

NM1 - _____53_____

**BORING
PLAN(S)**

2014

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey, Division Director
Oil Conservation Division



September 2, 2014

Greg Crabtree
Envirotech, Inc.
5796 US Highway 64
Farmington, New Mexico 87401

**RE: Hydrogeologic Investigation Boring Plan
Proposed Commercial Surface Waste Management Facility
Envirotech, Inc. – Proposed Landfarm #4
Location: E/2 of Section 6 and NE/4 of Section 7, Township 26 North, Range 10 West,
NMPM, San Juan County, New Mexico**

Dear Mr. Crabtree:

The Oil Conservation Division (OCD) has received Envirotech, Inc.'s boring plan proposal, dated August 28, 2014 and hand-delivered to OCD on September 2, 2014, to investigate and characterize the uppermost aquifer and subsurface geology for a proposed commercial surface waste management (landfarm) facility located within E/2 of Section 6 and NE/4 of Section 7, Township 26 North, Range 10 West, NMPM, San Juan County, New Mexico. OCD has completed its review and determined that the proposal is adequate to proceed with the site investigation, with the following conditional approval:

Please justify the depth of 110 feet below ground surface in which Envirotech proposes to obtain a soil sample from Soil Boring #4 for laboratory analyses for "porosity, permeability, conductivity, compaction ratios and swelling characteristics for the sediments on which the contaminated soils will be placed,..." pursuant to Subparagraph (g) of 19.15.36.8.C.(15) NMAC.

OCD agrees that the proposed boring locations appear adequate. However, if the hydrogeologic conditions cannot be determined, additional borings or monitoring wells may be needed.

The OCD appreciates your cooperation in providing a boring plan for review, in order to determine if the submitted application and the proposed site are suitable for consideration of approval. If there are any questions regarding this matter, please do not hesitate to contact me at (505) 476-3487 or brad.a.jones@state.nm.us.

Sincerely,

Brad A. Jones
Environmental Engineer

BAJ/baj

Cc: OCD District III Office, Aztec



Landfarm #4 Soil Boring Plan

Prepared for:

**State of New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
(505) 476-3490**

Submitted By:

**Envirotech, Inc.
5796 U.S. Highway 64
Farmington, New Mexico 87401
(505) 632-0615**

August 28, 2014



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Introduction

Envirotech, Inc.'s (Envirotech's) proposed Landfarm #4 is located approximately 15 miles south of Bloomfield, New Mexico, on Angel Peak Road/County Road 7175; see **Figure 1, Facility Location**. Envirotech's, proposed Landfarm #4 is a total of 260 acres with 158.16 acres of farmable area; see **Figure 2, Farmable Area Map**. Envirotech's Landfarm #4 will be used for the remediation of hydrocarbon contaminated soils and drill cuttings. No liquids will be accepted at Landfarm #4; therefore, a blending facility will not be constructed in Landfarm #4. All incoming contaminated soils or drill cuttings will be sampled and tested. Any incoming material that fails the paint filter or chloride test will be rejected/turned away. The following soil boring plan outlines the geologic and hydrogeologic investigation of Envirotech's Landfarm #4, per 19.15.36 NMAC requirements.

Objective

The objective of this soil boring plan is to collect data through subsurface investigation of Landfarm #4 to satisfy all applicable requirements of 19.15.36.8 (C) NMAC, paragraph 15, subparagraphs a through g and 19.15.36.13 (A) NMAC, paragraphs 2 through 5. The following is a list of items to be investigated, if applicable, during the subsurface investigation of Landfarm #4:

Soil

1. Lithologic description
2. Geologic cross-sections
3. Soil lab analysis (per 19.15.36.8 (C), 15(g))
4. Depth and name of formation

***Shallowest fresh water aquifer**

1. Depth and name
2. Potentiometric maps
3. Auqifer lab analysis (per 19.15.36.8, 15(b))

****Collection of aquifer data depends on if water is reached during drilling activities. If water is not reached during the onsite drilling activities then the aquifer lab analysis will not be collected and reported. The aquifer depth, name and potentiometric maps will be based solely on data collected from iWaters and/or NMOCD records that are applicable to Landfarm #4.***

Scope of Work

In order to accomplish the objectives of this soil boring plan, the following scope of work will be executed:

1. Review and use any applicable previous data gathered in 2008-2009.
2. Determine soil boring locations, based on overall assessment of geology and groundwater of Landfarm #4.
3. Complete drilling to maximum of 110 ft below ground surface (bgs).
4. Complete boring logs and record site lithology.
5. Collect soil samples as see fit to record subsurface soil characteristics.
6. Complete boring as monitor well (if necessary).
7. Collect a water sample for aquifer lab analysis (if necessary).

