District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources
Department
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-144
Revised June 6, 2013

For temporary pits, below-grade tanks, and multi-well fluid management pits, submit to the appropriate NMOCD District Office.
For permanent pits submit to the Santa Fe Environmental Bureau office and provide a copy to the appropriate NMOCD District Office.

Pit, Below-Grade Tank, or Proposed Alternative Method Permit or Closure Plan Application

Type of action:
- ☐ Below grade tank registration
- ☒ Permit of a pit or proposed alternative method
- ☐ Closure of a pit, below-grade tank, or proposed alternative method
- ☐ Modification to an existing permit/or registration
- ☐ Closure plan only submitted for an existing permitted or non-permitted pit, below-grade tank, or proposed alternative method

Instructions: Please submit one application (Form C-144) per individual pit, below-grade tank or alternative request

Please be advised that approval of this request does not relieve the operator of liability should operations result in pollution of surface water, ground water or the environment. Nor does approval relieve the operator of its responsibility to comply with any other applicable governmental authority's rules, regulations or ordinances.

1.
Operator: Yates Petroleum Corporation OGRID #: 25575
Address: 105 S. 4th Street, Artesia, NM 88210
Facility or well name: Dagger Draw Multi-Well Fluid Management Pit #1
API Number: See Appendix E OCD Permit Number: MWF 2-1
U/L or Qtr/Qtr SE1/4 of SE 1/4 Section 16 Township 19S Range 25E County: Eddy
Center of Proposed Design: Latitude 32 39 26.60 Longitude -104 28 55.80 NAD: ☐1927 ☒ 1983
Surface Owner: ☐ Federal ☒ State ☐ Private ☐ Tribal Trust or Indian Allotment

2.
☒ **Pit:** Subsection F, G or J of 19.15.17.11 NMAC
Temporary: ☐ Drilling ☐ Workover
☐ Permanent ☐ Emergency ☐ Cavitation ☐ P&A ☒ Multi-Well Fluid Management Low Chloride ~~Drilling~~ Fluid ☐ yes ☒ no
☒ Lined ☐ Unlined Liner type: Thickness 30 & 60 mil ☒ LLDPE ☒ HDPE ☐ PVC ☐ Other See Variance Request
☐ String-Reinforced 60 mil HDPE Primary Liner 30-mil Secondary Liner (LLDPE or HDPE as approved by OCD)
Liner Seams: ☒ Welded ☐ Factory ☐ Other _____ Volume 378,000 bbl Dimensions: L 450 x W 390 x D 10

3.
☐ **Below-grade tank:** Subsection I of 19.15.17.11 NMAC
Volume: _____bbl Type of fluid: _____
Tank Construction material: _____
☐ Secondary containment with leak detection ☐ Visible sidewalls, liner, 6-inch lift and automatic overflow shut-off
☐ Visible sidewalls and liner ☐ Visible sidewalls only ☐ Other _____
Liner type: Thickness _____mil ☐ HDPE ☐ PVC ☐ Other _____

4.
☐ **Alternative Method:**
Submittal of an exception request is required. Exceptions must be submitted to the Santa Fe Environmental Bureau office for consideration of approval.

5.
Fencing: Subsection D of 19.15.17.11 NMAC *(Applies to permanent pits, temporary pits, and below-grade tanks)*
☐ Chain link, six feet in height, two strands of barbed wire at top *(Required if located within 1000 feet of a permanent residence, school, hospital, institution or church)*
☒ Four foot height, four strands of barbed wire evenly spaced between one and four feet
☒ Alternate. Please specify Game fence _____

6.

Netting: Subsection E of 19.15.17.11 NMAC *(Applies to permanent pits and permanent open top tanks)*

☐ Screen ☐ Netting ☒ Other___Operator will evaluate need for netting as described in Construction/Design Plan

☐ Monthly inspections (If netting or screening is not physically feasible)

7.

Signs: Subsection C of 19.15.17.11 NMAC

☒ 12"x 24", 2" lettering, providing Operator's name, site location, and emergency telephone numbers

☐ Signed in compliance with 19.15.16.8 NMAC

8.

Variances and Exceptions:

Justifications and/or demonstrations of equivalency are required. Please refer to 19.15.17 NMAC for guidance.

Please check a box if one or more of the following is requested, if not leave blank:

☒ Variance(s): Requests must be submitted to the appropriate division district for consideration of approval.

☐ Exception(s): Requests must be submitted to the Santa Fe Environmental Bureau office for consideration of approval.

9.

Siting Criteria (regarding permitting): 19.15.17.10 NMAC

Instructions: The applicant must demonstrate compliance for each siting criteria below in the application. Recommendations of acceptable source material are provided below. **Siting criteria does not apply to drying pads or above-grade tanks.**

General siting	
Ground water is less than 25 feet below the bottom of a low chloride temporary pit or below-grade tank. - ☐ NM Office of the State Engineer - iWATERS database search; ☐ USGS; ☐ Data obtained from nearby wells	☐ Yes ☐ No ☒ NA
Ground water is less than 50 feet below the bottom of a Temporary pit, permanent pit, or Multi-Well Fluid Management pit . NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells **See Figures 1 & 2**	☐ Yes ☒ No ☐ NA
Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended. **(Does not apply to below grade tanks) See Figure 5** - Written confirmation or verification from the municipality; Written approval obtained from the municipality	☐ Yes ☒ No
Within the area overlying a subsurface mine. **(Does not apply to below grade tanks) See Figure 7** - Written confirmation or verification or map from the NM EMNRD-Mining and Mineral Division	☐ Yes ☒ No
Within an unstable area. **(Does not apply to below grade tanks) See Figure 8** - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; Topographic map	☐ Yes ☒ No
Within a 100-year floodplain. **(Does not apply to below grade tanks) See Figure 9** - FEMA map	☐ Yes ☒ No
Below Grade Tanks	
Within 100 feet of a continuously flowing watercourse, significant watercourse, lake bed, sinkhole, wetland or playa lake (measured from the ordinary high-water mark). - Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Within 200 horizontal feet of a spring or a fresh water well used for public or livestock consumption;. - NM Office of the State Engineer - iWATERS database search; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Temporary Pit using Low Chloride Drilling Fluid (maximum chloride content 15,000 mg/liter)	
Within 100 feet of a continuously flowing watercourse, or any other significant watercourse or within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). (Applies to low chloride temporary pits.) - Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Within 300 feet from a occupied permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; Aerial photo; Satellite image	☐ Yes ☐ No
Within 200 horizontal feet of a spring or a private, domestic fresh water well used by less than five households for domestic or stock watering purposes, or 300feet of any other fresh water well or spring, in existence at the time of the initial application. NM Office of the State Engineer - iWATERS database search; Visual inspection (certification) of the proposed site	☐ Yes ☐ No

Within 100 feet of a wetland. - US Fish and Wildlife Wetland Identification map; Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Temporary Pit Non-low chloride drilling fluid	
Within 300 feet of a continuously flowing watercourse, or any other significant watercourse, or within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). - Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Within 300 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; Aerial photo; Satellite image.	☐ Yes ☐ No
Within 500 horizontal feet of a spring or a private, domestic fresh water well used by less than five households for domestic or stock watering purposes, or 1000 feet of any other fresh water well or spring, in the existence at the time of the initial application; - NM Office of the State Engineer - iWATERS database search; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Within 300 feet of a wetland. - US Fish and Wildlife Wetland Identification map; Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Permanent Pit or Multi-Well Fluid Management Pit	
Within 300 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, or lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). **See Figure 3** - Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; Aerial photo; Satellite image **See Figure 4**	☐ Yes ☒ No
Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application. **See Figures 1 & 2** - NM Office of the State Engineer - iWATERS database search; Visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within 500 feet of a wetland. **See Figure 6** - US Fish and Wildlife Wetland Identification map; Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☒ No

10.

Temporary Pits, Emergency Pits, and Below-grade Tanks Permit Application Attachment Checklist: Subsection B of 19.15.17.9 NMAC

Instructions: Each of the following items must be attached to the application. Please indicate, by a check mark in the box, that the documents are attached.

☐ Hydrogeologic Report (Below-grade Tanks) - based upon the requirements of Paragraph (4) of Subsection B of 19.15.17.9 NMAC
☐ Hydrogeologic Data (Temporary and Emergency Pits) - based upon the requirements of Paragraph (2) of Subsection B of 19.15.17.9 NMAC
☐ Siting Criteria Compliance Demonstrations - based upon the appropriate requirements of 19.15.17.10 NMAC
☐ Design Plan - based upon the appropriate requirements of 19.15.17.11 NMAC
☐ Operating and Maintenance Plan - based upon the appropriate requirements of 19.15.17.12 NMAC
☐ Closure Plan (Please complete Boxes 14 through 18, if applicable) - based upon the appropriate requirements of Subsection C of 19.15.17.9 NMAC and 19.15.17.13 NMAC

☐ Previously Approved Design (attach copy of design) API Number: _____ or Permit Number: _____

11.

Multi-Well Fluid Management Pit Checklist: Subsection B of 19.15.17.9 NMAC

Instructions: Each of the following items must be attached to the application. Please indicate, by a check mark in the box, that the documents are attached.

☒ Design Plan - based upon the appropriate requirements of 19.15.17.11 NMAC APPENDIX A, B AND C
☒ Operating and Maintenance Plan - based upon the appropriate requirements of 19.15.17.12 NMAC APPENDIX D
☒ A List of wells with approved application for permit to drill associated with the pit. APPENDIX E
☒ Closure Plan (Please complete Boxes 14 through 18, if applicable) - based upon the appropriate requirements of Subsection C of 19.15.17.9 NMAC and 19.15.17.13 NMAC APPENDIX F
☒ Hydrogeologic Data - based upon the requirements of Paragraph (4) of Subsection B of 19.15.17.9 NMAC ATTACHED
☒ Siting Criteria Compliance Demonstrations - based upon the appropriate requirements of 19.15.17.10 NMAC ATTACHED

☐ Previously Approved Design (attach copy of design) API Number: _____ or Permit Number: _____

12.
Permanent Pits Permit Application Checklist: Subsection B of 19.15.17.9 NMAC
Instructions: Each of the following items must be attached to the application. Please indicate, by a check mark in the box, that the documents are attached.

