CORNERSTONE
Environmental Group, LLC

17 W. Wetmore Road, Suite 310 • Tucson, AZ • 85705 • (877) 633-5520 • Fax: (520) 888-4804

May 8, 2011

Ms. Denise McConaghy, P.E.
Arizona Department of Environmental Quality
Solid Waste Plan Review Unit
1110 West Washington Street
Phoenix, Arizona 85007

Re: Marana Regional Landfil
Solid Waste Facility Permit Submittal

Dear Ms. McConaghy:

On behalf of our client, DKL Holdings, Inc., Cornerstone Environmental Group, LLC, (Cornerstone), is pleased to submit the attached Solid Waste Facility Plan (SWFP) for the Marana Regional Landfill, located in Marana, Arizona. This SWFP was developed in accordance with the with the Municipal Solid Waste Landfill Application Content Checklist as posted on the ADEQ website. This is a new MSWLF site plan, and a check for the initial review fee in the amount of $15,000 is included. As discussed with you, Cornerstone is submitting three (3) hard copies of the SWFP document, along with a CD containing PDF files of the document.

In the interest of timely review of the SWFP, if you have any questions or need additional information, please don't hesitate to contact Garth Bowers at (630) 633-5804 (direct), (520) 888-4800 (main office), or (520) 360-3756 or by e-mail at garth.bowers@CornerstoneEG.com . Transmittals of review comments or other written information can also be faxed to Cornerstone's Tucson office at (520) 888-4804.

Sincerely,

Cornerstone Environmental Group, LLC

Garth R. Bowers, P.E.
Client Manager/Certifying Engineer

DKL Holdings, Inc.

Larry Henk
President

Enclosure: 3 Copies of Volumes 1 & 2 of the Solid Waste Facility Plan
1 CD with PDF copy of the full Solid Waste Facility Plan Document

cc: H. Kai - H. Kai Family NG1, L.L.C.
Project File

SOLID WASTE FACILITY PLAN

Volume 1 and 2

May 2011

Marana Regional Landfill
Pima County, Arizona

Prepared for:
DKL Holdings, Inc.
1849 East Guadalupe Road
C1010, PMB52
Tempe, Arizona 85283

CORNERSTONE Environmental Group, LLC

17 West Wetmore Road, Suite 310, Tucson, Arizona 85705

Building lifetime relationships with our clients and employees.

SOLID WASTE FACILITY PLAN

MARANA REGIONAL LANDFILL

PIMA COUNTY, ARIZONA

Prepared for
Marana Regional Landfill

May 2011

Prepared by

CORNERSTONE
Environmental Group, LLC
17 West Wetmore, Suite 310
Tucson, Arizona 85705

Project 090250

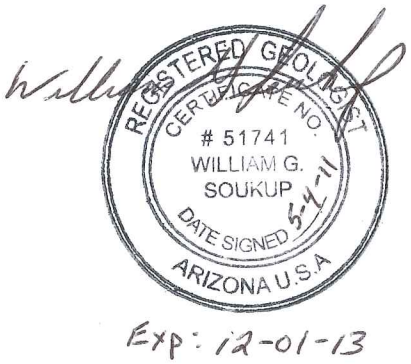
Solid Waste Facility Plan
Marana Regional Landfill

Pima County, Arizona

The material and data in this report were prepared under the supervision and direction of the undersigned.

Cornerstone Environmental Group, LLC

Carl Bueter, P.E.
Project Engineer



Exp: 12-01-13

William Soukup, P.G.
Certifying Geologist
(Sealing/Certifying Sections 7 and 8 **ONLY**)

Exp 9/30/11

Garth R. Bowers, P.E.
Client Manager/Certifying Engineer
(Sealing/Certifying All Other Sections **EXCEPT** 7 and 8)

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INTRODUCTION

The Marana Regional Landfill (MRLF) is a municipal solid waste landfill (MSWLF) located in the Town of Marana, Pima County, Arizona. This landfill is owned and operated by DKL Holdings, Inc. (dba Marana Regional Landfill), 1222 E. Coconino Drive, Chandler, Arizona, 85249-2812.

This Solid Waste Facility Plan (SWFP) has been prepared for DKL Holdings, Inc. by Cornerstone Environmental Group, LLC (Cornerstone). Because the proposed MRLF site has been used for agricultural activities and not landfilling, this permit application is the initial SWFP submitted for this "Greenfield" site. It has been prepared in accordance with the ADEQ *Municipal Solid Waste Landfill Application Content Checklist a*s well as the applicable requirements of 40 CFR §258 (Resource Conservation and Recovery Act (RCRA) "Subtitle D") and Arizona Revised Statutes (ARS) Title 49.

1 GENERAL INFORMATION

1.1 Type and General Description of Facility

The MRLF is a MSWLF located in Pima County, Arizona, as indicated on Figure 1-1. It is operated primarily using the area fill method. The overall landfill facility including support facilities, buffers and open space, occupies approximately 590 acres. Information on the property ownership is included in Appendix A.

1.2 Owner Information

The current owner of the MRLF property is Herb Kai. The property is under contract to be sold to DKL Holdings, Inc. contingent upon approval of the SWFP and other permits, whereupon, this statement will be deleted from this SWFP and the following will be true.

The owner of the Marana Regional Landfill is:

DKL Holdings, Inc.,
1222 E. Coconino Drive
Chandler, Arizona, 85249-2812

1.3 Operator Information

The Marana Regional Landfill is operated by:

Marana Regional Landfill
14508 West Avra Valley Road
Marana, Arizona, 85653

Local Contact:
Mr. Larry Henk
1222 E. Coconino Drive
Chandler, Arizona, 85249-2812

1.4 Agent Information

The SWFP for the Marana Regional Landfill has been prepared by:

Cornerstone Environmental Group, LLC
17 West Wetmore Road, Suite 310
Tucson, Arizona 85705
(520) 888-4800

1.5 Facility Information

1.5.1 Location Information

The MRLF property is a 591.21 acre parcel located approximately 8 miles west of Interstate 10, at the western jurisdictional limits of the town of Marana, Arizona, near the Pima/Pinal county line. The approximate latitude and longitude of the site are 32 degrees, 24 minutes, and 54 seconds north and 111 degrees, 16 minutes, and 38 seconds west, respectively. The site is located in Township 12 South, range 10 East, Section 1, Pima County, Arizona. A legal description of the property, which was included in the Specific Plan submitted by The Planning Center (TPC) for the Town of Marana zoning approval, is included in Appendix A. The Pima County Assessor's office parcel identification number for the site is 208-24-0010. Recording information is Docket No. 13705, Page 2054.

The mailing address for the Owner of the MRLF is:

DKL Holdings, Inc.,
1849 E. Guadalupe Rd., C1010 PMB52
Tempe, Arizona, 85283-3228
ATTN: Larry Henk

The physical address of the MRLF is:

Marana Regional Landfill
14508 West Avra Valley Road
Marana, Arizona, 85653

1.5.2 Population Base

The Town of Marana and its surrounding area is one of the fastest growing regions in the county. Its location along Interstate 10 between Phoenix and Tucson makes it one of the most important growth corridors statewide. Because of its location and due to the fact that Marana has a large amount of land (previously developed as farmland) available for businesses, industry, and homes, the area is forecasted to continue its rapid population growth. The latest available U.S. Census Bureau estimate indicates a population of just

under one million in Pima County. It is reasonable to assume that the MRLF will service half of this population as well as parts of southern Pinal County.

1.5.3 Major Design Features

The landfill design is discussed in detail in Section 6 and is depicted on the attached landfill Design Plan Drawings 1 through 16. In general, the landfill consists of a final waste footprint of approximately 415 acres. The site is surrounded by undeveloped lands. The East Branch of the Brawley Wash crosses the property at the extreme northeast corner. As part of the landfill site design, this portion of the East Branch of the Brawley Wash will be will be improved and revegetated, and the elevation along the west bank of the channel will be raised and armored. Diversion channels will be constructed along the east, west and south boundaries of the site to direct stormwater around the site. The landfill is designed to have a top deck with a minimum slope of 5% to accommodate future settlement, with a maximum side slope of 3:1. The landfill is constructed in accordance with RCRA Subtitle D and Arizona Department of Environmental Quality (ADEQ)solid waste regulations.

1.5.4 Meteorologic Information

Based on the Western Regional Climate Center (WRCC) the area around Marana (Red Rock weather station) receives an average annual rainfall of 9.78 inches per year. As in much of the state of Arizona, rainfall is typically received during two rainy seasons: a summer "monsoon" season in July, August, and September characterized by short duration high intensity thunderstorms; and a winter rainy season generally extending from November to March characterized by longer duration, lower intensity occasional frontal storms originating over the Pacific Ocean. Monsoon data for Marana indicates an average monsoon season rainfall of 4.33 inches during the rainfall season between July to September 30th.

WRCC for Marana also indicates that the MRLF area has an annual normal temperature average of a high of 85.1 °F with a low of 52.8 °F and a yearly average of 68.95 °F. Daytime low temperatures average approximately 35.8 °F for the months of December and January with a daytime high average of over 100 °F during the summer months. These high temperatures lead to relatively high potential evaporation rates at the site. Average annual open water surface evaporation rates for the area of the MRLF are approximately 68.1 inches based on ADEQ Bulletin No. 12, (ADEQ, 1989), (see Appendix B).

The nearest available full windrose for the site is from data collected at the Marana Regional Airport (AVQ). Since the MRLF site is located approximately 2.4 miles west of AVQ in the same valley, the wind conditions at MRLF are expected to be virtually identical. The prevailing wind direction for AVQ is southeast with winds speeds less than 6 knots more than half of the time (53.8%), based on information from the Marana Regional Master Plan (Town of Marana, 2006). A wind rose for the AVQ, wind data, and other weather related information furnished by National Oceanic and Atmospheric Administration (NOAA) are included in Appendix B.

1.5.5 Local Vegetation and Geographic Characteristics

The MRLF is located in the Northern Avra Basin approximately one and a half miles southwest of the Santa Cruz River and approximately one half mile south of the confluence of the East Branch and West Branch of the Brawley Wash. The project site has been used for agricultural purposes and most of the native vegetation has been removed. According to the Sonoran Desert Conservation Plan (SDCP), over 90% of the site is designated "agricultural" with the remaining portion designated "Sonoran Desert Scrub". The Sonoran Desert Scrub designation is located along the northern and northwestern boundary of the site along the East Branch of the Brawley Wash.

The Brawley Wash watershed (also known as the Altar Wash-Brawley Wash watershed, or Altar and Avra Valleys) is large- over 1,400 square miles. The watershed extends from just north of the Mexican border at the south end to just north of the Pima County line. The Brawley Wash begins as Altar Wash near the Mexican border and flows to the north through the alluvial valley between the Sierrita and Tucson Mountains on the East and the Baboquivari, Roskruge, and Silverbell Mountains of the west. The Altar Wash becomes the Brawley Wash approximately 8 miles south of Robles Junction and continues to flow north as a single braided stream until it crosses Manville Road, at which point it diverges into the East Branch of Brawley Wash and the West Branch of Brawley Wash, which have hydraulically distinct floodplains. After approximately 10 miles, and downstream of the MRLF site, these branches reconvene to form Brawley Wash, which becomes Los Robles Wash and ultimately flows into the Santa Cruz River.

1.5.6 Adjoining Land Use

The MRLF occupies most of Section 1, Township 12 South, Range 10 East. A 40-acre parcel in the northwest corner of the section is privately owned and undeveloped. Section 1 is surrounded on three sides, north, east and west, by State Trust Land, which is either undeveloped or currently vacant agricultural land. Over half of the southern boundary is adjacent to City of Tucson owned land which is retired agricultural land, and the remainder of the southern border, (the eastern third, approximately) is privately owned active agricultural land.

1.5.7 Drainage Characteristics

The location of the project site is approximately one half mile south of the confluence of the East Branch and West Branch of the Brawley Wash. The East Branch of the Brawley Wash crosses the property at the northeast corner. The Federal Emergency Management Agency (FEMA) floodplain map for this area shows the majority of the site being in Zone A and AO floodplain. Detailed modeling has been performed on the site using HEC-RAS and FLO-2D programs. This modeling indicated that the FEMA FIRM map floodplain areas are substantially correct, although details of the delineation should be revised to reflect actual topography. However, much of the area is in shallow sheet flow flooding from overbank

flows from the East Branch of the Brawley Wash, and such flooding can be addressed by collector/diversion channels and/or fill to raise the ground surface above the water surface.

Most of the offsite flow arriving at the south property line is shallow sheet flow from East Branch of Brawley Wash overbank flow. However, a small manmade channel arrives at the south property line approximately 2,000 feet west of the southeast corner. This channel collects flows at the Avra Valley Road crossing from a small natural channel referred to as China Draw, which is fed by breakout flows from the East Branch of the Brawley Wash. This manmade channel currently extends north into the southeast corner of the MRLF property and angles to the northeast to discharge into the East Branch of the Brawley Wash at approximately the midpoint of the east property line.

The largest offsite flow affecting the MRLF property is the East Branch of the Brawley Wash itself, which crosses the northeastern corner of the property. This channel has been previously modified by agricultural activity through the construction of several soil berms that constrain low flows to a small incised channel running around the northeastern perimeter of the property. These berms would be overtopped in a design storm flow and do not appear to have been constructed/certified to function as flood levees. Flows overtopping these berms spread out across the existing agricultural fields which have been leveled to support irrigation distribution.

The general slope of the ground in this area is to the north. A diversion channel will be constructed along the southern boundary of the site to direct off-site sheet flows around the site to the west, where they will exit the site in the northwest corner, which is the historical location of discharge for the western portion of the site. Another diversion channel will be constructed to collect the flows arriving via the manmade channel at the southern property line, along with sheet flows to the east, and convey them around the southeast corner of the property, north along the east property line, and discharge into the East Branch of the Brawley Wash. In addition, a new west bank of the East Branch of the Brawley Wash will be constructed and armored and the floodplain area between this bank and the existing low flow channel of the East Branch of the Brawley Wash will be graded to approximate the grade of the low flow channel. This will allow restoration of the geometry of the East Branch of the Brawley Wash to more natural conditions that would have existed prior to the agricultural activity at the site.

Surface water hydrology is discussed in more detail in Appendix S.

1.5.8 Landfill Capacity and Life

The estimated landfill capacity for the site is approximately 120.4 million cubic yards of airspace. It is estimated that approximately 19.5 million cubic yards of daily and intermediate cover soil will be required, assuming a 5:1 waste to soil ratio and a waste density of 1300 lbs per cubic yard. It is estimated that approximately 2.0 million cubic yards of final cover soil will be required, assuming a 3-foot final cover. The expected life of the landfill at an average annual tonnage of 600,000 tons is approximately 125 years.

1.5.9 Acknowledgements

The undersigned certifies that, to the best of his knowledge and belief, the applicant/operator have complied with all other applicable local regulations and ordinances relative to the construction and operation of the proposed facility, that the owner will grant site access as necessary to conduct any closure and/or post closure care, and that the information contained in this Solid Waste Facility Plan is true, accurate, and complete to the best of the applicant's knowledge and belief.

_____

Larry Henk
DKL Holdings, Inc.

2 LOCATION RESTRICTIONS

2.1 Irrigation Grandfathered Rights

Regulations for solid waste facilities at Arizona Revised Statutes (ARS) §49-772.A.1 require that approval for a SWFP not be granted if there are grandfathered irrigation rights appurtenant to all or any part of the site. According to the Arizona Department of Water Resources (ADWR), there are grandfathered irrigation rights for the landfill property, as indicated in Appendix C. These irrigation rights are in the process of being retired to a non-irrigation (Type 1) use. In the event that ADWR does not approve the retirement of the grandfathered irrigation rights to non-irrigation (Type 1) use, the grandfathered irrigation rights will be extinguished prior to issuance of the solid waste permit. Therefore, there will be no grandfathered irrigation rights associated with the landfill property when the permit is issued.

2.2 Floodplain Issues

The FEMA floodplain map for this area shows the majority of the site being in Zone A and AO floodplain (See Figure 2-1). Detailed modeling has been performed on the site using HEC-RAS and FLO-2D programs. This modeling indicated that the FEMA FIRM map floodplain areas are substantially correct, although details of the delineation should be revised to reflect actual topography. However, much of the area is in shallow sheet flow flooding from overbank flows from the East Branch of the Brawley Wash, and such flooding can be addressed by collector/diversion channels and/or fill to raise the ground surface above the water surface.

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The largest offsite flow affecting the MRLF property is the East Branch of the Brawley Wash itself, which crosses the northeastern corner of the property. This channel has been previously modified by agricultural activity through the construction of several soil berms

that constrain low flows to a small incised channel running around the northeastern perimeter of the property. These berms would be overtopped in a design storm flow and do not appear to have been constructed/certified to function as flood levees. Flows overtopping these berms spread out across the existing agricultural fields which have been leveled to support irrigation distribution.

An offsite drainage plan has been prepared to demonstrate the proposed design for the MRLF site complies with the requirements of 40 CFR §258.11. This plan is included in Appendix S.

2.3 Proximity to Regional Watercourses

The flows in the West and East Branches are 14,000 cubic feet per second (cfs) and 21,000 cfs respectively, per the FEMA. At the confluence, flows are approximately 35,000 cfs. The MRLF is located over half mile from the confluence of the East and West branches of the Brawley Wash as shown on Figure 2-1.

2.4 Airport Safety

The regulations at 40 CFR §258.10 require all landfills within 10,000 feet of the end of a runway serving turbojet aircraft (5,000 feet of the end of a runway serving only piston-engine aircraft) make a demonstration that the site is designed and operated to not pose a bird hazard to aircraft.

Cornerstone has reviewed the location of the proposed landfill site with respect to nearby airports based on the Phoenix Sectional Aeronautical Chart (NACO, 2011) (see Figure 2-2). This map shows the location of public, private, and military airports within the area covered by the chart. The closest airport to the MRLF is the Marana Regional Airport, formerly named Avra Valley Airport, and with the three-letter identifier of AVQ.

Cornerstone determined the distance from the end of the Marana Regional Airport runway to the location of the proposed Landfill site (parcel boundaries) based on the Pima County Mapguide mapping system (see Figure 2-3). The distance from the end of the Marana Airport runway to the closest point on the landfill property is approximately 13,530 feet (approximately 2.6 miles). The MRLF is not in line with approaches to either runway 12/30 or 03/21 at the AVQ.

Landfills located near airports are potentially subject to additional demonstrations based on the distance the landfill is from the airport. 40 CFR §258.10 sets forth location restrictions for MSWLFs to address airport safety. 40 CFR §258.10(a) and (c) contain requirements for new MSWLFs, existing MSWLFs and lateral expansions of landfills that are located within 10,000 feet of any airport runway used by turbojet aircraft or within 5,000 of any airport runway used only by piston-type aircraft. Owners or operators of such landfills are required to (1) demonstrate that the MSWLFs are designed and operated so as not to "pose a bird hazard to aircraft,"' (2) place a copy of the demonstration in the MSWLF operating record,

and (3) notify the State Director that it has been placed in the operating file. "State Director" is defined as "the chief administrative officer of the lead state agency responsible for implementing the state permit program for 40 CFR §257, subpart B and 40 CFR §258 regulated facilities." Section 258.10(b) applies to new MSWLFs and lateral expansions proposed to be constructed within a five-mile radius of the end of any airport runway used by turbojet or piston-type aircraft. For such proposed new MSWLFs and lateral expansions, the owner or operator must notify the affected airport and the Federal Aviation Administration (FAA). Based on the distance from the airport, the MRLF would only be required to inform the airport and FAA of its proposed construction. FAA notification forms completed for the purpose of this notification are included in Appendix D. No demonstrations that the landfill would be designed and operated so as not to "pose a bird hazard to aircraft" would be required to be made and kept on file.

The requirements of 49 United States Code (USC) §44718(d) limit the location of municipal solid waste landfills within 6 statute miles of certain airports based on the type of airport operations conducted at the airport. The landfill is located within 6 statute miles of the AVQ. 49 USC §44718(d)(1) states, "In general. - No person shall construct or establish a municipal solid waste landfill (as defined in 40 CFR §258.2, as in effect on the date of the enactment of this subsection) that receives putrescible waste (as defined in Section 257.3-8 of such title) within 6 miles of a public airport that has received grants under chapter 471 and is primarily served by general aviation aircraft and regularly scheduled flights of aircraft designed for 60 passengers or less unless the State aviation agency of the State in which the airport is located requests that the Administrator of the Federal Aviation Administration exempt the landfill from the application of this subsection and the Administrator determines that such exemption would have no adverse impact on aviation safety." The AVQ does not have regularly scheduled flights of aircraft designed for 60 passengers or less. Based on this, the requirements of 49 USC §44718(d) would not apply to the MRLF site.

2.5 Wetlands

No wetland areas occur within or adjacent to the proposed site.

2.6 Fault Areas

Subtitle D regulations at 40 CFR §258.13, place restrictions on landfills located within 200 feet of a fault that has experienced movement in Holocene time. As shown in Appendix E, the nearest known Quaternary (which includes both Holocene and Pleistocene time) fault is the Santa Rita fault zone, located approximately 45 miles southeast of the proposed MRLF site. This information was compiled from mapping of Quaternary faults in Arizona (Pearthree, 1998). The Quaternary period is composed of the Pleistocene Epoch (1.6 million to 10,000 years ago) and the Holocene Epoch (10,000 years ago to present).

2.7 Seismic Zones

Using the United States Geologic Survey (USGS) website (USGS, 2011) Cornerstone determined that the horizontal ground acceleration would be approximately 0.11g. The USGS website was utilized to determine acceleration using the latitude and longitude of the site. In addition, the interpolation method using the Arizona Department of Transportation (ADOT) (ADOT, 1992) maps was employed yielding a result of 0.07g. The results from the USGS website evaluation and the results from the ADOT method can be found in Appendix E.

2.8 Unstable Areas

Unstable ground in the general area of the site is primarily related to land subsidence which creates "earth fissures". The typical cause of land subsidence in this part of Arizona is the decline in water levels and the natural settling of the land resulting from the compaction of sediments. Future land subsidence due to groundwater level decline is not likely to occur near the site because groundwater levels have been on the rise since the early 1980's as further discussed in Section 7.5.4. The site is not in a region of Karst topography, steep slopes, or other lighologic/geomorphic features indicative of unstable ground.

3 ADMINISTRATIVE DEMONSTRATIONS

3.1 Financial Assurance

DKL Holdings, Inc. as the operator of the MRLF will comply with the financial assurance requirements of ARS 49-770 and 40 CFR §258.71. The financial assurance mechanism proposed for this site will be in the form of a performance bond. Arizona requirements specify that the amount of financial assurance be equal to the cost to have a third party close the current or existing landfill and perform 30-years of post closure care and monitoring.

As of this time, the access road, entrance facility and first cell have not been constructed, and the SWFP has not been approved. Therefore, a performance bond for closure and post-closure is not currently necessary, and has not been secured. Upon commencement of construction, and before landfilling operations begin, DKL Holdings, Inc. will secure the financial assurance instrument and provide evidence to the ADEQ as part of the Construction Certification Report for the initial cell, which must be approved by ADEQ prior to initial operation of the landfill.

A copy of this financial assurance information will be included in Appendix F. Cost estimates for closure and post-closure activities are included in Appendix Y.

3.2 Technical Capability

The MRLF is operated by DKL Holdings, Inc. They have the necessary expertise and technical capability to operate the MRLF. Brief descriptions of the qualifications of key site and management personnel are provided in Appendix G.

The SWFP and attached Design Plan Drawings have been prepared for the MRLF by Cornerstone. Detailed qualifications information for Cornerstone is included in Appendix G.

3.3 Land Ownership

The land at the location of the MRLF is currently owned by H. Kai Family NG1, LLC. The transfer of ownership of this land is contingent on the permitting of the site as a MSWLF. A letter describing the status of ownership is included in Appendix A. As required by the Municipal Solid Waste Landfill Application Content Checklist, a copy of this SWFP has

been provided to H. Kai Family NG1, LLC and a receipt of this is also included in Appendix A.

A copy of the legal description for the landfill property, from the Specific Plan prepared by The Planning Center for Town of Marana zoning is provided in Appendix A.

3.4 Certificate of Disclosure

The certificate of disclosure information for the owner of the MRLF is provided in Appendix H, as required by A.R.S. 49-109.G.

3.5 Restrictive Covenant

The MRLF property is currently vacant agricultural land and has not previously been used for landfill disposal. Therefore, a restrictive covenant has not been filed for the property.

Pursuant to A.R.S. §49-771, a restrictive covenant for the MRLF will be filed with the Pima County Recorder following initial approval of the design of the MRLF contained in this SWFP, but prior to any waste disposal activity. A draft copy of a proposed restrictive covenant including the entire landfill property is included in Appendix I. The proposed Restrictive Covenant is written with DKL as the property owner recording the covenant since DKL has a contractual right to acquire the property contingent on issuance of the solid waste permit (MFPA) for the site. DKL proposes that the MFPA be issued contingent on the documented recordation of the Restrictive Covenant prior to initial operation of the landfill.

4 OTHER APPROVALS/DEMONSTRATIONS

4.1 Archaeological Clearance

A request was forwarded to the Arizona State Museum regarding archaeological clearance for the subject property. The response to this request indicated there is a single identified archaeological resource (AZ AA:11:28) at the far northeast corner of the site and a formal archaeological survey should be performed.

An on-ground survey of the landfill site was conducted between September 14 and October 18, 2009 by David Stephen of Professional Archaeological Services of Tucson (PAST). Based on the archival information, field methods and the observable surface indications further archaeological studies on this parcel appear to be warranted unless archaeological site AZ AA:11:28(ASM) can be avoided completely. Since the existing known archaeological resource is located in an area to be set aside as open space, the site will remain undisturbed. In addition, effective resource avoidance would include developing and implementing an approved long-term preservation plan. A Class I report has been generated to document these results and is included in Appendix J of this SWFP.

4.2 Zoning/Specific Plan

The Town of Marana passed an ordinance, (Ordinance No. 2010.11) on November 3, 2010 which rezoned the subject property. The zoning was changed from a Pima County designation of "RD-180" (Rural Development – minimum lot size of 180,000 square feet) to 'F' Specific Plan, and created and applied the MRLF Specific Plan to the rezoned area. A copy of this ordinance and Specific Plan are included in Appendix K.

4.3 Floodplain Use Permits/Approval

As discussed previously, much of the MRLF property is currently shown within FEMA floodplain (Zones A and AO) and a design has been developed, as discussed in Section 6.3, to remove the landfill and appurtenant facilities from the floodplain. This design and construction will require approval by the Town of Marana as the Local Floodplain Administrator. This approval will be done in a parallel process with the ADEQ solid waste facility permit. DKL and Cornerstone have previously met with the Town of Marana to initiate the preparation of the Development Plan to acquire this Floodplain Use Permit. No

construction of any facilities within the floodplain will be initiated prior to obtaining Floodplain Use Permit approval.

It is not anticipated that landfilling will occur in an area within jurisdictional waters during the initial 25 to 30 years of operation, and Section 404 permits typically have limited durations (normally 5 years with potential extension totaling less than 10 years). It is expected that landfill development will occur in multiple phases over the life of the site. The initial phase of development will be focused in areas in the southwest corner of the site which have been previously disturbed by agricultural activity and do not contain jurisdictional waters. Any crossings of jurisdictional waters will be designed in accordance with the requirements of an applicable Nationwide Permit and will be less than the area requiring preconstruction notification. No construction activity for development of any phase of the landfill that affects any onsite watercourses will be initiated until the design is permitted by the Town of Marana (floodplain use) and/or the US Army Corps of Engineers (Section 404), as applicable.

4.4 Drainage Diversion

The off-site stormwater management was designed to direct flows around the landfill. All offsite flows requiring diversion channels come from the south side of the landfill. A man-made ephemeral channel currently enters the landfill property approximately 1000 feet west of the southeast corner of the property. The flows from this channel will be collected in a diversion channel running east along the south side of the landfill and conveyed under the entrance road and into a channel running north on the east side of the landfill where it will ultimately discharge into the East Branch of the Brawley Wash. The remainder of the flows impacting the site are sheet flows, west of this man-made channel. These flows will be collected in a diversion channel which flows west, along the southern property line. This channel will convey flow around the southwest corner of the property and continue north along the west side of the landfill where it will discharge into a natural channel near the northwest corner of the site. All diversion channels will be designed in accordance with Town of Marana requirements and will not affect the adjacent land. All channels were designed to convey the 100-year design storm event per Town of Marana requirements.

4.5 Well Registrations

Four monitoring wells have been drilled along the perimeter of the MRLF. The registration procedure has been completed and the well information is as follows:

Well Registration Number	Associated Site Well ID	Cadastral Location (T12S,R10E)
55-220306	CEG #1	01-DDC
55-220307	CEG #2	01-CCB
55-220308	CEG #3	01-BAC

55-220309 CEG #4 01-ADD

In addition, there are two existing registered wells (55-618389 and 55-618390) which have been historically used for agriculture irrigation.

A copy of the well information is contained in Appendix L.

4.6 Open Burn Permit

Operational practices at the facility do not include the burning of lumber, wood, waste, or paper. Accordingly, an Open Burn Permit is not required at the MRLF.

4.7 Endangered Plants/Species

Requests were submitted to the United States Fish and Wildlife Service (USFWS) and Arizona Game and Fish Department (AGFD) regarding endangered plants and species for the subject property. Responses from these agencies are included in Appendix M. USFWS reviewed the proposed action and found that the site primarily occurs within or adjacent to active and abandoned agricultural fields, as well as some areas of open desert. These areas do not support any potential habitat for threatened or endangered species known to occur in Pima County. Therefore, USFWS acknowledges there is no endangered or threatened species or critical habitat affected by this project nor is this project likely to jeopardize the continued existence of any proposed species or adversely modify any proposed critical habitat. However, the area does support riparian vegetation and potential habitat for the western burrowing owl, Tucson shovel-nosed snake and the ground snake, all sensitive species proposed for coverage under the three local habitat conservation plans.

In particular, the burrowing owl is identified as a Sensitive Species and is addressed under the Town of Marana's Draft Habitat Conservation Plan, (HCP) as well as the City of Tucson and Pima County Draft HCPs. Burrowing owls are also protected by the Federal Migratory Bird Treaty Act of 1918 and State of Arizona Revised Statute Title 17-235. Due to this project site being located within potential burrowing owl habitat, a burrowing owl survey will be completed 30 days prior to ground disturbance.

The Tucson shovel-nosed snake is protected by Arizona State law (ARS Title 17). In 2004, the USFWS was petitioned to list the Tucson shovel-nosed snake and to designate critical habitat. The Town's goal is to look for opportunities to obtain grants or support cooperators to conduct surveys or research on Tucson shovel-nosed snakes.

In addition, the AGFD reviewed its Heritage Data Management System (HDMS) concerning the site. Current HDMS records indicate the presence of the western burrowing owl, Tucson shovel nosed-snake, western yellow billed cuckoo, Thornber Fishhook Cactus and the Texas Horned Lizard within 3 miles of the project. The Town of Marana has also mapped this area as containing modeled habitat for the Tucson shovel-nosed snake.

It is anticipated ADEQ will solicit comments from USWS and AGFD as part of the public comment requirements for SWFP approval.

4.8 Section 404 Permits/Section 401 Certifications

As discussed in Section 4.3, it is anticipated that during the first 25 to 30 years of operation, no jurisdictional watercourses will be affected by construction/excavation activities, except for a haul road crossing of a manmade channel in the southeastern portion of the site. It is anticipated that this haul road will cross this watercourse in such a manner that a Nationwide 404 Permit will apply and the disturbance will be limited to less than the Pre-Construction Notification (PCN) trigger area. Once the landfill expands to the point where any other jurisdictional watercourse will be affected, Section 404/401 permit approval will be obtained prior to construction within the jurisdictional watercourse.

4.9 Stormwater Quality Permitting

MRLF will obtain permit coverage for their storm water discharges under the Arizona Pollutant Discharge Elimination System (AZPDES) program prior to commencement of construction. A copy of the Notice of Intent (NOI) will be placed in Appendix N. A Storm Water Pollution Prevention Plan (SWPPP) meeting the requirements of the AZPDES General Permit will be prepared and implemented at the site, a copy will be included in Appendix N.

4.10 Air Permitting

The existing design capacity proposed in this SWFP exceeds the New Source Performance Standards (NSPS) trigger capacity of 2.5 million cubic meters, which is the threshold at which a facility becomes subject to Title V permit requirements and must calculate its annual Non-Methane Organic Compound (NMOC) emissions. MRLF will obtain a Title V, Class A permit from the Pima County Department of Environmental Quality (PCDEQ) prior to commencement of construction and will maintain compliance with the Clean Air Act and permit requirements. A copy of the air permit will be included in Appendix O.

5 OPERATING CRITERIA

5.1 Operations Plan

5.1.1 Waste Inspections (Hazardous/Liquid Waste Exclusion)

The MRLF has established a program to inspect incoming loads for the presence of hazardous wastes (including Polychlorinated Biphenyls (PCBs)) and unauthorized wastes containing free liquids. Non-landfill vehicles delivering wastes to the landfill will be stopped at the scales. Random inspections will also be conducted at the disposal areas. Also, any vehicle suspected of carrying unacceptable materials will be directed to the inspection area where a visual inspection of the vehicles contents will be performed by the operations staff. Suspicious loads are those which include containers labeled as hazardous waste or appear to contain unauthorized free liquids or other materials not accepted by the MRLF.

Other vehicles will be directed to the active daily cell area. Site personnel are trained and are experienced at identifying containers and labels typically used for hazardous waste and to deal with unacceptable wastes and the waste haulers. If unacceptable materials are suspected or identified in the disposal area, these materials will be isolated and secured for further examination. A testing laboratory may be contacted to obtain samples and determine waste characteristics. If the waste is determined to be a regulated hazardous waste, the landfill supervisor will inform MRLF management and contact a contractor to remove the hazardous waste. The hazardous waste will be manifested and shipped to an approved facility. ADEQ will also be informed of the identification of the hazardous waste and procedures followed for proper disposal.

Specific elements of the waste inspection program include:

- Prohibited Wastes are clearly identified at the scale house entrance with signs banning the acceptance of lead acid batteries, unauthorized bulk liquids, PCB's and other hazardous substances.

- Observation of unloading of solid wastes by commercial and residential haulers to assess whether material being delivered to the landfill is acceptable. If unacceptable materials are discovered, the material will be removed by the hauler, who will be responsible for proper handling and disposal. If the hauler has left the site, personnel will determine whether the material presents an immediate threat to user and worker safety; informing the appropriate parties of the situation; attempting to determine who

generated the material; and take appropriate actions to comply with applicable regulations.

- Random selection of loads for inspection. Personnel visually inspect the material as it is being dumped and report the findings on a random load inspection form. A random load inspection form is used to ascertain what types of waste are being delivered, identify potential problems, and assist in identifying the generator of the material. Copies of completed random load inspection forms will be maintained in the operating record at the site.

- Traffic control of residential and commercial unloading areas. Personnel patrol the disposal area and prevent haulers from scavenging waste material.

Staff is trained in the recognition of hazardous wastes. Records of this training are kept in the operating record for the site.

5.1.2 Disposal Methods

The MRLF is operated under the area fill method. Details of typical cell design are provided in the Design Plan Drawings. The supervisor in charge of daily landfill operations directs the activities of the landfill and schedules personnel. Equipment may consist of a bulldozer, landfill compactor, loader, scraper, and dump truck. Other equipment may be used in place of or in addition to the listed equipment. These are used to spread and compact the waste and excavate and place cover soil. During the landfill operations, waste is evenly spread in layers and compacted. At the end of each working day, a layer of soil or alternate daily cover (ADC) is then spread over the waste as daily cover.

The scale house at the MRLF, as indicated on Drawings 3 and 5 of the Design Plan Drawings, enables waste receipts to be recorded by weight rather than volume. The scale house assists in standardizing the waste receipt records. The check-in process at the scale house will also allow the scale house operator to screen incoming vehicles for unauthorized wastes. Suspicious vehicles will be directed to a specified area for further inspection rather than to the working face of the landfill.

After weighing in at the scale house, the wastes will be hauled to the active fill area by the disposal trucks. The trucks will travel over graded internal haul roads. The operators will be responsible for overseeing that all wastes are unloaded in the designated locations at the working face. The working face will be confined to the smallest practicable area.

A compactor, dozer, or loader will be used for waste compaction. Waste may be unloaded at the bottom or top of the advancing lift (generally 8-12 feet high, although actual dimensions will vary based on daily operational requirements) and spread on a 3:1 slope or flatter to achieve proper compaction. Waste will be spread after unloading to reduce blowing litter and to keep the unloading area clear for additional loads. Compaction will generally be carried out by spreading the waste in layers. Compaction equipment will make several

passes over the entire layer as required for proper compaction. Individual layers of compacted wastes with a maximum compaction thickness will be built up during the day to create a daily cell. The actual dimensions of the daily cell will vary in proportion to how much waste is received.

Filling will commence at one end of an area and progress to the other end. Filling within a module/cell will typically continue until intermediate grades or final grades are attained. The interim fill slope which will be covered by subsequent modules/cells will be sloped at a ratio of 4 horizontal to 1 vertical or flatter. Adequate setbacks will be provided as needed between the toe of any fill slope and any property line or site structure that would inhibit access to the slope for maintenance of the sloped intermediate cover. The entire landfill is surrounded by an access road to be used for the maintenance of the slopes.

At the end of each working day, a layer of at least 6 inches of daily soil cover material or an approved ADC is placed on all exposed waste. The waste will be compacted prior to the placement and compaction (if necessary) of the daily cover. Daily cover soils, if used, will be obtained from on-site excavation and stockpiles or from off-site sources. The refuse will be covered at the end of each operating day in accordance with the requirements of 40 CFR §258.21.

Surface water controls for the MRLF are handled by several different methods. Temporary containment berms are used to control surface water, which will be routed to temporary or permanent retention or sedimentation basins by a series of channels. The purpose of the retention/sedimentation basin is to allow soil particles to settle from the surface water and control surface water generated on-site from the 25-year, 24-hour design storm. Details of the engineering design for on-site and off-site stormwater controls are included in Section 4.4 and 6.3.1. Stormwater contacting MRLF areas which have not received daily or final cover is considered to be landfill wastewater per the requirements of 40 CFR §445 and will be retained on-site within the lined area of the landfill. Since the working face will move daily during the operation of the site, this retention capacity will be provided as an operations concern and is not shown on the Design Plan Drawings. Temporary berms or drainage swales will be built on the covered sideslopes to prevent surface water runoff from entering the active landfill area. This measure is a daily operational concern and therefore the exact locations of temporary drainage ditches cannot be provided on the Design Plan Drawings. Since the active fill area will be increasing in elevation, the location of these ditches will change with time.

The design of the final landfill cover will provide for gentle slopes and frequent diversion berms on steeper slopes to reduce sheet flow path lengths and mitigate erosion potential.

Drainage control in the waste area is achieved through the following methods:

- Grading of inactive portions of the area to promote positive drainage.
- Covering of inactive portions of the area with approximately 6 inches of soil to limit infiltration of direct precipitation; and

- Control of precipitation runoff adjacent to the working face to minimize potential for saturation of landfill material.

Inactive-covered surfaces are generally graded to drain to the perimeter of the waste footprint. The positive grades encourage surface water runoff and decrease potential for ponding and surface water infiltration. Some minor ponding is unavoidable due to constraints caused by access requirements, surface irregularities, etc.

During waste placement, the base of the placement area is generally sloped away from the waste being placed to ensure that direct precipitation runs away from the waste rather than soaking into the exposed waste. During placement of the lifts, runoff from the active waste placement area is absorbed and evaporated from the upper few inches of the underlying landfill.

Disposal vehicles will be directed away from the top of excavation slopes.

As depicted in the Design Plan Drawings, the maximum slope at the MRLF is planned to be 3:1.

5.1.2.1 Alternative Daily Cover

The MRLF is requesting to be permitted to use the following items as ADC:

- Tarps
- Shredded/Processed Green Wastes
- Foam/Synthetic Spray-on Material
- Bottom Ash
- Shredded Waste Tires
- Petroleum Contaminated Soils (PCS)
- Auto Shredder Fluff
- Crushed Glass
- C&D Residual
- Shredded Shingles/Wood Waste

These materials have been approved for use as ADCs in various landfills across Arizona and the procedures for their use are included in Appendix P.

5.1.3 Litter Control

The MRLF facility uses daily cover to control waste that has the potential to become airborne. Also, as discussed below, the MRLF uses water for dust control and litter control. Additionally, the active portion of the facility will be surrounded by fencing to reduce the amount of blowing litter that leaves the site. Temporary fences will be placed near the active disposal area to control wind-blown debris from the working face. The site will be regularly maintained and a scheduled litter maintenance program utilized.

Observations of the site and incoming haul roads will be made on a regular basis by the site supervisor to identify the presence of wind-blown litter in these areas. Additional observations will be conducted after storm events or other severe wind events. If the presence of excessive wind-blown litter is identified, staff will be mobilized to collect the litter. Depending on the availability of staffing, this activity will be conducted either by permanent site staff or temporary staff.

MRLF can also assess a special fee for loads that arrive untarped or otherwise not contained. This measure not only reduces litter on the grounds of the facility but also encourages measures that reduce litter on public roads.

5.1.4 Dust Control

Conditions that lead to blowing dust problems are most prevalent in the late spring, summer and early fall when relatively high daytime temperatures and dry winds create blowing dust. The site utilizes a combination of the following methods to minimize blowing dust: 1) on-site vehicle speeds are limited; 2) entrance roads are stabilized or watered; 3) unpaved roads, the working face, the top deck, and any dusty roads are sprayed by water trucks or otherwise stabilized.

MRLF may use clean water to spray on loads as they are dumped or tipped and spread at the landfill to help control dust. Application of water will be in compliance with the current approval for this activity.

5.1.5 Disease Vector Control

Operating personnel will observe the site for vectors on a regular basis. The predominant vector control employed by the facility is the use of daily cover. In addition, no unshredded tires are allowed to be disposed at the working face, minimizing the potential for ponding of rainwater and subsequent mosquito breeding. If vectors are discovered at the facility, operating personnel may contact an exterminator to eradicate the problem.

5.1.6 Explosive Gas Monitoring

Consistent with 40 CFR §258.23, perimeter monitoring probes will be monitored for the presence of methane on at least a quarterly basis.

Standard gas sampling protocol will be to use the sampling meter to purge the probe until concentrations stabilize. Gas concentrations will be recorded using a real-time instrument capable of detecting methane as a total percentage by volume, or by a percentage of the lower explosive limit (LEL). Once concentrations stabilize, the reading will be recorded and will be placed in the operating record for the site. Although not required by regulations, the following additional information may be recorded, if possible:

- Presence of Water
- Gas Probe Pressure
- Ambient Temperature
- Barometric Pressure
- Time of Day
- Weather Conditions

This information will aid in the evaluation of the results of the monitoring.

In addition, the on-site scalehouse and other site structures will be monitored for the presence of methane on at least a quarterly basis. If additional structures are added in the future, similar measures will be taken to ensure that unsafe conditions do not occur within those structures.