The sections below describe these items in further detail.

2008-2009 Soil Boring Information:

Based on the USDA Web Soil Survey site, there are four (4) different soil groups within Landfarm #4 boundaries; see **Figure 3, Soil Survey Map with Boring Overlay**. The data from Web Soil Survey was used primarily to determine the best locations for soil borings that will help gain a better overall geological assessment of Landfarm #4. The subsurface information on Web Soil Survey only reaches to a depth of 5-6 feet below ground surface (bgs); therefore, previously drilled soil borings and proposed soil boring locations will provide a greater overall site assessment of Landfarm #4's site geology by drilling to depths greater than 5-6 feet bgs. The two (2) soil borings previously drilled in 2008 and 2009 will provide information at depths greater than 5-6 feet on one (1) of the four (4) dominate soil groups within Landfarm #4. Information such as the lithology logs recorded during the drilling of these two (2) soil borings will be used to help meet the previously discussed objectives for onsite soil information.

Based on the Web Soil Survey information and the locations of the previous borings, it was determined that two (2) more borings would be completed for the purpose of meeting the previously discussed objectives. Soil Boring #3 was chosen to provide more information on overall site geology beyond 5-6 feet. No subsurface lab analysis will be completed for Soil Boring #3 as one will be collected during the drilling of Soil Boring #4.

Soil Boring #4 was chosen specifically to provide information regarding groundwater information, per 19.15.36.13 (A) NMAC, paragraphs 2 through 5. In addition, lithology logs will be recorded during the drilling of Soil Boring #4 to provide further information of overall site geology and possibly gain some information about the site groundwater as well as provide subsurface information per 19.15.36.8 (C) NMAC, paragraph 15, subparagraph d, to help gain a greater knowledge of subsurface soil properties.

The closest well to the proposed facility that gives us information about depth to water is a cathodic well located near the Huerfano Unit #68 well site. The cathodic well is in the NE quarter of Section 7, Township 25N, Range 10W and was drilled by Meridian oil in 1975. The well information indicates a surface elevation of 6535 feet above mean sea level and a water zone indicated at approximately 275' below the surface elevation. The cathodic well information sheet is attached: see **Figure 6, Data Sheet for Ground Bed Cathodic Protection Wells**.

Soil Boring Locations:

Two (2) soil borings will be drilled; proposed Soil Boring #3 located at the north end of the proposed Landfarm #4 and proposed Soil Boring #4 located at an onsite elevation that may provide the most relevant groundwater information.

Proposed Soil Boring #3 location was chosen based on the requirement discussed in 19.15.36.8 (G) NMAC; to provide further information on overall site geology at depths beyond Web Soil Survey data; see **Figure 4, Soil Boring Locations**.

Proposed Soil Boring #4 location was chosen based on survey information collected on February 22, 2008 and information from an existing Huerfano Unit #68 Cathodic Well (cathodic well). The cathodic well is located only 89 feet west of the southwest property line of Landfarm #4, information from this cathodic well states groundwater was reached at 275 bgs and elevation of the cathodic well was recorded as 6535 feet. The survey information and location of the existing cathodic well was used to determine the locations of Soil Boring #4. A comparable elevation and location in close proximity to the existing cathodic well was found within the farmable area of Landfarm #4 in order to hopefully gain some information of groundwater below the site. Soil Boring #4 elevation was determined to be 6536 ft and is located within Landfarm #4 surveyed boundary; see **Figure 4, Soil Boring Locations**.

Drilling:

Proposed Soil Boring #3 will be drilled to gain more information of the sites overall geology and subsurface soil information. The starting elevation of proposed Soil Boring #3 was interpolated from the 2008 survey and was found to be; 6566 feet. Proposed Soil Boring #3 will be drilled at the north end of the proposed Landfarm #4 location at a depth of 40 ft; therefore, proposed Soil Boring #3 will be drilled to a maximum elevation of 6526 feet. Soil lithology will be recorded during drilling.