- ☐ Hydrogeologic Report - based upon the requirements of Paragraph (1) of Subsection B of 19.15.17.9 NMAC
- ☐ Siting Criteria Compliance Demonstrations - based upon the appropriate requirements of 19.15.17.10 NMAC
- ☐ Climatological Factors Assessment
- ☐ Certified Engineering Design Plans - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Dike Protection and Structural Integrity Design - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Leak Detection Design - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Liner Specifications and Compatibility Assessment - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Quality Control/Quality Assurance Construction and Installation Plan
- ☐ Operating and Maintenance Plan - based upon the appropriate requirements of 19.15.17.12 NMAC
- ☐ Freeboard and Overtopping Prevention Plan - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Nuisance or Hazardous Odors, including H_2S, Prevention Plan
- ☐ Emergency Response Plan
- ☐ Oil Field Waste Stream Characterization
- ☐ Monitoring and Inspection Plan
- ☐ Erosion Control Plan
- ☐ Closure Plan - based upon the appropriate requirements of Subsection C of 19.15.17.9 NMAC and 19.15.17.13 NMAC

13.
Proposed Closure: 19.15.17.13 NMAC
Instructions: Please complete the applicable boxes, Boxes 14 through 18, in regards to the proposed closure plan.

Type: ☐ Drilling ☐ Workover ☐ Emergency ☐ Cavitation ☐ P&A ☐ Permanent Pit ☐ Below-grade Tank ☒ Multi-well Fluid Management Pit ☐ Alternative

Proposed Closure Method: ☒ Waste Excavation and Removal
☐ Waste Removal (Closed-loop systems only)
☐ On-site Closure Method (Only for temporary pits and closed-loop systems)
☐ In-place Burial ☐ On-site Trench Burial
☐ Alternative Closure Method

14.
Waste Excavation and Removal Closure Plan Checklist: (19.15.17.13 NMAC) ***Instructions: Each of the following items must be attached to the closure plan. Please indicate, by a check mark in the box, that the documents are attached.***

- ☒ Protocols and Procedures - based upon the appropriate requirements of 19.15.17.13 NMAC
- ☒ Confirmation Sampling Plan (if applicable) - based upon the appropriate requirements of Subsection C of 19.15.17.13 NMAC
- ☒ Disposal Facility Name and Permit Number (for liquids, drilling fluids and drill cuttings)
- ☒ Soil Backfill and Cover Design Specifications - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC
- ☒ Re-vegetation Plan - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC
- ☒ Site Reclamation Plan - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC

15.
Siting Criteria (regarding on-site closure methods only): 19.15.17.10 NMAC
Instructions: Each siting criteria requires a demonstration of compliance in the closure plan. Recommendations of acceptable source material are provided below. Requests regarding changes to certain siting criteria require justifications and/or demonstrations of equivalency. Please refer to 19.15.17.10 NMAC for guidance.

Ground water is less than 25 feet below the bottom of the buried waste. - NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells	☐ Yes ☐ No ☐ NA
Ground water is between 25-50 feet below the bottom of the buried waste - NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells	☐ Yes ☐ No ☐ NA
Ground water is more than 100 feet below the bottom of the buried waste. - NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells	☐ Yes ☐ No ☐ NA
Within 100 feet of a continuously flowing watercourse, or 200 feet of any other significant watercourse, lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark). - Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Within 300 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; Aerial photo; Satellite image	☐ Yes ☐ No
Within 300 horizontal feet of a private, domestic fresh water well or spring used for domestic or stock watering purposes, in existence at the time of initial application. - NM Office of the State Engineer - iWATERS database; Visual inspection (certification) of the proposed site	☐ Yes ☐ No
Written confirmation or verification from the municipality; Written approval obtained from the municipality	☐ Yes ☐ No
Within 300 feet of a wetland. US Fish and Wildlife Wetland Identification map; Topographic map; Visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance	

adopted pursuant to NMSA 1978, Section 3-27-3, as amended. - Written confirmation or verification from the municipality; Written approval obtained from the municipality	☐ Yes ☐ No
Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Mineral Division	☐ Yes ☐ No
Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; Topographic map	☐ Yes ☐ No
Within a 100-year floodplain. - FEMA map	☐ Yes ☐ No

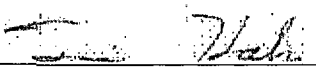
16.
On-Site Closure Plan Checklist: (19.15.17.13 NMAC) ***Instructions: Each of the following items must be attached to the closure plan. Please indicate, by a check mark in the box, that the documents are attached.***

- ☐ Siting Criteria Compliance Demonstrations - based upon the appropriate requirements of 19.15.17.10 NMAC
- ☐ Proof of Surface Owner Notice - based upon the appropriate requirements of Subsection E of 19.15.17.13 NMAC
- ☐ Construction/Design Plan of Burial Trench (if applicable) based upon the appropriate requirements of Subsection K of 19.15.17.11 NMAC
- ☐ Construction/Design Plan of Temporary Pit (for in-place burial of a drying pad) - based upon the appropriate requirements of 19.15.17.11 NMAC
- ☐ Protocols and Procedures - based upon the appropriate requirements of 19.15.17.13 NMAC
- ☐ Confirmation Sampling Plan (if applicable) - based upon the appropriate requirements of 19.15.17.13 NMAC
- ☐ Waste Material Sampling Plan - based upon the appropriate requirements of 19.15.17.13 NMAC
- ☐ Disposal Facility Name and Permit Number (for liquids, drilling fluids and drill cuttings or in case on-site closure standards cannot be achieved)
- ☐ Soil Cover Design - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC
- ☐ Re-vegetation Plan - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC
- ☐ Site Reclamation Plan - based upon the appropriate requirements of Subsection H of 19.15.17.13 NMAC

17.
Operator Application Certification:

I hereby certify that the information submitted with this application is true, accurate and complete to the best of my knowledge and belief.

Name (Print): Travis Hahn Title: Land Regulatory Agent

Signature:  Date: 2/20/14

e-mail address: THahn@yatespetroleum.com Telephone: 575 748 1471

18.
OCD Approval: ☐ Permit Application (including closure plan) ☐ Closure Plan (only) ☐ OCD Conditions (see attachment)

OCD Representative Signature: SEE April 2014 REVISED **Approval Date:**

Title: **OCD Permit Number:**

19.
Closure Report (required within 60 days of closure completion): 19.15.17.13 NMAC

Instructions: Operators are required to obtain an approved closure plan prior to implementing any closure activities and submitting the closure report. The closure report is required to be submitted to the division within 60 days of the completion of the closure activities. Please do not complete this section of the form until an approved closure plan has been obtained and the closure activities have been completed.

☐ **Closure Completion Date:**

20.
Closure Method:

☐ Waste Excavation and Removal ☐ On-Site Closure Method ☐ Alternative Closure Method ☐ Waste Removal (Closed-loop systems only)
☐ If different from approved plan, please explain.

21.
Closure Report Attachment Checklist: ***Instructions: Each of the following items must be attached to the closure report. Please indicate, by a check mark in the box, that the documents are attached.***

- ☐ Proof of Closure Notice (surface owner and division)
- ☐ Proof of Deed Notice (required for on-site closure for private land only)
- ☐ Plot Plan (for on-site closures and temporary pits)
- ☐ Confirmation Sampling Analytical Results (if applicable)
- ☐ Waste Material Sampling Analytical Results (required for on-site closure)
- ☐ Disposal Facility Name and Permit Number
- ☐ Soil Backfilling and Cover Installation
- ☐ Re-vegetation Application Rates and Seeding Technique
- ☐ Site Reclamation (Photo Documentation)

On-site Closure Location: Latitude Longitude NAD: ☐ 1927 ☐ 1983

22.

Operator Closure Certification:

I hereby certify that the information and attachments submitted with this closure report is true, accurate and complete to the best of my knowledge and belief. I also certify that the closure complies with all applicable closure requirements and conditions specified in the approved closure plan.

Name (Print): _____ Title: _____

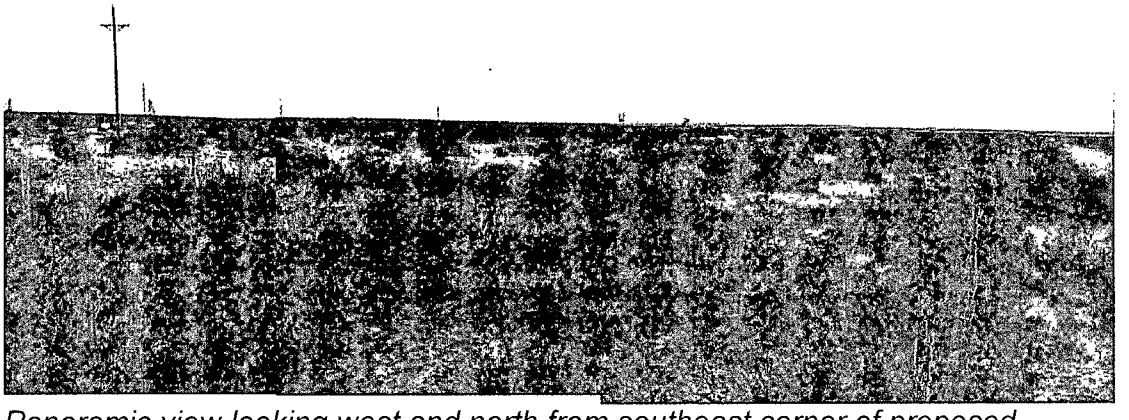
Signature: _____ Date: _____

e-mail address: _____ Telephone: _____

February 2014

C-144 Permit Package for Dagger Draw Multi-Well Fluid Management Pit #1 Section 16 T19S R25E Eddy County

Transmittal Letter
C-144 Form
Siting Criteria Demonstration
Appendices D-G



Panoramic view looking west and north from southeast corner of proposed locaton.

Prepared for
Yates Petroleum Corporation
Artesia, New Mexico

Prepared by
R.T. Hicks Consultants, Ltd.
Albuquerque, New Mexico

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

February 21, 2014

Mr. Mike Bratcher
NMOCD District 2
811 S. First Street
Artesia, New Mexico 88210
Via E-mail and US Mail

RE: Yates Petroleum Dagger Draw Multi-Well Fluid Management Pit #1

Dear Mike:

Enclosed is a C-144 permit application for the above-referenced project. The purpose of this pit is to facilitate the use of produced water for well stimulation, well drilling and other approved E&P activities in lieu of using fresh water.

