climate that naturally limits the amount of precipitation that can percolate into the waste prism.
    - Daily cover and intermediate cover will further reduce the amount of rainfall that can percolate into the waste prism.
    - Class III municipal solid waste and Class II designated waste expected to be disposed at the site is relatively dry (i.e., typical moisture content of approximately 20 to 25 percent).
    - Liquid or semisolid wastes would be solidified prior to landfilling
    - Historic leachate generation rates are low compared to previous models.

7. The Class I prism is isolated from Class II/III waste by the separation liner. The separation liner includes a drainage layer as described in Section 2.2 to remove leachate generated by the Class II/III waste. This drainage layer, as well as the HDPE geomembrane, minimizes the potential for infiltration into the Class I waste prism. The drainage layer conveys leachate to a collection point in the Phase IA area.

8. Section 3.3.2 discusses the engineering equivalence of the separation liner to adequately prevent infiltration.

2.4.2 LANDFILL GAS MIGRATION CONTROL

1. The Class I wastes within Landfill B-19 are not prone to generating landfill gas. Therefore, gas control systems internal to the Class I waste prism are not necessary.

2. The Class II/III waste currently being placed in Landfill B-19 is likely to generate landfill gas. The design of the separation liner and the Class II/III fill incorporates measures to prevent landfill gas migration into the Class I landfill prism. The separation liner includes a geomembrane, in part, for this purpose. In addition, the Class II/III area of Landfill B-19 will incorporate an active gas collection system, which will minimize gas pressure within the Class II/III prism. The combination of the separation liner system and the active gas collection system will minimize migration of landfill gas into the Class I prism.

2.5 Closure Sequence and Schedule

1. Closure of the Class I waste prism is occurring in three phases. The first two phases were associated with the conversion of Landfill B-19 from a Class I WMU to a Class II/III WMU and the construction

of a separation liner over a portion of the Class I waste prism. The third and final phase involves the pending construction of the soil stability berm and final cover over the Class I waste prism.

2. In October 1997, RUST/TRC completed the design for converting Landfill B-19 from a Class I WMU to a Class II/III WMU. The final grading plan was identical to that previously prepared by Golder (1991). To prevent the migration of liquids from the Class II/III waste into the underlying Class I waste, a separation liner was designed.

3. In October 1998, the first phase of separation liner construction was completed. The construction encompassed all of Phase IA and most of Phase IB, which contained some Class I waste. In these areas, the separation liner was installed per the construction documents. Per the requirements of CCR Titles 22, 23 and 27, a partial closure report and CQA report were prepared and submitted to the various agencies. Landfill B-19 started receiving Class II/III waste in November 1998.

4. In late 2003 and early 2004, the second phase of separation liner construction was completed at Landfill B-19. The second phase included the remaining separation liner. As with the earlier construction project, a partial closure report and CQA reported were prepared and submitted to the DTSC (for closure) and the RWQCB (for closure and Class II/III disposal area construction).

5. An approximately 100,000cy portion of the stability buttress was constructed in late 2004 along the eastern side of Landfill B-19.

6. An additional approximately 290,000cy portion of the stability buttress was constructed in late 2005 which added to the 2004 construction along the eastern side of Landfill B-19.

7. The remaining portion of the stability buttress and remaining areas to be closed with the Class I final cover, as shown on Sheet C-4 and Sheet C-5, will be completed in 2006.

8. The Class II/III portion of the landfill will continue to receive waste (solid and liquid) until the final grades are achieved.

9. The Bioreactor will begin operations in late 2006 (projected) and continue to operate for several years. Operations may shift to the proposed B-17 landfill while the bioreactor continues to be operated in B-19 to allow for settlement. Once adequate settlement has occurred, operations will return to B-19 to again fill to the permitted final grades. This interactive approach may be implemented several times until settlement subsides and it is no longer feasible to place additional wastes. The bioreactor will be operated under the jurisdiction of the RWQCB and LEA/CIWMB.

10. After settlement related to the Bioreactor operation has essentially ceased and final waste grades are achieved, the Class II/III portion of the landfill will be closed with an ET cover. The design and construction of the ET cover will be included in the Final Closure Plan for the Class II/III portion of the landfill.

3.0 AMENDED MODIFIED CLOSURE PLAN ENGINEERING ANALYSIS

3.1 Overview of Engineering Analyses

1. The engineering analysis presented within this report was prepared in sufficient detail to support the Landfill B-19 Hazardous Waste closure design. A general discussion of the engineering analysis is presented below, with details included in the appendices.

2. Components of the closure cover for the existing Class I waste contained within Landfill B-19 are presented in Section 2.2. The limits of the separation liner and final cover are shown on Sheets C-2 and C-4. As demonstrated by the engineering analysis below, the closure cover sections for the Class I landfill will protect the environment and human health by providing a stable landfill configuration and minimizing infiltration into the waste. Table 3-1 summarizes the regulatory requirements for closure of Class I landfills in accordance with CCR Titles 22 and 23.

3.2 Engineering Analyses

3.2.1 STABILITY EVALUATION

1. RUST evaluated the static and seismic stability of the modified configuration of Landfill B-19 with Class II designated waste and Class III municipal solid waste (MSW) fill, and separation liner over the existing Class I hazardous waste within Landfill B-19. The results of the stability evaluation were presented in *Preliminary Stability Evaluation,* July 1997 (also included as an appendix in the TRC/RUST modified closure plan). The purpose of the stability evaluation was to verify that the design provided a stable configuration both statically and seismically during the Maximum Credible Earthquake (MCE). Specifically for the Class I portion of the landfill, the analysis was performed to demonstrate that statically the factor of safety was greater than 1.5 and seismically induced permanent displacements along the Class I landfill base liner and along the Class I separation liner were less than the design criteria of six inches and the final cover displacements were less than 12 inches.

2. Hushmand (April 2006) evaluated the static and seismic stability of Landfill B-19 to address the modifications of the closure plan, including: conversion of a portion of the Class II/III WMU to a bioreactor, and revision of the Landfill B-19 grading plan. The bioreactor results in a waste that is heavier and has lower shear strength. The increase in the slope of the Class II/III waste results in greater driving force. Consequently, the soil stability buttress was reconfigured to resist the additional forces. The results of the stability analysis are presented in "Slope Stability Analysis for Cell Redesign and Bioreactor Evaluation," dated April 2006. This analysis supersedes the RUST 1997 evaluation. The results of the slope stability analyses are discussed below and a copy of the report is included in Appendix C.

3. During construction of the Final Closure, the assumed engineering strength parameters will be confirmed through the CQA Program. Testing shall include, at a minimum, the following:

Material [1]	DESIGN VALUES		Test Frequency
	Friction Angle	Cohesion (psf)	
Foundation Layer	31	0	50,000 cy
Engineered Fill/Buttress	33	100	50,000 cy
Vegetative Cover	28	100	50,000 cy
Foundation Layer/40mil HDPE	28	0	250,000 sf
40mil HDPE/Geotextile	21	0	250,000 sf
Geotextile/Vegetative Cover	21	0	250,000 sf

[1] Soil material will be tested using remolded samples compacted to represent the minimum specified compaction and maximum moisture content.

3.2.1.1 Regulatory Requirements

1. The stability design criteria were developed to satisfy the requirements of CCR Title 22, which includes an evaluation of the MCE. Additionally, a site-specific risk assessment was performed to demonstrate that the landfill design provides an acceptable level of risk. This evaluation meets or exceeds both state and federal regulations for Class I landfills, as well as the regulations for Class II/III landfills.

2. For static stability, only qualitative requirements are indicated in the cited regulations. The current state of practice in California for static design is to require a minimum factor of safety of 1.5 for final waste slopes and any cut or fill slopes which would impact the integrity of waste containment, affect off-site property, or endanger life.

3.2.1.2 Stability Evaluation Results

1. Ground motions at the site from the MCE for near- and far-field events have been determined as a result of a site-specific study using recently published attenuation equations and information on regional and local faulting. The analysis presented in Hushmand (2003) considered the previous work conducted for the KHF site (Golder, 1988; RUST, 1997). The Hushmand study resulted in slightly higher design ground motions for the far-field event (an approximate 23.5 percent increase). However the controlling near-field ground motion was essentially the same. The near-field and far-field MCEs for Landfill B-19 were characterized by PHGAs of approximately 0.57g and 0.21g, respectively. The calculated PHGA of 0.57g approximately corresponds to an average return period of 1,000 years.

2. A seismic response analysis was performed to determine induced accelerations of the landfill from the design earthquakes. Yield accelerations were determined from a pseudo-static slope stability analysis using the relevant landfill design configurations and appropriate material strengths. Where induced accelerations are larger than yield accelerations, seismically-induced permanent displacements were calculated. If permanent displacements were determined to be more than six inches along failure surfaces that include geomembrane liners, the geometry of the buttress was modified (i.e., increased). The analysis was performed again until the buttress configuration analyzed resulted in acceptable displacement criteria. The final configuration and analysis is included in Appendix B of Appendix C – Slope Stability.

3. Due to the geometric changes in the Class II/III waste and inclusion of the bioreactor, the stability buttress was widened by as much as 40 feet, and the height increased by approximately 10 feet compared to the previous configuration. Thus, the impact of the bioreactor on waste density and strength and the increased slope angle are mitigated by a larger stability buttress. The elevation changes in Landfill B-19 resulting from the proposed changes are graphically shown on Figure 2-1. From Figure 2-1 the impact of the increased waste slopes, changes in berm geometry, as well as the reduced waste footprint in the southern portion of the landfill can be seen.

4. Computed static factors of safety were higher than 1.5 for all analyzed cross-sections. The analyses indicated that the proposed revision to the landfill final cover design and conversion of a portion of the Class II/III landfill into a bioreactor result in a stable configuration under both static and dynamic loading conditions. The maximum permanent displacements along the base liner or separation liner system is approximately 6-inches for a near-field event; the maximum permanent displacements for the cover system is approximately 8-inches, which is less than the generally accepted maximum value of 12-inches for final cover systems.

3.2.2 INFILTRATION CONTROL/SOLID WASTE LEACHATE CONTROL

3.2.2.1 Leachate Generation

1. As part of the permitting of the Class II/III Landfill, RUST (1997) estimated the leachate generation rates for the Class II/III operations. Calculations were performed for the amount of leachate, which would be collected by the Class II/III LCRS, and an estimation of leachate that would infiltrate through the Class I waste prism separation liner. Results of the Hydrologic Evaluation of Landfill Performance (HELP) modeling was updated to the revised landfill configuration. The results indicated that infiltration through the separation liner system is approximately 0.01 gallons per acre per day. The results of the analysis are applicable to the 12-acre control cell over the Class I separation liner. As discussed in Section 2.4.1, the leachate generated in the control cell is not expected to be influenced by the bioreactor. The 4-acres of separation liner, which are within the bioreactor, are on an approximate 3:1 slope. Calculations by Shaw (2006) indicate that the head on the liner will not exceed 0.25-inches. Given the very low head, infiltration through the separation liner within the bioreactor is expected to be consistent with the HELP model results presented for the other areas of the separation liner.

3.2.2.2 HELP Model

1. The HELP model is a computer simulation model developed by the U.S. Army Corps of Engineers for the U.S. EPA. The HELP model performs a water balance analysis of rainfall, runoff, evapotranspiration, soil-moisture storage, lateral drainage, and percolation using a quasi-two-dimensional simulation approach. The HELP model is typically used to estimate leachate generation and leachate head above the landfill liner system.

3.2.2.3 HELP Model Inputs

1. The HELP model utilizes climatological data, landfill component properties, and landfill design parameters to perform the water balance analysis. The parameters used in the HELP model runs are discussed below.

2. *Climate:* The HELP model includes a synthetic weather generator that can generate daily rainfall and mean daily temperatures based on climate data from various weather stations throughout the United States. For the Landfill B-19 HELP model simulations, the program's climatic data for the Bakersfield, California station were selected as the default data nearest to the landfill with generally similar climatic conditions. The Bakersfield station is located approximately 75 miles southeast of the KHF, with rainfall distribution and temperature patterns very similar to the Kettleman station.

3. *Landfill Component Properties*: The HELP model includes standardized selections for various types of soil or other landfill liner components which comprise the separation liner and the overlying Class II/III waste. Soil type 10 (Unified Soil Classification System designation of SC) was selected for the operations layer, daily and intermediate soil cover, cover foundation layer, and vegetative soil cover. Material type 19 (municipal waste with channeling) was selected for the waste. The geocomposite was modeled as a lateral drainage layer with a permeability of 10 cm/sec. Default soil type 21 (gravel with a permeability of 1×10^{-2} cm/sec) was selected for the LCRS drainage layer. The 60mil thick HDPE liner was modeled based on excellent installation procedures with 4 holes per acre installation defects and 4 holes per acre material defects.

3.2.2.4 HELP Model Results

1. HELP model (version 3.07) simulations were run to simulate a typical phase of construction of the separation liner/closure cover system for Landfill B-19. The simulations were performed for the revised configuration of the control cell of the Class II/III landfill. Additional, calculations performed by Shaw (2006) for the separation liner within the bioreactor portion of the Class II/III landfill was reviewed and the results incorporated. The output from the runs relevant to the closure of the Class I unit are included in Appendix E.

2. Peak Daily and Average Annual Generation: For the 11-acre control unit, the results of the 30-year simulation indicate that the peak daily leachate production rate in the LCRS drainage layer above the separation liner/closure cover will be 2,227 cubic feet (16,700 gallons) per day, the peak daily leachate leakage rate through the separation liner/closure cover will be 0.01 gallons per acre per day, and the average annual leakage through the separation liner is anticipated to be 0.172 cubic feet or 1.3 gallons. Once the bioreactor is in operation, the leachate generation rate over 4-acres will increase to a maximum of 40,000 gallons per day, thus the leachate generated from the entire separation liner would be 50,000 to 60,000 gallons. Infiltration through the separation liner is expected to remain very low given the steepness of the slopes and the highly transmissive layer maintaining the head to approximately 0.25-inches.

3. Long-term Generation: After the bioreactor ceases and the Class II/III final cover is applied, the peak daily leachate production rate and average annual leachate production rate diminish over time and approach zero. Consequently, the daily head on the liner also approaches zero and the daily leakage rate through the separation liner/closure cover remains zero gallons per acre per day.

3.2.2.5 Leachate Collection Capacity

1. In the design of the Class II/III landfill, a leachate collection point was located in the southeast corner of Landfill B-19, over a portion of the Class I landfill. RUST (1997) presented calculations that demonstrated that the capacity of the collection system exceeded twice the anticipated volume of leachate (as required per CCR Title 27). RUST (1997) concluded that the presence of the leachate collection sump should not impact the performance of the closure cover for the Class I landfill.

2. As a result of the Class II/III waste not being placed in the southern portion of Landfill B-19, the sump in the southeastern corner was no longer required. As originally designed, the leachate from the Class II/III waste is directed through the geocomposite drainage layer to an LCRS collection pipe (see Detail 1 on Sheet C-8) along the eastern side of Landfill B-19. The collection pipe connects to a "riser" pipe extending up from the LCRS sump in Phase IA.

3.2.3 SETTLEMENT AND COVER GRADES

3.2.3.1 Evaluation of Settlement

1. Evaluation of the settlement of the Class I waste underlying the separation liner is an important aspect of ensuring that positive drainage is maintained and that liquids will not pond on its surface. For this revision to the modified closure plan, the pre- and post-settlement grades of the separation liner were evaluated to demonstrate compliance with CCR Title 22, which requires that a minimum three percent grade be maintained on the final cover. Supporting calculations are provided in Appendix F.

2. For this revision to the modified closure plan, the main consideration for post-closure grades will be secondary settlement of the 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 Class I waste in Landfill B-19 range between 3H: 1V along the Phase IB slope to approximately 5% along the benched areas and the top of the prism. These grades have been designed to accommodate anticipated settlement and still maintain positive drainage off the landfill area. The settlement of the Class II/III waste prism was evaluated as part of the JTD.

3. Evaluation of the anticipated component parts of the overall settlement is presented in the following subsections.

Foundation Settlement

1. Consolidation of the bedrock and liner system was previously evaluated by Golder (1991) for continued Class I operations in Landfill B-19. The Golder analysis determined that foundation settlement will be approximately 1.35 feet (0.25 foot for bedrock, 0.7 foot for the secondary liner, and 0.4 foot for the primary liner). The cell configuration analyzed by Golder in 1991 is comparable to that proposed for the Landfill B-19 (including Class II/III wastes) with respect to the liner systems and total waste fill thicknesses; therefore, the foundation settlement previously determined by Golder was used in the overall settlement analysis.

Class I Waste Fill Settlement

1. The existing Class I waste will settle during Class II/III waste operations and continue to settle after closure. Settlement of the Class I waste was evaluated in two phases. The initial phase considers the time from placement (conservatively assumed to be placed instantaneously) of the Class II/III waste to the completion of Class II/III fill operations (Year 0 to Year 25). The second settlement phase

analyzed considered a period to 30 years after placement of Class II/III waste ceased (Year 25 to Year 55). The analyses indicate over 90 percent of settlement of the existing Class I waste will occur during Class II/III waste filling operations over the Class I area. Settlement values for the Class I waste are shown in Appendix F.