In addition, as discussed in Section 4.10, the site will comply with applicable monitoring requirements of the Clean Air Act, New Source Performance Standards, and Emissions Guidelines. Procedures for this monitoring will be developed as necessary to comply with these requirements.

5.1.6.1 Recordkeeping

In order to demonstrate compliance with the regulations, the results of all perimeter probe monitoring, as well as alarm and instrument calibration and maintenance, will be placed in the operating record as discussed in Section 5.1.13. If exceedances are not experienced, results of the landfill gas monitoring will not be forwarded to ADEQ.

5.1.6.2 Exceedances

If methane gas levels are recorded above 100% LEL in the perimeter probes, or if levels exceeding 25% of the LEL are detected in on-site structures, the owner or operator will:

1. Immediately take all steps necessary to ensure protection of human health *and* notify the State Director of the exceedance,

2. Within 7 days of the exceedance, place the results of the monitoring in the operating record along with a description of the steps taken to ensure the protection of human health,

3. Within 60 days of the exceedance, implement a remediation plan to control the methane gas releases, place the plan in the operating record, and notify the State Director that the plan has been implemented.

Based on gas concentrations, human health is usually protected by evacuating all personnel from affected areas, eliminating sources of ignition, and ventilating closed structures (i.e., opening doors and windows).

Any remediation plan will be dependent on the nature, concentration, and duration of the exceedances.

5.1.7 Odor Control

Daily cover provides an effective method of controlling odors at the facility. Any wastes which may be putrid or objectionable will be buried immediately upon receipt at the landfill to prevent an odor problem.

5.1.8 Fire Control

Fire control at the facility consists of several preventative measures. Personnel check loads for hot wastes and smoke. Any smoldering load is dumped away from other trash to be extinguished safely. As discussed in Section 5.1.16.2 and 5.2.2.3, no open burning is allowed at the MRLF and smoldering ashes/hot loads are not accepted. Daily cover is placed on waste materials to help prevent exposure to potential ignition sources. Soil stockpiles are readily available to smother any potential fires.

All heavy equipment used at the facility is equipped with a fire extinguisher to handle small fires. The fire department is contacted for large fires. Site personnel are trained in fire response procedures as part of their site orientation/training.

5.1.9 Access Control

The active area of the facility is surrounded by either chain link or barbed wire perimeter fence. Access to other portions of the property is controlled by the remote location and lack of access around the property. Ingress/egress to the facility is controlled through the entrance gate located near the southwest corner of the site. The entrance gate is open during normal business hours and closed and locked during non-business hours.

5.1.10 Personnel

Site staff responsible for the operation of the MRLF may consist of an Operations Manager, Site Foreman, Equipment Operators/Mechanics, Spotters/Laborers, and Scalehouse/Gate Attendants. Individual personnel at the landfill site may simultaneously serve more than one role and in any combination at any given time. The technical responsibilities of each personnel category are described below. MRLF reserves the right to adjust staffing roles and numbers based on operational requirements.

5.1.10.1 Operations Manager

The Operations Manager is responsible for site management of the MRLF. He is responsible for staff training, safety issues, operations, and site development. As discussed in Section 5.2.1.2, the Operations Manager will also serve as the Emergency Coordinator should an emergency situation arise at the MRLF and will be the first point of contact on the emergency chain-of-command.

As of the submittal of this SWFP, the Operations Manager for the site has not been hired. The Operations Manager will be hired prior to opening of the landfill and his contact information will be placed in the operating record.

Name: **To Be Determined (TBD)**
Office Address:
Office Phone:
Cell Phone:

Should the Operations Manager, address, or phone number change, such changes will be placed into the operating record.

5.1.10.2 Site Foreman

The Site Foreman is responsible for the day-to-day supervision of the site staff. The site foreman may also serve as an equipment operator for the site.

5.1.10.3 Equipment Operators/Mechanics

The Equipment Operators/Mechanics are responsible for operating the landfill equipment and screening incoming loads for unacceptable waste. They also are responsible for the maintenance of all heavy equipment and trucks. The equipment operators may also serve as landfill spotters, depending on staffing requirements/availability.

5.1.10.4 Landfill Spotters/Laborers

The Landfill Spotters/Laborers are responsible for screening incoming loads for unacceptable wastes and for directing traffic at the working face. Additional responsibilities include collecting wind-blown debris, assisting the mechanic with equipment maintenance, and other miscellaneous function necessary to operations of the MRLF. As discussed above, the equipment operators/mechanics on duty may also serve as landfill spotters, depending on staffing requirements/availability.

5.1.10.5 Scalehouse/Gate Attendants

The scalehouse facility will be staffed by a scalehouse/gate attendant. The scalehouse/ gate attendants will be responsible for operating the scales, controlling access, and collecting fees from MRLF customers, visually inspecting loads, checking manifests, and maintaining disposal records.

5.1.11 Equipment

MRLF will provide and maintain sufficient equipment on site to ensure proper operation. The facility will utilize a variety of equipment to operate the landfill and may share equipment with other sites/operations. The following is a list of equipment that may be on site and used as necessary:

- Compactor(s)
- Scraper(s) or Excavator(s) or Trucks
- Bulldozer(s)
- Motorgrader(s)
- Backhoe(s)
- Water Wagon/Truck(s)
- Various Site Vehicles, including pickup trucks.

5.1.12 Ownership of Solid Waste

Upon acceptance of the solid waste received at the facility, the solid waste will become the sole property of MRLF, and it is the operator's responsibility to retain the solid waste, its components, or products of decomposition on the landfill's property and treat or dispose of the solid waste in accordance with state statutes.

MRLF reserves the right or remedies to seek corrective action, remedial action, contribution, cost recovery, or indemnification from or against any other person as allowed by other local, state, federal, or common law.

5.1.13 Recordkeeping Requirement

Recordkeeping will be maintained for MRLF in accordance with the requirements of 40 CFR §258.29. Records will be maintained at the off-site MRLF office or on site. The operating record file will contain the following information (copies of forms used to document this information are included in Appendix Q):

- The Approved SWFP (including the location restriction demonstrations of 40 CFR §258, Subpart B);
- Any Amendments or Revisions to the SWFP;
- Training Procedures and Documentation.
- Inspections Records;
- Records of Notification of ADEQ regarding the receipt of hazardous waste, if any, as required by 40 CFR §258.20;
- Scale House Receipts;
- Fee Collection Records;
- Landfill Gas Monitoring Results, Notification Records (as required by 40 CFR §258.23(c)), and Remedial Plans (if necessary);
- Any demonstrations, certifications, findings, monitoring, testing, or analytical data required under Subpart E, of 40 CFR §258;
- Equipment Maintenance Records;
- Contingency Response Records (See Section 5.2);
- Fill Sequence Records;
- Closure and Post-Closure Plans (as they are developed to a greater level of detail than contained in the SWFP);
- Cost Estimates and Financial Assurance Documentation (developed under the requirements of 40 CFR §258, Subpart G and ARS §49-770); and
- Any other information required to be maintained in the operating record under state or federal laws and regulations.

The operating record will be maintained as the information becomes available. The record will be made available to inspection by ADEQ upon request during normal business hours.

5.1.14 Signage

The landfill signage is installed in accordance with MRLF requirements. Signs are posted at the landfill entrance indicating the hours of operation; name, address, and telephone number

of the landfill operator; lists clarifying acceptable, prohibited and special wastes; and the following statements of prohibited/restricted activities:

- "No Smoking"
- "No Salvaging"
- "Asbestos Waste Disposal Site. Do not create dust. Breathing asbestos is hazardous to your health."
- "All visitors must sign in at the Scalehouse. This includes Vendors, Contractors, Subcontractors, Salesmen, and all other visitors. Site access is strictly enforced. Any violation of this sign-in policy will result in restriction from this site."
- "Notice: Random waste screening is practiced here! We reserve the right to inspect any load or portion thereof arriving at this facility and determine any items as unacceptable."

In addition to the entrance signs, the following signs may be posted as needed at various locations around the landfill. The location of these signs will vary based on the position of the working face at any given time and/or other operations considerations.

- Speed Limits
- Directional Signs Indicating the Route to the Operating Area(s)
- Stop Signs

MRLF reserves the right to adjust this signage based on operational requirements.

5.1.15 Waste Characterization and Acceptance

The MRLF receives residential and commercial waste. In addition, white goods and other recyclable products may also be received. Waste is delivered in pick-up trucks, trailers, semi-trucks, transfer trucks, compactor vehicles, and open-type roll-off bins. The communities in Pima County and southern Pinal county are the major waste contributors. It is expected that, as this region grows, the waste received at the landfill may increase. Waste from other counties and from out-of-state may also be received.

The MRLF facility is a MSWLF. As such, the facility has a list of acceptable wastes as defined by statute. Wastes defined by statute that cannot be accepted at an MSWLF will not be accepted at MRLF.

The following is a general list of the types of materials that are accepted at MRLF:

- Municipal Solid Waste (MSW): including household waste, commercial solid waste, non-hazardous sludge, conditionally exempt small quantity generator waste, and industrial solid waste.

- Vegetative (Green) Waste: as defined at ARS §49.701.36, vegetative (green) waste includes waste derived from plants, including tree limbs and branches, stumps, grass clippings and other waste plant materials.
- Construction and Demolition Debris: as defined at ARS §49.701.5 & 7, construction and demolition debris includes solid waste derived from the construction, repair, remodeling, or demolition of building or other structures.
- Inert Material: as defined at ARS §49.701.15, inert material is material that is not flammable, will not decompose, and will not leach substances in concentrations that exceed Aquifer Water Quality Standards using a water leach test that is designed to approximate natural infiltrating waters. Inert materials include concrete, asphaltic pavement, brick, rock, gravel, sand, soil and metal, if used as reinforcement in concrete, but does not include special waste, hazardous waste, glass or other metal.
- White Goods: White goods containing CFCs must have a certification that the CFCs have been properly recycled by a certified technician.
- Automobiles.
- Animal Carcasses. The carcass(es) are placed in an excavation made in or near the working face and immediately covered with other MSW or daily cover soil.
- Pesticide and other empty containers from conditionally exempt small quantity generators.
- Non-hazardous, non-infectious, treated, biomedical wastes.
- Special Wastes: As defined by ARS §49-851, special wastes are non-hazardous wastes which require special handling and management to protect the public health or environment. These wastes include waste categories listed at ARS §49-852 or adopted by rule pursuant to ARS §49-855. This plan constitutes a special waste management plan in accordance with ARS §40.857. Disposal of special wastes will comply with BMPs as adopted by the Department.
- Petroleum contaminated soil (PCS) as defined in ARS §49-852(A)(1) and ARS §49-851(A)(3) may be accepted and will be managed in accordance with ARS §49-855.
- Non-friable and regulated asbestos-containing material.
- Shredded, sliced, or quartered tires. (Including “alligator” pieces.)
- Landscape rubble as defined in ARS §49-701.17.
- Sewage sludge, septage and other wastes passing the paint filter test.
- Untreated Medical Wastes which are non-hazardous (including medical sharps, discarded drugs, blood and blood products, cultures, and other wastes which are potentially bio-hazardous). They will meet the definition found in AAC R18, Chapter 13, Article 18-13-1401.

- Other Non-Hazardous Wastes: Any other non-hazardous solid waste, as defined at ARS §49-701.01 or 40 CFR §258.2 which is not prohibited by statute or regulation from receipt at an MSWLF may be accepted at MRLF.

The following is a list of wastes prohibited for disposal at the MRLF, including:

- Regulated Hazardous Waste (as defined at 40 CFR §261);
- Polychlorinated Biphenyl (PCB) Waste (as defined at 40 CFR §761);
- Whole Tires;
- Batteries; and
- Any other waste which is prohibited by Federal or State of Arizona statute or regulation from disposal at an MSWLF.

In the event that non-acceptable wastes are delivered to the landfill, the hauler will be notified of the reasons for non-acceptance of his load. Nothing in this section shall be considered to preclude DKL from collecting any of these listed materials for transport to an off-site recycling facility or to another appropriate disposal facility in coordination with ADEQ. However, all of these materials are precluded from being placed within the landfill for disposal.

5.1.15.1 Special Handling Procedures

In the event that animal carcasses are brought to the MRLF, the carcasses are placed at the toe of the waste and immediately covered with other MSW or daily cover soil. Alternatively, a small excavation sufficient to contain the carcass is made in or near the working face of the landfill. The carcass(es) are then placed within this excavation and immediately covered with other MSW or daily cover soil.

Special wastes will be disposed in accordance with any Best Management Practices (BMPs) adopted by ADEQ. MRLF will comply with the requirements of ARS §49-860 and AAC R-18-13-1606 for Special Waste Disposal. The site will generate an annual report on all special wastes received and the State of Arizona fees pertaining to Special Wastes will be paid on the prescribed schedule. The MRLF will adhere to the applicable requirements of AAC R-18-13-1303, 1304, and 1305.

MRLF will dispose of friable asbestos material in accordance with 40 CFR §61.154. The site will only accept friable asbestos from certified asbestos abatement contractors. All manifests for friable asbestos will be kept on file in the operating record and the disposal location will be indicated on the manifest.

Regulated asbestos-containing materials (RACM) disposed of at the facility will be in accordance with 40 CFR §61 Subpart M - National Emission Standard for Asbestos, and specifically 40 CFR §61.154 - Standard for Active Waste Disposal Sites. The RACM area is

prepared prior to incoming loads of RACM arriving at the site. The loads are tipped and covered without compaction, to prevent any material from becoming airborne and to comply with "no visible emissions" requirements.

White goods and other metallic items accepted at the MRLF can be directed to a separate area for storage before recycling. Any recycling area would be located to facilitate easy delivery of white goods to the area. Therefore this location would move as the active face of the landfill is moved. All CFC containing items will be certified as having the CFC's removed prior to acceptance for disposal or recycling.

Any whole tires brought to the facility are separated from the waste stream and brought to a specified area. The area designated for the tire piles is equipped with adequate fire controls and other required safety measures. As the development of the site continues, the tire storage area will be moved to accommodate the operational needs of the site. Tires collected in the storage area will either be shredded or otherwise processed to allow disposal within the landfill as discussed previously in Section 5.1.15 or will be transported off-site for recycling or other use.

5.1.16 Restricted Activities

The following activities are restricted at the MRLF:

5.1.16.1 Scavenging

No scavenging is permitted unless under the authorization of the Operations Manager.

5.1.16.2 Open Burning

No open burning in allowed at the facility. Smoldering ashes are not accepted. If incoming loads contain burning or smoldering refuse, they will be refused. If a hot load is inadvertently accepted, the operators will take the appropriate actions to contain and extinguish the material.

5.1.16.3 Smoking

No smoking is permitted at the working face or around flammable materials. A sign is posted at the scale house to inform landfill users of this policy.

5.1.16.4 Hazardous Waste Disposal

A waste screening and training program has been established to evaluate incoming wastes at the landfill. The waste screening program is accomplished through several different

mechanisms, including random inspection of the waste profiling, manifesting, and continuous visual inspection.

In addition, no waste disposal will be allowed within 200 feet of any of the facility boundaries. The areas within this 200-foot setback distance will be used for vehicular access, stormwater management, gas monitoring probes, groundwater monitoring, equipment storage, and other non-waste disposal uses. No waste disposal will occur within 100 feet of any well, excluding monitoring wells, piezometers or the on-site production well pursuant to ADWR well locations requirements of AAC R-12-15-818.

5.2 Contingency Plan

The purpose of the Contingency Plan and Emergency Procedures is to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water. In general, the order of priority for any contingency response is to protect personnel first, minimize threats to the environment second, and protect property third. The provisions of the plan will be immediately carried out whenever there is a hazard that could threaten human health or the environment. A copy of this Plan is kept at the facility at all times and is available to potential emergency response personnel/agencies, along with a map of the landfill site. Personnel responsible for responding to an emergency would be familiar with both the Plan and the facility layout. All employees will have immediate access to emergency care telephone numbers.

5.2.1 General Procedures

Potential contingency situations that may occur at the landfill include: accidental spills and discharges, leachate production and seepage, drainage failure, slope failure, and fires. The specific contingency response for implementation for these potential situations is discussed in this Section. The following describes general contingency procedures, training, documentation, and prevention strategies to be followed at the MRLF:

1. Compliance with the contingency plan is the responsibility of the emergency coordinators and daily management staff at the facility.
2. The Emergency Coordinator at the MRLF is the Operations manager. The Emergency Coordinator will have the direct responsibility for on-going development and day-to-day compliance with the Plan. Additionally, the Emergency Coordinator or his/her designated representative, is responsible for initiating containment and cleanup activities and for implementing any necessary procedures described in this Plan.
3. The Emergency Coordinator will designate specific landfill employees to identify material and waste inventories; identify potential spill sources, including a risk assessment if necessary; implement spill reporting procedures as described in this Plan; and perform visual inspection of site facilities where potential contamination could be released.

4. If necessary, outside emergency services will be called to respond to contingency situations at the MRLF. These emergency services may include police, fire department, ambulance service, private hazardous waste cleanup contractors, or other providers. At this time, communications from the site to emergency services providers is by two-way radio, land lines, and/or cellular phone.

5.2.1.1 Employee Training Program

1. All employees are given instruction in basic first-aid procedures and basic containment of spills and leaks. If a major spill, leak, or emission problem occurs, a qualified cleanup contractor will be summoned to assist in the containment/cleanup procedures.
2. Landfill Equipment Operators are trained to recognize the effects of erosion, excessive velocity of storm runoff, leakage of leachate, and signs that the mechanical systems are not functioning properly. Operating personnel will also be familiar with alarm systems, monitoring equipment, and instrumentation systems as applicable.
3. Landfill Equipment Operators are experienced in the use and capabilities of equipment and machinery at the facility. New employees receive on-the-job training under the direct supervision of an experienced heavy equipment operator before they are permitted to operate equipment and machinery alone. Occupational Safety and Health Administration (OSHA) guidelines are adhered to during site operations.
4. Employees are informed of proper evacuation procedures, emergency response notification procedures, and initial emergency response procedures for fires and explosions.
5. Periodic safety meetings will provide a means by which employees can be kept up-to date with landfill oriented safety issues, appropriate OSHA requirements, operational changes, incoming disposal materials, and Contingency Plan changes. Employees are informed about, and required to follow, the preventive maintenance programs and housekeeping programs described in the Contingency Plan.

5.2.1.2 List of Emergency Coordinators

Chain of Command

In the event of an emergency, the following people will be notified in the order they appear. The first person contacted will function as emergency coordinator and will contact any other person(s) needed to alleviate the situation. This list is included in the Contingency Plan located at the landfill and will be updated as changes to the emergency coordinator chain-of-command are made.

Emergency Coordinators

As of the submittal of this SWFP, the Emergency Coordinators for the site have not been hired. The personnel to fulfill the roles as Emergency Coordinators will be hired prior to opening of the landfill and their contact information will be placed in the operating record.

Operations Manager

Name: **TBD**
Address: 14508 West Avra Valley Road
Marana, Arizona, 85653
Office: (520)
Cell: (520)

Site Supervisors

Name: **TBD**
Address: 14508 West Avra Valley Road
Marana, Arizona, 85653
Office: (520)
Cell: (520)

Name: **TBD**
Address: 14508 West Avra Valley Road
Marana, Arizona, 85653
Office: (520)
Cell: (520)

Engineering Manager

Name: **TBD**
Address: 14508 West Avra Valley Road
Marana, Arizona, 85653
Office: (520)
Cell: (520)

Duties and Responsibilities of the Emergency Coordinator:

Whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his/her designee must immediately:

1. Activate the communications systems to notify facility personnel.
2. Notify MRLF management.

3. Notify emergency response agencies, including the ADEQ, Town of Marana Police Department, and the Fire Department if necessary.

Whenever a potential contaminant release, spill, fire, or other emergency situation occurs, the Emergency Coordinator must immediately identify the character, source, and extent of the incident. In addition, the Emergency Coordinator must assess the possible hazards to health or the environment that may result from the incident. Immediate, delayed, direct, and indirect effects of the incident must also be assessed.

If the Emergency Coordinator determines that the incident is a definite threat to the health and safety of any person or persons on or near the landfill, he or she must notify the applicable local authorities who will indicate the appropriate action to be taken. If necessary, the Department of Environmental Quality and/or the appropriate Police/Fire Department will be notified immediately. The following information will be reported.

1. Name of the Emergency Coordinator reporting the incident.
2. Telephone number where Emergency Coordinator reporting the incident can be reached.
3. Name, location, and permit number of the landfill facility.
4. Date, time, and location of the incident.
5. A brief description of the incident, nature of materials involved, extent of any injuries, and possible hazards to health and environment that exist or may occur.
6. Estimated quantity of materials involved.
7. Extent of contamination of land, water, or air.
8. Portions of the Contingency Plan which have been or are being initiated.

During an emergency, the Emergency Coordinator must take all reasonable measures to ensure that fire, explosion, emission, spill, or discharge do not reoccur or spread. These measures may include temporarily halting operations, collection and containing released materials, and/or removing or isolating containers. An assessment will be made at this time if it is feasible to continue normal operation of the facility.

If operations are temporarily halted in response to an incident, the Emergency Coordinator will ensure that adequate mitigation measures have been taken before operations resume.

Immediately after an emergency, the Emergency Coordinator must arrange services to treat, store, and/or dispose of residues, etc., from an emission, discharge, fire, or explosion at the installation.

The Coordinator will ensure that, in the affected areas of the installation, no material incompatible with the emitted residue is processed, stored, treated, or disposed of until

cleanup procedures are completed. All emergency equipment listed in this plan will be cleaned and fit for its intended use before operations are resumed.

The report of the incident must include the following as indicated in the Contingency Procedures outlined previously:

1. Name of the individual filing the report.
2. Name of the landfill facility.
3. Date, time, and location of the incident.
4. A brief description of the circumstances causing the incident.
5. Description and estimated quantity of material involved.
6. An assessment of any contamination of land, water, or air that has occurred due to the incident.
7. Estimated quantity and disposition of recovered materials or wastes that resulted from the incident.
8. Sampling protocols and results.
9. A description of what actions the installation intends to take to prevent a similar occurrence in the future.

During the emergency and initial implementation of the Contingency Plan, it will be the Emergency Coordinator's responsibility to coordinate removal and/or relocation of any equipment and vehicles prohibiting access to the incident area.

As part of implementing the Contingency Plan, the emergency response agencies are provided a copy of the Contingency Plan.

5.2.1.3 General Contingency Actions/Contacts

The following actions may be taken if an emergency, injury or accident occurs at the facility. The order of priority for emergency responses is:

1) Personnel
2) Environment
3) Property

The Operations manager will be immediately notified by landfill personnel. If the Operations manager cannot be immediately contacted, the landfill personnel will call MRLF management personnel directly. They will also notify the Fire Department directly if deemed necessary.

The Operations manager will notify MRLF management who will evaluate the situation and determine the next course of action.

Notify the Fire Department/ambulance service for emergency response by telephone (**911**). Response time is estimated to be less than 10 minutes. The nearest fire station is located approximately 2 miles northwest of MRLF:

Avra Valley Fire District Station #191
15790 W. Silverbell Road
Marana, Arizona 85653-9577
911

HOSPITAL - Fire Department/ambulance personnel will make arrangements to transport the injured person to the appropriate medical facility if needed. Ambulance response time to the nearest hospital (Northwest Medical Center) is estimated to be approximately 20-25 minutes from the MRLF site.

The Northwest Medical Center is located approximately 18.74 miles via ground ambulance, and approximately 16 miles from the landfill via air ambulance. Helicopter service to a hospital would be called in if necessary. Information on the Northwest Medical Center is as follows:

Northwest Medical Center
6200 N La Cholla Blvd
Tucson, Arizona
(520) 742-9000

Additional points of Contact:

ADEQ 1-602-771-2300 or 1-800-234-5677 National Response Center 1-202-267-2675 or 1-800-424-8802

5.2.1.4 Emergency Equipment

Emergency equipment available at the site includes two-way radio equipment for communication with other site personnel and emergency responders, and fire extinguishers. Radios are maintained at the scale house, with the Operations manager, and with all equipment operators. The radio equipment may be attached to a specific vehicle or carried by the operator. A fire extinguisher is maintained in all site vehicles including heavy equipment and trucks.

In addition to the above-described emergency equipment, other site equipment may be used in an emergency response (for example, a dozer or loader could be used to place cover soil to smother a small fire). A list of the site equipment is provided in Section 5.1.11.

5.2.1.5 Evacuation Plan for Landfill Personnel

The potential for injuries and emergencies requiring facility evacuation are considered minimal at this site. However, a voice alarm can be given through the site two way radio system if it is deemed necessary. Should an emergency arise requiring outside support operations, personnel will be directed by the Emergency Coordinator to keep access roads free from obstructions and/or equipment so that emergency vehicles will have a clear right-of-way and so that evacuation, if necessary, can take place in an orderly manner.

If an evacuation of the entire landfill facility is deemed necessary, the following actions will be initiated by the Emergency Coordinator:

1. A voice alarm will be given through the site radio system.
2. Access roads will be cleared of obstructions.
3. Personnel will exit the property using the landfill entrance/exit road.
4. Emergency response agencies will be notified accordingly.

5.2.1.6 Material and Waste Inventory

Material Safety Data Sheets (MSDS) for site operation materials are available and posted in the Site Manager's office. These sheets describe a materials' physical, chemical, toxicological, health, and safety considerations. Appropriate safety notices will also be posted in accordance with OSHA and the Arizona Department of Labor regulations.

5.2.1.7 Inspection, Monitoring, and Preventative Maintenance

Regularly scheduled inspections are conducted at the facility during construction and operational periods. These inspections are conducted so that construction, environmental monitoring, and landfill operations are done in compliance with applicable regulations and codes. These inspections are by MRLF in addition to the routine inspections conducted by ADEQ.

The following inspections are performed:

1. Examination of outside slopes and perimeter for any signs of erosion. All repair work is done at once.
2. Inspection of the diversion ditches for any blockage or signs of erosion. Remedial work, if necessary, is to be done as soon as possible.
3. Inspection of the site for adequacy of landfill cover and other site conditions such as litter.

5.2.2 Response to Specific Contingencies

5.2.2.1 Methane Gas Migration Hazard

Methane gas monitoring probes are installed along the perimeter of the landfill, as discussed in Section 5.1.6. If the methane gas levels rise above 5% by volume on one of the probes or above 25% of the LEL in on-site structures, MRLF will notify the ADEQ. A plan for controlling the migration of gas off site will be immediately developed in accordance with the requirements of 40 CFR §258.23(c). As discussed in Section 5.1.6, the actual response to the contingency of methane migration/exceedances will depend on the nature, concentration, and duration of the exceedances. Typically, response to methane exceedances involves active or passive venting of the subsurface gasses.

5.2.2.2 Unusual Traffic Conditions

Unusual traffic conditions may occur on the regional highways bringing traffic into the site (such as I-10 or Avra Valley Road), the site access road, or internal haul roads within the landfill. Contingency response for each of these locations will be somewhat different. In addition, the cause of the unusual traffic condition will affect the response. If the cause of the unusual traffic condition is a vehicular accident, the contingency response detailed in Section 5.2.2.4 will be initiated. If unusual traffic conditions occur on the public highways leading to the site, the Town of Marana Police Department, Pima County Sheriff's Department, and/or Arizona Department of Public Safety will be contacted and informed of the unusual traffic conditions. The incident will be managed at the direction of these agencies. If unusual traffic conditions occur on the site access road and do not involve a vehicular accident or personal injury, site personnel and equipment may be dispatched at the direction of the Operations manager to respond to the cause of the unusual traffic conditions. This may involve removal of debris from the access roadway, repair of damage to the roadway, towing a stalled or inoperable vehicle from the roadway, or other response action.

If unusual traffic conditions exist within the landfill site itself and do not involve a vehicular accident or personal injury, site personnel and equipment may be dispatched at the direction of the Operations manager. If possible, the cause of the unusual traffic condition will be removed by removal of debris or towing a stalled or inoperable vehicle from the site roadway. If the cause cannot be removed quickly an alternate traffic pathway will be established by direction of the vehicles. If the cause is an unusual number of disposal vehicles arriving at the site simultaneously, personnel will queue the vehicles in an orderly fashion to minimize congestion at the working face, maintain two-way traffic flow on the site access road, and prevent traffic backup on any public highway.

5.2.2.3 Fire Contingency Plan

As discussed in Section 5.2.1.3, the nearest Fire Department is located approximately 2 miles northwest of the landfill and can be contacted by dialing 911 or (520) 682-3255. Anticipated response time to the landfill is approximately 10 minutes. The following describes general

contingency actions to be followed in case of fire at the MRLF followed by specific contingency actions for specific types of fires that may occur:

General

1. The purpose of the fire contingency plan is to prevent fires, and control them in the event they develop. The principal means of fire prevention are to not accept smoldering ashes and highly flammable materials, monitoring and control of potential methane buildup, daily equipment checks, and prohibiting smoking in the facility.
2. Fire control equipment includes a fire extinguisher in each of the on-site buildings, and a fire extinguisher in each piece of landfill equipment. This equipment is inspected on a regular basis to insure proper operation. Fire extinguishers are recharged after use or after an inspection which discovers the extinguisher is in need of recharging. Fire extinguishers are inspected annually and re-tagged after inspection. The site has a water truck for the facility, which would be available for use during a fire emergency.
3. The Operations manager should be notified as soon as possible after a fire has occurred. A list of emergency personnel's numbers is kept next to each telephone.
4. If evacuation is necessary, MRLF personnel should direct all members of the public in and around the facility to leave the area. Vehicle drivers should be directed to slowly drive their vehicles out of the facility past the scale house. If an immediate threat is apparent, people should be directed to leave the facility without attempting to remove their vehicles.
5. All employees on duty at the time of a fire evacuation should meet at the entrance to the landfill. The Emergency Coordinator in charge of the facility at the time of the fire should verify that all employees on duty have evacuated the facility. If the Coordinator must leave the site a designated representative should be directed to fulfill this duty in the event of a fire.
6. Should a fire occur in any of the structures or areas of the facility, the operator will call the Fire Department as discussed in Section 5.2.1.3. Meanwhile, the operator will proceed with the following actions if the fire does not endanger the personnel's safety.
7. Should the fire be localized in a fill area, the operator will proceed to excavate the burning refuse to separate it from the rest of the fill, and proceed to cover it with on-site soil. Only if available and considered necessary, water from the proposed on-site water truck will be used.
8. Should the fire be localized to a buffer zone surrounding the fill areas, the operator will excavate the necessary fire breaks to prevent the fire from reaching any fill area and will water down the area between the fire break and the refuse area using the proposed on-site water truck, if available.
9. Should the fire be localized to an on-site structure, the operator will direct the use of on-site fire extinguishers to control the fire as much as possible, will construct fire breaks and, if the proposed on-site water truck is available, will water down the areas

surrounding the fire. On arrival at the site, the Fire Department will be in charge of the necessary actions and, on their completion, will report the conditions at the site. The Landfill Supervisor will conduct a field investigation of the origin and extent of the damages to the containment and other structures, its impact on the landfill operations, temporary and permanent repairs and changes in operational plans considered necessary to prevent similar occurrences.

Emergency response procedures for specific fires are as follows:

Minor Fire in On-Site Building

1. If necessary, evacuate the building and area.
2. Suppress fire with extinguisher.
3. If fire cannot be controlled quickly, contact the fire department (911).
4. Contact the Operations manager.
5. Contact MRLF management.

Small Surface Landfill Fire

1. If necessary, evacuate the affected area(s).
2. Suppress fire with soil or extinguisher.
3. If necessary, contact the fire department (911).
4. Contact the Operations manager.
5. Contact MRLF management.

Large Landfill Fire

1. Evacuate the affected area(s).
2. Try to excavate and isolate burning debris, smother with soil and/or water.
3. If necessary, contact the fire department (911).
4. Contact the Operations manager.
5. Contact MRLF management.

Landfill Equipment Engine Fire

1. Attempt to isolate equipment and avoid areas of exposed debris.
2. Evacuate area if necessary.
3. Contact the Operations manager.
4. Contact MRLF management.

Landfill Equipment Fire

1. If a small fire, suppress with fire extinguisher.
2. Evacuate area(s), if necessary.
3. Contact the Operations manager.
4. Contact MRLF management.

Smoldering Fire or Flames In Hauler Transport Trailer

1. Have hauler empty the contents of the trailer onto the ground in an area designated by the operator. If the load has been dumped already, isolate the load to the extent possible.
2. Allow contents to burn out if people, the environment, or property is not threatened.
3. If necessary, spread the load out and extinguish the fire.

Minor Vehicle Fire

1. Isolate the vehicle to the extent possible.
2. Suppress fire with extinguisher.
3. If necessary, evacuate the area.
4. If necessary, call the fire department (911).
5. Contact the Operations manager.
6. Contact the MRLF management.

Small Electrical Or Equipment Fire

1. Extinguish fire with extinguisher.
2. Evacuate affected area.
3. Contact the Operations manager.
4. Contact MRLF management.

5.2.2.4 Injury or Accidents

In the event of injury or accident to anyone at the facility, personnel should:

1. Assess the injury.
2. Call for rescue assistance (911) if needed.

3. Provide appropriate level of first aid.
4. Contact Operations manager and MRLF management.
5. If necessary, assist in transporting the victim(s) to the nearest hospital.
6. Complete accident and injury report forms as soon as the situation is resolved.

If a vehicle accident occurs on the site, personnel should:

1. Assess if injuries are involved.
2. Call for rescue assistance and provide the appropriate level of first aid.
3. Call the Police/Sheriff's Department (911).
4. Call Operations manager.
5. If necessary, assist in transporting victim to nearest hospital.
6. Contain any liquid spills with shovels full of dirt.
7. Move the vehicles involved out of the traffic flow if possible.
8. If a fire is involved follow procedures for a small vehicle fire.

5.2.2.5 Adverse Weather Conditions/Acts of God

Wind

If convenient, filling is performed at lower elevations in the landfill during extremely windy weather.

Wet Weather

Temporary berms and ditches are provided when necessary to divert surface water from the working face and areas where vehicular traffic will occur. During severe flooding events, the Operations manager has the authority to temporarily shut down operations.

Other Conditions

If other conditions exist that prevent effective operation of the MRLF or present a significant concern for user or staff personnel safety or potential environmental damage, the Operations manager has the authority to temporarily shut down operations. In the event that the Operations manager deems it necessary to temporarily shut down the facility under the provisions of this section, an orderly shutdown procedure will be initiated to direct disposal vehicles from the site and apply daily cover soil or ADC to exposed waste. If emergency conditions occur that prevent an orderly shutdown, available actions will be initiated to protect personnel

first, minimize threats to the environment second, and prevent damage to property third in accordance with the general priority of contingency actions.

5.2.2.6 Equipment Malfunction

Normal operations at the facility rely on the function of many types of heavy machinery, pumps, electrical tools, and generators. In cases where minor problems occur, personnel will attempt to make the appropriate repairs, if possible. Responses to larger malfunctions are as follows:

If a piece of heavy machinery were to malfunction, that particular piece of machinery would first be checked by a mechanic and the Operations manager. If the equipment cannot be repaired on site, it is transported off-site for repair. A short term replacement of malfunctioning equipment can be made by borrowing equipment, rental of equipment from a rental company, or using a substitute machine. Repair of landfill machinery is accomplished as quickly as possible to prevent undue operational hardships for the facility.

5.2.2.7 Release of Hazardous or Toxic Materials

The operations manager is trained in the identification of hazardous or toxic materials. If a release should occur at the facility, evacuation procedures will be instituted. After the public and all employees are safe, the Hazardous Materials Control Team (Fire Prevention Section) of the Avra Valley Fire District will be called to respond to the incident. Avra Valley Fire District personnel will determine the level of personal protective equipment necessary to enter the facility and assess cleanup and disposal requirements.

5.2.2.8 Spills and Discharges

1. In the event of any accidental spill or unauthorized discharge of suspected hazardous or toxic materials on the facility site, the related area will be promptly isolated and attempts to identify the material will be made as discussed in Section 5.2.2.7. Information on persons that may have been exposed or may become exposed to the material will be recorded.
2. If the material is identified to be acceptable waste, the operator will dispose of the material in the landfill.
3. Otherwise, if the material is not identified with certainty, or is identified as being in the category of unacceptable waste, Avra Valley Fire District may be contacted to remove and dispose of the material according to applicable federal, state, and local regulations.
4. For spills of unacceptable materials, notify the ADEQ Water Quality Compliance Section within five days and within 30 days a report fully documenting the occurrence, the measures taken to remediate or mitigate the effects of the spill, and to attain cleanup standards.

5.2.2.9 Leachate Seepage

As shown in the Design Plan Drawings, the facility does have a leachate collection and recovery system (LCRS). This system is designed to provide for collection of leachate in discrete sumps at the site. However, some potential may exist for localized leachate seepage through slopes above grade. The following actions will be initiated if these conditions are encountered:

1. A temporary containment structure consisting of a berm and a sump will be constructed in the vicinity of the outbreak and within the lined footprint of the landfill immediately after such a leak is observed.
2. The landfill cover in the area of the seepage will be excavated to permit free drainage of the leachate to the sump and allowed to drain.
3. The leachate will be collected, removed, and disposed of appropriately.

5.2.2.10 Fuel Tank Leak/Rupture

The facility does not have an underground fuel storage tank. All above-ground fuel storage will comply with applicable Spill Prevention, Control, and Countermeasure (SPCC) Plan requirements and response to leaks or ruptures will follow procedures listed in the SPCC plan.

5.2.2.11 Power Outage

In the event of power outage, the facility would continue to operate with handwritten transactions. If necessary, a backup generator or alternative electrical system may be used until the power is restored.

5.2.3 Emergency Response Recording Criteria

In the event of an emergency incident at the landfill, a record of the incident will be maintained by the DKL.

6 DESIGN CRITERIA

6.1 Engineering Design Plans/Site Drawings

Engineering design plans for the MRLF have been developed and are attached to this SWFP as Design Plan Drawings 0 through 16 and include:

Cover

Existing Conditions Plan

Subgrade Plan (North)

Subgrade Plan (South)

Final Cover Plan (North)

Final Cover Plan (South)

Stormwater Drainage Plan

Typical Cell Base Liner and LCRS Plan

Landfill Cross-Sections

Liner Details

Terminal Leachate Sump Details

Temporary Leachate Sump Details

Channel Details

Cover and Stormwater Management Details

Stormwater Management Details

Conceptual Landfill Gas Details

Environmental Monitoring Plan

6.2 Design Specifications

An example of Design Specifications has been prepared for materials and installation/construction methods for several elements of the landfill design including

earthwork, geosynthetics, pipe and drainage features. The following conceptual design specification sections are included in Appendix R:

Section 02110 Clearing and Stripping

Section 02221 Excavating and Stockpiling

Section 02222 Engineered Fill, Operations Layer, and Anchor Trench Backfill

Section 02223 Liner Subgrade Preparation

Section 02227 Rip-Rap

Section 02711 Polyethylene Pipe

Section 02771 Geotextile

Section 02778 Geomembrane

Section 02779 Geosynthetic Clay Liner

Specifications are provided to show design intent and supplement drawings. They are not intended for construction purposes and will be modified and expanded prior to actual construction.

6.3 Engineering Report

6.3.1 Hydrologic/Hydraulic Calculations

An off-site drainage report has been prepared to demonstrate the proposed design for the MRLF site to comply with the requirements of RCRA Subtitle D (40 CFR §258.11). The report is included in Appendix S of this SWFP. The proposed drainage design, analyzed using the HEC-RAS modeling program, focused on grading the floodplain west of the existing low flow channel of the East Branch of the Brawley Wash to approximate the elevation and width of the low flow channel to reflect the proposed floodplain restoration. The proposed model also focused on identifying the position of the west bank of the channel, adjacent to the MRLF eastern property line, which would result in water surface elevations of no more than one foot above existing.

The major hydraulic design to ensure compliance with 40 CFR §258 is the design of the channel/floodplain restoration area for the East Branch of the Brawley Wash across the northeastern corner of the MRLF property. This channel design was analyzed using the HEC-RAS program for pre- and post-development conditions for the 100-year storm event to demonstrate that there would be no restriction in the flow of the 100-year storm event that would result in increases in water surface elevations outside the property limits greater than

one foot. The results of this evaluation are presented in the off-site drainage report located in Appendix S of this SWFP.

Off-site flows which break out from the main East Branch of the Brawley Wash significantly upstream of the MRLF also arrive at the southern boundary of the site. A man-made channel currently enters the project site on the southern boundary, approximately 1,850-feet west of the southeast corner of the site. These flows will be collected in a riprap lined channel running along the south side of the landfill. These flows will be conveyed to the east, under the entrance road via concrete box culverts, and into an existing channel which flows north along the eastern boundary of the site. Flows from the south which impact the site west of this man-made channel will be collected in a separate channel, flowing west along the southern border of the site. This channel will continue along the west side of the landfill, flowing north, and discharge into the existing natural drainageway at the northwest corner of the site. The details of the discharge for detention basins will be designed in accordance with Town of Marana requirements and will not adversely affect adjacent land owners.

All diversion channels were designed to convey the 100-year design storm event per City of Tucson Drainage Design Standards. The peak flow rate for the 100-year event would be larger than the peak flow rate for the 25-year, 24-hour design storm event, required by 40 CFR §258.

The general design concept for the on-site stormwater management is presented in Appendix S. The hydraulic analysis of the on-site stormwater management system was performed using Manning's Equation.

The on-site surface water management system consists of a series of features (ridges, top deck swales, downdrains and perimeter channels) to collect sheet flow runoff from the landfill surface and convey it to one of three detention basins located in the northwest and southeast corners of the site, as shown on Drawing 6 of the Design Plan Drawings. These retention basins were sized to fully retain the runoff generated from a 25-year, 24-hour storm event, with a freeboard allowance.

Flows will be conveyed to the retention basins by perimeter channels running parallel to the landfill and located between the landfill perimeter berm and the limit of waste. These channels were sized to convey the peak flow of the 25-year storm event. Channels will be trapezoidal in cross-section and will be constructed with an energy dissipation structure at the locations of the downdrains.

Flows will be conveyed down the slope of the landfill by corrugated high density polyethylene (HDPE) or other equivalent construction material downdrain pipes placed perpendicular to the slope contours on the sideslopes of the landfill. Each downdrain pipe will service an individual diversion berm, so there will be no inlets along the length of the downdrain pipe. The pipes were sized to pass the peak flow from the 100-year storm event of the largest watershed contributing to a diversion berm system. In order to reduce the potential for pipe clogging, no pipe smaller than 24 inches in diameter is proposed for use as

a downdrain pipe. In addition, a welded rebar inlet screen will be provided at the inlet end of the downdrains to reduce the potential for debris entering the downdrains.

The downdrains will receive flows collected on diversion berms on the top deck sideslopes of the landfill. The primary purpose of the diversion berms is to reduce the flow path length on the surface of the landfill and thereby reduce the potential for rilling and surface erosion. Therefore, diversion berms will be placed at 25-foot vertical spacing on the landfill. The longitudinal slope of these diversion berms is maintained at 0.5% to reduce the velocity of concentrated flows along the diversion berm. The height of the diversion berms was determined to pass the flowrate generated by the largest contributing area, with a freeboard allowance, at its point of discharge to a downdrain. Since a consistent berm height will be maintained throughout the site, most of the berms will have significant freeboard (i.e., much greater than the freeboard calculated for the design berm).