The review of this permit at the District Office, as mandated by OCD Rules, should be straight-forward due to the following elements of the package:

- Design Plan – The set of certified engineering design plans are stamped by a New Mexico Professional Engineer are nearly identical to the designs conditionally approved by OCD for the Mack Energy Permanent Pit on 2/14/14. The District Office should be able to compare the two sets of drawings and specifications to verify their similarity. The District will receive the final engineering drawings for the Round Tank Permanent Pit under separate cover.
- Operating and Maintenance Plan – This plan is essentially the same as that recently approved by OCD for the Mack Energy Round Tank Permanent Pit.
- A List of wells with approved application for permit to drill associated with the pit is provided in Appendix A.
- Closure Plan - Again, this "clean closure" plan is essentially the same as OCD recently approved for the Mack Permanent Pit
- Hydrogeologic Data and Siting Criteria Compliance Demonstrations – This presentation is unique to the site and is consistent with similar work that District 2 has reviewed for temporary pits under the 2013 Pit Rule

In addition, Yates will implement Best Management Practices as outlined in the Quality Plan that is available for OCD Review in the Yates Petroleum Offices. These documents are not part of the submission and are not required under the Rule for Multi-Well Fluids Management Pit. Perhaps the most important element of the Quality Plan is a site-specific geotechnical study that will result in foundation design recommendations from a New Mexico Professional Engineer.

The Dagger Draw MWFM Pit #1 does not call for netting. Based upon preliminary evaluation of the treated produced water that will be stored in the pond, we believe the pond will be "otherwise rendered non-hazardous to wildlife, including migratory birds" as required by the Rule. Yates proposes to implement a monitor and respond protocol that is

in concert with their Avian Protection Plan. If bird mortality is an unexpected issue at the pit, netting can be installed as a retrofit.

The submission includes a request for a variance from two prescriptive mandates of OCD Rules. This variance request from the two mandates of the Pit Rule is identical to the "exception" request for the Mack Energy Permanent Pit. OCD has approved the exception request for the use of a Hypernet drainage system in lieu of 2-feet of compacted earth for part of the leak detection system. The request to employ a 30-mil secondary liner rather than the prescribed 60-mil HDPE for the secondary liner is currently under review by OCD. Note that the design drawings specify the secondary liner as "in accordance with permit". This description allows Yates to work with OCD on the variance request to arrive at a suitable material in lieu of the 60-mil HDPE.

Yates will submit a description of the produced water treatment system under separate cover. We understand that OCD is interested in making a determination regarding the disposition of any wastes generated by the treatment system with respect to compliance with OCD Rules Part 36 and Part 34.

Time is of the essence. Yates has started using fresh water for drilling and stimulation of wells that are part of the Dagger Draw project. The sooner OCD can review this plan, the sooner we can remedy any problems and begin conserving fresh water resources. We thank you in advance for your diligence of the review. Please contact me if you have any questions.

Sincerely,
R.T. Hicks Consultants

Randall Hicks
Principal

Copy: Yates Petroleum
State Land Office (surface owner)

C-144 and Site Specific Information for Temporary Pit

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Distance to Groundwater

Figure 1, Figure 2, and the discussion below demonstrates that groundwater (fresh water as defined by NMOCD Rules) at the location is greater than 100 feet beneath the MWFM pit that will contain fluids that cannot be classified as "low-chloride." .

Figure 1 is a geologic/ topographic map that shows:
1. The location of the MWFM Pit location.
2. Water wells from the OSE database as a blue triangle inside colored circles that indicate well depth. OSE wells are often miss-located in the WATERS database as older wells are plotted in the center of the quarter, quarter, quarter, of the Section Township and Range. Only one OSE well is on the state database.
3. Water wells from the USGS database as large green triangles.
4. Water wells, which are not documented in the public databases but were identified by field inspection or other published reports as colored squares.
5. The depth-to-water from the most recent available measurement for each well is provided adjacent to the well symbol.

At Misc-96, located about 1.5 miles southwest of the proposed pit (See Figure 2), we measured a depth to water of 315.1 feet in 2013. We also measured the depth to water of 230 feet in Misc-124, located about 1 mile south of the proposed MWFM pit (Figure 2). The Interstate Stream Commission is currently monitoring several wells in the area south of Artesia. On Figure 2, the following wells were gauged by the ISC in December 2014 or January 2014: Misc-91, Misc-127, Misc-125, Misc-126 and Misc-130. At least one well in the ISC database for the area of Figure 2 is incorrectly located as it could not be identified on aerial photographs and is not plotted on Figure 2 as a result..

Several USGS database wells in this area were not identified on air photos and the surface elevations in the database do not match the elevation on the map. These wells, measured in 2013, are mis-located in the database and are not plotted on Figure 2 (USGS wells 698, 683 and 723).

Figure 2 is discussed in detail in the following sections and shows:
1. The location of the MWFM Pit.
2. Water wells measured by the USGS that we believe are correct, the year of the measurement and the calculated elevation of the groundwater surface.
3. Water wells measured by the ISC or Hicks Consultants
4. Water wells reported in Ground Water Report #3 (1952)
5. Isocontour lines displaying the elevation of the groundwater surface (potentiometric surface) based upon data collected since 1999.

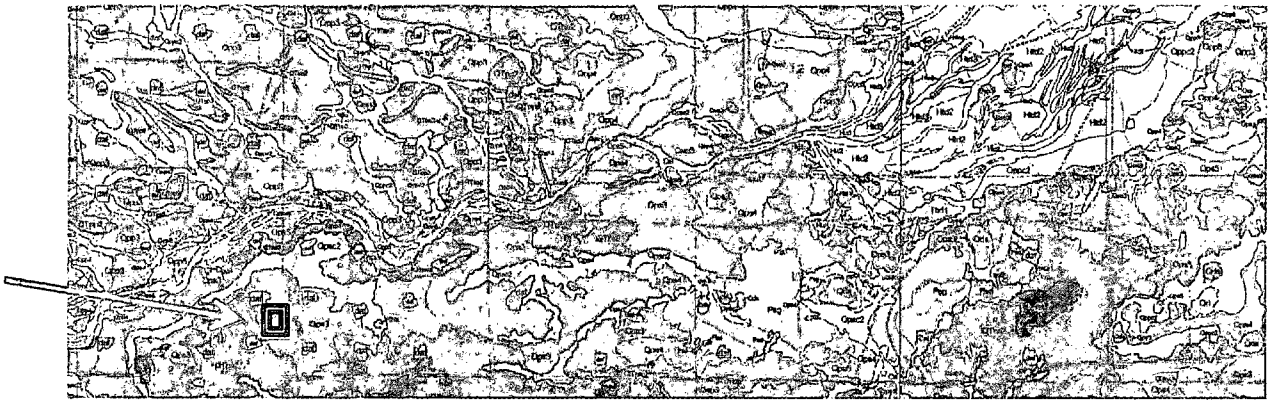
Geology

The pit location is displayed on the Dayton Geologic Quadrangle Map (OF-GM-160, see http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/downloads/160/Dayton_geomap.pdf). This publication describes the area as alluvial piedmont deposits that overlay Permian Artesia Group bedrock. The piedmont deposits vary in thickness from more than 400 feet thick near the

Pecos River to less than 15 feet thick on the western margin of the map. The bedrock dips east at an angle of about 1 degree, creating a ramp (also known as the Pecos Slope) between the Guadalupe Mountains and the Delaware Basin. The Permian bedrock units crop out only in the south central portion of the map.

About 2 miles east of the proposed pit location, the Seven Rivers formation of the Artesia Group crops out. Presumably this unit also underlies the general area of the proposed pit. This unit (Psg, see below) is comprised of brick-red gypsum with lesser amounts of siltstone and mudstone. Thin beds of dolomite are also present within this unit.

The proposed pit will be constructed within the piedmont deposits of the North Seven Rivers alluvial piedmont complex. Specifically, the surface geology is mapped as Qps3, which is 6-12 feet thick and composed of gravels derived from the uplands and post-depositional caliche. A portion of the Dayton Geologic Quadrangle showing the location of the proposed pit (arrow) is presented below with the location of the pit shown in the southwest corner of the graphic.



In addition to the recent alluvium deposited by Fourmile Draw to the north of the proposed pit (Qa), the map shows numerous disturbed land features mapped as daf, which are oil well locations. Also mapped throughout the quadrangle and in the general area of the proposed pit are sinkhole deposits (Qds), the closest of which is about ½ mile southeast. The authors of the quadrangle map identify a large depression (sinkhole) 3 miles east and about 1 mile north of the site. The authors suggest formation of the sinkhole, which now contains several deltas of Fourmile Draw, occurred in the late Pleistocene or early Holocene (perhaps 12,000-9,000 years ago). The authors do not speculate about the age of the smaller sinkholes which are common throughout the map.

Water Table Elevation

We relied upon the data measured by the USGS for which we could verify, our recent measurements and those of the ISC to create the water table elevation map shown in Figure 2. Note that several of the "Misc" well data (see Figure 1) are water levels reported in Groundwater Report #3 (1952). We used the 60 year old data from Groundwater Report #3 only as a reference regarding the general slope of the water table and to provide the reader with an idea of the decline in water levels over this timeframe. Data from the USGS show that water levels in the

area have declined about 30 feet since 1990. However, about 1 mile east of the proposed pit Misc-124 and Misc-86 suggest a 140-foot decline in groundwater elevation since 1950.

Water level data from the OSE database rely upon observed water levels by drillers during the completion of the water well. The OSE dataset provides some useful data in certain areas. The area near the proposed pit contains sufficient high-quality data that we did not rely on OSE data.

For the potentiometric surface map (Figure 2), we honored all data that we know are accurate. From these data, we conclude:

- The elevation of the groundwater surface beneath the proposed pit is approximately 3,260 feet above mean sea level.
- The surface elevation at the proposed MWFM Pit site is about 3475 ft above sea level.
- The distance between the bottom of the 15-foot deep MWFM pit and the potentiometric surface of the regional aquifer is approximately 220 feet (3475-15-3260 = 200).

Distance to Surface Water

Figure 3 and the site visit demonstrates that the location is not within 300 feet of a continuously flowing watercourse or any other significant watercourse or 200 feet from lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark).

- No continuously flowing watercourses, significant watercourses, sinkhole or other water bodies, as defined by NMOCD Rules, exist within the prescribed setback criteria for the siting the MWFM Pit at this location.
- The area surrounding the proposed pit location shows little topographic relief and is characterized by exposed caliche and a thin soil horizon
- Four Mile Draw is mapped about ½ mile north of the location
- We observed no evidence of sinkholes at or near the location

Distance to Permanent Residence or Structures

Figure 4 and the site visit demonstrates that the location is not within 300 feet from an occupied permanent residence, school, hospital, institution, church, or other structure in existence at the time of initial application.

- The nearest structures are oil and gas wells and tank batteries.
- Pipelines and power lines are near the site

Distance to Non-Public Water Supply

Figures 1 and Figure 2 demonstrates that the location is not within 500 horizontal feet of a private, domestic fresh water well or spring that less than five households use for domestic or stock watering purposes, or within 1,000 horizontal feet of any other fresh water well or spring, in existence at the time of initial application.