Proposed Soil Boring #4 will be drilled outside of the farmable area to a maximum depth of 110 feet bgs, if groundwater is not encountered prior to reaching 100 feet bgs. If groundwater is not encountered, the soil boring will be extended to 110 feet to be conservative. The actual soil boring will be drilled outside the farmable area of Landfarm #4, in the event the soil boring must be completed as a monitor well. Based on the 2008 topography, a comparable elevation to the existing cathodic well within the farmable area was determined to be 6536 feet, a point outside of the farmable area (labeled proposed Soil Boring #4) was found at the same elevation; see **Figure 4, Soil Boring Locations**. Proposed Soil Boring #4 will be completed as a monitor well only if groundwater is encountered within 100 feet bgs. Proposed Soil Boring #4 elevation was interpolated from the survey to be; 6536 feet. Proposed Soil Boring #4 will be drilled to a maximum elevation of 6426 feet, which is comparable to drilling at the elevation of the existing cathodic well within the farmable area; see **Figure 4, Soil Boring Locations**. The elevation of the borehole will be determined based on if groundwater is encountered or a maximum elevation of 6426 feet, whichever is reached first.

Proposed Soil Boring #3 will be bored to 40 feet bgs and proposed Soil Boring #4 will be bored to 110 feet bgs using 4.25 inner diameter hollow stem augers complete with five (5) foot split tube CME style dry core sampler. Beginning at the surface, the five (5) foot split tube will be loaded into the auger and hooked up to the drill rig. The auger will be advance down five (5) feet, the sampler will be removed by a winch line, set on a stand and taken apart for the geologist to log and collect samples. An empty sampler will be place in the auger and the drill rig will advance the augers another five (5) feet. This process will take place to auger refusal or no recovery in the core barrel, whichever comes first. At the point of auger refusal or empty core barrel sampler the rig will be converted over to HQ wireline core, where a core barrel complete with an inner barrel to collect a sample will be drilled using air and the sample will be retrieved by a wireline after advancing five (5) feet. An empty five (5) foot barrel will be lowered in the hole and the process will repeat itself to total depth. If water is not encountered, the hole will be backfilled with bentonite/grout slurry poured from the surface down the hole.

If groundwater is encountered, a two (2) inch schedule 40 pvc well will be installed completed with factory slot screen through five (5) feet above static water table and casing to three (3) feet above ground surface. The hole will be backfilled with 10/20 sand to two (2) feet above the screen and bentonite/grout slurry to the surface. The surface completion will consist of a four (4) inch by four (4) inch by five (5) foot tall steel stickup cover and set in concrete form two (2) feet by two (2) feet square. If a confined aquifer is encountered well drilling and completion will be completed as specified in NMAC 19.27.4.31. The responsibility to comply with the provisions set forth in NMAC 19.27.4.29 and 19.27.4.31 will be the responsibility of the drilling contractor who possesses the drilling license.

Soil Sampling and Lithology:

The continuous core for proposed Soil Boring #4 will be sampled at 110 feet bgs and sent to an independent commercial lab for analysis of porosity, permeability, conductivity, compaction ratios and swelling characteristics. Testing will be completed in accordance with the test methods specified by the NMOCD document entitled "OCD Requirements for Soil Testing Pursuant to 19.15.36 NMAC". This document is attached at the end of this document.

An Environmental Scientist will be on site to photograph and note the texture, color and moisture content of the subsurface soil during the drilling of both soil borings. The depth and description of changes in the soil during drilling will be recorded on boring logs.

Monitor Well Installation and Sampling (if applicable):

If damp soil is encountered during the drilling of proposed Soil Boring #4, Envirotech will wait 24 hours for any water to potentially gather in the well in order to determine if the damp zone could be a perched aquifer. If groundwater is encountered during the drilling of proposed Soil Boring #4, the boring will be completed as a monitor well, per ASTM D5092 Standard Practice for Design and Installation of Groundwater Monitoring Wells; see *Figure 5, Typical Monitor Well Construction*.

