

DESIGN REPORT

MOLOKAI INTEGRATED SOLID WASTE MANAGEMENT FACILITY

PHASE 5 AND PHASE 6 DISPOSAL CELLS AND DRAINAGE IMPROVEMENTS

Prepared for

COUNTY OF MAUI

**Department of Environmental Management
Solid Waste Division
One Main Plaza
2200 Main Street, Suite 225
Wailuku, Hawaii 96793**

Prepared by

**A-MEHR, INC
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October 2019

CERTIFICATION

This is to certify that the Phase 5 and Phase 6 landfill areas are designed to meet applicable State and Federal regulations.

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**PHASE 5 AND 6 DESIGN REPORT
MOLOKAI INTEGRATED SOLID WASTE MANAGEMENT FACILITY
OCTOBER 2019**

1. INTRODUCTION

This report presents the design drawings along with technical analysis, associated technical specifications, and construction quality assurance documents for the Phase 5 and Phase 6 disposal areas at the Molokai Integrated Solid Waste Management Facility (MISWMF). It has been prepared for submittal to the Hawaii Department of Health (HDOH) as support for requested approval of design plans and specifications for the construction work in these areas.

The report is organized in the following sections:

Section 2	Area Description
Section 3	Liner and Leachate Collection Systems
Section 4	Slope Stability and Seismic Impact Analysis
Section 5	Roads and Drainage
Section 6	Capacity and Operational Life
Section 7	Earthwork Requirements

Design drawings and technical specifications are contained in Appendix A and Appendix B, respectively.

2. AREA DESCRIPTION

The Phase 5 and Phase 6 disposal cells at Molokai Integrated Solid Waste Management Facility (MISWMF) are located immediately adjacent to the west perimeter of the existing Phases 1 and 2. Figures 2, Appendix A illustrates the entire MISWMF site as well as the location and boundaries of the proposed Phase 5 and Phase 6 disposal areas. The lined disposal area for both Phases measures approximately 6.6 acres in total. Development of the area is planned to occur in two sub-phases. Phase 5, which measures approximately 3.2 acres, is projected to be constructed in 2020. Phase 6, which measures approximately 3.4 acres, is projected to be constructed in 2026. Figures 3 and 4, Appendix A illustrate the proposed subgrade and liner grade design for both Phases.

3. LINER AND LEACHATE COLLECTION SYSTEM

3.1 Liner System

The proposed liner system design for Phase 5 and Phase 6 is identical to that of existing Phases 3 and 4, and includes the following components, listed in order from bottom to top:

- A prepared subgrade consisting of native soil and rock, covered with a leveling layer of compacted soil as needed to provide a firm and smooth subgrade;
- A minimum 12-inch thick layer of compacted low-permeability soil with a maximum hydraulic conductivity of 1.0×10^{-6} cm/sec; and
- A geomembrane liner of 80 mil high density polyethylene (HDPE).

The liner perimeter landfill slopes will be inclined at maximum grade of 2:1 (horizontal:vertical). The floor liner grades are sloped at a minimum grade of 2% towards the centrally located leachate collection and removal system (LCRS) trench.

The Phase 5 and Phase 6 liner will tie into the adjacent Phase 1 and Phase 2 liner/base grades.

Figures 9 and 10, Appendix A illustrate the liner details described above.

3.2 Leachate Collection and Removal System

The leachate collection and removal system (LCRS) for the floor areas of Phase 5 and Phase 6 consists of the following components:

- A layer of 16-ounce per square yard non-woven geotextile placed above the HDPE geomembrane liner;
- A 12-inch thick layer of gravel drainage rock placed above the geotextile on the floor;
- A layer of 16-ounce per square yard non-woven geotextile placed above the LCRS gravel; and
- A centrally located LCRS trench, constructed with an 8-inch diameter perforated HDPE pipe and the trench filled with gravel, that is graded at a minimum slope of 1% to drain to the Phase 5 LCRS sump.

The Phase 5 LCRS sump will be graded to a depth of 4 feet below the adjacent cell floor and be constructed with the following components (from top to bottom):

- A layer of 16-ounce per square yard non-woven geotextile placed above the LCRS drainage rock;
- 4 feet thick layer of LCRS drainage rock placed above the geotextile on the floor;
- A layer of 16-ounce per square yard non-woven geotextile placed above the HDPE geomembrane;
- Double layer of 80 mil HDPE geomembrane liner; and

- 4 feet thick layer of low permeability compacted soil liner with a maximum hydraulic conductivity of 1.0×10^{-6} cm/sec.

The LCRS sump will be equipped with a vertical leachate collection pipe and riser for monitoring and pumping leachate from the sump.

Underlying the Phase 5 LCRS sump, there will be a pan lysimeter constructed with the following components (from top to bottom):

- A layer of 16-ounce per square yard non-woven geotextile placed above the lysimeter drainage rock;
- 18 inches of LCRS drainage rock;
- A layer of 16-ounce per square yard non-woven geotextile placed above the HDPE geomembrane; and
- An 80 mil HDPE geomembrane liner.

The pan lysimeter will be equipped with a 6-inch diameter HDPE slope riser pipe to permit monitoring and pumping of liquids from the lysimeter.

In order to develop the liner grades for Phase 6, the current Phase 2 lysimeter sampling port will be removed and the lysimeter will be converted to drain onto the adjacent Phase 6 liner. Drainage from the Phase 2 lysimeter will be collected in the Phase 5 sump.

The Phase 5 liner will tie into the Phase 1 liner/base grades and leachate from Phase 1 will drain onto the Phase 5 liner and be collected and managed in the Phase 5 sump which is sized to manage leachate from Phases, 1, 2, 5, and 6. The Phase 1 leachate wet well will be abandoned and removed upon completion of the construction of the Phase 5 area.

Figure 4, Appendix A illustrates the Phase 5 and Phase 6 liner and LCRS trench and sump grades with Figure 8 providing additional sump grading information. Figure 10, Appendix A illustrates the LCRS trench detail, and Figure 12 illustrates the LCRS sump and lysimeter cross section and associated details.

4. SLOPE STABILITY AND SEISMIC IMPACT ANALYSIS

HAR 11-58.1-13(e) establishes the following criteria:

“New MSWLF units and lateral expansions shall not be located in seismic impact zones, unless the owner or operator demonstrates to the director that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.”

"Seismic impact zone" means an area with a ten per cent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a per cent of the earth's gravitational pull (g), will exceed 0.10g in two hundred fifty years.

"Lithified earth material" is defined in USEPA regulations Subtitle D, Section 258.14 as "all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments".

The United States Geological Survey (USGS) has classified the island of Molokai in UBC Seismic Zone 2B, defined as having a 10% probability of exceeding a peak ground acceleration of 0.15 g in 50 years. According to USGS seismic hazard maps and data, the peak horizontal ground acceleration expected to occur with a probability of ten percent in 250 years is 0.31 g. Therefore, Molokai is located within a seismic impact zone and a seismic impact study must be conducted to demonstrate the landfill is designed to withstand the maximum horizontal acceleration.

The Phase 5 and Phase 6 disposal area containment system design has been analyzed together with the contiguous areas of Phases 1 through 4 to demonstrate they will resist the maximum horizontal acceleration anticipated at the site. Using the design final grades, the stability of the final landfill slopes of this area were evaluated using PCSTABL5M a computer-based analytical program that computes static and pseudo-static factors of safety for the selected critical slope cross-sections. The critical slope cross-sections selected and analyzed pass through the lined disposal area. The analysis found for all of the cross-sections the static factor of safety exceeds 1.5 and the pseudo-static factor of safety exceeds 1.0, the generally accepted critical value for static and pseudo-static slope stability. Also, there will be no permanent deformation of the liner system during the design seismic event.

Appendix C contains the slope stability report.

5. ROADS AND DRAINAGE

5.1 Existing Surface Water Management System

Runoff, from existing landfill Phases 1, 2, 3 and 4, is collected in perimeter drainage channels/roads and is routed to the primary sedimentation basin located in the southwest corner of the site. Runoff from the presently undeveloped Phases 5 and 6 is collected in existing perimeter drainage channels "A" and "B", located immediately adjacent to the future liner limits of Phases 5 and 6, and routed to the primary sedimentation basin.

Currently, stormwater runoff from the entrance facility area flows overland, across the undeveloped area, and is collected in a sedimentation basin located approximately 200-feet south of the maintenance shop.

Figure 1, Appendix A, illustrates the existing facility drainage channels and sedimentation basins. Figure 11, Appendix A illustrates the existing perimeter drainage channel cross section.

5.2 Proposed Surface Water Management System Improvements

Existing perimeter drainage channels “A” and “B”, located immediately adjacent to the limits of liner of Phases 5 and 6, will be retained after construction of Phases 5 and 6. Drainage from the future refuse fill slopes of Phases 5 and 6 will be conveyed via drainage benches/roads and downdrains to these existing perimeter channels which discharge to the existing primary sedimentation basin. The existing basin will be enlarged by approximately 200%, to increase retention capacity, improve sediment removal, and minimize discharge events. The expanded basin will continue to utilize the existing discharge structure as it was sized to accommodate the maximum design discharge from the site after final build out. Figures 2 and 3, Appendix A illustrate the expanded primary sedimentation basin.

The surface water management system for the entrance facility area is proposed to eliminate use of the existing basin in the area and to be improved to include the following:

- Development of a channel for the collection of all runoff from the entrance facility area where recycling and other potential future activities may occur, and routing it to the existing channel bordering the Phase 3 disposal area; and,

The proposed future channel will be constructed with a 12 ft wide asphalt paved bottom and 8-inch high asphalt curbs.

Figure 2, 6, and 7, Appendix A, illustrate the location, alignment and profile of the proposed entrance facility drainage channel. Figure 11, Appendix A illustrates the proposed entrance facility drainage channel cross section.

Appendix D is a hydrology study evaluating the proposed drainage facilities in relation to the design 25-year storm specified in HAR 11-58. 1-15(g). It demonstrates that the structures, as designed, have adequate capacity to handle the peak flow during the design storm event. Appendix D also contains figures illustrating the current and proposed surface water management systems.

6. CAPACITY AND OPERATIONAL LIFE

The net volumetric capacity of Phase 5 and Phase 6 is estimated as follows:

Phase 5 (3.2 acres)	111,700 cubic yards
<u>Phase 6 (3.4 acres)</u>	<u>261,900 cubic yards</u>
Total	373,600 cubic yards

Figures 14 and 15, Appendix A illustrate the incremental refuse fill plans for Phase 5 and Phase 6.

Based on anticipated waste intake volumes and airspace utilization factor, the Phase 5 area is expected to provide approximately 7 years of operational life and Phase 6 is projected to provide approximately 16 years of operational life.

Combining the Phase 5 and Phase 6 disposal capacity with the existing constructed disposal capacity, the overall projected site life is projected to be approximately 23 years or until year 2043. Table 1 presents the projected disposal capacity, estimated annual disposal capacity utilization, and the projected timeframes for the construction of Phase 5 and Phase 6.

Table 1 - Projected Capacity, Annual Capacity Utilization & Cell Construction Schedule

Fiscal Year	Beginning Capacity (cy)	Cell Constructed	Additional Capacity (cy)	Projected Annual Airspace Consumption (cy)	Ending Capacity (cy)
2019	53,987			12,453	41,534
2020	41,534	Phase 5	111,698	17,617	135,615
2021	135,615			17,617	117,998
2022	117,998			17,617	100,381
2023	100,381			17,617	82,764
2024	82,764			17,617	65,148
2025	65,148			17,617	47,531
2026	47,531	Phase 6	261,898	17,617	291,811
2027	291,811			17,617	274,195
2028	274,195			17,617	256,578
2029	256,578			17,617	238,961
2030	238,961			17,617	221,344
2031	221,344			17,617	203,727
2032	203,727			17,617	186,110
2033	186,110			17,617	168,493
2034	168,493			17,617	150,876
2035	150,876			17,617	133,259
2036	133,259			17,617	115,642
2037	115,642			17,617	98,025
2038	98,025			17,617	80,409
2039	80,409			17,617	62,792
2040	62,792			17,617	45,175
2041	45,175			17,617	27,558
2042	27,558			17,617	9,941
2043	9,941			9,941	0

- Notes:**
1. Beginning capacity based on aerial topographic survey dated 4-17-2019.
 2. Average Annualized Capacity Consumption: 17,617 cy/year
 3. 2019 airspace consumption prorated for the period from 4-17-2019 through 12-31-2019.
 4. Total Remaining Capacity projected to be exhausted approximately mid-2043.

7. EARTHWORK REQUIREMENTS

The Phase 5 and Phase 6 subgrade will be prepared by relatively shallow excavation and grading of the existing natural terrain. The exposed native rock and soil of the subgrade will be covered with a leveling layer of compacted soil to provide a firm surface for placement of the compacted low-permeability soil liner.

Estimated earthwork quantities are summarized in Table 2:

Table 2: Phase 5 and Phase 6 Earthwork Quantities

Phase	Excavation (cy)	Structural Fill (cy)	Low-Permeability Soil (cy)	LCRS Gravel (cy)	Operations Layer (cy)
Phase 5	31,240	384	6,098	5,999	10,696
Phase 6	34,501	143	6,422	4,644	11,066
Total	65,741	527	12,520	10,643	21,763

APPENDIX A

DESIGN DRAWINGS

Molokai Integrated Solid Waste Facility

Molokai, Hawaii

Phase 5 and Phase 6 Disposal Cells and Drainage Improvements

Prepared by:

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 (949) 206-0157

7/23/19

This work was prepared by me
 or under my supervision

Project Engineer:

Ali Mehrazarin, P.E.

