FINAL POST-CLOSURE MAINTENANCE PLAN
LOPEZ CANYON SANITARY LANDFILL
LAKE VIEW TERRACE, CALIFORNIA

VOLUME II OF II
AMENDMENT TO PARTIAL POST-CLOSURE MAINTENANCE PLAN

Prepared for

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1. INTRODUCTION

1.1 Terms of Reference

This report presents an amendment to the Partial Post-Closure Maintenance Plan (Partial PCMP) for the Lopez Canyon Sanitary Landfill. The objective of this amendment is to incorporate into the Partial PCMP information on the post-closure maintenance of the deck areas of Disposal Areas A and B and the deck and slopes of Disposal Areas AB+ and C sufficient to constitute a Final PCMP for the entire landfill. This report includes revisions to the ground-water monitoring procedures required by changes made in the ground-water monitoring system since the submittal of the Partial PCMP.

This report was prepared by GeoSyntec Consultants (GeoSyntec) for the Bureau of Sanitation, Department of Public Works of the City of Los Angeles (BOS). The report was written by Mr. Michael S. Snow, P.E., and Dr. Neven Matasović and was reviewed by Dr. Edward Kavazanjian, Jr., P.E., G.E., of GeoSyntec. GeoSyntec prepared this report as a task within the scope of a general consulting services contract with the City of Los Angeles entitled "Engineering Services for the Development of Disposal Area C and Partial Closure of Disposal Areas A and B at the Lopez Canyon Sanitary Landfill, Lake View Terrace, California, Contract #C-85555." The scope of work for this task was presented to the BOS in a letter entitled, "Proposal for Amendment to the Partial Closure and Post-Closure Maintenance Plans, Lopez Canyon Sanitary Landfill, Lake View Terrace, California," dated 29 November 1993 and was verbally approved by Mr. Luther Derian, P.E., of the BOS on 6 December 1993.

1.2 Purpose of Amendment

The purpose of this amendment to the Partial PCMP is to provide the Local Enforcement Agency (LEA), Los Angeles Regional Water Quality Control Board (RWQCB), and California Integrated Waste Management Board (CIWMB) with the necessary information to consider the Partial PCMP and this amendment as the Final PCMP for the Lopez Canyon Sanitary Landfill in accordance with §18265. of Title 14 of the California Code of Regulations. Post-closure requirements for municipal solid waste landfills are contained in the California Code of Regulations Title 14 (Title 14) and Chapter 15, Division 3, Title 23 (Chapter 15), and in §258. of Title 40 of the Code of Federal Regulations, commonly referred to as Subtitle D of the Resource Conservation and Recovery Act (Subtitle D). Information on application of these requirements by the RWQCB to the Lopez Canyon Landfill is contained in RWQCB Order No. 93-062.

The Partial PCMP was submitted along with a Partial Closure Plan to the three governing agencies in January 1993. The Partial PCMP was approved by the RWQCB on 21 July 1993, by the LEA on 4 November 1993, and by the CIWMB on 16 December 1993. The Partial PCMP was prepared in order to accommodate closure of the slopes of Disposal Areas A and B in advance of the remaining disposal areas. The Partial Closure Plan proposed that the closure of the landfill be accomplished in two phases. Phase I closure includes the slopes of Disposal Areas A and B, while Phase II closure includes the top decks of Disposal Areas A and B and all of Disposal Areas AB+ and C. Phase I closure is currently scheduled to begin in the spring of 1994. The current permits for the landfill require Phase II closure to be implemented in early 1996. The Partial PCMP was prepared to a level of detail consistent with the state requirements of a Final PCMP contained in Title 14 and Chapter 15 as well as federal requirements for a post-closure maintenance plan contained in Subtitle D.

The Partial PCMP contained final cover maintenance requirements for the entire landfill based on the assumption that an earthen final cover would be employed for closure of Disposal Area C and that the final elevation of the deck area for Disposal Area C would be 1,770 ft above mean sea level (MSL). Subsequent to the completion of the Partial PCMP, the final cover design of Disposal Area C has been modified to comply with the requirements of Subtitle D and RWQCB Order No. 93-062. The primary modification to the final cover design for Disposal Area C is inclusion of a geomembrane in the infiltration barrier layer of the cover in the deck and bench areas. A cushion geotextile placed on top of the geomembrane was also included in these areas. Furthermore, the final elevation of the deck area in Disposal Area C is now projected to be at 1,585 ft MSL, as indicated on the Revised Final Grading and Surface-Water Drainage Plan presented as Figure 1-1. In addition to these changes, two new ground-water monitoring wells were installed as part of the ground-water monitoring network subsequent to the completion of the Partial PCMP.