2. Generally accepted equations specific to quantifying waste settlement have not been developed due to the number of variables and range of site-specific conditions that affect settlement. Therefore, the waste fill settlement was evaluated using Terzaghi's one-dimensional consolidation theory, which address both primary and secondary settlement:

   - Primary settlement, or
   - $H_p = H_f * 1/(1+e_0) * C_c * \log_{10}(s_f/s_i)$

   Where:

H_p	=	primary settlement
H_f	=	fill height
e_0	=	initial void ratio
C_c	=	primary compression index
s_f	=	$s_i + s$ = final overburden pressure
s_i	=	initial overburden pressure
s	=	overburden

   - Secondary compression, or
   - $H_s = H_f * 1/(1+e_0) * C_a * \log_{10}(t_2/t_1)$

   Where:

H_s	=	secondary settlement
H_f	=	fill height
e_0	=	initial void ratio
C_a	=	secondary compression index
t_2	=	time at end of settlement analysis period
t_1	=	time at beginning of settlement analysis period

   The settlement values were then used to calculate the post-settlement grades after the post-closure maintenance period. Additionally, elongation of the separation liner was also calculated to demonstrate that the integrity of the separation liner system was not impacted. The results of the settlement and elongation calculations indicate that a minimum grade of 3% in the direction of flow is maintained for the final cover and separation liner, and that the liner system is not subjected to significant tensile stresses. Detailed output of the settlement and elongation calculations are presented in Appendix F.

3.2.3.2 Post-Closure Monitoring

Following completion of the closure of Landfill B-19 a survey will be performed by a licensed surveyor. The survey will include the closure cover, other containment features, monitoring facilities and drainage structures per § 66264.228(p). The baseline survey data is compared on an annual basis to determine the magnitude of settlement and evaluated to identify any potential problems. The annual post-closure survey returns to the same locations as the baseline survey to allow direct comparison of results. This system has been successfully utilized by the site for post-closure surveys for over 10-years.

3.2.4 SURFACE WATER DRAINAGE

3.2.4.1 Surface Water Drainage System Capacity Requirements

1. Pursuant to 22 CCR, the capacity of site drainage courses will be sufficient to accommodate flows from the Probable Maximum Precipitation (PMP) event, a 7.4-inch rainfall in a 24-hour duration storm. Drainage controls have been designed and will be constructed to limit, to the extent possible, ponding, infiltration, inundation, erosion slope failure, washout, and overtopping.

2. Surface drainage studies for the revised geometric configuration of Landfill B-19, including the Class I hazardous waste area were performed by Shaw-Emcon (June, 2004) to determine the runoff from the site during the PMP storm for developed conditions. Hydraulic analyses were subsequently performed to evaluate the capacity of the onsite conveyance structures during this peak storm event.

3. The calculation method for both studies involved dividing the site into individual drainage subareas, and determining the drainage flow lines, points of confluence, and hydrologic characteristics for each. Hydrologic analysis was then performed based on the Soil Conservation Service Method using TR-55 hydrology software to generate subarea peak flows, an overall peak flow leaving the site, and hydrograph for the 24-hour PMP storm event. Finally, the hydraulic analysis of the onsite conveyance structures was performed using Haestad Methods Flowmaster, which models Manning's open channel flow. A complete write-up for each study, including assumptions, subareas, calculation procedure, and computer analysis are presented in Appendix G.

4. All conveyance structures onsite are sized appropriately, with no adverse flooding or overflow conditions anticipated. A minimum of 3-inches of freeboard is provided for all channels during the 24-hour PMP event. Additional capacity is provided along roads and benches adjacent to the channel, increasing the available freeboard to 9-inches. Although there are no specific requirements for freeboard described in Title 27, the freeboard within the channel and adjacent roadway provide sufficient capacity to accommodate the 24-hour PMP with an adequate factor of safety.

3.2.4.2 Soil Loss Analysis

1. Soil loss calculations are presented in Appendix H that indicated that the Class I final cover design, once fully vegetated, would have an acceptable erosion rate (less than 1 ton/acre/year). The U.S. EPA recommends a maximum soil loss of 2 tons per acre per year for hazardous (Class I) waste landfill final covers. The calculations were prepared by Golder using the U.S. Department of Agriculture's Revised Universal Soil Loss Equation Version 2 (RUSLE2). The separation liner was excluded from the soil loss calculations as it would be buried by Class II/III waste.

2. Calculations are also presented for bare ground conditions for the Class I final cover. Bare ground conditions would result in a maximum of 7.5 tons/ac/year. This is an unacceptable level of erosion. Based on the results, a well-vegetated final cover will minimize the amount of erosion to acceptable levels.

3. Similar calculations were also performed for the Class II/III final cover and the stability buttress. Assuming vegetative slopes, the soil loss will be less than 1 ton/acre/year for all slopes. In all cases, bare ground yielded higher than acceptable erosion rates, up to 14 tons/acre/year.

4. Observation of the existing closed landfill slopes would support the low erosion rates. There have been no reports of rill erosion of the cover during the last 5 years of annual inspections performed by Golder.

3.2.5 BIOTIC EXCLUSION LAYER

1. The final cover for the Class I waste prism (not overlain by Class II/III waste) consists of a 2.5-foot thick vegetative layer combined with a geotextile and 40-mil HDPE geomembrane. This approach is consistent with the recommendations of BioSystems Analysis, Inc. (BioSystems, 1989) where a layer of HDPE geonet was to be installed between the clay and vegetative layer to discourage or prevent animals from burrowing into the cover system. Based on BioSystems recommendations, the "Rodent Management and Closure Cap Disturbance Mitigation Plan" (CWM, 1991) included the use of a barrier like the 40-mil HDPE geomembrane to discourage or prevent animals from burrowing into the cover system.

2. In areas where Class II/III waste has been placed, the closure cover for the Class I waste is covered with a 2-foot thick operations layer above the HDPE geomembrane. Additionally, the thickness of the Class II/III waste overlying the operations layer will range from a few feet to over 40 feet once filling is complete.

3. Thus, it is concluded that both the separation liner and the final cover for the Class I landfill are not susceptible to biotic intrusion.

3.2.6 FROST PROTECTION

1. The cover section has been analyzed with regard to potential for significant deterioration from frost penetration. Review of design depths of frost penetration reported in literature for the Kettleman Hills area indicates that the maximum depth of frost penetration is approximately 2 inches (EPA, 1979). The vegetative layer covering the composite liner system of the final cover is 30 inches thick. In areas where Class II/III waste has been placed, the combined thickness over the composite separation liner system is greater than 30 inches thick. Therefore, the barrier components of the cover system are not subject to frost penetration.

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FIGURES

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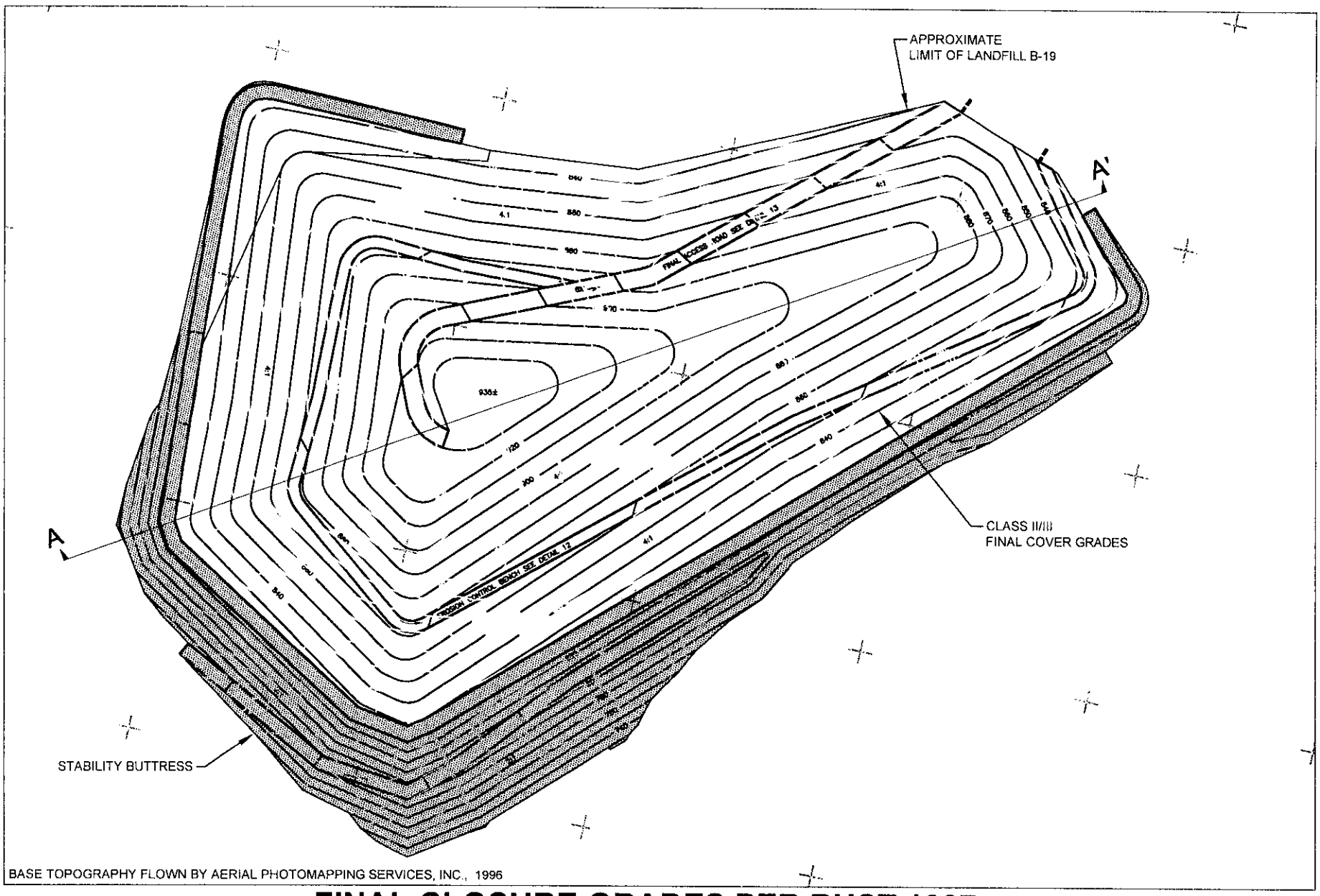
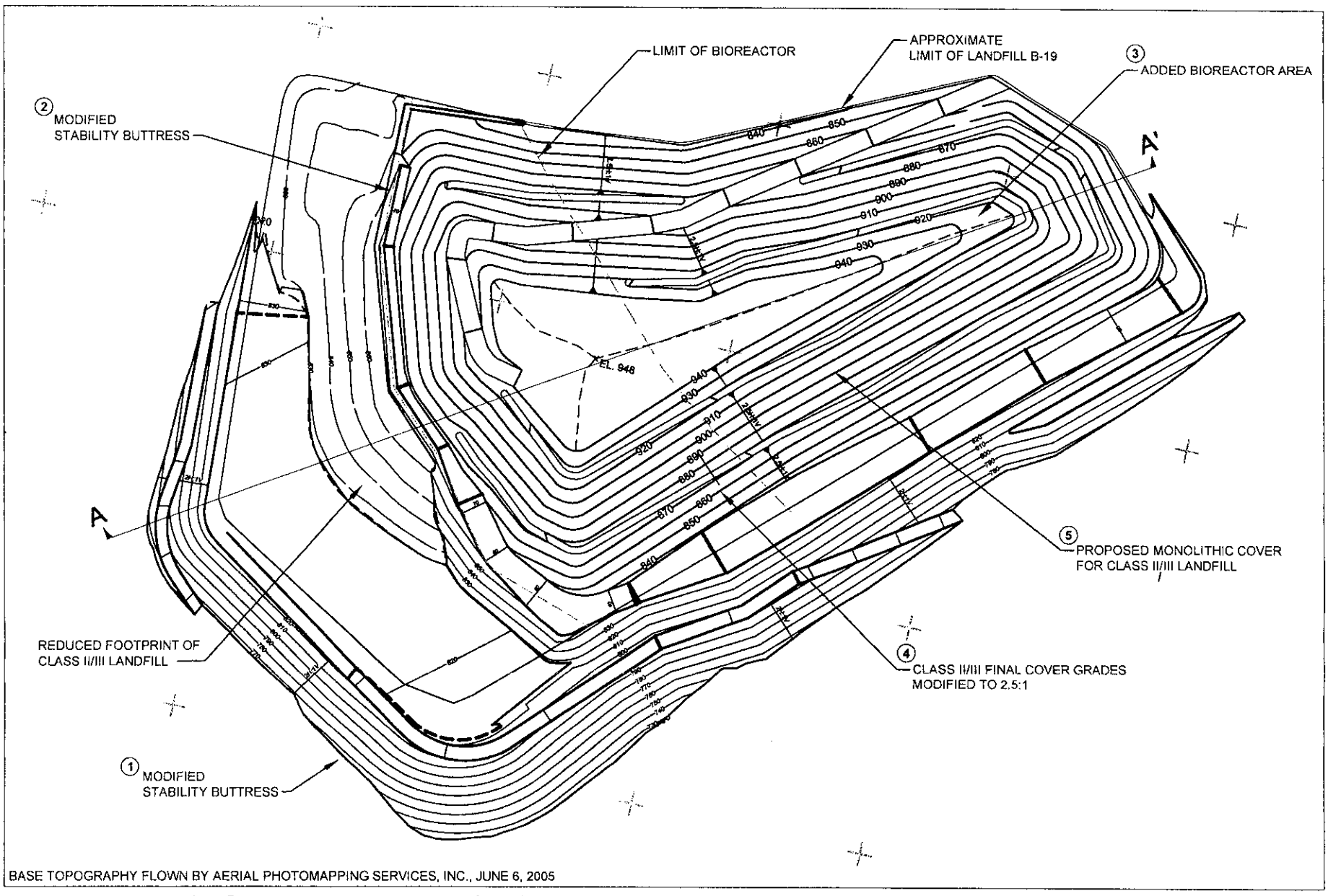


FINAL CLOSURE GRADES PER RUST 1997



MODIFIED FINAL CLOSURE GRADES (APPROXIMATELY 2008)

SEE FIGURE 1-2 FOR CROSS-SECTION

(1) DENOTES MODIFICATION FROM RUST 1997 CLOSURE PLAN

300 0 300

1" = 300' Feet

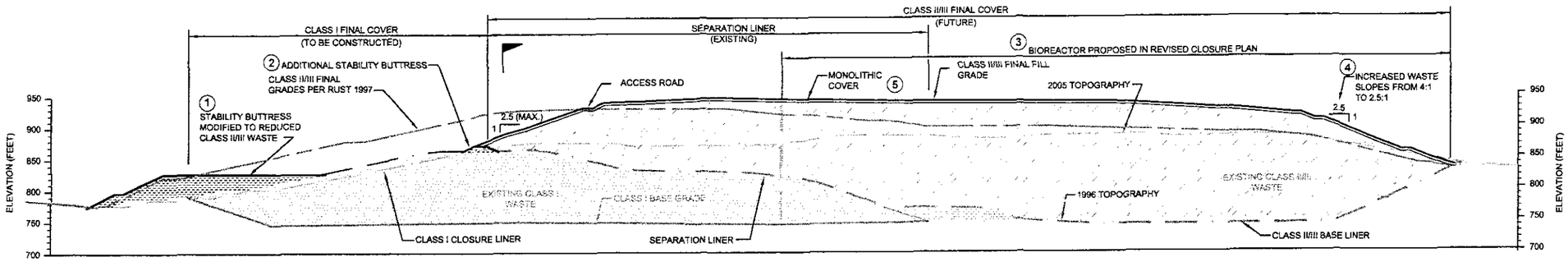
Golder Associates

Project No.: 053-1910	Date: Oct. 2005
Drawn by: KJK	Checked by: SGS

FIGURE 1-1

PROPOSED CHANGES TO FINAL COVER

CHEMICAL WASTE MANAGEMENT, INC.
KETLLEMAN HILLS FACILITY



NOTE
SEE FIGURE 1-1 FOR CROSS-SECTION LOCATION.

(1) DENOTES MODIFICATION FROM RUST 1997 CLOSURE PLAN.