_____ Date

Owner:

County of Maui
 Department of Public Works
 Solid Waste Division
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 Wailuku, Hawaii 96793

Sheet Number	Sheet Title
1	Site Map and Existing Conditions
2	Project Overview
3	Liner Subgrades
4	Liner Grades
5	Protective Soil Grades
6	Entrance Facility Drainage Channel Plan
7	Entrance Facility Drainage Channel Profile
8	Liner Sump Area
9	Liner Details 1
10	Liner Details 2
11	Drainage Details 1
12	LCRS Sump Details 1
12A	LCRS Sump Details 2
12B	Leachate Handling System Details 1
12C	Leachate Handling System Details 2
13	Phases 1 through 4 Interim Refuse Grades
14	Phases 5 Interim Refuse Grades
15	Phases 6 Refuse Grades



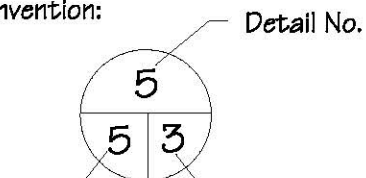
Approved by:

Original Signed by _____

Director of Public Works and
 Environmental Management
 2050 Main Street, Suite 2B
 Wailuku, Hawaii 96793

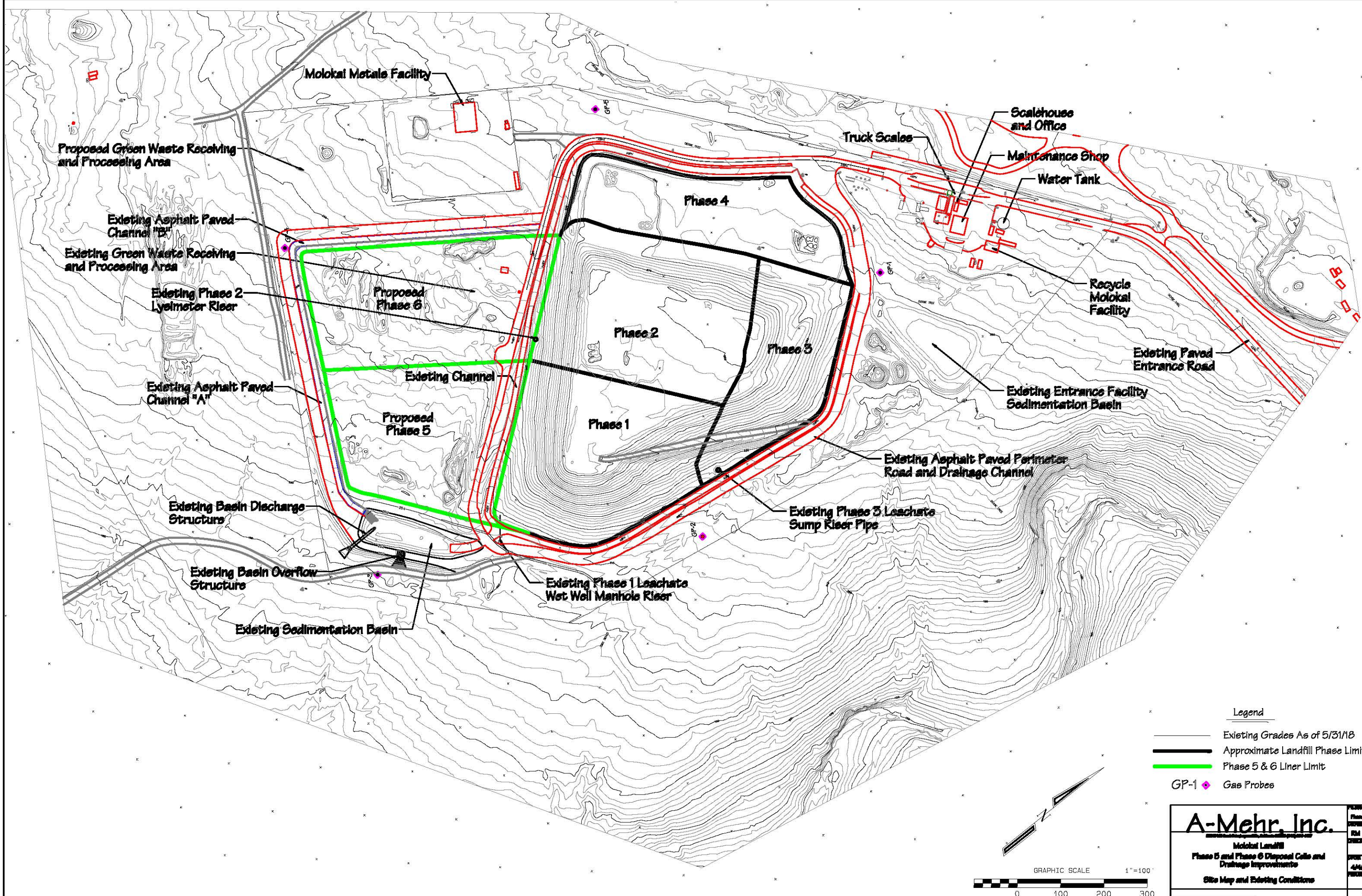
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Detail Convention:



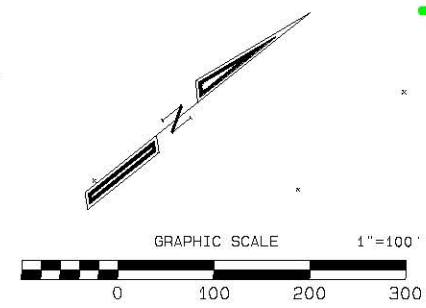
Sheet where Detail
 is Referenced

Sheet Where
 Detail is Shown

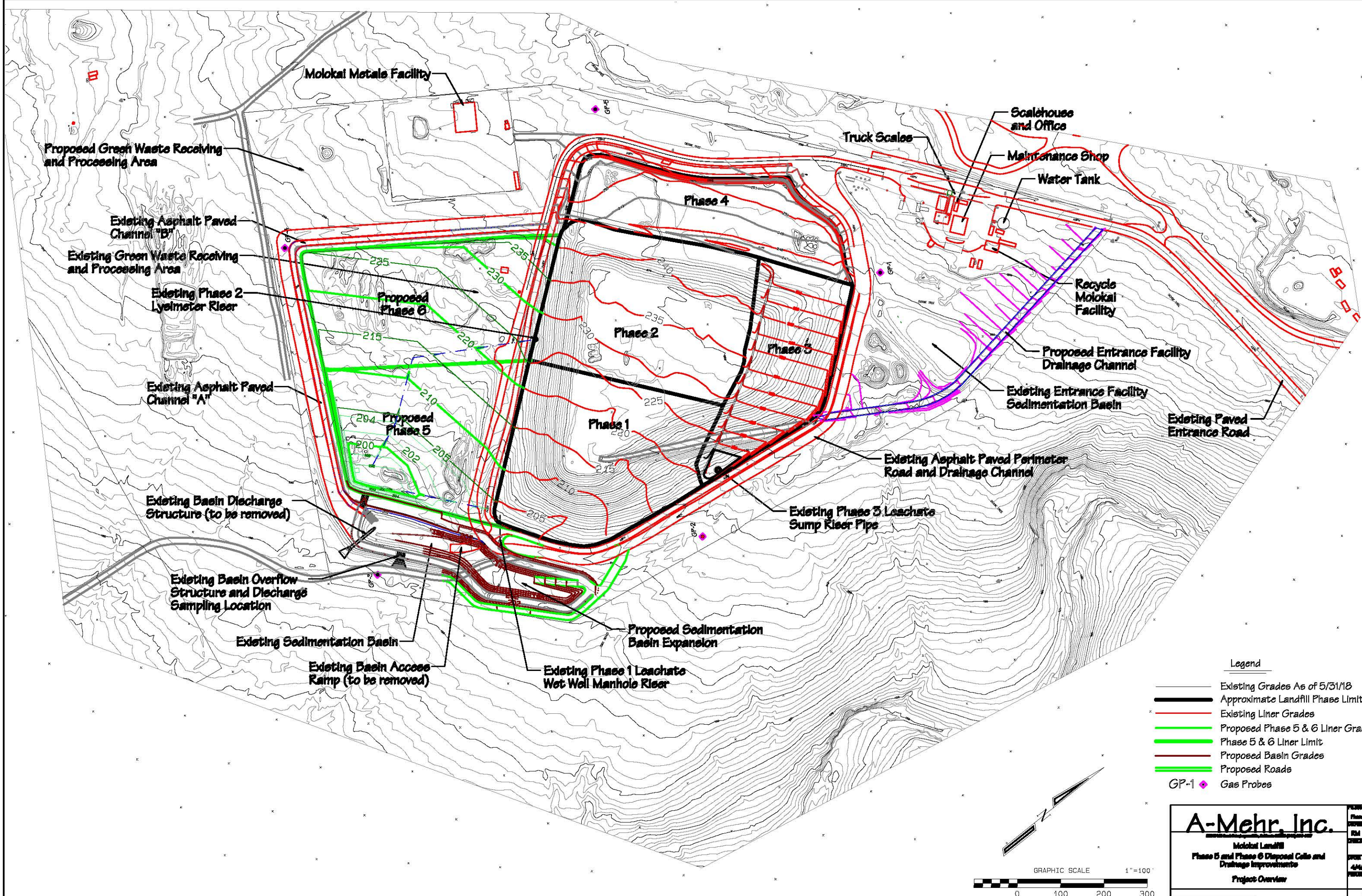


Legend

- Existing Grades As of 5/31/18
- Approximate Landfill Phase Limits
- Phase 5 & 6 Liner Limit
- GP-1 ♦ Gas Probes



A-Mehr, Inc.		PROJECT Phase 1D
Molokai Landfill		DRAWN RM
Phase 5 and Phase 6 Disposal Cells and Drainage Improvements		DATE 4/4/18
Site Map and Existing Conditions		SHEET 1



Proposed Green Waste Receiving and Processing Area

Molokai Metals Facility

Truck Scales

Scalehouse and Office

Maintenance Shop

Water Tank

Phase 4

Recycle Molokai Facility

Existing Asphalt Paved Channel "B"

Existing Green Waste Receiving and Processing Area

Existing Phase 2 Lysimeter Floor

Proposed Phase 6

Phase 2

Phase 3

Proposed Entrance Facility Drainage Channel

Existing Asphalt Paved Channel "A"

Proposed Phase 5

Phase 1

Existing Entrance Facility Sedimentation Basin

Existing Paved Entrance Road

Existing Basin Discharge Structure (to be removed)

Existing Asphalt Paved Perimeter Road and Drainage Channel

Existing Phase 3 Leachate Sump Riser Pipes

Existing Basin Overflow Structure and Discharge Sampling Location

Proposed Sedimentation Basin Expansion

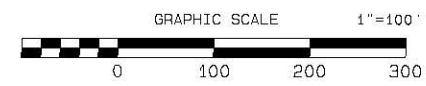
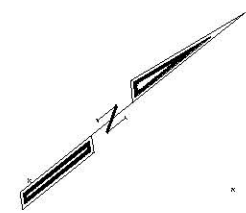
Existing Sedimentation Basin

Existing Phase 1 Leachate Wet Well Manhole Riser

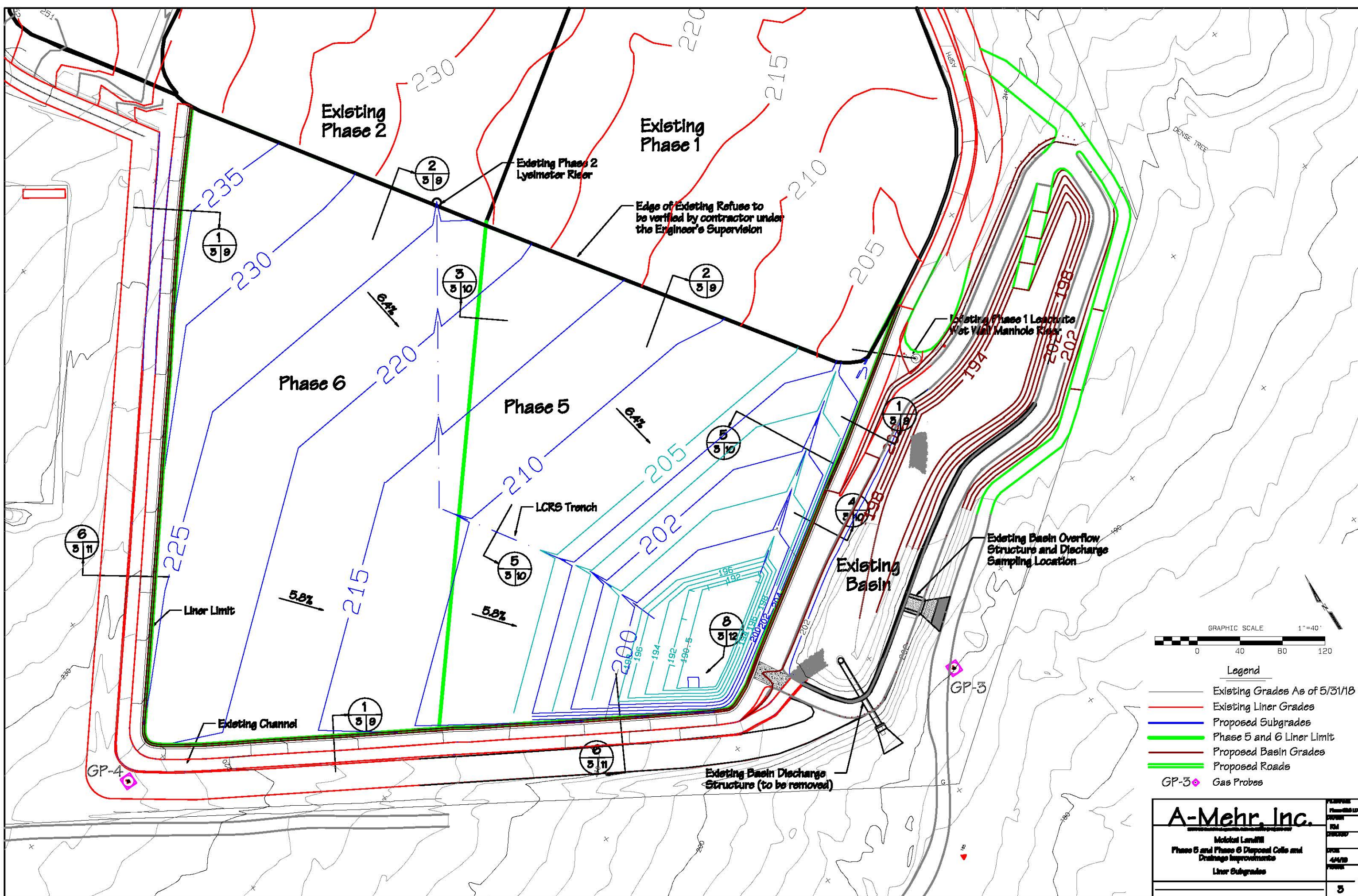
Existing Basin Access Ramp (to be removed)