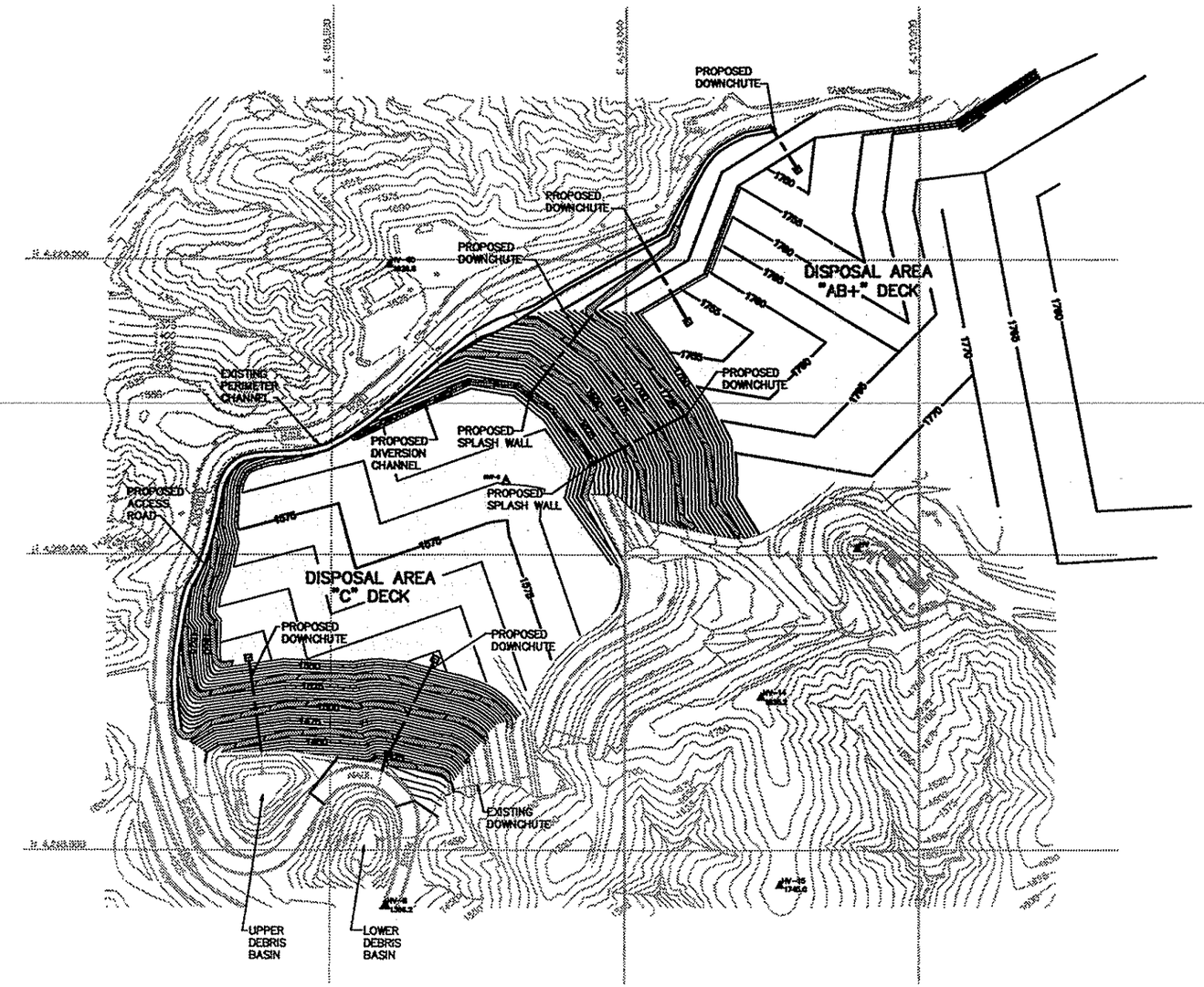
1.3 Report Organization

The revisions to the Partial PCMP contained in this amendment are organized into three sections as follows:

- Section 2 presents the revised final cover maintenance requirements for Disposal Area C; these revised requirements reflect inclusion of the geomembrane barrier and geotextile layers in the final cover;

- Section 3 presents the revision to the ground-water monitoring plan resulting from the addition of two ground-water monitoring wells; and

- Section 4 presents a revised post-closure maintenance cost estimate resulting from the changes described in Sections 2 and 3 as well as the reduction in the total final cover surface area of the landfill described in the amendment to the Partial Closure Plan.



