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January 26, 2011

Waste Management of Hawaii
Waimanalo Gulch Sanitary Landfill
92-460 Farrington Highway
Kapolei, Hawai'i 96707

Attention: Mr. Jesse Frey

Subject: Liner Damage Assessment and Construction Quality Assurance Report for Cell E-6 and E-4 Repairs, Waimanalo Gulch Sanitary Landfill, Kapolei, HI

Dear Mr. Frey:

1. INTRODUCTION

This letter report presents a liner damage assessment and construction quality assurance (CQA) documentation of liner repairs recently completed for the municipal solid waste (MSW) Cells E4 and E6 at the Waimanalo Gulch Sanitary Landfill (WGSL) at 92-460 Farrington Highway in Kapolei, Hawai'i. A series of storm events occurring in late December 2010 through mid-January 2011 resulted in high surface runoff flows that flooded MSW Cell E6 and damaged portions of the liner system.

2. DAMAGE ASSESSMENT

In late December 2010, a series of storms produced high runoff resulting in damage to the northwestern (up-canyon) edge of the floor MSW Cell E6 liner system where it joins with MSW Cell E4. In early January, work began to expose the edge of liner to observe the extent of damage. However, before this work could be completed, a large storm arrived on evening of January 12, 2011 that resulted in severe flooding of the landfill and caused additional damage to this area as well as to the exposed western slope of the Cell E6 liner area. The damaged areas are shown on Figure 1, in Attachment 1. Photos of the damaged areas are presented in Attachment 2.

This letter report focuses on the damage to the edge of the liner system where MSW Cell E6 joins with E4. It is our understanding that the damaged western slope area of Cell E6 will be investigated at a later date. The high flows and sloping topography in the area at the Cell E6/E4 tie-in resulted in erosion and exposure of the leading edge of the liner. The high flows caused the leading edge to fold upward allowing rocks and debris to accumulate on top and underneath both Cell E6 and E4 liners, as well as tearing the composite liner in multiple locations.

Work began on January 17, 2011 to expose the edge of liner in this area to determine the extent of damage and was completed on January 21, 2011. An excavator and hand labor were used to carefully remove MSW, operations layer, leachate collection gravel, and flood debris off of the liner so it could be inspected. Inspection holes were cut through the multiple

layers of liner to determine if the underlying geosynthetic clay liner (GCL) had been hydrated and whether the subgrade cushion soil was intact. This uncovering process continued to the south, east, and west until undamaged layers and suitable subgrade soil were exposed. The area requiring repair is shown on Figure 2, Attachment 1.

Once the damaged liner area was fully delineated, the up-canyon edge of the Cell E6 encapsulated liner was uncovered working from the damaged area to the north. Approximately 40 linear feet (ft) of encapsulated liner was exposed (corresponding to panels P 52 and P-53 shown on Figure 2) and no damage was observed. The encapsulated weld was intact and the edge of liner was found to be buried in a shallow trench as was originally constructed. The leading edge of the 1-ft thick leachate collection removal system (LCRS) drainage gravel layer was exposed as well. The gravel layer was found to be covered with geotextile as was originally constructed. The gravel beneath the geotextile was found to be clean and in its original condition.

Based on these observations and the fact that the remainder of the encapsulated edge of floor liner is buried in a trench, and is covered with plywood and a 4.5-ft high diversion berm, it is presumed that the liner and LCRS layer and pipe are intact and functioning as designed in this area (panels P-59, P-60, P-61, P-62, and P-64 shown on Figure 2). This area will be uncovered later in 2011 when the remainder of MSW Cell E6 is constructed and these conclusions will be verified.

3. CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

Once the damaged area was delineated, repairs of the MSW Cells E4 and E6 liner began on January 22, 2010.

The participants in the Cell E4 and E6 repairs at WGSL and their respective roles are noted below:

- Grading Contractor: Goodfellow Brothers Inc.
- Geosynthetic Materials Repair Contractors: American Environmental Group, Ltd. (AEG)
- CQA Observation: AECOM Technical Services, Inc. (AECOM)

AECOM's CQA officer/project manager performed oversight for the documentation procedure including both fieldwork and report preparation. The CQA officer also prepared the documentation report and provided the engineering certification. The CQA officer's statement is included in Attachment 3. All repair work was performed in accordance with the construction documents prepared by Geosyntec Consultants, Inc. 2010: *Technical Specifications and Construction Drawings, Cells E-6 through E-8, Waimanalo Gulch Landfill, Ewa Beach, O'ahu, Hawai'i, dated January 2010 with revisions dated February 11, March 11, and March 16, 2010.*

In addition to the CQA officer, AECOM's full time CQA monitor was responsible for onsite observation and documentation, including preparation of daily field reports, logging of repairs to the geomembrane, and obtaining photos. Daily field reports are included in Attachment 4. Photographs of the liner repairs are presented in Attachment 2.

Details of the CQA performed on the original MSW Cells E4 and E6 construction can be found in the following documents:

- *Construction Quality Assurance Report for Cell E-6 (Partial), Waimanalo Gulch Sanitary Landfill, Kapolei, Oahu, Hawaii* (AECOM, October 2010)
- *Construction Quality Assurance Report for Cell E-4, Waimanalo Gulch Sanitary Landfill, Kapolei, Oahu, Hawaii* (AECOM, January 2008).