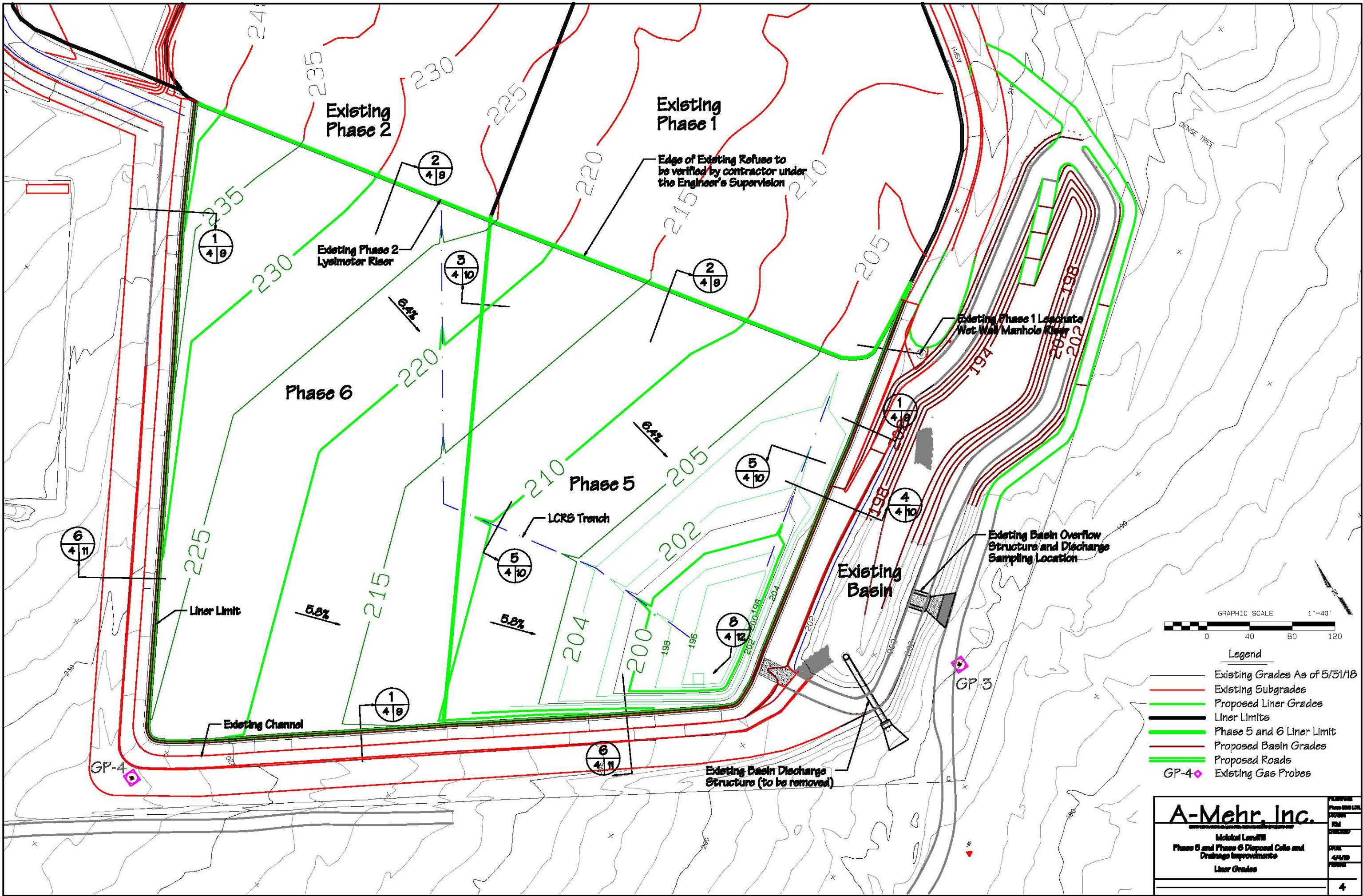
Legend

- Existing Grades As of 5/31/18
- Approximate Landfill Phase Limits
- Existing Liner Grades
- Proposed Phase 5 & 6 Liner Grades
- Phase 5 & 6 Liner Limit
- Proposed Basin Grades
- Proposed Roads
- GP-1 ♦ Gas Probes



A-Mehr, Inc.		PROJECT Phase 5 and 6
Molokai Landfill		DATE 4/4/18
Phase 5 and Phase 6 Disposal Cells and Drainage Improvements		SHEET 2
Project Overview		





Existing Phase 2

Existing Phase 1

Edge of Existing Refuse to be verified by contractor under the Engineer's Supervision

Existing Phase 2 Lysimeter Riser

Existing Phase 1 Leachate Wet Wall Manhole Riser

Phase 6

Phase 5

LCRS Trench

Existing Basin

Existing Basin Overflow Structure and Discharge Sampling Location

Liner Limit

Existing Channel

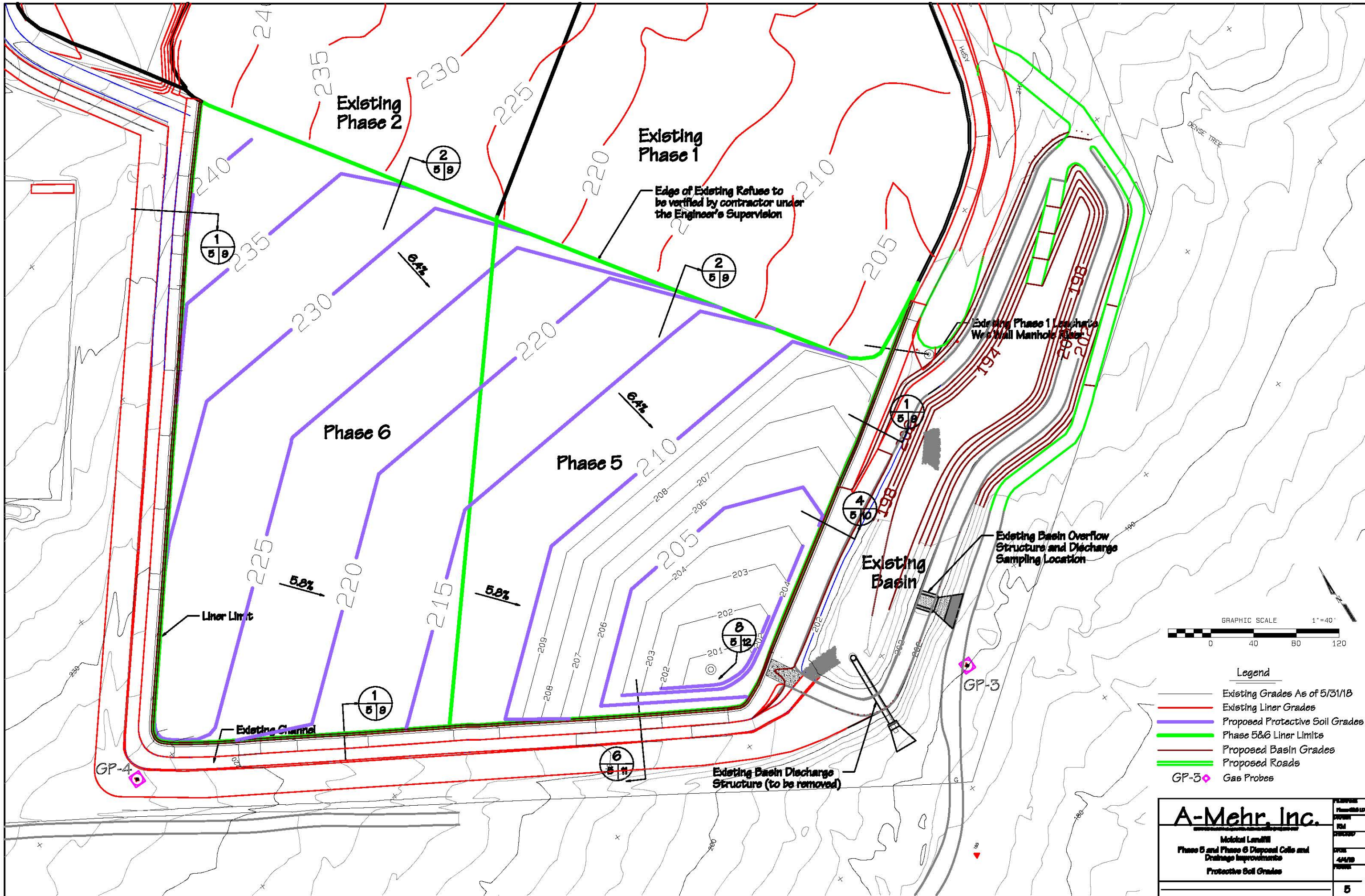
Existing Basin Discharge Structure (to be removed)



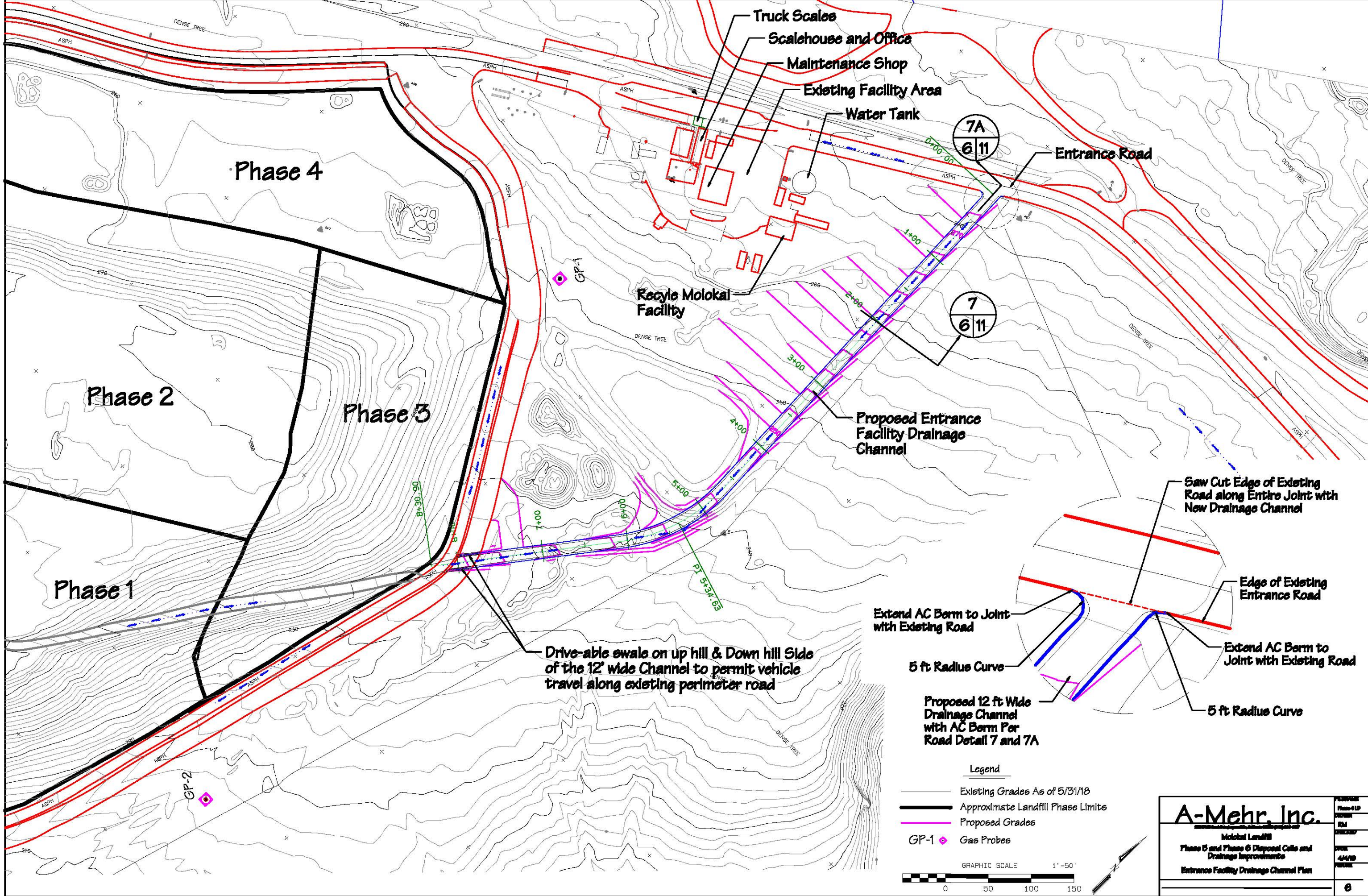
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- Existing Grades As of 5/31/18
- Existing Subgrades
- Proposed Liner Grades
- Liner Limits
- Phase 5 and 6 Liner Limit
- Proposed Basin Grades
- Proposed Roads
- GP-4 Existing Gas Probes

A-Mehr, Inc.	
Molokai Landfill	
Phase 5 and Phase 6 Disposal Cells and Drainage Improvements	
Liner Grades	
DATE	4/11/18
DRAWN	PM
CHECKED	PM
SCALE	AS SHOWN
SHEET	4



A-Mehr, Inc.		<small> PROJECT NO. 18-001 DATE 4/11/18 SHEET 5 </small>
Mohawk Landfill Phase 5 and Phase 6 Disposal Cells and Drainage Improvements Protective Soil Grades		



Phase 4

Phase 2

Phase 3

Phase 1

Truck Scales
Scalehouse and Office
Maintenance Shop

Existing Facility Area
Water Tank

Entrance Road

Recycle Molokai Facility

Proposed Entrance Facility Drainage Channel

Drive-able swale on up hill & Down hill Side of the 12' wide Channel to permit vehicle travel along existing perimeter road