NORTH

LEGEND

- EXISTING CONTOURS (JUNE 1993)
- PROPOSED FINAL GRADE CONTOURS
- EXISTING DOWNCHUTE
- PROPOSED DOWNCHUTES
- PROPOSED DIVERSION CHANNEL
- EXISTING PERIMETER CHANNEL
- BENCHMARKS
- PROPOSED ACCESS ROAD
- PROPOSED BENCHES
- PROPOSED DECK INLET STRUCTURES

200 100 0 200 400
SCALE IN FEET

REVISED FINAL GRADING AND SURFACE WATER DRAINAGE PLAN DISPOSAL AREAS AB+ AND C

		DATE
DESIGNED	MSS	12-10-93
DRAWN	MA	12-16-93
CHECKED	EK	12-20-93
SUPERVISED	EK	12-22-93
PROJECT ENGR.		R.C.E. NO.
DIV./DIST. ENGR.		R.C.E. NO.

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LOPEZ CANYON LANDFILL

NO.	REVISION DESCRIPTION	DRN.	DATE

CITY OF LOS ANGELES
BUREAU OF SANITATION — DELBERT A. SMAIL, DIRECTOR
DATE _____, 19__
STEPHEN A. FORTUNE, DIV. MGR., ENGR. — R.C.E. NO. 35737

SCALE: AS SHOWN
FIGURE NO.: 1-1
DWG. NO.: 4100-004
JOB NO.: CE4100-06

DWG: 4100-004 9864018037 LP

2. REVISED FINAL COVER MAINTENANCE PROCEDURES

2.1 General

The functions of the final cover for a municipal solid waste landfill are to minimize liquid infiltration into the closed landfill, contain and control landfill gas generated in the facility, isolate the buried wastes, promote surface water runoff, and control erosion while accommodating settlement and subsidence. The primary purpose of the post-closure maintenance procedures described herein is to maintain the integrity of the completed final cover over the long term so that these performance goals are realized. Towards this end, this document provides maintenance scheduling and documentation procedures so that materials and maintenance practices are consistent with the final cover design. Deviations from the design of the final cover during construction and/or maintenance of the final cover should be reported to the engineer in responsible charge of the site (Engineer) or his representative so that the effects of these deviations with respect to the performance of the final cover may be evaluated and that the post-closure maintenance plan may be modified, if necessary.

Long-term maintenance activities following construction of the final cover are anticipated as a result of the following conditions:

- elective intrusion into or through the final cover associated with maintenance of landfill gas control or liquid management systems;
- settlement related sags and surface-water drainage interruptions which interfere with the controlled runoff of surface waters from the closed landfill surface;
- surface erosion as a result of high runoff velocities associated with intense rains or malfunctioning irrigation systems;

- vertical and subvertical cracking of final cover soils as a result of landfill differential settlement; and

- local surficial slumping on slopes resulting from intense seasonal rainfall or malfunctioning irrigation systems, or resulting from seismic loading.

2.2 Inspection Procedures

Routine inspection of the final cover will be conducted to identify areas where maintenance is required in order to minimize the effect and extent of the above conditions. The following inspection procedures will be instituted following closure:

- a final cover performance officer will be designated; this individual will be responsible for inventorying, monitoring, and coordinating repair of final cover irregularities;

- employees with access to the site will be instructed to notice and report in writing to the final cover performance officer any surface cracking, ponding, surface drainage interruptions or unusual surface conditions at the time they are observed;

- deck and slope areas will be visually inspected in detail by grid walking on a quarterly basis by a representative of the final cover performance officer instructed in inspection procedures; a formal report of findings will be prepared by the final cover performance officer or his designated representative; and

- deck and slope areas will be visually inspected in detail by grid walking by a representative of the final cover performance officer instructed in inspection procedures following unusual events such as earthquakes, landfill fires, vehicle accidents, and usually heavy rainstorms; a formal report of findings will be entered into the record following any such unusual event.

2.3 Repair Procedures

Final cover repair and/or reconstruction activities will be conducted in a manner to maintain the integrity of the as-built final cover system. Repair materials will be placed in layers consistent with the layers placed during the original final cover construction.