The drainage design shown on Drawing 6 depicts final development conditions of the landfill. Since solid waste facilities develop in a phase manner over time and phasing is dependent on waste receipt rates the drainage facilities will also develop over time as more and more of the footprint is occupied. The initial cell development shown on Drawing 7 shows temporary drainage facilities that will be developed for this initial development. As new modules/cells are developed stormwater management facilities (either permanent or temporary) will be developed to maintain compliance with 40 CFR §258.25. The capacity and design details of temporary facilities from the landfill area will be documented in the Construction Certification Report for the relevant module/cell construction. Any temporary facilities for off-site surface water management will be permitted and approved by Town of Marana via Development Plan or Improvement Plan.

6.3.2 Slope Stability Calculations

PCSTABL was used to analyze five different scenarios at the MRLF. All of these scenarios were analyzed for static and pseudo-static conditions. Horizontal ground bedrock acceleration factors of 0.07g and 0.11g were used in all pseudo-static conditions. The subgrade was modeled using the steepest cut slope for the site, which resulted in a lowest factor of safety for the static condition of 1.87 and in the pseudo-static condition no seismic displacement was predicted. Two interim fill scenarios were also modeled, with factors of safety ranging from 1.64 to 1.84 for static conditions, and seismic displacement ranging from "none predicted" to 0.33 feet (which is less than the assumed design limit of 1.0 feet). The final closure scenario was also modeled at two locations with resulting factors of safety ranging from 1.63 to 1.96 for static conditions and seismic displacement ranging from "none predicted" to 0.05 feet (which is far less than the assumed design limit of 1.0 feet). The results of all the modeling can be found in Appendix T.

6.3.3 Methane Collection and Monitoring

Since this is a new landfill facility without waste in place currently, it is not anticipated that a gas collection and control system (GCCS) will be required in the initial development of the landfill. The site will be covered under a Title V air permit and will install a GCCS when required by NSPS regulations or when voluntarily constructed by DKL prior to triggering NSPS regulations. Conceptual GCCS well details are provided on Drawing 15 of the Design Plan Drawings. It should be understood that this conceptual design will be modified as necessary to accommodate actual development patterns, waste in place, and design level detail.

The MRLF is located in an area surrounded by undeveloped land. Migration of landfill gas to off-site structures is not anticipated to be a significant risk. However, landfill gas migration probes are installed in accordance with ADEQ requirements, every 1,000 feet around the landfill perimeter. The initial probes are placed at or near the southwest corner of the site as shown on Drawing 16 of the Design Plan Drawings, with additional probes being installed along the direction of landfill expansion. Quarterly landfill gas monitoring will be performed at the MRLF.

6.3.4 Leachate Collection

The Leachate Collection and Recovery System (LCRS) was designed using HELP modeling in order to limit the maximum hydraulic head on the lining system to one foot and to remove leachate in a timely manner. The design concept brings leachate from the floor to a limited number of sumps which are designed to be located on the perimeter of the landfill (See Design Plan Drawings 10 and 11 for sump details). Lateral leachate collection lines are designed to be located across the floor of the MRLF and will reduce the flow path to the sumps as well as provide a mechanism for cleanout.

HELP modeling was used to model a typical flow path to a lateral leachate collection line. The model results (as shown in Appendix U) indicate that for the proposed minimum base slope of 2 % and maximum drainage length 350 feet less than one foot of leachate will be contained on the liner. Six-inch diameter HDPE pipes in the leachate collection trenches will have enough capacity to handle the estimated peak leachate generation.

6.4 Construction Quality Assurance/Quality Control Plan

A Construction/Quality Assurance (CQA) plan will be developed along with construction drawings/specifications prior to construction of any new liner or final cover systems at the landfill. A conceptual CQA plan is included in Appendix V. This plan designates responsibilities for quality assurance/quality control for the constructed system(s) to be implemented during the construction process. Because changes in technology, regulation, and/or design criteria may cause changes in final designs for these systems, the attached CQA plan will be reviewed and may be modified prior to each phase of construction.

6.5 Landscape Plan

From the Marana Regional Landfill Specific Plan (TPC, 2010):

A 103-acre buffer area is proposed around the perimeter of the site. Native plants will be placed around the perimeter of the site and at the landfill entrance to provide an aesthetic break and mask the operational activities of the facility. Landscaping will also occur along the entrance roadway (80-foot private access easement) and near the administrative area. All landscape and screening treatments will be in compliance with the Town of Marana Native Plant Ordinance and the landscape requirements per the Town of Marana Land Development Code. Landscaping will consist of salvaged native plant material supplemented with trees and hydrostock and be located in the areas where slope conditions allow for additional plantings. Passive water harvesting techniques will be utilized where feasible within the buffer and entrance areas.

To further mitigate any impacts to nearby property, earthen berms 15 feet in height will be installed along the southern and western boundaries of the site in conjunction with the initial phase of the landfill. The initial excavation of the first phase of landfill will provide the soil for these berms. Breaks in the berms may be necessary for accommodation of the pass through of any identified jurisdictional waters. These berms will be 15 feet high, with 3:1 side slopes. Trees will be placed at a ratio of a minimum of 30 feet apart and rock mulch will be applied to the surface along the outside slopes. The trees will be irrigated for a period of two (2) years. This irrigation period will ensure for establishment and initial rapid growth of the trees.

In lieu of berming and due to existing drainage conditions, a continuous berm is not proposed on the north and east sides of the site. Instead, a combination of flood control berming and revegetation is proposed to enhance the visual quality. Supplemental irrigation during plant establishment will be by water truck, agricultural irrigation equipment or other temporary measures. An elevation of the proposed berms and cross section of the perimeter buffer to be located along the south and west boundary is shown on Exhibit II.K: Perimeter Berm Conceptual Design.

Ultimately, portions of the proposed landfill will rise above these berms and will be somewhat visible from the nearest residential areas and from nearby roadways. However, the distance between these areas is a mitigating factor, as is the existing vegetation (especially the treeline). Additionally, the proposed landfill will be contoured and configured to mimic more natural forms, and will not be a regular geometric shape as is currently seen in older landfills in the area.

Additionally, the portion of East Branch of the Brawley Wash that intersects the project site, comprising approximately 34 acres, will be restored to its natural pre-development condition. This area will be designated as Natural Open Space, will be protected from development and will ultimately be dedicated to the Town of Marana.

6.6 Construction Certification Report Requirements

Construction certification reports will be developed and submitted to ADEQ following construction of new areas at the landfill. All construction certification reports will be sealed by an Arizona Registered Professional Engineer and will indicate conformance with plans and specifications as indicated under Section 6.1 and 6.2 of this SWFP. The construction certification reports will include the results of all quality assurance/quality control (QA/QC) testing, including failed test results. Procedures utilized to correct improperly installed or defective material will be provided along with results of QA/QC retests. In addition, the construction certification reports will document the construction process including record drawing noting any deviations from the approved plan, a summary of the daily report log, and color photographs of key features of the design. Construction certification reports will be submitted to ADEQ within 45-60 days after completion of construction.

6.7 Base Liner Design

The MRLF will be lined with a single-composite liner system, consisting of compacted subgrade, a geosynthetic clay liner (GCL), a 60-mil HDPE geomembrane liner, a geocomposite drainage layer, and a 2-foot thick operations layer. The GCL will be placed in prepared subgrade consisting of either in-situ subsurface soils or recompacted soils. Details of the liner system are included on Drawing 9 of the Design Plan Drawings.

6.8 Alternative Final Cover Design

The MRLF site does not currently have any waste in place and, therefore, is not expected to have any areas which will receive final cover in the immediate future. In addition, geotechnical borings collected for the site (see Appendix W) indicate significant variability of soil texture across the site. Since it is anticipated that closure construction will be performed at a unknown point in the future, and the particular soils that will be used for such closure are not known at this point in time, a detailed final cover design has not been performed.

It is expected that the final cover design for the MRLF will be a monolithic soil cover (evapo-transpiration cover) using onsite soils. HELP modeling using a soil texture similar to those available on-site indicate that a 36-inch monolithic soil cover can provide infiltration control to limit infiltration to less than 1mm/yr under the climactic conditions at the MRLF site. Results of the HELP modeling are contained in Appendix U.

Soil testing will be performed on the soils actually proposed for use as final cover for a specific closure event to confirm the adequacy of those particular soils to provide modeled leakage rates under both the HELP and UNSAT-H models. HELP and UNSAT-H modeling will be performed using the laboratory test results for these soils to confirm that they meet the equivalency standard listed in the ADEQ guidance document. If the results of this

modeling indicate that leakage rates will be less than or equal to 1 mm/yr, the soils will be considered acceptable for use in the final cover system. The soil testing results and confirmatory model runs will be included in the Construction Certification Report submitted to ADEQ for the final cover construction.

Additional alternative cover designs may be considered, depending on technological developments and comparative costs/benefits of alternative final covers at the time of closure. Should such an alternative cover be considered, design details and demonstration of equivalency will be submitted to ADEQ as a Type III Change. It is also possible, but unlikely, that the final cover design will be revised to a prescriptive cover meeting the requirements of 40 CFR §258.60.

7 HYDROGEOLOGIC STUDY

A hydrologic investigation and assessment was performed by Cornerstone in support of an application for construction of the MLRF municipal solid waste facility in Avra Valley, Pima County, Arizona. The objective of the investigation was to characterize the site's current geologic and hydrogeologic conditions, including groundwater quality, and assess groundwater trends and uses in the area. The study was performed consistent with the following state, federal, and county regulations regarding the siting a municipal solid waste landfill.

- Code of Federal Regulations 40, Part 258 (40 CFR §258) location restrictions (faults, seismic impact zones, unstable areas, groundwater monitoring, and corrective action).
- Arizona Administrative Code (AAC) and ADEQ checklist for municipal solid waste landfill facility.
- ADWR and Pima County water resources, subsidence and earth fissures, water quality, and goals, objectives, and policies.

7.1 Approach

Characterization of the site geology and hydrogeology was accomplished using the following sources of information and data.

- Subsurface hydrogeologic information collected during Cornerstone's drilling and sampling of four on-site groundwater monitoring wells and four geotechnical borings around the perimeter of the MRLF facility.
- Historical groundwater levels and water quality data from potable supply wells and retired agricultural production wells provided by the City of Tucson (Tucson Water).
- Historical water level and well construction data found in the Ground Water Site Inventory (GWSI) maintained by the ADWR.
- Results of Regional Groundwater Flow Modeling of the Tucson Active Management Area (AMA), prepared by the ADWR.
- Estimates of aquifer recharge rates in nearby infiltration basins provided by Metro Water and the Central Arizona Project (CAP).
- The Arizona Water Atlas (Tucson Active Management Area (AMA)) prepared by the ADWR.

- Data provided by the USGS Regional Aquifer-System Analysis (RASA) program for the southwest alluvial basins in south-central Arizona.

- Various maps and reports from the Arizona Geological Survey.

7.2 Geologic Setting

7.2.1 Regional Geology

The MRLF site is located in the Sonoran Desert in the Basin and Range physiographic province of the southwest United States. The basin and range regional tectonic fabric has produced a series of mountain ranges that typically have nearly straight segments of consolidated rocks that are more or less parallel, predominantly trending north to northwest. The mountain ranges separate the region into a series of generally oval shape sediment-filled basins. The basins were formed during the middle to late Miocene Basin and Range structural disturbance, which occurred between 10 and 15 million years ago (mya). Movement along high-angle normal faults down-dropped basins in relation to the mountain masses and resulted in a series of generally north to northwest-trending basins. Basin development was gradual.

Basins of the Basin and Range Province are typically filled with alluvial deposits that range from a few thousand feet to more than 10,000 feet thick. Basin filling occurs contemporaneously with the slow gradual process of basin subsidence. Locally derived sediments are deposited in closed (internally drained) basins. Sediments deposited in closed drainage basin create a lateral gradation of coarse-grained sediment near the mountains and finer-grained sediment near the basin center. The depositional centers of the basins often contain evaporate deposits, such as gypsum, anhydrite, and halite, in addition to fine-grained sediments. As the basins filled, they evolved from closed basins to integrated basins, forming a network of interconnected basins. Regional uplift during the Quaternary caused erosion of Tertiary and older materials and the consequent deposition of detritus from the surrounding mountains.

Earth fissures are a phenomenon found in the Basin and Range Province, and are typically associated with land subsidence caused by aquifer compaction (Carpenter, 1983). Earth fissuring can occur by a combination of mechanisms including differential compaction of alluvium over a bedrock high and rotation of alluvial slab caused by land subsidence induced by compaction of sediments by lithostatic loads or groundwater withdrawal. In these cases, earth fissures typically occur at the hinge of the rotated slab.

Earth fissures commonly occur as long, curvilinear cracks in the land surface near and sub-parallel to mountain fronts. Most fissures occur as long, linear features in the form of single, parallel or anastomosing cracks. Fissures vary in length from a few yards to 10-miles, but are typically tens of feet to hundreds of yards. Fissures can widen by erosion to 30 feet and be open to depths of 30 feet. Fissures generally do not intersect at angles greater than

approximately 30 degrees. Polygonal patterns and echelon cracks are rare. No strike-slip movement has been observed. Horizontal movement is slow, not rapid. Measurements of horizontal movement have typically been less than a foot. Near the mountain front, movements were generally small with horizontal displacements dominating over vertical displacements. With increasing distance from the mountain fronts into the basin, subsidence increased markedly and horizontal displacements decreased. Recharging groundwater levels since the early 1980's has reversed some localized subsidence.

Traditional surveying methods, horizontal and vertical extensometers, and aerial photography are common reliable methods for monitoring earth fissures. Aerial photographs are useful for identifying new fissures.

7.2.2 Geology of the Avra Valley

The principal geologic units in the Avra Valley include Quaternary sedimentary deposits, Late Cretaceous to Early Tertiary (Larimide-age) intrusive rocks, and Tertiary volcanic rocks. A regional geologic cross-section showing the vertical distribution of the various geologic units and structures is provided in Figure 7-1. The older crystalline (igneous, metamorphic, and volcanic rocks) units have not been differentiated, however their approximate limit of exposure is shown. The principal units of interest for the MRLF are the Quaternary deposits that underlie the site as further described below.

7.2.3 Quaternary and Tertiary Deposits

Holocene surficial deposits occupy the stream channels of the Santa Cruz River and its major tributaries. These deposits are typically less than 100 feet thick (Davidson, 1973) and primarily consist of unconsolidated sand and gravel with relatively high infiltration rates. Below these deposits is a thick sequence of unconsolidated to semi-consolidated sedimentary units. In the Avra Valley, these deposits have been subdivided into the Upper Basin-Fill unit and the Lower Basin-Fill unit. The Upper unit is composed of the Quaternary Fort Lowell Formation, and the Tertiary Upper Tinaja Beds. Both units are generally finer grained in the northern portion of the Avra Valley, such as in the vicinity of the proposed MRLF (Anderson, 1988). The Upper Basin-Fill sediments were deposited during a transition period in which the basin drainage evolved from closed to integrated has historically provided most of the water used in the Tucson basin.

The Lower Basin-Fill unit is composed of the Tertiary Middle and Lower Tinaja beds and the underlying Pantano Formation. These deposits are several thousand feet thick and are semi-consolidated. In general, the Lower unit grades from sands, gravels, and conglomerates in the southern portion of the Avra Valley to anhydritic clayey silts and mudstones in the central and northern portion of the valley, such as in the vicinity of the proposed landfill.

7.2.4 Larimide-age Intrusive Rocks

Geologic mapping of the Picacho Mountains (Richard, 2000) showed them to consist of Tertiary to early Proterozoic gneiss, early Tertiary to late Cretaceous granite, and middle Proterozoic granite. The gneissic rocks have complex histories of uplift from middle crustal levels by large displacement middle Tertiary normal faults. The granites were emplaced during the Laramide orogeny. Most of the large copper deposits of Arizona are associated with the porphyritic Early Tertiary to Late Cretaceous granitic rocks. The crystalline bedrock in the Avra Valley near the site has been interpreted to be approximately 4,800 feet deep (Richard, 2000).

7.2.5 Faulting

Faults active in the Late Pliocene-Quaternary (post 4 mya) have been mapped along the central and eastern portions of the Avra Valley. The faults zones are generally parallel to the Tucson Mountains and strike NW-SE (Mason, 2006). This relationship places the MRLF site on the down-thrown block between two high-angle normal faults as shown on Figure 7-2. The closest fault is located approximately 1.5 miles west of the MRLF. This faulting reportedly occurred prior to Holocene time (Mason, 2006).

7.2.6 Earth Fissures

As discussed in Section 8.2.1, Earth fissures are a phenomenon found in the Basin and Range Province, and are typically associated with land subsidence caused by aquifer compaction (Carpenter, 1983). Earth fissuring can by a combination of mechanisms including differential compaction of alluvium over a bedrock high and rotation of alluvial slab caused by land subsidence induced by compaction of sediments by lithostatic loads or groundwater withdrawal. In these cases, earth fissures typically occur at the hinge of the rotated slab. Earth fissures commonly occur as long, curvilinear cracks in the land surface near and sub-parallel to mountain fronts. Groundwater levels at the site have been rising since the early 1980's. This site is also located miles away from the nearest mountain front. Earth fissuring has not been identified by visual observations during site reconnaissance during the hydrogeological investigation phase of this project either on the site or on adjacent properties. Due to the rising groundwater levels and the location of the site in the center of the Avra Valley Basin, distant from the mountain fronts, the probability of earth fissures occurring at the site is very low.

7.2.7 Seismic Zones

The site is located in an area of approximately 7 percent gravity acceleration for 90-percent non-exceedance in 250 years (ADOT, 1992).

A review of the Quaternary Fault Data and Map for Arizona (Pearthree, 1998) did not show any faults or folds within 30 miles of the landfill property, that have been active in

Quaternary (Holocene and Pleistocene) periods. A review of the USGS Seismic Hazard Mapping of the U.S. shows a Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 Years of 11.2 % g based on the USGS website.

7.2.8 Unstable Areas

Unstable ground in the general area of the site is primarily related to land subsidence which creates "earth fissures". The typical cause of land subsidence is the decline in water levels and the natural settling of the land resulting from the compaction of sediments. Future land subsidence due to groundwater level decline is not likely to occur near the site because groundwater levels have been on the rise since the early 1980's as further discussed in Section 7.5.4. The site is not in a region of Karst topography, steep slopes, or other lithologic/geomorphic features indicative of unstable ground.

7.3 Hydrogeologic Setting

7.3.1 Regional Hydrogeology

The unconsolidated alluvial deposits form the principal aquifer in each sub-basin in the Tucson AMA. Although the deposits are quite variable, they are hydraulically interconnected and form a single aquifer system within each basin (Anderson, 1995A). In contrast, the surrounding bedrock of the mountains can be considered impermeable. Useable amounts of groundwater are only obtained from bedrock units where they are extensively fractured or faulted. The amount of secondary permeability is controlled by the tectonic history of the area. The upper unit of the basin fill deposits is commonly the most productive aquifer. However, highly permeable water-bearing sands and gravels occur at many depths in both the upper and lower units. The southwest alluvial basins behave as a series of groundwater reservoirs that are variably interconnected in a dendritic pattern closely parallel to that of the regional surface-water drainage.

Groundwater generally occurs in unconfined conditions in the alluvial aquifers (Anderson, 1995A). Locally confined conditions occur where a principal water-bearing unit is beneath a fine-grained unit or where fine- and coarse-grained units interfinger. In general, groundwater in Arizona is replenished at very slow rates because of very little precipitation, high evaporation losses, and the considerable depth water must infiltrate to recharge groundwater. Tritium age dating of groundwater indicates that 55-percent of wells sampled in the Central Arizona Basins (CAZB) study as part of the National Water Quality Assessment (NAWQA) program were recharged prior to 1953 (Cordy, 2000). Groundwater inflow to a basin generally occurs through three mechanisms: (1) infiltration of runoff along major streams, (2) infiltration along mountain fronts, and (3) from underflow from adjacent basins. Mountain front recharge is generally a minor component in the central basins such as Avra Valley (Anderson, 1995A). The central basins generally receive the greatest recharge from intrabasin inflow.

7.3.2 Hydrogeology of Avra Valley

The MRLF site is located within the Tucson AMA. The Tucson AMA encompasses approximately 4,000 square miles and is comprised of two parallel north-south trending alluvial sub-basins that are separated by block-fault mountains. The Upper Santa Cruz sub-basin occupies the eastern portion of the Tucson AMA, and the Avra Valley sub-basin occupies the western portion. The MRLF site is located in the northern portion of the Avra Valley sub-basin as shown on Figure 7-3.

The Avra Valley sub-basin is approximately 64 miles long and is approximately 20 miles wide near the site. However, east of the site, a gap between the intervening Tortolita and Tucson fault block mountains allows the Avra Valley to join with the Upper Santa Cruz valley, extending the width of the alluvial basin to nearly 30 miles. Localized areas of perched groundwater due to interbedded layers of fine-grained deposits have been mapped in the central portion of the Valley as shown on Figure 7-2 (Mason, 2006). However, these maps were prepared during the 1980's when groundwater levels were at their lowest levels (refer to Section 7.5.4) and thus the current magnitude and extent of perched conditions are expected to be significantly less. This is supported by measured groundwater elevations at the MRLF site as discussed in Section 7.5.3. Surface water within the Avra Valley (when present) drains to the north via the Brawley Wash and the Santa Cruz River.

The primary source of groundwater inflow to the Avra valley aquifer is from interbasin groundwater flow from the south; from the Altar valley and the Tucson Basin. However, other sources include mountain-front recharge, intermittent stream infiltration, infiltration of effluent released into the Santa Cruz River, and deep percolation of excess agricultural irrigation water. Colorado River water is also brought into Avra Valley via the Central Arizona Project (CAP) aqueduct. Some of this water is allowed to recharge the aquifer through various recharge projects such as the Avra Valley, Lower Santa Cruz, BKW-Farms, and Kai Farms recharge projects near Marana (refer to Figure 7-4).

The general slope of the groundwater potentiometric surface within the Avra Valley has been mapped on numerous occasions by ADWR using data from periodic "basin-wide sweeps" of available wells. In the past, basin-wide sweeps were conducted approximately once every 10 years, however, the most recent sweep started in 2010 was not completed due to budgetary cutbacks in the program. Thus, the most recent full data set was obtained in 2000 and is shown on Figure 7-5. Groundwater elevations ranged from 2,400 feet above mean sea level (amsl) in the south, to approximately 1,600 feet amsl in the northern portion of the valley with an elevation of approximately 1,725 indicated for the vicinity of the MRLF site. The regional direction of groundwater flow near the MRLF site is interpreted to be to the northwest.

7.4 Groundwater Investigation

A subsurface investigation was conducted on the MRLF property to identify the local hydrogeologic conditions, collect samples for geotechnical tests, and to install a perimeter

groundwater monitoring network of monitoring wells. The investigation included the following activities.

- Drilling, soil sample collection, and downhole geophysical logging of four deep soil borings
- Installation of permanent monitoring wells in each of the four deep borings
- Drilling of four shallow geotechnical soil borings
- Geotechnical laboratory testing of soil samples from the shallow borings
- Collection of periodic rounds of manual water level measurements
- Installation of automatic water level data loggers in selected monitoring wells
- Collection and analysis of groundwater samples from the four permanent monitoring wells.
- Compilation and review of water level and water quality data from adjacent wells owned by the City of Tucson (Tucson Water)
- Compilation and review of available water level data in ADWR's Ground Water Site Index (GWSI) database.
- Compilation and review of groundwater recharge data from the Metropolitan Domestic Water Improvement District (Metro Water).

On-going activities include conducting additional water level measurement rounds, obtaining access to selected retired irrigation wells owned by Tucson Water, water level trend monitoring using data loggers, and additional rounds of groundwater sampling and analysis.

7.4.1 Deep Test Borings

Four deep test borings were conducted at the locations shown on Figure 7-6. Drilling began on January 10, 2011 by Far West Drilling and Pump Company of Tucson Arizona, and was concluded on February 8, 2011. Since permanent monitoring wells were to be installed in the borings, the locations were chosen to be outside of the limits of waste placement, and in locations that were clear of perimeter facilities such as stormwater basins, and the like. The well locations were also chosen to provide an upgradient monitoring location (CEG-4) and three downgradient and/or side-gradient locations, assuming a generally east to west groundwater flow direction.

The borings were advanced using the wet-rotary method to depths ranging from 260 to 360 feet below ground surface (bgs) as shown on the boring logs in Appendix W. Representative soil samples were collected in two different ways. Composite samples were obtained using a soil strainer in the return fluid during each ten-foot depth interval. The drilling "action" was also noted and used to interpret the returned samples. These soil descriptions are indicated on the boring logs as CS-# and are shown at the midpoint of the ten-foot run.

Discrete soil samples were also collected at approximately twenty-foot intervals using an 18-inch long split-spoon sampler. The sampler was placed at the bottom of the boring and pushed into the underlying formation with the weight of the rig. Discrete split-spoons sample descriptions are indicated on the boring logs as SS-# and are shown adjacent to the depth of collection.

The total depth of the deep borings were determined in the field based on the anticipated depth to water of approximately 180 feet and the nature of the encountered soils. Since we wanted the monitoring wells to be at least 50 feet below this level, the minimum depth of the deep borings was set at 230 feet bgs. The first boring, CEG-1, was taken the deepest (to 360) feet to provide information of the deeper stratigraphy and to be used as a reference for the other borings. Considering that the majority of the material encountered below the water table was silt and clay, the three remaining borings were terminated between 260 and 280 feet.

7.4.2 Downhole Geophysical Logging

At the completion of each deep test boring, the borehole was logged using Cornerstone's downhole geophysical logger. Specifically, a natural gamma tool was run to detect the rate of gamma ray emissions from naturally occurring radioactive materials in the soils. Since these materials are more abundant in clay minerals, the tool provides an indication of the amount of clay in the subsurface. Assuming the strata are continuous features across the site, the signature provided by the logs can be used to correlate formations from borehole to borehole. The natural gamma logs are provided in Appendix W.

7.4.3 Monitoring Well Installations

Groundwater monitoring wells were installed in each of the four deep test borings. The wells were constructed of 4.5 inch diameter polyvinyl chloride (PVC) casing and slotted PVC well screens. The casing and screens were joined together with gasket slip joins and nylon insert locks. The screens were manufactured with 0.032-inch slots and were terminated with a PVC end cap. Due to the historic variability of groundwater levels in the Avra Valley (refer to Section 7.3.2), and the desire to monitor the top of the water table, 100-foot long screens were used. The screens were positioned such that the anticipated groundwater table surface was at the mid-point of the screen. The pre-investigation water level surface was estimated from depth to groundwater measurements at the two abandoned irrigation wells (No.'s 26 and 27) located along the southern property boundary. This approach will accommodate a water level fluctuation of 50 feet in either direction from current conditions.

The borehole below the bottom of the well screen was backfilled with clean pea gravel to provide a solid base for the wells. A graded sand pack material labeled "#10-#20 Gravel Pack" was placed in the annulus around the well screen using the tremie method. Bentonite chips were then placed in the annulus from the top of the sand pack to approximately 20 feet below the surface. The remaining annulus was filled with cement to the surface. The wells

were completed at stickups with an 8-inch diameter steel protective casing set in a concrete pad, protected by four steel bollards.

After the wells were installed, a winch-operated steel bailer was used to develop the wells. The bailer was a nominal 4 inches in diameter and thus provided a surging utility as well. Well development by surging/bailing was conducted for 4 to 8 hours on each well until the turbidity of the discharged water improved. The well was then subjected to overpumping using a submersible pump until the discharge ran clear.

7.4.4 Geotechnical Test Boring Program

Four geotechnical test borings were conducted at the locations shown on Figure 7-6. Drilling began on February 9, 2011 by Far West Drilling and Pump Company of Tucson Arizona, and was concluded on February 10, 2011. The locations for the four borings were chosen to be inside of the limits of waste placement to determine soil conditions within the future limit of waste.

The borings were advanced using the air-rotary method to depths ranging from 50 to 80 feet bgs as shown on the boring logs in Appendix W. Representative soil samples were collected in two different ways. Composite samples were obtained by collecting the discharge from the hole during each twenty-foot depth interval. These soil descriptions are indicated on the boring logs as CS-# and are shown at the midpoint of the twenty-foot run.

Discrete soil samples were also collected at approximately twenty-foot intervals using an 18-inch long split-spoon sampler. The sampler was placed at the bottom of the boring and pushed into the underlying formation with the weight of the rig. Discrete split-spoons sample descriptions are indicated on the boring logs as SS-# and are shown adjacent to the depth of collection.

The total depth of the deep borings was determined prior to drilling based on the anticipated depth of the landfill at each point. The depth was determined to ensure that the borings were not advanced below the estimated bottom of the landfill.

7.4.5 Groundwater Level Monitoring

Groundwater level monitoring has been conducted both manually and through the use of automatic data loggers. Manual depths to groundwater measurements began on January 12, 2011 during oversight of the deep test borings and, as shown on Table 7-1, have continued at a variable frequency depending on the nature of site activities. To date, data have been collected from the four on-site monitoring wells and the two on-site abandoned irrigation wells. However, a request to gain access to a number of adjacent wells (primarily former irrigation wells), is pending approval by Tucson Water. The wells are generally within a two-mile radius of the site as shown on Figure 7-7 and will be added to the program once access is granted.

To calculate groundwater elevations, reference marks were established at each well. The top of the PVC well casings was used for the four on-site monitoring wells, whereas off-set marks were needed on the two irrigation wells due to access limitations to the well casings. Reference point elevations were then determined by Settlemeyer, LLC surveyors in the NAVD88 datum.

Groundwater levels are also being monitored using automatic data loggers that incorporate pressure transducers. These units (Solinst Level Logger Juniors) were placed in each of the four on-site monitoring wells on March 21, 2011 and set to record water pressure at 6-hour intervals. Efforts are also underway to install loggers in two of the adjacent abandoned irrigation wells as shown on Figure 7-7, once access to the wells is obtained from Tucson Water. After several months of monitoring, data from this program will be compiled and reviewed to assess regional groundwater level trends and the impact of local stresses such as irrigation pumping on groundwater levels.

7.4.6 Groundwater Quality Sampling and Analysis

An initial round of groundwater samples was collected from the four on-site monitoring wells on April 6, 2011 in accordance with the procedures provided in Section 8 (Recommendation for Monitoring Networks and Schedules) of this SWFP. The new monitoring wells are equipped with dedicated electric submersible pumps (Redi-flow II) that are set approximately half way between the groundwater surface and the bottom of the well. For this initial round, samples were analyzed for an extended list of parameters as shown on Appendix X. This list was developed to provide baseline data for the landfill and for comparison with historic data from adjacent wells. The results are discussed in Section 7.6 and will be used to develop the long term groundwater sampling plan for the landfill. This plan will include the frequency of sampling and modified set parameters for analysis based on previous results.

7.5 Site Hydrogeology

7.5.1 Site Stratigraphy

The stratigraphy beneath the site was investigated to a depth of approximately 350 feet below grade, which is more than 270 feet below the deepest planned limit of the landfill (80 feet deep) and approximately 120 feet below the current groundwater level (180 feet deep). The encountered strata are shown on the four geologic cross-sections provided on Figure 7-8 along with the approximate elevation of the groundwater table and the screened intervals of the four monitoring wells. The natural gamma responses (down-hole geophysical logs) are shown next to the four deep borings as well.

In general, the stratigraphy consists of alternating layers of unconsolidated Upper Basin fill deposits that range from clay to coarse gravel and vary considerably across the MRLF

property. Although many of the thinner units do not correlate from borehole to borehole, there are several larger-scale features that are readily apparent. For example, an upper, near surface deposit of brown fine sand, approximately 40 feet thick was encountered in all four borings and appears to be a site-wide feature. More importantly, the cross-sections clearly illustrate that the more permeable zones of sand and gravel are generally found within the upper 200 feet and are underlain by finer-grained deposits, primarily silts and clays. This stratigraphic sequence is important relative to groundwater flow as further discussed in Section 7.5.3. The sequence shows that most of these potential groundwater flow zones are above the water table and are thus unsaturated.

The cross sections also depict a clear trend of coarser materials toward the northeast portion of the site, closer to the East Branch of the Brawley Wash and the Santa Cruz River. Boring CEG-4 for example encountered nearly all sand and gravel to a depth of 200 feet, with some of the gravel lenses so coarse that drilling was temporarily impaired due to difficulty in maintaining a mudpack seal in the borehole. By contrast, boring CEG-2 in the southwest corner of the site, only encountered two relatively thin layers of fine to medium sand, the deepest of which was 120 feet. A 60-foot thick clay layer was also encountered in both CEG-1 and CEG-2. This trend of coarsening sediments toward the Brawley Wash and the Santa Cruz River is consistent with the regional geology presented in Section 7.2.2.1.

As noted earlier, correlation using the natural gamma logs was difficult at best with only a few features, such as the upper fine sand unit showing a recognizable signature. This is likely due to the local variability of the depositional environment, and suggests it is more complex than indicated on the cross sections.

7.5.2 Aquifer Hydraulic Properties

Typical hydraulic conductivities for Basin and Range sediments range from 30 to as much as 1,000 feet per day (ft/day) for the coarse-grained stream alluvium (coarse sands and gravels), 1 to 500 ft/day for intermediate grain-size alluvial deposits such as fine to coarse sand, and 0.1 to 10 ft/day for finer grain alluvial deposits such as silt and silty fine sand. In general, the fine-grain materials limit vertical groundwater flow whereas the majority of groundwater flow is horizontally in the coarser grained deposits.

Hydraulic characteristics for the Avra Valley groundwater flow system were developed for groundwater modeling efforts, first by the USGS (Anderson, 1995A) and more recently by ADWR (Mason, 2006). The three dimensional groundwater flow model published in 2006 by ADWR consists of a three-layer flow system in the Avra Valley. Model layer 1 represents the saturated portion of the younger stream channel and flood plain alluvium and the Fort Lowell formation. Model layer 2 represents the upper Tinaja beds and model layer 3 the lower Tinaja beds and Pantano formations. The sands and gravels encountered in the four on-site test borings (in the upper 200 feet) would be represented by model layer 1 and were assigned a range of 50 to 100 feet per day in the model (Mason, 2006). This range appears appropriate based on Cornerstone's visual inspection of the soil samples.

The hydraulic conductivity of the underlying deposits (model layer 2) were also assigned a range of between 51 and 100 ft/d in the model however, observations of nearby irrigations wells by Cornerstone suggests that this may underestimate the true hydraulic conductivity of the unit. During the drilling program, an irrigation well located one mile south of the MRLF site was observed to pump an estimated 1200 gallons per minute (gpm). According to ADWR records, this well (#85) is 1,150 feet deep and thus would likely be representative of the Upper to Middle Tinaja beds. Given this high pumping rate that was sustained for several months, the actual hydraulic conductivity of this unit is likely in the 500 to 1000 ft/d range.

Initially, aquifer testing was planned as part of the hydrogeologic investigation of the MRLF site. However, as discussed in Section 7.5.1, the majority of the permeable deposits are positioned above the groundwater table. This leaves the monitoring wells screened predominantly in finer grained deposits and unable to yield decent quantities of groundwater. This was confirmed during well development activities in which maximum well yields were only in the 5 to 10 gpm range. Thus, given the fact that the permeable units were largely unsaturated and the saturated layers were low-yielding, an effective aquifer testing program was not able to be developed. As a substitute, information on the vertical connectivity of the screened intervals of the monitoring wells with the deeper, more productive zones will be obtained from the data loggers that have been deployed in selected wells around the site. These data, in combination with local irrigation records, will continued to be used to shed light on the saturated flow system beneath the site.

7.5.3 Groundwater Occurrence and Flow Direction

Groundwater occurs at a depth of approximately 180 feet below ground surface on the MRLF property. Manual water level data from these wells are tabulated in Table 7-1 and data from the April 6, 2011 measurement round have been plotted on the cross sections on Figure 7-8 and in plan view on Figure 7-9. These data indicate that the direction of groundwater flow is to the west-northwest at a gradient of approximately 7.5 feet per mile. This flow direction is slightly more west than the regional flow direction noted in Section 7.3.2 based on ADWR's basin-wide mapping; however, this difference is not considered significant. The more westerly direction may be due one or more factors, such as increased infiltration from the groundwater recharge projects located east of the site and/or agricultural pumping west of the site. According to representatives of Metro Water which recently took over operations of both the Santa Cruz and Avra Valley recharge projects, approximately 61,000 acre feet of water per year is permitted to be recharged at these locations which may be causing a westerly flow direction beneath the MRLF.

The other possible reason for the slight difference in flow direction is if the shallow water table represented by the on-site monitoring wells is "perched" to a degree above a semi-confining layer that slopes to the west, and restricts vertical connection to the deeper, more permeable zones that are represented by the basin-wide monitoring network. This scenario is supported by the low permeability sediments encountered in the borings below a depth of 200 feet, the fact that perched conditions have been regionally mapped in this area by ADWR

(Mason, 2006), and preliminary information from the adjacent deep irrigation wells # 26 and #27. Estimates of groundwater elevation in these agricultural wells is 3 to 5 feet lower than those in the shallow monitoring well system at the same location (Figure 7-9). This would suggest a downward vertical gradient which may also be indicative of quais-perched conditions. Further information on the interaction between the regional deeper groundwater system and the shallower on-site system will become available when access to the former irrigation wells in the area is provided by Tucson Water.

7.5.4 Historical Groundwater Levels and Trends

The use of groundwater resources in southwestern Arizona during the past 70+ years has resulted in a net overdraft of groundwater in most developed basins. In places, water levels had declined more than 400 feet with declines of 50 to 200 feet common in developed basins. Significant groundwater development began in the 1940's for agricultural use. As shown on Figure 7-10, withdrawals in the Avra Valley were estimated to be 12,000 acre-feet in 1940 and increased to over 200,000 acre-feet by 1975. Figure 7-11 depicts groundwater elevations in Avra Valley prior to this increase in pumping and indicates that the historic (natural) groundwater elevation at the MRLF site was approximately 1,800 feet amsl. By contrast, the groundwater elevation at the MRLF site during the mid-1970's was on the order of 1,630 feet or approximately 170 feet lower due to over pumping.

However, because the Avra Valley basin is not highly developed and was used primarily for irrigation, annual withdrawals began to decrease in the late 1970's as agricultural lands were retired. Many of these farms were purchased by the City of Tucson and left unplanted. Figure 7-10 indicates that pumping was reduced to less than 50,000 acre-feet per year in the late 1990's. As a result, groundwater levels have been on the rise since the late 1970's as shown on the hydrograph from well D-12-11 located just south of the MRLF site. The maximum rate of groundwater rise has been on the order of 20 feet per year such that the groundwater elevation reported for the MRLF site during the basin-wide sweep in 2000, was 1,720 feet amsl or just 80 feet below the level in 1940. Continued recovery of groundwater levels is expected although the rate of recovery is expected to diminish as water levels approach static conditions.

Groundwater level trends will continue to be monitored as part of the long-term monitoring plan for the MRLF site. Final steady-state groundwater elevations at the MRLF site will depend on factors such as the future operation of the recharge projects east of the site, whether groundwater recovery wells are installed and used to harvest a portion of the recharged water, and the nature and rate of development in the Marana area. However, groundwater levels are not expected to rise significantly above the 1940 levels which would still leave 100 feet between the bottom of the landfill and the groundwater table.

7.6 Groundwater Quality

Water quality for the site was evaluated using information published for the National Water-Quality Assessment Program (NAWQA) program for the Central Arizona Basins (Cordy, 2000), by Anderson (1995A), and data provided by Tucson water for four adjacent retired irrigation wells and two active potable water supply wells. An initial round of groundwater samples was also collected from the four on-site monitoring wells.

7.6.1 Regional Water Quality

Groundwater quality in the Avra Valley is generally suitable for most uses (Anderson, 1995A). However, Cordy (2000) reports that more than 75-percent of the samples collected for the NAWQA study exceeded United States Environmental Protection Agency (USEPA) guidance for nitrate and total dissolved solids (TDS). More than 90-precent of groundwater samples collected from the West Salt River Valley, Upper Santa Cruz Basin and the Sierra Vista sub-basin exceeded the USEPA's proposed drinking water standard for radon (Cordy, 2000).

TDS concentrations range from approximately 300 to 1,000 mg/L in most basins. Dissolution reactions are principle causes of dissolved solids concentrations in excess of approximately 1,000 mg/L. TDS concentrations greater than 1,000 mg/L can also be attributed to evaporites within the basin. The lower dissolved solids concentrations (300 to 500 mg/L) generally occur near the mountain front recharge zones. TDS may either increase or decrease with depth in a basin; however, concentrations tend to increase downgradient in each basin.

In most basins concentrations of magnesium, bicarbonate, and silica decrease with depth, while pH, temperature, and concentrations of most trace elements increase with depth. The pH of groundwater in recharge areas is generally near neutral but increases to as high as 9.5 in downgradient discharge areas.

Groundwater temperature typically ranges from 15 to 30 degrees Celsius along recharge areas and increases to as high as 45 degrees Celsius near discharge areas. Dissolved oxygen is at near saturation in groundwater in recharge areas and decreases to 50 to 80 percent of saturation near discharge areas.

In small parts of several basins, trace elements and other compounds are present in groundwater in concentrations that exceed standards for public water supply and certain agricultural uses (Anderson, 1995A). Fluoride, barium, chromium, arsenic, mercury, lead, boron, and nitrate are known to present environmental problems in some areas where concentrations exceed the federal maximum contaminant level (MCL). Typically, trace element concentrations are below detection levels near mountain front recharge zones and tend to increase downgradient (Anderson, 1995A). Fluoride concentrations of less than 1 to 3 mg/L are indicative of granites and gneisses.

The Avra Basin is classified as an open geochemical system, where the chemistry of groundwater is influenced by the addition of gases and water as groundwater moves downgradient (Anderson, 1995A).

7.6.2 Groundwater Quality Data from Tucson Water Wells

Table 7-2 summarizes groundwater quality data provided by the City of Tucson (Tucson Water) for four former irrigation wells (AF-008A, AF-012A, AF-013A, and AF-018A) that have since been taken out of service and are now owned by Tucson Water. Data were also provided for two active potable water supply wells (W-001A and W-001B) located near the Silver Bell residential development northeast of the site. These wells are shown on Figure 7-7.

Chloride. Chloride ranged from 14 to 199 milligrams per liter (mg/L), which is less that the USEPA secondary MCL of 250 mg/L (Cordy, 2000).

Nitrate. Nitrate ranged from 2.2 to 9.8 mg/L, which although is less than the USEPA MCL of 10 mg/L it is indicative of the former agricultural use in the vicinity of the site...

Total Dissolved Solids. TDS ranged from 246 to 778 mg/l and exceeded the USEPA secondary MCL of 500 mg/L in all but one of the six wells tested.

Volatile Organics. The only volatile organic compounds (VOC)s reported for these wells were ethylbenzene, toluene, and xylene. Each of these constituents was detected at trace levels (below USEPA drinking water criteria) in the two water supply wells.