Saw Cut Edge of Existing Road along Entire Joint with New Drainage Channel

Edge of Existing Entrance Road

Extend AC Berm to Joint with Existing Road

Extend AC Berm to Joint with Existing Road

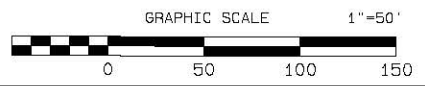
5 ft Radius Curve

5 ft Radius Curve

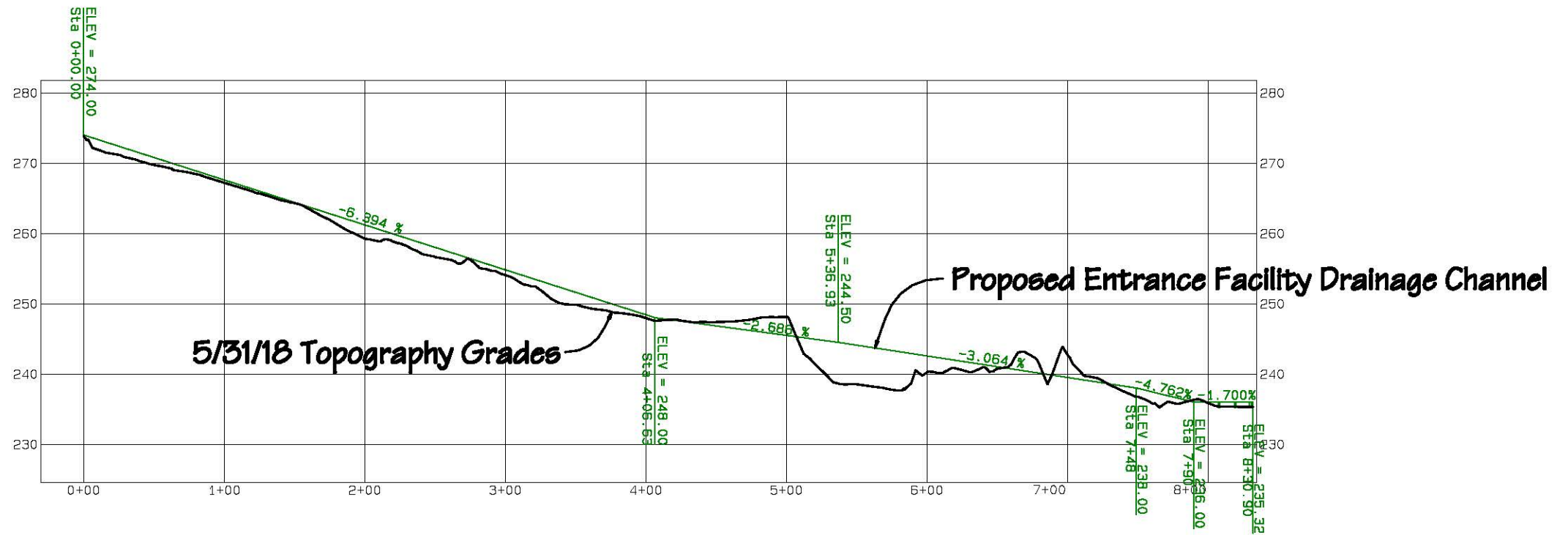
Proposed 12 ft Wide Drainage Channel with AC Berm Per Road Detail 7 and 7A

Legend

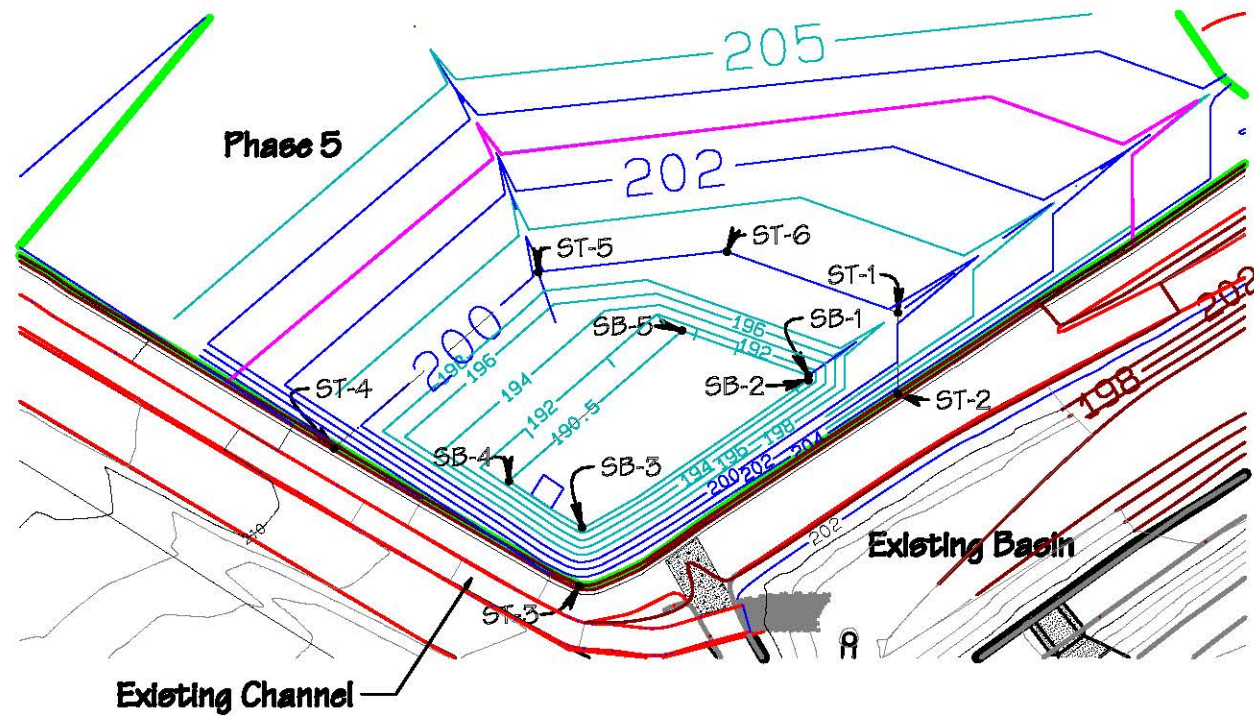
- Existing Grades As of 5/31/18
- Approximate Landfill Phase Limits
- Proposed Grades
- GP-1 ♦ Gas Probes



A-Mehr, Inc.		PROJECT Phase 41P
Molokai Landfill		DRAWN RM
Phase 1 and Phase 6 Disposal Cells and Drainage Improvements		DATE 4/4/18
Entrance Facility Drainage Channel Plan		SHEET NO. 6



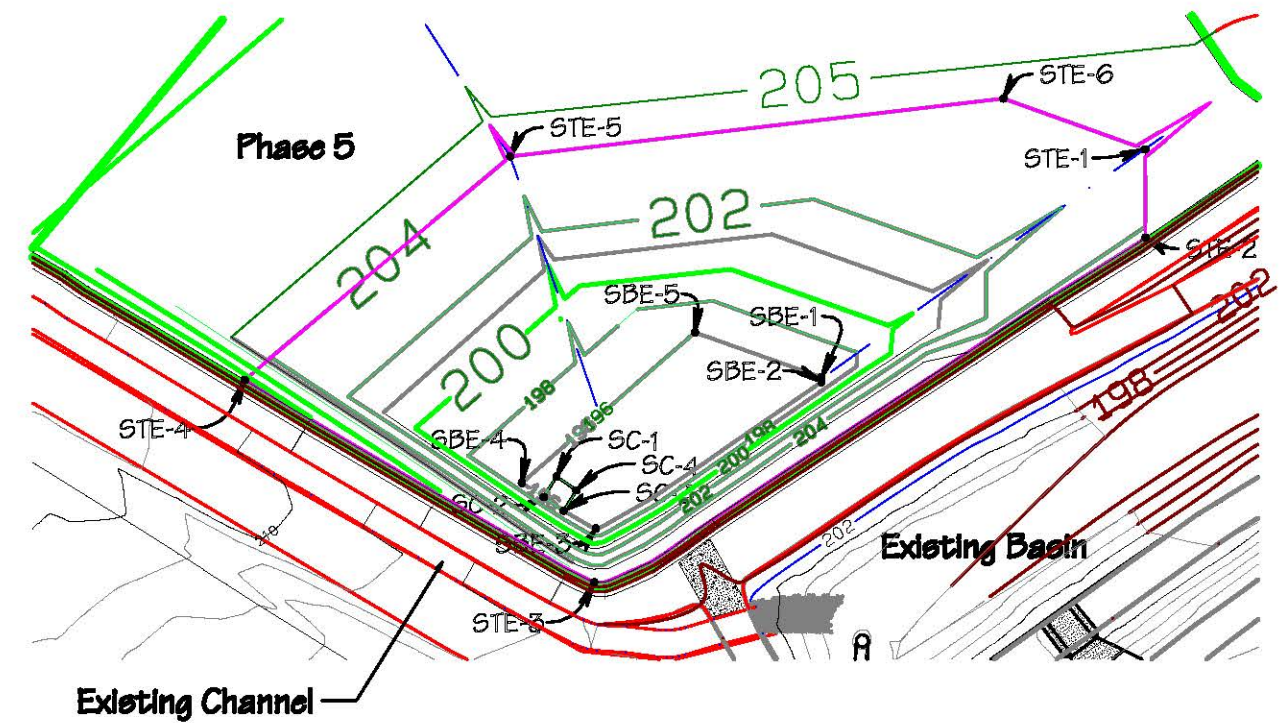
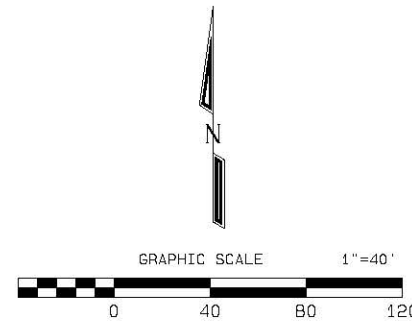
Proposed Entrance Facility Drainage Channel Profile



Proposed Sump Subgrades and Control points

Control Points of LCRS Sump (Subgrades)

Name	North	East	Elev
SB-1	-12626.4460	-3640.1378	190.50
SB-2	-12628.4296	-3640.1309	190.50
SB-3	-12689.6438	-3734.5374	190.50
SB-4	-12670.3611	-3764.9852	190.50
SB-5	-12607.7773	-3692.8330	190.50
ST-1	-12600.3212	-3602.8398	200.00
ST-2	-12634.2280	-3602.8835	205.00
ST-3	-12714.0795	-3735.7374	205.55
ST-4	-12656.7752	-3837.8108	209.50
ST-5	-12583.4388	-3752.7712	200.00
ST-6	-12574.8637	-3674.1208	200.00



Proposed Sump Liner Grades and Control points

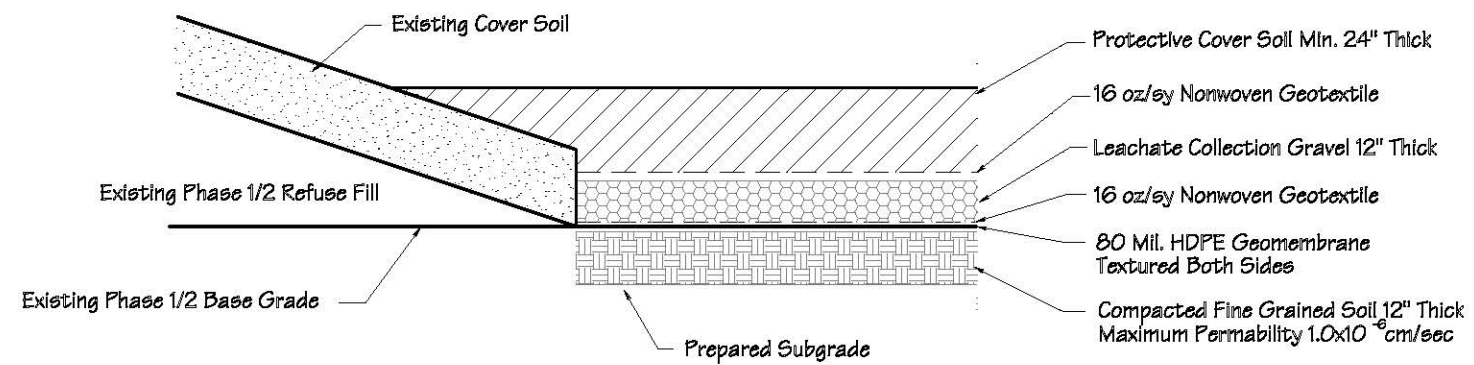
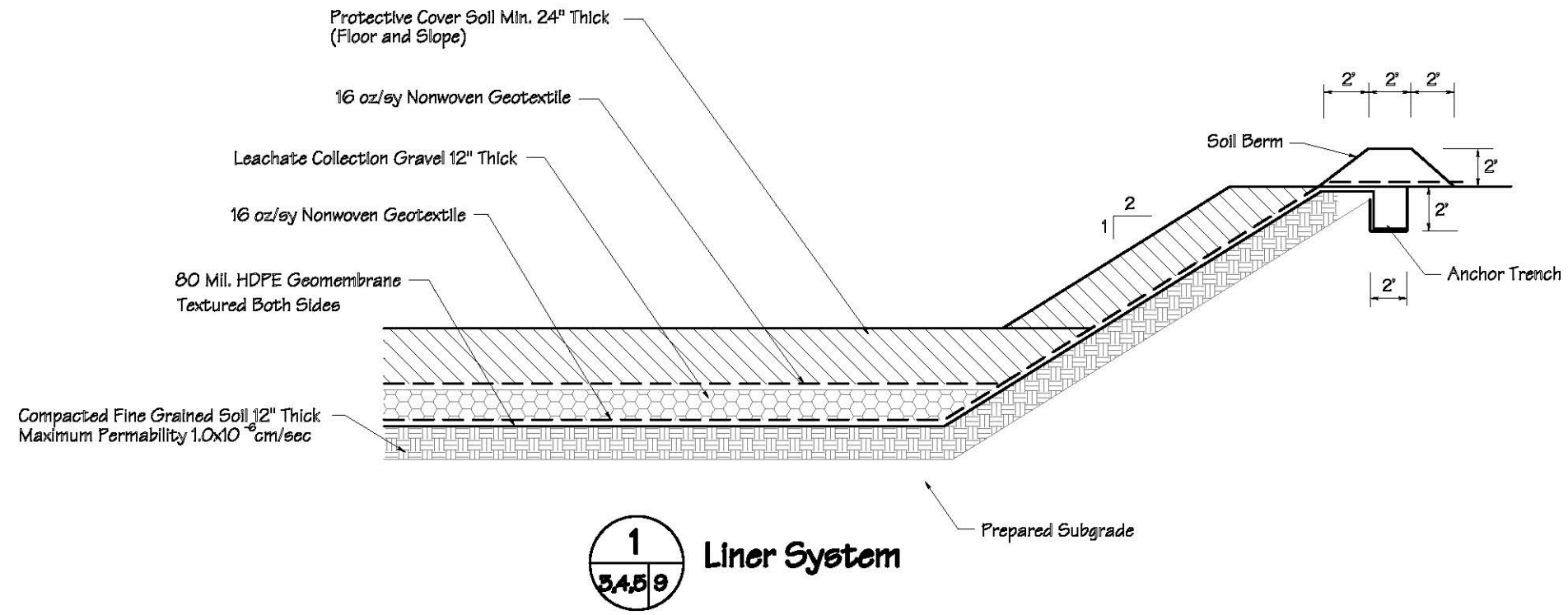
Control Points of LCRS Sump (Liner Grades)