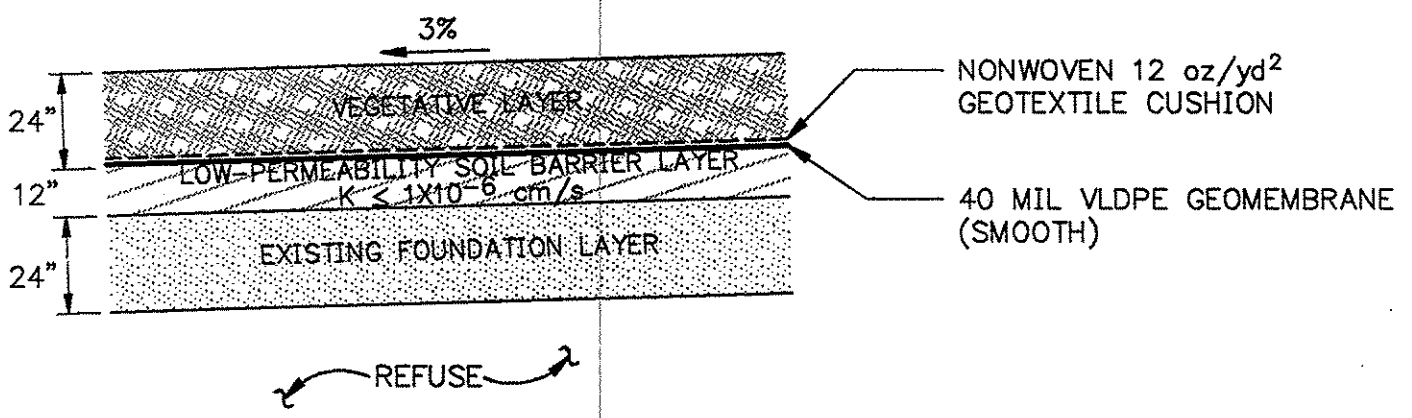
The final cover for deck and slope areas of Disposal Areas A, B, and AB+ and for the slopes of Disposal Area C are composed entirely of earthen materials. On the slopes of Disposal Areas A and B, the final cover consists of 3-ft (0.9-m) thick monolithic cover of compacted low permeability soil overlying a 24-in. (600-mm) thick (minimum) foundation layer. On the decks of Disposal Areas A, B, and AB+, the final cover consists of a 24-in. (600-mm) thick vegetative erosion control layer overlying a 15-in. (375-mm) thick low permeability soil layer overlying the foundation layer. On the slopes of Disposal Areas AB+ and C, the final cover consists of a 24-in. (600-mm) thick vegetative erosion control layer overlying a 12-in. (300-mm) thick low permeability soil layer overlying the foundation layer. Repair procedures for the earthen final cover employed in the deck and slope areas of Disposal Areas A, B, and AB+ and the slopes of Disposal Area C are presented in Section A.1.3 of the Partial PCMP.

The final cover for the deck and bench areas of Disposal Area C is presented in Figure 2-1 and includes a 24-in. (600-mm) thick vegetative cover, a 12 oz/yd^2 (410 g/m^2) nonwoven geotextile cushion, a 40-mil (1-mm) thick very low density polyethylene (VLDPE) geomembrane, a 12-in. (300-mm) thick compacted low-permeability soil barrier layer, and a 24-in. (600-mm) thick foundation layer. The remainder of this section presents repair procedures specific to the deck and bench areas of Disposal Area C.