Prior to the well being developed, the static water level will be measured and recorded using a Solnist Water level meter to the nearest 0.01 feet below the top of the casing (TOC). After the static water level is measured the monitor well will be developed by either bailing or pumping a minimum of three (3) well volumes of water and the pH, temperature are allowed to stabilize. A water sample will be collected and analyzed at an independent commercial laboratory for major cations, anions, benzene, toluene, ethylbenzene, xylenes, RCRA metals and total dissolved solids (TDS), see attached *Table 1, Groundwater Analysis List*, for the full list.

In the event groundwater is not encountered during the drilling of the proposed Soil Boring #4 in Landfarm #4, the borehole will be backfilled with bentonite grout slurry from total depth to ground surface.

Schedule

We anticipate drilling activities will take approximately four (4) days, depending on weather and unforeseen drilling difficulties. Soil boring records and the collection of soil samples will be completed during the four (4) day drilling activities. In the event water is encountered, drilling will cease and the soil boring will be completed as a monitor well and a sample will be collected and analyzed as previously discussed.

Personnel

A representative from the following companies/divisions **will be** on site during Landfarm #4 drilling activities:

- Precision Exploration (Drilling Contractor)
- Envirotech, Inc. (Scientist and/or Project Manager)

A representative from the following companies/divisions **may be** on site during Landfarm #4 drilling activities:

- New Mexico Oil Conservation Division (NMOCD) inspector. (Brad Jones and Brandon Powell will be notified 14 days prior to on site drilling activities in the event NMOCD personnel are able to be present for drilling activities).

Upon NMOCD approval of this soil boring plan, a representative of each company/division listed above will be contacted for coordination and scheduling of drilling activities at Landfarm #4.

Reporting

Upon completion of Landfarm #4 drilling activities and obtaining final lab results, Envirotech, Inc. will complete a geological/hydrological report for submittal with the Landfarm #4 permit. The report will include the following information:

- Depth to fresh water aquifer based on TOC (if groundwater is encountered during drilling)
- Overall site geology, using past lithology log information and lithology log information gathered from proposed soil borings
- Summary of soil analysis results from Soil Boring #3
- Summary of any data gathered from iWaters or NMOCD that is applicable to the site

Table 1. Groundwater Analysis List	
Field Parameters	
pH	
Specific Conductivity	
Temperature	
Static Water Level	
LAB Analysis	
Characteristic	Unit
Resistivity @ 68 °F	ohm-meters
Conductivity @ 25 °C	umhos/cm
pH	s.u.
Total Dissolved Solids (TDS) @ 180 °C	mg/L
Major Ions	
Carbonate as CO ₃	mg/L
Bicarbonate as HCO ₃	mg/L
Calcium	mg/L
Chloride	mg/L
Flouride	mg/L
Hydroxide (OH)	mg/L
Iron	mg/L
Magnesium	mg/L
Nitrates	mg/L
Nitrites	mg/L
Phosphate	mg/L
Potassium	mg/L
Sodium	mg/L
Sulfate	mg/L
RCRA Metals	
Arsenic	mg/L
Barium	mg/L
Cadmium	mg/L
Chromium	mg/L
Lead	mg/L
Mercury	mg/L
Selenium	mg/L
Silver	mg/L
Volatile Organic Compounds (VOCs)	
Benzene	ug/L
Ethlybenzene	ug/L
m+p-Xylenes	ug/L
o-Xylenes	ug/L
Toulene	ug/L
Total Xylenes	ug/L



KEY

— LANDFARM #4 SURVEYED BOUNDARY (260 ACRES)

FIGURE 1
FACILITY LOCATION
LANDFARM #4 PERMIT
June 18, 2014

SCALE: N.T.S.