3.1 Subgrade Preparation

Liner materials were removed to expose subgrade areas where gravel and rocks had been washed beneath the liner from the flooding. The loose gravel and rocks were removed using an excavator as well as hand labor to expose the underlying cushion soil. A thin layer (2 to 6 inches) of soil cushion material was then placed throughout the subgrade area using an excavator to fill in uneven areas. The soil cushion material was then compacted using a hand-held vibrator plate compactor to create a relatively smooth, unyielding surface, with no protrusions exceeding 3/8-inch. A subgrade acceptance form was completed as required by the project specifications and is presented in Attachment 5.

3.2 Geosynthetic Materials

Geosynthetic materials used to repair the liners were obtained from the stockpile of remaining material used for the Cell E-6 (Partial) construction. Manufacturer's quality control documentation, conformance testing, and interface friction results for the materials were presented in the original E6 CQA report referenced above.

3.3 Trial Welds

Extrusion trial weld samples were produced several times during each day's production seaming. The seams were made by AEG technicians on representative pieces of the geomembrane to monitor each seaming apparatus and operator under the daily site conditions. At a minimum, trial welds were performed once in the morning and again during early afternoon. The trial seams were observed, monitored, and documented by AECOM.

Trial weld samples were a minimum of 5-ft-long by 1-ft-wide after seaming, with the seam centered lengthwise. Two specimens, measuring 1-inch-wide, were die-cut from each trial seam. The specimens were tested by AEG, for peel adhesion and bonded seam strength (shear strength) using an onsite tensiometer supplied by AEG. The tensiometer certification is presented in Attachment 6.

For the 40-mil geomembrane, the specified strength for peel adhesion was 52 pounds per inch (ppi) for extrusion welds. The specified strength for shear specimens was 80 ppi. In addition to the strength criteria, specimens were required to fail outside of the weld area in a film tear bond.

For the 60-mil geomembrane, the specified strength for peel adhesion was 78 ppi for extrusion welds. The specified strength criteria for shear specimens was 120 ppi. In addition to the strength criteria, specimens were required to fail outside of the weld area in a film tear bond.

Production seaming was conducted after passing results on trial welds were achieved. Each trial seam was assigned a number, and pertinent information was recorded by AECOM. The summary of the trial weld seam results is presented Attachment 7.

3.4 Geomembrane Repairs

The repair area is shown on Figure 2 in Attachment 1. The area is along the northeastern edge of Cell E6, corresponding to originally installed panels P-27 through P-31 (60-mil panel numbers), and is approximately 60-ft long in the north-south direction and 30-ft wide in the east-west direction. Approximately half of the repair was to the E4 liner system (60-mil high-density polyethylene [HDPE] over GCL) and the other half to the E6 liner system (60-mil HDPE over GCL over 40-mil HDPE). The tie-in weld between the E6 liner system and the E4 liner system was constructed in accordance with the project specifications.

Geomembrane repair sheets were heat tacked in place over the damaged geomembrane with a leister gun. An electric grinder was used on the edges of the patch and existing geomembrane prior to extrusion welding to complete the repair. For damage where the geomembrane was not penetrated, an extrusion weld bead was used. The repairs were documented by recording the date repaired, location, description of damage, size and type of repair, crew that made the repair, date, and technician that conducted the non-destructive test on the repair. Following welding of each repair, a vacuum box was used to non-destructively test the weld. All welds passed the vacuum box test and no leaks were observed.

Dates, locations, dimensions, and testing of repairs to the geomembranes are presented in the Geomembrane Repair Summary in Attachment 8. Photos of the repair activities are included in Attachment 2.

3.5 GCL Repairs

Hydrated or otherwise damaged GCL was replaced in the designated repair area shown on Figure 2. The GCL was deployed in a manner not to entrap stones or other loose soil under the material. All adjacent panels of new GCL were overlapped a minimum of 18 inches and bentonite was applied at a rate of 1/4 pound per ft of seam. The Cell E6 GCL was connected to the Cell E4 by overlapping a minimum of 36 inches.

3.6 Cushion Geotextile Repairs

Following completion of the geomembrane and GCL repairs, the 16 ounce (oz)/square yard (yd^2) cushion layer geotextile was repaired using patches of new material which were sewn using a “prayer” style seam.

3.7 LCRS Drainage Gravel

LCRS drainage gravel was placed over the E6 liner area in a 1-ft thick layer. AECOM observed that the new drainage gravel was placed up against the existing drainage gravel material to form a continuous layer. The drainage gravel material was obtained from the remaining stockpile of approved material used to construct the original E6 LCRS. A filter layer of 10 oz/yd^2 geotextile was installed over the LCRS drainage gravel and was sewn using a “prayer” style seam.

3.8 Operations Layer

The operations layer consisted of onsite crushed/screened stone material and was placed in a 2-ft-thick (minimum) layer over the LCRS drainage gravel layer in E6 and over the cushion geotextile in E4.