SECTION A

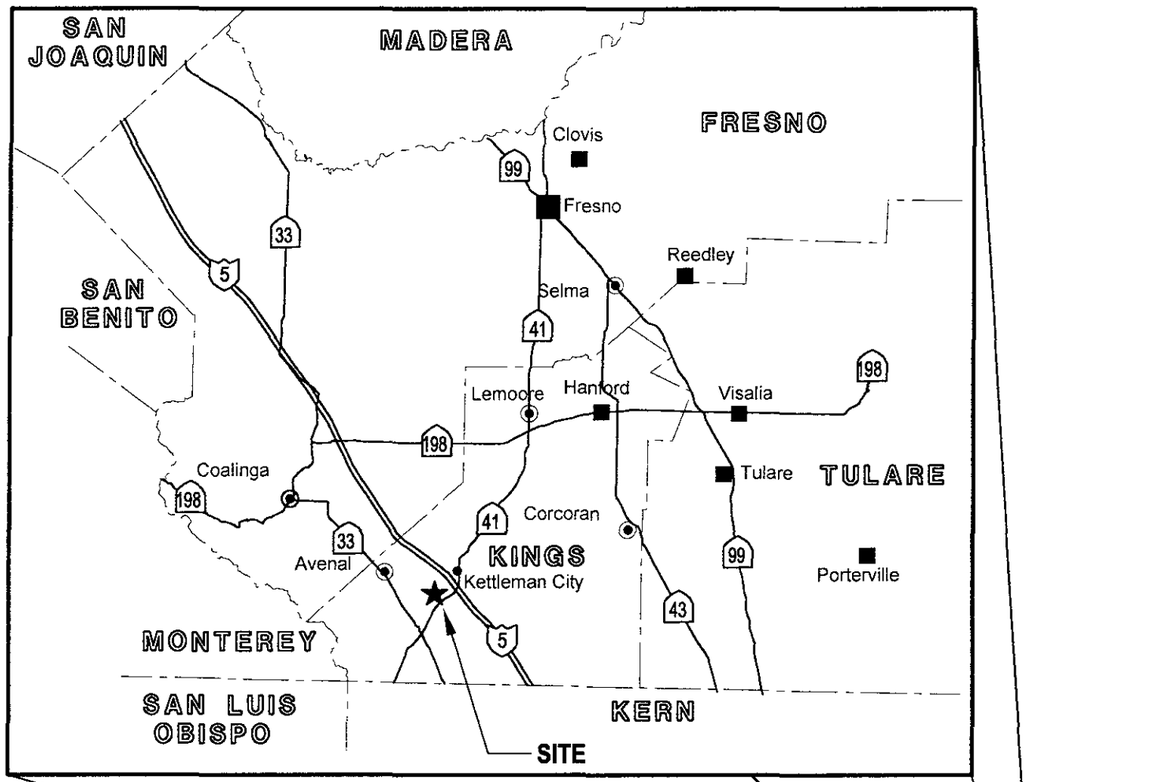
0 200 400'

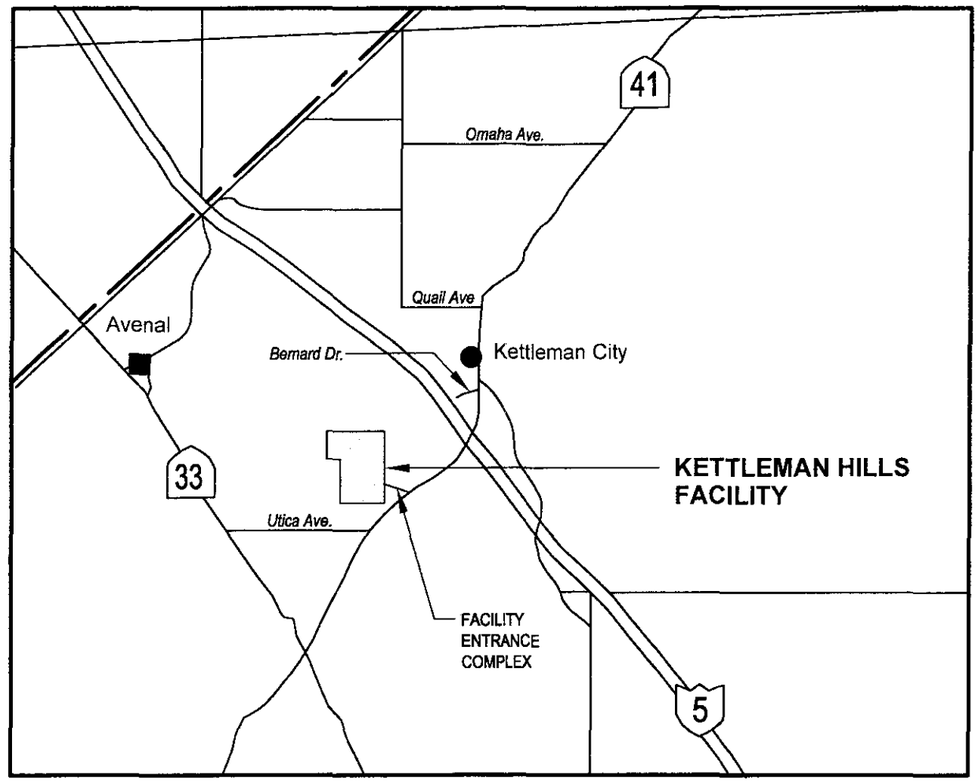
1 Inch = 200 Feet

Golder Associates	Project No.: 033-1844	Date: 9/19/06
	Drawn by: KJK	Checked by: SGS

FIGURE 1-2
PROPOSED CHANGES TO FINAL COVER - CROSS-SECTION
CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

S:\cad\Drawings_Kettleman LF\053-1910.B-19.CP\033-1844B19CP-05.dwg 11/20/2006 10:35





PROJECT LOCATION
NOT TO SCALE

REGIONAL LOCATION MAP

0 20 40

APPROXIMATE SCALE
1 Inch = 20 Miles

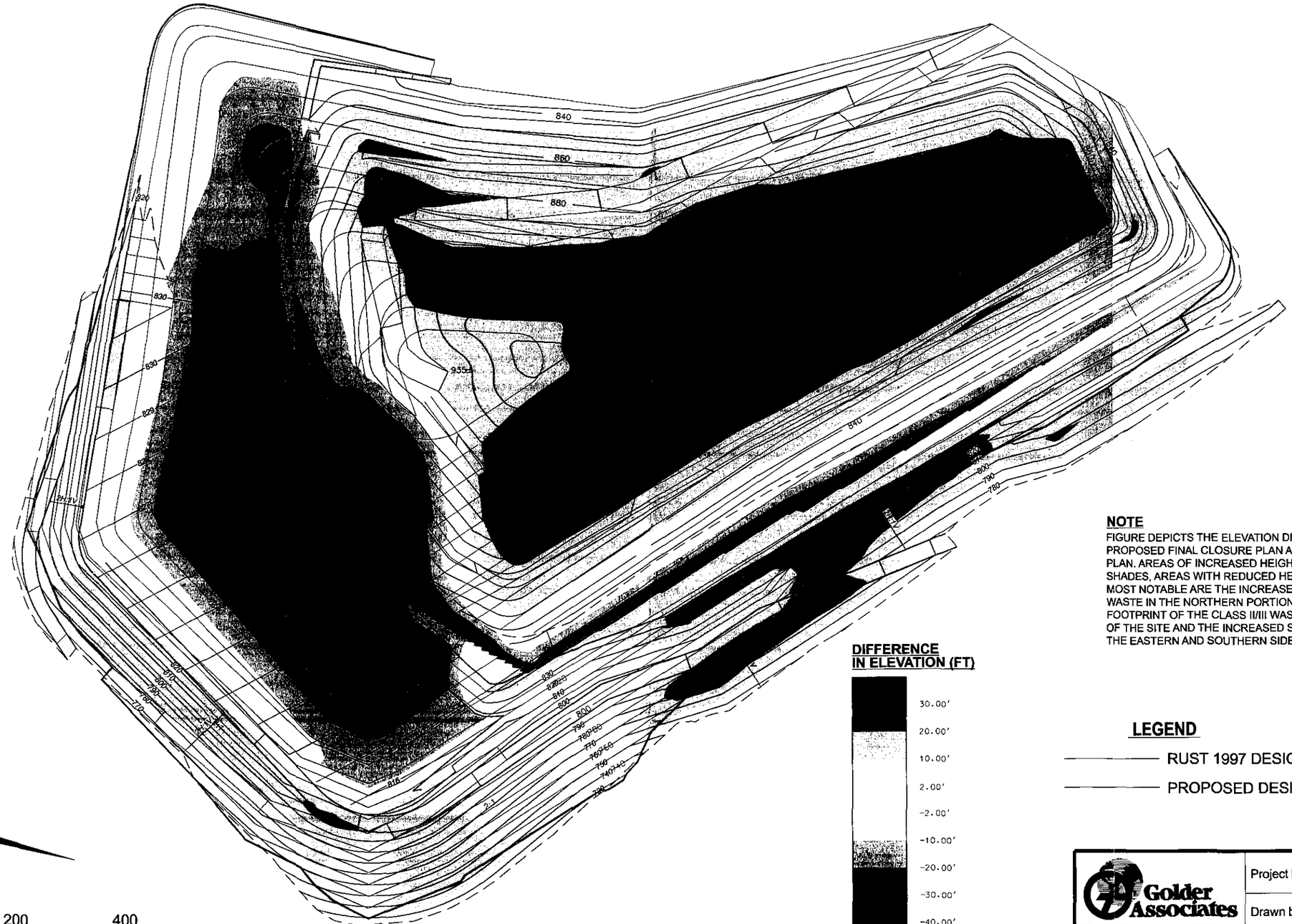
Golder Associates	Project No.: 053-1910	Date: April. 2006
	Drawn by: KJK	Checked by: SGS

FIGURE 1-3

LOCATION MAP

CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

S:\cad\Drawings_Ketti... ...F\053-1910.B-19.CP\053-1853\B19CP-01.dwg 11/20/2006, 10:36



NOTE

FIGURE DEPICTS THE ELEVATION DIFFERENCE BETWEEN THE PROPOSED FINAL CLOSURE PLAN AND THE RUST 1997 CLOSURE PLAN. AREAS OF INCREASED HEIGHT ARE SHOWN IN BLUE SHADES, AREAS WITH REDUCED HEIGHT ARE IN RED SHADES. MOST NOTABLE ARE THE INCREASED ELEVATIONS OF CLASS II/III WASTE IN THE NORTHERN PORTION OF THE SITE, REDUCED FOOTPRINT OF THE CLASS II/III WASTE IN THE SOUTHERN PORTION OF THE SITE AND THE INCREASED SIZE OF THE BUTTRESS ALONG THE EASTERN AND SOUTHERN SIDES.

LEGEND

——— RUST 1997 DESIGN

——— PROPOSED DESIGN

Golder Associates

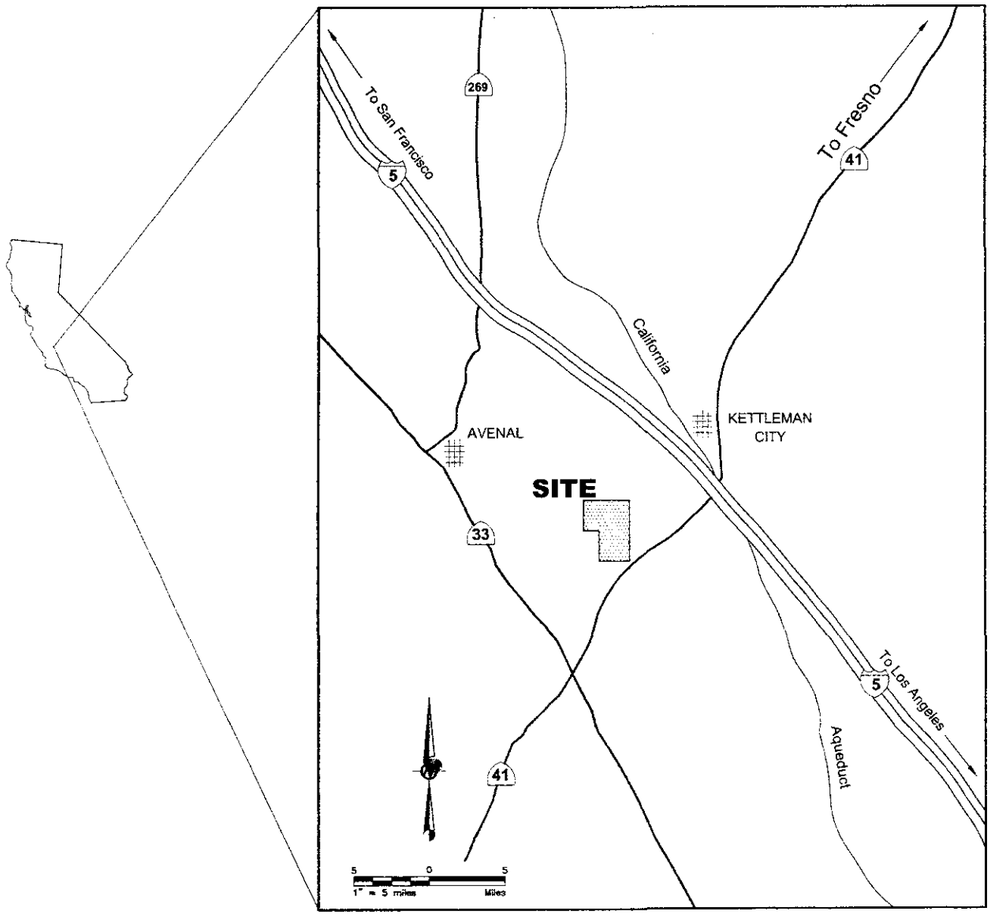
Project No.: 053-1910	Date: 4/10/06
Drawn by: KJK	Checked by: SGS

FIGURE 2-1
ISOPACH OF CHANGES IN ELEVATION OF LANDFILL B-19 FINAL GRADES
CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY

$files$

CHEMICAL WASTE MANAGEMENT, INC.
KETTLEMAN HILLS FACILITY
MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA
OCTOBER 2005



LOCATION MAP

LEGEND

GENERAL LINES

- CONDITIONAL USE PERMIT BOUNDARY (C.U.P.)
- LIMIT OF CLASS I WASTE
- LIMIT OF SEPARATION LINER
- LIMIT OF CUT
- LIMIT OF FILL
- GRADE BREAK
- LIMIT OF B-19 LANDFILL
- LIMIT OF PROPOSED BIOREACTOR
- FENCE LINE
- DRAINAGE CHANNEL
- DOWNCHUTES / PIPES
- EXISTING ELEVATION CONTOURS (JUNE 2005)
- EXISTING ROADWAY

HATCH PATTERNS

- SUBGRADE
- DRAINAGE AGGREGATE
- OPERATIONS LAYER
- EXISTING CLASS I WASTE
- CONCRETE
- CLASS II/III WASTE
- PROPOSED BUTTRESS/ STRUCTURAL FILL
- CLOSED CLASS I LANDFILL
- CLASS I WASTE (TO BE CLOSED)
- EXISTING PERIMETER BUTTRESS

ABBREVIATIONS

APPROX.	APPROXIMATE
DIA.	DIAMETER
E	EASTING
EL.	ELEVATION
FL	FLOW LINE
FT.	FOOT/FEET
GCL	GEOSYNTHETIC CLAY LINER
HDPE	HIGH DENSITY POLYETHYLENE
IN.	INCH/INCHES
MAX.	MAXIMUM
MIN.	MINIMUM
N	NORTHING
NOM.	NOMINAL
NTS	NOT TO SCALE
TYP.	TYPICAL

SYMBOLS

- 2H:1V — SLOPE INDICATOR (PLAN)
- 2 / 1 — SLOPE INDICATOR (DETAIL)
- 2% — GRADE INDICATOR
- 1000 — SURVEY CONTROL POINT
- SURVEY BENCHMARK
- GROUNDWATER MONITORING WELL
- GAS WELLS

GEOSYNTHETICS

- GEOMEMBRANE
- GCL
- FILTER AND UV GEOTEXTILE
- CUSHION GEOTEXTILE
- GEOCOMPOSITE

KEY

1 / C-2 | C-4

- DETAIL/SECTION DESIGNATION
- DRAWING WHERE SECTION/DETAIL IS LOCATED
- DRAWING WHERE SECTION/DETAIL IS FIRST REFERENCED

SHEET NO.	TITLE	REVISION
T-1	TITLE SHEET	B
C-1	SITE PLAN	B
C-2	EXISTING CONDITIONS	B
C-3	GEOMEMBRANE PREPARATION PLAN	B
C-4	FINAL GRADING PLAN	B
C-5	FILL SEQUENCE PLAN	B
C-6	SECTIONS	B
C-7	DETAILS	B
C-8	DETAILS	B
C-9	FINAL DRAINAGE PLAN	B
C-10	BORROW AREA GRADING PLAN	B

NOTE: THESE DRAWINGS ARE BASED ON THE "MODIFIED CLOSURE PLAN" PREPARED BY RUST E & I DATED 1997.