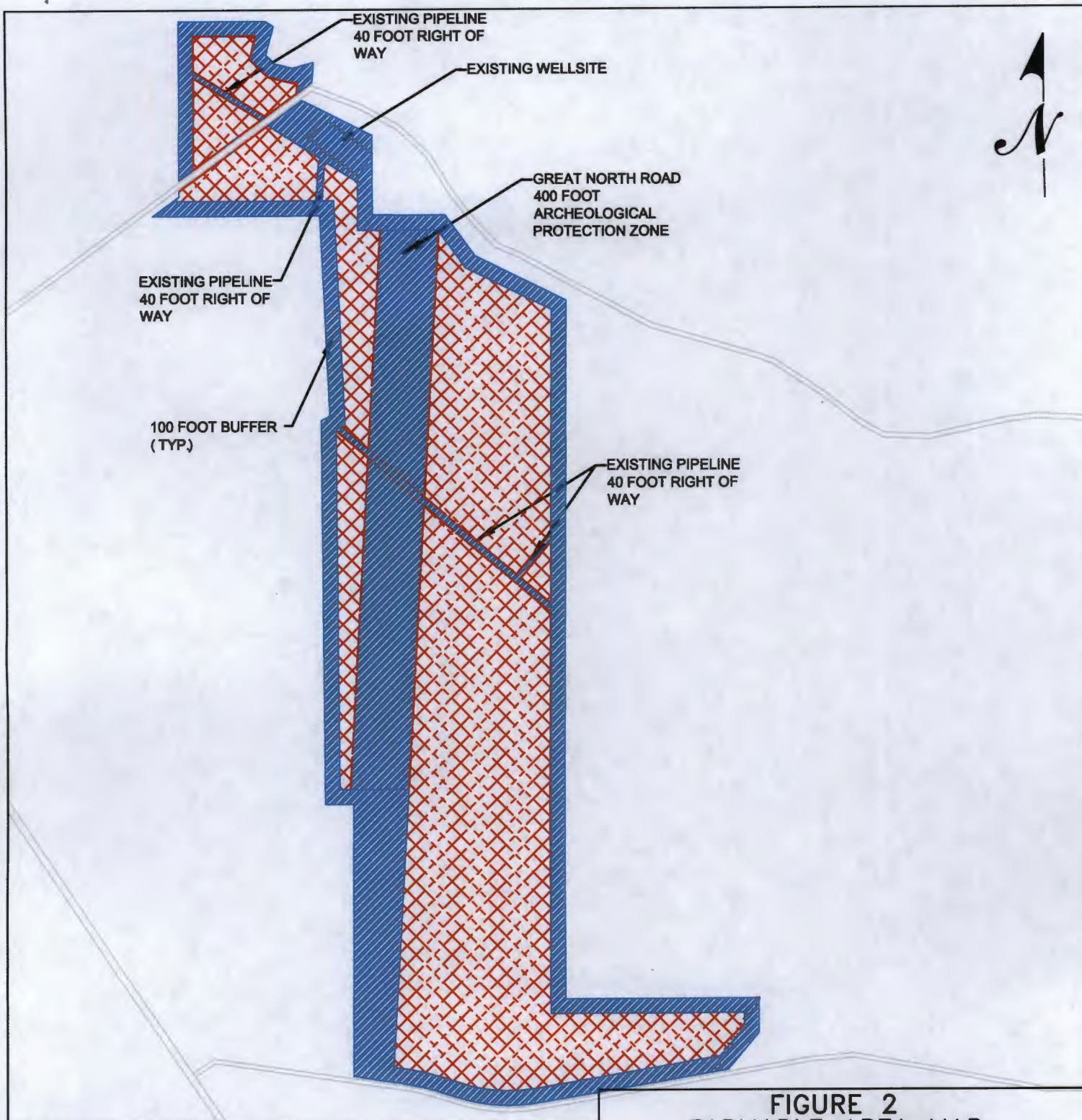
PROJECT NO.

MAP DRWN JKA

BASE DRWN



5796 U.S. HIGHWAY 64, FARMINGTON, NM 87401 505-632-0615



KEY

- LANDFARM #4 SURVEYED BOUNDARY (260 ACRES)
- ▨ FARMABLE AREA (158.16 ACRES)
- ▨ NON FARMABLE AREA

FIGURE 2
FARMABLE AREA MAP
 LANDFARM #4 PERMIT
 June 18, 2014

SCALE: N.T.S.

PROJECT NO.