7.6.3 Groundwater Quality Data from On-site Monitoring Wells

One groundwater sample was collected from each of the four on-site monitoring wells. Water was purged for between 40 to 60 minutes from each of the wells using the dedicated submersible pumps installed in each of the wells. During purging, field parameters were measured and recorded in the field, along with other pertinent purging and sampling information. Final field parameters are as follows:

Parameter	Well CEG#1	Well CEG#2	Well CEG#3	Well CEG#4
pH	7.42	7.17	7.33	7.18
Temperature (°C)	24.8	25.3	25.5	25.4
Conductivity (microsiemens)	990	1168	1420	1936
Dissolved Oxygen (mg/L)	5.50	2.93	7.33	5.69

After the wells were purged, a groundwater sample was collected from the closest discharge point to the well. Sample containers were filled directly from the discharge point. The groundwater samples were packed on wet ice in coolers with chain-of-custody (COC) forms and sent to TestAmerica Laboratory located in Phoenix, Arizona for analysis. The samples were dropped off at the TestAmerica Tucson service center.

The analytical results of this sample were compared to sample results collected from the three Central Arizona Basins (CAZB) sampled for the NAWQA Program and with the ADWR water quality database. The laboratory analytical results are discussed below. A copy of the laboratory analytical results is included in Appendix X.

Volatile organic compounds analyzed by USEPA method 5030B/8260B, semi-volatile compounds analyzed by USEPA method 3520C/8270C, and Organochlorine Pesticides analyzed by USEPA method 3510C/8081A were not detected at or above their respective reporting limits for each analyte.

Chloride. Chloride was detected at between 160 and 310 milligrams per liter (mg/L), with one detection (310 mg/L) above the USEPA secondary MCL of 250 mg/L.

Nitrate. Nitrate was detected at between 9 and 27 mg/L, which except for the detection at 9 mg/L are all greater than the USEPA MCL of 10 mg/L.

Total Dissolved Solids. TDS was detected at between 630 and 1100 mg/L, which are all greater than the USEPA secondary MCL of 500 mg/L.

Fluoride. Fluoride was detected in only one sample at 0.4 mg/L which is less than the USEPA MCL of 4.0 mg/L.

Total Arsenic. Arsenic was detected at between 0.0042 and 0.01 mg/L which is less than the USEPA MCL of 0.04 mg/L.

Water quality concentrations of target analytes may be naturally occurring.

Groundwater chemistry can also be characterized using the relative concentrations of dissolved cations and anions plotted on a trilinear diagram. Typically calcium bicarbonate or calcium sodium bicarbonate type groundwater is prevalent near the mountain front recharge areas. The groundwater evolves to a sodium mixed anion type near the center or near the outlet of some basins, or as TDS increased to a sodium chloride or sodium calcium chloride sulfate type (Anderson, 1995A). The cations and anions for the water quality sample collected from the monitoring wells plot as sodium mixed anion type water on the trilinear diagram (Figure 7-12). Sodium mixed anion type waters are more indicative of basin center water, basin outlets, or waters having long residence times. TDS was detected at between 630 and 1100 mg/L in the water quality sample collected from the monitoring wells; suggesting that groundwater in the area of the site is not influenced by mountain front recharge .

7.7 Groundwater Rights

Regulations for solid waste facilities at Arizona Revised Statutes (ARS) §49-772.A.1 require that approval for a SWFP not be granted if there are grandfathered irrigation rights appurtenant to all or any part of the site. According to the ADWR, there are grandfathered irrigation rights for the landfill property, as indicated in Appendix C. These irrigation rights are in the process of being retired to a non-irrigation (Type 1) use. In the event that ADWR does not approve the retirement of the grandfathered irrigation rights to non-irrigation (Type 1) use, the grandfathered irrigation rights will be extinguished prior to issuance of the solid waste permit. Therefore, there will be no grandfathered irrigation rights associated with the landfill property when the permit is issued.

There are also industrial groundwater rights associated with the proposed site. These groundwater rights will be transferred to the landfill operations and additional industrial groundwater rights will be obtained for landfill operations. Landfill operations are not expected to impact groundwater rights and are not limitation to obtaining water rights in the project area.

8 RECOMMENDATIONS FOR GROUNDWATER MONITORING NETWORKS AND SCHEDULES

This section presents a site groundwater monitoring plan (GWMP) describing the (1) proposed groundwater monitoring network, (2) field and laboratory procedures for monitoring groundwater at MRLF, and (3) reporting protocols. The GWMP was prepared in accordance with the requirements specified in the 40 CFR §258, Subpart E – Groundwater Monitoring and Corrective Action. The site is a new facility and the preparation of the monitoring plan is a condition of approval of the SWFP that will allow the facility to begin operating.

The GWMP is based on information compiled during characterization of the site geology and hydrogeology. The proposed groundwater quality monitoring network will consist of the four existing monitoring wells. This proposed monitoring network meets the requirements for a groundwater monitoring system specified in 40 CFR §258.51.

Groundwater monitoring at MRLF will be performed to determine the site-specific groundwater flow direction and gradient and to characterize background groundwater quality before waste is placed in the landfill units. The groundwater monitoring system was also designed to identify environmental impacts associated with the landfill.

8.1 Groundwater Monitoring Network

The groundwater monitoring network will be composed of four monitoring wells. The existing monitoring well locations are screened in the upper basin fill, which is considered the uppermost aquifer at the site. Monitoring wells are located in Figure 7-9 and are designated as follows:

- CEG-1 is an existing upgradient monitoring well located in the southeast corner of the site property.
- CEG -2 is an existing downgradient monitoring well located in the southwest corner of the site property.
- CEG -3 is an existing downgradient monitoring well located in the northwest corner of the site property.

- CEG -4 is an existing crossgradient monitoring well located in the northeast corner of the site property

8.2 Monitoring Schedule

Water Levels. Water levels will be measured quarterly in the site monitoring wells.

Routine Groundwater Quality Monitoring. The proposed monitoring schedule is summarized in below. In lieu of the four independent samples during the first semi-annual event indicated in 40 CFR §258.54, it is proposed that background and compliance monitoring wells CEG-1, CEG-2, CEG-3, and CEG-4 will be monitored (for water quality) quarterly during the first 2 years and to establish background water quality and identify seasonal variations, if any. Subsequently, sampling will be performed semi-annually over the life of the landfill and during the post-closure period. Sampling will be performed during the following periods:

Quarterly Sampling Events	Time Period
1st Quarter	January 1 to March 31
2nd Quarter	April 1 to June 30
3rd Quarter	July 1 to September 30
4th Quarter	October 1 to December 31

Semi-Annual Sampling Events	Time Period
1st Half	January 1 to June 30
2nd Half	July 1 to December 31

8.3 Groundwater Monitoring Methods and Procedures

8.3.1 Groundwater Elevation Measurements

Before purging and sampling, the depth to groundwater will be measured using an electronic sounder or approved alternate measurement method in all accessible network wells using the following procedure:

- The protective shroud installed over the monitoring well will be unlocked and the well cap removed.

- The water-level indicator will be decontaminated before its use in each well to reduce the potential for cross-contamination.

- Water level will be measured with an electronic sounder or approved alternate measurement method. The water level will be measured by raising and lowering the measuring device at least three times to verify the measurement is valid.

- Water levels will be recorded on the field sampling data sheet (FSDS) to the nearest 0.01 foot. The date (month, day, and year) and time (24-hour clock) of each measurement will be recorded.

- The measurement will start from the reference point or other mark on the top of the well casing.

- Care will be taken so that the water-level measuring device hangs freely and does not adhere to the wall of the well casing.

- The groundwater elevation at each monitoring location will be calculated from the measured distance between the reference elevation measuring point and the top of the water column.

8.3.2 Field Meter Operations

Field meters will be used to measure water quality parameters during sample collection. Field meters to be used routinely will measure pH, specific conductance, dissolved oxygen, and temperature. The sampler will maintain and calibrate the meters (as described below) at recommended frequencies and maintain a logbook or other acceptable documentation that records the maintenance and calibration on each meter. Procedures for field meter use and calibration are described below.

8.3.2.1 Field Meter Use

- During well purging and sample collection, the temperature, pH, dissolved oxygen, and specific conductance of water samples will be measured with portable water quality meters.

- When possible, the water quality measurements will be taken using a flow-through cell to prevent exposing of groundwater to the atmosphere. Flow-through cells require dedicated bladder pumps, which are installed in each monitoring well. However, the groundwater sample collected from the on-site water supply well will be collected directly from a discharge port located near the well head.

- Measurements will be recorded to the following standards: pH to ±0.1 units, conductivity to ±1 microsiemens per centimeter (μS/cm), and temperature to ±1°C.

- The field meters will be operated consistent with the manufacturers' recommendations. The manufacturers' instrument manuals will be available for reference during sampling.

8.3.2.2 Field Meter Calibration

- Instruments will be calibrated daily to a known standard(s) before they are used, and they will be checked again at the end of the day.
- Calibration standards will be prepared according to the instrument manufacturer's specifications.
- Calibration procedures, dates, and times will be recorded in the field.
- Field instruments will be properly maintained.

8.3.3 Groundwater Sampling Equipment

Before it is taken into the field, nondedicated equipment should be cleaned or decontaminated (as described in Section 1.8), checked to ensure functioning properly.

8.3.3.1 Pumps

The existing monitoring wells (CEG-1, CEG-2, CEG-3, and CEG-4) have dedicated electric submersible pumps. The pumps will be used for development and for collecting water samples.

8.3.3.2 Bailers

Bailers are to be used only on a *temporary basis* if no other sampling equipment is available or if otherwise necessary (e.g., if there is inadequate volume to use a pump). Bailers should be made of suitable inert materials (such as polyethylene, stainless steel, PVC, or Teflon) when monitoring for organic compounds. PVC bailers with nonglued joints may also be used.

When bailers are used, the bailer cord shall be fastened securely to the bailer and shall be constructed of nylon, stainless steel, or polypropylene, and preferably braided. This cord must be new, clean, and in good condition. The end of the cord should be fastened to the well cap, wrist, or to a large spool to prevent the rope and bailer from being lost in the well. The cord's connection to the bailer must be checked with each bail during purging. Extreme care should be taken not to excessively disturb the column of water in the well casing. Gently lower the bailer into the well with each cycle. Attempt to lower the bailer into the

water only to the extent necessary to fill or partially fill the chamber. Avoid submerging the top of the bailer.

When used, nondedicated bailers must be thoroughly decontaminated and triple-rinsed with de-ionized water (or laboratory reagent water) before and after sampling at each location. Dedicated bailers do not require decontamination.

8.3.4 Groundwater Sampling Procedures

Traditional purge or low-flow purge sampling methods may be used at the site. The existing monitoring wells will be sampled using the traditional purging technique of three casing volumes. The subsections below describe well purging requirements and stabilization criteria of water quality parameters before and during purging. For purging to be considered complete, the final three consecutive sets of field parameter measurements must meet these criteria.

8.3.4.1 Traditional Purge Sampling Method

Three to five times the volume of water in the well casing (water in the sand pack around the well is not considered when computing the volume to purge) is purged before sampling to draw representative formation water into the well for sampling. The casing volume will be calculated by determining the diameter of the monitoring well and the height of water. Water quality parameters (pH, temperature, specific conductivity [corrected to 25°C], and dissolved oxygen) are monitored and recorded on the FSDS.

The acceptable standards for parameter variances for the final three incremental purge volumes are as follows:

- pH: ±0.3 standard units (SU);
- Temperature: ±10 percent;
- Specific conductivity: ±10 percent;
- Dissolved oxygen: ±10 percent; and

The stabilization of these parameters indicates that the pump discharge water is representative of formation water and samples can be collected.

8.3.4.2 Low-Flow Purge Sampling Method

Low-flow purge sampling is based on the principle that water flowing through an aquifer and a well screen results in a continuous purging of the screened interval of the well and provides representative samples without disturbing overlying standing water. The goal of this method is to obtain a sample from the screened interval without drawing potentially stagnant water from the well casing into the sample. Low-flow sampling reduces the volume of water that

must be purged and can reduce the variability of the analytical data by eliminating some of the drawbacks associated with the traditional sampling method. There are three basic requirements for low-flow purge sampling:

1. The use of dedicated sampling equipment. Inserting sampling equipment disturbs potentially stagnant water stored in the well casing and mixes it with the water in the screened interval.
2. The intake of the dedicated sampling pump must be positioned approximately in the middle of the well screen.
3. Flow rates must be low enough to avoid degassing the sample and to achieve no net drawdown of the water level to prevent mixing inside the well (a pumping rate of 0.25 liter per minute or less will be used).

Groundwater quality parameters (pH, temperature, specific conductance, and dissolved oxygen) will be monitored and recorded on an FSDS for stabilization during low-flow purging (it is not necessary to monitor redox potential for stabilization). The stabilization of these parameters indicates that the pump discharge water is representative of formation water and samples can be collected.

The acceptable standards for parameter variances at the completion of low-flow purging are as follows:

- pH: ±0.1 SU;
- Temperature: ±1.0 °C;
- Specific conductivity: ±5.0 percent; and
- Dissolved oxygen: ±0.5 milligrams per liter (mg/L).

8.3.5 Sample Collection and Description

After purging a well, laboratory-supplied bottles will be filled from the discharge tube of the dedicated pumps. When collecting samples for VOC analysis, the pump flow rate should be regulated to approximately 100 ml/min to minimize turbulence and aeration in the pump effluent. A physical description of the sample, including the sample color, clarity, foaming, and any other physical characteristics will be recorded on the FSDS.

8.3.6 Field-Filtering

Groundwater samples will be collected for both total trace metals (un-filter) and dissolved trace metals (field filtered). The intent is if total suspended solid (TSS) levels are greater than 100 mg/L, dissolved trace metals will be more representative of actual groundwater quality. Filtering is necessary to determine the concentration of ions and compounds that are dissolved in the groundwater rather than those present as particulates. If the water is not filtered, ions or compounds naturally present in, or adsorbed to, suspended particles may be

released when samples are preserved and analyzed. Release can result in higher dissolved constituent concentrations than are actually present in the groundwater sample.

Groundwater samples collected for trace metals analysis (see Table 8-1) will be field-filtered in compliance with Subtitle D. Should the analytical data indicate that the TSS concentration exceeds 100 mg/L, the additional field-filtered trace metals sample will be analyzed. Field-filtering for dissolved constituent analysis will be performed using 0.45-micron-membrane disposable pressure filters. Filters will be used only once.

8.3.7 Equipment Cleaning and Decontamination

If dedicated sampling equipment is removed and nondedicated equipment is used to collect groundwater or leachate samples, it must be decontaminated using the procedures below.

8.3.7.1 Sampling Equipment

All nondedicated groundwater sampling equipment and newly installed pumps will be decontaminated in the following sequence before samples are collected at any monitoring well or leachate sump:

- Rinse with tap or distilled water.
- Wash with nonphosphate detergent consisting of a dilute mixture of Liquinox or Alconox (or its equivalent) and tap or distilled water.
- Rinse with distilled water.
- Rinse with methanol solution (50 percent methanol, 50 percent distilled water) if subjected to petroleum contamination or visible contamination that is not removed with the Liquinox or Alconox.
- Finally, rinse with distilled water.

8.3.7.2 Water-Level Measurement Equipment

The portion of the water-level detector that enters the water (the tip) and a 5-foot section above that portion will be decontaminated before its use in each well. Decontamination will consist of a distilled water rinse. An optional a 1:1 diluted methanol rinse and a final distilled water rinse will be used if the equipment is subjected to petroleum contamination or visible contamination not removed by the distilled water rinse.

8.3.8 Sample Handling

The sample containers will be prepared and provided by the analytical laboratory. Samples must be properly and carefully handled to ensure that they are representative of the sampled media.

8.3.9 Sample Preservation

Samples will be preserved consistent with laboratory recommendations. The type and size of container used for each analysis and the type of preservative added, if any, will be recorded on the FSDS.

Each analytical parameter has its own preservation requirement. Bottles will be pre-preserved with HCl, HNO_3, and H_2SO_4. In most cases, the preservative should adequately adjust the pH of the sample and no further action is required in the field. As part of its protocol, the laboratory verifies that the sample pH meets QC criteria when the samples are received and before they are logged in.

8.3.10 Sample Storage and Shipping

Before packing the sample bottles into the shipment coolers, the sampler must record the sample designations in the appropriate place on the FSDS and chain-of-custody (COC) form. Sample containers should be placed in an iced cooler (approximately 4°C) immediately after sample collection. Sample containers must be kept closed, maintained under custody, and cooled until the sample is analyzed. Recommended holding times from when samples are collected until sample analysis should not be exceeded. The COC form for the samples in the container will be placed inside the cooler.

To comply with packaging regulations and to take practical measures to prevent damaging samples, the sampling personnel will follow packaging and shipping instructions supplied by the certified testing laboratory. Containers typically are directly delivered to the laboratory by the sampler or sent by overnight courier to the laboratory. Each container will have a unique tracking number. A copy of the shipping manifest will be kept with the field data.

8.3.11 Sampling Documentation

8.3.11.1 Field Sampling Data Sheet

It is essential that all sampling activities be documented on a FSDS. Entries should be made in indelible ink and changed by crossing out the entry with a single line and initialing it. The data recorded on a FSDS depends on the sampling activity being performed and will include some or all of the following:

- Facility name;
- Date;
- Sampler's name and signature;
- Sample type;
- Sample identification;
- Weather (ambient temperature, atmospheric pressure, wind condition);
- Field instrument calibration;
- Field measurements (water level, pH, conductivity, temperature, and dissolved oxygen);
- Field calculations (such as well purge volumes);
- Number, volume, and type of sample containers;
- Condition of the sample location (monitor well, riser pipe, etc.); and
- Any unusual conditions that may affect samples or any deviations from the normal sampling protocol.

8.3.11.2 Chain-of-Custody

To help maintain the integrity of the samples, strict COC procedures will be implemented. These procedures will help ensure that tampering of samples does not occur. The COC form is a manifest of the sample containers and describes the analyses to be performed on the samples in each container. All sample containers will be clearly and unambiguously labeled and COC forms will be completed before the end of each sampling day. A written record of the sample bottle possession and any transfer of the samples must be maintained and documented on the COC record. The COC forms and relevant FSDSs will be sent with the samples to the laboratory. Copies of FSDSs and COCs forms will be retained in the site files.

8.4 Field Quality Assurance/Quality Control Procedures

Trip blanks, field blanks, equipment blanks, and duplicate samples provide field QA/QC measures for the monitoring program. These are discussed below.

8.4.1 Trip Blanks

Trip blanks are samples of organic-free de-ionized water prepared at the laboratory. They are used to detect contamination that may be introduced in the field (either atmospheric or from equipment), in transit (to or from the sampling site), or in the bottle preparation, sample

log-in, or sample storage stages at the laboratory. In general, trip blanks are analyzed for each shipping container containing VOC samples.

Trip blanks remain with the sample bottles while in transit to the site, during sampling, and during the return trip to the laboratory. The condition of the trip blanks should be noted on a FSDS. Trip blank sample bottles must not be opened at any time during this process. If a trip blank is opened accidentally, a note must be made on the COC form. On return to the laboratory, trip blanks are analyzed by the same procedures and methods used for the collected field samples. Trip blank results are reported in the laboratory results as separate samples.

8.4.2 Field Blanks

Field blanks are used to detect any contamination that might be introduced into sample containers before, during, or after sample collection. A field blank is generally obtained for every 10 samples.

Field blanks are prepared at one of the sampling locations using laboratory-supplied bottles and de-ionized or laboratory reagent-quality water. Each field blank will be prepared as follows:

- For dedicated or disposable equipment requiring no filtration or in-line filtration, the de-ionized or laboratory reagent-quality water will be exposed to the air, poured into field blank bottles, and the proper preservative added, if required.

- If the required filtration is not done in-line, the de-ionized or laboratory reagent-quality water will be exposed to the air, poured into prefiltration bottles, filtered (as required), placed in the field blank bottles, and the proper preservative added, if required.

The location where the field blank is prepared must be identified on a FSDS, along with any observations that might help explain anomalous results (e.g., prevailing wind direction, upwind potential sources of contamination). After a field blank is collected, it will be handled and shipped in the same manner as the rest of the samples. Field blank results are reported in the laboratory results as separate samples.

8.4.3 Equipment Blanks

Equipment blanks are prepared only if nondedicated sampling equipment is used. The purpose of the equipment blank is to detect any contamination that is introduced to a sample by the equipment. Equipments blank are collected and analyzed for every sampling parameter once per sampling day or once for every 10 samples, whichever is more frequent.

Decontamination procedures for nondedicated equipment consist of rinsing once with de-ionized or laboratory reagent-quality water, brushing with a non-phosphate soap, and rinsing

with de-ionized or laboratory reagent-quality water, rinsing with a 50:50 solution of methanol and de-ionized water, and finally rinsing with de-ionized water.

After the equipment is decontaminated, more de-ionized or laboratory reagent-quality water is poured onto the cleaned sampling device (e.g., bailer) and collected as the equipment blank. If the analytes for the equipment blank would normally be filtered, the water will be poured into a prefiltration bottle and then filtered. Whether or not it is filtered, the water will be poured into the equipment blank bottles, and the proper preservative added, if required.

The location where the equipment blank is prepared must be identified on a FSDS, along with any observations that might help explain anomalous results. After collecting an equipment blank, it will be handled and shipped in the same manner as the rest of the samples. The equipment blank results will be reported in the laboratory results as separate samples.

8.5 Laboratory Analytical Parameters and Procedures

Laboratory samples will be analyzed by TestAmerica located in Phoenix, Arizona, or another analytical laboratory if necessary. Table 8-1 gives the list of the parameters that are specified in 40 CFR §258 for laboratory testing of groundwater, and shows the proposed analytical methods. The analytical methods to be used for the parameters in the monitoring program are also summarized in Table 8-1. All the methods are approved by the USEPA per Publication Number SW-846, Test Methods for Evaluating Solid Waste-Physical/Chemical Methods.

8.5.1 QA/QC Procedures

The quality assurance program for TestAmerica is described in their Quality Assurance Project Plan (QAPP), maintained at the laboratory.

8.6 Laboratory Data Review

Laboratory data will be reviewed to determine whether the data meet QC requirements. Data review, at a minimum, will consist of the following:

- Cross-checking analyses requested in chain-of-custody documentation against analyses listed as performed in the laboratory report.

- Preliminary data-proofing for anomalies (e.g., typographic errors, surrogate recoveries, matrix spike duplicate, relative percent difference, matrix spike percent recovery calculations, and laboratory control samples) and correcting anomalies by contacting the laboratory for explanation, when reasonably possible.

8.7 Reporting

Environmental monitoring data collected will be maintained as part of the facility operating record and will be available for agency review on request. An annual environmental monitoring report will be prepared for submittal to the ADEQ by June 15 of each calendar year during the duration of monitoring activities. The annual report will be signed and stamped by an Arizona Registered Geologist or Professional Engineer with experience in hydrogeologic investigations. The annual report will present data from the previous four quarters and will include the following:

- Updated water-level information for each sampling event, depicting groundwater flow rates and directions and piezometric water contours.
- Summary of sampling and analysis, field QA/QC, and laboratory QA/QC techniques implemented during the year.
- Copies of applicable information, including field data, laboratory analytical reports (with data validation documentation), and chain-of-custody reports.
- Comparison of the analytical results with applicable state and federal regulatory standards.
- Interpretation of the hydrogeologic and analytical data.

8.8 Point of Compliance

Groundwater flow has been estimated to flow from the east to the west towards wells CEG-2 and CEG-3. For the initial operations of the landfill, the regulatory point of compliance will be CEG-2. The regulatory point of compliance will be maintained a minimum of 150 meters from the western edge of the waste management unit.

8.9 Monitoring Data Review

Groundwater monitoring analytical data results will be reviewed and compared to Alert levels or MCLs as shown in Table 8-1. MRLF will also determine if a statistically significant increase over background levels has occurred. An Alert level is if any detection of any organic compound or if 80% of the MCL for inorganic analytes as detected.

If an Alert level is reached or a statistically significant increase over background is detected for one or more of the constituents listed in Appendix I of 40 CFR §258, then the site will:

(1) place a notice in the operating record indicating which constituents have shown statistically significant changes from background levels, and notify the State director that this notice was placed in the operating record; and

(2) establish an assessment monitoring program meeting the requirements of 40 CFR §258.55 within 90 days.

(3) MRLF will determine if a source other than the landfill caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground-water quality. If MRLF determines that the source is not from the landfill, MRLF will document this demonstration, place a copy of the demonstration in the operating record, and will continue with normal detection monitoring. If, after 90 days, MRLF cannot determine that the source is not landfill related, MRLF will initiate an assessment monitoring program as required in §258.55.

8.9.1 Assessment Monitoring Program

Assessment monitoring is required whenever a statistically significant increase over background has been detected for one or more of the constituents listed in the Appendix I of 40 CFR §258 or in the alternative list approved in accordance with 40 CFR §258.54(a)(2).

Within 90 days of triggering an assessment monitoring program, and annually thereafter, MRLF will sample and analyze the ground water for all constituents identified in Appendix II of 40 CFR §258. A minimum of one sample from each downgradient well will be collected and analyzed during each sampling event. For any constituent detected in the downgradient wells as a result of the complete Appendix II analysis, a minimum of four independent samples from each well (background and downgradient) will be collected and analyzed to establish background for the constituents.

9 CLOSURE AND POST-CLOSURE

The following sections provide a brief overview of the conceptual closure and post-closure plans for the facility as required by the ADEQ. A more detailed closure and post-closure plan will be developed prior to closure of the MRLF.

9.1 Final Closure Elevations

Final closure elevations are indicated on Drawings 4 and 5 of the Design Plan Drawings. The elevations shown on these drawings are to the top of final cover; therefore, the top of waste placement will be at least 3.0 feet lower than the elevations shown. Consistent with the approved maximum height for the current landfill design, the peak elevations of the top of final cover will be approximately 2145 feet above mean sea level. The design includes placement of a 2.0-foot monolithic soil cover, with minimum slopes of 5% in sheet flow areas to accommodate drainage. Maximum slopes of the final cover will be 3:1.

The schedule for closure will be based on waste receipts at the site but is not anticipated to occur in the near future. The site may perform closure of portions of the landfill in phases; however, the schedule and feasibility for phased closure of the site will be determined by the owner based on a number of factors including cover soil availability, landfill gas control, end use of the site, workface availability, and economic factors.

9.2 Conceptual Stormwater Management

The conceptual surface water management plan is depicted on Drawing 6 of the Design Plan Drawings. As discussed in Section 6.3.1, the stormwater management system for on-site flows is designed to convey flows from the 25-year design storm event to sedimentation basins constructed around the periphery of the landfill.

9.3 Conceptual Closure QA/QC Plan

A conceptual Construction/Quality Assurance (CQA) plan has been included in Appendix V for construction activities at the MRLF including the construction of the final cover system at the landfill. This plan designates responsibilities for quality assurance/quality control for the constructed system to be implemented during the construction process. Because of changes in technology, regulations, and/or design criteria, changes in final designs for this system

may be developed. However, any CQA specifications developed during the final design will be submitted to the ADEQ.

9.4 Closure/Post-Closure Cost Estimates

Estimated costs associated with the closure of the landfill are shown in Appendix Y. Closure costs will be updated annually, as filling activities continue, in accordance with Federal Subtitle D regulations at 40 CFR §258, Subpart G. Following closure of the landfill, Marana Regional Landfill Incorporated will conduct post-closure maintenance of the site for a period of 30 years of post-closure maintenance. As discussed in Section 3.1, Marana Regional Landfill Incorporated will be responsible for all closure and post-closure requirements at the MRLF site. The information is presented in support of the financial assurance documentation shown in Appendix F.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

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TABLES

Table 7-1 Water Level Data

Marana Groundwater Well Elevations

Date	Time	Elevation of Sounding Mark CEG #1	Depth to Water CEG #1	Water Elevation CEG #1	Elevation of Sounding Mark CEG #2	Depth to Water CEG #2	Water Elevation CEG #2
1/12/2011							
1/14/2011	12:40 PM	1978.34203	32.00	1946.34			
1/14/2011	1:30 PM	1978.34203	51.00	1927.34			
1/14/2011	3:15 PM	1978.34203	51.00	1927.34			
1/15/2011	5:00 PM	1978.34203	172.50	1805.84			
1/16/2011	5:00 PM	1978.34203	179.50	1798.84			
1/17/2011	8:00 AM	1978.34203	180.30	1798.04			
1/17/2011	4:15 PM	1978.34203					
1/18/2011	9:00 AM	1978.34203	178.00	1800.34			
1/18/2011	4:30 PM	1978.34203					
1/19/2011	8:15 AM	1978.34203	175.00	1803.34			
1/19/2011	7:15 PM	1978.34203					
1/20/2011	11:00 AM	1978.34203	187.00	1791.34			
1/21/2011	8:00 AM	1978.34203	180.00	1798.34			
1/21/2011	3:00 PM	1978.34203					
1/24/2011	8:45 AM	1978.65	176.25	1802.40			
1/25/2011	8:35 AM	1978.65	182.00	1796.65	1976.09	185.46	1790.63
1/26/2011	9:00 AM	1978.65	181.08	1797.57	1976.09	187.00	1789.09
1/27/2011	8:30 AM	1978.65	181.42	1797.23	1976.09	187.08	1789.01
1/28/2011	10:00 AM	1978.65	181.33	1797.32	1976.09	184.92	1791.17
1/31/2011	9:00 AM	1978.65	181.33	1797.32	1975.83	184.58	1791.25
2/1/2011	9:00 AM	1978.65	181.25	1797.40	1975.83	184.58	1791.25
2/2/2011	10:00 AM	1978.65	181.50	1797.15	1975.83	185.08	1790.75
2/3/2011	12:15 PM	1978.65	181.67	1796.98	1975.83	185.25	1790.58
2/4/2011	10:45 AM	1978.65	181.50	1797.15	1975.83	184.83	1791.00
2/7/2011	10:00 AM	1978.65	181.42	1797.23	1975.83	184.50	1791.33
2/8/2011	9:45 AM	1978.65	180.83	1797.82	1975.83	184.33	1791.50
2/9/2011	8:15 AM	1978.65					
2/9/2011	9:45 AM	1978.65	181.58	1797.07	1975.83	184.67	1791.17
2/10/2011	10:40 AM	1978.65	182.00	1796.65	1975.83	184.67	1791.17
2/28/2011	9:00 AM	1978.65	180.67	1797.98	1975.83	184.75	1791.08
3/18/2011	9:00 AM	1978.65	180.67	1797.98	1975.83	184.58	1791.25
3/21/2011	10:00 AM	1978.60	180.38	1798.23	1976.12	184.50	1791.62
4/6/2011	9:00 AM	1978.60	180.67	1797.94	1976.12	184.50	1791.62
4/13/2011	10:00 AM	1978.60	180.92	1797.69	1976.12	184.58	1791.53

Table 7-1 Water Level Data

Marana Groundwater Well Elevations

Date	Time	Elevation of Sounding Mark CEG #3	Depth to Water CEG #3	Water Elevation CEG #3	Elevation of Sounding Mark CEG #4	Depth to Water CEG #4	Water Elevation CEG #4
1/12/2011							
1/14/2011	12:40 PM						
1/14/2011	1:30 PM						
1/14/2011	3:15 PM						
1/15/2011	5:00 PM						
1/16/2011	5:00 PM						
1/17/2011	8:00 AM						
1/17/2011	4:15 PM						
1/18/2011	9:00 AM						
1/18/2011	4:30 PM						
1/19/2011	8:15 AM						
1/19/2011	7:15 PM						
1/20/2011	11:00 AM						
1/21/2011	8:00 AM						
1/21/2011	3:00 PM						
1/24/2011	8:45 AM						
1/25/2011	8:35 AM						
1/26/2011	9:00 AM						
1/27/2011	8:30 AM						
1/28/2011	10:00 AM						
1/31/2011	9:00 AM	1967.2462	167.67	1799.58			
2/1/2011	9:00 AM	1967.2462	172.92	1794.33			
2/2/2011	10:00 AM	1967.2462	175.83	1791.41			
2/3/2011	12:15 PM	1967.5	175.00	1792.50			
2/4/2011	10:45 AM	1967.5	174.75	1792.75			
2/7/2011	10:00 AM	1967.5	174.33	1793.17			
2/8/2011	9:45 AM	1967.5	174.17	1793.33			
2/9/2011	8:15 AM				1965.86	74.50	1891.36
2/9/2011	9:45 AM	1967.5	174.50	1793.00			
2/10/2011	10:40 AM	1967.5	174.33	1793.17	1965.86	84.08	1881.77
2/28/2011	9:00 AM	1967.5	171.67	1795.83	1966.03	168.67	1797.37
3/18/2011	9:00 AM	1967.5	174.50	1793.00	1966.03	168.75	1797.28
3/21/2011	10:00 AM	1967.56	174.38	1793.18	1965.99	168.42	1797.58
4/6/2011	9:00 AM	1967.56	174.58	1792.98	1965.99	168.58	1797.41
4/13/2011	10:00 AM	1967.56	174.58	1792.98	1965.99	168.67	1797.33

Table 7-1 Water Level Data

Marana Groundwater Well Elevations

Date	Time	Elevation of East Ag Well	Survey Elevation 1982.18 East Ag	Water Elevation East Ag	Elevation of West Ag Well	Survey Elevation 1982.64 West Ag	Water Elevation West Ag
1/12/2011		1982.18	189.30	1792.88	1982.64	193.00	1789.64
1/14/2011	12:40 PM						
1/14/2011	1:30 PM						
1/14/2011	3:15 PM	1982.18	189.30	1792.88	1982.64	193.00	1789.64
1/15/2011	5:00 PM	1982.18	189.30	1792.88			
1/16/2011	5:00 PM						
1/17/2011	8:00 AM	1982.18	189.80	1792.38	1982.64	194.40	1788.24
1/17/2011	4:15 PM	1982.18	189.80	1792.38	1982.64	194.30	1788.34
1/18/2011	9:00 AM	1982.18	190.00	1792.18	1982.64	193.00	1789.64
1/18/2011	4:30 PM	1982.18	190.17	1792.01	1982.64	193.42	1789.22
1/19/2011	8:15 AM				1982.64	194.17	1788.47
1/19/2011	7:15 PM	1982.18	191.08	1791.10			
1/20/2011	11:00 AM	1982.18	190.08	1792.10	1982.64	194.92	1787.72
1/21/2011	8:00 AM						
1/21/2011	3:00 PM	1982.18	190.58	1791.60	1982.64	195.00	1787.64
1/24/2011	8:45 AM	1982.18	190.25	1791.93	1982.64	195.00	1787.64
1/25/2011	8:35 AM	1982.18	190.38	1791.81	1982.64	195.00	1787.64
1/26/2011	9:00 AM	1982.18	190.25	1791.93	1982.64	194.33	1788.31
1/27/2011	8:30 AM	1982.18	191.42	1790.76	1982.64	194.75	1787.89
1/28/2011	10:00 AM	1982.18	190.42	1791.76	1982.64	194.75	1787.89
1/31/2011	9:00 AM	1982.18	190.42	1791.76	1982.64	195.08	1787.56
2/1/2011	9:00 AM	1982.18	190.58	1791.60	1982.64	194.58	1788.06
2/2/2011	10:00 AM	1982.18	190.92	1791.26	1982.64	195.58	1787.06
2/3/2011	12:15 PM	1982.18	191.00	1791.18	1982.64	195.50	1787.14
2/4/2011	10:45 AM	1982.18	191.17	1791.01	1982.64	193.75	1788.89
2/7/2011	10:00 AM	1982.18	190.00	1792.18	1982.64	194.33	1788.31
2/8/2011	9:45 AM	1982.18	190.00	1792.18	1982.64	194.33	1788.31
2/9/2011	8:15 AM						
2/9/2011	9:45 AM	1982.18	190.25	1791.93	1982.64	194.42	1788.22
2/10/2011	10:40 AM	1982.18	193.25	1788.93	1982.64	193.00	1789.64
2/28/2011	9:00 AM	1982.18	189.67	1792.51	1982.64	193.75	1788.89
3/18/2011	9:00 AM	1982.18	190.08	1792.10	1982.64	194.42	1788.22
3/21/2011	10:00 AM	1982.18	190.33	1791.85	1982.64	195.25	1787.39
4/6/2011	9:00 AM						
4/13/2011	10:00 AM						

Table 7-2

Groundwater Quality for City of Tucson Former Irrigation Wells AF-008A, AF-012A, AF-013A, and AF-018A

Summary of Detections, Concentration Range of Detected Parameters

Data Source: Water Quality.xls

PARAMETER NAME	UNITS	AF-008A	AF-012A	AF-013A	AF-018A
ALKALINITY, BICARBONATE	MG/L	118.130 - 118.130	105.004 - 164.069	143.970 - 156.686	111.600 - 134
ALKALINITY, TOTAL	MG/L	118.130 - 118.130	105.004 - 164.069	143.970 - 156.686	111.600 - 134
ARSENIC	MG/L	-	-	-	-
BARIUM	MG/L	-	-	-	-
BIS(2-ETHYLHEXYL) PHTHALATE	MG/L	-	-	-	-
BORON	MG/KG	-	-	-	-
BORON	MG/L	-	-	-	-
BROMIDE	MG/L	-	-	-	-
BROMODICHLOROMETHANE	mg/L	-	-	-	-
BROMOFORM	mg/L	-	-	-	-
CAFFEINE	ng/L	-	-	-	-
CALCIUM	MG/L	38 - 38	110 - 30	103 - 51	105 - 39
CARBAMAZEPINE	ng/L	-	-	-	-
CHLORIDE	MG/L	14 - 14	147 - 20	130 - 80	199 - 36
CHLORINE RESIDUAL, TOTAL	MG/L	-	-	-	-
CHLORINE, FREE	MG/L	-	-	-	-
CHLORODIBROMOMETHANE	mg/L	-	-	-	-
CHOLESTEROL	ng/L	-	-	-	-
CHROMIUM	MG/L	-	-	-	-
COLILERT MPN (Q-TRAY),	MPN/100ML	-	-	-	-
CONDUCTIVITY	umhos/cm	-	1019.307 - 935	1020.330 - 714	1013.736 - 962
COPPER	MG/L	-	-	-	-
DI-N-BUTYL PHTHALATE	MG/L	-	-	-	-
DISSOLVED OXYGEN	mg/L	-	-	-	-
ETHYLBENZENE	mg/L	-	-	-	-
FLUORIDE	MG/L	-	0.450 - 0.490	0.200 - 6.800	0.320 - 0.730
GROSS ALPHA ACTIVITY	PCI/L	-	-	-	-
GROSS ALPHA ACTIVITY ADJUSTED	PCI/L	-	-	-	-
GROSS BETA	PCI/L	-	-	-	-
HARDNESS	MG/L	94.886 - 95	274.670 - 75	127.347 - 339.551	122.091 - 97.383
HETEROTROPIC PLATE COUNT	CFU/ml	-	-	-	-
IRON	MG/L	-	-	0.320 - 0.320	0.130 - 0.130
LEAD	MG/L	-	-	-	-
M/P-XYLENES	mg/L	-	-	-	-
MAGNESIUM	MG/L	-	12 - 15	13 - 20	6 - 9
MANGANESE	MG/L	-	-	-	-
METHYLENE CHLORIDE	MG/L	-	-	-	-
NITRATE AS N	MG/L	-	9.500 - 9.500	2.273 - 9.318	2.955 - 7.050
NITRITE AS N	mg/L	-	-	-	-
ORTHO-XYLENE	mg/L	-	-	-	-
PERFLUORO OCTANESULFONATE-PFOS	ng/L	-	-	-	-
PERFLUORO-1-HEXANESULFONIC ACID	ng/L	-	-	-	-
PH	S.U.	-	7.300 - 7.600	7.800 - 7.800	7.300 - 8.200
POTASSIUM	MG/L	-	-	-	-
RADIUM 226 ACTIVITY	PCI/L	-	-	-	-
RADIUM 228 ACTIVITY	PCI/L	-	-	-	-
RADIUM ACTIVITY, COMBINED	PCI/L	-	-	-	-
RADON ACTIVITY	PCI/L	-	-	-	-
SELENIUM	mg/L	-	-	-	-
SILICA	MG/L	-	-	-	-

Table 7-2
Groundwater Quality for City of Tucson Former Irrigation Wells AF-008A, AF-012A, AF-013A, and AF-018A

Summary of Detections, Concentration Range of Detected Parameters
Data Source: Water Quality.xls

PARAMETER NAME	UNITS	AF-008A	AF-012A	AF-013A	AF-018A
SILICON	MG/L	-	-	-	-
SIMAZINE	mg/L	-	-	-	-
SODIUM	MG/L	30 - 30	44 - 76	55 - 63	57 - 59
SULFATE	MG/L	20 - 20	37.500 - 63	40 - 70	19 - 46
TEMPERATURE	Deg. C	-	25 - 25	-	24 - 24
TOLUENE	mg/L	-	-	-	-
TOTAL DISSOLVED SOLIDS	MG/L	246 - 246	376 - 592.506	448 - 606	323 - 640
TOTAL ORGANIC CARBON	mg/L	-	-	-	-
TOTAL PHOSPHATE AS P	mg/L	-	-	-	-
TOTAL SUSPENDED SOLIDS	MG/L	-	-	-	-
TOTAL TRIHALOMETHANES	mg/L	-	-	-	-
TRITIUM ACTIVITY	PCI/L	-	2.880 - 2.880	-	-
TURBIDITY	NTU	-	-	-	-
URANIUM	ug/L	-	-	-	-
URANIUM ACTIVITY	PCI/L	-	-	-	-
VANADIUM	mg/L	-	-	-	-
XYLENES (TOTAL)	mg/L	-	-	-	-
ZINC	MG/L	-	-	-	-

Table 8-1
Sample Analytical Methods, Maximum Method Reporting Levels and Regulatory Limits
Marana Regional Landfill

Analyte	USEPA Method	Maximum MRL (mg/L)	ADEQ Alert Level[a]	Regulatory Limit[b] (mg/L)
Total Trace Metals				
Antimony	200.8/6020	0.001	0.0048	0.006
Arsenic	200.8/6020	0.005	0.04	0.05
Barium	200.8/6020	0.1	1.6	2
Beryllium	200.8/6020	0.001	0.0032	0.004
Cadmium	200.8/6020	0.001	0.004	0.005
Chromium	200.8/6020	0.005	0.04	0.05
Cobalt	200.8/6020	0.01	NL	NL
Copper	200.8/6020	0.1	0.8	1.0[c]
Lead	200.8/6020	0.001	0.008	0.010
Nickel	200.8/6020	0.01	0.08	0.1
Selenium	200.8/6020	0.001	0.04	0.05
Silver	200.8/6020	0.005	NL	NL
Thallium	200.8/6020	0.001	0.0016	0.002
Vanadium	200.8/6020	0.01	NL	NL
Zinc	200.8/6020	0.5	4	5.0
Volatile Organic Compounds	8260B/524.2	0.001[d]	Any detection >MRL	-

Notes: MRL = method reporting limit; mg/L = milligrams per liter; NL = No regulatory limit established.