Name	North	East	Elev
SBE-1	-12626.4460	-3640.1378	196.00
SBE-2	-12628.4296	-3640.1309	196.00
SBE-3	-12689.3862	-3734.1584	196.00
SBE-4	-12670.3611	-3764.9852	196.00
SBE-5	-12607.7773	-3692.8330	196.00
STE-1	-12531.5612	-3505.1779	204.00
STE-2	-12568.3502	-3505.0870	206.00
STE-3	-12711.7776	-3734.9098	205.60
STE-4	-12627.4359	-3880.3768	210.50
STE-5	-12534.4386	-3769.7829	204.00
STE-6	-12510.4012	-3564.2452	204.00
SC-1	-12667.7737	-3750.5284	201.00
SC-2	-12676.2145	-3755.8906	201.00
SC-3	-12681.9245	-3747.5950	201.00
SC-4	-12673.4837	-3742.2328	201.00

Legend

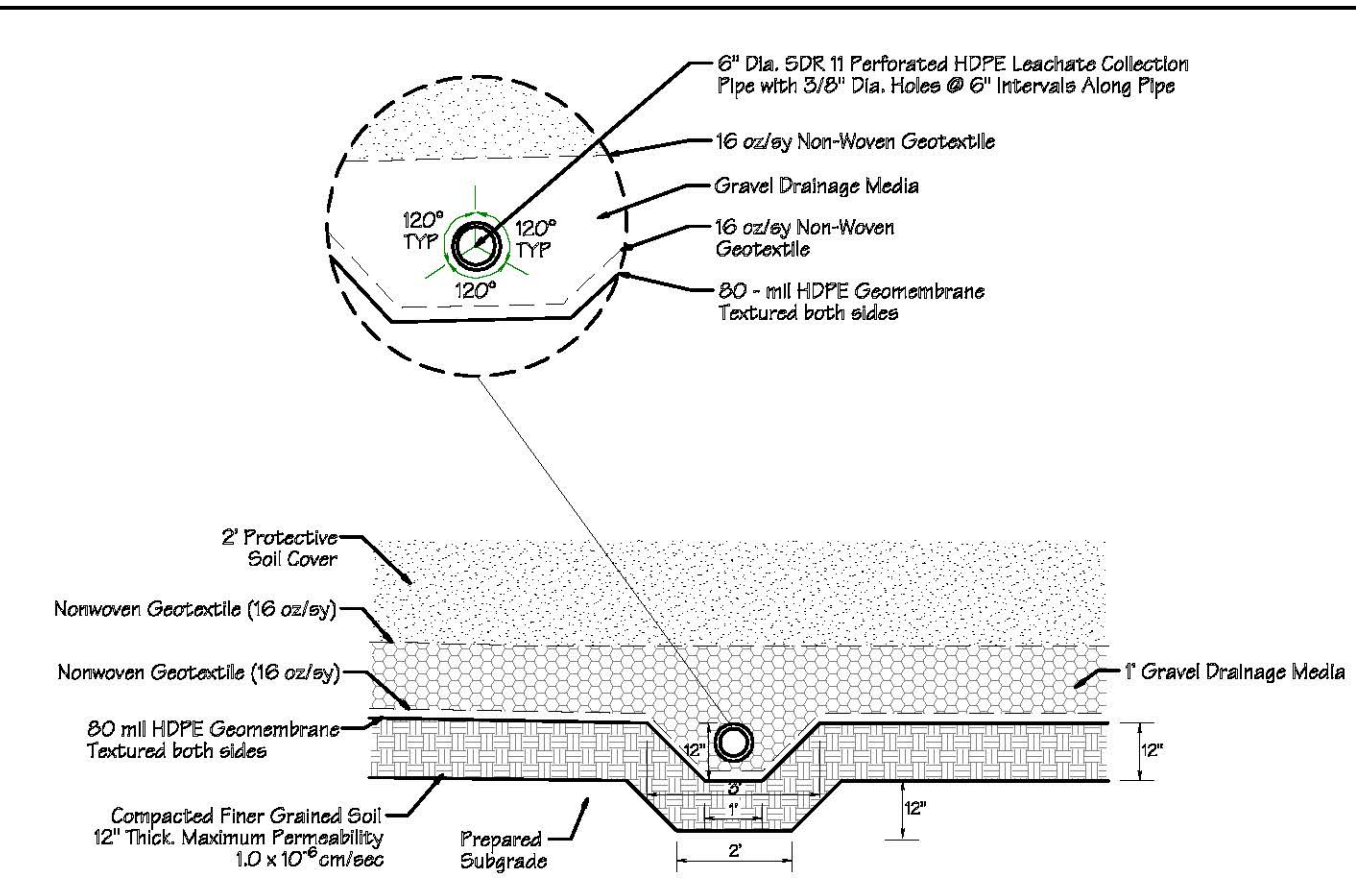
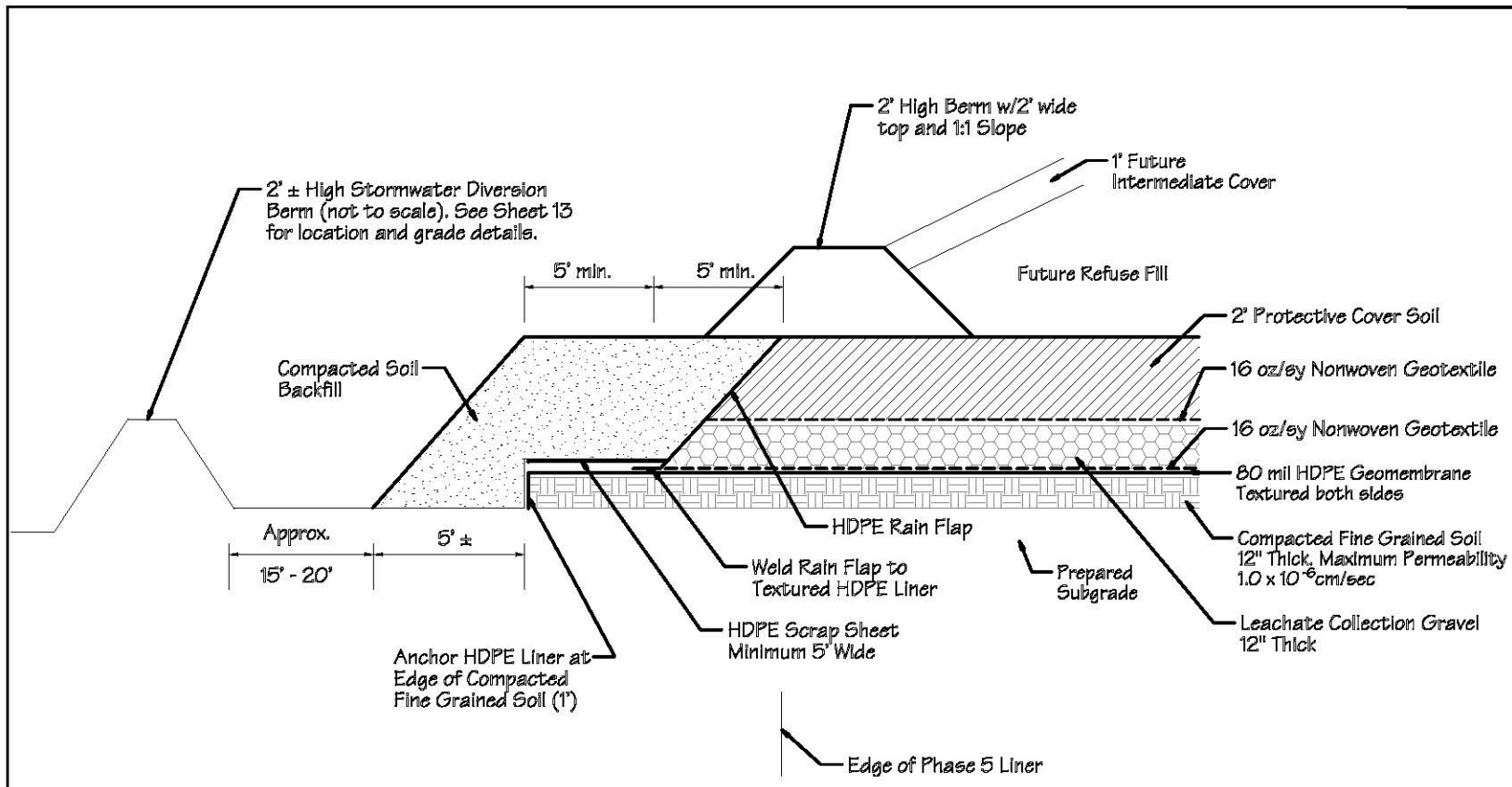
- Existing Grades As of 5/31/18
- Proposed Liner Grades (Sump Area)
- Proposed Liner Grades
- Proposed Liner Limit
- SC-4 Sump Riser Concrete Pad Bottom Corner
- SB-5 Lysimeter Bottom of Slope Corner
- ST-5 Lysimeter Top of Slope Corner (Edge of Lysimeter HDPE Liner)
- STE-6 Top Edge of Sump 4' Compacted Soil Liner
- SBE-5 Top of Sump 4' Compacted Soil Liner (Bottom of Slope Corner)

A-Mehr, Inc.		DRAWING NUMBER 44478 DATE 11/18
Mohai Landfill Phase 5 and Phase 6 Disposal Cells and Drainage Improvements Liner Sump Area		SHEET 8



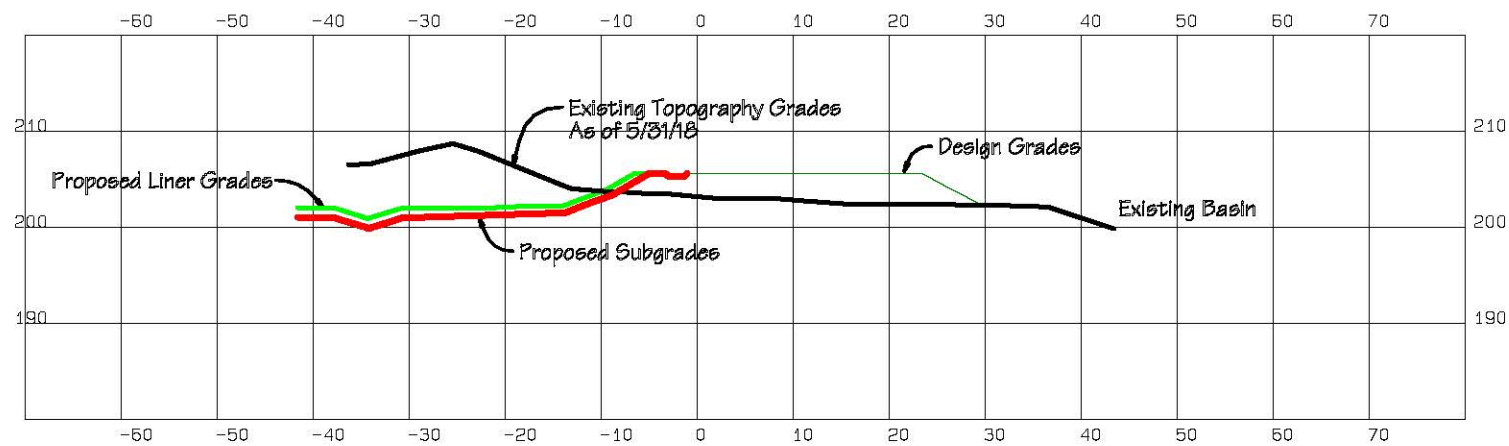
2
3,4,5,9
Liner Termination at Existing Refuse Slope

A-Mehr, Inc. Mohai Landfill Phase B and Phase C Disposal Cells and Drainage Improvements Liner Details 1	PLAN Phase 41P 4/14/10 RM
	DATE 4/14/10
	SCALE AS SHOWN
	SHEET NO. 9

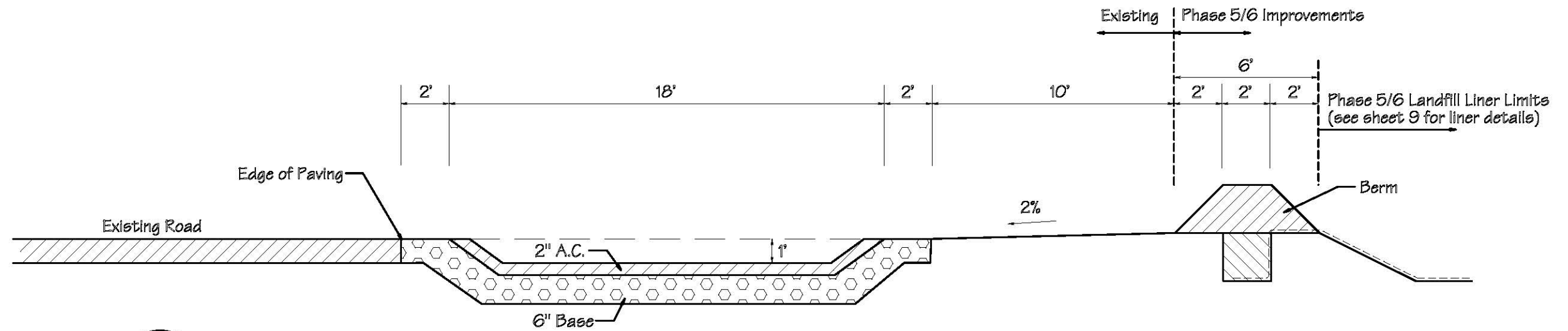


3
5.4.510 Temporary Phase 5 Liner Termination at Future Phase 6 Liner Tie-In
(Not to Scale)

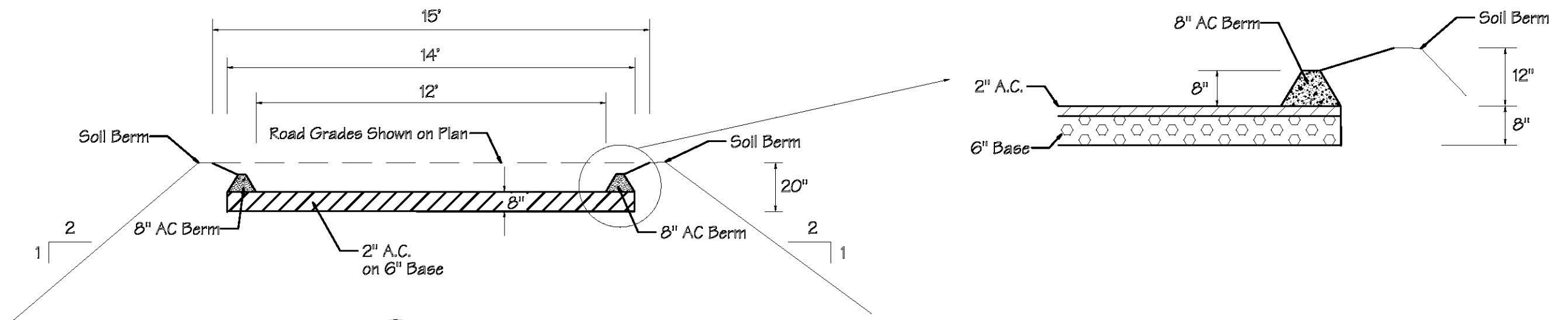
5
5.4.510 Leachate Collection Trench and Pipe
(Not to Scale)