4. CONCLUSIONS

AECOM performed field observations and documentation of Cell E-6 Repairs at WGSL as shown on Figure 1. In summary, based upon our observations and test results, we conclude that the work represented by the attached documentation is in substantial conformance with the original construction contract documents and their design intent, and industry standard construction practices.

Due to obvious liner damage to the western slope of MSW Cell E6, future MSW placement operations should be kept at least 50 ft away from this slope area to allow liner repair work to be completed.

If you have any questions or need more information about this project please call me at (808) 356-5321.

Sincerely yours,

Ronald E. Boyle, P.E.
Project Manager
AECOM Technical Services, Inc.

Attachments:

1 Figures
2 Photo Log
3 CQA Officer's Statement
4 Daily Reports
5 Subgrade Acceptance Form
6 Tensiometer Certificate
7 Trial Weld Summary
8 Geomembrane Repair Summary

cc: Joe Whelan, Waste Management of Hawaii

WMH007057

Attachment 1
Figures

WMH007059

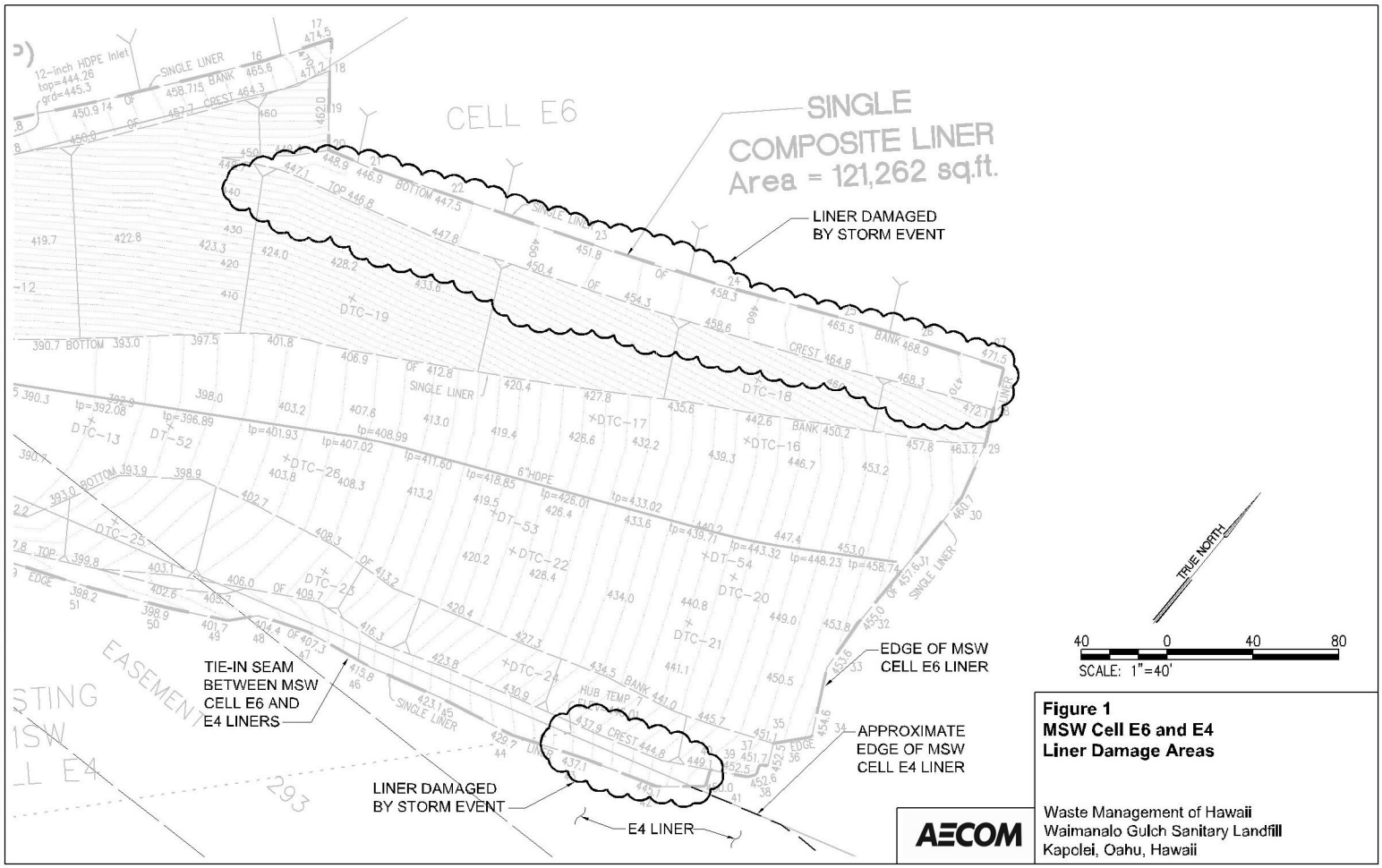

Figure 1
MSW Cell E6 and E4
Liner Damage Areas

AECOM

Waste Management of Hawaii
Waimanalo Gulch Sanitary Landfill
Kapolei, Oahu, Hawaii