ISSUED FOR REGULATORY APPROVAL

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	08/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	11/21/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

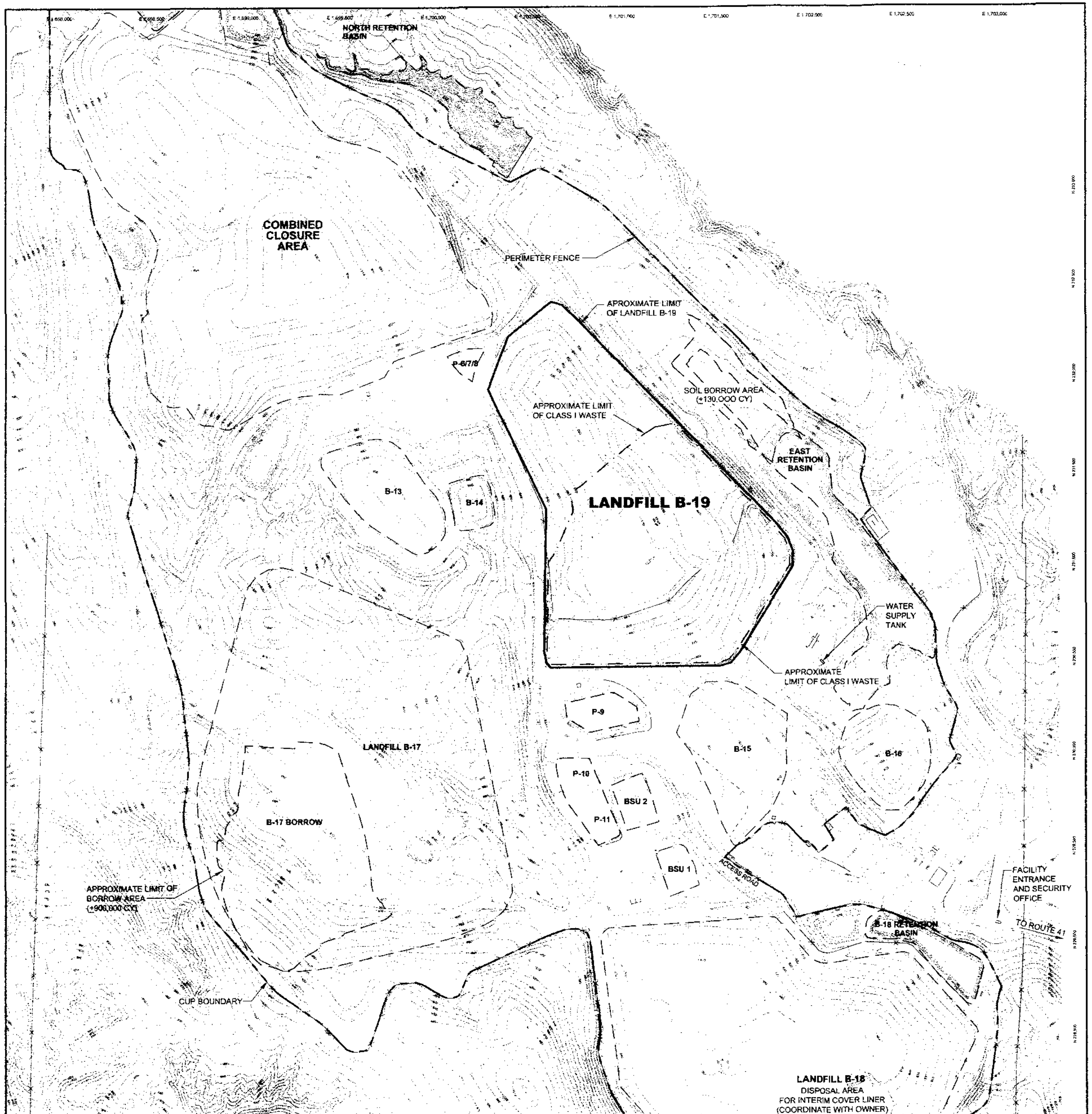
MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

TITLE SHEET

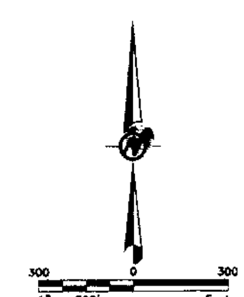
SHEET NUMBER

T-1

1 OF 11 SHEETS



BASE TOPOGRAPHY FLOWN BY AERIAL MAPPING SERVICES, INC., JUNE 6, 2005



ISSUED FOR REGULATORY APPROVAL

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	11/21/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

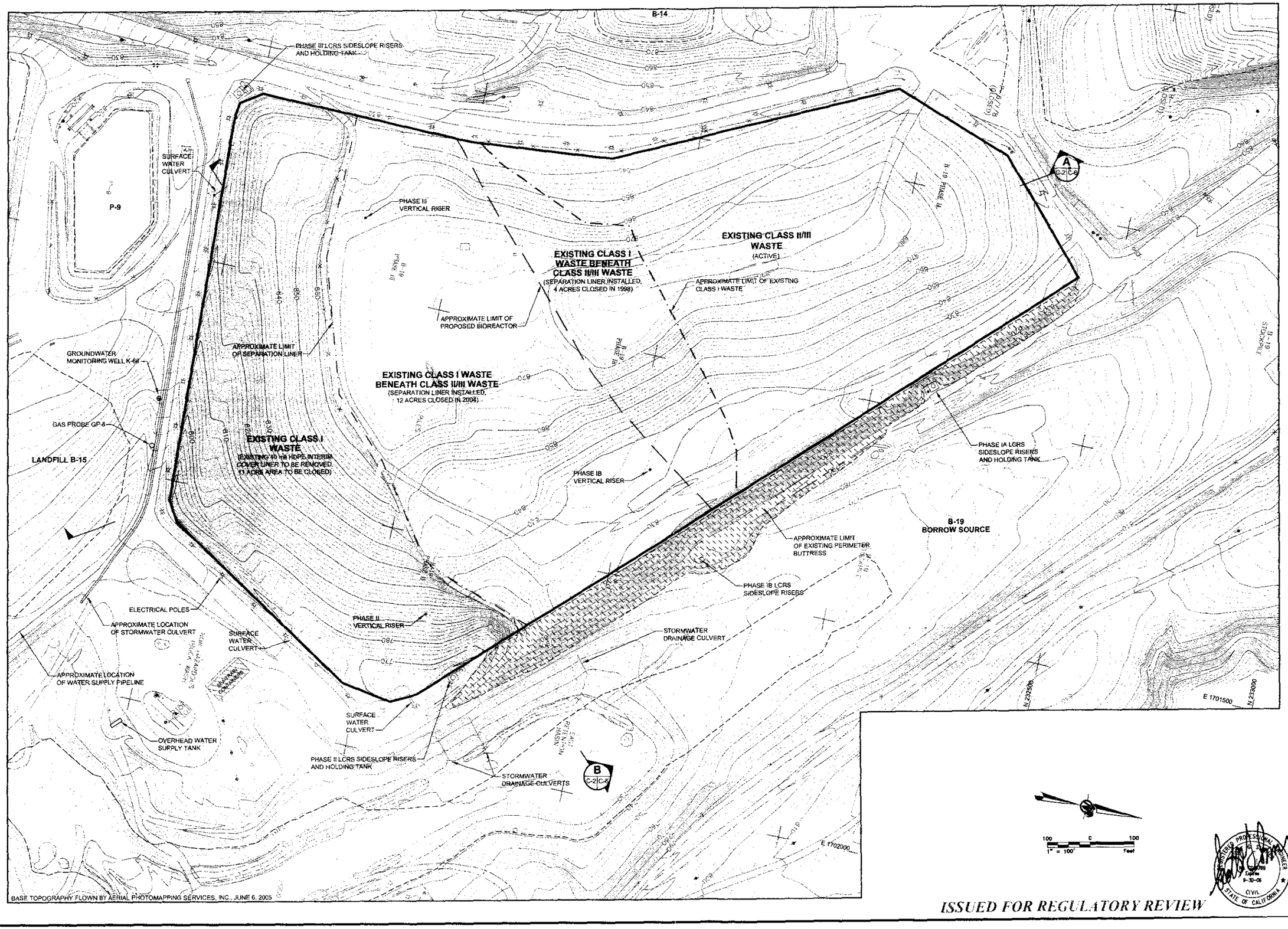
MODIFIED CLOSURE PLAN FOR B-19 CLASS I LANDFILL

SITE PLAN

SHEET NUMBER

C-1

2 OF 11 SHEETS



BASE TOPOGRAPHY FLOWN BY AERIAL PHOTOMAPPING SERVICES, INC., JUNE 6, 2005

ISSUED FOR REGULATORY REVIEW

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BPM	KJK	SGS
B	11/21/05	ISSUED FOR REGULATORY REVIEW	BPM	KJK	SGS

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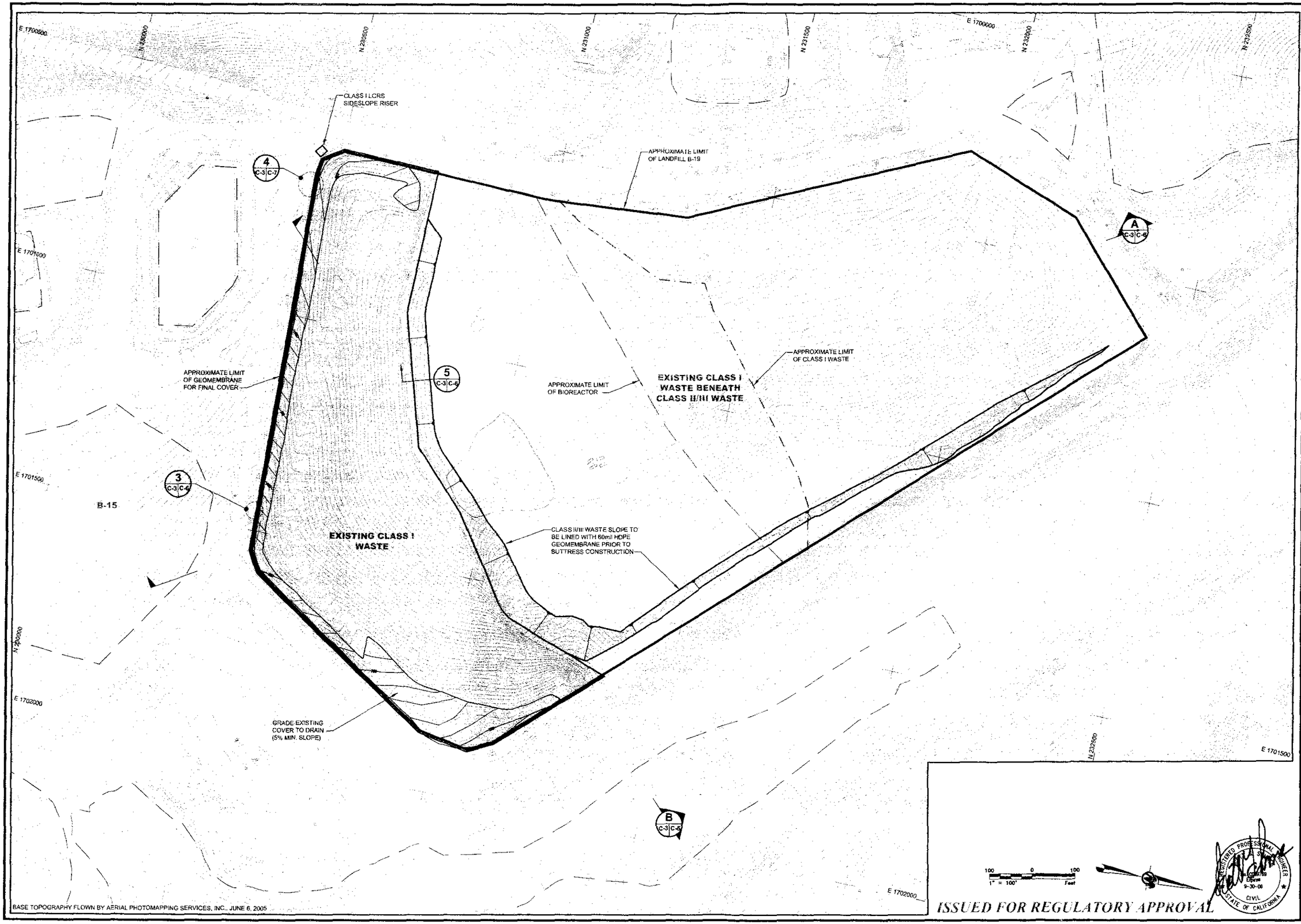
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

EXISTING CONDITIONS

SHEET NUMBER
C-2
3 OF 11 SHEETS



BASE TOPOGRAPHY FLOWN BY AERIAL PHOTOMAPPING SERVICES, INC., JUNE 6, 2005

ISSUED FOR REGULATORY APPROVAL

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	10/10/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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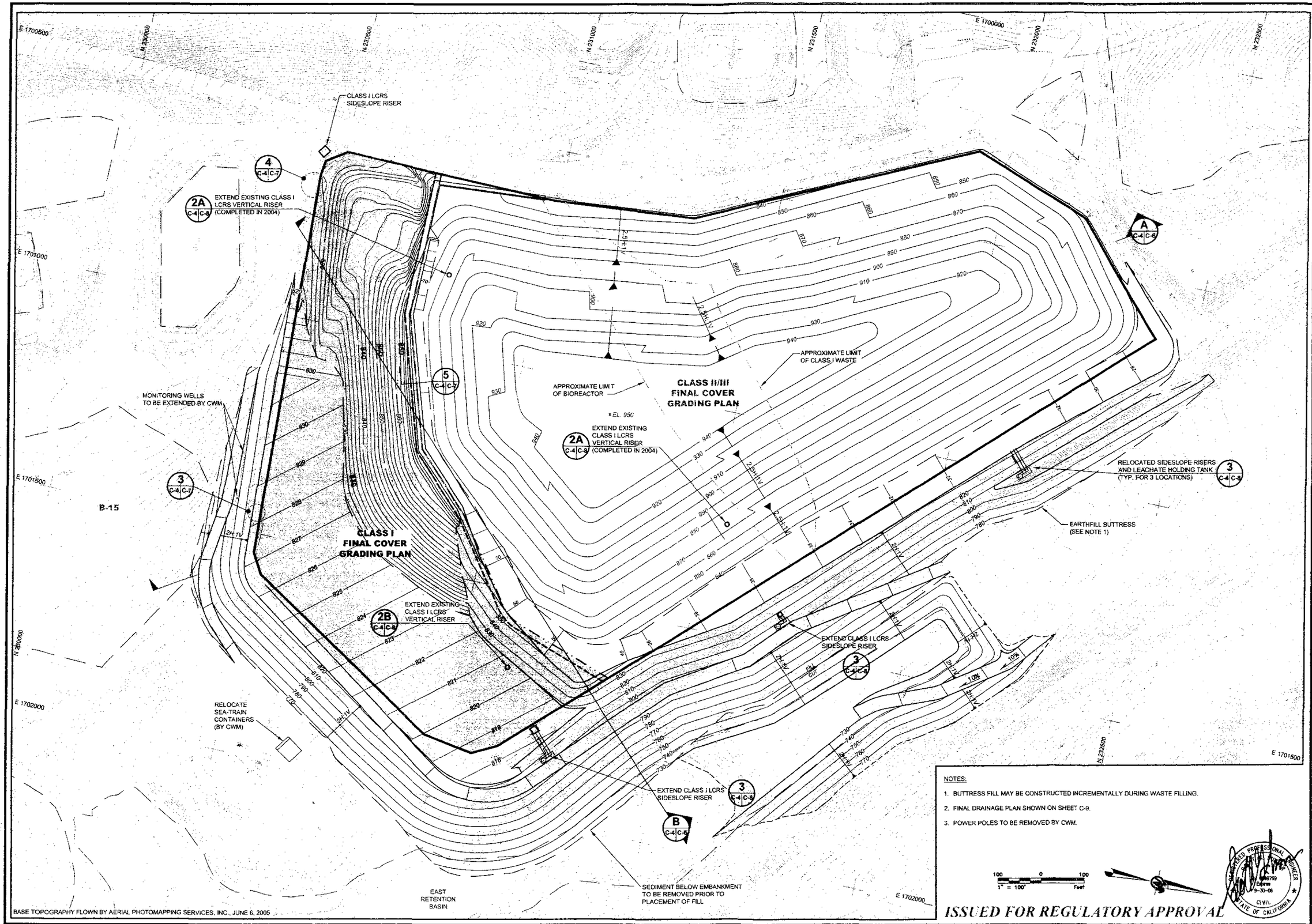
35251 OLD SKYLINE ROAD
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

GEOMEMBRANE PREPARATION PLAN

REGISTERED PROFESSIONAL ENGINEER
No. C061759
Expires 9-30-06
CIVIL
STATE OF CALIFORNIA

SHEET NUMBER
C-3
4 OF 11 SHEETS



NOTES:

1. BUTTRESS FILL MAY BE CONSTRUCTED INCREMENTALLY DURING WASTE FILLING.
2. FINAL DRAINAGE PLAN SHOWN ON SHEET C-9.
3. POWER POLES TO BE REMOVED BY CWM.

100 0 100
1" = 100' Feet

ISSUED FOR REGULATORY APPROVAL

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BPM	KJK	SGS
B	11/21/05	ISSUED FOR REGULATORY APPROVAL	BPM	KJK	SKS

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35251 OLD SKYLINE ROAD
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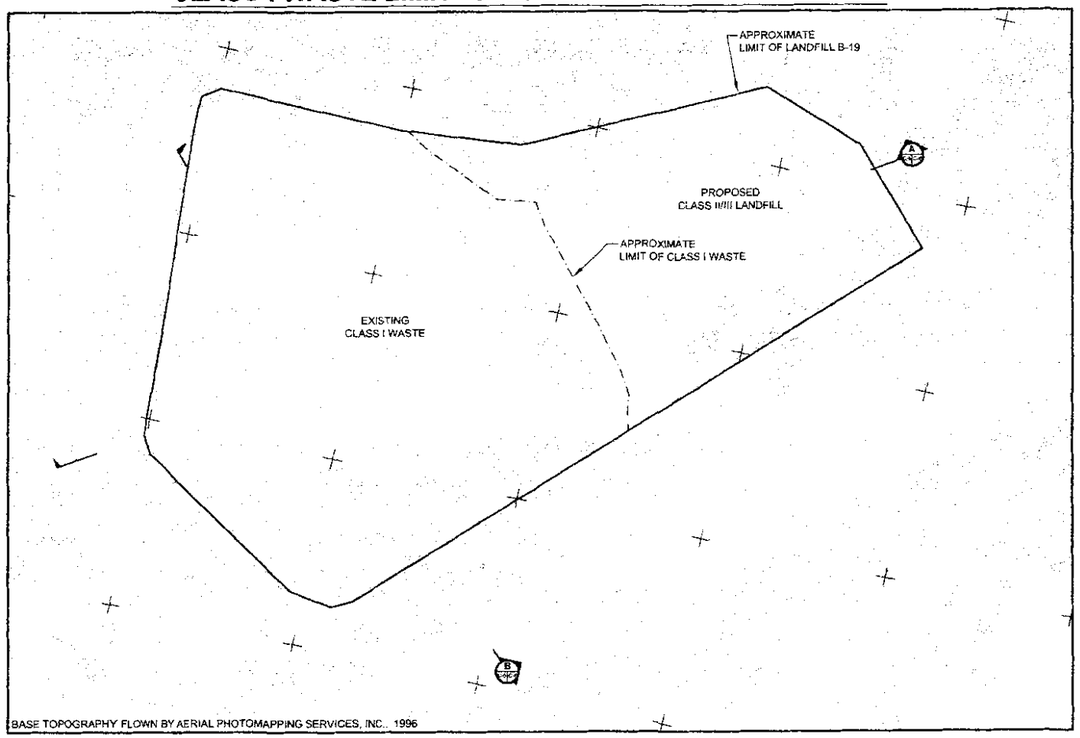
MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