MAP DRWN JKA

BASE DRWN



envirotech

5796 U.S. HIGHWAY 64, FARMINGTON, NM 87401 505-632-0615

FIGURE 3, SOIL SURVEY MAP WITH BORING OVERLAY



Drainage Class

Drainage Class— Summary by Map Unit — San Juan County, New Mexico, Eastern Part (NM618)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BT	Blancot-Notal association, gently sloping	Well drained	18.9	7.0%
DS	Doak-Sheppard-Shiprock association, rolling	Well drained	129.9	48.0%
FX	Fruitland-Persayo-Sheppard complex, hilly	Well drained	14.5	5.4%
Sd	Sheppard-Mayqueen-Shiprock complex, 0 to 8 percent slopes	Somewhat excessively drained	107.4	39.7%
Totals for Area of Interest			270.7	100.0%

Description

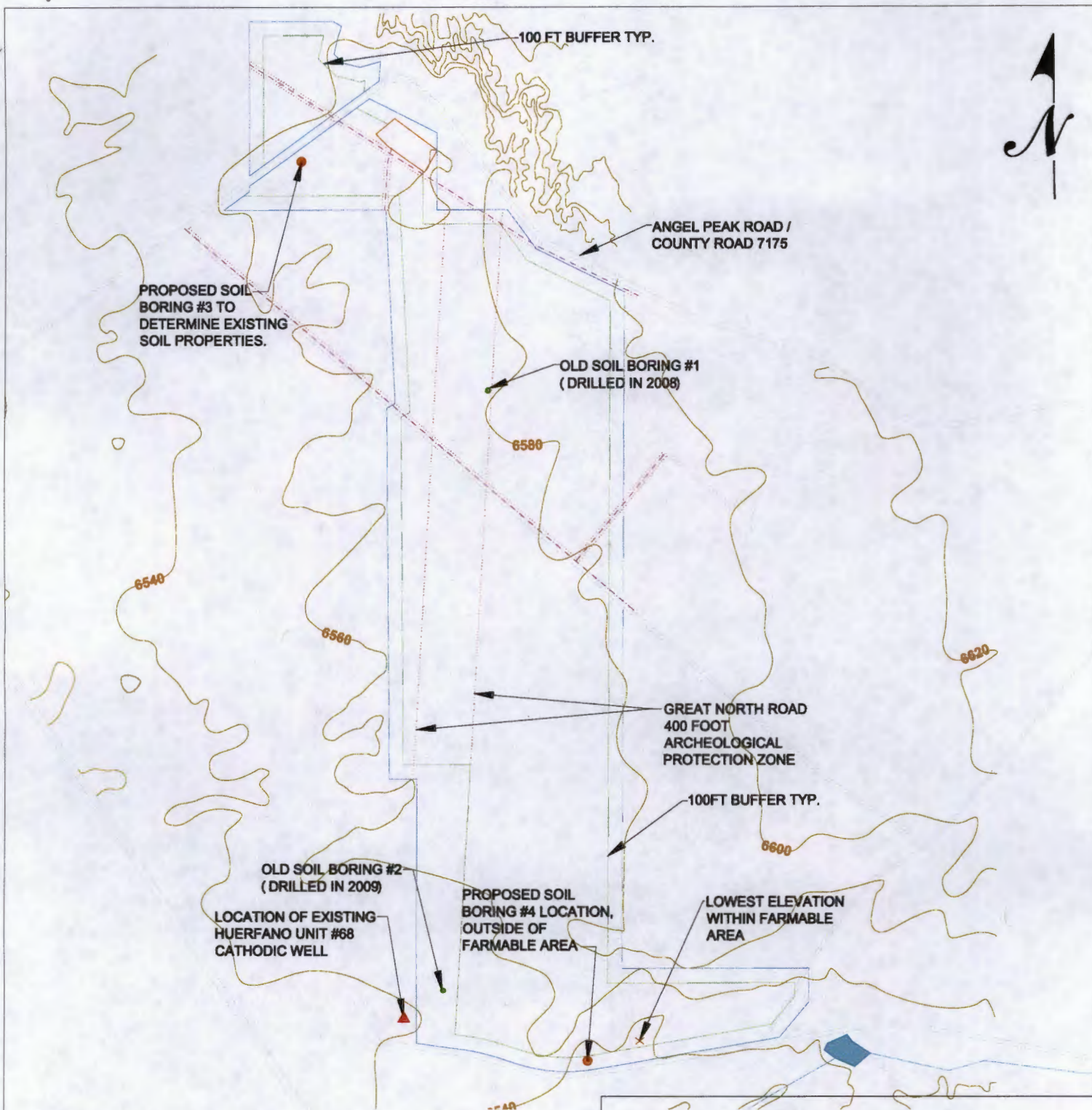
"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