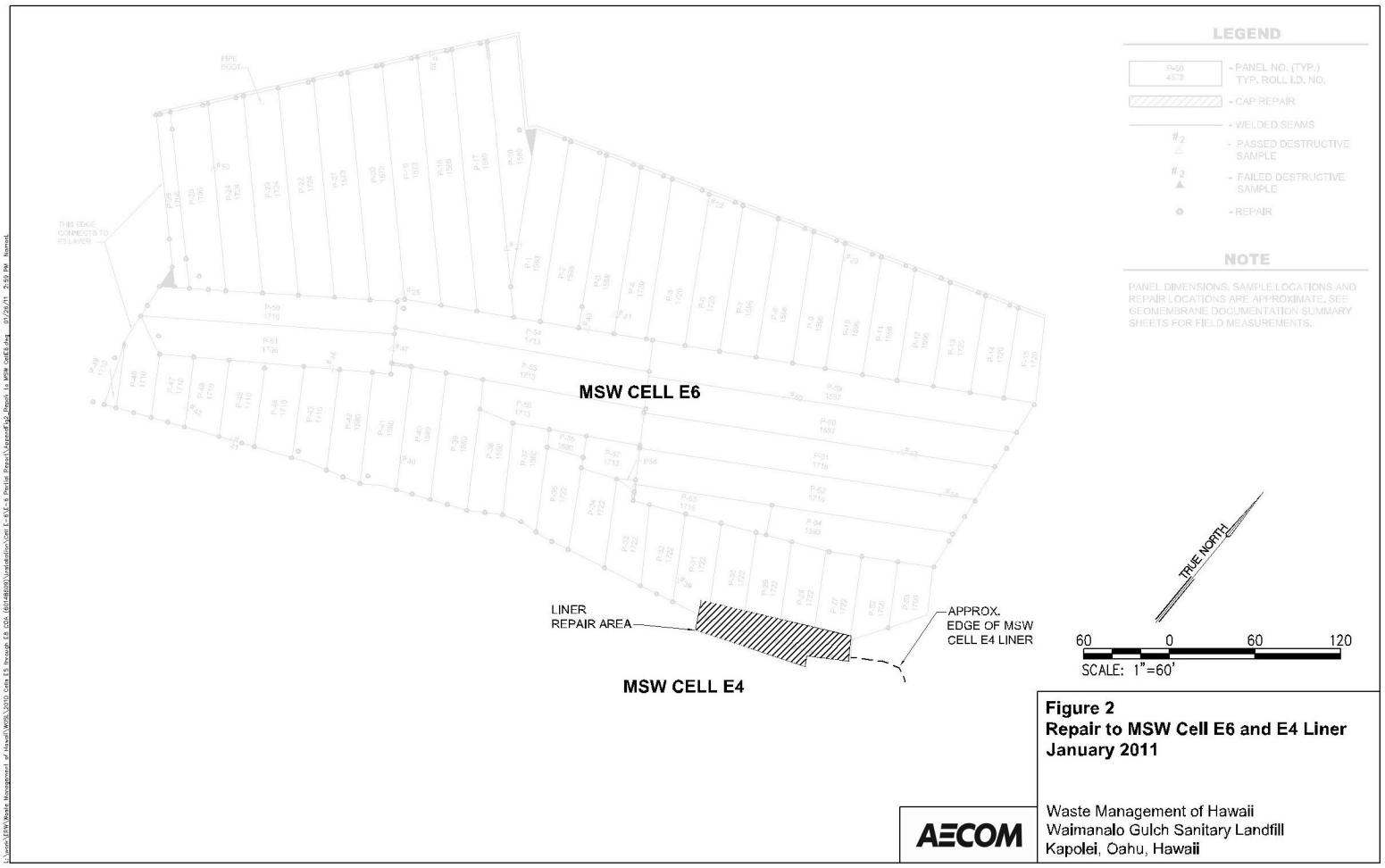

Figure 2
Repair to MSW Cell E6 and E4 Liner
January 2011

AECOM

Waste Management of Hawaii
Waimanalo Gulch Sanitary Landfill
Kapolei, Oahu, Hawaii

Attachment 2
Photo Log

Photo 1. Storm damage to Cell E6, western slope.

Photo 2. Storm damage to Cell E6, western slope, close-up.

Photo 3. Storm damage, Cell E6/E4 tie-in, looking southwest.

Photo 4. Storm damage, Cell E6/E4 tie-in, looking west.

Photo 5. Clearing rocks from Cell E6/E4 tie-in subgrade.

Photo 6. Cell E6/E4 tie-in, subgrade preparation.

Photo 7. Placement of soil cushion material for liner subgrade.

Photo 8. Compaction of soil cushion material.

Photo 9. Placement of GCL for Cell E4 tie in, looking north.

Photo 10. Placement of 60-mil HDPE geomembrane for Cell E4 tie-in.

Photo 11. Extrusion welding of 40-mil HDPE geomembrane (left panel) to 60-mil geomembrane (right panel).

Photo 12. Trial weld.

Photo 13. Preparation of extrusion weld to existing E4 60-mil geomembrane, looking northeast.

Photo 14. Extrusion weld new 60-mil HDPE to existing 60-mil HDPE Cell E4, looking southwest.

Photo 15. Compaction of soil cushion layer.