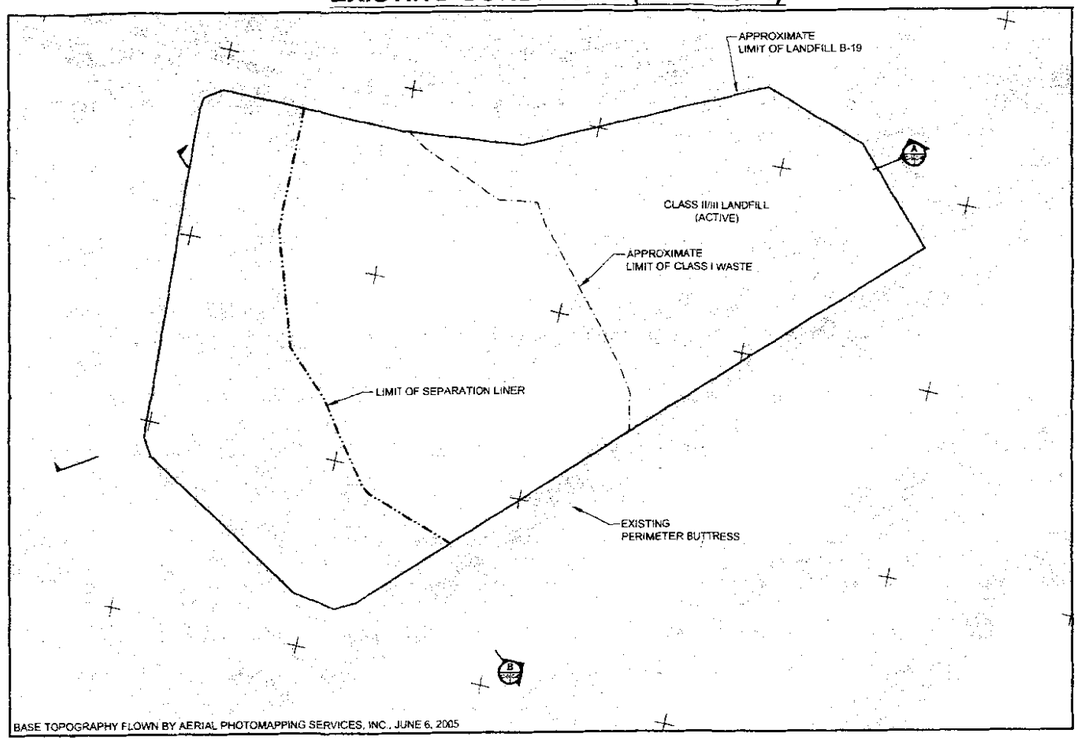
FINAL GRADING PLAN

SHEET NUMBER
C-4
5 OF 11 SHEETS

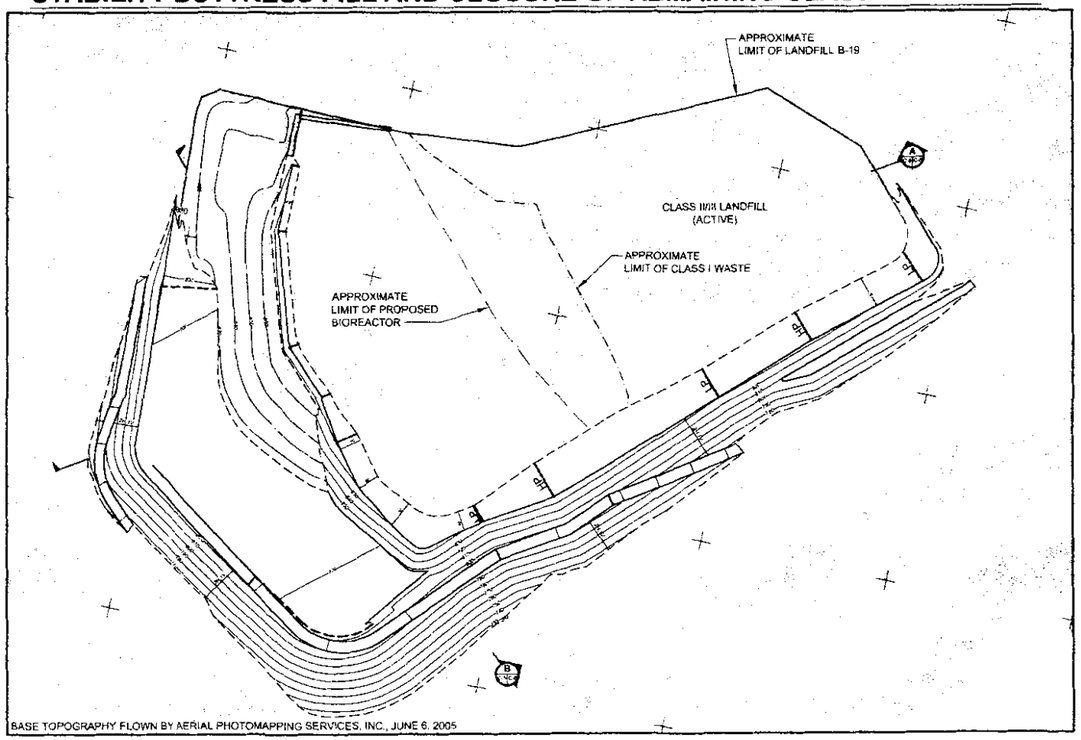
CLASS I WASTE LIMIT - PRE-CLASS II/III DEVELOPMENT



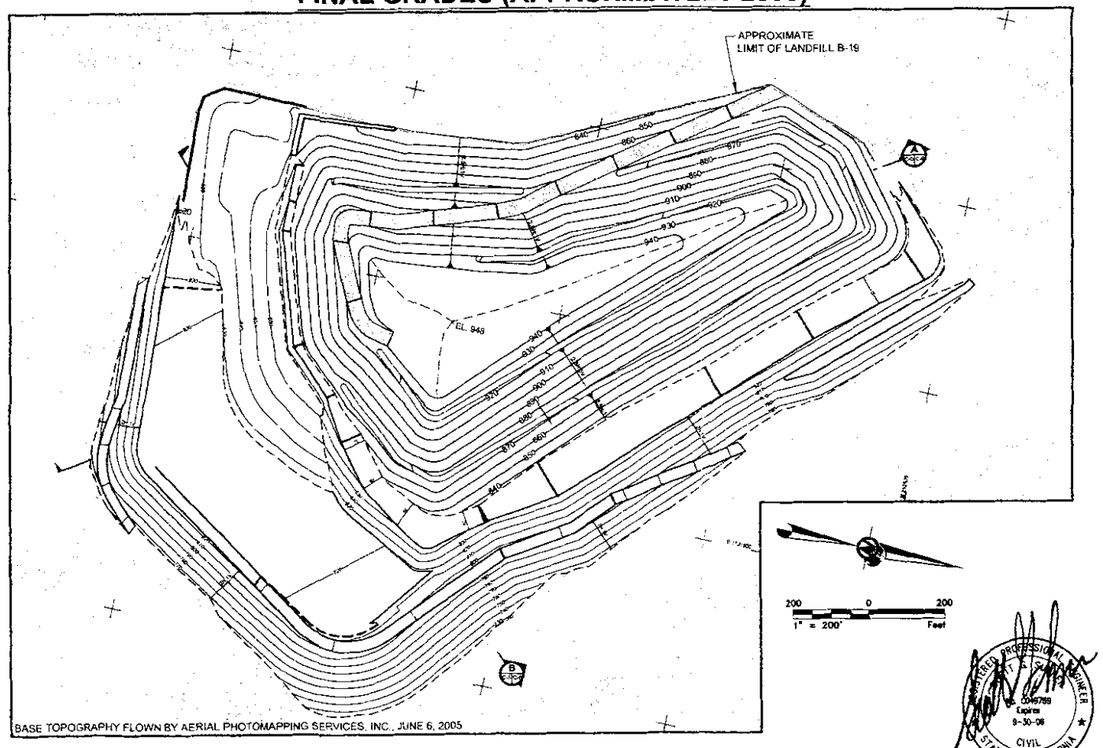
EXISTING CONDITIONS (JUNE 2004)



STABILITY BUTTRESS FILL AND CLOSURE OF REMAINING CLASS I - 2005/2006



FINAL GRADES (APPROXIMATELY 2008)



REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	09/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	10/10/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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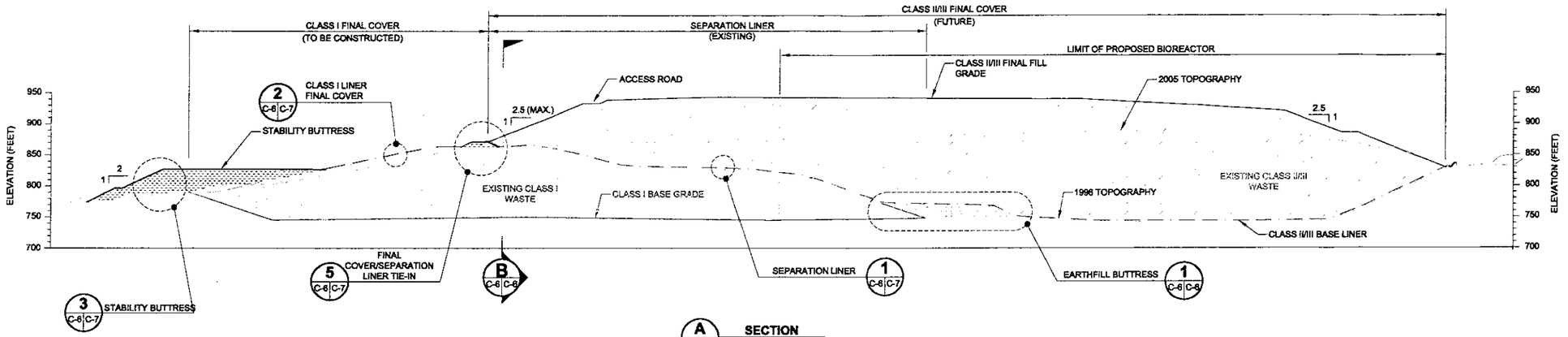
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

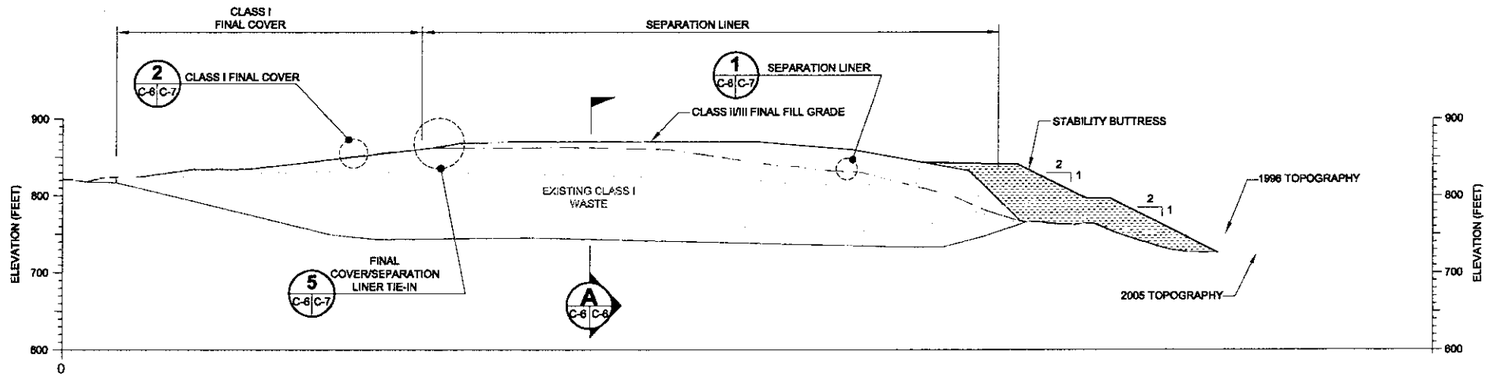
FILL SEQUENCE PLAN

SHEET NUMBER
C-5
5 OF 11 SHEETS

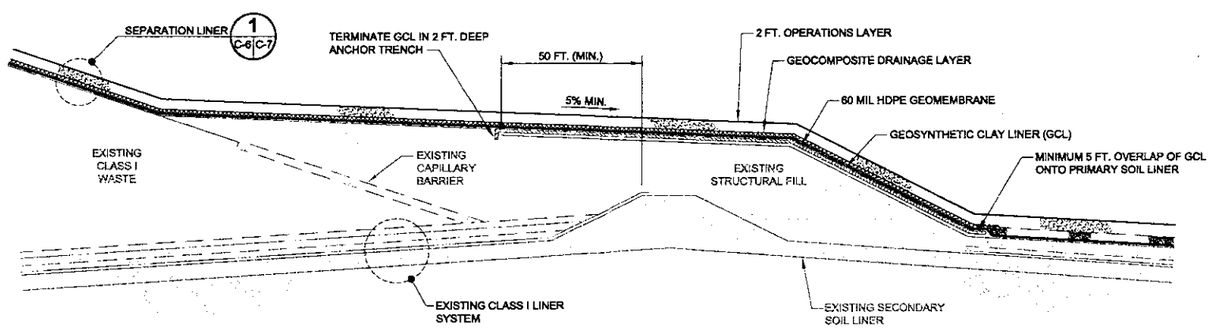
ISSUED FOR REGULATORY APPROVAL



A C-2,C-3,C-4 C-5 C-6 **SECTION**
SCALE: 1" = 200'



B C-2,C-3,C-4 C-5 C-6 **SECTION**
SCALE: 1"=100'



1 C-6 C-6 **EXISTING EARTHFILL BUTTRESS**
NOT TO SCALE

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/05/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	11/27/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	EGS
C	9/18/06	REISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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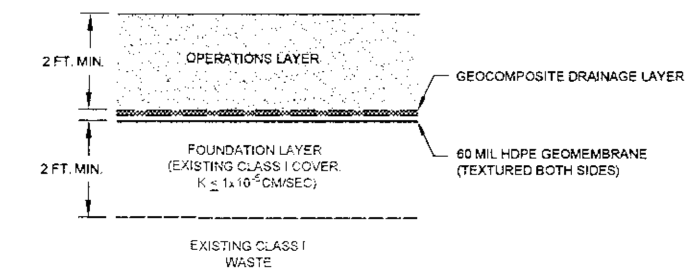
KETTLEMAN HILLS FACILITY
35251 OLD SKYLINE ROAD
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