- Figure 1 shows the locations of all area water wells, active or plugged.
- The nearest active water well that we could reliable document is located approximately 1.5 miles west.
- There are no known domestic wells within 1,000 feet of this location.
- No springs were identified within the mapping area (see Figure 3).

Distance to Municipal Boundaries and Fresh Water Fields

Figure 5 demonstrates that the location is not within incorporated municipal boundaries or within defined municipal fresh water well fields covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended.

- The closest municipality is Artesia, NM approximately 15 miles to the northeast.
- The closest public well field is located approximately 25 miles to the south, north of Carlsbad.

Distance to Wetlands

Figure 6 demonstrates the location is not within 300 feet of wetlands.

- The nearest designated wetlands are "freshwater pond" located approximately 1 mile south of the location

Distance to Subsurface Mines

Figure 7 and our general reconnaissance of the area demonstrate that the nearest mines are caliche pits. This location is not within an area overlying a subsurface mine.

- The nearest mapped caliche pit is located approximately 7 miles to the east.
- The nearest caliche pit is about 1.5 miles east and is visible in Google Earth images.

Distance to High or Critical Karst Areas

Figure 8 shows the location of the MWFM Pit with respect to BLM Karst areas.

- The proposed MWFM pit is mapped as a "moderate" potential karst area.
- No evidence of solution voids were observed near the site during the field inspection.
- No evidence of unstable ground was observed
- The closest mapped sinkhole (12,000-9,000 years ago?) is about ½ mile to the southeast, as discussed above

The design/construction plan calls for implementing engineering measures to create a strong and stable foundation for the liner. Part of the foundation design includes a geotechnical study of the site.

Distance to 100-Year Floodplain

Figure 9 demonstrates that the location is outside of the 100-year flood even as designated by the Federal Emergency Management Agency with respect to the Flood Insurance Rate 100-Year Floodplain.

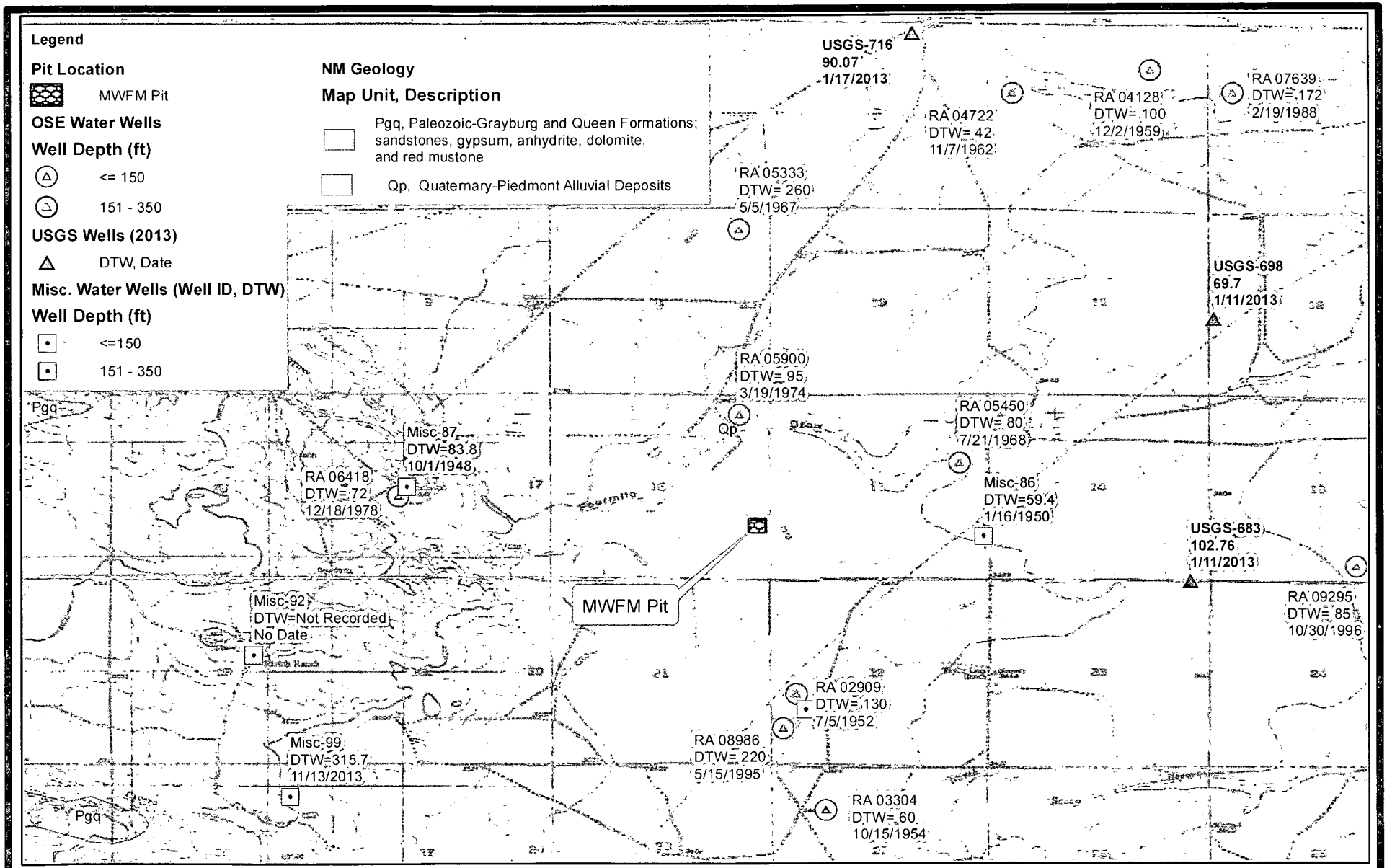
- The 100-year flood event area lies within Four Mile Draw, about 1700 feet from the site
- Our field inspection and examination of the topography permits a conclusion that the location is not within any unmapped floodplain and has low risk for flooding.

Pit Design

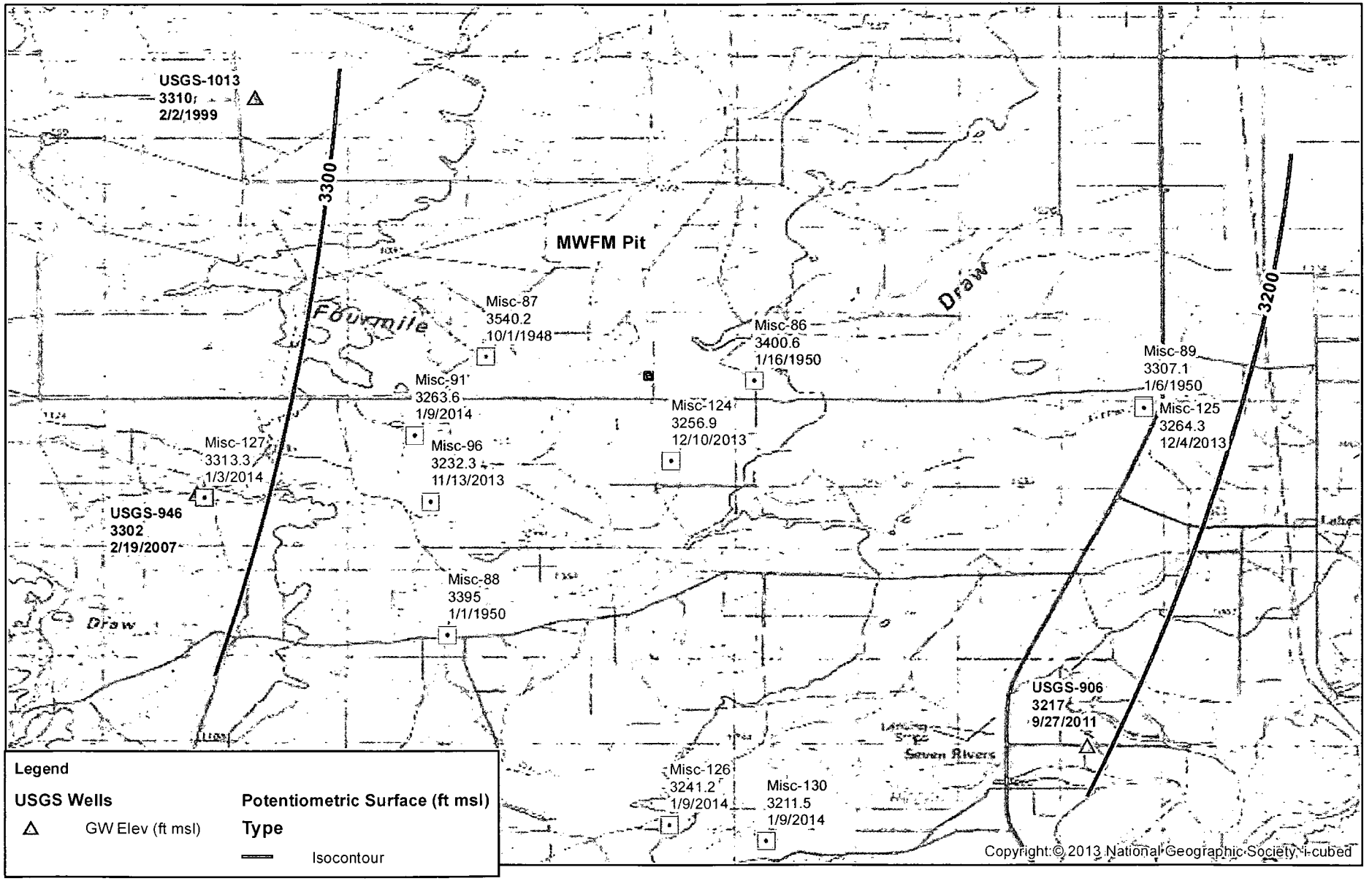
Please refer to Appendix A for engineering drawings of the MWFM Pit.