Photo 16. Extrusion weld new 40-mil HDPE to existing Cell E6 40-mil HDPE.

Photo 17. Vacuum box testing of extrusion weld.

Photo 18. Cell E6, GCL layer between 40-mil and 60-mil HDPE.

Photo 19. Cell E6, placement of 60-mil HDPE over GCL, looking northeast.

Photo 20. Placement of geotextile cushion.

Photo 21. Sewing of geotextile cushion layer.

Photo 22. Cell E6, exposed LCRS drainage gravel layer with filter geotextile on top.

Photo 23. Cell E6, placement of new LCRS drainage gravel against existing layer.

Photo 24. Placement of geotextile filter layer over LCRS drainage gravel.

Photo 25. Placement of operations layer.

Attachment 3
CQA Officer's Statement

CQA OFFICER'S STATEMENT

The Quality Assurance Consultant for MSW Cell E6 and Cell E4 Repairs construction was AECOM Technical Services, Inc. (AECOM) located at 1001 Bishop Street, Suite 1600, Honolulu, Hawaii 96813.

All quality assurance activities performed by AECOM personnel were under the direct supervision of the Construction Quality Assurance (CQA) Officer or his designated representative, the CQA Monitor. The activities undertaken by AECOM are documented in the attached Construction Quality Assurance Letter Report for Cell E6 and E4 Repairs, prepared by AECOM, dated January 2011. The CQA activities included visual observations of all geomembrane trial weld testing, as well as vacuum testing of all welded seams. The monitoring, observation, and testing performed by and under the direction of AECOM have verified that Cell E6 and E4 Repairs were constructed in substantial conformance with the permit, approved project plans and specifications, construction quality assurance plan, and generally accepted construction practices.

The CQA Officer for this project was Mr. Ron Boyle. Additionally, Mr. Dan Frerich and Mr. Russ Kotrba were on-site serving as CQA Monitors. The CQA Officer assumes full responsibility for all CQA related activities performed by AECOM at this site whether under his direct supervision or at the direction of the CQA Monitor.

AECOM

RONALD E. BOYLE
LICENSED PROFESSIONAL ENGINEER
Exp. 4/30/12
No. 8431-C
HAWAII, U.S.A.

Ron Boyle, P.E.
CQA Officer
Registered Professional Engineer
State of Hawaii No. 8431

Attachment 4
Daily Reports

Daily Field Report

AECOM

Site: Waimanalo Gulch Sanitary Landfill

Report Number: 1

Client: Waste Management of Hawaii

Date: 01/22/2011

Project: Cells E-4 and E-6 Liner Repair

Project No.: 6019059.02.04

Page 1 of 2

Temp (°F): Low 68 Wind Speed (mph): 5-10

High 75 Wind Direction: North

Weather Conditions: Mostly clear

Contractor(s) on-site	No. of people
Goodfellow Bros. (GBI)	5

Equipment	No. on-site	No. in-use
Excavator		1

Visitors	Representing

Daily Notations:

Arrive on-site at 0830. At the E-6 and E-4 tie-in on the northeast edge of Cell E-6 (Partial), GBI has exposed the extent of the damage to the liner system following damage during flash flood events. Area of repair is along the northeastern edge of Cell E-6 panels P-27 thru P-31 (60-mil panel numbers) and is approximately 60-ft north/south and 30-ft east/west. Approximately half of the repair area is to the E-4 liner system (GCL and 60-mil geomembrane) and half is to the E-6 liner system (40-mil, GCL, and 60-mil encapsulated liner).

GBI uses excavator to remove ~ 6-12 inches of deposited rocks/debris material. A vibratory plate compactor was used to compact the subgrade prior to placement of a thin layer (2 to 6-inches) of soil cushion material, which was subsequently compacted with a hand-held vibratory plate compactor. Following placement of the soil cushion layer with the excavator, the vibratory plate compactor was used to compact the soil cushion, water was applied to help achieve compaction.

Subgrade ready for geosynthetics repair on Monday.

Depart site at 1200.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Report Number: 1

Daily Notations (cont.):

Following deployment of the 60-mil geomembrane for the E-4 liner system repair, AEG conducts a trial weld of 60-mil to 60-mil with an extrusion weld. Trial weld meets project specifications, see field forms for additional information.

AEG uses the lyster gun to heat tack the 60-mil repair geomembrane to the existing 60-mil geomembrane. Following heat tacking, AEG uses a grinder to prepare the edges of the 60-mil geomembrane places and extrusion weld along the E-4 liner repair.

Depart site at 1720.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Site: Waimanalo Gulch Sanitary Landfill

Report Number: 2

Client: Waste Management of Hawaii

Date: 01/24/2011

Project: Cells E-4 and E-6 Liner Repair

Project No.: 6019059.02.04

Page 1 of 2

Temp (°F): Low 68 High 79

Wind Speed (mph): 5-10

Wind Direction: Variable

Weather Conditions: Mostly clear

Contractor(s) on-site	No. of people
American Env. Group (AEG)	2
Goodfellow Bros. (GBI)	5

Equipment	No. on-site	No. in-use
Excavator		1
Forklift		1

Visitors	Representing
Ron Boyle	AECOM

Daily Notations:

Arrive on-site at 0700. At the E-6 and E-4 tie-in on the northeast edge of Cell E-6 (Partial), the subgrade of 1-ft thick soil cushion layer has been compacted and is ready for repair following damage during flash flood events. Area of repair is along the northeastern edge of Cell E-6 panels P-27 thru P-31 (60-mil panel numbers) and is approximately 60-ft north/south and 30-ft east/west. Approximately half of the repair area is to the E-4 liner system (GCL and 60-mil geomembrane) and half is to the E-6 liner system (40-mil, GCL, and 60-mil encapsulated liner).