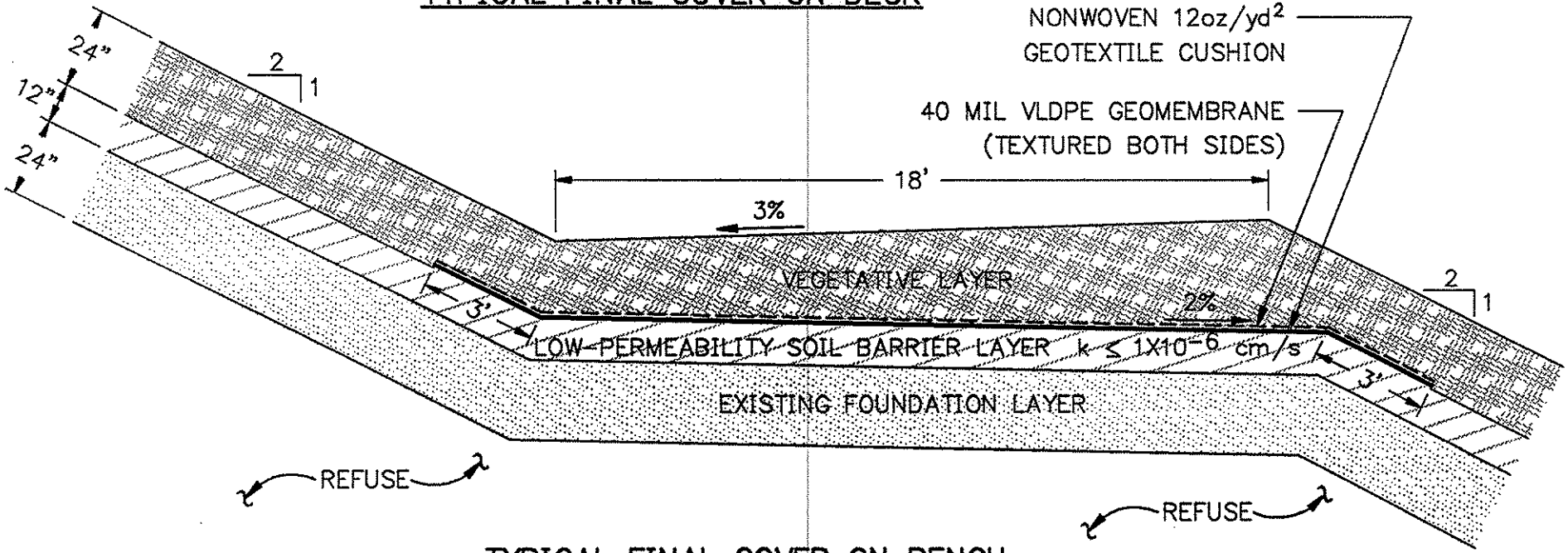
2.3.1 Elective Intrusion

Elective intrusive into of the final cover will be avoided whenever possible. Excavation will be initiated only after receiving approval from the final cover performance officer and should be conducted under the full-time observation of the Engineer or his representative. Additionally, final cover excavation will be conducted in coordination with the appropriate regulatory agencies (e.g. SCAQMD) in accordance with applicable regulations.

Prior to excavation of the final cover in the deck and bench areas of Disposal Area C for the purpose of elective intrusion, the geotextile cushion and VLDPE geomembrane component of the final cover shall be cut to dimensions exceeding those of the excavation by at least 12 in. (300 mm). The edges of the cut geotextile and geomembrane shall be temporarily protected using plywood sheets during the excavation. Once the excavation has been completed and the foundation and low-permeability soil barrier layers have been repaired (see Appendix A.1.1 of the Partial PCMP), a new piece of geotextile and VLDPE geomembrane shall be used to replace the cut out area. The geotextile cushion and VLDPE geomembrane material and installation shall conform to the requirements of the final cover construction specifications and drawings. The VLDPE geomembrane shall be fitted with prefabricated HDPE boots where protrusions are required. The HDPE boots shall be



TYPICAL FINAL COVER ON DECK



TYPICAL FINAL COVER ON BENCH

APPROXIMATE SCALE: 1" = 2'

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FINAL COVER ON DECK/BENCH AREAS
DISPOSAL AREA C
LOPEZ CANYON SANITARY LANDFILL

FIGURE NO.	2-1
PROJECT NO.	CE4100-06
DRAWN BY:	LPR
DATE:	12-07-93

DWG: 4100F031 19940124103 LP

approved by the Engineer or his designated representative. Repairs of the VLDPE geomembrane shall be subjected to construction quality assurance (CQA) testing in accordance with the approved CQA Plan for construction of the final cover contained in Appendix B of Volume IV of the Final Cover Plan, the Amendment to the Partial Closure Plan.

2.3.2 Sags, Ponds, Drainage Interruptions, and Surface Erosion

Sags, ponds, surface erosion, or other settlement features which could interfere with surface water drainage along the top of the VLDPE geomembrane and low-permeability soil barrier layer will be repaired immediately.