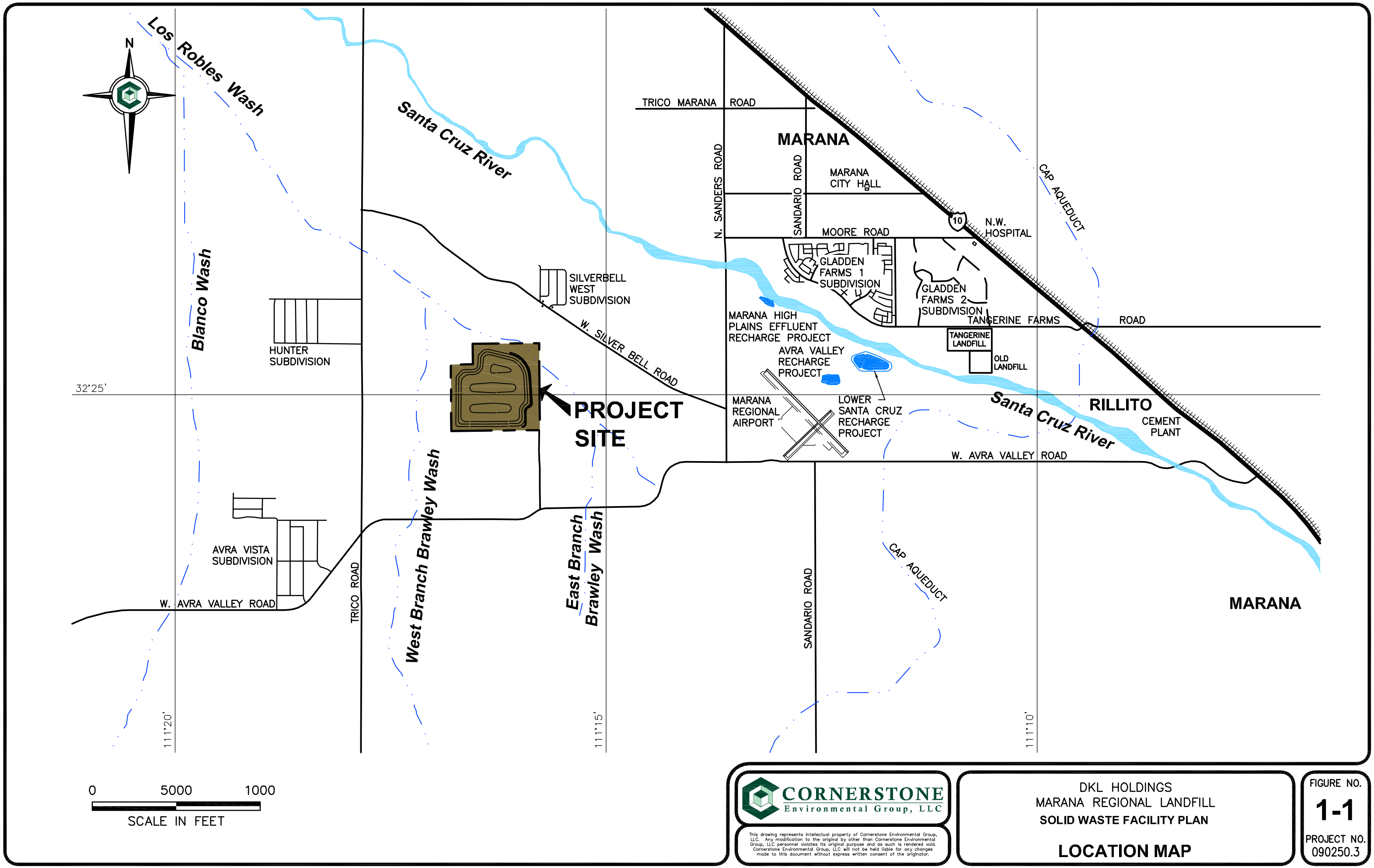
[a] ADEQ alert levels are 80-percent of the MCL and SMCL or any organic compound detecteed above the laboratory method reporting limit

[b] Federal primary drinking water maximum contaminant level (MCL)(USEPA, May 1993).

[c] Federal Secondary drinking water standard (USEPA, May 1993).

[d] For halogenated and aromatic VOCs; unless significant matrix interferences are encountered that would require dilution.

FIGURES



CORNERSTONE Environmental Group, LLC

DKL HOLDINGS
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

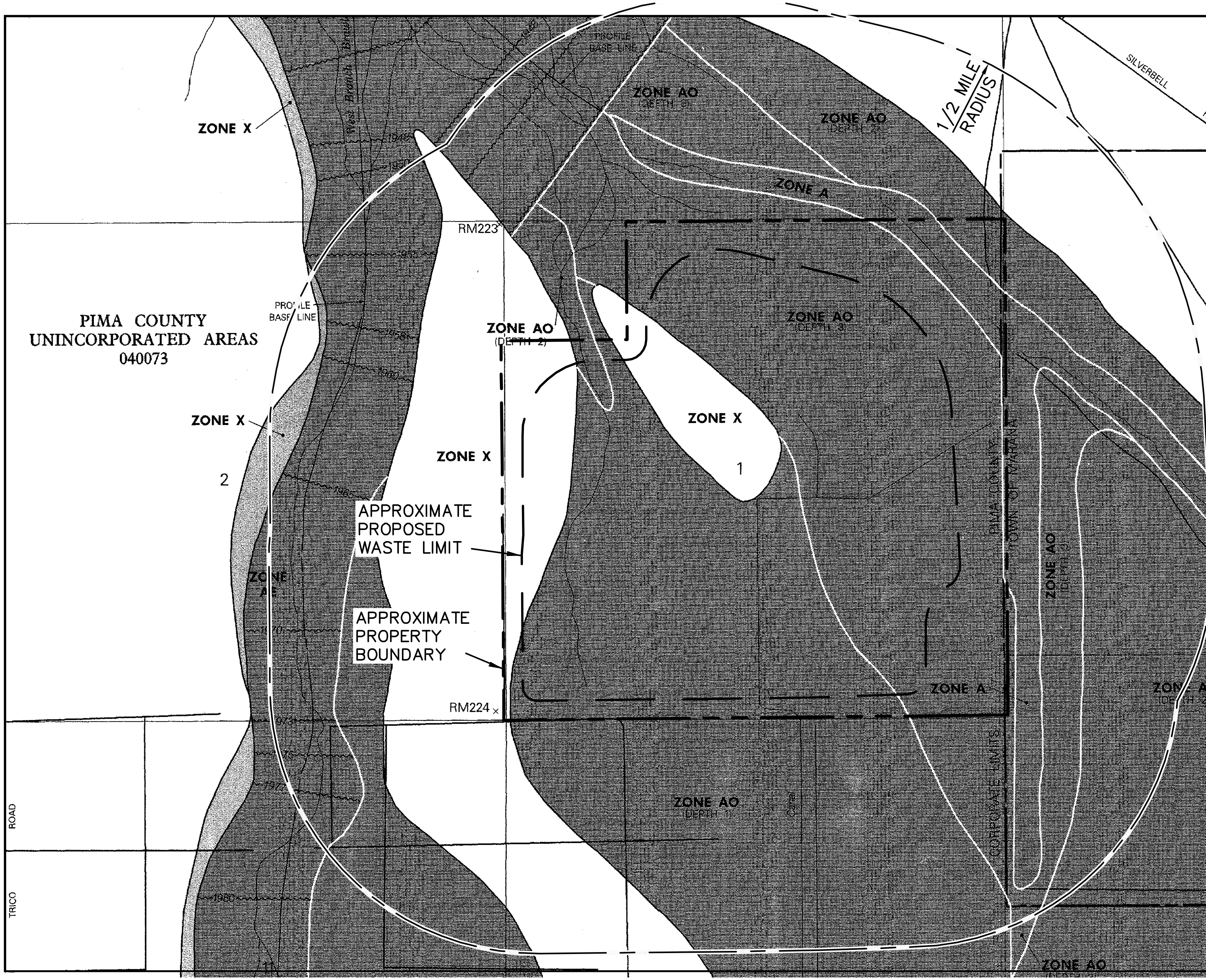
LOCATION MAP

FIGURE NO. **1-1**

PROJECT NO. 090250.3

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPMSWFPS-FIG 1-1_LOCATION MAP.dwg Layout: FIG 1-1 User: Mark.Case May 05, 2011 - 1:23pm

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPMSWFPS-FIG 2-1_FEMA MAP.dwg Layout: FEMA User: Mark.Case May 05, 2011 - 1:25pm



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 970 OF 4700

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
MARANA TOWN OF	040118	0970	K
PIMA COUNTY UNINCORPORATED AREAS	040073	0970	K

MAP NUMBER
04019C0970 K

EFFECTIVE DATE:
FEBRUARY 8, 1999

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

CORNERSTONE
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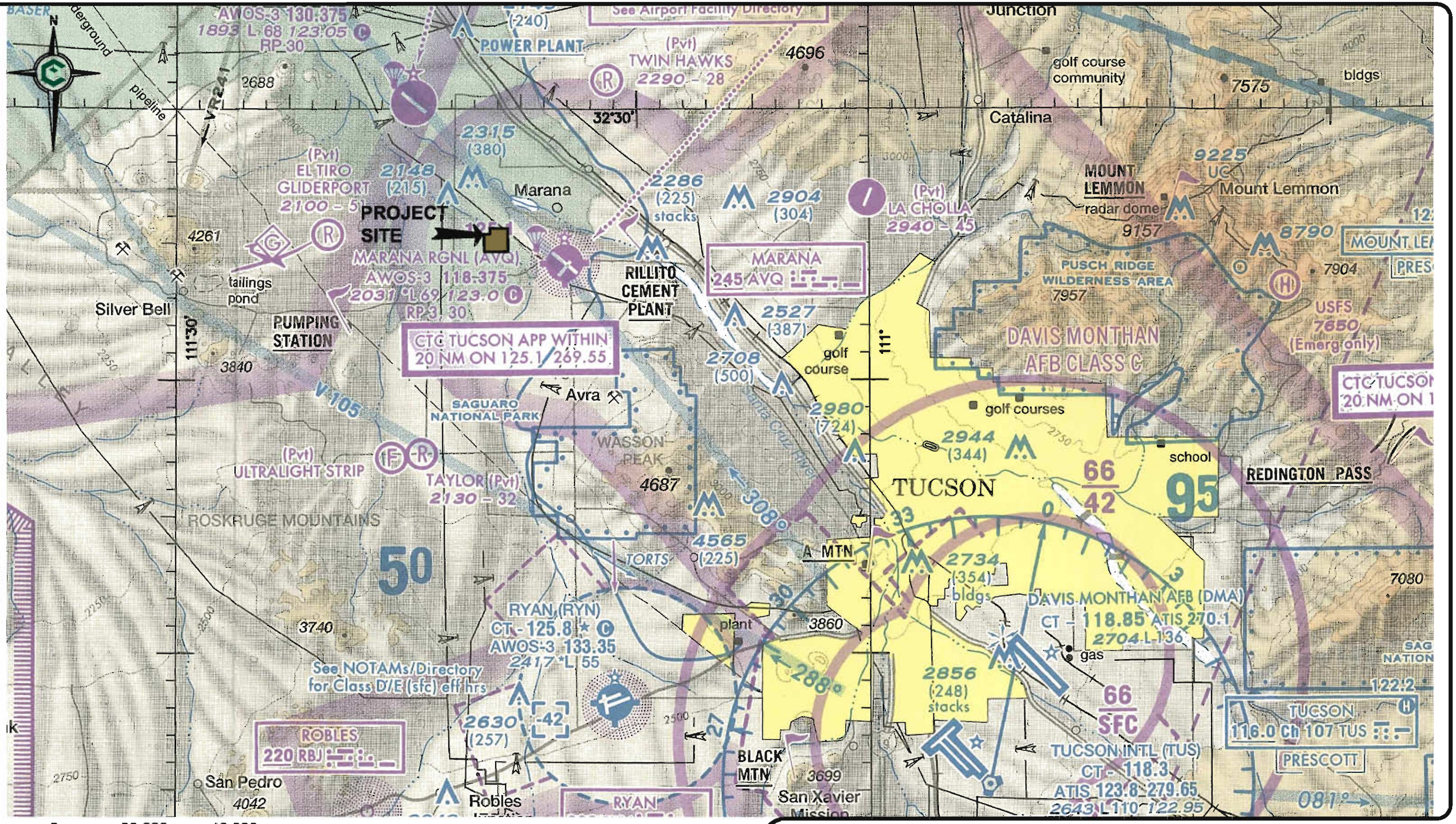
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

FEMA FLOOD INSURANCE RATE MAP

FIGURE NO.
2-1

PROJECT NO.
090250.3



0 20,000 40,000

SCALE IN FEET

0 4 8

SCALE IN MILES

SOURCE: NACO, 2011

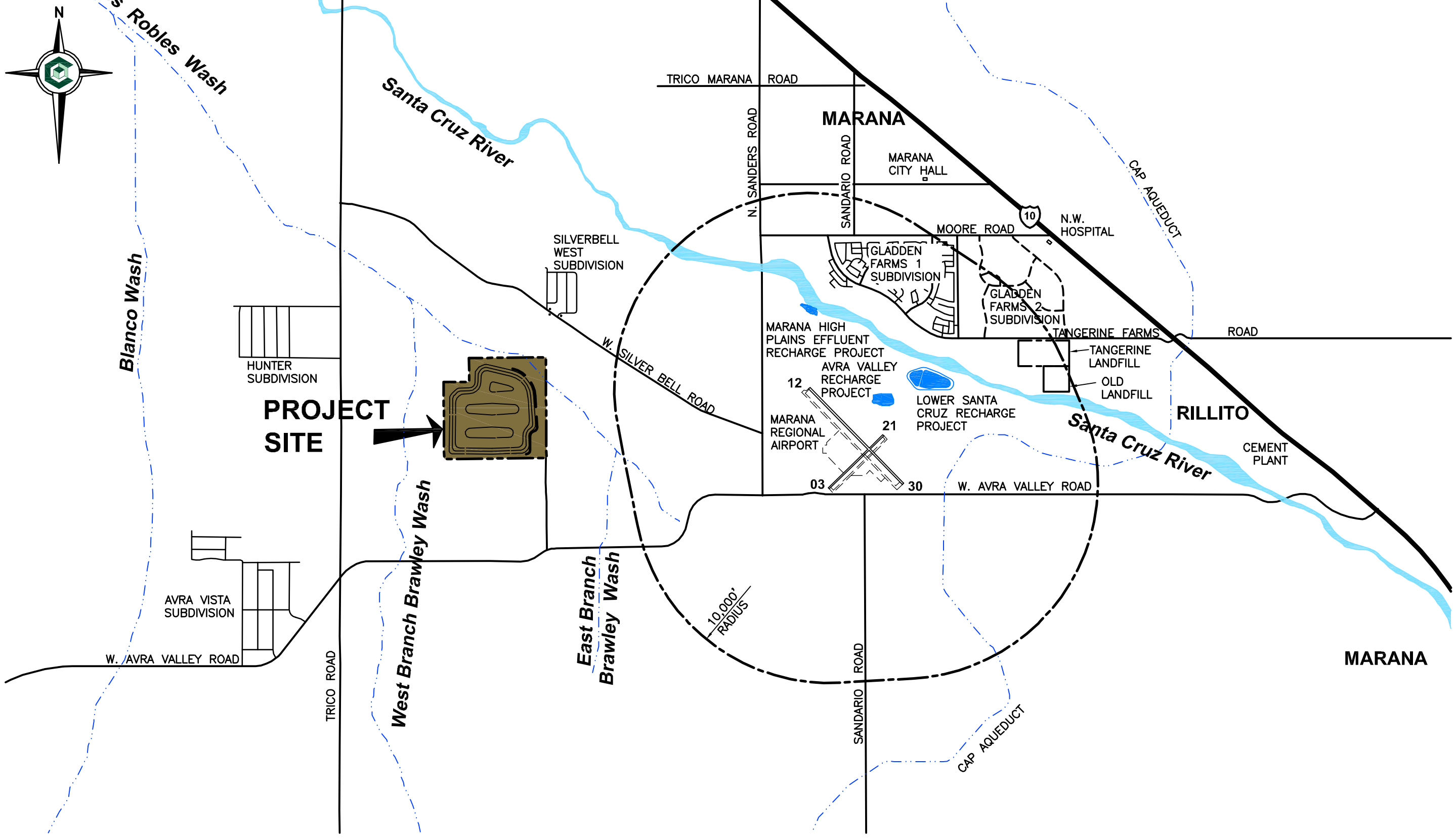
CORNERSTONE Environmental Group, LLC

DKL HOLDINGS
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

FAA LOCATION MAP

FIGURE NO. **2-2**

PROJECT NO. 090250.3



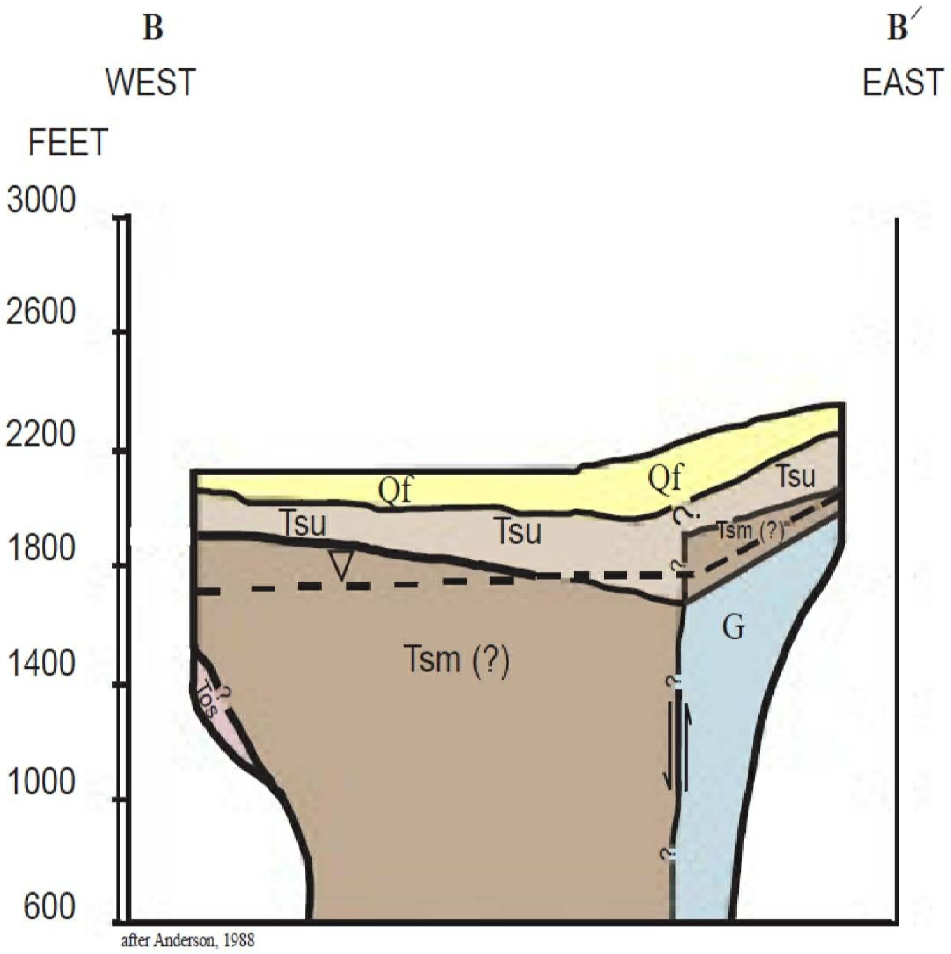
CORNERSTONE Environmental Group, LLC

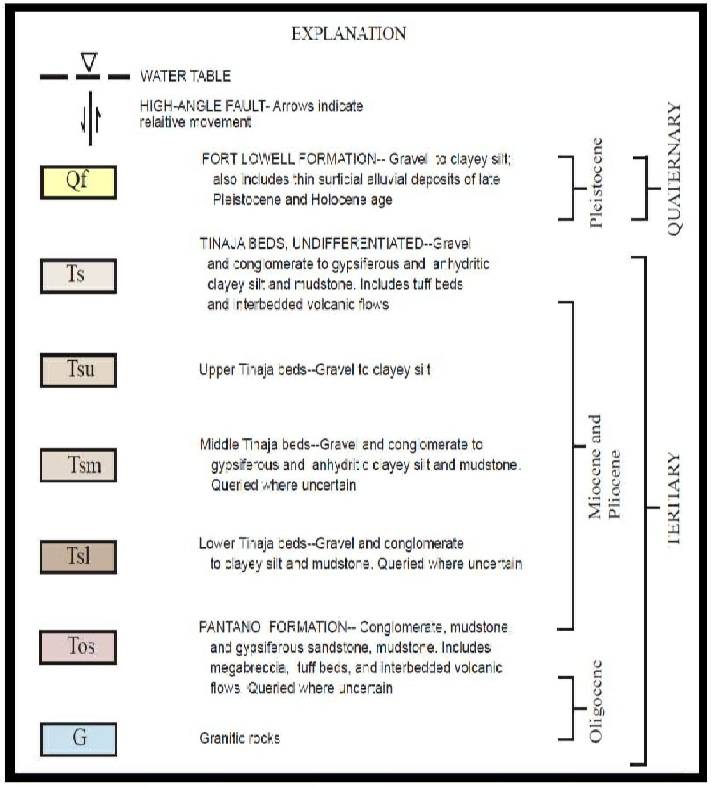
DKL HOLDINGS
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

AIRPORT LOCATION MAP

FIGURE NO. **2-3**

PROJECT NO. 090250.3





SOURCE: REGIONAL GROUNDWATER FLOW MODEL
OF THE TUCSON AMA (MASON, ET.AL. 2006)
FIGURE 4

NOT TO SCALE

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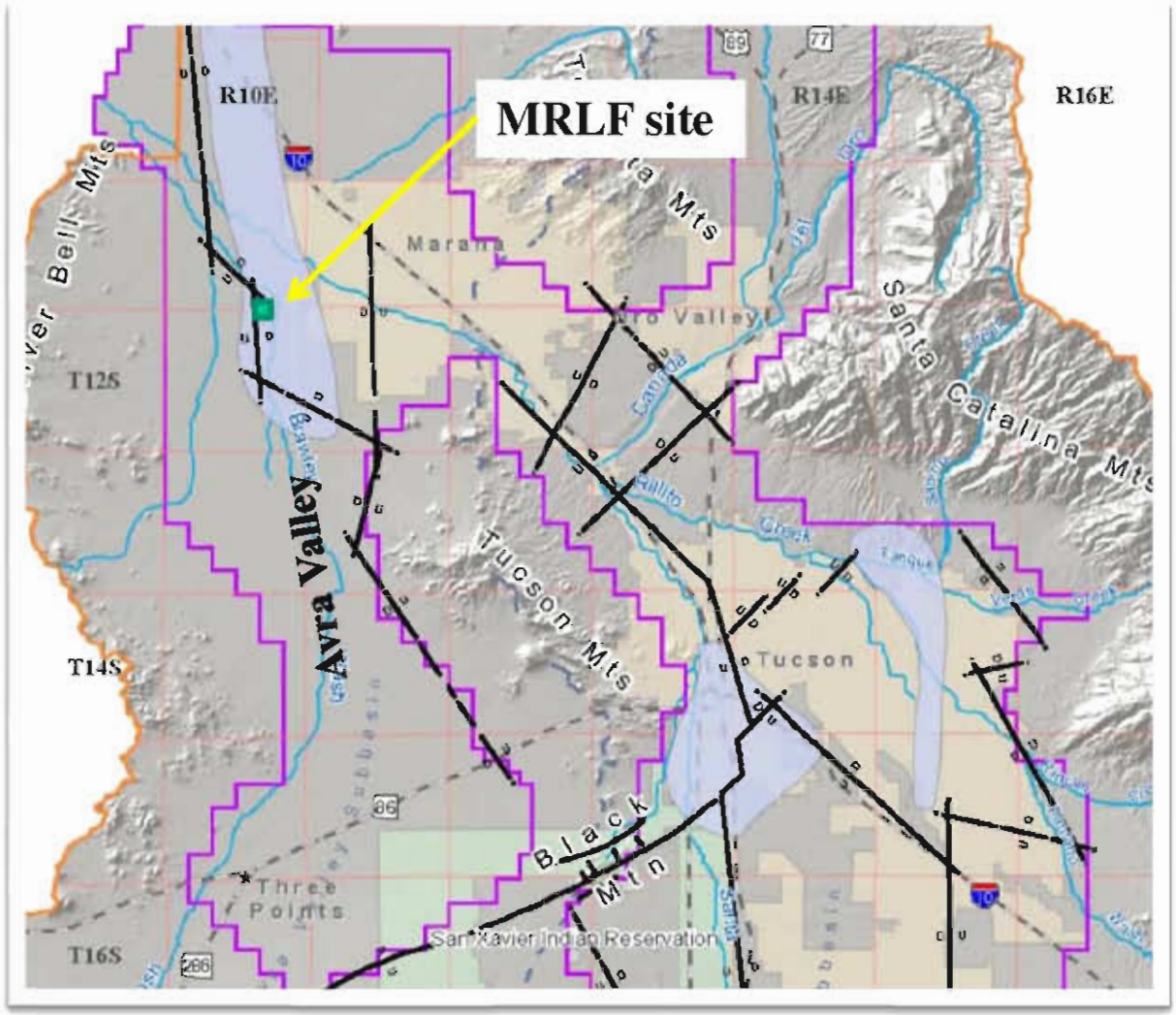
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

REGIONAL GEOLOGY IN THE AVRA VALLEY

FIGURE NO.
7-1
PROJECT NO.
090250



LEGEND

FAULTS

PERCHED AREAS

SOURCE: REGIONAL GROUNDWATER FLOW MODEL OF THE TUCSON AMA (MASON, ET.AL. 2006) FIGURE 5

NOT TO SCALE

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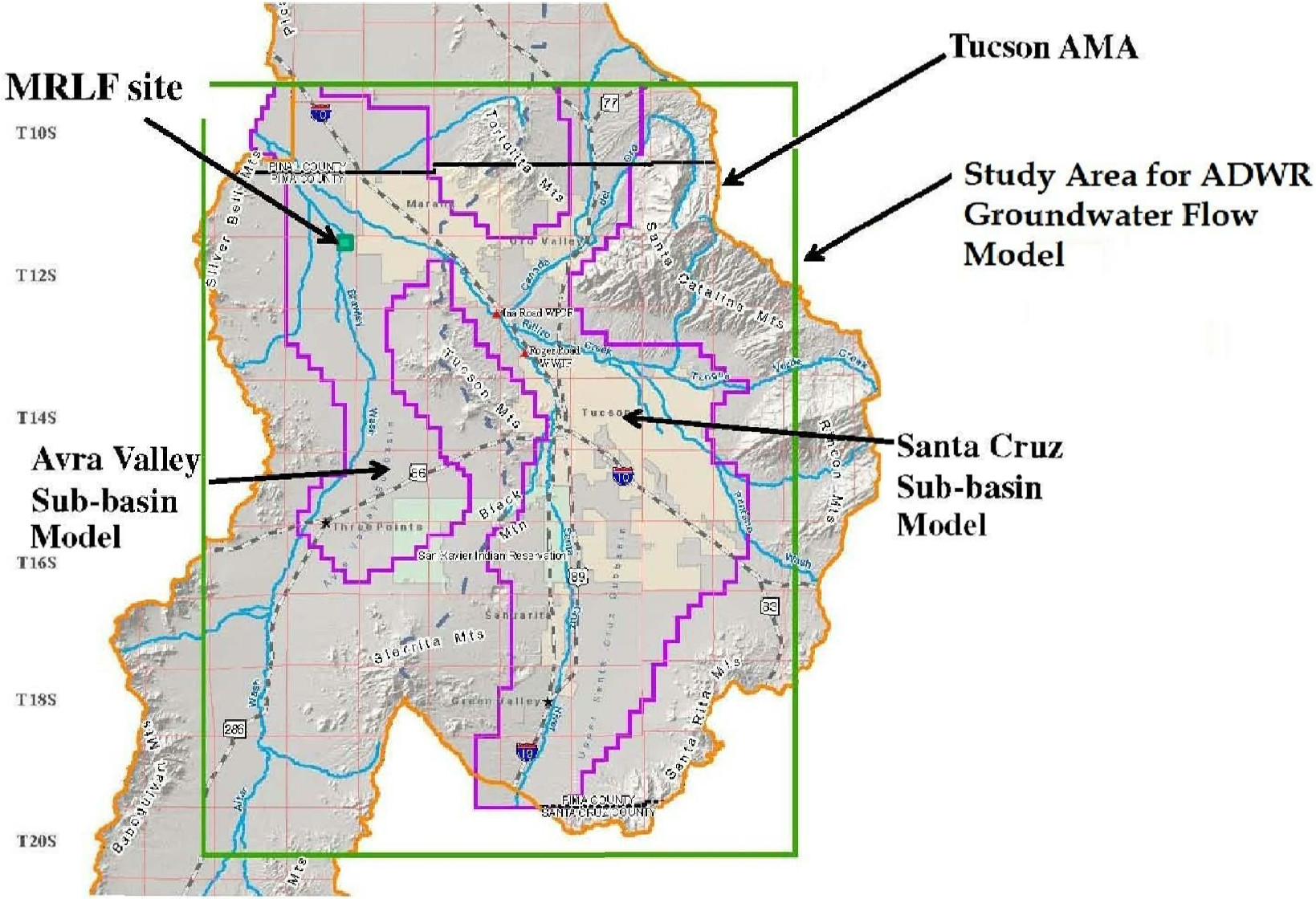
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

LOCATION OF REGIONAL FAULTS AND PERCHED ZONES

FIGURE NO. 7-2

PROJECT NO. 090250



SOURCE: REGIONAL GROUNDWATER FLOW MODEL OF THE TUCSON AMA (MASON, ET.AL. 2006) FIGURE 1

NOT TO SCALE

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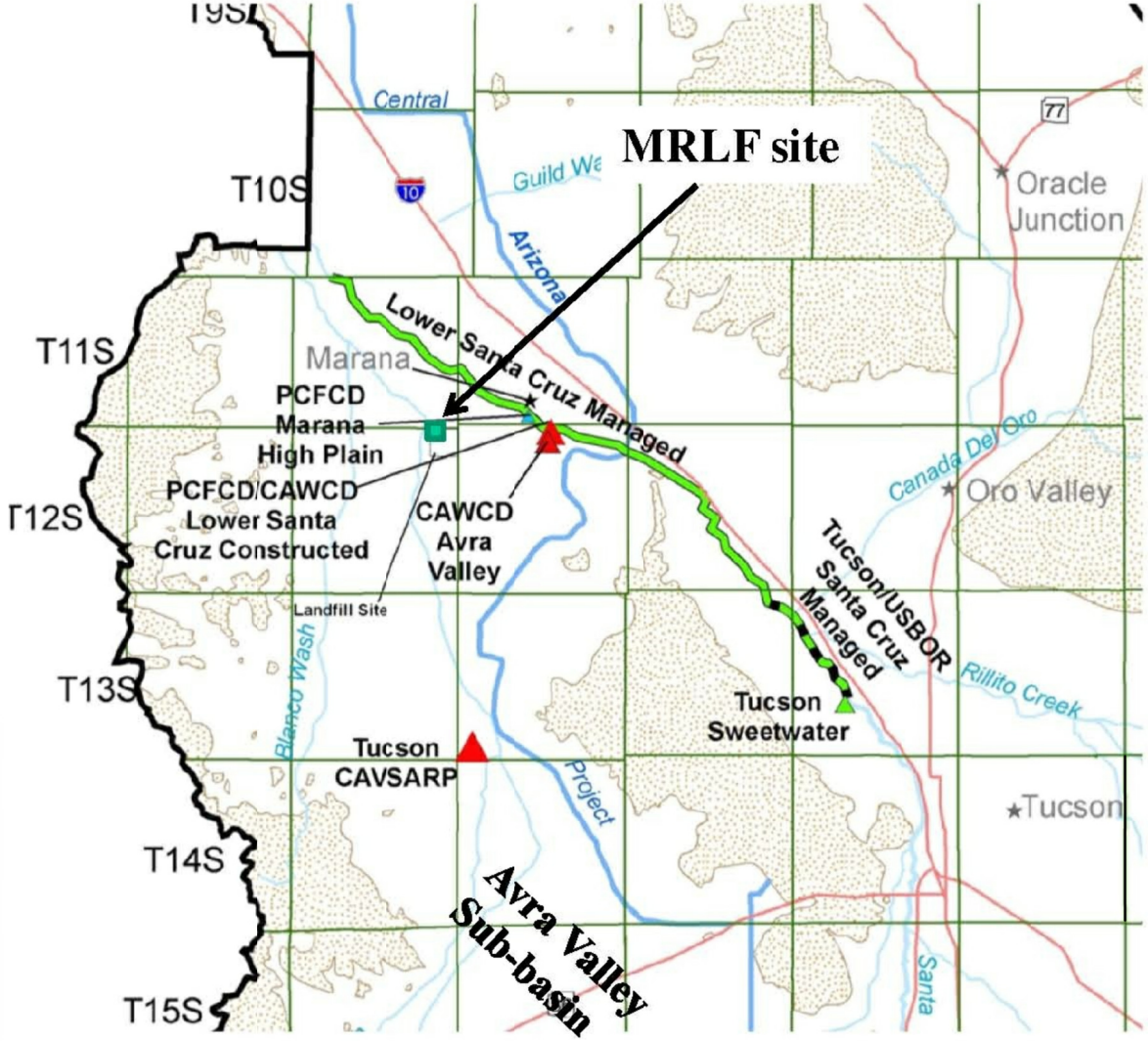
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

LOCATION OF AVRA VALLEY SUB-BASIN WITHIN TUCSON AMA

FIGURE NO. **7-3**

PROJECT NO. 090250



SOURCE: CAP BOARD WORK–STUDY SESSION
(NOV. 19, 2009)

0 3 6
SCALE IN MILES

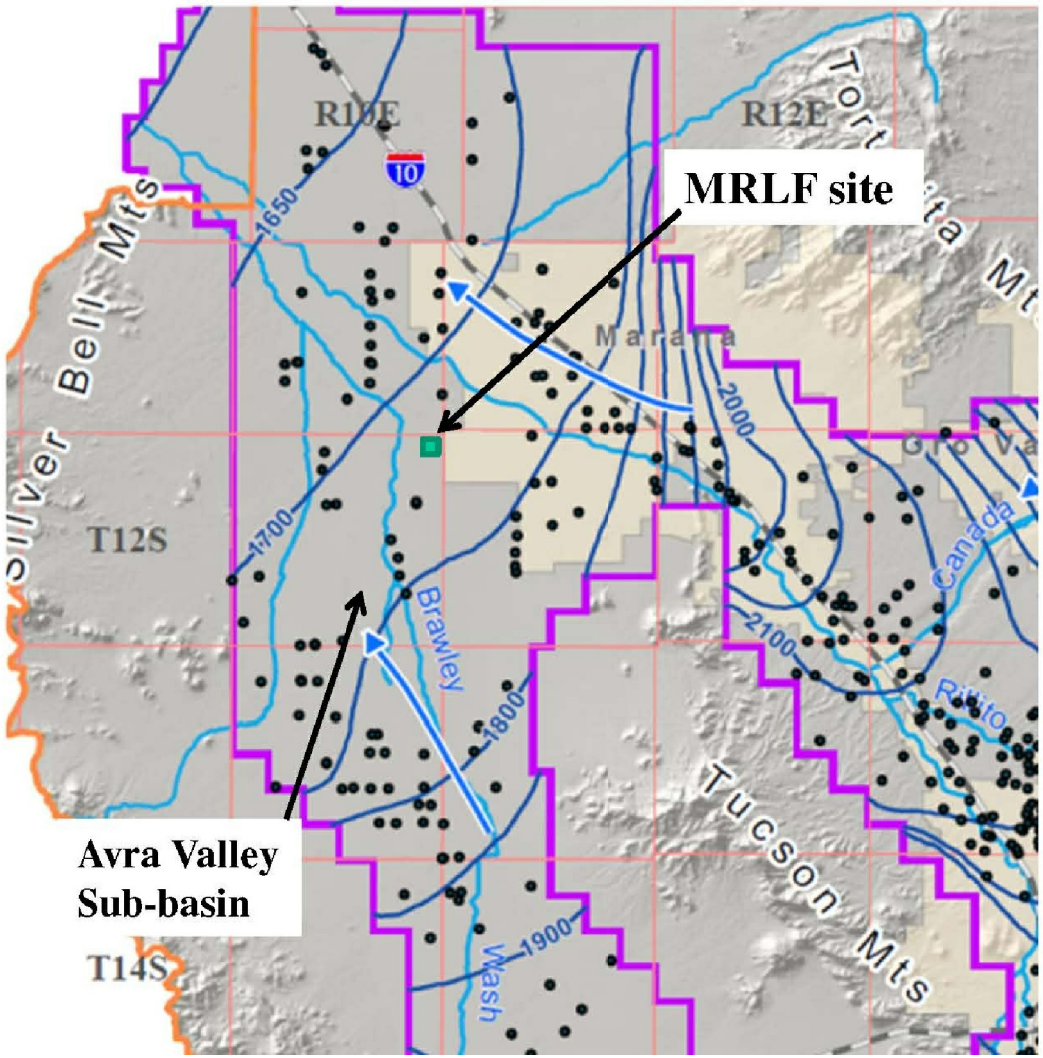
CORNERSTONE
Environmental Group, LLC

DKL HOLDINGS
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

PERMITTED UNDERGROUND SAVINGS FACILITIES NEAR MARANA, AZ

FIGURE NO.
7-4
PROJECT NO.
090250



N

LEGEND

1700 — GROUNDWATER ELEVATION CONTOUR (FT, MSL)

← REGIONAL GROUNDWATER FLOW DIRECTION

SOURCE: REGIONAL GROUNDWATER FLOW MODEL OF THE TUCSON AMA (MASON, ET.AL. 2006) FIGURE 10

NOT TO SCALE

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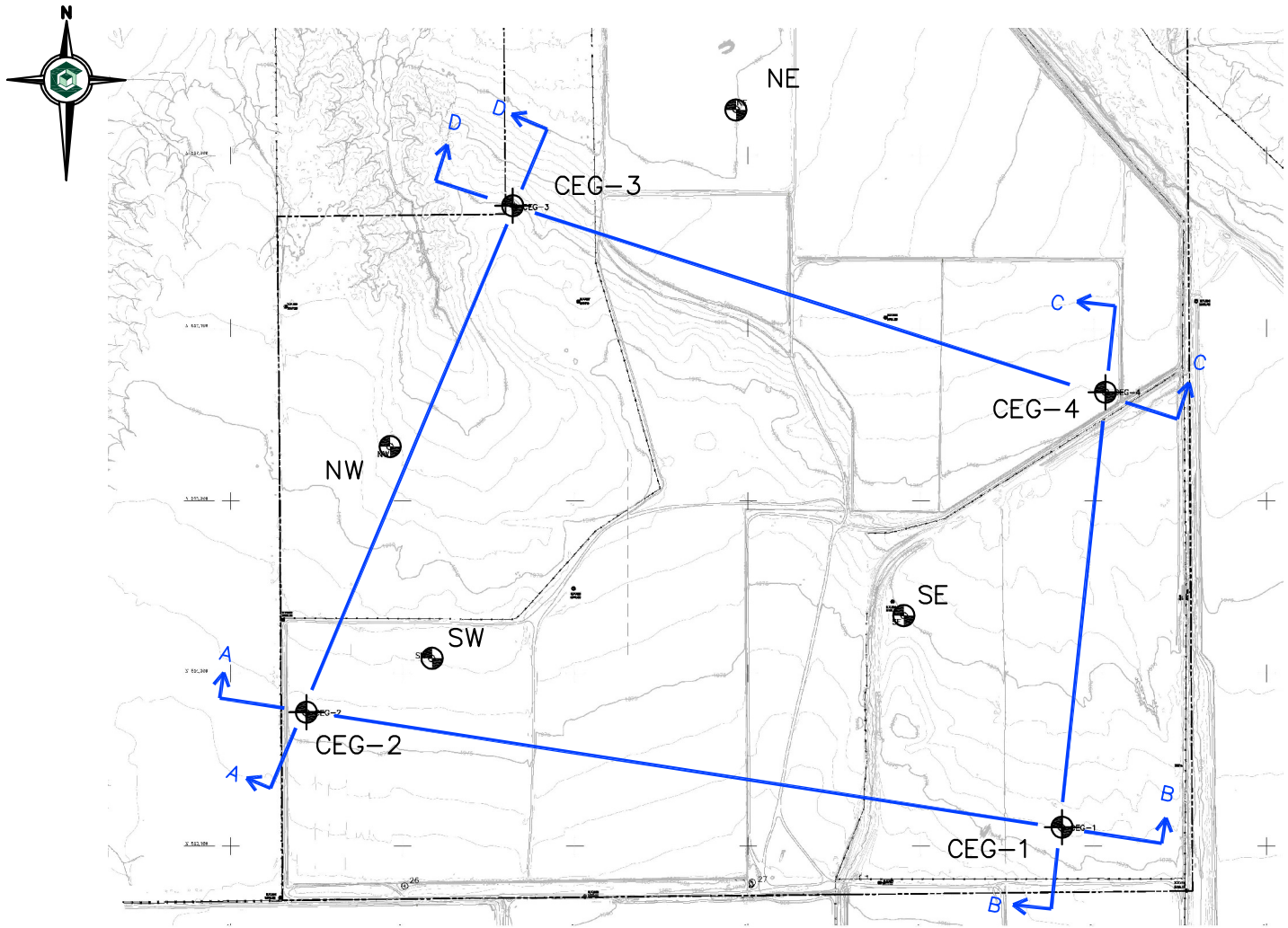
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

GROUNDWATER ELEVATION CONTOURS IN AVRA VALLEY - 2000 BASIN-WIDE SWEEP

FIGURE NO. **7-5**

PROJECT NO. 090250



LEGEND:

- CEG-1 — DEEP TEST BORING MONITORING WELL
- NW — GEOTECHNICAL BORING
- A — B — LINE OF GEOLOGIC CROSS SECTION

0 1000 2000

SCALE IN FEET

CORNERSTONE Environmental Group, LLC

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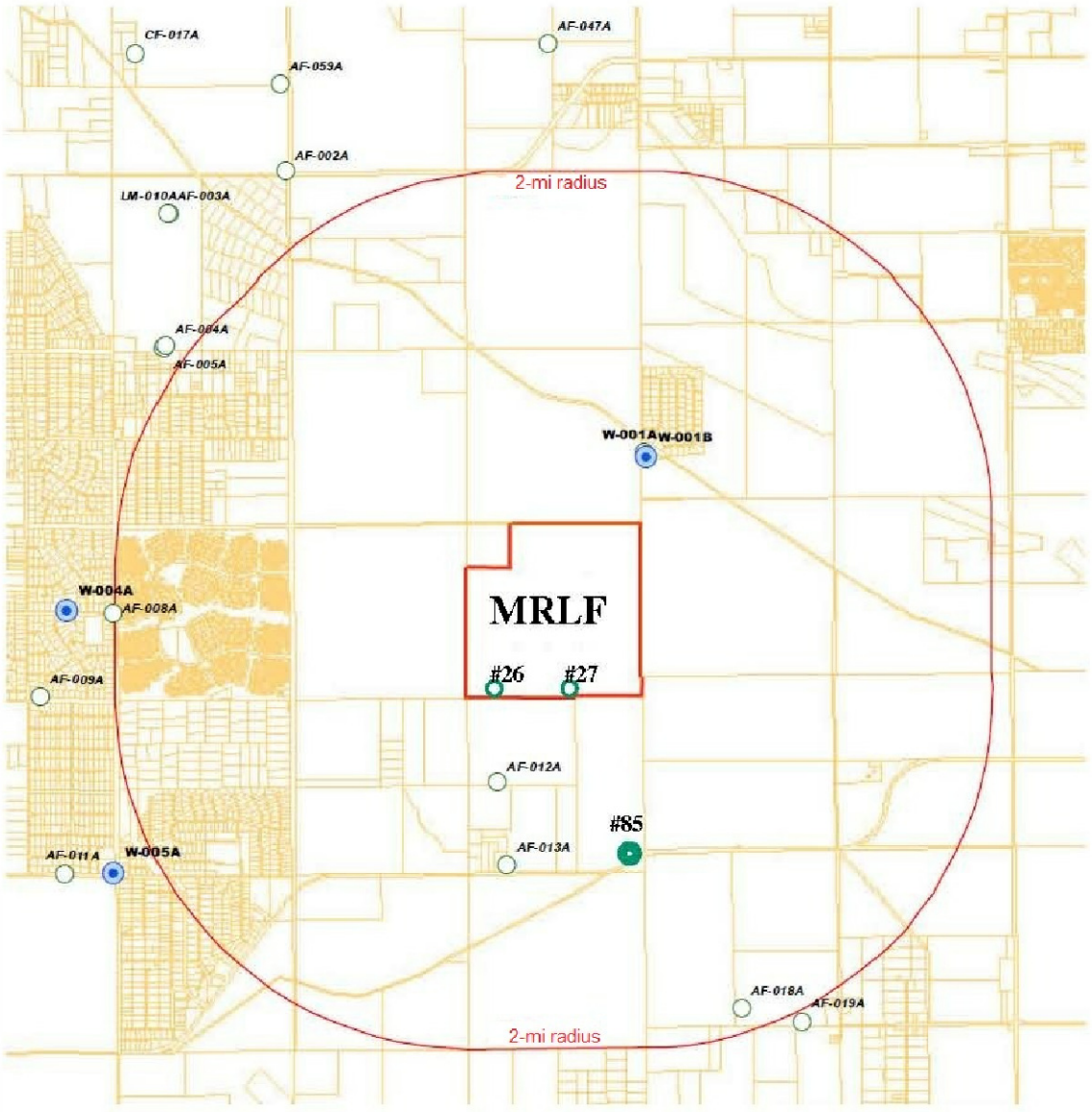
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

LOCATION OF TEST BORINGS MONITORING WELLS AND GEOLOGIC CROSS SECTIONS

FIGURE NO.
7-6
PROJECT NO.
090250



N

LEGEND

- RETIRED IRRIGATION WELL
- ACTIVE IRRIGATION WELL
- POTABLE WATER SUPPLY WELL

0 1/2 1
SCALE IN MILES

CORNERSTONE Environmental Group, LLC

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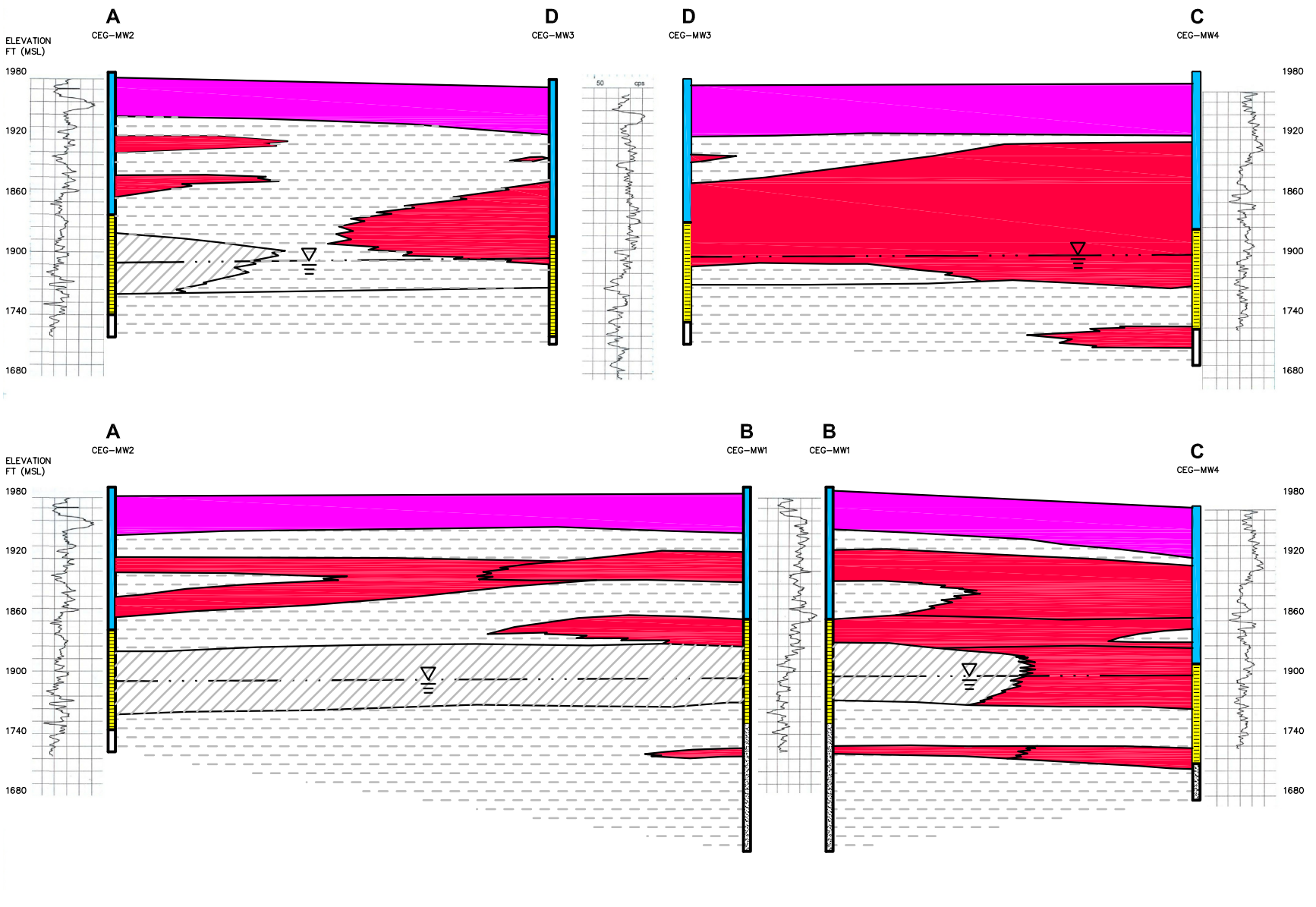
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

LOCATION OF SELECTED IRRIGATION AND WATER SUPPLY WELLS

FIGURE NO.
7-7
PROJECT NO.
090250



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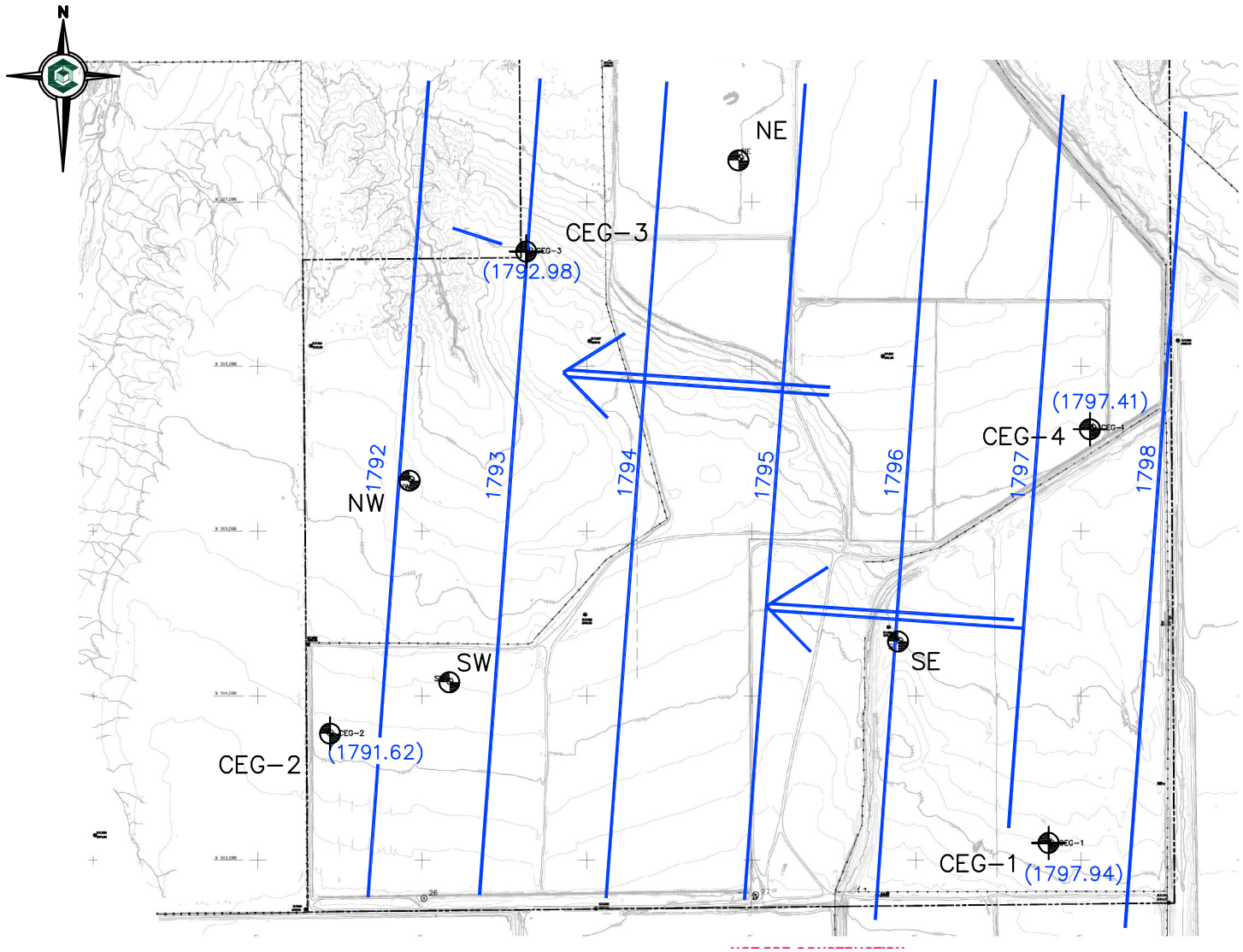
DKL HOLDINGS
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

GEOLOGIC CROSS SECTIONS

FIGURE NO.
7-8
PROJECT NO.
090250



LEGEND:

- CEG-1 — GROUNDWATER MONITORING WELL
- (1797.94) — GROUNDWATER ELEVATION (FT., MSL)
- —1797— GROUNDWATER CONTOUR ELEVATION (FT., MSL)
- GROUNDWATER FLOW DIRECTION

CI = 1.0'

0 1000 2000

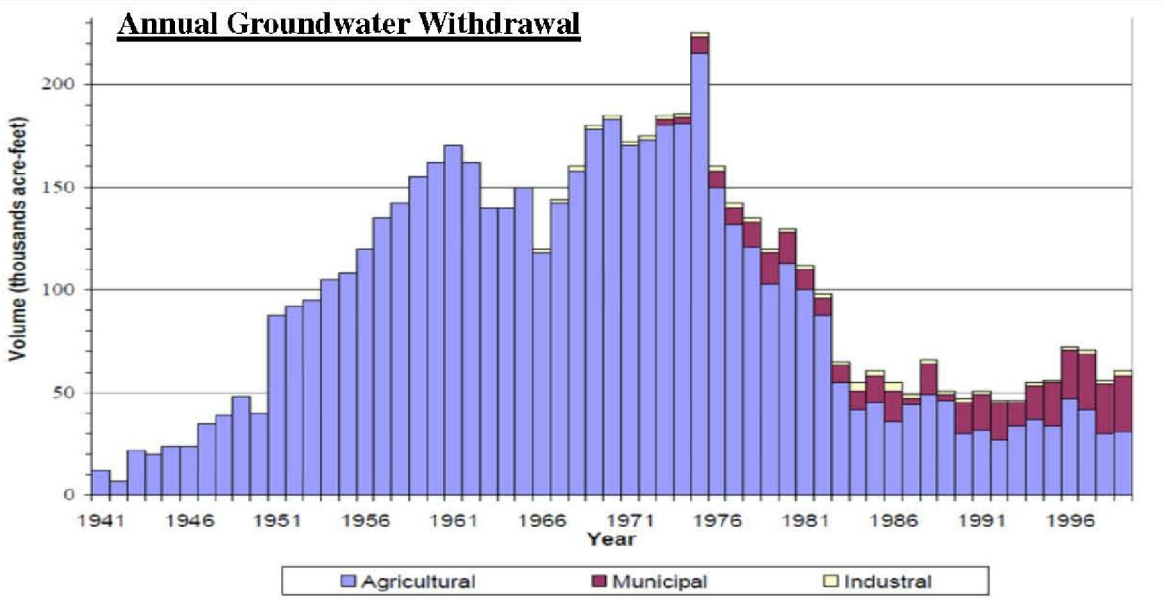
SCALE IN FEET

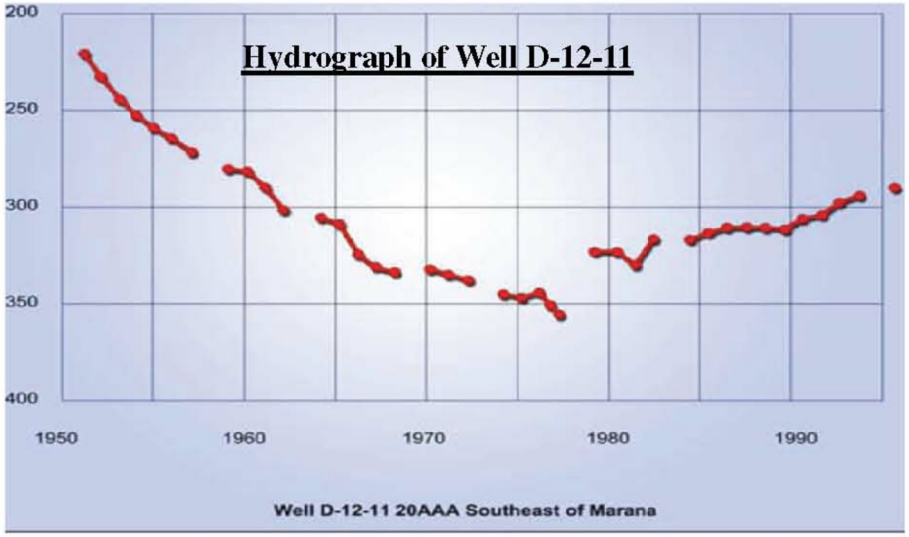
CORNERSTONE Environmental Group, LLC

DKL HOLDINGS
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

GROUND WATER ELEVATIONS (APRIL 6, 2011)

FIGURE NO.
7-9
PROJECT NO.
090250





SOURCE: REGIONAL GROUNDWATER FLOW MODEL OF THE TUCSON AMA (MASON, ET.AL, 2006) FIGURE 14

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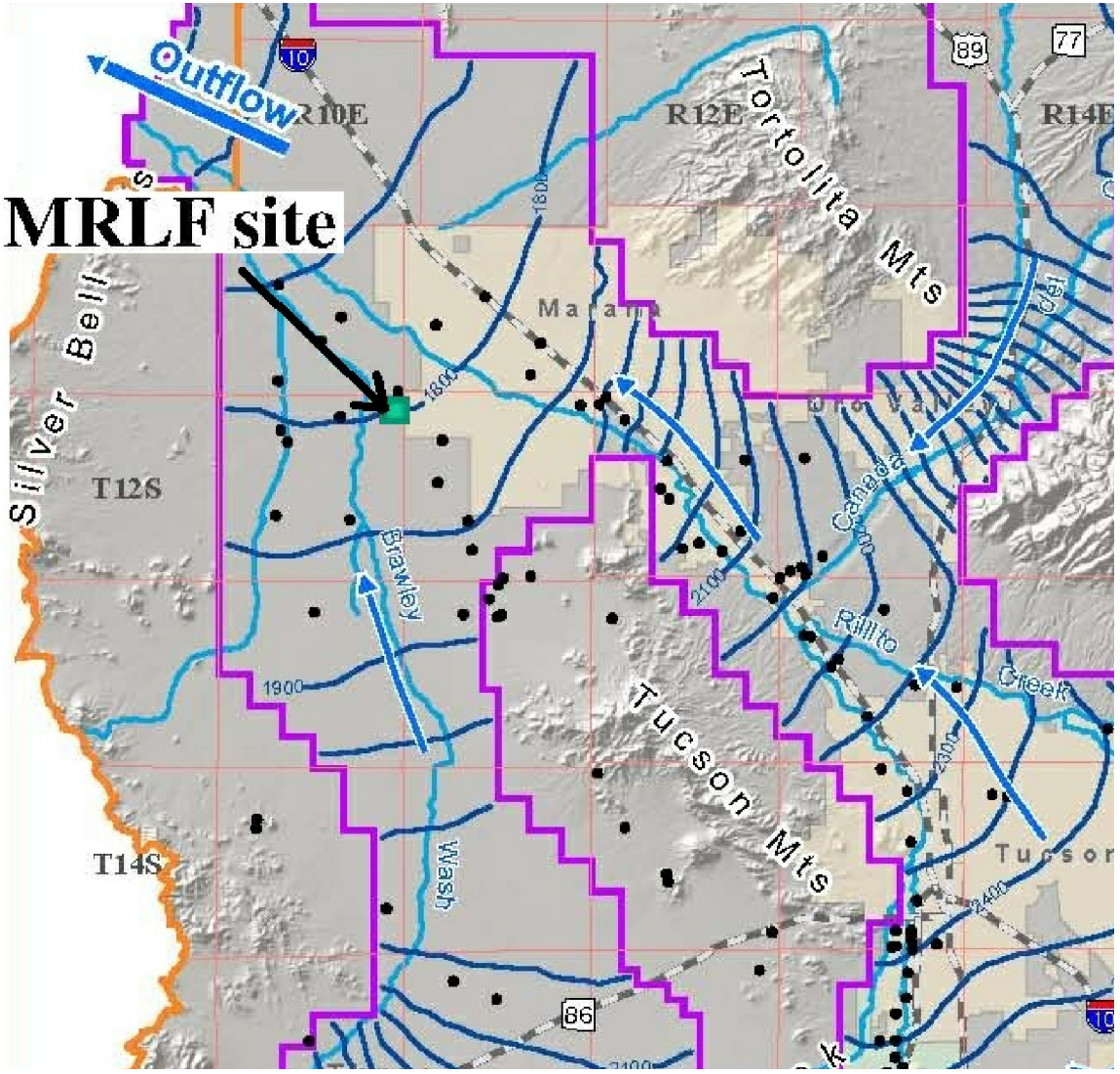
DKL HOLDINGS
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

RELATIONSHIP OF GROUNDWATER WITHDRAWAL IN AVRA VALLEY TO GROUNDWATER ELEVATIONS

FIGURE NO.
7-10
PROJECT NO.
090250



N

LEGEND

1700 — GROUNDWATER ELEVATION CONTOUR (FT, MSL)

← REGIONAL GROUNDWATER FLOW DIRECTION

SOURCE: REGIONAL GROUNDWATER FLOW MODEL OF THE TUCSON AMA (MASON, ET.AL. 2006) FIGURE 8

NOT TO SCALE

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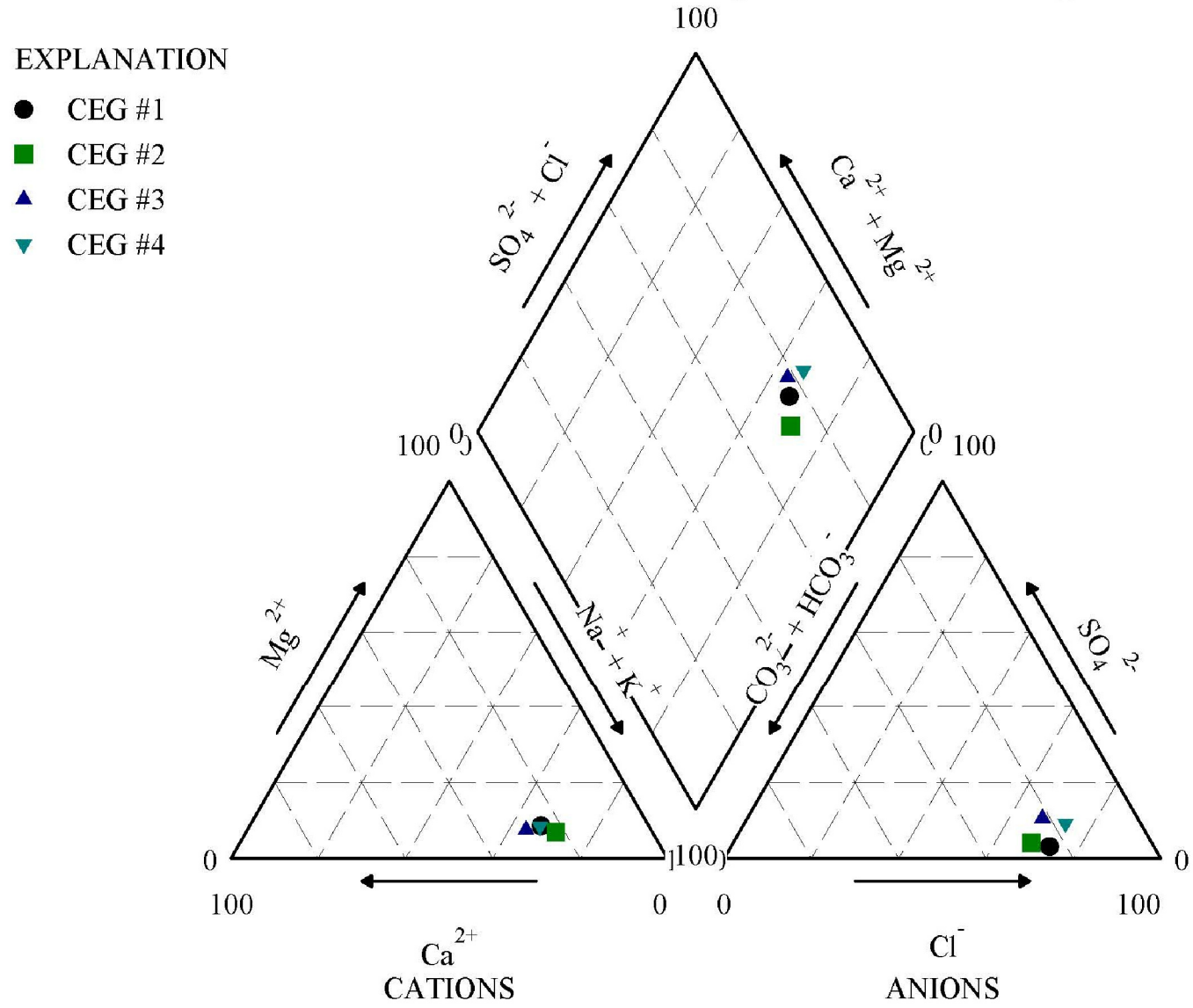
MARANA REGIONAL LANDFILL

SOLID WASTE FACILITY PLAN

GROUNDWATER ELEVATION CONTOURS IN AVRA VALLEY - 1940

FIGURE NO. **7-11**

PROJECT NO. 090250



CORNERSTONE
Environmental Group, LLC

DKL HOLDINGS
MARANA REGIONAL LANDFILL
SOLID WASTE FACILITY PLAN

TRILINEAR DIAGRAM OF MONITORING WELLS

FIGURE NO.
7-12
PROJECT NO.
090250.3

DRAWINGS

PLANS FOR THE

SOLID WASTE FACILITY PLAN

MARANA REGIONAL LANDFILL

MARANA, ARIZONA

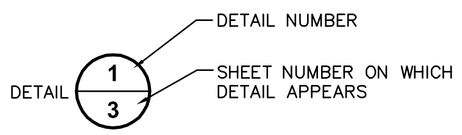
MAY 2011

ABBREVIATIONS

ø/DIA	DIAMETER
DWG	DRAWING
ELEV	ELEVATION
E	EASTING
EG	EXISTING GRADE
FT	FEET
FG	FINAL GRADE
GCCS	GAS COLLECTION CONTROL SYSTEM
HDPE	HIGH DENSITY POLYETHYLENE
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
LFG	LANDFILL GAS
MIN	MINIMUM
N	NORTHING
(NIC)	NOT IN CONTRACT
NTS	NOT TO SCALE
%	PERCENT
PERF	PERFORATED
PVC	POLYVINYL CHLORIDE
R/W	RIGHT OF WAY
S	SLOPE
SDR	STANDARD DIMENSION RATIO
SG	SUBGRADE
TYP	TYPICAL
WSEL	WATER SURFACE ELEVATION
W/	WITH

DETAIL INDICATOR:

SHEET ON WHICH DETAIL IS REFERENCED:



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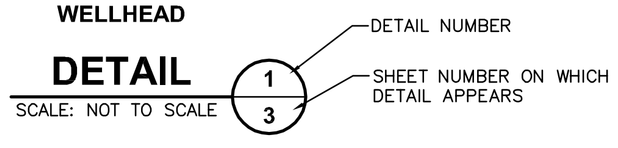
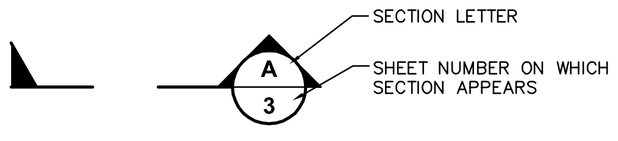


SECTION INDICATOR:

SHEET ON WHICH SECTION IS CUT:



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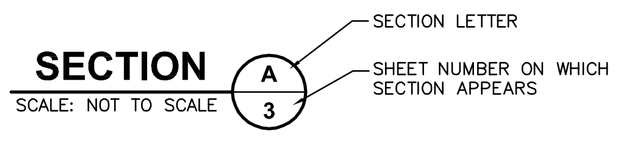

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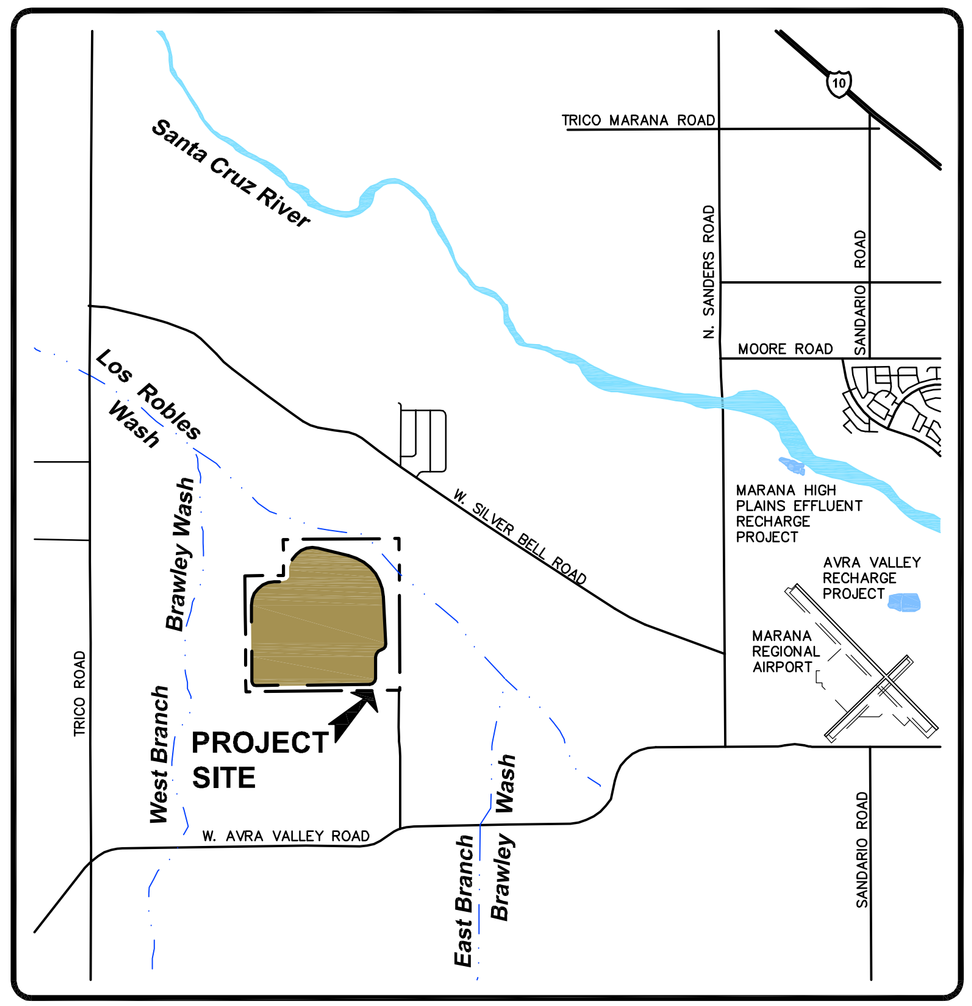
CORNERSTONE
Environmental Group, LLC
17 WEST WETMORE ROAD, SUITE 310
TUCSON, ARIZONA 85705
Tel. (520) 888-4800
Fax (520) 888-4804

INDEX OF DRAWINGS



LOCATION MAP

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GARTH R. BOWERS, P.E.

P.E. Lic. No. 27290 Date

1" 1/2" 0" 1"

File: X:\PROJECTS\MARANA - SWFP - 09\2009\PROJECT DRAWINGS\SPADEWFPS-C001_COVER.dwg Layout: Cover sheet User: MarkGoar May 04, 2011 - 2:05pm

N 518000 | E 883000 | E 884000 | E 885000 | E 886000 | E 887000 | E 888000 | E 889000 | E 890000 | E 891000

N 517000

N 516000

N 515000

N 514000

N 513000

N

STATE LAND (VACANT)

PRIVATE LAND (VACANT)

GLO BRASS CAP 1966.49

BM-1 1966.06

WEST BRANCH BRAWLEY WASH

EAST BRANCH BRAWLEY WASH

STATE LAND (VACANT)

PROPOSED LANDFILL

BM-3 1972.62

STATE LAND (VACANT)

PROPERTY BOUNDARY

BM-2 1979.19

CITY OF TUCSON (VACANT)

PRIVATE (AGRICULTURAL)

0 300 600

SCALE IN FEET

LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- EXISTING BENCHMARK (SETTLEMEYER LLC)
- TOC TOP OF CASING (MEASURED AT TOP OF WELL SEAL – NORTH SIDE)

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

GROUND CONTROL BY SETTLEMEYER LLC.

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APPROVED BY GRB

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DKL HOLDINGS
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

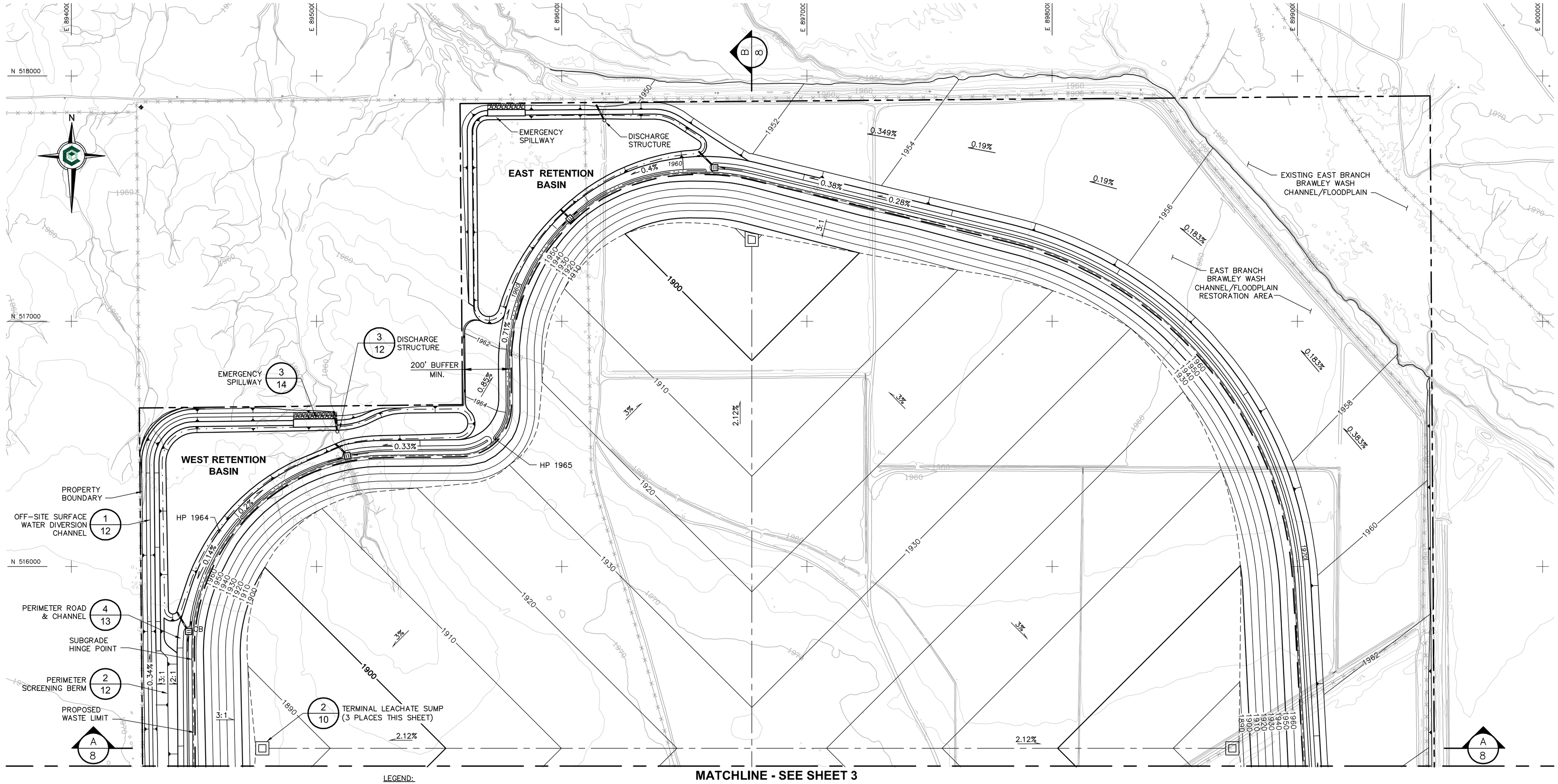
EXISTING CONDITIONS PLAN

SHEET NO. 1

PROJECT NO. 090250.3

1" 1/2" 0" 1"

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPMDWFPS-SP01_EXIST COND.dwg Layout: SHT1 User: Mark.Case May 04, 2011 - 2:13pm



LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- SUBGRADE INTERMEDIATE CONTOUR (C.I.=10FT, 2FT OUTSIDE WASTE FOOTPRINT)
- 1950 SUBGRADE INDEX CONTOUR (C.I.=50FT)
- PROPOSED WASTE LIMIT
- WATER SURFACE
- DRAINAGE DITCH
- GRADE BREAK
- SUBGRADE FLOWLINE
- CULVERT
- INLET
- TERMINAL LEACHATE SUMP

0 200 400
SCALE IN FEET

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

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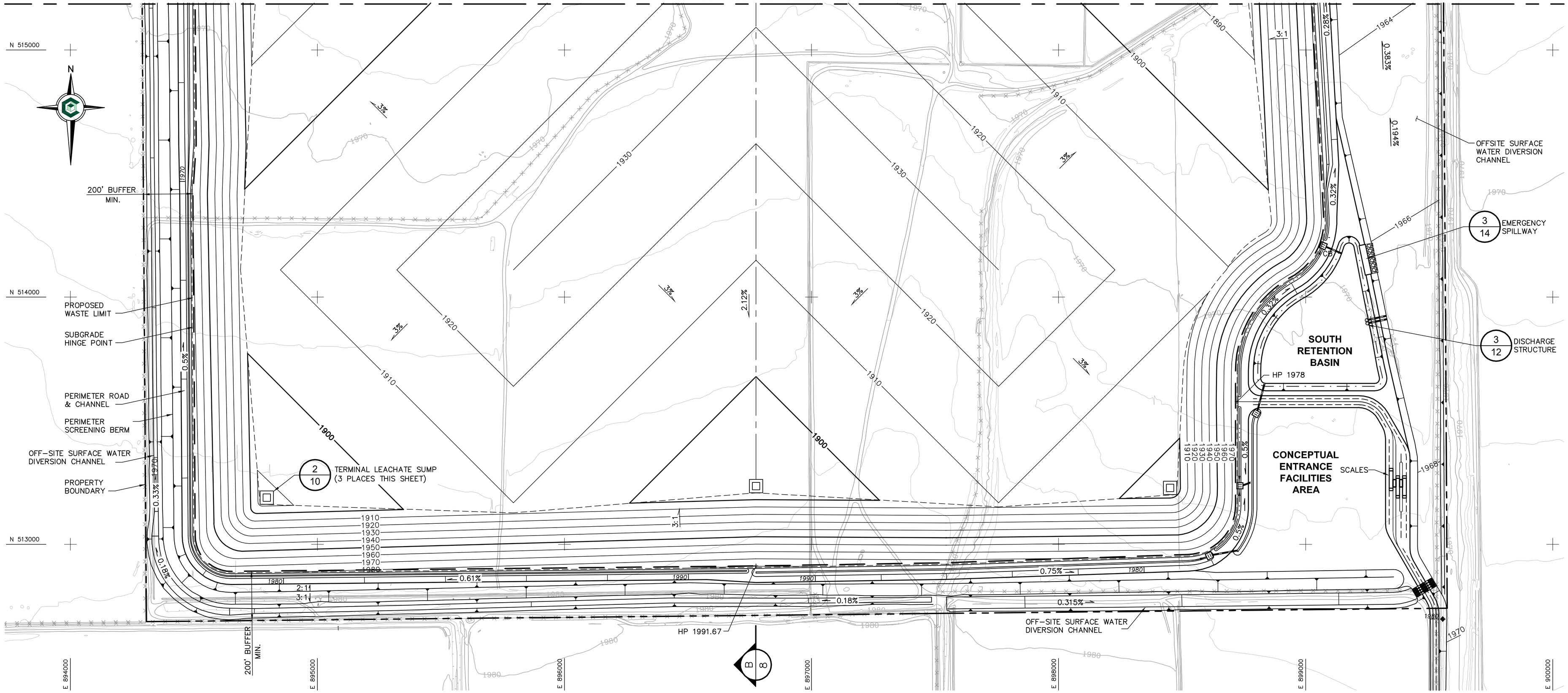
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

SUBGRADE PLAN (NORTH)

SHEET NO. **2**
PROJECT NO. 090250.3

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPMSWFP\S-SPRO_SUBGRADE PLAN.dwg Layout: SHT2 User: MarkCase May 04, 2011 - 2:22pm

MATCHLINE - SEE SHEET 2



LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- SUBGRADE INTERMEDIATE CONTOUR (C.I.=10FT, 2FT OUTSIDE WASTE FOOTPRINT)
- 1950 SUBGRADE INDEX CONTOUR (C.I.=50FT)
- PROPOSED WASTE LIMIT
- WATER SURFACE
- DRAINAGE DITCH
- GRADE BREAK
- SUBGRADE FLOWLINE
- CULVERT
- INLET
- TERMINAL LEACHATE SUMP

0 200 400
SCALE IN FEET

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

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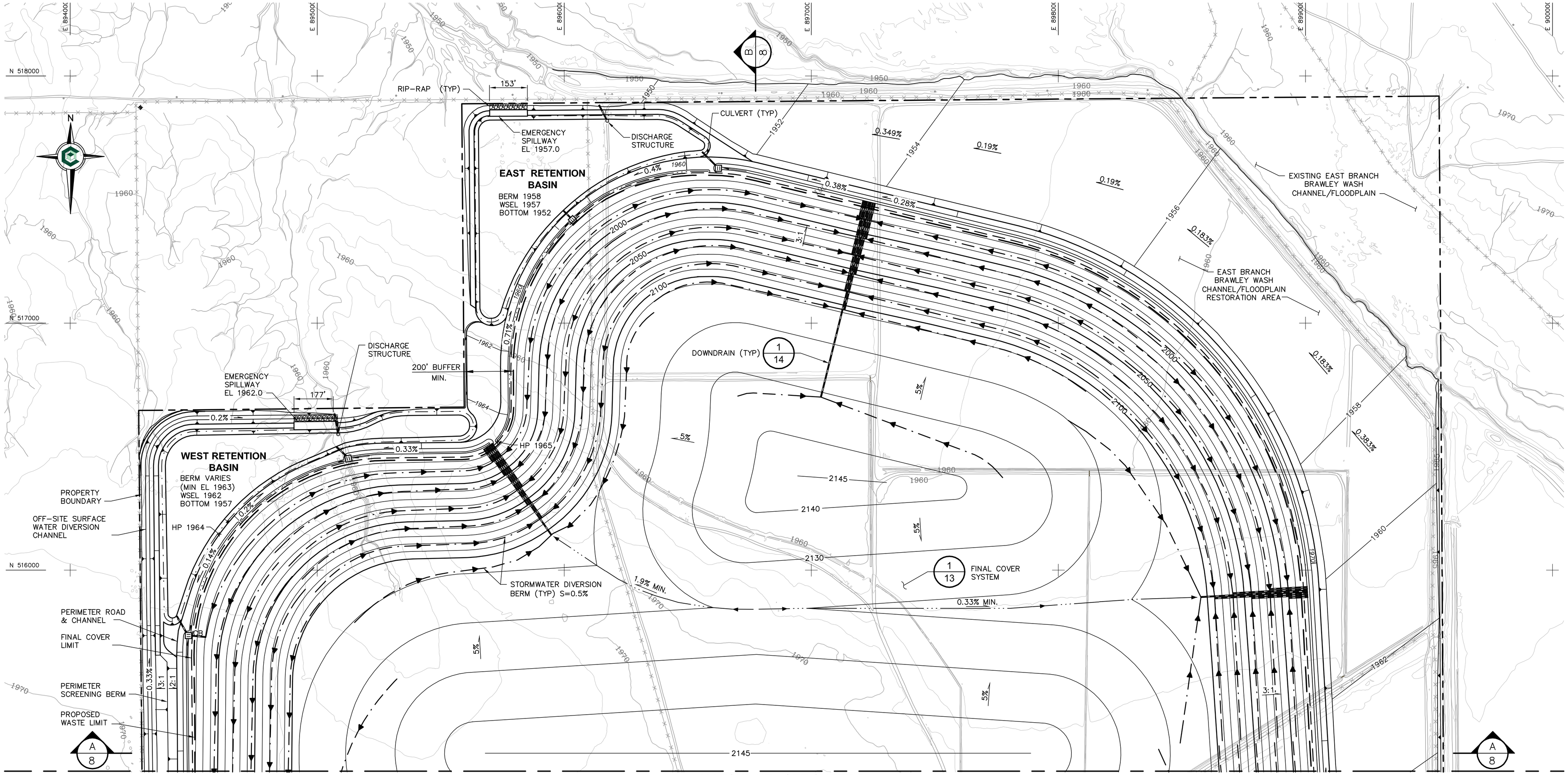
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

SUBGRADE PLAN (SOUTH)

SHEET NO. 3
PROJECT NO. 090250.3

File: K:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPMSWFP\SPSG_SUBGRADE PLAN.dwg Layout: SH3 User: MarkCase May 04, 2011 - 2:25pm

1" 1/2" 0" 1"



MATCHLINE - SEE SHEET 5

LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- FINAL GRADE INTERMEDIATE CONTOUR (C.I.=10FT, 2FT OUTSIDE WASTE FOOTPRINT)
- 1950 FINAL GRADE INDEX CONTOUR (C.I.=50FT)
- PROPOSED WASTE LIMIT
- WATER SURFACE
- DRAINAGE DITCH
- CULVERT
- INLET
- DOWNDRAIN
- STORMWATER DIVERSION BERM

0 200 400
SCALE IN FEET

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

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DKL HOLDINGS
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

FINAL COVER PLAN (NORTH)

SHEET NO. 4
PROJECT NO. 090250.3

MATCHLINE - SEE SHEET 4

N 515000

N 514000

N 513000

E 894000

E 895000

E 896000

E 897000

E 898000

E 899000

E 900000

200' BUFFER MIN.