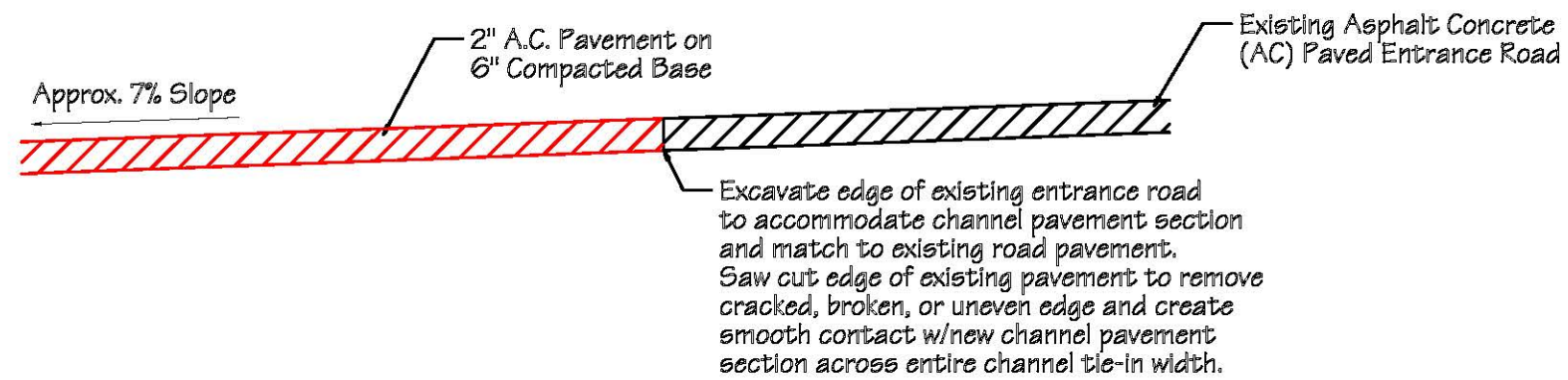
4
5.4.510 Liner System, Perimeter Road and Basin



6
34.5 11
Cross-Section - Existing Perimeter Road and Channel with Phase 5/6 Improvements

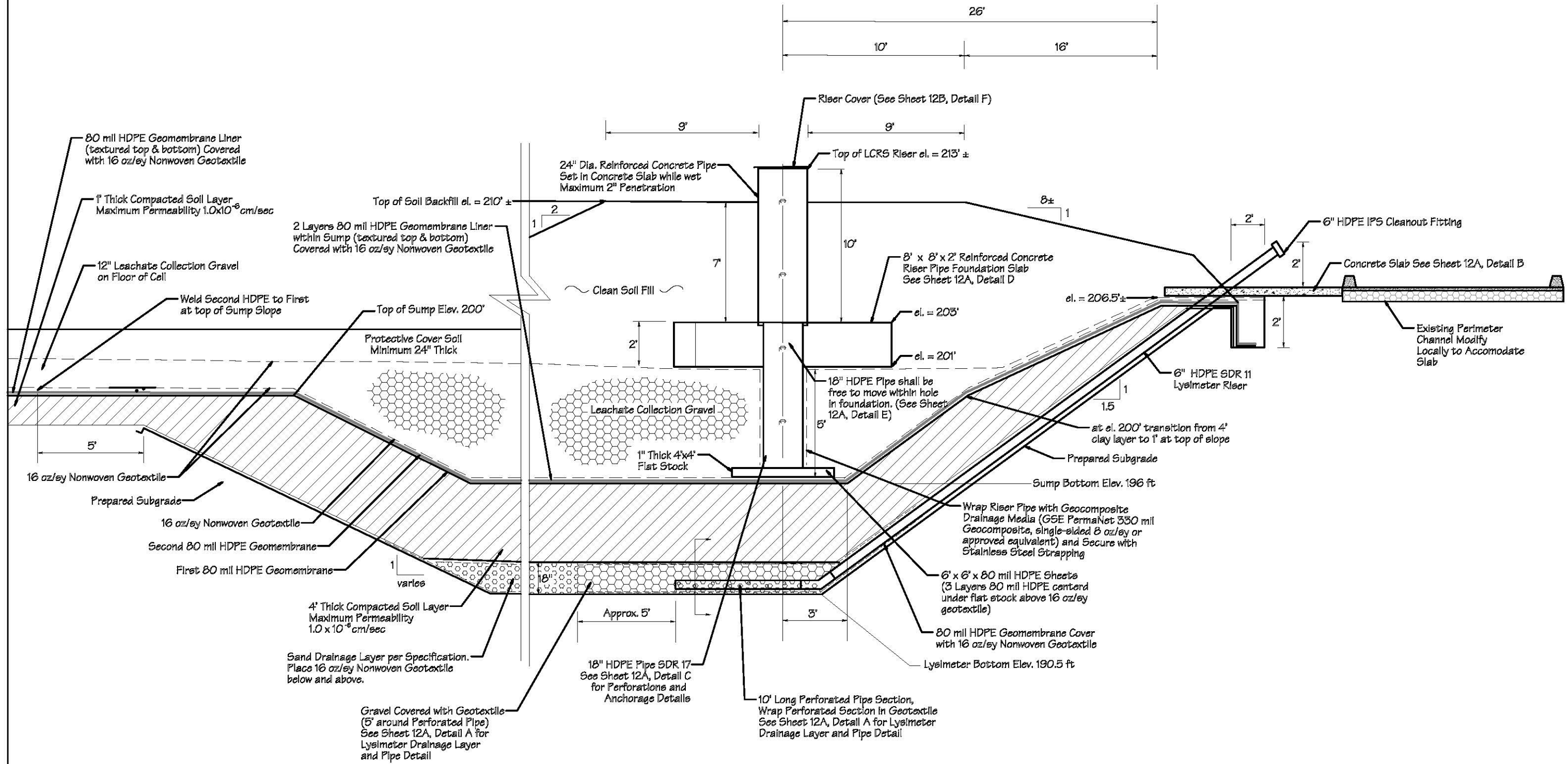


7
6 11
Proposed Entrance Facility Drainage Channel Section



7A
6 11
Proposed Entrance Facility Drainage Channel at Entrance Road

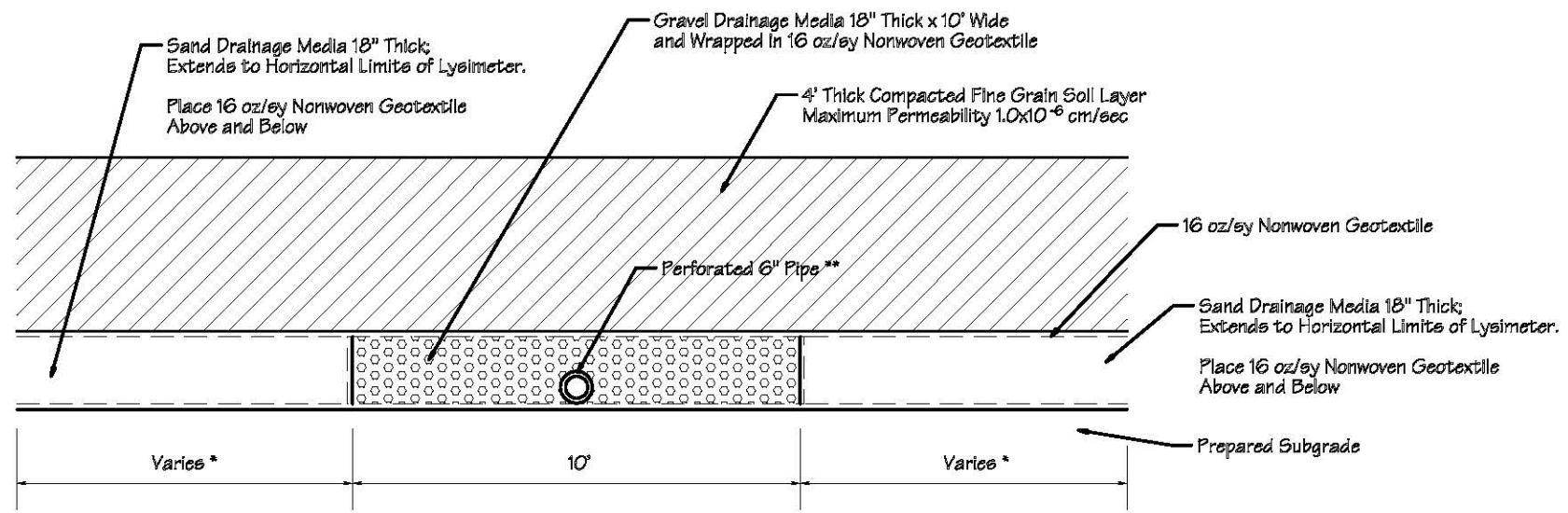
A-Mehr, Inc.		PROJECT Phase 5/6
Molokai Landfill		DESIGN RM
Phase 5 and Phase 6 Disposal Cells and Drainage Improvements		DATE 4/4/10
Drainage Details 1		SHEET NO. 11



8
3,4,5,12

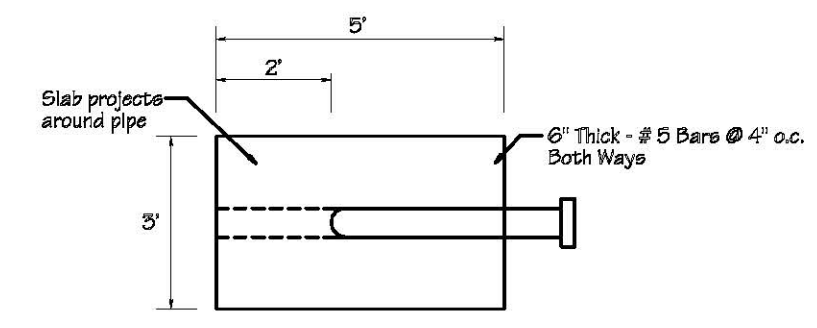
Leachate Collection Sump, Lysimeter, and Riser

A-Mehr, Inc.		Phase 4 LP
Molokai Landfill		REV
Phase 5 and Phase 6 Disposal Cells and		DATE
Drainage Improvements		4/4/10
LCRS Sump Details 1		PROJECT
		12

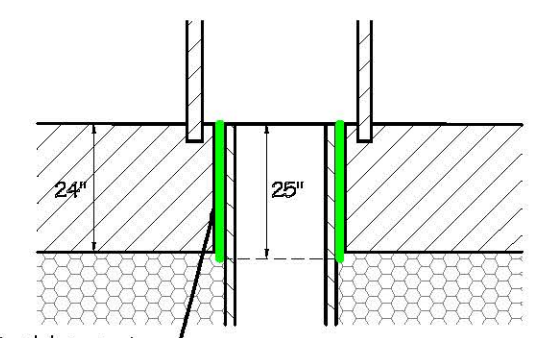


* - Dimension varies. Lysimeter sand drainage media layer extends to limits of lysimeter as illustrated on Sheet B.
 ** - Perforate pipe per Leachate Collection Trench & Pipe Detail 5, Sheet 10.

Detail A - Lysimeter Drainage Layer and Pipe Detail
 (Not to Scale)