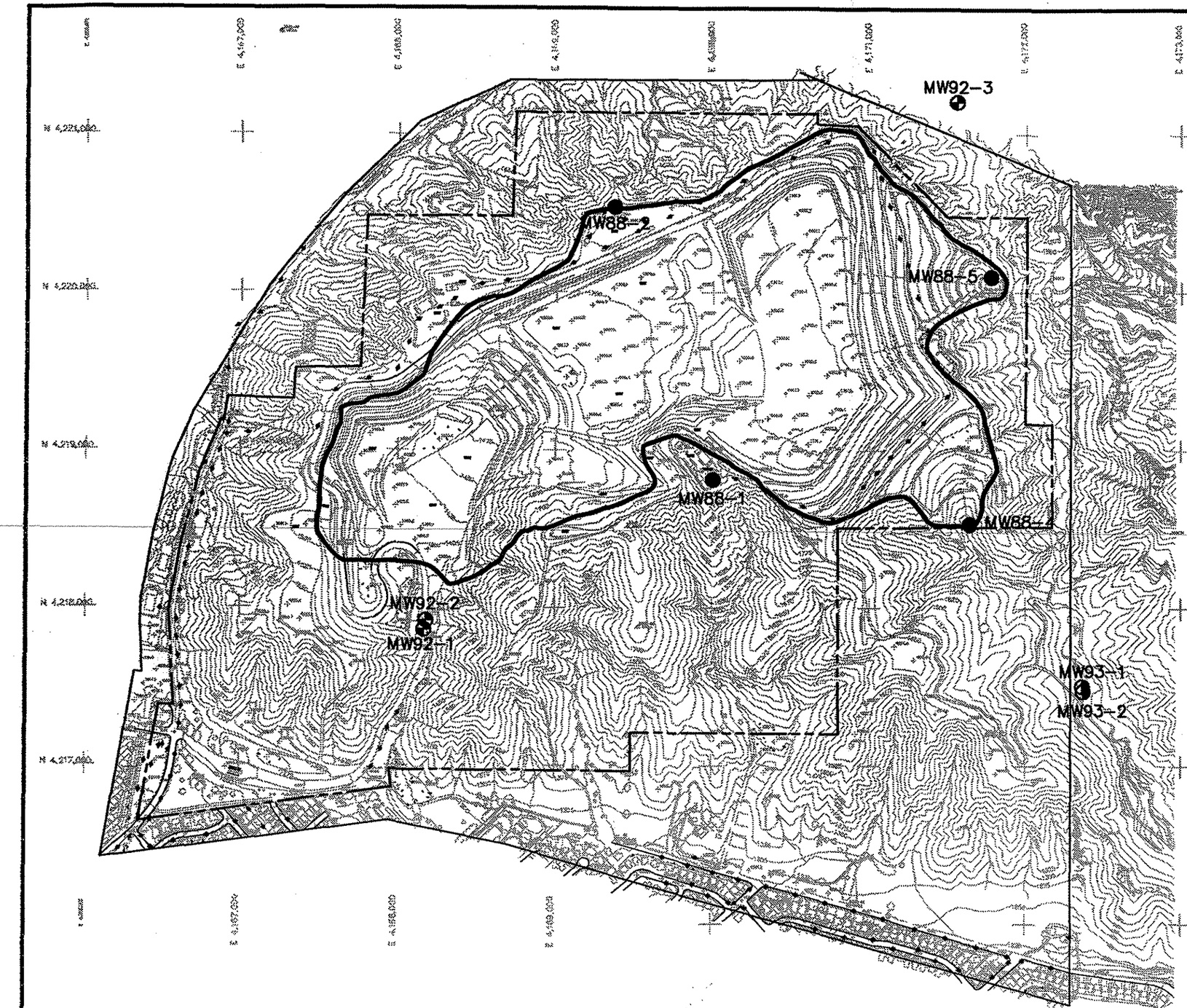
Sags and ponds in the deck and bench areas of the final cover of Disposal Area C due to non-uniform displacement of the VLDPE geomembrane barrier will be repaired by excavating to the geotextile cushion and VLDPE geomembrane, cutting and removing the geotextile cushion and VLDPE geomembrane, and rebuilding grades by placing additional foundation and low-permeability soil barrier material as outlined in Appendix A.1.1 of the Partial PCMP. Once the grades have been rebuilt, new pieces of VLDPE geomembrane and geotextile cushion shall be used to replace the cut out area. Replacement of the VLDPE geomembrane and geotextile cushion shall be completed as described in Section 2.3.1 of this amendment. In no event will grade recovery in areas of non-uniform displacement of the VLDPE geomembrane be completed solely by placement of additional vegetative layer soil. In areas of surface-water drainage interruption and erosion, reconstruction will be consistent with the materials and practices utilized in original construction.

3. UPDATED GROUND-WATER MONITORING NETWORK

This section presents an update of the ground-water monitoring network for the Lopez Canyon Sanitary Landfill described in Section B.1 of the Partial PCMP. Two additional ground-water monitoring wells, designated MW93-1 and MW93-2, were installed in Bartholomaus Canyon since completion of the Partial PCMP to enhance the ground-water monitoring network at the Lopez Canyon Sanitary Landfill. The installation of these two ground-water monitoring wells was approved by the RWQCB.

Monitoring Wells MW93-1 and MW93-2 are located in Bartholomaus Canyon, a canyon trending in a north-south direction along the eastern property boundary of the Lopez Canyon Sanitary Landfill. The locations of Monitoring Wells MW93-1 and MW93-2 and the locations of the pre-existing ground-water monitoring wells at the Lopez Canyon Sanitary Landfill are shown in Figure 3-1 and Drawing 1. Monitoring Wells MW93-1 and MW93-2 are located in the Bartholomaus Canyon downgradient of Disposal Areas A and B and of Monitoring Well MW92-3. Monitoring Well MW92-3 is a background monitoring well located in Bartholomaus Canyon upgradient of Disposal Areas A and B, as shown in Figure 3-1. These two wells were located to provide additional ground-water monitoring points downgradient of Monitoring Wells MW88-4 and MW88-5, which are located at the toe of Disposal Areas A and B, respectively.

Presently, quarterly and annual monitoring of ground-water wells is performed in accordance with the most recent Waste Discharge Requirements (WDRs). The monitoring frequency during the post closure period may change on approval of or directive from the RWQCB.



SCALE
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(IN FEET)

LEGEND

- MW88-4 GROUND-WATER MONITORING WELL CONSTRUCTED IN 1988
- MW92-3 GROUND-WATER MONITORING WELL CONSTRUCTED IN 1992
- MW93-1 GROUND-WATER MONITORING WELL CONSTRUCTED IN 1993
- LANDFILL BOUNDARIES
- WASTE DISPOSAL BOUNDARIES

		DATE
DESIGNED	HA	01-25-93
DRAWN		
CHECKED	MS	12-22-93
SUPERVISED	EK	12-23-93
PROJECT ENGR.		R.C.E. NO.
DIV./DIST. ENGR.		R.C.E. NO.