KEY

- EDGE OF ROAD
- CENTERLINE OF ROAD
- ROAD & PIPELINE R.O.W.
- 100 FOOT BUFFER
- SURVEYED LANDFARM #4 BOUNDARY
- PROPOSED SOIL BORING LOCATION, OUTSIDE OF FARMABLE AREA
- × LOWEST ELEVATION WITHIN FARMABLE AREA
- LOCATIONS OF PREVIOUS DRILLED SOIL BORINGS
- ▲ LOCATION OF HUERFANO UNIT #68 CATHODIC WELL

FIGURE 4
SOIL BORING LOCATIONS
LANDFARM #4 PERMIT
July 30, 2014

SCALE: N.T.S.

PROJECT NO.

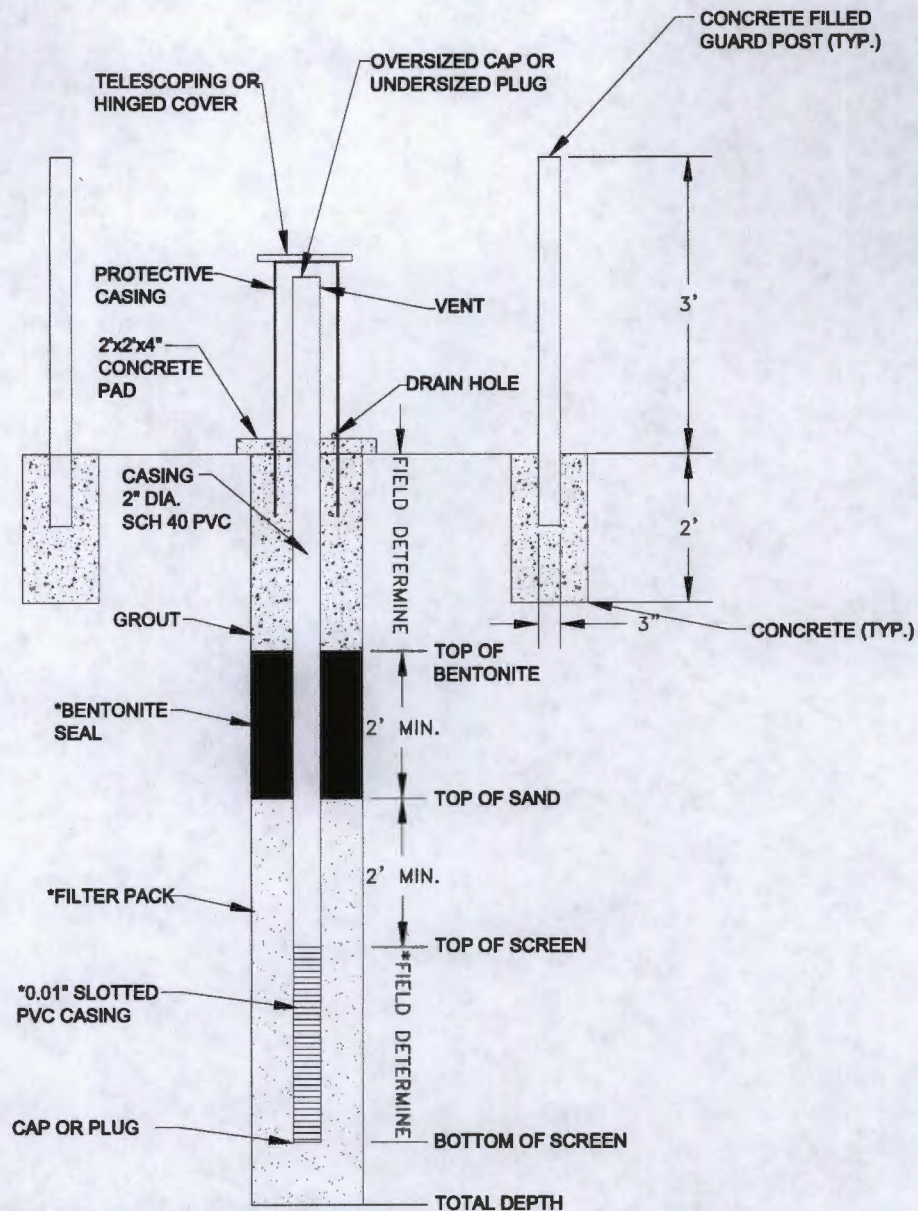
MAP DRWN GWC

BASE DRWN



envirotech

5796 U.S. HIGHWAY 64, FARMINGTON, NM 87401 505-632-0615



***NOTE:**

MONITOR WELL CONSTRUCTION FOR AN UNCONFINED AQUIFER:

EXTEND FILTER PACK 3-5 FEET ABOVE TOP OF SCREEN

USE HYDRATED BENTONITE CHIPS 2-3 FEET THICK

PLACE SCREEN 5 FEET ABOVE CURRENT WATER LEVEL TO ACCOMMODATE FOR SEASONAL FLUCTUATIONS IN WATER

BENTONITE OR BENTONITE/GROUT SLURRY WILL BE PLACED USING A TREMMIE PIPE

MONITOR WELL CONSTRUCTION FOR A CONFINED AQUIFER:

EXTEND FILTER PACK 0.5-1.0 FEET ABOVE TOP OF SCREEN

PLACE 2-3 FT THICK LAYER OF TIME RELEASED BENTONITE CHIPS WITHIN THE TOP CONFINING LAYER

PLACE SCREEN WITHIN CONFINED AQUIFER

BENTONITE OR BENTONITE/GROUT SLURRY WILL BE PLACED USING A TREMMIE PIPE

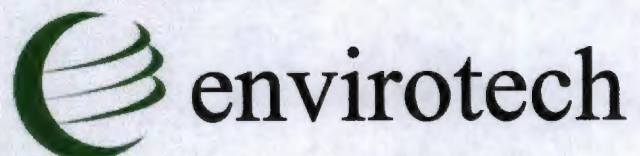
FIGURE 5
TYPICAL MONITOR WELL CONSTRUCTION
LANDFARM #4 PERMIT
June 18, 2014

SCALE: N.T.S.

PROJECT NO.

MAP DRWN JKA

BASE DRWN



5796 U.S. HIGHWAY 64, FARMINGTON, NM 87401 505-632-0615

30-045-21397

DATA SHEET FOR DEEP GROUND BED CATHODIC PROTECTION WELLS
NORTHWESTERN NEW MEXICO
(Submit 3 copies to OCD Aztec Office)

Operator MERIDIAN OIL Location: Unit NE Sec. 7 Twp 25 Rng 10

Name of Well/Wells or Pipeline Serviced HUERFANO UNIT #68

cps 953w

Elevation 6535' Completion Date 8/20/75 Total Depth 480' Land Type* N/A

Casing, Sizes, Types & Depths N/A

If Casing is cemented, show amounts & types used N/A

If Cement or Bentonite Plugs have been placed, show depths & amounts used
N/A

Depths & thickness of water zones with description of water when possible:
Fresh, Clear, Salty, Sulphur, Etc. 275'

RECEIVED
MAY 31 1991

Depths gas encountered: N/A

Type & amount of coke breeze used: 4600 lbs.

Depths anodes placed: 440', 430', 420', 410', 400', 390', 350', 340', 300', 290'

Depths vent pipes placed: N/A

Vent pipe perforations: 200'

Remarks: gb #1

If any of the above data is unavailable, please indicate so. Copies of all logs, including Drillers Log, Water Analyses & Well Bore Schematics should be submitted when available. Unplugged abandoned wells are to be included.

*Land Type may be shown: F-Federal; I-Indian; S-State; P-Fee.
If Federal or Indian, add Lease Number.

OCD Requirements for Soil Testing Pursuant to 19.15.36 NMAC

Total Porosity:

- Initial Properties: Moisture Content (ASTMD2216 - 10; ASTM D6836 – 68(2006)); Dry Bulk Density (ASTM D6836); Calculated Porosity (ASTM D6836 – 68(2006)).

Permeability/Saturated Hydraulic Conductivity:

- Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter (ASTM D5856 - 95(2007))
- Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter. (ASTM D5084 – 10)

Compaction Ratios:

- Proctor Compaction Test. (ASTM698 – 07e1)

Swelling Characteristics:

- Atterberg Limits. (ASTM D4318 - 10)