Site Specific Information Figures

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Depth To Water and Geology	Figure 1
	Yates Petroleum: Multi-Well Fluid Management Pit	February 2014



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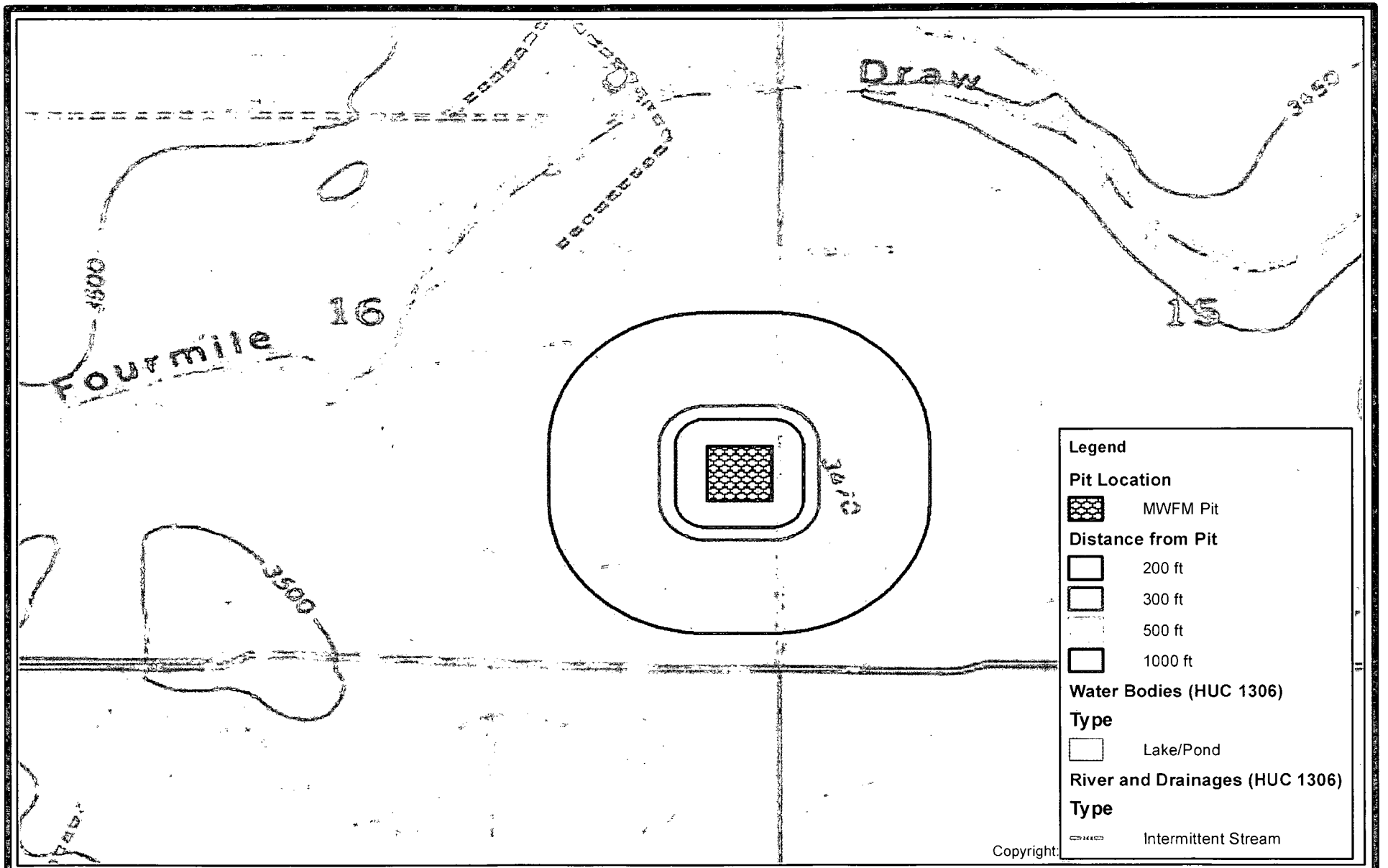
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Potentiometric Surface and Groundwater Elevation at Nearby Water Wells

Figure 2

Yates Petroleum: Multi-Well Fluid Management Pit

February 2014



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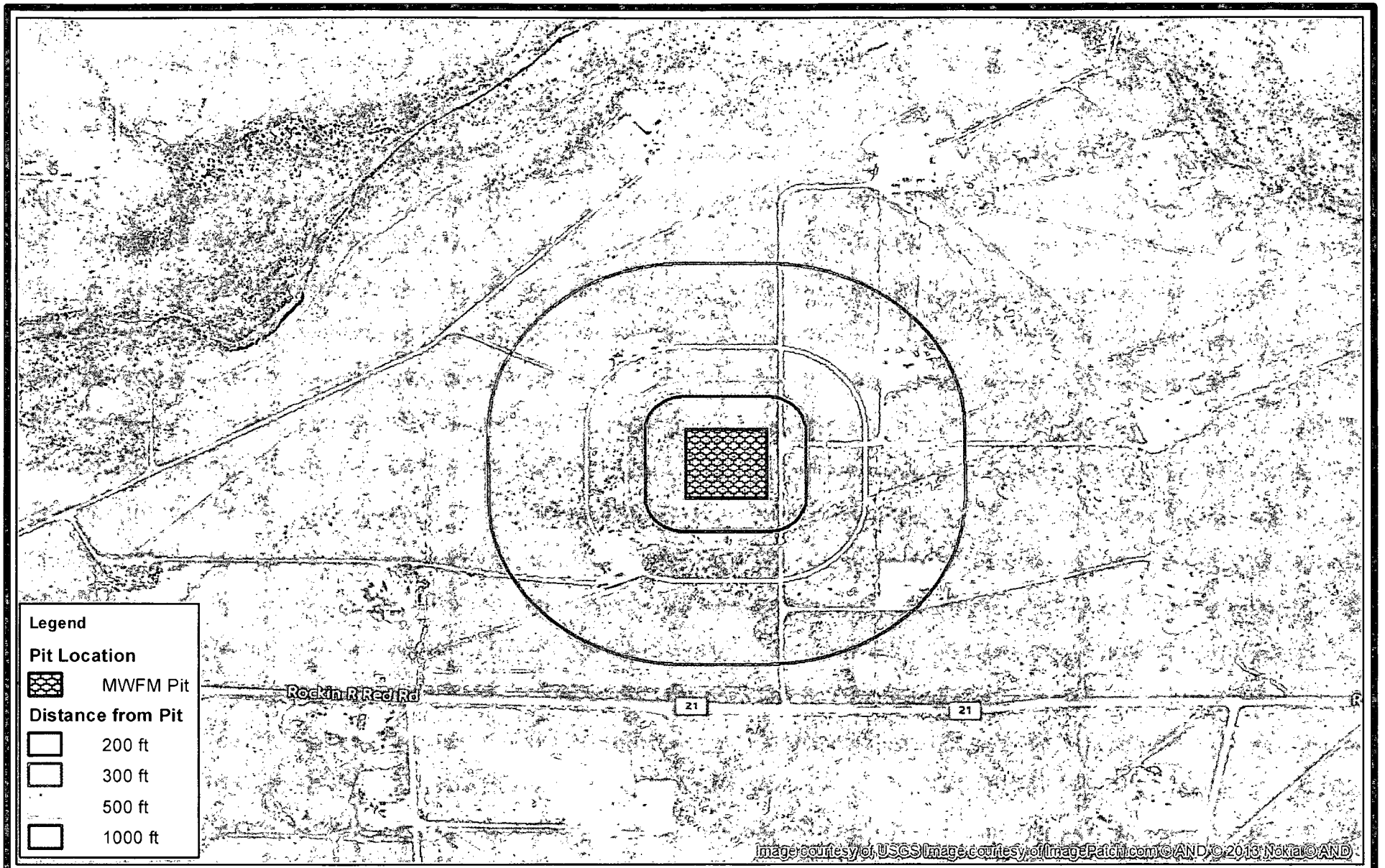
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Surface Water and Topography

Figure 3

Yates Petroleum: Multi-Well Fluid Management Pit

February 2014



(aerial image c.2013)

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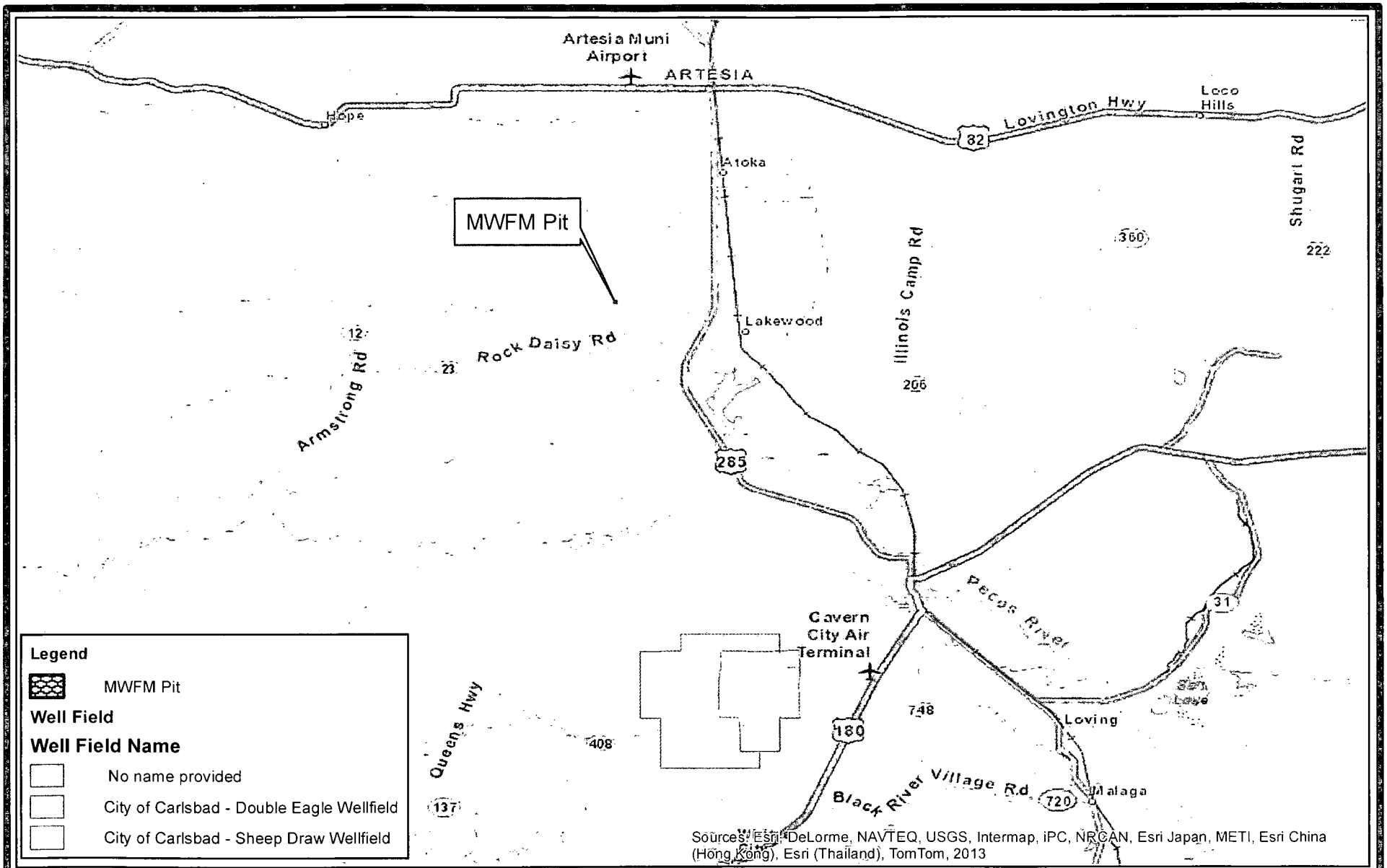
R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Nearby Structures	Figure 4
	Yates Petroleum: Multi-Well Fluid Management Pit	February 2014