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LOPEZ CANYON LANDFILL

NO.	REVISION DESCRIPTION	ENGR.	DATE

CITY OF LOS ANGELES
BUREAU OF SANITATION DELMAR A. BIAGI, DIRECTOR
DATE _____, 19__
STEPHEN A. FORTUNE R.C.E. NO. 21737
DIV. DIST. ENGR.

SCALE AS SHOWN
SHEET NO. 3-1
DWG. NO. 4100E024
JOB NO. GE4100-06

REVISED GROUND-WATER MONITORING NETWORK

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4. REVISED POST-CLOSURE MAINTENANCE COST ESTIMATE

This section presents revisions to the post-closure maintenance cost estimate resulting from the modifications to the final cover post-closure maintenance requirements and ground-water monitoring activities described herein. The use of a geotextile cushion and a VLDPE geomembrane in the final cover of the deck and bench areas of Disposal Area C, a reduction in the total surface area of the landfill, and the addition of two more wells to the ground-water monitoring network will have an impact on the post-closure maintenance cost estimate.

The total area of geotextile cushion and VLDPE geomembrane to be used in final cover construction for the deck and bench areas of Disposal Area C is about 1,051,160 ft^2 (97,650 m^2). The additional annual cost of repairing and/or replacing areas underlain by the geotextile cushion and the VLDPE geomembrane has been estimated assuming that about 5,000 ft^2 (460 m^2) of geotextile cushion and VLDPE geomembrane will be replaced annually. Based on a furnished and installed cost of about \$1.10/ft^2 (\$11.80/m^2) for the geotextile and geomembrane, the annual additional cost of repairing or replacing areas of the geotextile cushion and VLDPE geomembrane is about \$5,500 in 1994 dollars. The annual cost of providing construction quality assurance (CQA) during these repairs is estimated to be 25 percent of the construction cost, or \$1,375 in 1994 dollars. Therefore, the total annual cost of repairing the geotextile cushion and VLDPE geomembrane, and providing CQA is \$6,875 in 1994 dollars. The revised final cover maintenance costs also include 17,500 ft^2 (1,625 m^2) of earthen final cover repair and CQA at a total annual cost of \$11,783 in 1994 dollars.

The addition of two ground-water monitoring wells will result in additional post-closure monitoring costs for the Lopez Canyon Sanitary Landfill. Based on an annual monitoring and maintenance cost of about \$6,500 (i.e., four samples per year) per ground-water monitoring well, the additional annual monitoring costs for the two

new wells is about $13,000 in 1994 dollars. The revised cost for ground-water monitoring also reflects an increase from one to four in the annual frequency of sampling for the six wells described in the Partial PCMP. This results in an additional cost of $24,500 in 1994 dollars.

Semi-annual sampling of leachate from the leachate collection and removal system (LCRS), performed in accordance with RWQCB Order No. 93-062 for the purposes of building the Constituents of Concern (COC) list, is also included in the revised ground-water monitoring costs. Assuming that samples will be recovered and tested from the LCRS for both Areas AB+ and C in October and April for COCs results in an additional annual cost of $6,500 in 1994 dollars.

The "revegetation" cost presented in the Partial Closure Plan for irrigation and fertilizer use over the first four to six years following closure was reduced due to the smaller surface area associated with the revised final grading plan (i.e., 161 vs. 166 acres [65 vs. 67 hectares]). The revised cost for revegetation is therefore $1,485,362 in 1994 dollars, reflecting a decrease of $46,133.