AEG mobilizes equipment and materials to repair area while GBI continues to exposed the cell E-6 encapsulated weld on the leading edge north of the tie-in repair. Following excavation of cell E-6 panels P-52 and P-53, no damage to the encapsulated weld was observed. Rocks and debris were cleared back from under the geotextile from the leading edged ~10-ft back. Minor damage to the encapsulated weld along the leading edge north of the tie in will be repaired following tie-in repair.

GCL for the E-4 liner system repair is deployed from roll #4205 and overlaps the remaining E-4 GCL by ~3-ft. The 40-mil geomembrane for the lower layer of the E-6 liner system repair is deployed from roll #1761, followed by deployment of the 60-mil geomembrane for the E-4 liner system repair from roll #1598.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Report Number: 2

Daily Notations (cont.):

Following deployment of the 60-mil geomembrane for the E-4 liner system repair, AEG conducts a trial weld of 60-mil to 60-mil with an extrusion weld. Trial weld meets project specifications, see field forms for additional information.

AEG uses the lyster gun to heat tack the 60-mil repair geomembrane to the existing 60-mil geomembrane. Following heat tacking, AEG uses a grinder to prepare the edges of the 60-mil geomembrane places and extrusion weld along the E-4 liner repair.

Depart site at 1720.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Site: Waimanalo Gulch Sanitary Landfill

Report Number: 3

Client: Waste Management of Hawaii

Date: 01/25/2011

Project: Cells E-4 and E-6 Liner Repair

Project No.: 6019059.02.04

Page 1 of 2

Temp (°F): Low 60 High 79

Wind Speed (mph): 5-10

Wind Direction: north

Weather Conditions: Mostly clear

Contractor(s) on-site	No. of people
American Env. Group (AEG)	2
Goodfellow Bros. (GBI)	5

Equipment	No. on-site	No. in-use
Excavator		1
Forklift		1

Visitors	Representing
Ron Boyle	AECOM

Daily Notations:

Arrive on-site at 0700. Continue repairs to the E-6 and E-4 tie-in on the northeast edge of Cell E-6 (Partial).

GBI removes rocks/debris from the leading edge along panels P-28 and P-27, compact subgrade with vibratory plate compactor followed by a thin layer (<6-inchs) of 3/8" minus soil cushion. Compaction of soil cushion with vibratory plate compactor following application of water with a water truck. Panels P-52 and P-53 are intact with the leading edge of the encapsulated weld in the anchor trench previously installed.

AEG conducts trial weld throughout the day based on the material being welding (see Trial Weld field form for additional information) all trial welds meet project specifications. Continue making repairs with extrusion welds and conducting non-destructive testing using vacuum box of all welds.

Used additional 60-mil material from parital rolls #1587 and 1573 for the top layer of the encapsulated liner system repair of cell E-6. Complete repairs along the tie-in (repair IDs R-1 thru R-8), see Geomembrane Repair Summary field for for additional information. Remaining repairs include the encapsulated liner system on the leading edge of panels P-28 and P-27.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Report Number: 3

Daily Notations (cont.):

Begin deploying 16-oz geotextile on the southern section of the completed tie-in repairs. Plan to complete remaining repairs along the leading edge tomorrow followed by tie-in to the E-6 LCRS layer.

Depart site at 1800.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Site: Waimanalo Gulch Sanitary Landfill

Report Number: 4

Client: Waste Management of Hawaii

Date: 01/26/2011

Project: Cells E-4 and E-6 Liner Repair

Project No.: 6019059.02.04

Page 1 of 2

Temp (°F): Low 63 High 82

Wind Speed (mph): 5-10

Wind Direction: north

Weather Conditions: Mostly clear

Contractor(s) on-site	No. of people
American Env. Group (AEG)	2
Goodfellow Bros. (GBI)	5

Equipment	No. on-site	No. in-use
Excavator		1
Forklift		1

Visitors	Representing

Daily Notations:

Arrive on-site at 0700. Continue repairs to the E-6 and E-4 tie-in on the northeast edge of Cell E-6 (Partial).

AEG conducts trial weld throughout the day based on the material being welding (see Trial Weld field form for additional information) all trial welds meet project specifications. Continue making repairs with extrusion welds and conducting non-destructive testing using vacuum box of all welds. Repairs include the leading edge of the encapsulated weld along panel P-28 and P-29.

Continue to deploy 16-oz geotextile over the completed repairs. Sewing machine used to secure panels of geotextile. Following 16-oz, LCRS gravel exposed along E-6 including ~2' of the overlying 10-oz geotextile. Once LCRS layer exposed, GBI places a min of 1-ft of clean LCRS rock with an excavator to replace what was exposed during excavation of repair (approximatly 3-ft). New 10-oz geotextile placed over the LCRS gravel and sewn to the existing material, extending past the gravel onto the 16-oz geotextile.