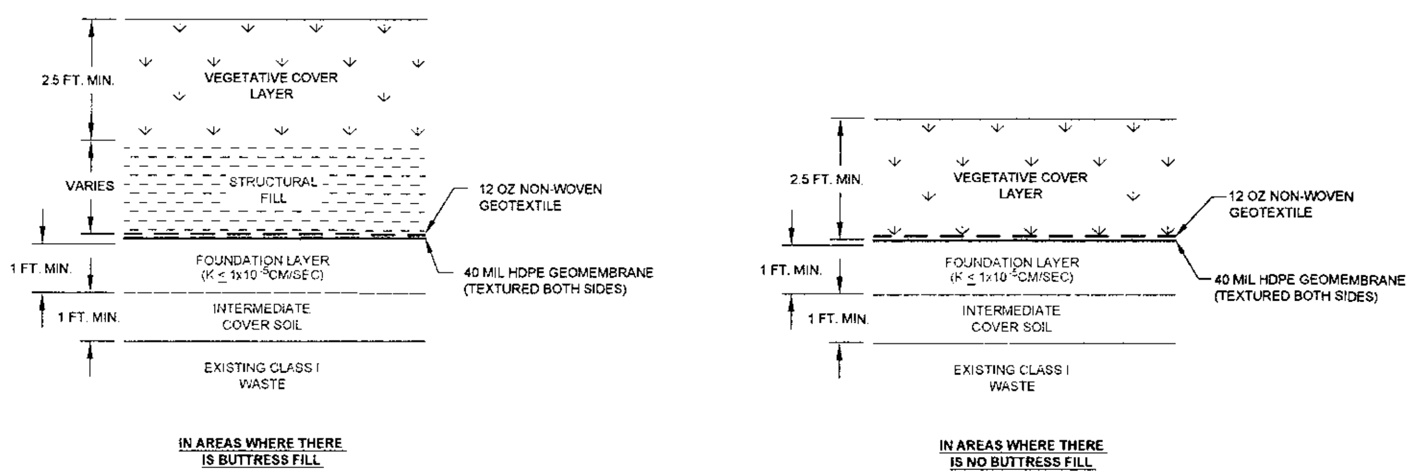
SECTIONS

REGISTERED PROFESSIONAL ENGINEER
CIVIL
CA 49769
Expires 9-30-06
STATE OF CALIFORNIA

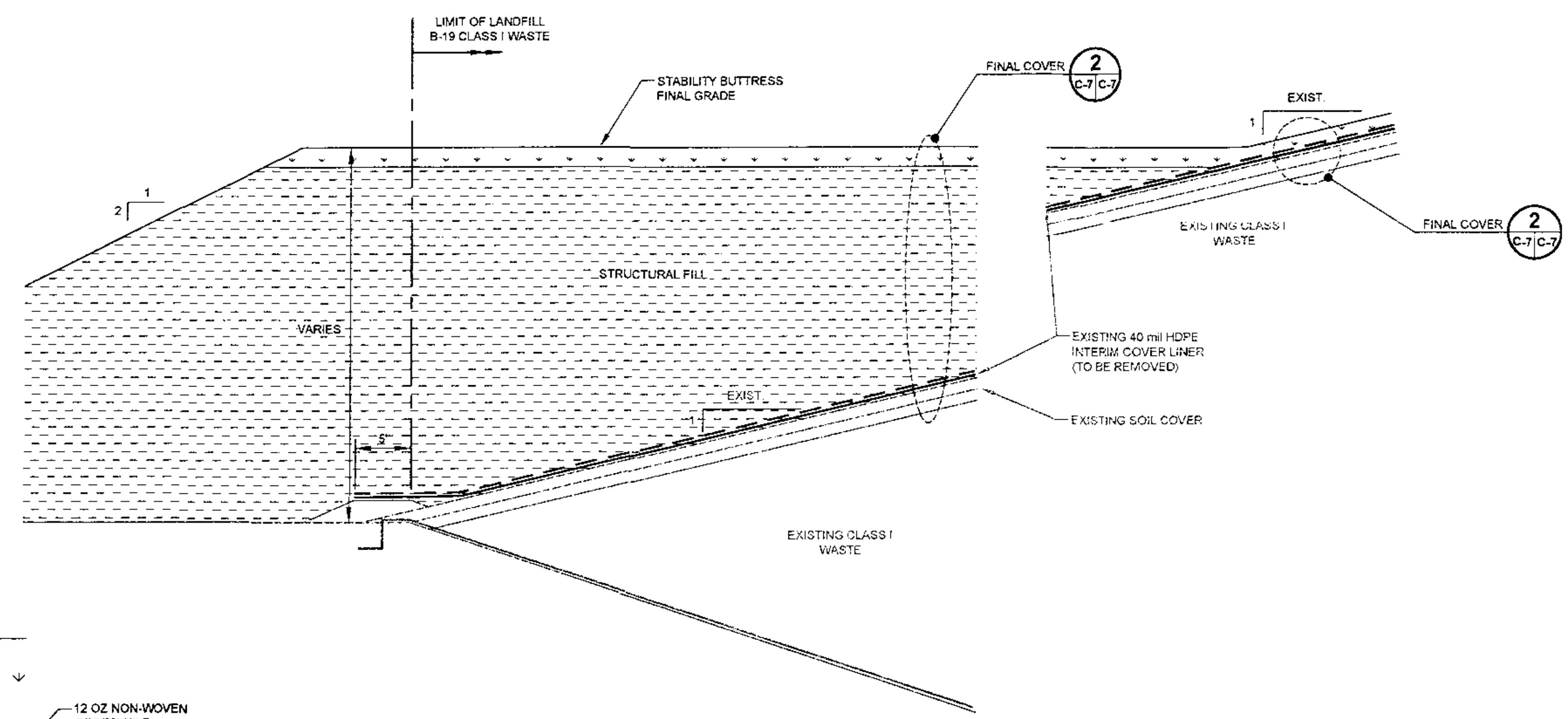
SHEET NUMBER
C-6
7 OF 11 SHEETS



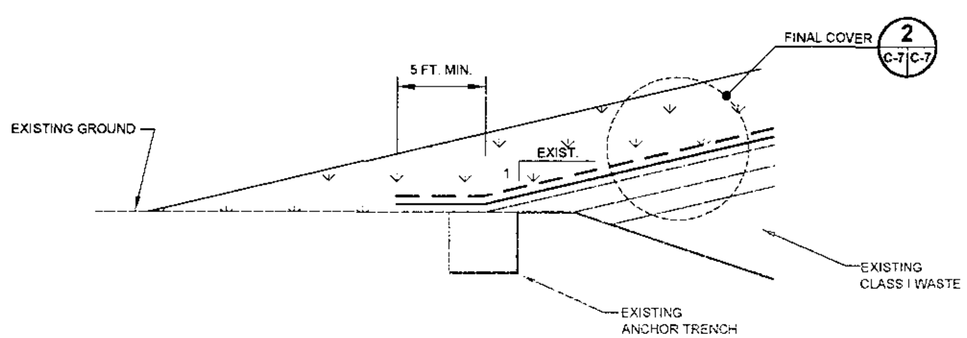
1 C-6,C-7 | C-7 SEPARATION LINER DETAIL (TYP.)
N.T.S.



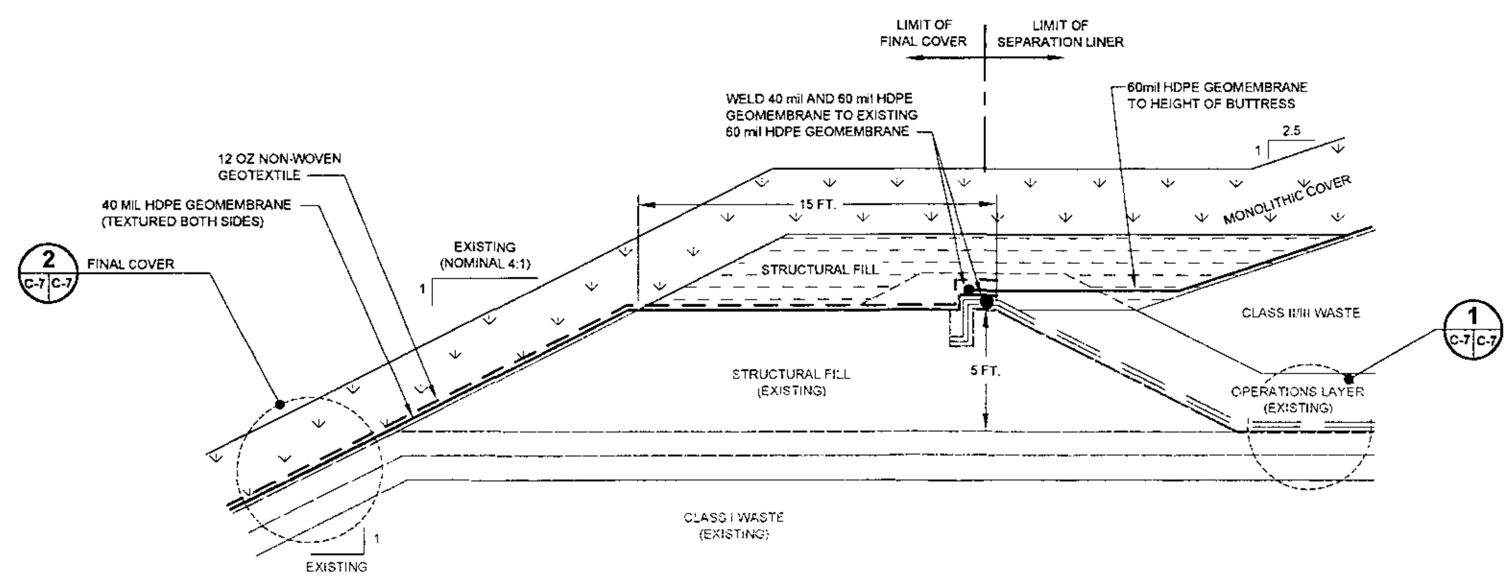
2 C-4,C-6,C-7 | C-7 FINAL COVER DETAIL (TYP.)
N.T.S.



3 C-4 | C-7 FINAL COVER TERMINATION DETAIL - STABILITY BUTTRESS (TYP.)
N.T.S.



4 C-4 | C-7 FINAL COVER TERMINATION DETAIL (TYP.)
N.T.S.



5 C-4,C-6 | C-7 FINAL COVER/SEPARATION LINER TIE-IN DETAIL (TYP.)
N.T.S.

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SGS
B	11/21/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS
C	9/16/06	REISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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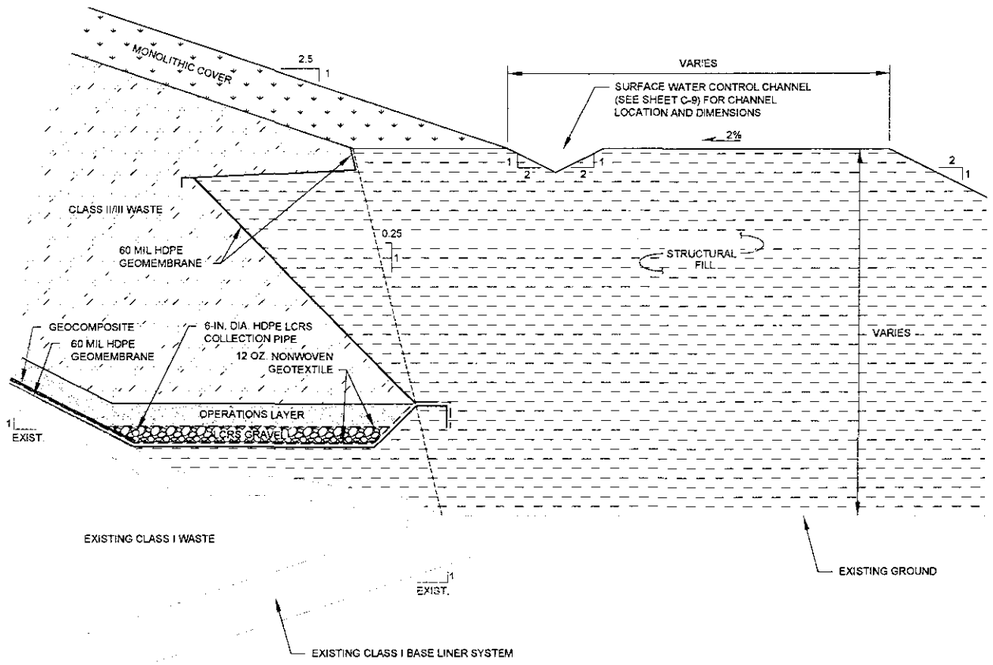
35251 OLD SKYLINE ROAD
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN FOR B-19 CLASS I LANDFILL

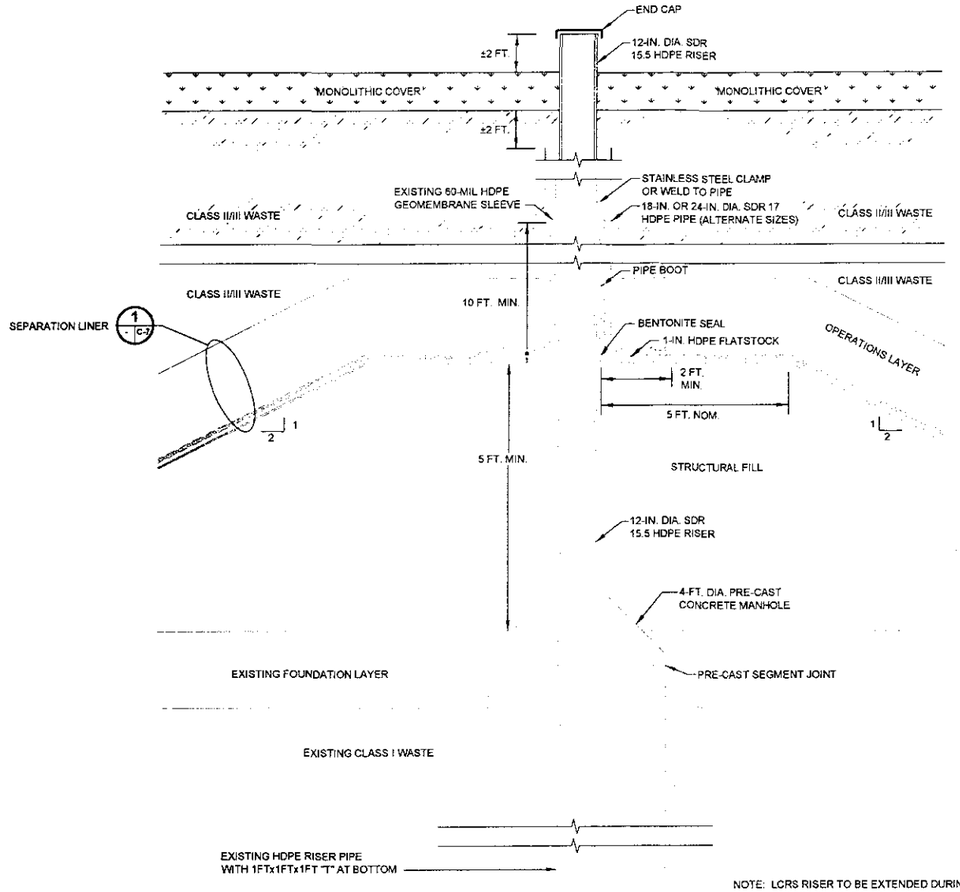
DETAILS

REGISTERED PROFESSIONAL ENGINEER SCOTT ... C046283 Expires 9-30-06 CIVIL STATE OF CALIFORNIA

SHEET NUMBER
C-7
8 OF 11 SHEETS

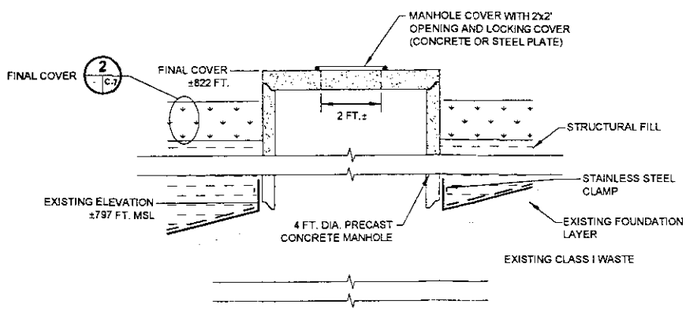


PERIMETER STABILITY BUTTRESS DETAIL (TYP.)
1 / C-4 | C-5
N.T.S.

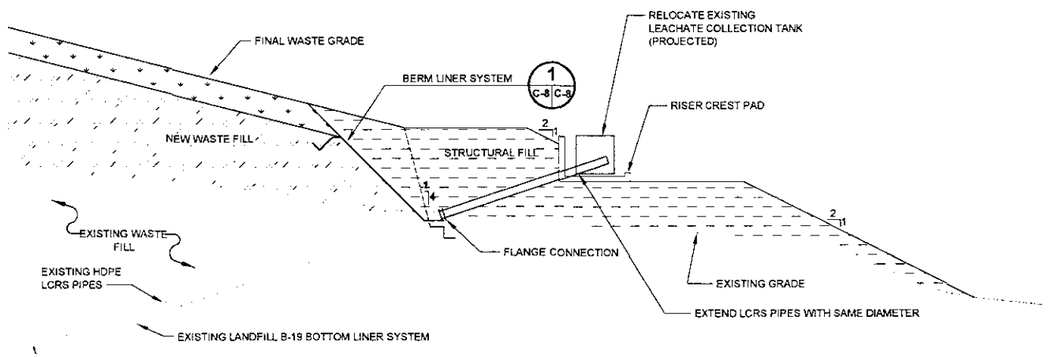


NOTE: LCRS RISER TO BE EXTENDED DURING CLASS II/III OPERATIONS BY CWM.

EXISTING CLASS I VERTICAL LCRS RISER EXTENSION DETAIL
2A / C-4 | C-8
(PHASE IB AND PHASE 3) N.T.S.



CLASS I VERTICAL LCRS RISER EXTENSION DETAIL
2B / C-4 | C-8
(PHASE 2) N.T.S.



EXTEND CLASS I LCRS SIDESLOPE RISER
3 / C-4 | C-8
N.T.S.

REV.	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/20/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SKS
B	10/19/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS
C	9/16/06	REISSUED FOR REGULATORY APPROVAL	BFM	KJK	SGS

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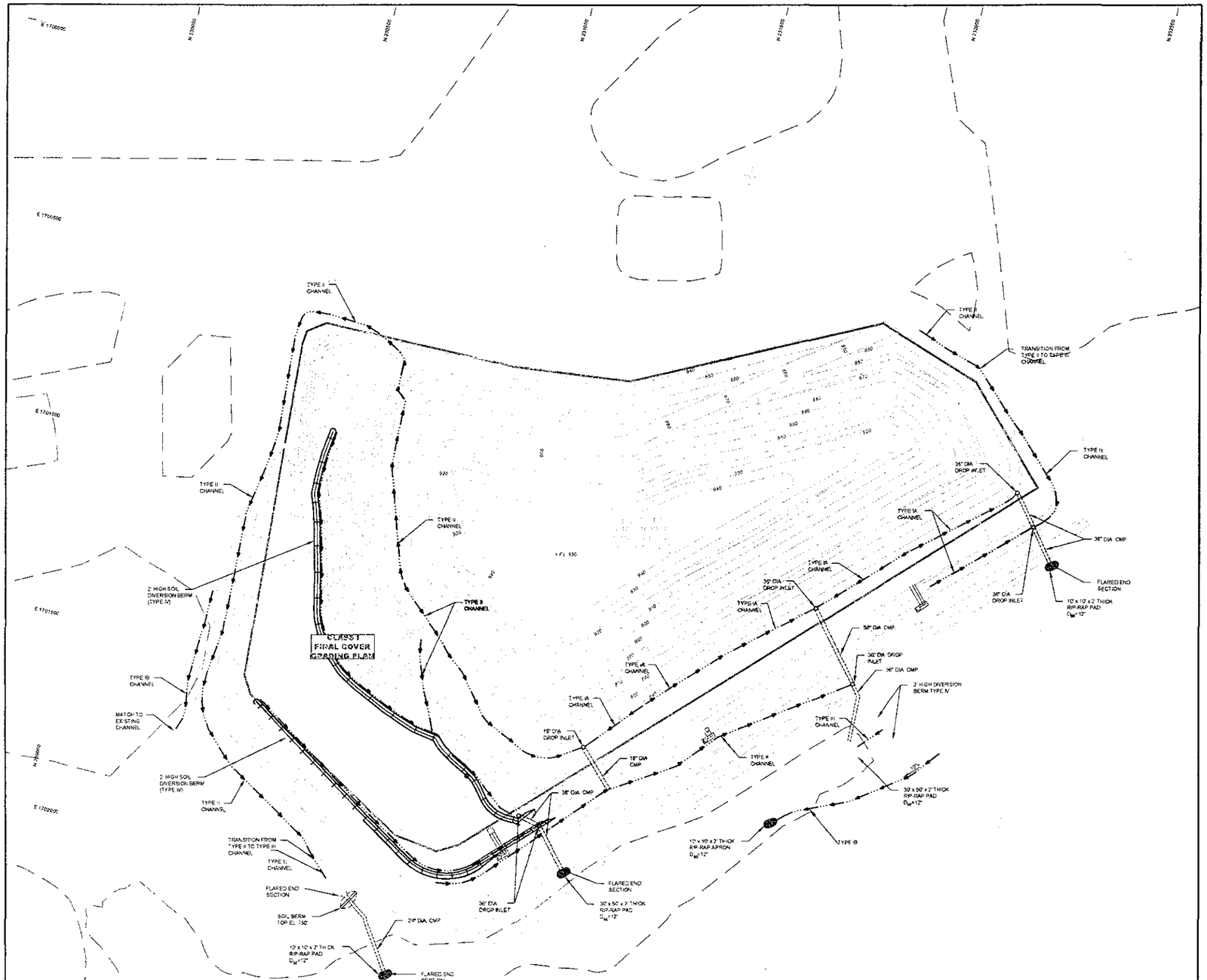
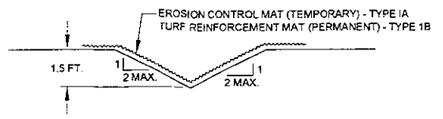
KETTLEMAN HILLS FACILITY
35251 OLD SKYLINE ROAD
KETTLEMAN CITY, CALIFORNIA 93239
(559) 386-6151

MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL
DETAILS

SHEET NUMBER
C-8
9 OF 11 SHEETS

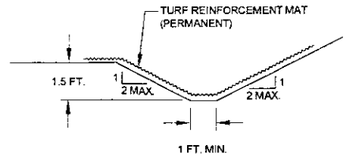


BASE TOPOGRAPHY FLOWN BY AERIAL PHOTOMAPPING SERVICES, INC., JUNE 6, 2005



TYPE 1A & B DRAINAGE CHANNEL

N.T.S.