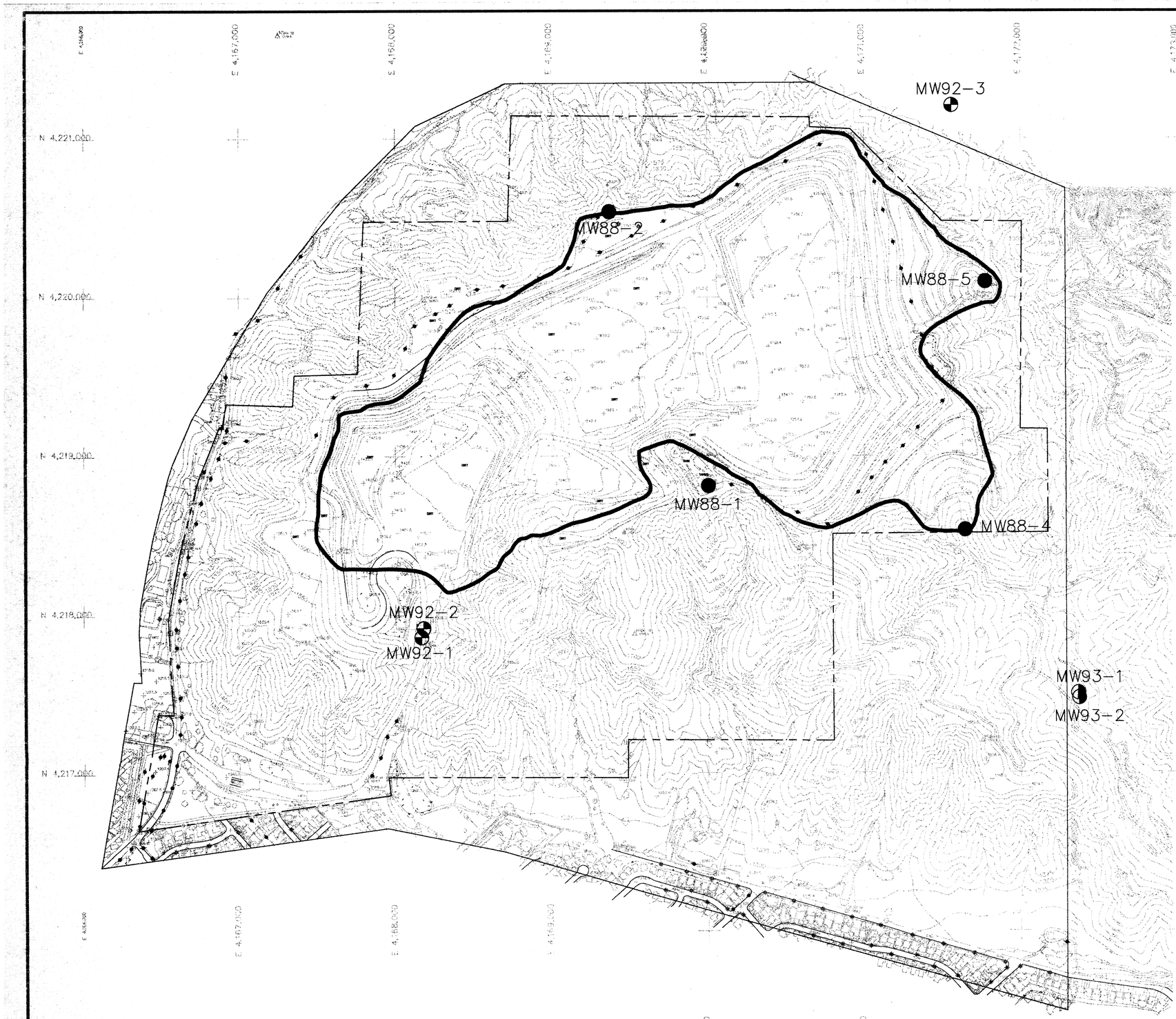
The revised total post-closure maintenance cost increases from $34,578,685 to $36,412,292 in 1994 dollars over a 30 year period as a result of the additional final cover maintenance costs, monitoring costs for quarterly sampling of eight ground-water monitoring wells, semi-annual sampling of leachate from Areas AB+ and C, and revegetation costs. The revised total post-closure maintenance cost is summarized in Table 4-1.

TABLE 4-1

REVISED SUMMARY OF POST-CLOSURE MAINTENANCE COST ESTIMATE AMENDMENT TO POST-CLOSURE MAINTENANCE PLAN LOPEZ CANYON SANITARY LANDFILL

POST-CLOSURE MAINTENANCE AND MONITORING FEATURES	ESTIMATED COST (1994 Dollars)
Final Cover Maintenance*	$18,658
Leachate Management	$63,223
Landfill Gas Management	$277,500
Ground Water Monitoring*	$70,700
Surface Water Drainage	$37,000
Site Security	$7,000
Landfill Inspection	$300,000
Other: Supervision, Surface Water Monitoring, Health and Safety, Site Monitoring)	$390,150
I. Annual Cost	$1,164,231
II. Annual Cost x 30 years	$34,926,930
III. Revegetation*	$1,485,362
Total Post-Closure Maintenance Costs (Item II + Item III)	$36,412,292

Note: * cost estimate features changed from the Partial PCMP



SCALE

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(IN FEET)

LEGEND

- MW88-4 — GROUND-WATER MONITORING WELL CONSTRUCTED IN 1988
- MW92-3 — GROUND-WATER MONITORING WELL CONSTRUCTED IN 1992
- MW93-1 — GROUND-WATER MONITORING WELL CONSTRUCTED IN 1993
- LANDFILL BOUNDARIES
- WASTE DISPOSAL BOUNDARIES

DWG: 4100E024 19931230141 3 LP

REVISED GROUND-WATER MONITORING NETWORK

		DATE
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DRAWN		
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LOPEZ CANYON LANDFILL

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1

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CE4100-06