Name: Dan Frerich

Signature:

Daily Field Report

AECOM

Report Number: 4

Daily Notations (cont.):

Following placement of the 10-oz geotextile, GBI uses excavator to place 3-ft thick layer of operations layer (3/8" minus sand material) over the LCRS layer and 3-ft thick layer on areas outside the LCRS layer.

Complete repairs along the tie-in, encapsulated weld and other minor cuts made during the excavation of the repair area (repair IDs R-9 thru R-21), see Geomembrane Repair Summary field for for additional information.

Name: Dan Frerich

Signature:

Attachment 5
Subgrade Acceptance Form

AECOM

AECOM Technical Services, Inc.
1001 Bishop Street, Suite 1600
Honolulu, HI 96813-3698

Certificate of Acceptance of Soil Subgrade

Owner: Waste Management of Hawaii

Project Name: E-6/E-4 Liner Repair

Site Name: Waimanalo Gulch Sanitary Landfill

Location: Kapolei, Oahu, Hawaii

Date: 1/24/11

Installer: American Environmental Group (AEG)

I the Undersigned, a duly authorized representative of AEG do hereby accept the Soil Subgrade surface covered by geomembrane panel(s) R-1 and R-2 as an acceptable surface on which to install geomembrane.

Raul Borbolla — Name
Raul Borbolla — Signature
Title

1/24/11
Date

AECOM's CQA certification acceptance by:

Dan Frerich — Name
Signature
CQA Monitor — Title

1/24/11
Date

WMH007097

Attachment 6
Tensiometer Certificate

WMH007099

SYSTEM LOAD CALIBRATION CERTIFICATE

GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax: 281-875-6010

GSE Equipment Number	**OET-026**
Device	WEGENER
Display Instrument	# 015990
Load Cell Number	# 092758

GSE verifies the calibration of field testing equipment with a T-Hyronics TC-S-0-500 lb. load cell, serial number 228696, and a T-Hydronics 1028 transducer indicator, serial number 638, manufactured by T-Hydronics, Inc. of Westerville, Ohio. The transducer was compared to standards certified traceable to the National Institute of Standards and Technology, Washington, D. C. The most recent factory force transducer calibration for this device was August 20, 2009.

The calibration of the tensiometer, designated GSE equipment number **OET-026** was verified using the calibration load cell indicator described above on **April 26, 2010** . The reading of the calibrations are recorded as "true load".

True Load (lb.)	0	50	100	150	200	250	300	350	400	450	500
Display Load (Run #1)	0	50	100.2	150	200	250.2	300.5	350.2	400.1	450.2	500.4
Display Load (Run #2)	0	50	100.4	150.6	200.7	250.7	300.6	350.6	400.9	450.2	500.3
Display Load (Run #3)	0	50	100.3	150.2	200.4	250.3	300.3	350.4	400.5	450.3	500.2
Display Load (Average)	0	50	100.3	150.2	200.3	250.4	300.4	350.4	400.5	450.2	500.3

Wayne Leger
Field Services Manager

Tomas Duque
Tomas Duque
Utility Technician

Attachment 7
Trial Weld Summary

TRIAL WELD SUMMARY

Waste Management of Hawaii
Waimanalo Gulch Sanitary Landfill
AECOM Project Number: 60148809
Project Name: Cells E6 and E4 Liner Repair

Weld Requirements

	40-mil Peel	40-mil Shear		60-mil Peel	60-mil Shear
Fusion:	60 ppi	80 ppi	Fusion:	91 ppi	120 ppi
Extrusion:	52 ppi	80 ppi	Extrusion:	78 ppi	120 ppi

AECOM

Sample ID	Date	Time	Ambient Temp	Seamer ID	Machine ID	Extrusion Welds Barrel Temp	Extrusion Welds Preheat Temp	Fusion Welds Wedge Temp	Fusion Welds Wedge Speed	Peel (ppi)	Shear (ppi)	Observer	Pass/Fail	Comments
TWX-1	1/24/11	1530	79	RB	1290	250	224	-	-	128	156	DF	Pass	60/60
										129	153		Pass	
TWX-2	1/25/11	745	60	RB	1290	250	224	-	-	90	138	DF	Pass	40/60
										91	121		Pass	
TWX-3	1/25/11	750	60	RB	1290	250	224	-	-	82	137	DF	Pass	40/40
										76	99		Pass	
TWX-4	1/125/11	1330	80	RB	1290	250	223	-	-	138	160	DF	Pass	60/60
										140	159		Pass	
TWX-5	1/26/11	805	63	RB	1290	250	223	-	-	124	210	DF	Pass	40/40
										133	213		Pass	
TWX-6	1/26/11	915	65	RB	1290	250	223	-	-	139	230	DF	Pass	60/60
										156	299		Pass	
TWX-7	1/26/11	1310	80	RB	1290	250	223	-	-	120	155	DF	Pass	60/60
										135	172		Pass	
TWX-8	1/26/11	1308	80	RB	1290	250	223	-	-	92	106	DF	Pass	40/60
										96	118		Pass	