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901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Nearby Municipalities and Well Fields

Figure 5

Yates Petroleum: Multi-Well Fluid Management Pit

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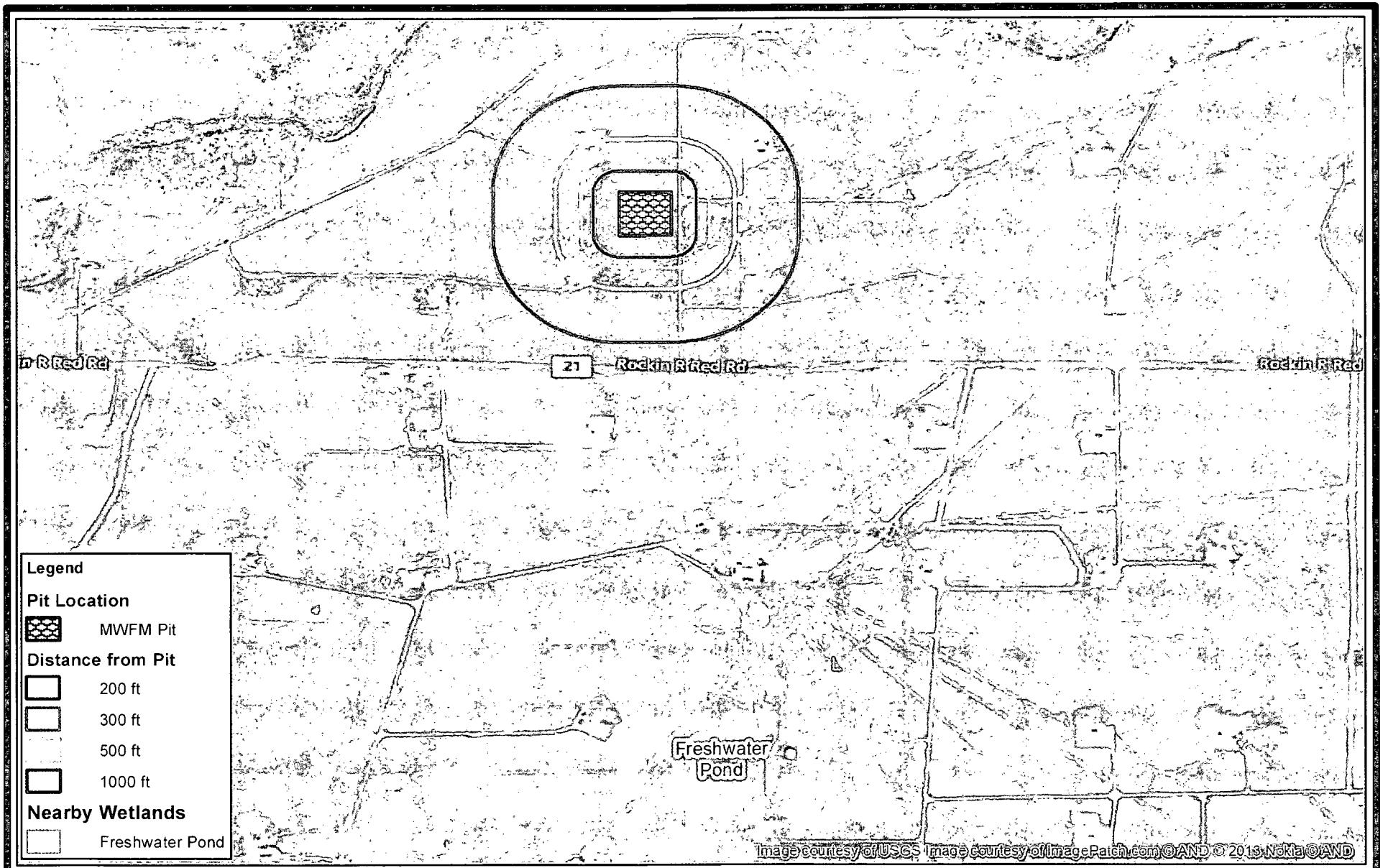
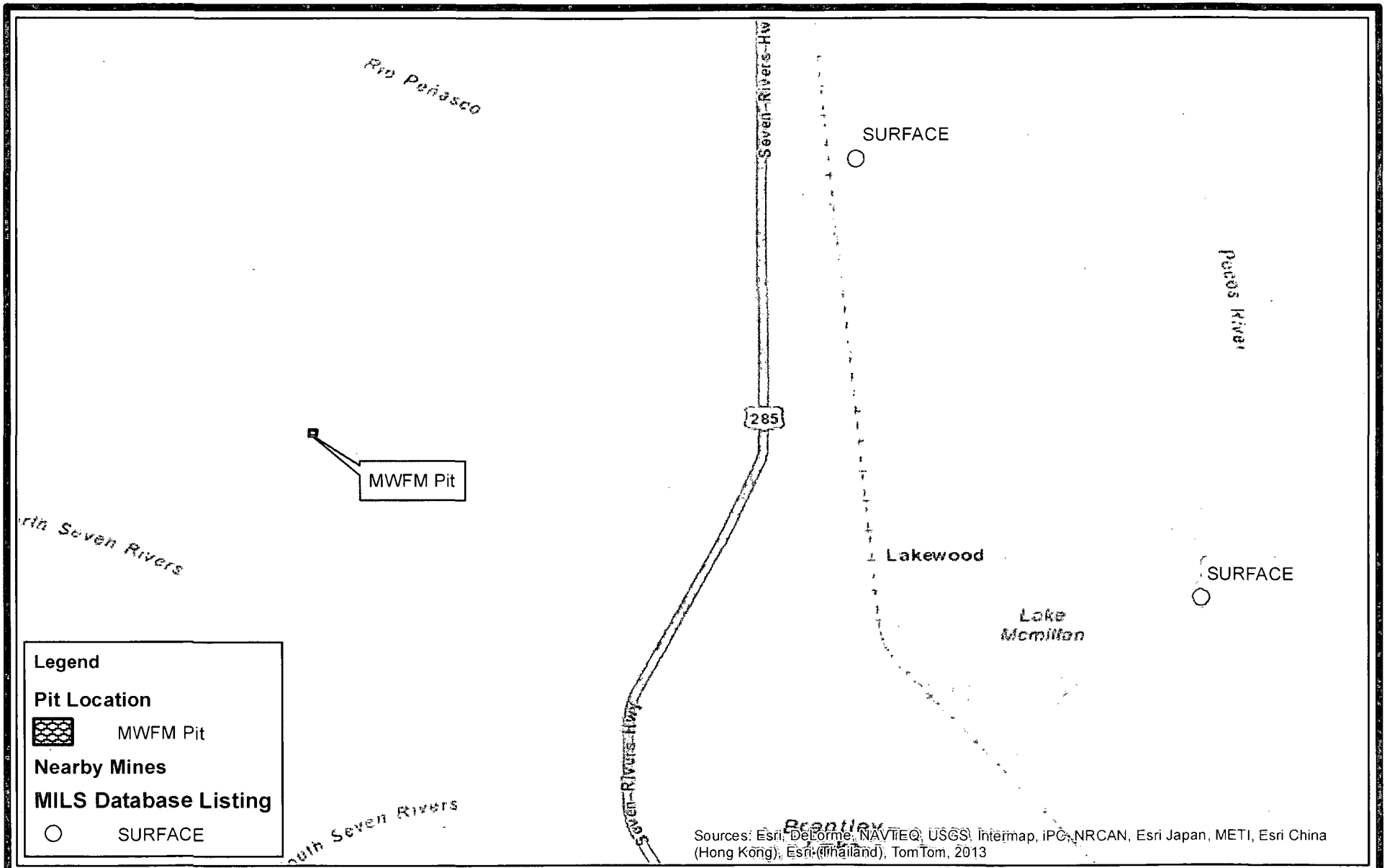


R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Nearby Wetlands	Figure 6
	Yates Petroleum: Multi-Well Fluid Management Pit	February 2014



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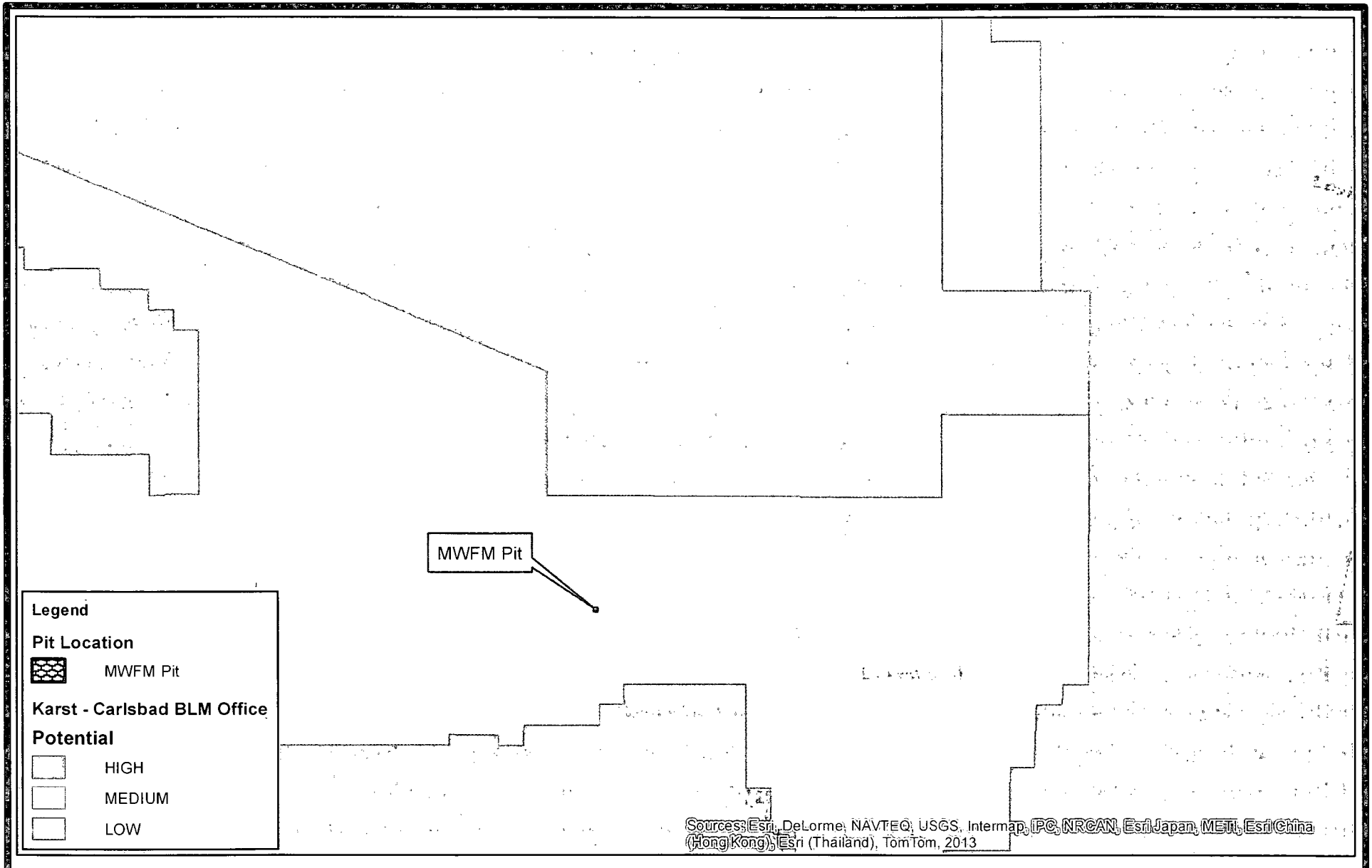
Albuquerque, NM 87104
Ph: 505.266.5004