PROPOSED WASTE LIMIT

FINAL COVER LIMIT

PERIMETER ROAD & CHANNEL

PERIMETER SCREENING BERM

PROPERTY BOUNDARY

200' BUFFER MIN.

OFF-SITE SURFACE WATER DIVERSION CHANNEL

1 / 13 FINAL COVER SYSTEM

DOWNDRAIN (TYP)

STORMWATER DIVERSION BERM (TYP) S=0.5%

HP 1991.67

B 8

OFFSITE SURFACE WATER DIVERSION CHANNEL

EMERGENCY SPILLWAY EL 1974.0

RIP-RAP (TYP)

DISCHARGE STRUCTURE (TYP)

SOUTH RETENTION BASIN
BERM VARIES
(MIN EL 1975)
WSEL 1971
BOTTOM 1967

HP 1978

CONCEPTUAL ENTRANCE FACILITIES AREA

SCALES

OFF-SITE SURFACE WATER DIVERSION CHANNEL

CULVERT (TYP)

LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- FINAL GRADE INTERMEDIATE CONTOUR (C.I.=10FT, 2FT OUTSIDE WASTE FOOTPRINT)
- 1950 FINAL GRADE INDEX CONTOUR (C.I.=50FT)
- PROPOSED WASTE LIMIT
- WATER SURFACE
- DRAINAGE DITCH
- CULVERT
- INLET
- DOWNDRAIN

0 200 400
SCALE IN FEET

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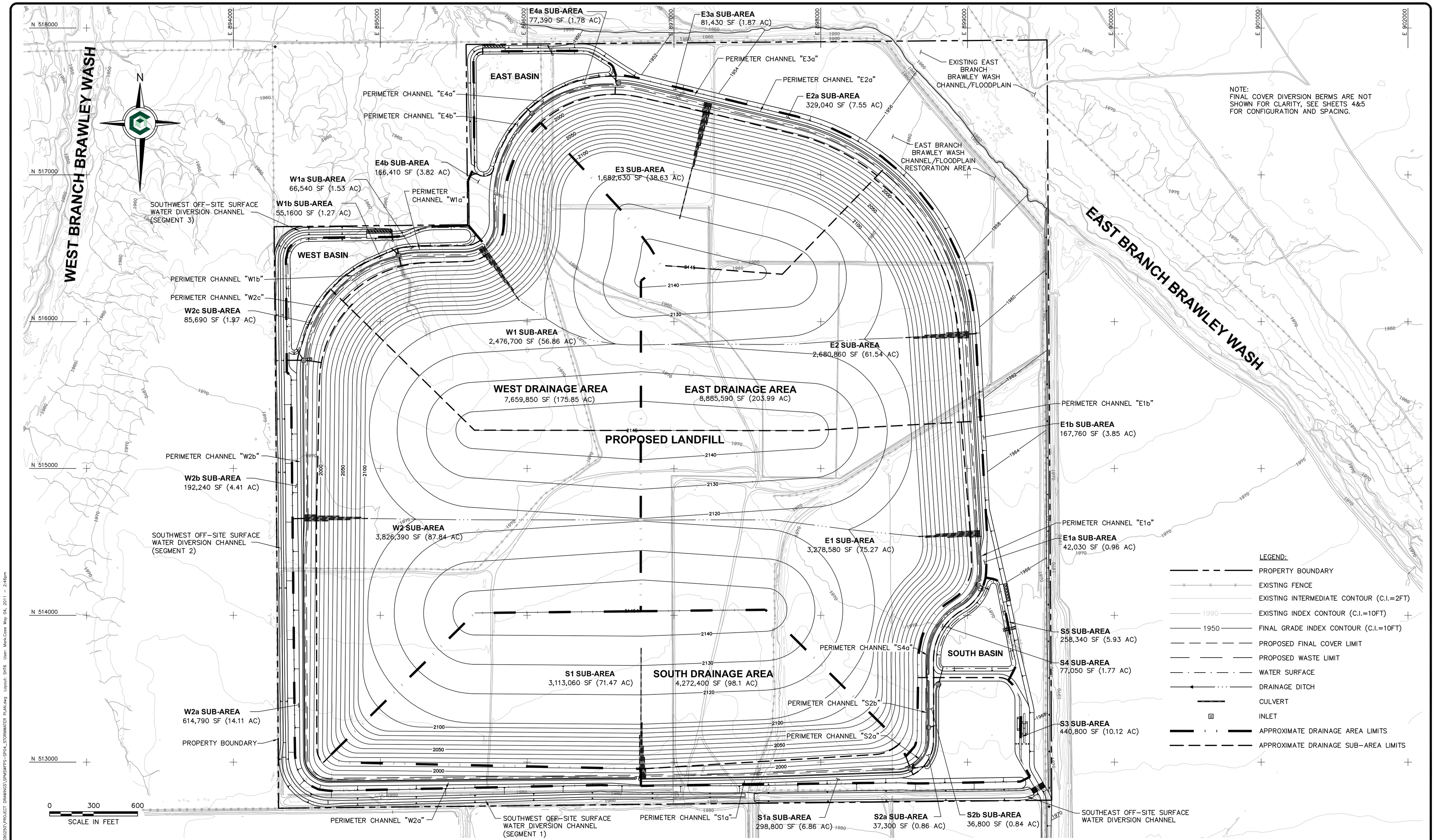
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

FINAL COVER PLAN (SOUTH)

SHEET NO. **5**

PROJECT NO. 090250.3



TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010.

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MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

STORMWATER PLAN

SHEET NO. **6**

PROJECT NO. 090250.3

File: K:\PROJECTS\MARANA - SWPP - 090250\PROJECT DRAWINGS\SPADWG\PPS-SPDA_STORMWATER PLAN.dwg Layout: SHT6 User: MarkCase May 04, 2011 - 2:46pm

1" 1/2" 0" 1"

E 894,000 | E 895,000 | E 896,000 | E 897,000

514,000 | 513,000

N

CELL 4
(FUTURE)

CELL 1

NEW MODULE 1A

MODULE 1B
(FUTURE)

CELL 2
(FUTURE)

ACCESS ROAD

GB 1974.1

PERIMETER BERM

PERIMETER ROAD/CHANNEL

BUFFER

40'

3:1

SIDESLOPE LINER TERMINATION

BASE LINER TERMINATION 6/9

BASE LINER SYSTEM 3/9

SIDESLOPE LINER SYSTEM 2/9

4/9 LEACHATE COLLECTION PIPE TRENCH

2/10 TERMINAL LEACHATE SUMP

PROPERTY BOUNDARY

LCRS CLEANOUT PIPE

BOLLARD (TYP) 3/14

LCRS RISER

TEMPORARY STORMWATER DIVERSION BERM (GRADE TO DRAIN)

RUN-ON STORMWATER BASIN. SIZE TO RETAIN 25-YR RUNOFF FROM CONTRIBUTING DRAINAGE AREA @ C=0.52 (3 PLACES)

1/9 ANCHOR TRENCH

8/9 SIDESLOPE LINER TERMINATION

1970 1960 1950 1940 1930 1920 1910 1900 1890 1880 1972 1975 1980

LEGEND:

- PROPERTY BOUNDARY
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- 1990 EXISTING INDEX CONTOUR (C.I.=10FT)
- 1950 SUBGRADE INDEX CONTOUR (C.I.=10FT)
- PROPOSED WASTE LIMIT
- WATER SURFACE
- GRADE BREAK
- SUBGRADE FLOWLINE
- TERMINAL LEACHATE SUMP
- PERFORATED LEACHATE COLLECTION PIPE

0 100 200
SCALE IN FEET

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON MARCH 30, 2010.

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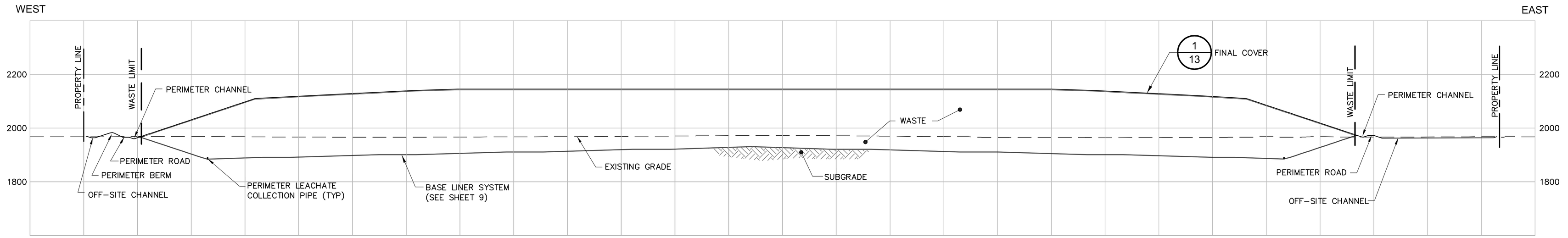
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

TYPICAL MODULE BASE LINER & LCRS PLAN

SHEET NO. 7
PROJECT NO. 090250.3

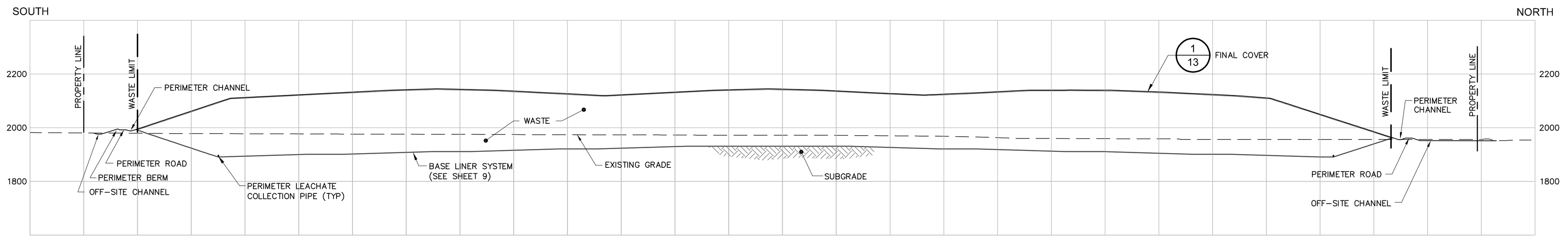
1" 1/2" 1"

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPW\SWFPS-SPD5_TYP CELL PLAN.dwg Layout: SHT7 User: MarkCase May 04, 2011 - 2:56pm



0 200 400
SCALE IN FEET

SECTION A/8
SCALE: 1"=200'



0 200 400
SCALE IN FEET

SECTION B/8
SCALE: 1"=200'

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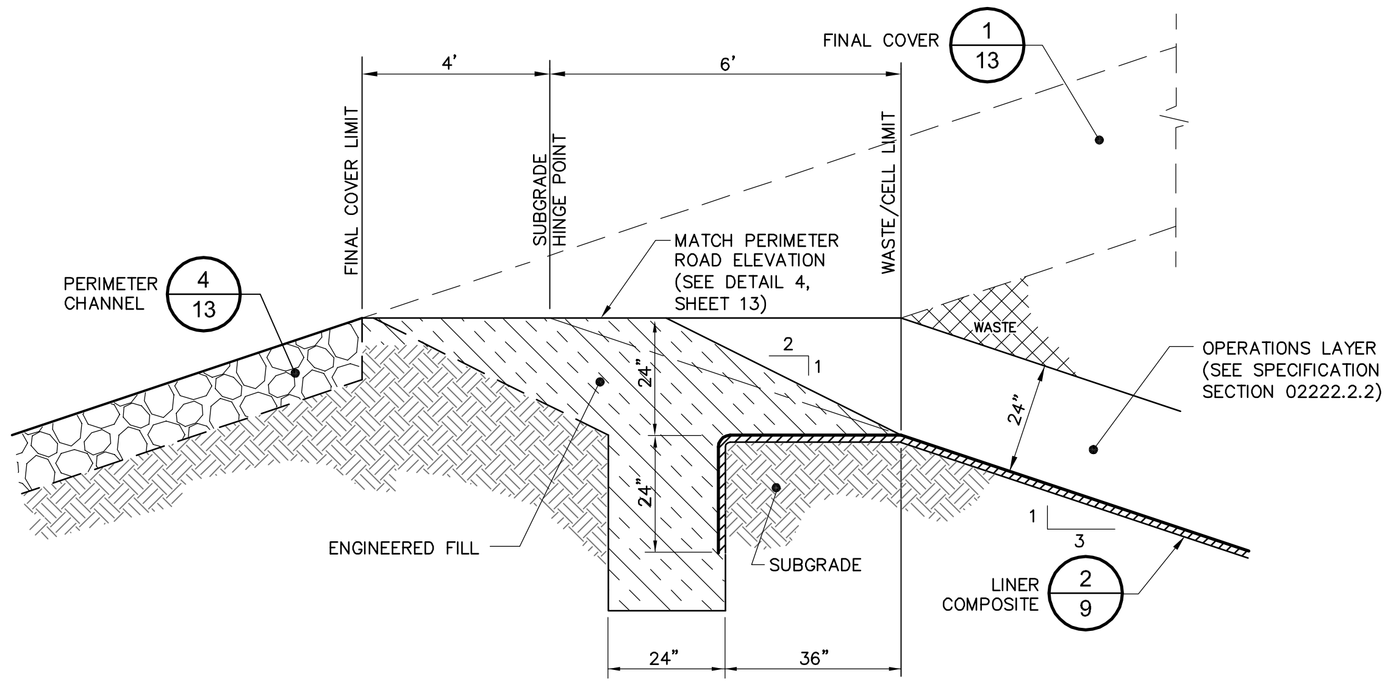
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

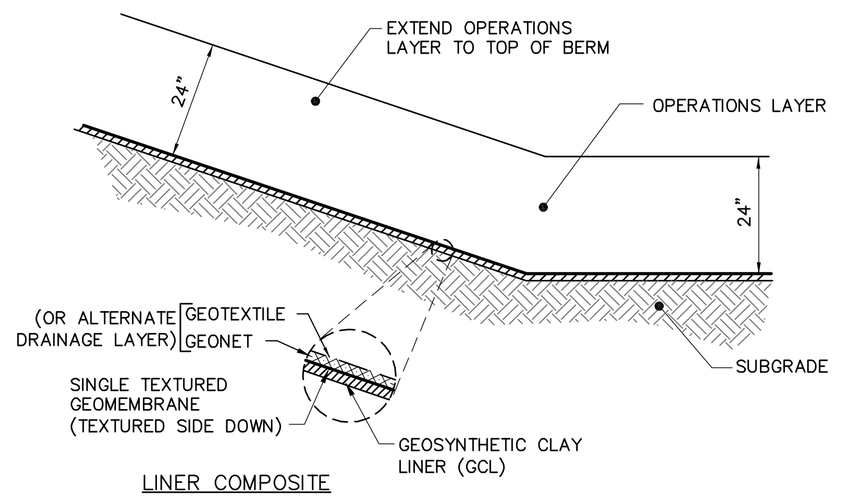
LANDFILL CROSS-SECTIONS

SHEET NO. **8**
PROJECT NO. 090250.3



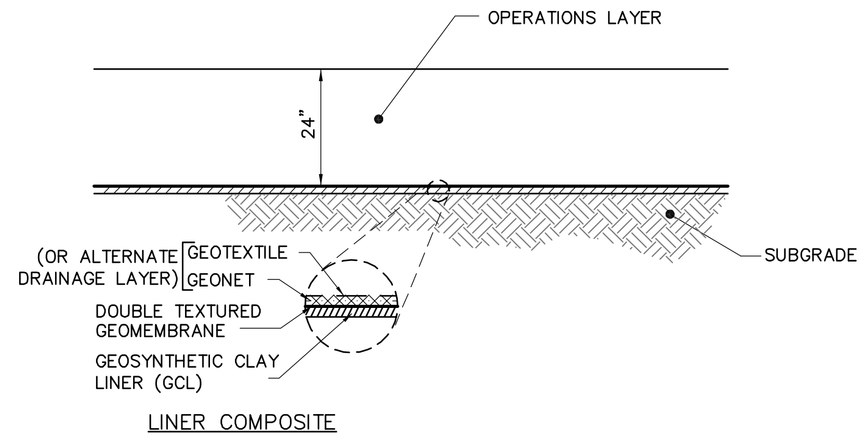
ANCHOR TRENCH

DETAIL 1/9
SCALE: 1"=2'



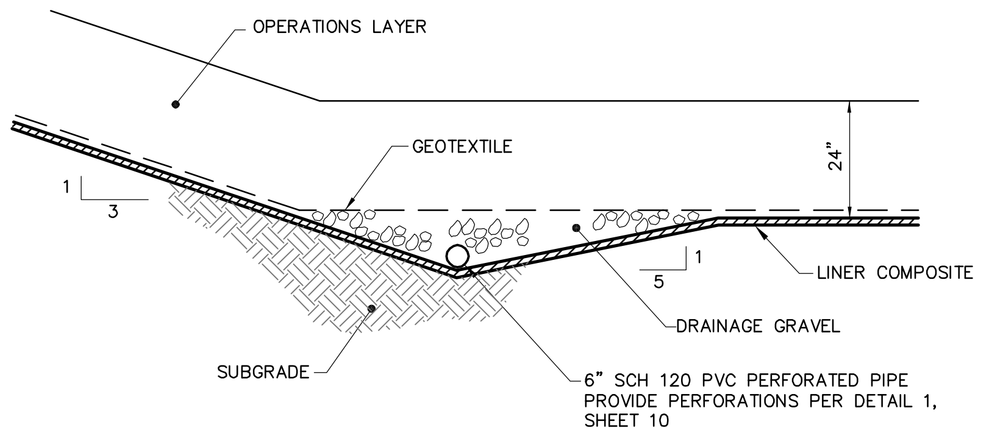
SIDESLOPE LINER SYSTEM

DETAIL 2/9
SCALE: 1"=2'



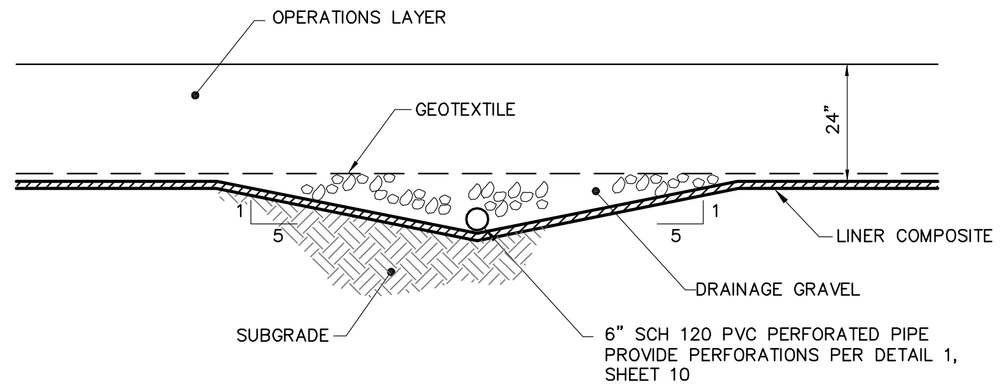
BASE LINER SYSTEM

DETAIL 3/9
SCALE: 1"=2'



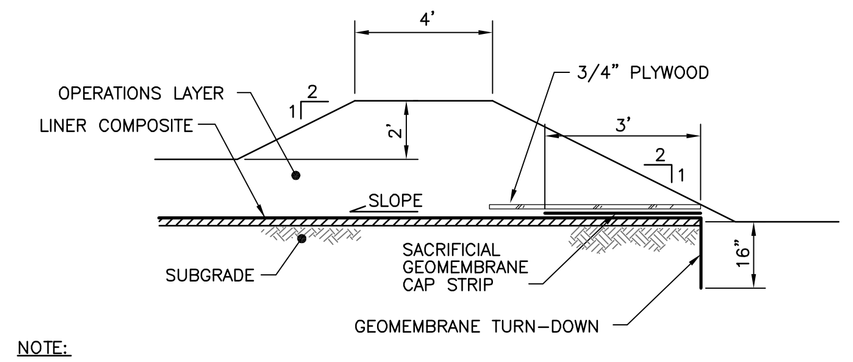
PERIMETER LEACHATE COLLECTION PIPE TRENCH

DETAIL 4/9
SCALE: 1"=2'



BASE LEACHATE COLLECTION PIPE TRENCH

DETAIL 5/9
SCALE: 1"=2'

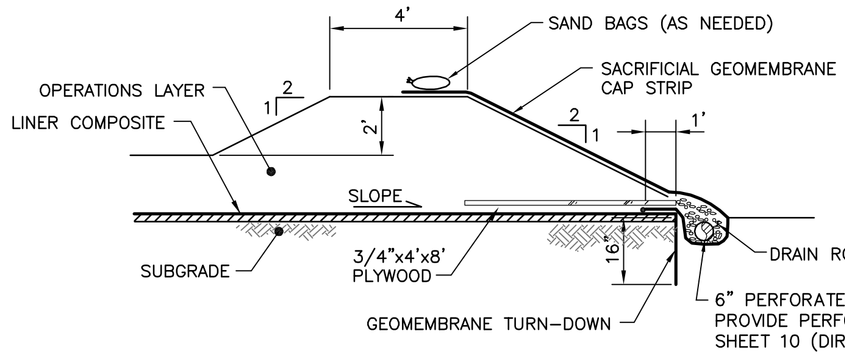


NOTE:

PLACE PLYWOOD TO PROTECT EDGE OF GEOMEMBRANE. SIMILAR MEANS OF PROTECTING THE EDGE OF GEOMEMBRANE MAY BE ALLOWED WITH APPROVAL OF ENGINEER.

BASE LINER TERMINATION

DETAIL 6/9
SCALE: NOT TO SCALE

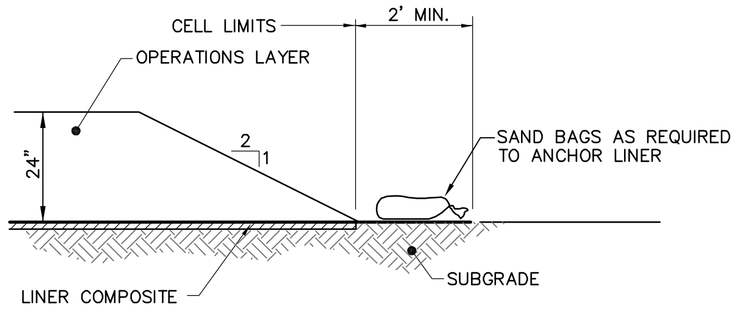


NOTE:

ELIMINATE THE SACRIFICIAL HDPE FLAP AND LCRS PIPE AT THE TOE OF THE BERM (IF PROVIDED) WITHIN THE LIMITS OF THE LINED LEACHATE COLLECTION SUMP (SEE PLAN).

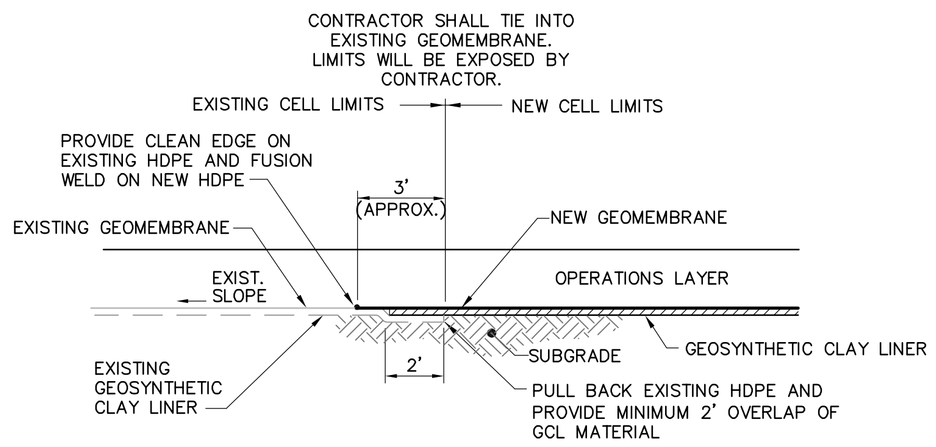
BASE LINER TERMINATION WITH LCRS PIPE

DETAIL 7/9
SCALE: NOT TO SCALE



SIDESLOPE LINER TERMINATION

DETAIL 8/9
SCALE: 1"=2'



SIDESLOPE LINER CONNECTION

DETAIL 9/9
SCALE: 1"=2'

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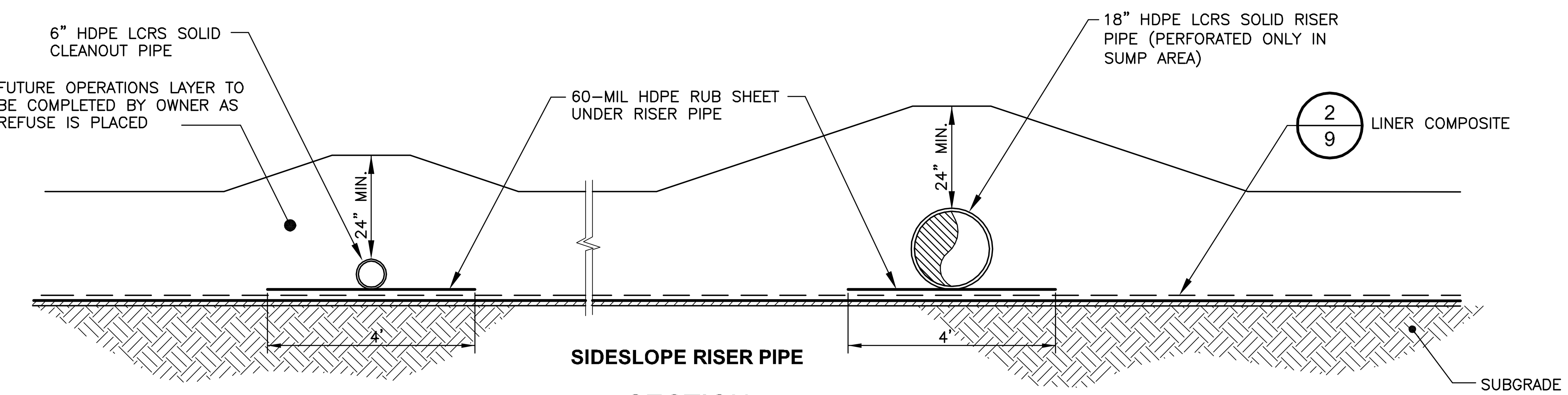
DKL HOLDINGS
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

LINER DETAILS

SHEET NO. 9
PROJECT NO. 090250.3

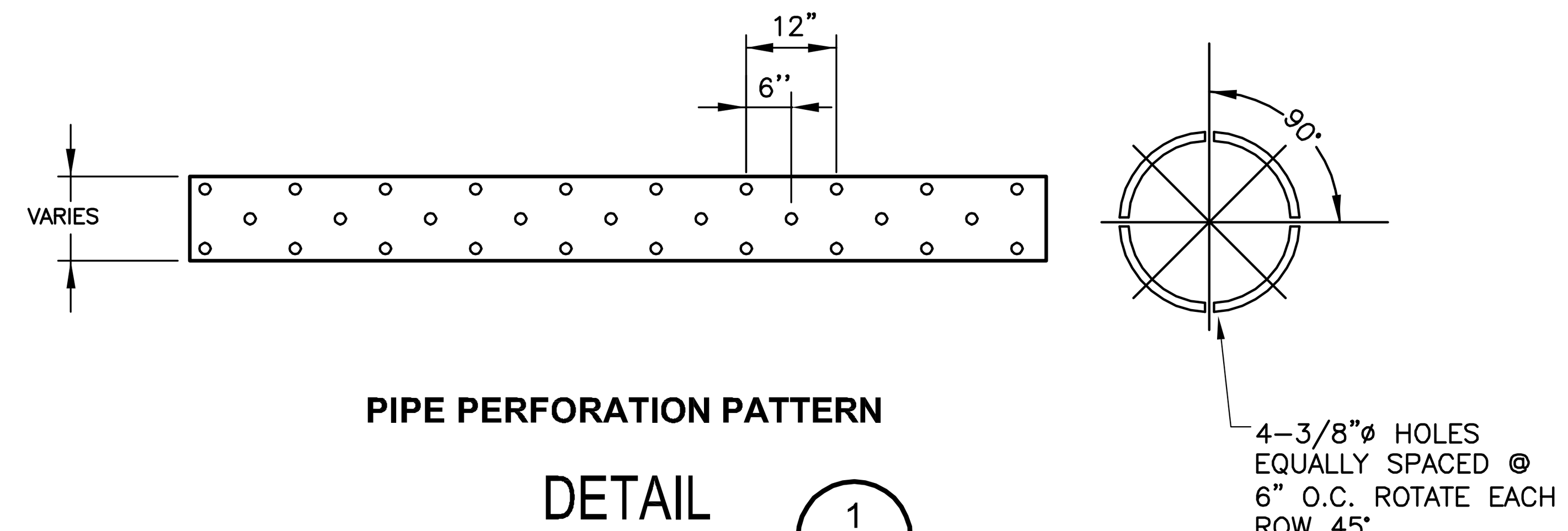
1" 1/2" 0" 1"

File: X:\PROJECTS\MARANA - SWFP - 090250\PROJECT DRAWINGS\SPM\SWFP5-15022_LF DETAILS.dwg Layout: Liner details User: Mark.Case May 04, 2011 - 3:05pm



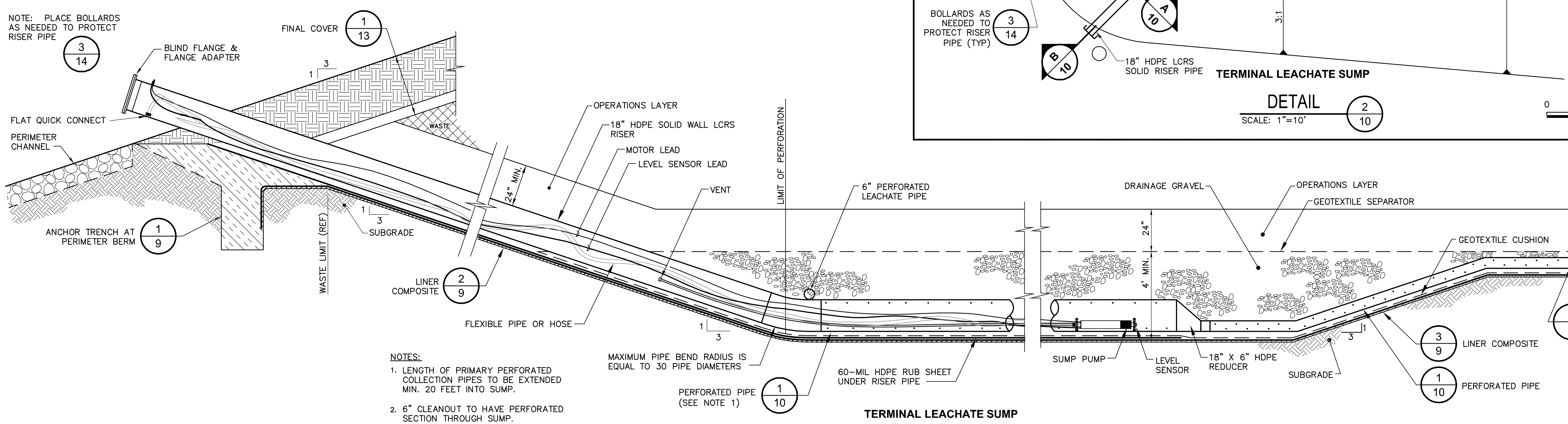
SIDESLOPE RISER PIPE

SECTION A/10
SCALE: 1"=2'



PIPE PERFORATION PATTERN

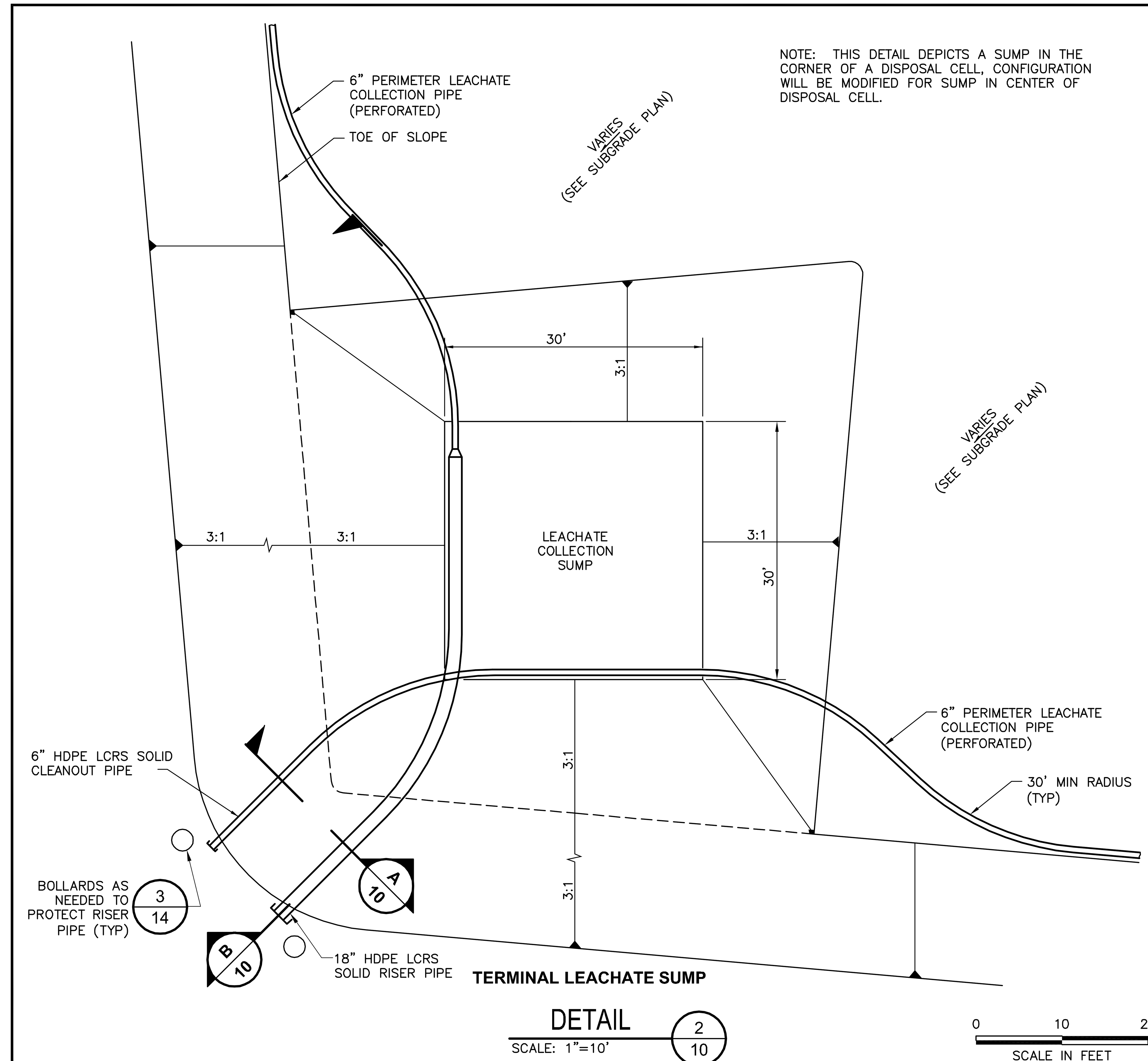
DETAIL 1/10
SCALE: NOT TO SCALE



NOTES:
1. LENGTH OF PRIMARY PERFORATED COLLECTION PIPES TO BE EXTENDED MIN. 20 FEET INTO SUMP.
2. 6" CLEANOUT TO HAVE PERFORATED SECTION THROUGH SUMP.

TERMINAL LEACHATE SUMP

SECTION B/10
SCALE: NOT TO SCALE



NOTE: THIS DETAIL DEPICTS A SUMP IN THE CORNER OF A DISPOSAL CELL, CONFIGURATION WILL BE MODIFIED FOR SUMP IN CENTER OF DISPOSAL CELL.

TERMINAL LEACHATE SUMP

DETAIL 2/10
SCALE: 1"=10'

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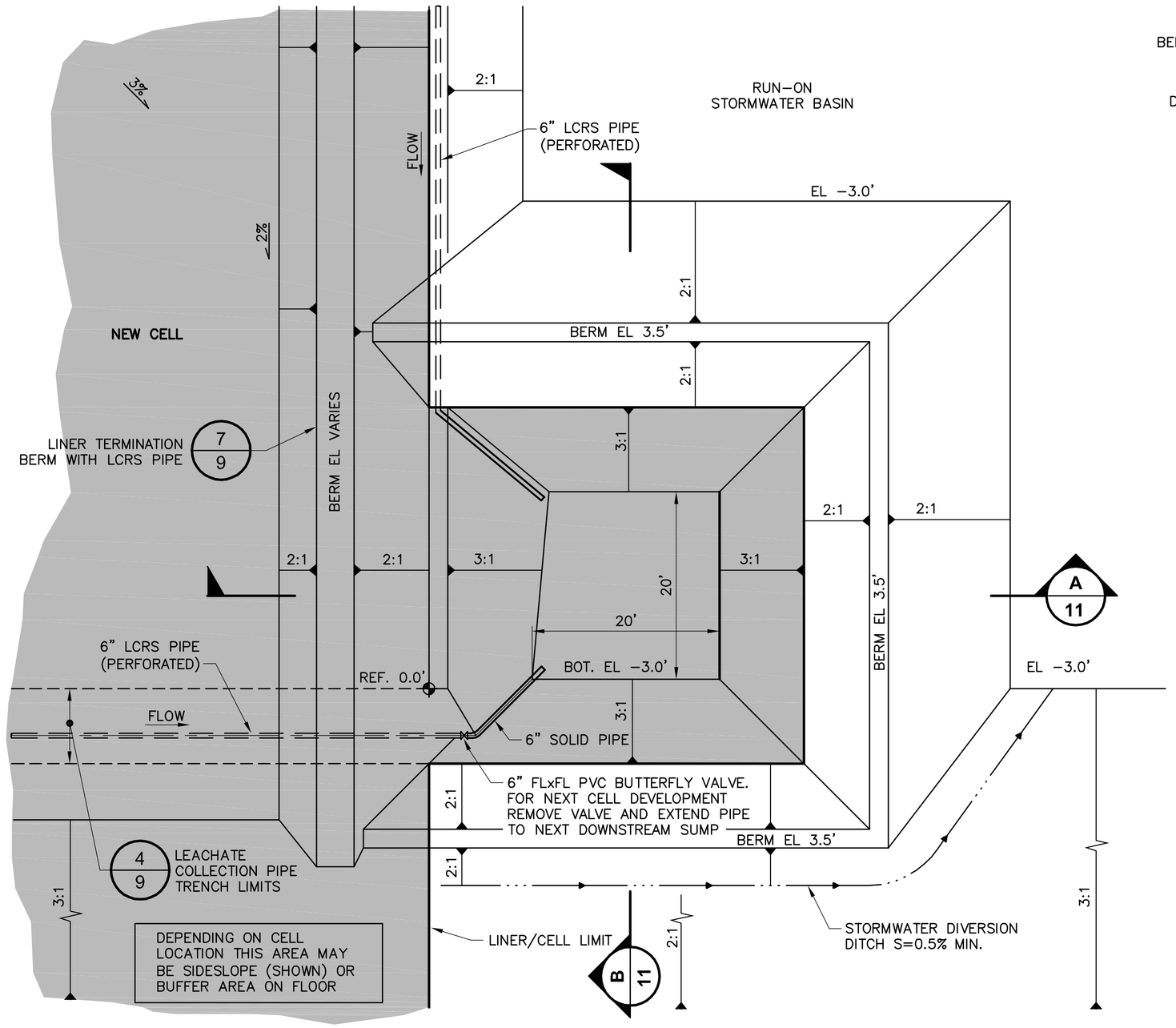
SOLID WASTE FACILITY PLAN

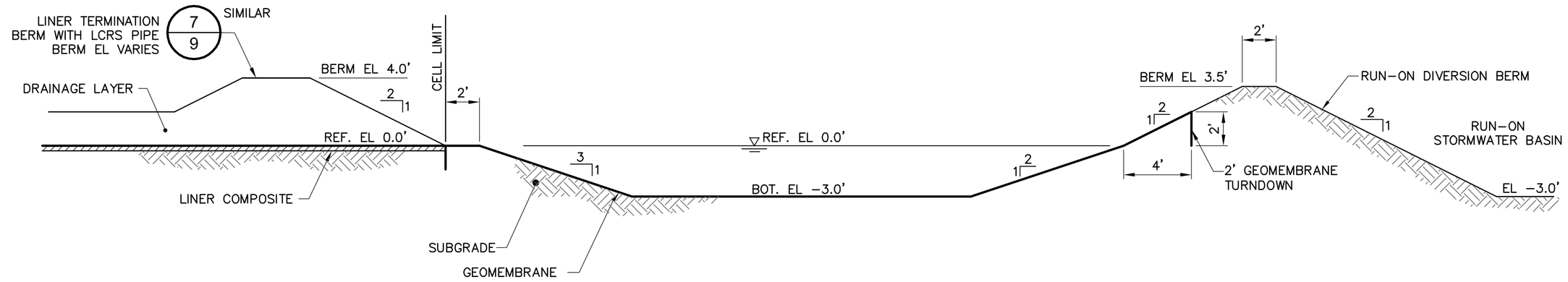
TERMINAL LEACHATE SUMP DETAILS

SHEET NO. 10
PROJECT NO. 090250.3



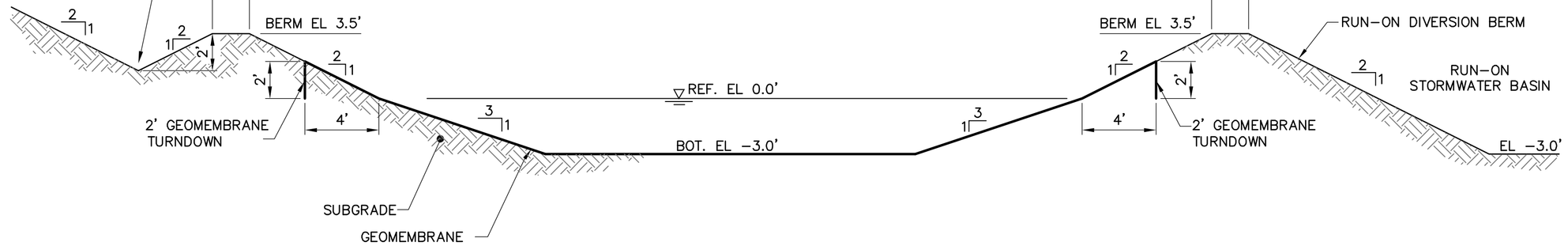
PLAN
TEMPORARY LEACHATE SUMP

DETAIL 1/11
SCALE: 1"=10'



TEMPORARY LEACHATE SUMP

SECTION A/11
SCALE: 1"=5'



TEMPORARY LEACHATE SUMP

SECTION B/11
SCALE: 1"=5'

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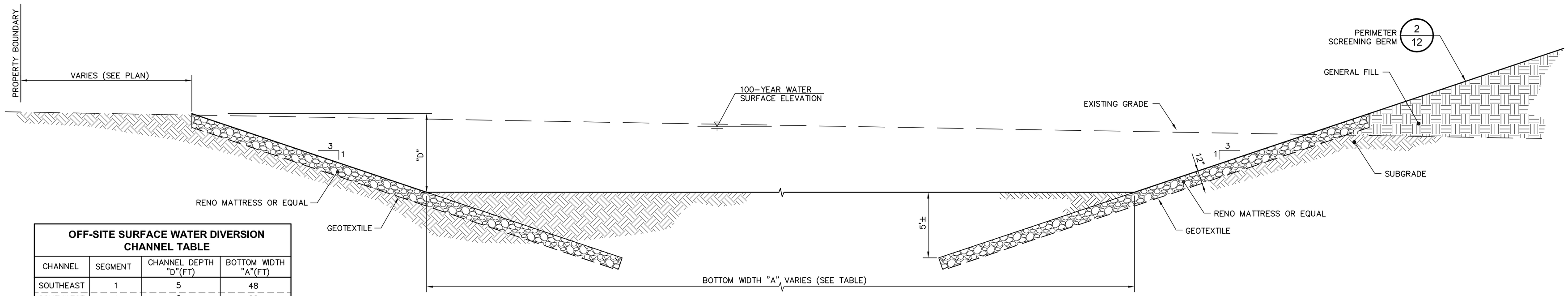
TEMPORARY LEACHATE SUMP DETAILS

SHEET NO. 11
PROJECT NO. 090250.3



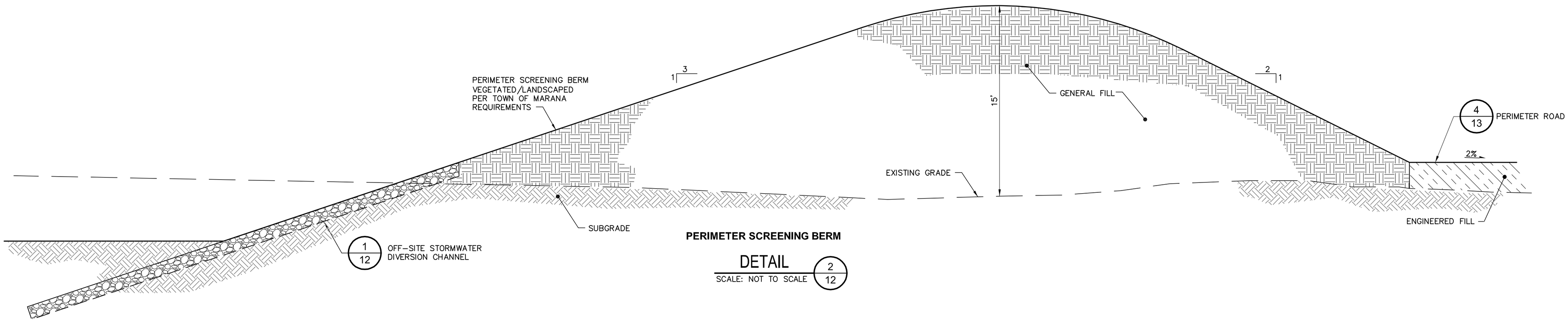
OFF-SITE SURFACE WATER DIVERSION CHANNEL TABLE

CHANNEL	SEGMENT	CHANNEL DEPTH "D"(FT)	BOTTOM WIDTH "A"(FT)
SOUTHEAST	1	5	48
SOUTHWEST	1	6	20
SOUTHWEST	2	5.5	15
SOUTHWEST	3	6	15

NOTE:
ALTERNATE CHANNEL CONFIGURATION PROVIDING EQUAL CAPACITY (Q_{100}) MAY BE UTILIZED SUBJECT TO TOWN OF MARANA FLOODPLAIN REVIEW/PERMIT.