TYPE II DRAINAGE CHANNEL

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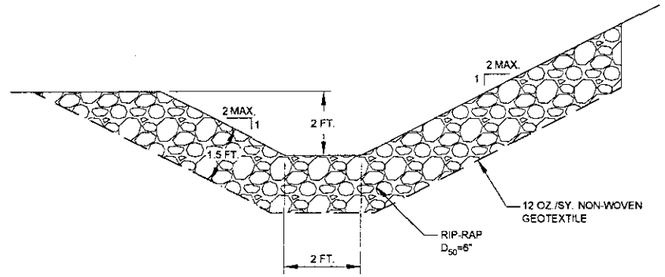
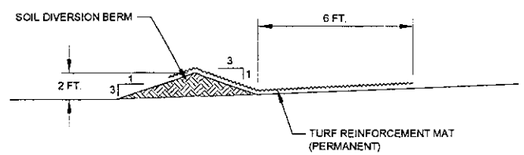


TYPE III DRAINAGE CHANNEL

N.T.S.



TYPE IV DRAINAGE CHANNEL

N.T.S.

NOTES:

1. DRAINAGE CONTROL FEATURES FOR CLASSIII/III COVER NOT SHOWN, HYDRAULIC ANALYSIS INCLUDED IN MODIFIED CLOSURE PLAN, APPENDIX F FOR INFORMATION.

100 0 100
1" = 100' Feet

REGISTERED PROFESSIONAL ENGINEER
Steven G. Sayles
9-30-08
CIVIL
STATE OF CALIFORNIA

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	05/2005	ISSUED FOR CLIENT REVIEW	BPM	KJK	SGS
B	10/2005	ISSUED FOR REGULATORY REVIEW	BPM	KJK	SGS

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CHEMICAL WASTE MANAGEMENT
KETTLEMAN HILLS FACILITY
35251 OLD SKYLINE ROAD
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(559) 386-6151

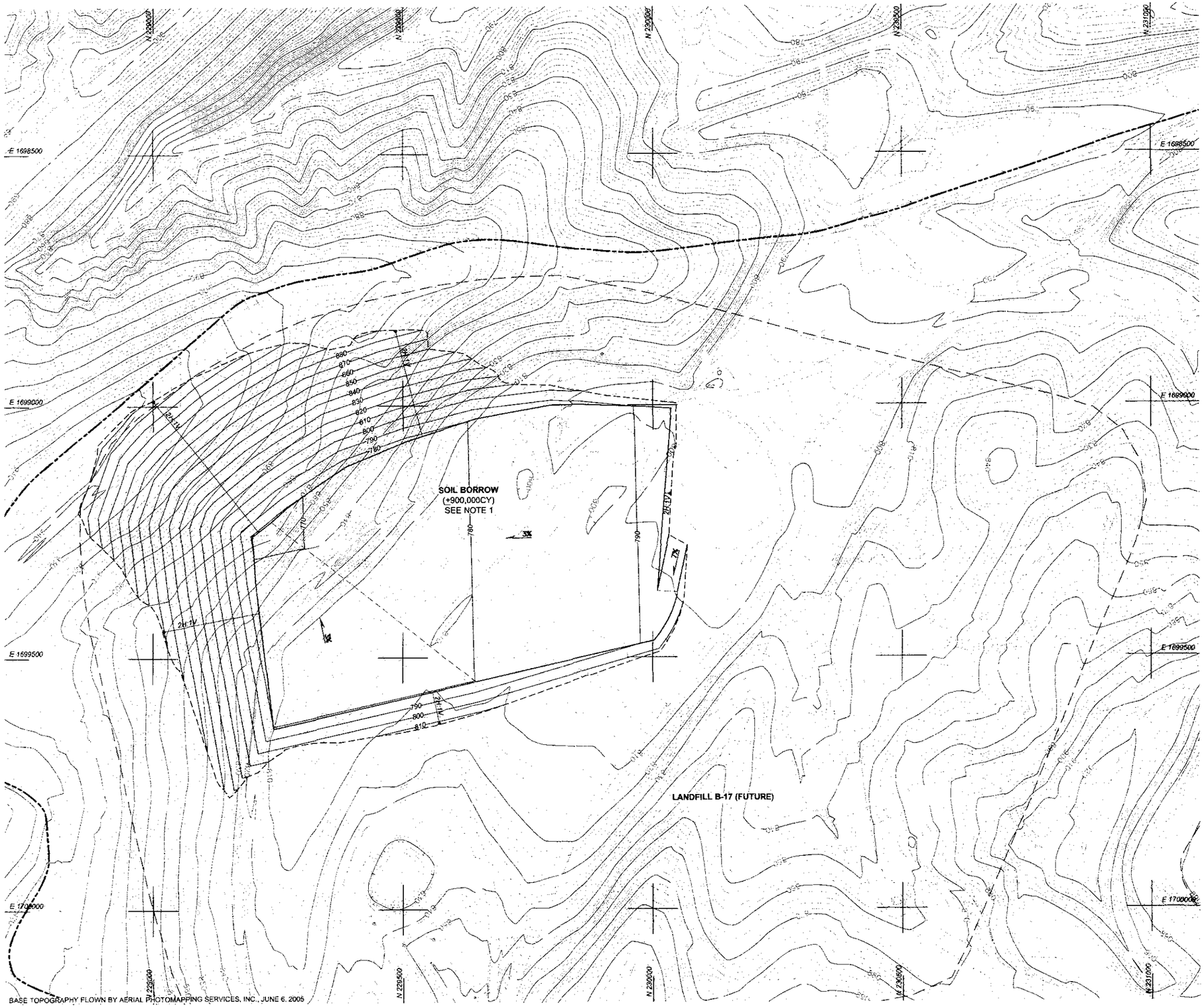
MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

FINAL DRAINAGE PLAN

SHEET NUMBER

C-9

10 OF 11 SHEETS



NOTES

1. GRADING FOR BORROW AREA BASED ON BASE GRADES FOR LANDFILL B-17, PLUS 5 FEET PER GEOSYNTEC, 2005.

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	06/30/05	ISSUED FOR CLIENT REVIEW	BFM	KJK	SCS
B	10/10/05	ISSUED FOR REGULATORY APPROVAL	BFM	KJK	SCS

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MODIFIED CLOSURE PLAN
FOR B-19 CLASS I LANDFILL

BORROW AREA GRADING PLAN

100 0 100
1" = 100' Feet

REGISTERED PROFESSIONAL ENGINEER
BRIAN F. MCENROE
No. C056789
Expires 9-30-06
CIVIL
STATE OF CALIFORNIA

ISSUED FOR REGULATORY APPROVAL

SHEET NUMBER
C-10
11 OF 11 SHEETS

TABLES

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
	22 CCR 66264.112	
(a)(1)	The Operator/owner of a hazardous waste management facility shall have a written closure plan that shall be submitted to and approved by the Department (DTSC).	Satisfied by prior closure plan submittals and this submittal for modified closure.
(a)(2)	DTSC's approval shall assure consistency with closure regulations. A copy of the approved closure plan shall be maintained onsite and furnished to DTSC upon request.	DTSC approval requirement to be satisfied by DTSC review. A copy of the approved plan will be maintained onsite and furnished to DTSC upon request.
(b)	Plan shall identify steps necessary to perform partial (unit) closure or final (facility) closure at any point in its active life. Closure plan shall include:	
(b)(1)	A description of how and when each hazardous waste management unit at facility will be closed in accordance with Section 66264.111, which requires closure in a manner that: Minimizes the need for further maintenance. Controls, minimizes or eliminates to extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off or hazardous waste decomposition products to ground water, surface water or atmosphere. Complies with applicable unit-specific closure requirements (i.e., 66264.310).	Final closure of the KHF will occur in accordance with other approved closure plan submittals to DTSC and the RWQCB, and permits issued by these agencies. This submittal is unit-specific for the existing Landfill Unit B-19 Class I waste prism. Descriptions of this proposed modified partial closure are provided in Chapters 2.0, 3.0 and the appendices of this submittal. See Table 3-1 for unit-specific closure requirements.

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
	22 CCR 66264.112 (Continued)	
(b)(2)	A description of how and when final closure of the facility will be conducted in accordance with Section 66264.111. The description shall identify the maximum extent of the operations which will be unclosed during the active life of the facility.	Not applicable. This modification is unit-specific. Except for the partial (unit) closure discussed in this submittal, final closure of the KHF will occur in accordance with other approved closure plan submittals to DTSC and the RWQCB, and permits issued by these agencies.
(b)(3)	An estimate of maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of methods to be used during partial closures and final closures including removing, transporting, treating, storing and identification of off-site waste management units to be used.	Partially applicable. This modified closure submittal is unit-specific for the existing B-19 Class I waste prism. Section 1.2 identifies the volume of Class I waste in this unit. No reworking of the existing waste prism is anticipated. No removing, transporting, treating or storing of the existing Class I waste is planned. Existing waste will be left in-place. See Section 2.2. Waste inventories and closure measures for other units at the KHF and final (facility) closure are not applicable to this modification submittal. Final closure will occur in accordance with other approved closure plan submittals to DTSC and the RWQCB, and permits issued by these agencies.

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
	22 CCR 66264.112 (Continued)	
(b)(4)	A detailed description of steps to remove or decontaminate all hazardous waste residues and contaminated containment systems, equipment, structures and soils.	No reworking of the existing Class I waste prism is anticipated. No hazardous waste residue or contaminated containment systems occur that could require removal. The existing waste prism will be left in-place. A two-foot minimum thickness soil cover is in-place over the existing waste prism that prevents contact of the waste with the existing interim cover FML. While the interim cover FML is not expected to be contaminated to the extent that it may be classified as a hazardous waste, to be conservative, it will be disposed of in Landfill Unit B-18 after removal. The two-foot minimum thickness soil cover that is in-place over the existing waste prism will also prevent contact of the waste with heavy equipment to be utilized for cover construction. Therefore, decontamination of equipment is not expected to be necessary. See Section 2.2.
(b)(5)	A detailed description of other activities necessary during closure period to ensure that all partial closure and final closures satisfy the closure performance standards including, but not limited to ground water monitoring, leachate collection and run-on and run-off control.	A description of the closure design and activities is provided in Chapters 2.0 and 3.0 and appendices to this submittal. Ground water monitoring, LCRS operation and run-on-runoff control will occur as addressed in Table 3-1.
(b)(6)	A schedule for closure for each hazardous Waste Management Unit and for final closure of facility.	Partially applicable. This modified closure submittal is unit-specific for the existing Landfill Unit B-19 Class I waste prism. Section 2.5 identifies the closure schedule for this unit.
(b)(7)	An estimate of the expected year of final closure.	Not applicable. This modification is unit specific and will not result in any change to the year of final closure of Class I facilities.

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
23 CCR 2597(a)		
(a)	The following information shall be included in the closure and post-closure maintenance plans:	
(a)(1)	Projected schedule for partial and final closure.	Partially applicable. This modified closure submittal is unit-specific for the existing B-19 Class I waste prism. Section 2.5 identifies the closure schedule for this unit.
(a)(2)	Description of proposed final treatment procedures which may be used for the wastes in each waste management unit, including methods for total removal and decontamination, if applicable.	Not applicable. Final closure of the KHF will occur in accordance with other approved closure plans submittals to the DTSC and the RWQCB and permits issued by these agencies. No hazardous waste residue or contaminated containment system occurs that could require removal at the B-19 unit.
(a)(3)	A topographic map at appropriate scale, contour interval, and detail showing the boundaries of the unit or facility to be closed and projected final contours and any changes in natural surface drainage patterns.	See design drawings in Appendix A and surface water drainage discussion in Section 2.3 and 3.2.4.
(a)(4)	A description of the design and the location of all features and systems which will provide waste containment during the post-closure maintenance period to the extent that such features and systems differ from those described under Section 2596 of Article 23.	Partially applicable. Features that differ from design reports previously submitted to DTSC and the RWQCB for the Landfill Unit B-19 Class I waste prism are described in Chapters 2.0 and 3.0 and appendices to this report.
(a)(5)	A description of the precipitation and drainage control features at closed units, to the extent that such features differ from those described under Section 2596 of Article 23.	See Sections 2.3 and 3.2.4.

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
23 CCR 2597(a) (Continued)		
(a)(6)	A description of the leachate control features and procedures at closed units, to the extent that such features and procedures differ from those described under Section 2596 of Article 23.	Partially applicable. Features that differ from design reports previously submitted to DTSC and the RWQCB for the Landfill Unit B-19 Class I waste prism are described in Chapters 2.0 and 3.0 and appendices to this report.
(a)(7)	A map and discussion of ground water and unsaturated zone monitoring programs for the post-closure maintenance period, including location, construction details, and rationale of all monitoring facilities; to the extent that such systems differ from those described under Section 2596 of Article 23.	Not applicable. No changes to post-closure ground water or unsaturated zone monitoring programs are proposed. Monitoring plans have been previously submitted to and approved by the DTSC and RWQCB.
(a)(8)	An evaluation of anticipated settlement due to decomposition and compaction of wastes and subsidence of underlying natural geologic materials.	See Section 3.2.3.
(a)(9)	A description of the nature of the final cover, including its physical characteristics, permeability, thickness, slopes, elasticity (shrink and swell), and erodibility, including design details of all proposed landscaping, drainage and irrigation facilities, and other features to be placed over the final cover.	See Chapters 2.0 and 3.0.
(a)(10)	The post-closure land use of the disposal site and the surrounding area.	As discussed in Chapter 1.0, the post-closure use of the Landfill Unit B-19 is proposed to include utilization of remaining airspace for Class II/III waste disposal. Following the Class II/III waste disposal, and for the remainder of lands at the KHF, no changes to post-closure uses are proposed compared to closure plans previously submitted to and approved by the DTSC and RWQCB.

TABLE 1-1

22 CCR AND 23 CCR
INFORMATION REQUIREMENTS FOR CLOSURE PLANS

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
23 CCR 2597(a)		
(a)(11)	Estimates of costs for closure and post-closure maintenance for the anticipated post-closure maintenance period.	No changes to post-closure maintenance are proposed that could increase post-closure maintenance costs compared to estimates previously submitted to DTSC and the RWQCB. Furthermore, the Class I waste prism in the current configuration that will be closed is much smaller than the configuration reflected in closure estimates previously submitted to DTSC and the RWQCB. Closure and post-closure cost estimates for the Class II/III fill will be addressed under separate permitting pursuant to 27 CCR. For these reasons it is not anticipated that new closure and post-closure cost estimates will be required for this modified submittal. CWMI may update cost estimates for the Class I waste prism in Landfill Unit B-19 in the future (e.g., in conjunction with routine updates pursuant to 22 CCR 66264.142 and 66264.144).