Nearby Mines and Minerals

Figure 7

Yates Petroleum: Multi-Well Fluid Management Pit

February 2014



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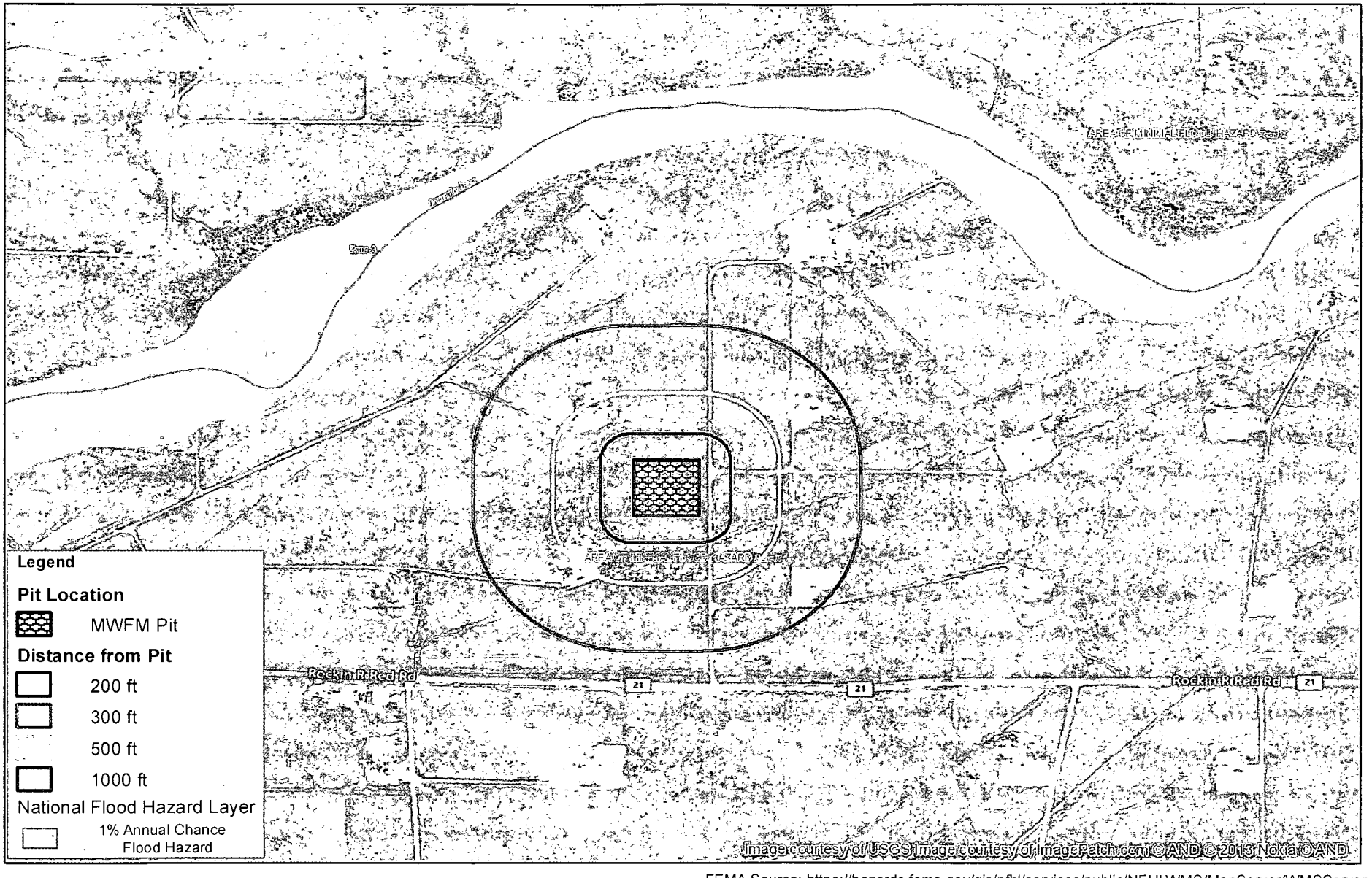
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Karst Potential

Figure 8

Yates Petroleum: Multi-Well Fluid Management Pit

February 2014



FEMA Source: https://hazards.fema.gov/gis/nfhl/services/public/NFHLWMS/MapServer/WMSServer

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901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

FEMA Flood Map	Figure 9
Yates Petroleum: Multi-Well Fluid Management Pit	February 2014

Appendix D

Operating and Maintenance Plan

Operating and Maintenance Procedures

Yates Petroleum will operate and maintain the MWFM Pit to contain liquids and solids (blow sand and minimal precipitates from the treated produced water) and maintain the integrity of the liner system in a manner that prevents contamination of fresh water and protects public health and the environment as described below. The purpose of the MWFM pit is to facilitate recycling, reuse and reclamation of produced water derived from nearby oil and gas wells listed in Appendix E. During periods when water for E&P operations is not needed, produced water will discharge to one of the injection wells in the Dagger Draw SWD system, which is also listed in Appendix E.

The operation of the MWFM pit is summarized below.

A. Via pipeline, produced water generated from nearby oil and gas wells is delivered to a treatment system located within the perimeter fence on the north side of the MWFM pit. The treatment capacity of the proposed unit is about 8,000 bbls/day.
B. After initial treatment, the produced water flows into frac tanks which provide the required residence time after treatment to remove H2S and certain other constituents, then discharges into the pit
C. When required, treated produced water is removed from the pit for E&P operations. At this time, treated produced water will be used for drilling beneath the fresh water zones (beneath surface casing), for well stimulation (e.g. hydraulic fracturing) and other E&P uses as approved by OCD.
D. Typically, two wells will be stimulated during the same contractor mobilization event. Each simulation requires about 120,000 bbls and each stimulation event occurs over a several day period (set up-fracturing-demobilization). Because the pit cannot be 100% evacuated of fluid and the treated produced water serves other E&P uses (e.g. drilling), the pit must hold more than 240,000 bbls prior to each stimulation event.
E. A treatment rate of 8,000 bbl/day allows stimulation of two wells per month.
F. Whenever the maximum fluid capacity of the pit is reached, treatment and discharge to the pit ceases (see Freeboard and Overtopping Plan, below)

The operation of the MWFM pit will follow the mandates listed below:

1. The operator will not discharge into or store any hazardous waste (as defined by 40CFR 261 and NMAC 19.15.2.7.H.3) in the pits.
2. If the pit liner's integrity is compromised above the water line, then The operator will repair the damage within 48 hours of discovery.
3. If any penetration of the pit liner is visually identified below the normal high water mark of the pit, then The operator will suspend operations of the pit, remove all liquid above the damage or leak within 48 hours, notify the district office within 48 hours (phone or email) of the discovery and repair the damage or replace the pit liner.
4. If any penetration of the pit liner is confirmed by sampling of fluid in the leak detection system (see Inspection and monitoring plan), The operator will
    a. Begin and maintain fluid removal from the leak detection/pump-back system
    b. notify the district office within 48 hours (phone or email) of the discovery
    c. Schedule a shut-down of produced water treatment/re-use, then
        i. remove all liquids
        ii. identify the location of the leak and
        iii. repair the damage or replace the pit liner prior to continuing operation
5. The operator will report releases of fluid to the subsurface in a manner consistent with NMAC 19.15.29

6. As shown in the engineering drawings (Appendix A), the injection and withdrawal or treated and untreated produced water is accomplished through a piping system to prevent liner damage.
7. Appendix A also demonstrates that the elevation and slopes of the pit prevent the collection of surface water run-on.
8. No oil or floating hydrocarbon shall be present in the MWFM pit. In the on-site storage building, The operator will maintain an oil absorbent boom to contain and remove oil from the pit's surface.
9. The operator will maintain the pit free of miscellaneous solid waste or debris.
10. The operator will maintain at least three feet of freeboard for the permanent pit and will use a free-standing staff gauge to allow easy determination of the required 3-foot of freeboard.
11. The operator will ensure that all gates associated with the fence are closed and locked when responsible personnel are not on-site.

Monitor, Inspection, and Reporting Plan

When the pit holds fluid, the operator will inspect the pit daily and document such inspections until the pit is closed. Daily inspections consist of

a. reading and recording the fluid height of staff gauges
b. recording any evidence that the pond surface shows visible oil
c. visually inspecting the pit's exposed liners.

If a liner's integrity is compromised, or if any penetration of the liner occurs above the water surface, then the operator will notify the Artesia district office within 48 hours (phone or email).

After back-to-back stimulation of two wells, the fluid level in the pit should be relatively low and the nature (e.g. jetting) of water that is actively leaving and/or entering the pit should be visible. At this time, the daily inspection includes:

1. a thorough examination of the liner (e.g. with binoculars) for any possible loss of integrity.
2. Watching the movement of fluid into and/or out of the pit to monitor any liner damage due to fluid jets, vibration or other problems with the manifold system (see Design and Construction Plan for data relating to this equipment).