Notes:

DF	Dan Frerich (AECOM)
ppi	pounds per inch
Temp	temperature (degrees Fahrenheit)
TWX	Trial weld-extrusion

Attachment 8
Geomembrane Repair Summary

GEOMEMBRANE REPAIR SUMMARY

Waste Management of Hawaii

Waimanalo Gulch Sanitary Landfill

AECOM Project Number: 6019059

Project Name: Cells E6 and E4 Liner Repair

AECOM

Number	Date Repaired	Seam ID	Panel (s)	Location	Description of Damage	Type/Size of Repair (ft)	Repair Crew	Date Tested	Tested By	Observer	Comments
R-1	1/25/2011		E4 Existing	NW Corner of E4	Rip along tie-in due to flash flood	60 x 22	RB	1/25/2011	RB	DF	60-mil repair to E4 liner
R-2	1/25/2011		E6 (S-28 to S-31)	Tie-in of E6 to E4	Rip along tie-in due to flash flood	60 x 62 x 15 triangle	RB	1/25/2011	RB	DF	40-mil repair to E6 liner
R-3	1/25/2011		E4 Existing	15 ft south of leading edge	Hole	3 x 2	RB	1/25/2011	RB	DF	60-mil repair to E4 liner
R-4	1/25/2011		E4 Existing	65 ft south of leading edge	Holes	22 x 12	RB	1/25/2011	RB	DF	60-mil repair to E4 liner
R-5	1/25/2011		E6 (P-29 to P-31)	Tie-in of E6 to E4	Rip along tie-in due to flash flood	42 x 11	RB	1/25/2011	RB	DF	60-mil repair to E6 liner
R-6	1/25/2011		E6 (P-29 and P-28)	Tie-in of E6 to E4	Rip along tie-in due to flash flood	20 x 20	RB	1/25/2011	RB	DF	60-mil repair to E6 liner
R-7	1/25/2011		E6 (P-31)	65 ft south of leading edge	Cut to expose liner	4 x 2	RB	1/25/2011	RB	DF	60-mil repair to E6 liner
R-8	1/25/2011		E6 (P-30)	55 ft south of leading edge	Cut to expose liner	3 x 1	RB	1/25/2011	RB	DF	60-mil repair to E6 liner
R-9	1/26/2011		E6 (S-28 and S-27)	E6 leading edge	Rip along encapsulated weld	13 x 13	RB	1/26/2011	RB	DF	40-mil repair to E6 liner
R-10	1/26/2011		E6 (S-27 and S-51)	E6 leading edge	Rip along encapsulated weld	24 x 13	RB	1/26/2011	RB	DF	40-mil repair to E6 liner
R-11	1/26/2011		E6 (S-51)	10 ft west from leading edge	Cut to expose liner	2 x 1	RB	1/26/2011	RB	DF	40-mil repair to E6 liner
R-12	1/26/2011		E6 (S-28)	10 ft west from leading edge	Cut to expose liner	1 x 1	RB	1/26/2011	RB	DF	40-mil repair to E6 liner
R-13	1/26/2011		E6 (S-30)	E6, 8 ft from tie-in	Hole from exposing LCRS	3 x 3	RB	1/26/2011	RB	DF	40-mil repair to E6 liner
R-14	1/26/2011		E6 (P-30)	E6, 8 ft from tie-in	Hole from exposing LCRS	5 x 4	RB	1/26/2011	RB	DF	60-mil repair to E6 liner

GEOMEMBRANE REPAIR SUMMARY

Waste Management of Hawaii

Waimanalo Gulch Sanitary Landfill

AECOM Project Number: 6019059

Project Name: Cells E6 and E4 Liner Repair

Number	Date Repaired	Seam ID	Panel (s)	Location	Description of Damage	Type/Size of Repair (ft)	Repair Crew	Date Tested	Tested By	Observer	Comments
R-15	1/26/2011		E6 (P-28)	10 ft west from leading edge	Cut to expose liner	2 x 3	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-16	1/26/2011		E6 (P-52)	10 ft west from leading edge	Cut to expose liner	2 x 3	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-17	1/26/2011		E6 (P-28 and P-27)	E6 leading edge	Rip along encapsulated weld	20 x 14	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-18	1/26/2011		E6 (P-27 and P-52)	E6 leading edge	Rip along encapsulated weld	25 x 14	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-19	1/26/2011		E6 (P-27)	14 ft from leading edge	Cut to expose liner	1 x 1	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-20	1/26/2011		E6 (P-52)	14 ft from leading edge	Cut to expose liner	1 x 1	RB	1/26/2011	RB	DF	60-mil repair to E6 liner
R-21	1/26/2011		E6 (P-53)	3 ft from leading edge	Cut to inspect GCL	3 x 2	RB	1/26/2011	RB	DF	60-mil repair to E6 liner

Notes:

DF	Dan Frerich (AECOM)
ft	feet
GCL	geosynthetic clay liner
LCRS	leachate collection and removal system
P-#	P layer 60-mil panel number of composite liner system
S-#	S layer 40-mil panel number of composite liner system