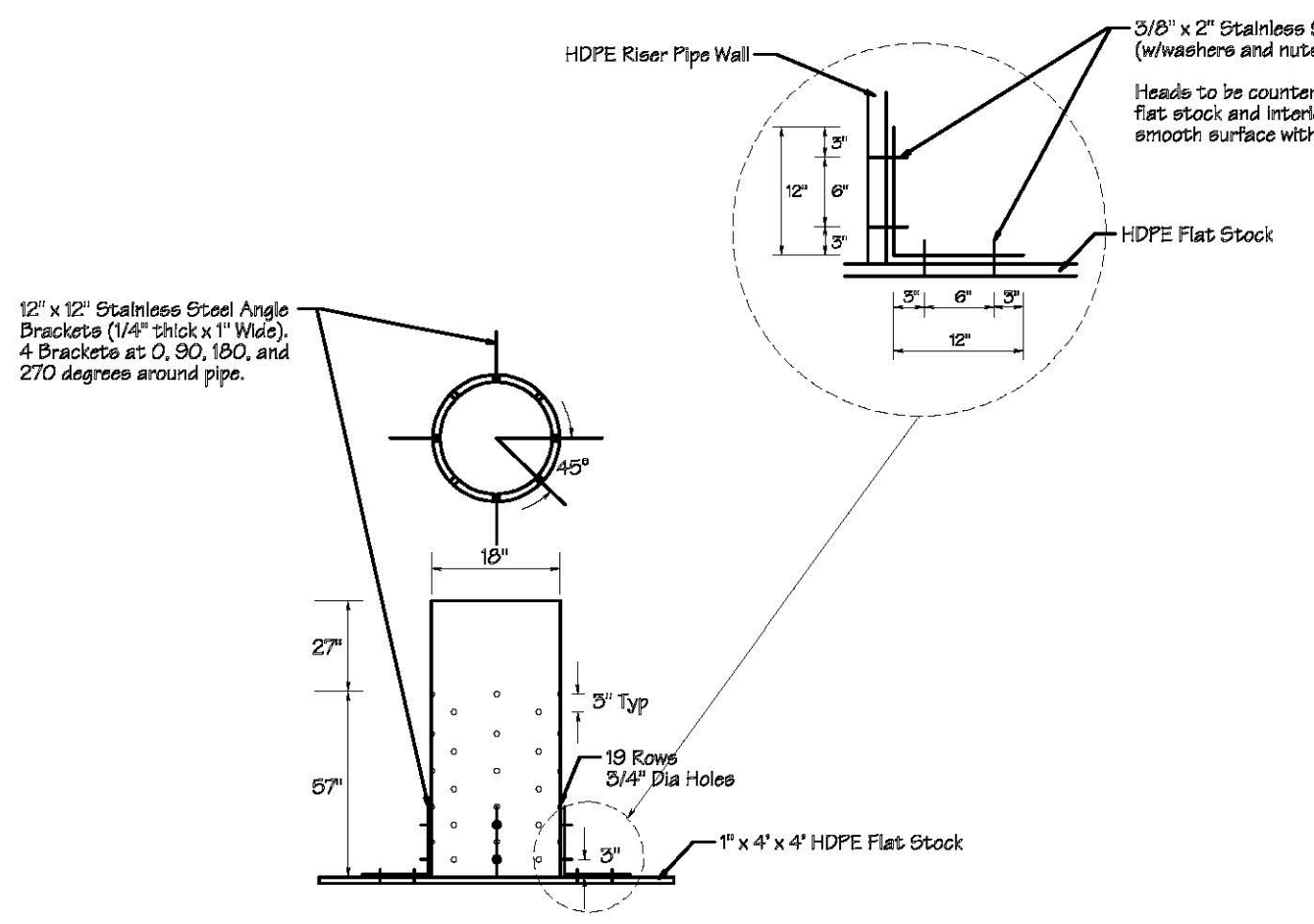


Detail B - Lysimeter Riser Slab

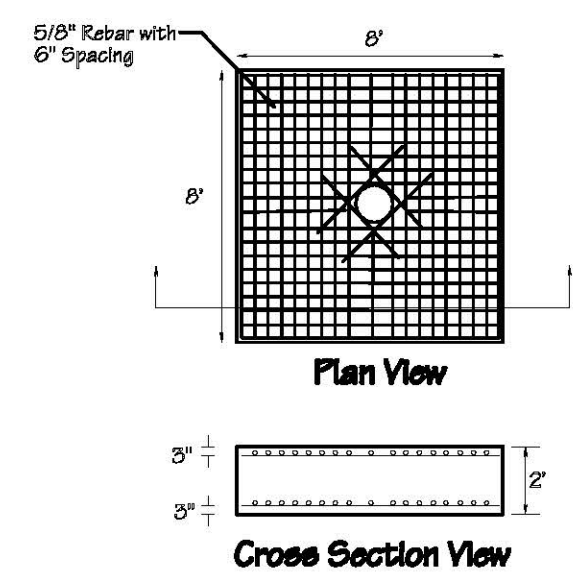


Before pouring concrete slab, wrap pipe with polyethylene foam creating 1/2\"/>

**Detail E - Placement of 18\"/>
 (Not to Scale)**

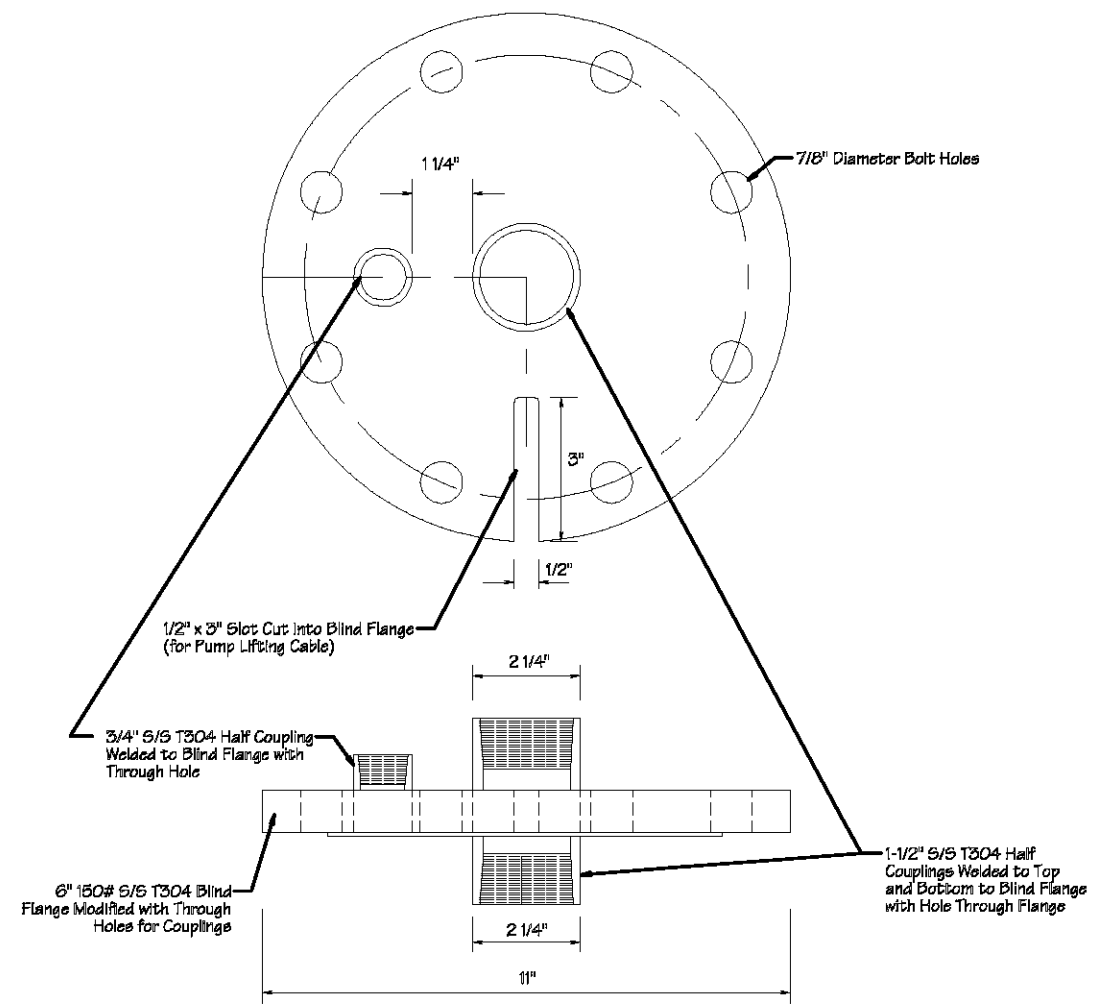


Detail C - HDPE Pipe Perforation and Anchorage to Flat Stock
 (Not to Scale)

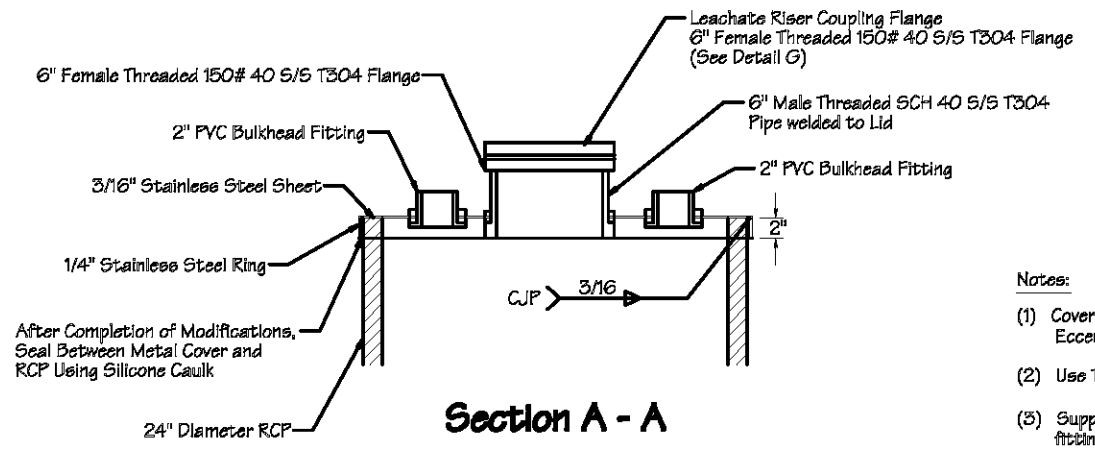
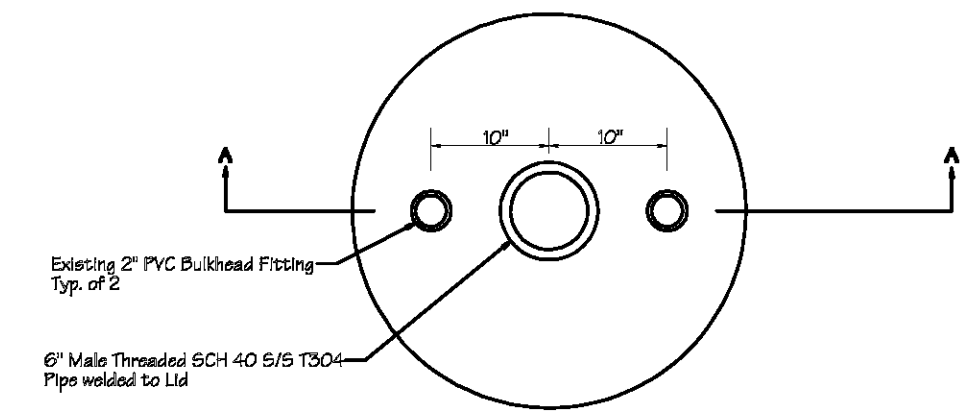


Detail D - Reinforced Concrete Riser Pipe Foundation Slab

A-Mehr, Inc.		Phase 4 LP
Molecular Landfill		PHD
Phase 5 and Phase 6 Disposal Cells and		PHD
Leachate Collection and		PHD
Drainage Improvements		PHD
LCRS Sump Details 2		PHD
		12A

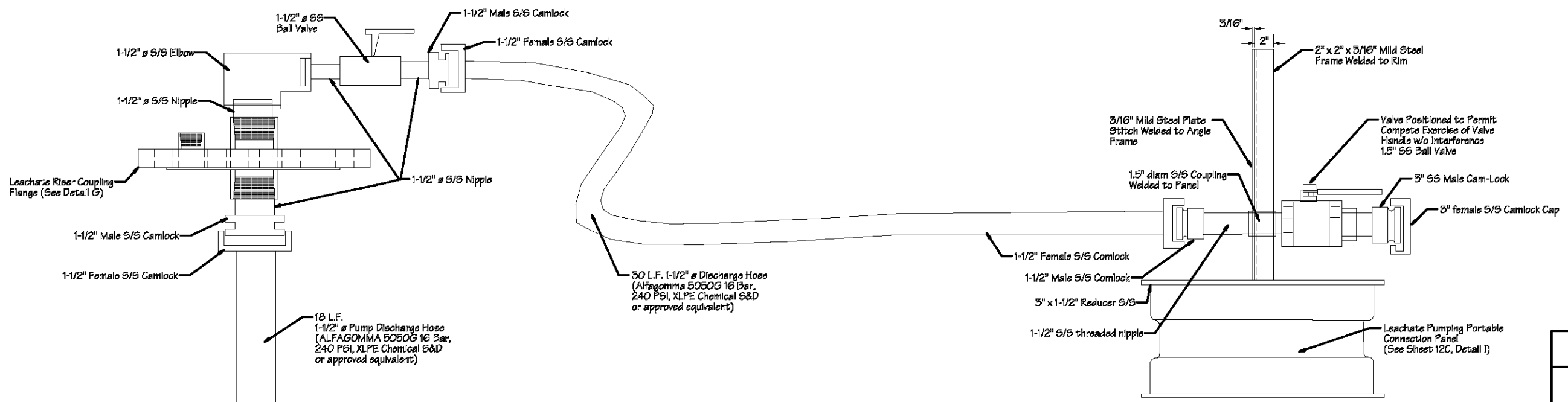


Detail G - Leachate Riser Coupling Flange Detail



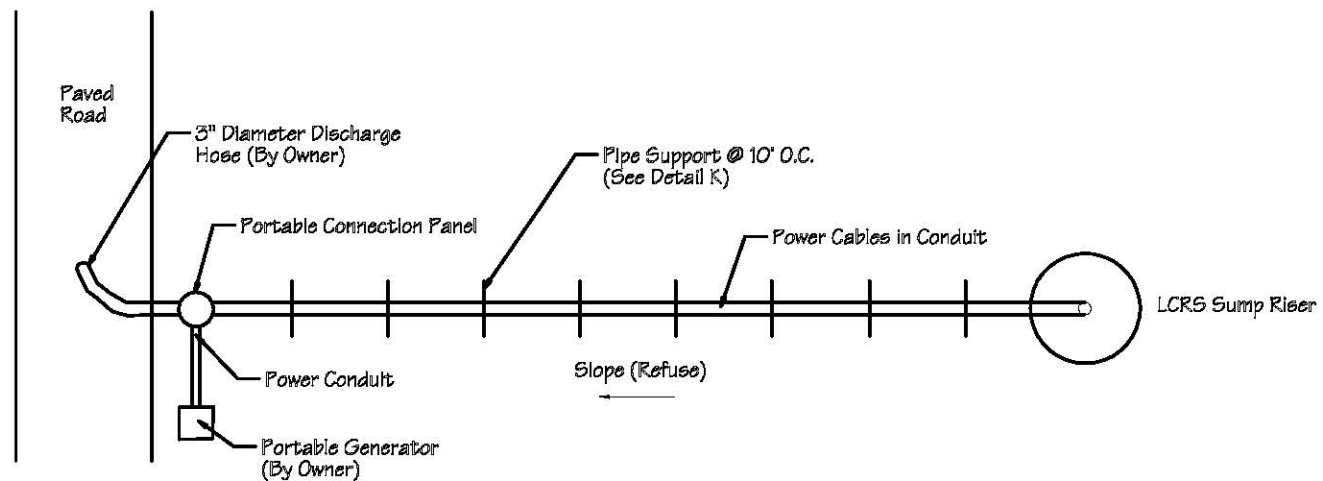
Detail F - Leachate Riser Cover Details
(Not to Scale)

- Notes:
- (1) Cover shall be circular with maximum Eccentricity 1/4" on any diameter.
 - (2) Use Type 304 or Type 316 stainless steel.
 - (3) Supply and install threaded caps on bulkhead fittings (not shown).
 - (4) Secure flange w/ 3/16" S/S nuts, washers, and all - thread bolts