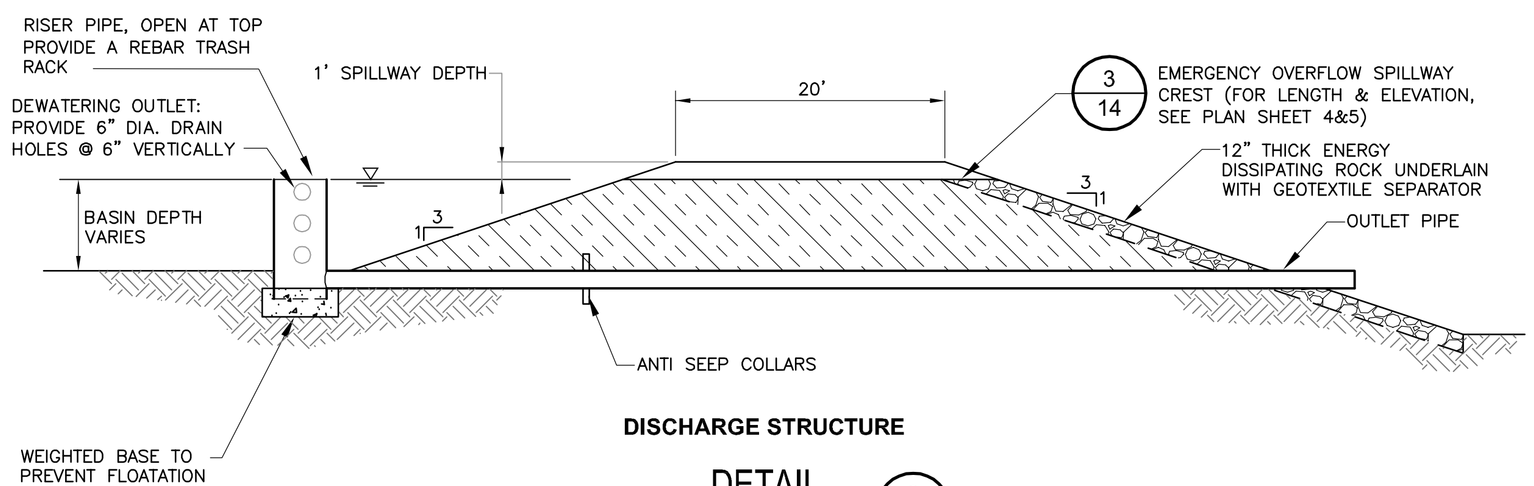
OFF-SITE SURFACE WATER DIVERSION CHANNEL

DETAIL 1/12
SCALE: 1"=4'



PERIMETER SCREENING BERM

DETAIL 2/12
SCALE: NOT TO SCALE



DISCHARGE STRUCTURE

DETAIL 3/12
SCALE: NOT TO SCALE

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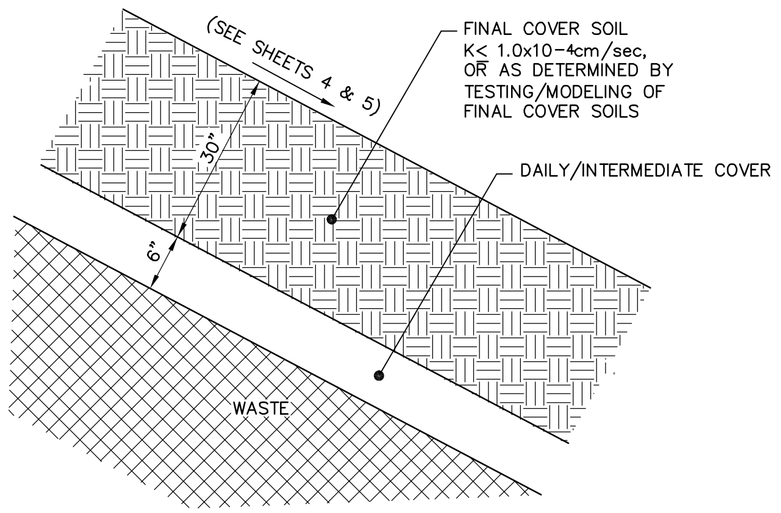
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

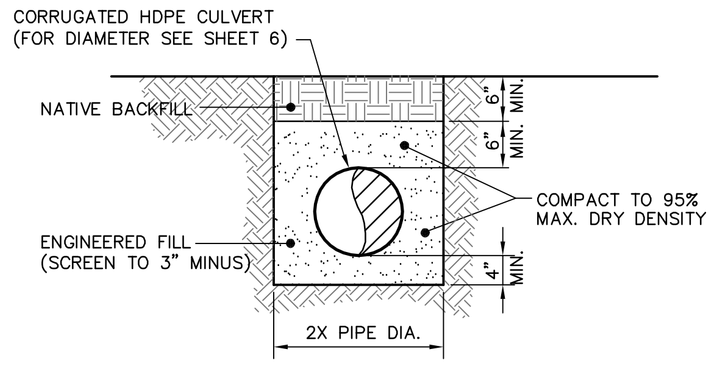
CHANNEL DETAILS

SHEET NO. 12
PROJECT NO. 090250.3



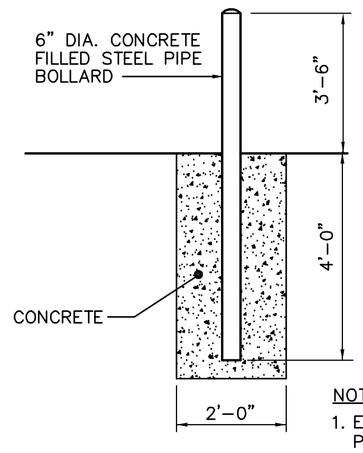
FINAL COVER SYSTEM

DETAIL 1/13
SCALE: 1"=2'



TYPICAL CULVERT TRENCH

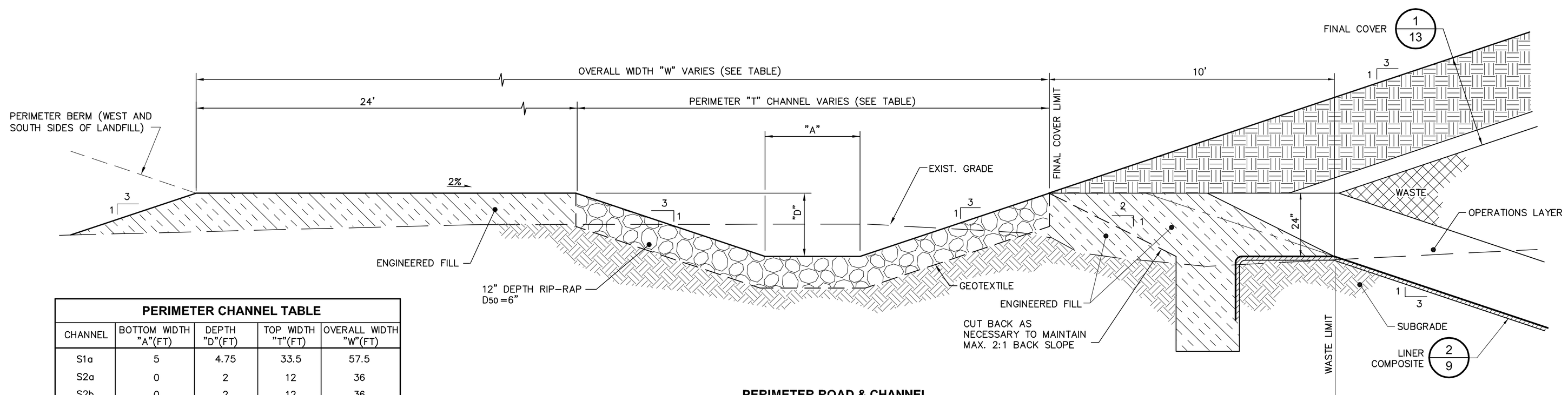
DETAIL 2/13
SCALE: NOT TO SCALE



NOTES
1. EXPOSED PORTION OF STEEL PIPE TO BE PAINTED WITH REFLECTIVE YELLOW COATING
2. LOCATE BETWEEN ROAD AND STRUCTURE TO BE PROTECTED

BOLLARD

DETAIL 3/13
SCALE: NOT TO SCALE



PERIMETER ROAD & CHANNEL

DETAIL 4/13
SCALE: 1"=2'

PERIMETER CHANNEL TABLE

CHANNEL	BOTTOM WIDTH "A"(FT)	DEPTH "D"(FT)	TOP WIDTH "T"(FT)	OVERALL WIDTH "W"(FT)
S1a	5	4.75	33.5	57.5
S2a	0	2	12	36
S2b	0	2	12	36
S4a	0	2	12	36
E1a	0	2	12	36
E1b	9	5	39	63
E2a	9	5	39	63
E3a	9	5	39	63
E4a	0	2	12	36
E4b	0	2	12	36
W1a	6	5	36	60
W1b	0	2	12	36
W2a	4	2.5	19	43
W2b	6.5	5	36.5	60.5
W2c	0	2.25	13.5	37.5
ENTRANCE	6	4.5	33	57

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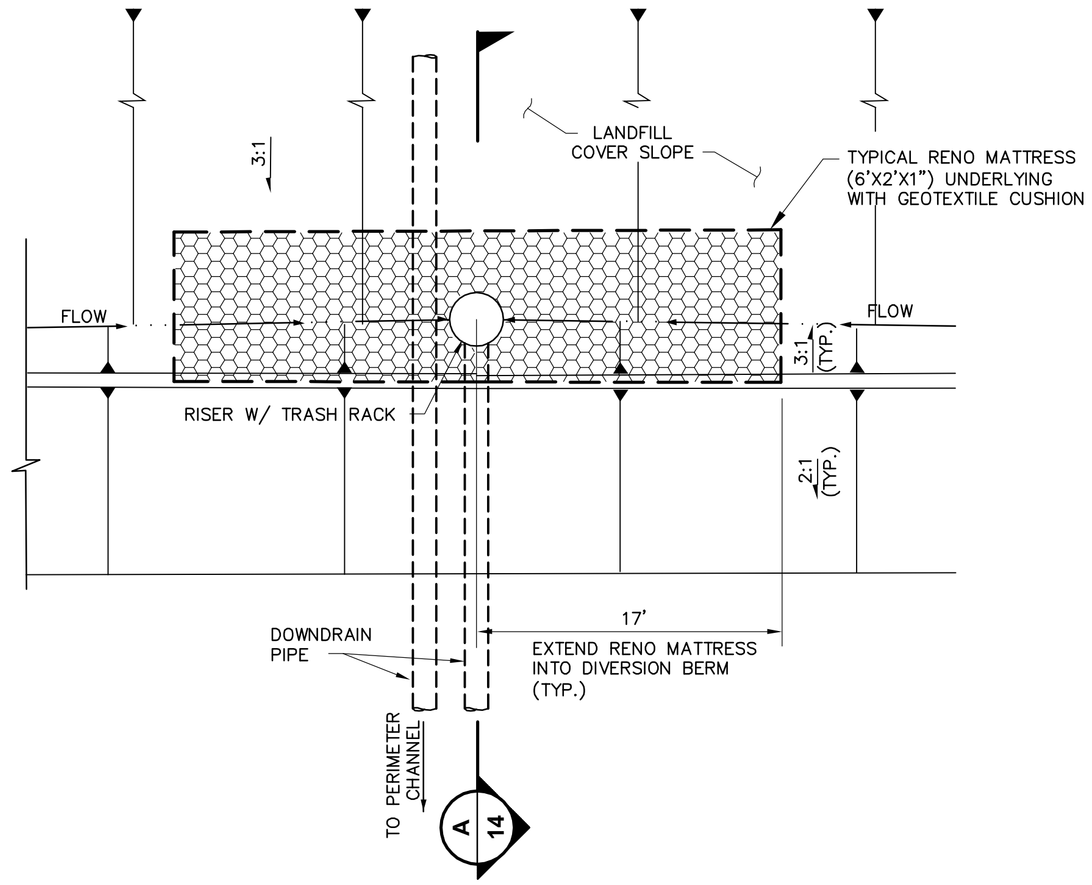
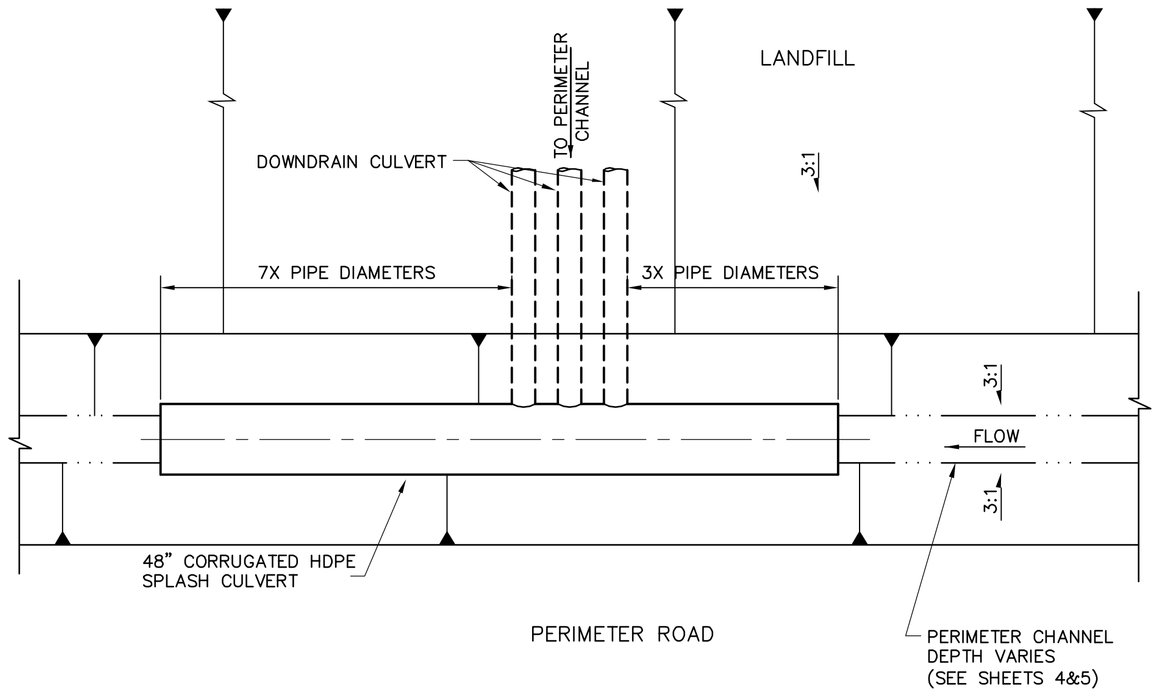
COVER & STORMWATER MANAGEMENT DETAILS

SHEET NO. 13
PROJECT NO. 090250.3



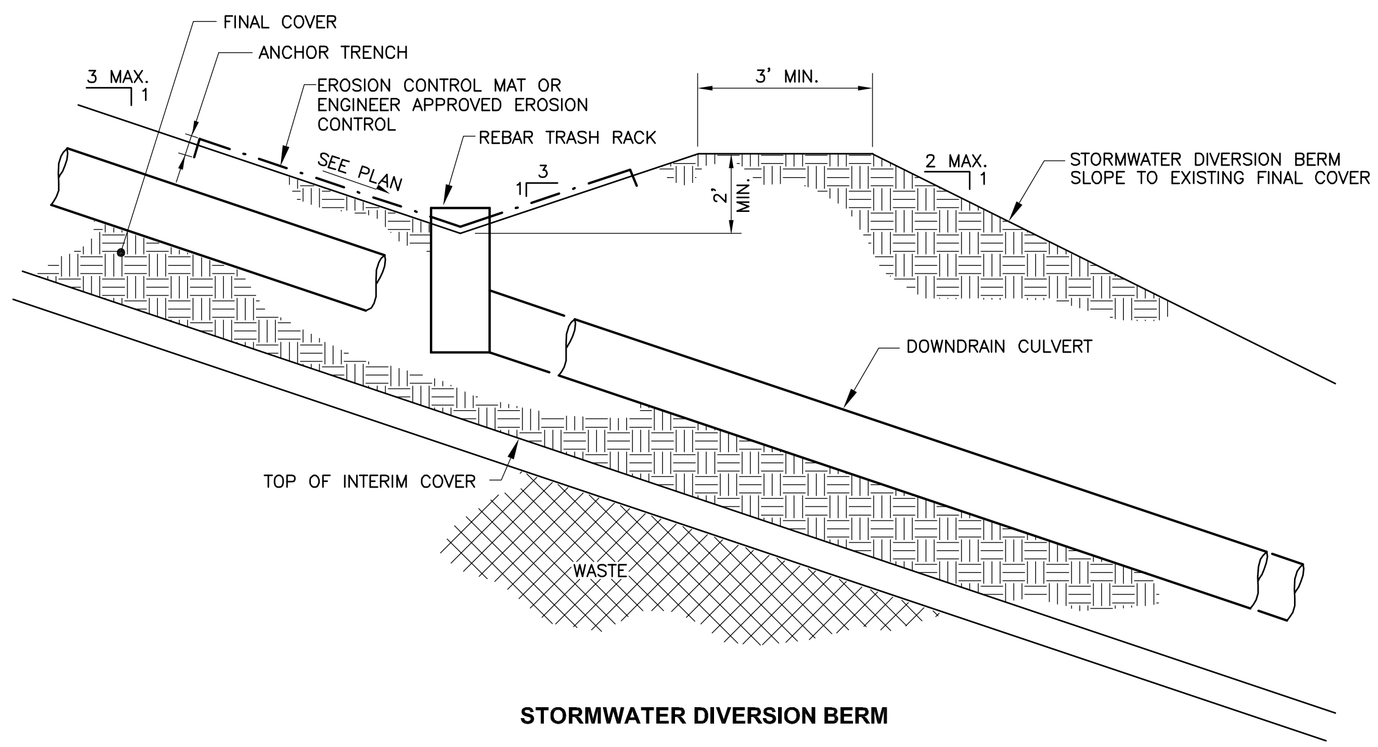
DISCHARGE TRANSITION FROM DIVERSION BERM INTO DOWNDRAIN PIPE

DETAIL — SCALE: NOT TO SCALE — 1/14



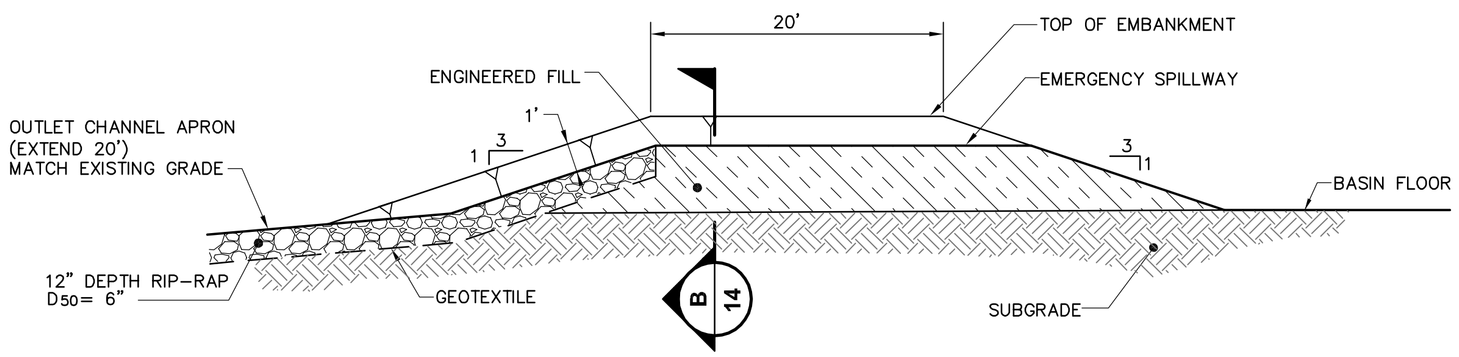
TRANSITION FROM DOWNDRAIN PIPE INTO PERIMETER CHANNEL

DETAIL — SCALE: NOT TO SCALE — 2/14



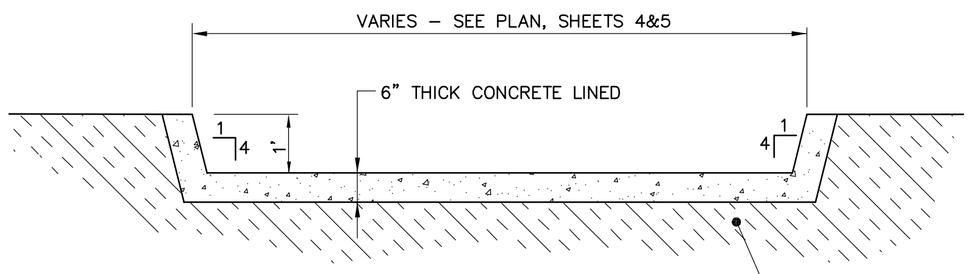
STORMWATER DIVERSION BERM

SECTION — SCALE: NOT TO SCALE — A/14



EMERGENCY SPILLWAY

DETAIL — SCALE: NOT TO SCALE — 3/14



EMERGENCY SPILLWAY

SECTION — SCALE: NOT TO SCALE — B/14

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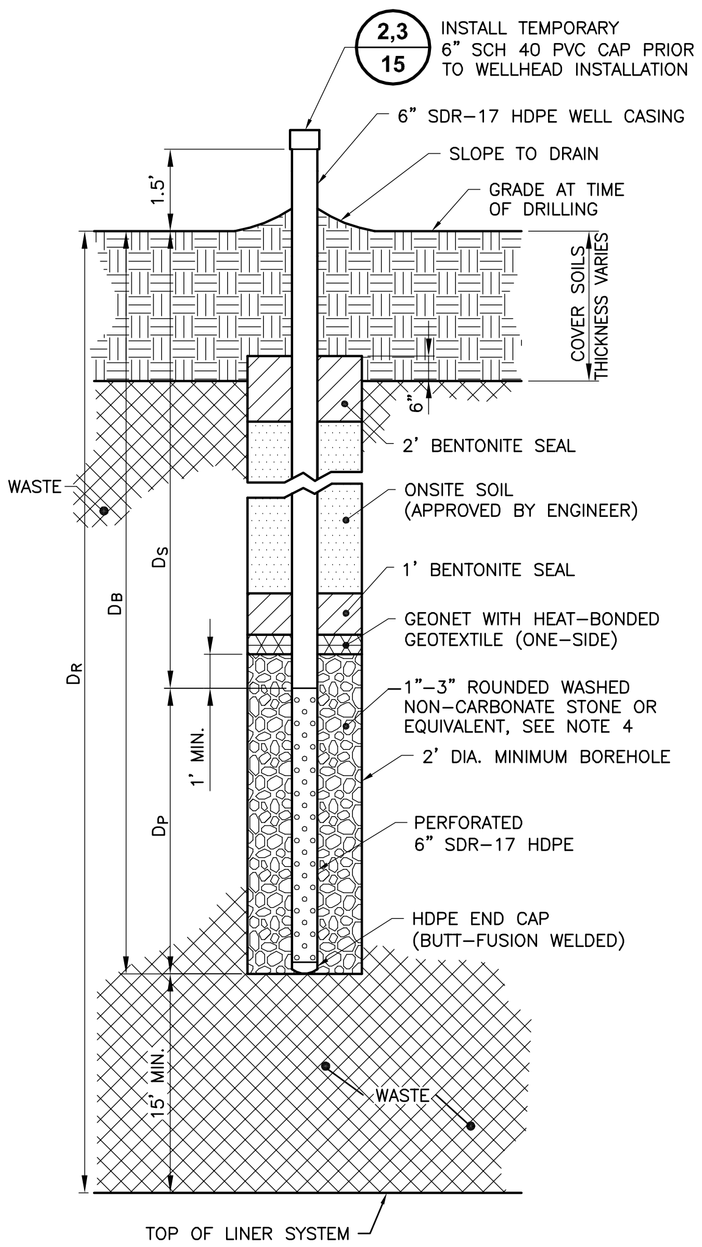
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

STORMWATER MANAGEMENT DETAILS

SHEET NO. **14**
PROJECT NO. 090250.3

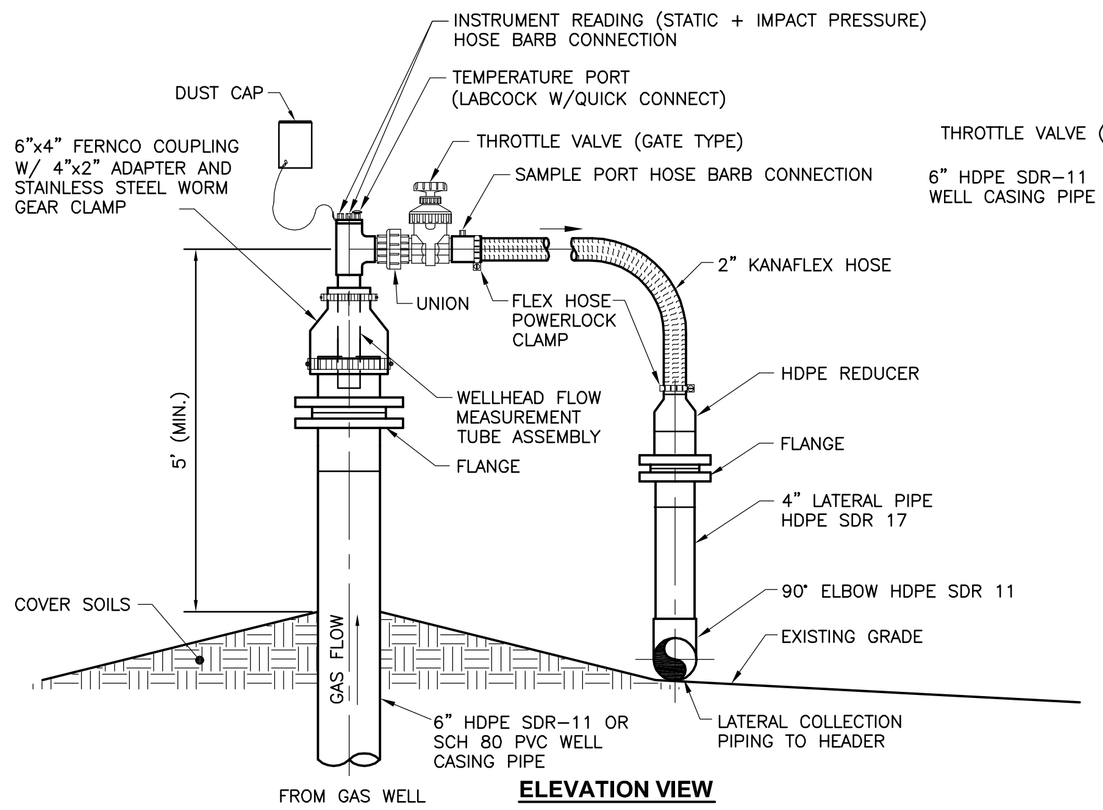


GAS EXTRACTION WELL

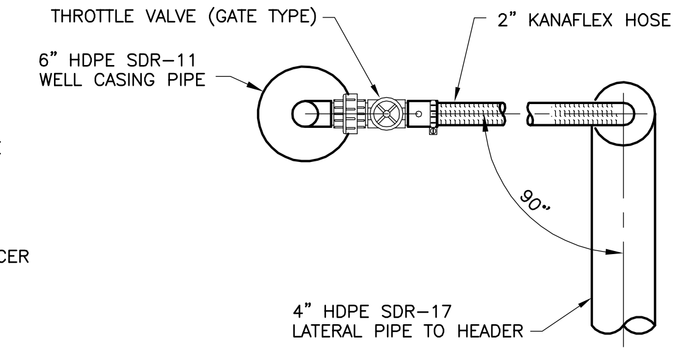
DETAIL 1/15
SCALE: NOT TO SCALE

NOTES:

1. D_R = DEPTH OF REFUSE
   D_B = DEPTH OF BORING
   D_S = DEPTH OF SOLID PIPE (BELOW GRADE)
   D_P = LENGTH OF PERFORATED PIPE
2. D_B ~ 75% D_R, 140 FEET MAXIMUM.
3. MINIMUM 15 FEET SEPARATION BETWEEN BASE OF BORING AND TOP OF LINER SYSTEM.
4. LIMESTONE, CRUSHED CONCRETE, AND LIKE MATERIALS ARE NOT APPROVED BACKFILL MATERIALS. TIRE CHIPS MAY BE APPROVED BY ENGINEER.
5. PVC OR OTHER APPLICABLE MATERIALS MAY BE SUBSTITUTED FOR WELL CASING.
6. CASING SIZE AND WELL BORE DIAMETER MAY BE MODIFIED TO ACCOMMODATE FIELD CONDITIONS.



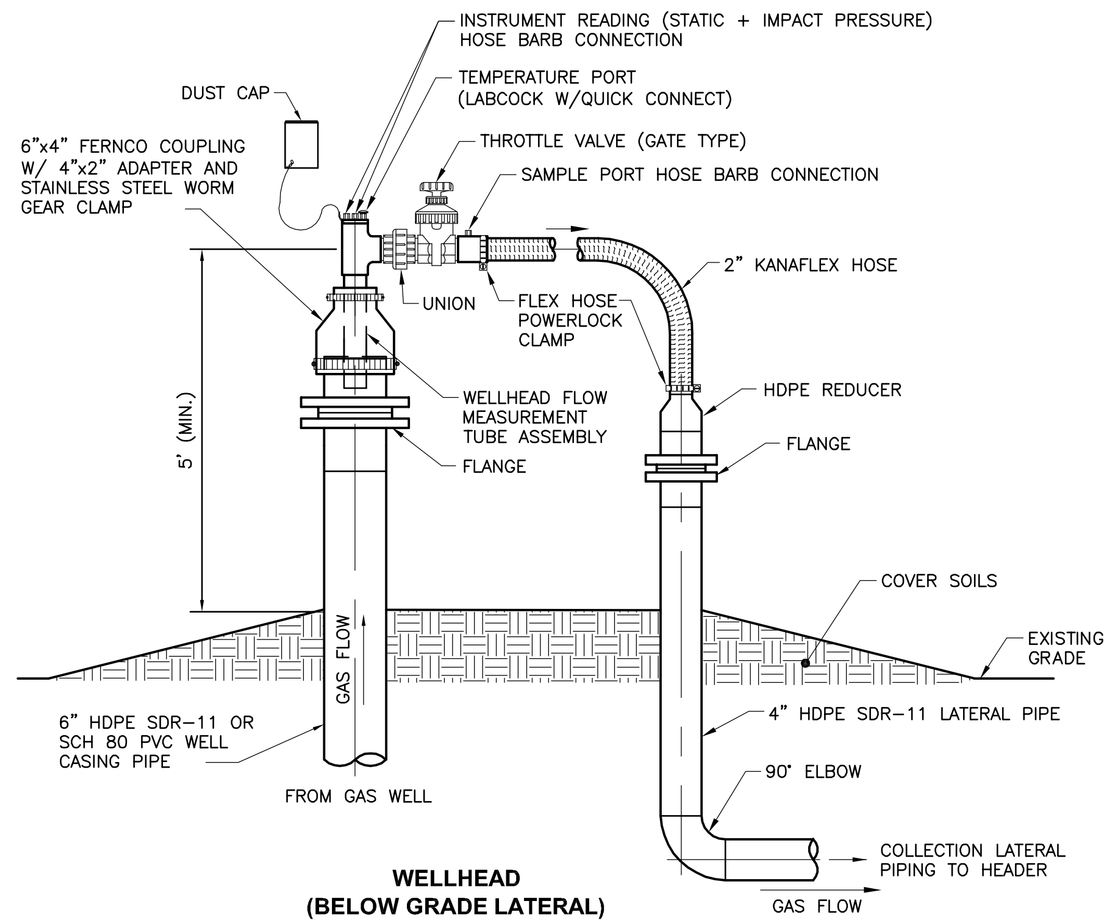
ELEVATION VIEW



PLAN VIEW

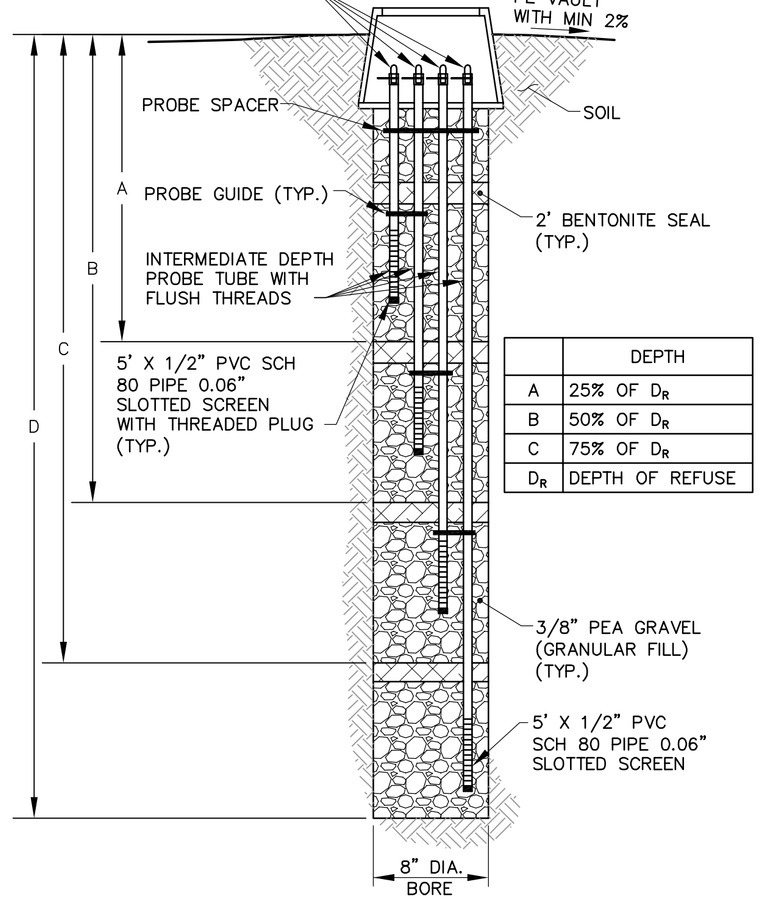
WELLHEAD (ABOVE GRADE LATERAL)

DETAIL 2/15
SCALE: NOT TO SCALE



WELLHEAD (BELOW GRADE LATERAL)

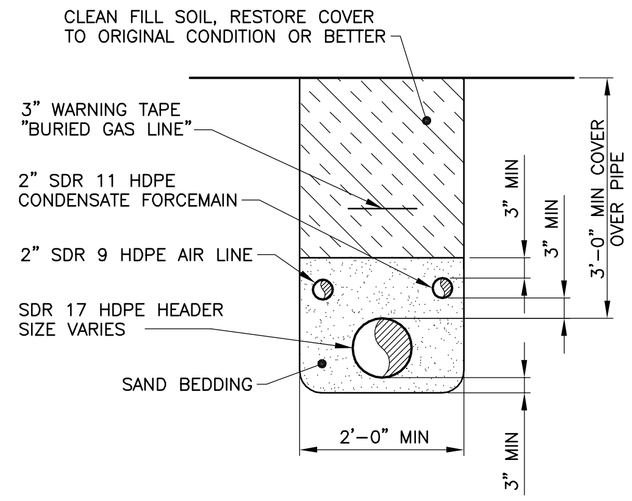
DETAIL 3/15
SCALE: NOT TO SCALE



	DEPTH
A	25% OF D_R
B	50% OF D_R
C	75% OF D_R
D_R	DEPTH OF REFUSE

LFG MONITORING PROBE

DETAIL 4/15
SCALE: NOT TO SCALE



HEADER TRENCH

DETAIL 5/15
SCALE: NOT TO SCALE

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MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

CONCEPTUAL LANDFILL GAS DETAILS

SHEET NO. **15**
PROJECT NO. 090250.3

1" 1/2" 0" 1"

N 518000
N 517000
N 516000
N 515000
N 514000
N 513000

E 894000
E 895000
E 896000
E 897000
E 898000
E 899000
E 900000
E 901000
E 902000

GLO BRASS
CAP. 1966.49

BM-1
1966.06

CEG-3
N 516702.31
E 895648.03
EL 1967.25 TOC

N 515628.86
E 899071.07
EL 1965.86 TOC
CEG-4

BM-3
1972.62

N 513773.39
E 894443.19
EL 1975.83 TOC
CEG-2

GP-1

MODULE 1A

N 513106.76
E 898817.59
EL 1978.34 TOC
CEG-1

BM-2
1979.19

GP-2

GP-3

26

27

LEGEND

- PROPERTY BOUNDARY
- PROPOSED WASTE LIMIT
- EXISTING FENCE
- EXISTING INTERMEDIATE CONTOUR (C.I.=2FT)
- EXISTING INDEX CONTOUR (C.I.=10FT)
- EXISTING BENCHMARK (SETTLEMEYER LLC)
- EXISTING IRRIGATION WELL
- EXISTING MONITORING WELL LOCATION
- PROPOSED LANDFILL GAS PROBE (MODULE 1A)
- FUTURE LANDFILL GAS PROBE
- TOC — TOP OF CASING (MEASURED AT TOP OF WELL SEAL – NORTH SIDE)

0 300 600
SCALE IN FEET

TOPOGRAPHY PREPARED BY COOPER AERIAL. THIS COMPUTER PLOTTED MAP WAS GENERATED FROM DATA COMPILED BY DIGITAL STEREO METHODS USING AERIAL PHOTOGRAPHY TAKEN ON APRIL 6, 2010

BENCHMARK AND WELL COORDINATES WERE MEASURED BY SETTLEMEYER LLC, ON MARCH 11, 2011

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DKL HOLDINGS
MARANA REGIONAL LANDFILL
MARANA, ARIZONA
SOLID WASTE FACILITY PLAN

ENVIRONMENTAL MONITORING PLAN

SHEET NO. **16**

PROJECT NO. 090250.3