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.310		
(a)	At final closure of the landfill or upon closure of any cell, the owner or operator shall cover the landfill or cell with a final cover designed and constructed to:	
(a)(1)	Prevent the downward entry of water into the closed landfill throughout a period of at least 100 years;	Final cover and separation liner designs are discussed in Section 2.2. The cover systems are designed to prevent downward entry of water for the long term. This is accomplished through the use of low-permeability soils, an HDPE geomembrane, and a drainage layer.
(a)(2)	Function with minimum maintenance;	Final cover and separation liner designs are discussed in Section 2.2. The cover systems are designed to function with minimum maintenance. Approximately half of the Class I prism will be covered with the separation liner, which will be maintenance-free once it is covered by the Class II/III prism. The remaining half of the Class I waste prism will be closed with the final cover, which includes a top vegetative layer that will control erosion and minimize the need for maintenance in this area.
(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;	Design drawings in Appendix A show that the Class I final cover is adequately sloped to promote drainage. Erosion and abrasion will be controlled by the separation liner design until the overlying Class II/III waste is placed, after which no erosion or abrasion will occur. Shallow-rooted grass will be planted on the vegetative layer of the Class I final cover that to control erosion. See Section 2.2 for additional discussion.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.310		
(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained;	See Section 3.2.3. Calculations indicate that settlement of the Class I waste will not result in a failure of the separation liner and adequate drainage capacity will be maintained to prevent ponding of liquids on the liner.
(a)(5)	Accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained;	See Section 3.2.1. Calculations indicate the final cover system will accommodate the MCE.
(a)(6)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present; and	The permeability of the HDPE liner controls infiltration through the cover. The HDPE cover liner is the same as the base liner and is therefore equivalent.
(a)(7)	Conform to the provisions of subsections (e) through (r) of subsection 66264.228, except that the Department shall grant a variance from any requirement of subsections (e) through (r) which the owner or operator demonstrates to the satisfaction of the Department is not necessary to protect public health, water quality or other environmental quality.	See 22 CCR 66264.228(e) through (r) below.
(b)	After final closure, the owner or operator must comply with all post-closure requirements contained in Sections 66264.117 through 66264.120, including maintenance and monitoring throughout the post-closure care period specified in the permit.	Post-closure inspection, monitoring and maintenance will occur in accordance with the approved post-closure plan submitted to DTSC and the RWQCB, and permits issued by these agencies. Post-closure monitoring will include surface inspections, continued operation of the LCRS, ground water monitoring, and other measures required by regulation. Post-closure inspections of the separation liner will occur over exposed portions of this cover component. Since the separation liner is buried by Class II/III waste fill, post-closure inspections of the buried portion will not be required.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.310		
(c)	Unless the owner or operator can demonstrate to the satisfaction of the Department that significant amounts of toxic or flammable gas or vapor will not be emitted by waste and that no gas will be emitted that is capable of disrupting the cover or causing other property damage, the owner or operator shall provide a control system designed to prevent migration of gas.	Not applicable. The B-19 Class I waste prism will not generate significant amounts of toxic or flammable gas or vapor. See Section 2.4.2 for additional discussion.
(d)	If gas or vapor that can be expected to be emitted from buried waste after closure would be flammable or toxic, the owner shall describe in the closure plan measures to render such gases or vapors harmless, or export gas from the site, and shall estimate the cost of such measures as part of the cost of closure and post-closure care.	Not applicable. B-19 Class I hazardous waste will not generate significant amounts of toxic or flammable gas or vapor. See Section 2.4.2 for additional discussion.
22 CCR 66264.228(e) through (r) [required by 22 CCR 66264.310(a)(7)]		
(e)	If waste is to remain in a unit after closure, the Owner or Operator shall comply with and plan for the following:	
(e)(1)	The unit shall be compacted before any portion of the final cover is installed.	The existing Class I waste was compacted as it was placed. The foundation layer shall be further compacted to meet project specifications.
(e)(2)and(e)(3)	Reserved.	Not applicable.
(e)(4)	A foundation layer shall be provided for the compacted barrier layer of the final cover. If needed, foundation layer shall contain herbicide sufficient to prevent vegetative growth, and shall be free of decomposable organic matter.	A 2-foot thick foundation will cover the Class I waste prior to placement of the HDPE geomembrane barrier layer of the final cover. No herbicide is anticipated to be required.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(e)(5)	A compacted barrier layer of clean earth shall be provided above the foundation layer and shall be provided around the unit to a depth as low as the level at which the owner or operator has deposited waste to prevent lateral migration of waste and gas/vapor from waste. The layer shall be wholly below the average depth of frost penetration and shall be compacted at a moisture content sufficient to achieve a percent compaction to prevent the downward entry of water into the foundation layer for a period of at least 100 years.	A HDPE geomembrane was incorporated as an alternative to the soil barrier layer in previous closure submittals. The HDPE geomembrane, shown in the design drawings, will be below the frost depth and effectively prevent downward entry of water into the foundation layer.
(e)(6)	The earthen material shall contain herbicide sufficient to prevent growth of vegetation. The slope of the final top surface of compacted barrier layer shall be sloped after allowance for settling and subsidence to prevent the buildup of hydraulic head.	The closure grades will be 5 percent minimum and thus allows for settlement. See Section 3.2.3.
(e)(7)	Owner or Operator may use non-earthen materials for the barrier layer provided it is demonstrated to the satisfaction of the Department that the barrier layer of alternate composition will equally impede movement of fluid and be as durable as a compacted earthen barrier.	A HDPE geomembrane was incorporated as an alternative to the soil barrier layer in previous closure submittals. See Chapter 3.0 for design analyses.
(e)(8)	If a hazardous waste is underlain by a liner containing a synthetic membrane, then a synthetic membrane shall be provided in the final cover above the compacted barrier layer. Membrane shall be made of material chemically resistant to the waste at the facility, shall have thickness and strength sufficient to withstand the stresses to which it shall be including shear forces, puncture from rocks or penetration from roots.	Landfill B-19 has a synthetic membrane underlying the waste. A similar liner will be included in the closure cover. See Section 2.2.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(e)(9)	If a synthetic membrane is used in the final cover system, the Owner or Operator shall provide a layer of material above the synthetic membrane of the final cover, and a layer of material below this synthetic membrane, to protect the membrane from damage.	The foundation layer will be compacted and prepared in accordance with the CQA plan to ensure that the overlying geomembrane is not damaged. Additionally, a geotextile will be installed over the geomembrane as a protective cushion and drainage layer.
(e)(10)	The Owner or Operator shall provide a water drainage layer, blanket or channel above the compacted barrier layer of the final cover to provide a path for water to exit rapidly.	See Sections 2.2 and 2.4.1.
(e)(11)	The Owner or Operator shall provide a filter layer above the water drainage layer to prevent soils from clogging the drainage layer.	See Section 2.2.
(e)(12)	The Owner or Operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion control deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth.	As discussed in Chapters 1.0 and 2.0, the separation liner will ultimately be covered by Class II/III fill and, therefore, vegetation requirements do not apply. For the Class I final cover, a 2.5-foot thick vegetation layer is provided above the drainage layer and FML. This thickness is adequate to prevent root penetration of the drainage layer due to the shallow-rooted nature of grass species that will be planted on the vegetative layer. The underlying infiltration barrier is comprised of an FML and a 2-foot thick foundation layer. The FML is not subject to desiccation. The overlying vegetative layer and FML will both help to prevent desiccation of the foundation layer.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(e)(13)	Permanent disposal areas shall be graded at closure so that with allowance for settling and subsidence, the slope of the land surface above all portions of the cover, shall be sufficient to prevent ponding of water. Such areas shall be graded to drain precipitation away from the disposal area. Portions of the land surface above the cover with unavoidable slopes great enough to invite erosion which cannot be readily controlled by vegetation shall be protected by gunite, rip-rap or other material.	The final cover is designed to allow for settlement and to maintain drainage. See Section 3.2.3 for additional discussion.
(e)(14)	Unless vegetation on the cover would pose a significant fire hazard unacceptable to the fire prevention authority or would interfere with a planned post-closure use of the site that is acceptable to the Department, the owner or operator shall provide conditions favorable for hearty growth of vegetation that will provide erosion control without forming roots that would penetrate the compacted earth cover, and shall estimate the cost of providing such conditions and vegetation as part of the cost of closure. Vegetation for closed disposal areas shall be selected to require minimum watering and maintenance. Plantings shall not impair the integrity of containment structures or the final cover.	See comment to Subsection (e)(12) above. In addition, the current configuration of the Class I waste prism that will be closed is much smaller than the configuration reflected in closure estimates previously submitted to DTSC and the RWQCB by CWMI. Therefore, it is not anticipated that revised closure estimates will be required for this modified submittal. CWMI may update closure cost estimates for the Class I waste prism in B-19 in the future.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(e)(15)	At and after closure, permanent disposal areas shall have drainage systems capable of transporting water from the water drainage layer away from the closed facility and capable of diverting surface runoff away from or around disposal areas, containment structures, leachate collection systems and monitoring facilities. Drainage systems shall be capable of preventing erosion of containment structures. Drainage system components themselves shall be lined or otherwise protected against erosion.	See Sections 2.3 and 3.2.4.
(e)(16)(A)	When closing a permanent disposal site, the owner or operator shall provide survey monuments from which the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features can be determined throughout the entire post-closure care period (according to professional survey practices and by land survey or PE or RG).	The Kettleman Hills Facility has sufficient existing survey monuments to satisfy this requirement for the Landfill Unit B-19.
(e)(16)(B)	The Owner or Operator shall submit a copy of the surveyor's notes used to establish the benchmarks described in this subsection in accordance with section 66264.116.	To be provided at time of closure certification.
(e)(17)	Owner or Operator shall provide predictions of the magnitude of the drops in elevation that will occur at various portions of the top surface of the final cover as a result of settling and subsidence (account for compression of material underlying the liner and compression of the liner, waste, fill and cover). The prediction of the drop in elevation due to compression shall account for immediate settlement, primary consolidation, secondary consolidation and creep, liquefaction and dynamic consolidation due to earthquake loads.	See Section 3.2.3.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(e)(18)	If information has not already been submitted and if dikes and hazardous waste will remain at the site after closure, the owner or operator shall provide in the closure plan proof that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure.	Not applicable. No dikes containing Class I waste will occur upon closure of the Class I waste prism.
(e)(19)	The Owner or Operator shall include in the closure plan an explanation of how the cover, construction procedures and planned post-closure care are designed to accommodate or avoid the effects or differential settlement and consolidation without loss of integrity of the cover.	See Section 3.2.3.
(f)	Before installing the compacted barrier layer of the final cover the owner or operator shall accurately establish the correlation between the desired permeability and the density at which that permeability is achieved. To accomplish this the owner or operator shall incorporate specified procedures (specified in Subsections [f][1] through [f][4]).	A HDPE geomembrane was incorporated as an alternate to the compacted barrier layer in previous closure submittals.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(g)	The Owner or Operator shall comply with specified QA procedures when installing the compacted barrier layer of the final cover (specified in Subsections [g][1], [g][2] and [g][3]). In addition, an independent, qualified person registered in California as a professional engineer or certified in California as an engineering geologist shall supervise construction and construction QA of the final cover and shall prepare a report to be submitted to the Department. Before starting compaction of earthen material to form the compacted barrier layer of the cover, the owner or operator shall submit results of the geotechnical determinations on material to be used for the compacted barrier layer of the final cover.	Construction will be performed in accordance with the requirements of 66264.19 and the Quality Assurance Guidance Document referenced in Section 2.2. The construction will be documented in accordance with this requirement. Since HDPE geomembrane is used as an alternative to the compacted barrier layer, no separate results are required.
(h)	All slopes shall be designed and constructed to minimize the potential for failure.	See Section 3.2.1. The slopes will be designed to meet the requirements of 66264.25.
(i)	Adequate facilities shall be provided to ensure for a 100 year period that no leachate shall be discharged to surface waters or ground water, except as authorized by the hazardous waste facility permit.	See Sections 2.4.1 and 3.2.2.
(j)	Hazardous waste and discarded hazardous material contained in the closed facility shall be protected from washout and erosion as the result of tides or floods having a predicted frequency of once in 100 years.	The site is not subject to tidal inundation. Surface water drainage controls that protect against washout and erosion are addressed in Sections 2.3 and 3.2.4.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(k)	An inspection and monitoring program shall be established at every closed disposal area wherein an independent, qualified engineer registered in California shall annually evaluate and document the condition of all surface improvements, drainage facilities, erosion control facilities, vegetative cover, gas control facilities and monitoring facilities.	Post-closure inspection, monitoring and maintenance will occur in accordance with the approved post-closure plan submitted to DTSC and the RWQCB, and permits issued by these agencies. Post-closure monitoring will include surface inspections, continued operation of the LCRS, ground water monitoring, and other measures required by regulation. Post-closure inspections of the separation liner will occur over exposed portions of this cover component. Once the separation liner is buried by Class II/III waste fill, post-closure inspections of the buried portion will not be required.
(l)	Reserved.	Not applicable.
(m)	All construction features which will remain at permanent disposal areas containing hazardous waste material shall be able to withstand the maximum credible earthquake without significant damage to foundations, structures, waste containment features and features which control leachate, surface drainage, erosion and gas.	See Section 3.2.1.
(n)	Reserved.	Not applicable.
(o)	If monitoring equipment or other features which are required to be operable after closure of the facility pursuant to this chapter are rendered inoperable, the Owner or Operator shall render it operable or replace it with operable equipment or other features.	CWMI will comply with this requirement during the post-closure period.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
22 CCR 66264.228(e) through (r) [continued]		
(p)	Post-closure care which the Owner or Operator shall provide for shall include the conducting of surveys by a licensed land surveyor, to determine the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features, and markers installed at the site pursuant to subsection (e)(16) of this section. Such surveys shall be taken annually.	Since portions of this closure cover will be covered by Class II/III waste this requirement is only partially applicable. Surveys will be conducted annually as applicable.
(q)	The Owner or Operator shall reconstruct the closed facility to restore slopes and other conditions to conform to the requirements of this chapter when movement at the site has caused them not to comply with such requirements.	CWMI will comply with this requirement during the post-closure period.
(r)	The Owner or Operator shall submit annual reports to the Department describing measures undertaken at the site during the post-closure maintenance period.	CWMI will comply with this requirement during the post-closure period.
23 CCR 2581		
(a)	Final cover requirements:	
(a)(1)	Closed landfills shall be provided with not less than two feet of appropriate materials as a foundation layer for the final cover. The foundation layer shall be compacted to the maximum density obtainable at optimum moisture content using methods that are in accordance with accepted civil engineering practice. A lesser thickness may be allowed for waste management units if the regional board finds that differential settlement of waste, and ultimate land use will not affect the structural integrity of the final cover.	The design includes a 2-foot minimum compacted foundation layer.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
	23 CCR 2581	
(a)(2)	Closed landfills shall be provided with not less than one foot of soil containing no waste or leachate, placed on top of the foundation layer compacted to attain a permeability of either 1×10^{-6} cm/sec or less, or equal to the permeability of any bottom liner system or underlying natural geologic materials, whichever is less. Permeability determinations for cover materials shall be as specified in Article 4 and shall be appended to the closure and maintenance report.	A HDPE geomembrane was incorporated as an alternative to a soil barrier layer in previous closure submittals. The permeability of the cover geomembrane is equivalent to the permeability of the bottom liner.
(a)(3)	Closed landfills shall be provided with not less than one foot of soil, containing no waste or leachate, placed on top of the material described in subsection (a)(2) of this section; the rooting depth of any vegetation planted on the cover shall not exceed the depth to the material described in subsection (a)(2) of this section.	A 2.5-foot-thick vegetative layer was incorporated in the final cover design in previous closure submittals. The vegetation will consist of shallow-rooted grasses that will not reach the HDPE geomembrane.
(a)(4)	The cover shall be designed and constructed to function with the minimum maintenance possible.	Final cover and separation liner designs are discussed in Section 2.2. The cover systems are designed to function with minimum maintenance. Approximately half of the Class I prism will be covered with the separation liner, which will be maintenance-free once it is covered by the Class II/III prism. Until it is covered, the 2-foot thick protective soil layer will protect the underlying drainage layer and FML components. The remaining half of the Class I waste prism will be closed with the final cover, which includes a top vegetative layer that will control erosion and minimize the need for maintenance in this area.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
23 CCR 2581 (Continued)		
(b)	Grading requirements:	
(b)(1)	Closed landfills shall be graded and maintained to prevent ponding and to provide slopes of at least three percent. Lesser slopes may be allowed if an effective system is provided for diverting surface drainage from covered wastes.	See Section 3.2.3.
(b)(2)	Areas with slopes greater than ten percent, surface drainage courses, and areas subject to erosion by water and wind shall be protected or designed and constructed to prevent such erosion.	The cover has been designed to meet this requirement. See Chapter 3.0.
(c)	Throughout the post-closure maintenance period, the discharger shall:	
(c)(1)	Maintain the structural integrity and effectiveness of all containment structures and maintain the final cover as necessary to correct the effects of settlement or other adverse factors.	Post-closure inspection, monitoring and maintenance will occur in accordance with the approved post-closure plan submitted to DTSC and the RWQCB, and permits issued by these agencies. Post-closure monitoring will include surface inspections, continued operation of the LCRS, ground water monitoring, surface water monitoring, vadose zone monitoring and other measures required by regulation. Post-closure inspections of the separation liner will occur over exposed portions of this cover component. Once the separation liner is buried by Class II/III waste fill, post-closure inspections of the buried portion will not be required. Maintenance indicated to be required by results of post-closure inspections will be performed in accordance with regulations.
(c)(2)	Continue to operate the leachate collection and removal system as long as leachate is generated and detected.	See (c)(1) above.

TABLE 3-1

22 CCR AND 23 CCR
CLOSURE REQUIREMENTS FOR LANDFILLS
(Continued)

REGULATORY SUBSECTION	REQUIREMENT	COMMENT
23 CCR 2581 (Continued)		
(c)(3)	Maintain monitoring systems and monitor the ground water, surface water, and the unsaturated zone in accordance with applicable requirements of Article 5.	See (c)(1) above.
(c)(4)	Prevent erosion and related damage of the final cover due to drainage.	See (c)(1) above.
(c)(5)	Protect and maintain surveyed monuments.	See (c)(1) above.