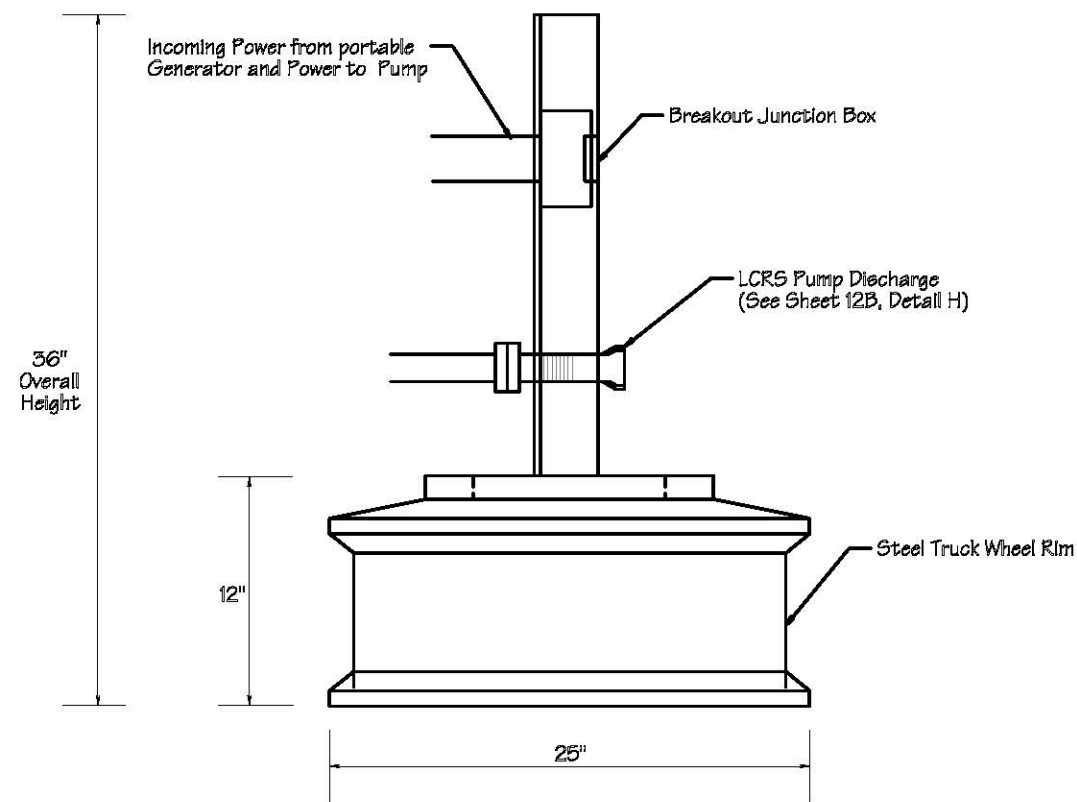


Detail H - Leachate Pump Discharge Hose/Piping Details
(Not to Scale)

A-Mehr, Inc.		Phase 4 LP
Model LMD7E		Rev
Phase 5 and Phase 6 Disposal Cells and Discharge Improvements		Date
Leachate Handling System Details 1		7/25/10
		Author
		123

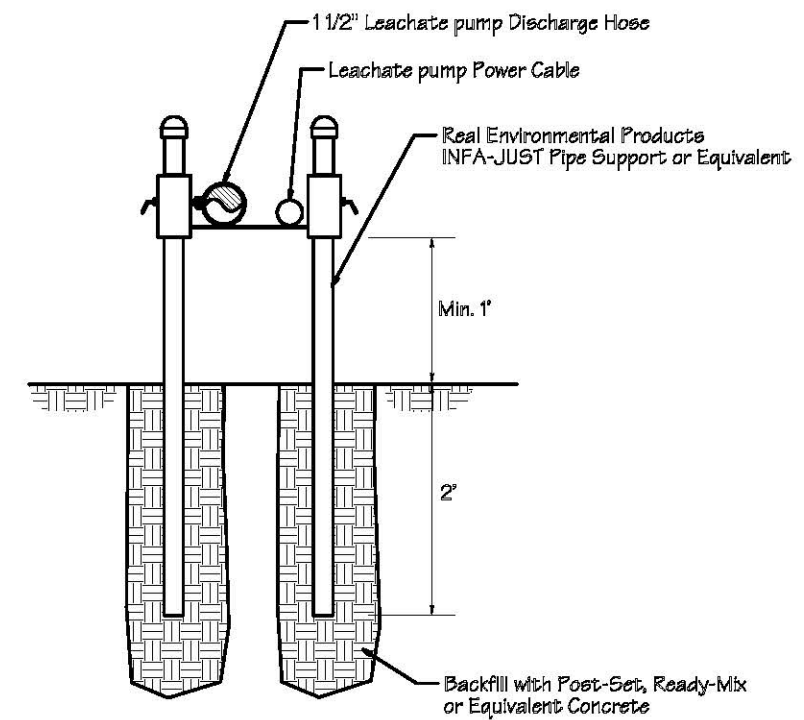


Detail J - Schematic Layout at Sump - Plan View
(Not to Scale)



Detail I - Leachate Pumping Portable Connection Panel

Scale: 1" = 10"



Detail K - Above-Ground Discharge Hose and Power Support
(Not to Scale)

A-Mehr, Inc.		Phase 4 LP
Model Landfill		10/1
Phase 5 and Phase 6 Disposal Cells and Discharge Improvements		10/1
Leachate Handling System Details 2		12C

**EXISTING LINED LANDFILL
(PHASES 1 THROUGH 4)**

PHASE 6

Stormwater Diversion
Berm

PHASE 2

PHASE 3

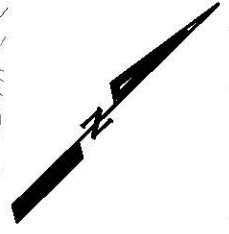
PHASE 5

PHASE 1

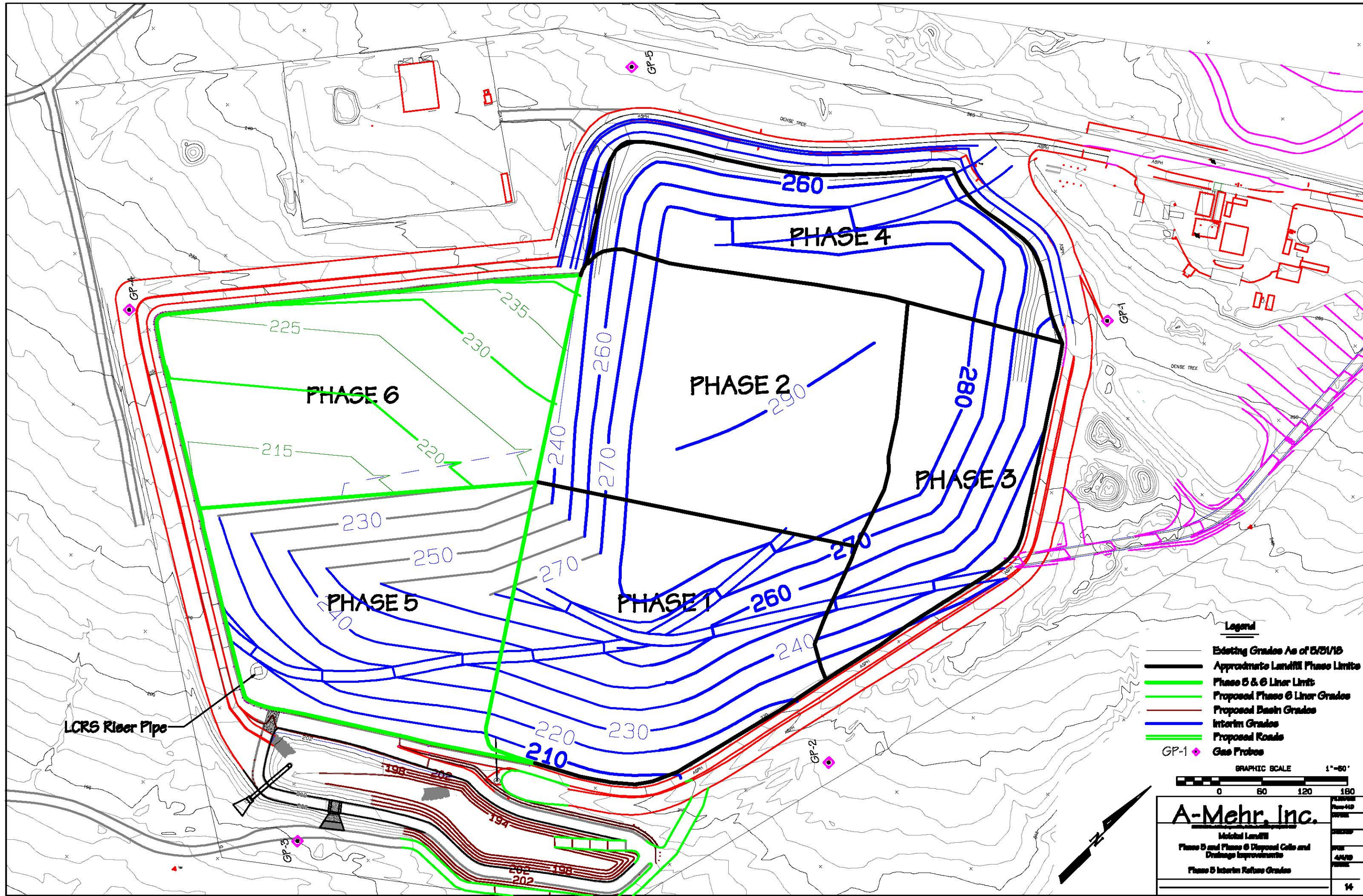
PHASE 4

Legend

- Existing Grades As of 5/31/18
- Approximate Landfill Phase Limits
- Phase 5 & 6 Liner Limit
- Proposed Phase 5 Liner Grades
- Proposed Basin Grades
- Interim Grades
- Proposed Roads
- GP-1 Gas Probes



A-Mehr, Inc.		PLANNING Phase 418 FORM
Molokai Landfill		2/28/20
Phase 5 and Phase 6 Disposal Cells and Drainage Improvements		FORM 44/18 FORM
Phase 1 through 4 Interim Refuse Grades		13



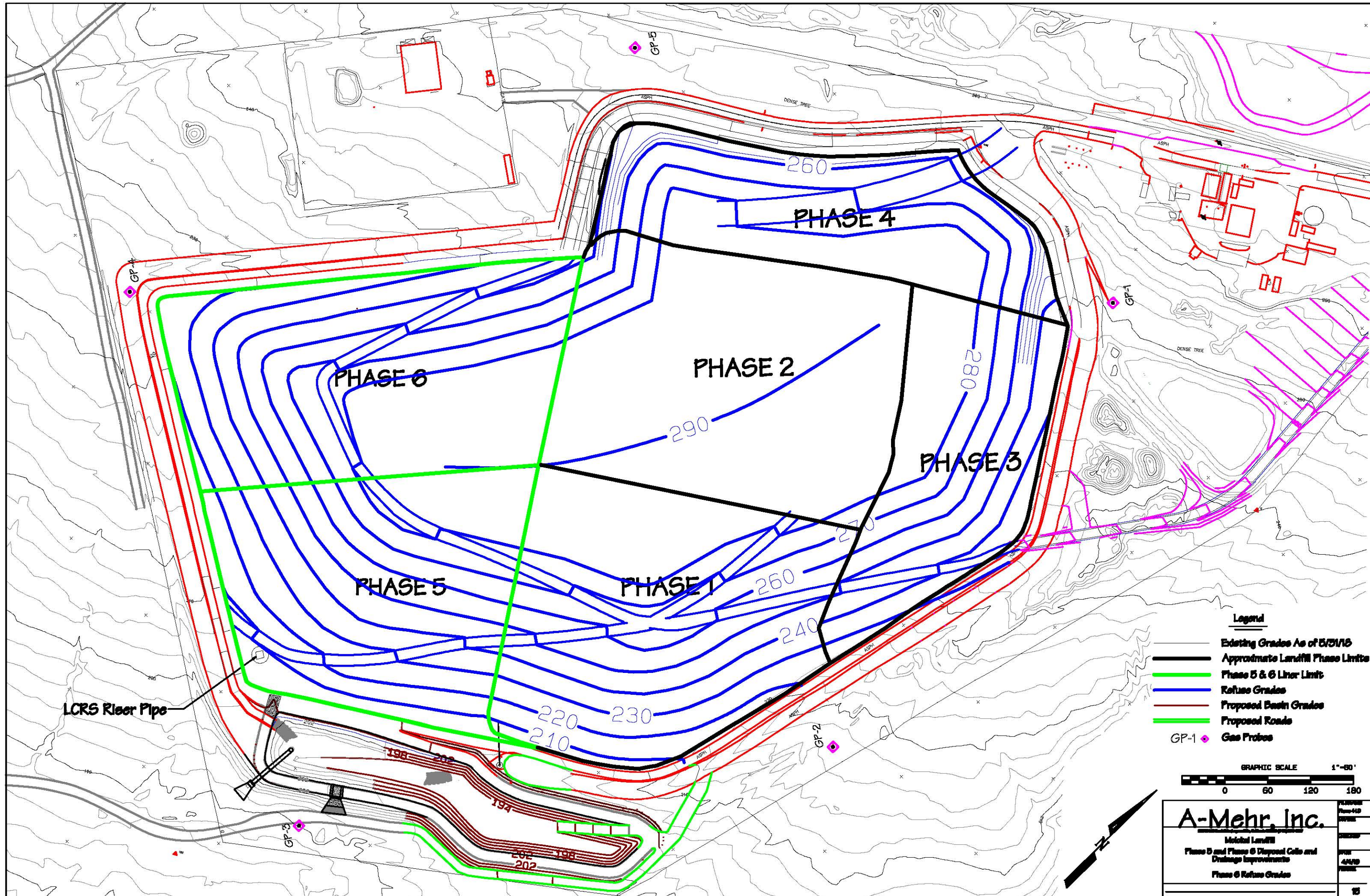
- Legend**
- Existing Grades As of 5/31/18
 - Approximate Landfill Phase Limits
 - Phase 5 & 6 Liner Limit
 - Proposed Phase 6 Liner Grades
 - Proposed Basin Grades
 - Interim Grades
 - Proposed Roads
 - Gas Probes



A-Mehr, Inc.

Metal Landfill
 Phase 5 and Phase 6 Disposal Cells and
 Drainage Improvements
 Phase 5 Interim Refuse Grades

DATE: 4/4/19
 SHEET: 14



- Legend**
- Existing Grades As of 5/31/15
 - Approximate Landfill Phase Limits
 - Phase 5 & 6 Liner Limit
 - Refuse Grades
 - Proposed Basin Grades
 - Proposed Roads
 - Gas Probes



A-Mehr, Inc.

Mechanical Landfill
 Phase 5 and Phase 6 Disposal Cells and
 Drainage Improvements
 Phase 6 Refuse Grades

PLANSHEET
 Phase 418
 DATE
 4/4/18
 SHEET
 15