Monthly, the operator will

A. Inspect diversion ditches and berms around the pit to check for erosion and collection of surface water run-on.
B. For the first year, measure H_2S concentrations on the down-wind side of the pit.
C. Inspect the leak detection system for evidence of damage or malfunction and monitor for leakage (see Design and Construction Plan for data relating to this system).
D. inspect the pit for dead migratory birds and other wildlife. Within 30 days of discovery, the operator will report such findings to the USFWS and to the Artesia Division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

The operator will maintain a log of all inspections and make the log available for the appropriate Division district office's review upon request. An example of the log is attached to this section of the permit application.

Freeboard and Overtopping Prevention Plan

The method of operation of the pit allows for maintaining freeboard with very few potential problems. When the capacity of the pit is reached (3-feet of freeboard), the discharge of treated

produced water ceases and the produced water generated by nearby oil and gas wells is managed by one of the injection wells identified in Appendix E.

If rising water levels suggest that 3-feet of freeboard will not be maintained, the operator will implement one or more of the following options

I. Cease discharging produced water scheduled for recycling to the pit
II. Accelerate re-use of the treated produced water for purposes approved by the Division
III. Transfer treated produced water from the pit to one of the injection wells listed in Appendix E

The reading of the staff gauge occurs daily. In order for the MWFM Pit to rise 1-foot above the required 3-feet of freeboard (thus creating only 2-feet of freeboard) a total volume of 25,000 bbls of treated must enter the pit. At a treatment rate of 8,000 bbls/day, this 1-foot rise requires 3 days of discharge. Overtopping the pit would require more than a week of inattention, which is essentially impossible, given the need to maintain the treatment unit.

Protocol for Leak Detection Monitoring, Fluid Removal and Reporting

As shown in Appendix A, the leak detection system includes a monitoring system. Any fluid released from the primary liner will flow to the collection sump where fluid level monitoring is possible at the monitoring riser pipe associated with the leak detection system (see Appendix A). Yates personnel will employ a portable electronic water level meter to determine if fluid exists in the monitoring riser pipe. Obtaining accurate readings of water levels in a sloped pipe beneath a pit can be a challenge. An electrician's wire snake may be required to push the probe to the bottom of the port and the probe may be fixed in a 2-inch PVC pipe "dry housing" to avoid false readings due to water condensation on the pipe. There are many techniques to determine the existence of water in the sumps – including low flow pumps.

If seepage from the pit into the leak detection system is suspected by a positive fluid level measurement, the operator will

1. Re-measure fluid levels in the monitoring riser pipe on a daily basis for one week to determine the rate of seepage.
2. Collect a water sample from the monitoring riser pipe to confirm the seepage is treated produced water from the pit via field conductivity and chloride measurements.
3. Notify NMOCD of a confirmed positive detection in the system within 48-hours of sampling (initial notification).
4. Install a pump into the monitoring riser pipe sump to continually (manually on a daily basis or via automatic timers) remove fluids from the leak detection system into the pit until the liner is repaired or replaced.
5. Dispatch a liner professional to inspect the portion of the pit suspected of leakage during a "low water" monitoring event.
6. Provide NMOCD a second report describing the inspection and/or repair within 20 days of the initial notification

If the point of release is obvious from the low water inspection, the liner professional will repair the loss of integrity. If the point of release cannot be determined by the inspection, the liner professional will develop a more robust plan to identify the point(s) of release. The inspection plan and schedule will be submitted to OCD with the second report. The operator will implement the plan upon OCD approval.

Pit Inspection Form Dagger Draw MWFM Pit #1

Month **Jun-14**

Day	Weekly	Low Water	Activity	Monthly	Staff Gauge	Comments
1 - Sun						
2	x				8.75	Gate unlocked upon arrival - notified Mike Hill, no birds in pit
3					10	
4					11	
5			x			Water transfer to frac - pipes are good
6			x			Water transfer to frac - pipes are good
7		x			2.5	No visible liner problems
8					3	
9	x				4	All OK - no oil on surface, no birds in pit
10					5	
11					5	
12					6	
13					7	
14					7.5	
15				x	8	No fluid in ports, outer berm and stormater diversion OK, H2S - no alarm,
16					9	
17					9	
18					9.5	
19	x				10	All OK
20					11	
21					12	
22			x			Water transfer to frac - no problems
23			x			Water transfer to frac - no problems
24		x			1.75	No visible liner problems
25					2.25	
26	x				3.75	High wind -liner is good, no birds
27					4.75	
28					5.5	
29					6.75	
30					7.75	
31					8.5	

Appendix E

List of Wells with Approved APDs

C-144 Supplemental Information: Wells with Approved APDs for Multi-Well Fluid Management Pit

At the time of writing, the following wells that will be serviced by the proposed MWFM Pit have approved API numbers. As additional well locations are approved by OCD prior to permit approval, an updated list will be provided as an amendment to the application.

	New Well Name	API #
1.	Sears BSR #1H –	30-015-41652
2.	McAdory BTC #1H	30-015-41611
3.	McAdory BRC #2H	30-015-41605
4.	Nickson BM #5H	30-015-41725
5.	Nickson BM #6H	30-015-41838
6.	Roy AET #6H	30-015-41726
7.	Roy AET #10H	30-015-41804
8.	Savannah State Com	30-015-41754
9.	Patriot AIZ #13H	30-015-41755
10.	Patriot AIZ #14H	30-015-41787
11.	Alto AOL #2H	30-015-41757
12.	Abundance AVZ #2H	30-015-41782
13.	Abundance AVZ #3H	30-015-41773
14.	Cutter APC #2H	30-015-41786

	Recompletion Well	API #
15.	NDDUP Unit 9	30-015-26672
16.	NDDUP Unit 11	30-015-26292
17.	NDDUP Unit 41	30-015-27314
18.	NDDUP Unit 42	30-015-28552
19.	NDDUP Unit 49	30-015-28374
20.	NDDUP Unit 63	30-015-26997
21.	NDDUP Unit 64	30-015-28188
22.	NDDUP Unit 65	30-015-27356
23.	NDDUP Unit 86	30-015-27777
24.	NDDUP Unit 97	30-015-30881
25.	NDDUP Unit 101	30-015-27689
26.	NDDUP Unit 105	30-015-26489
27.	NDDUP Unit 107	30-015-27012
28.	NDDUP Unit 108	30-015-27378
29.	NDDUP Unit 111	30-015-28669
30.	NDDUP Unit 119	30-015-28053
31.	NDDUP Unit 123	30-015-27355
32.	NDDUP Unit 127	30-015-25787
33.	NDDUP Unit 129	30-015-26364
34.	NDDUP Unit 134	30-015-28346
35.	NDDUP Unit 135	30-015-28370

C-144 Supplemental Information: Wells with Approved APDs for Multi-Well Fluid Management Pit

At this time, the following wells within the Dagger Draw SWD system are capable of accepting any water from the pit for disposal

Archimedes SWD # 1	30-015-10414
Cotton MX Federal Com # 1 SWD	30-015-23315
Donahue Federal SWD # 1	30-015-00087
King SWD # 1	30-015-20257
Mimosa Federal SWD # 1	30-015-26449
Mimosa Federal SWD # 3Y 3	0-015-29123
Mimosa Federal SWD # 4	30-015-26950
Mansanto Foster SWD # 1	30-015-10340
Routh Deep SWD # 2	30-015-23585
Roy SWD # 3	30-015-26562
State D SWD # 1	30-015-21572

Appendix F
Closure Plan

The MWFM pit is expected to contain a small volume of solids, the majority of which will be windblown sand and dust with some mineral precipitates from the water.

Closure Notice

Yates Petroleum (the operator) will not commence closure without first obtaining approval of the closure plan submitted with the C-144 application. To allow for review time and site inspection, the operator will notify the Division's Artesia office at least 30 days prior to cessation of operations and provide a proposed schedule for closure. The operator will close the permitted MWFM pit within 60 days of cessation of operation of the pit in accordance with an approved closure plan.

At least 72 hours, but not more than one week, prior to any closure activities, the operator will notify the surface owner (State Land Office) by certified mail, return receipt requested. This notice will include the project name and location description.

Excavation and Removal Closure Plan – Protocols and Procedures

1. The operator will remove all liquids from the pit and either:
    a. Dispose of the liquids in a division-approved facility (see Appendix D for a list of injection wells), or
    b. Recycle, reuse or reclaim the water for reuse in drilling, stimulation or other approved uses.
2. The operator will remove all solid pit contents and transfer those materials to the following division-approved facility:
    Disposal Facility Name: R360 Permit Number NM 01-0006
3. If possible, pit liner that exhibits good integrity may be recycled for use as an underliner of tank batteries or other use as approved by OCD.
4. After the removal of the pit contents and liners, soils beneath the MWFM Pit will be tested as follows
    a. Collect a five-point (minimum) composite from beneath the pit liner sample to include any obviously stained or wet soils, or any other evidence of impact from the pit for laboratory analyses for the constituents listed in Table I of 19.15.17.13 NMAC.
    b. If any concentration is higher than the parameters listed in Table I, additional delineation may be required and closure activities will not proceed without Division approval.
5. If all constituents' concentrations are less than or equal to the parameters listed in Table I, then The operator will proceed to backfill the former pit location in accordance with the **Soil Cover Design** (below) with non-waste containing, uncontaminated, earthen material blended to the surrounding topography and arranged in a manner that prevents surface erosion.
6. Re-vegetation protocols are outlined below

Soil Cover Design

The operator will backfill the former pit locations and the soil cover will consist of

- At least 3-feet of compacted, uncontaminated, non-waste containing earthen fill with chloride concentrations less than 600 mg/kg as analyzed by EPA Method 300.0.
- Either the background thickness of topsoil or one foot of suitable material to establish vegetation at the site, whichever is greater, over the 3-foot earth material.

- Contours to blend with the surrounding topography and to prevent erosion of the cover and ponding over the cover.

Closure Documentation

Within 60 days of closure completion, The operator will submit a closure report on form C-144, with necessary attachments to document all closure activities including sampling results; information required by 19.15.17 NMAC; a plot plan; and details on back-filling, capping and covering, where applicable.

In the closure report, the operator will certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in the approved closure plan.

Reclamation and Re-vegetation

The operator will reclaim to a safe and stable condition that existed prior to oil and gas operations and that blends with the surrounding undisturbed area

Areas not reclaimed as described herein due to their use in production or drilling operations will be stabilized and maintained to minimize dust and erosion.

For all areas disturbed by the closure process that will not be used for production operations or future drilling, the operator will

A. Replace topsoils and subsoils to their original relative positions
B. Grade so as to achieve erosion control, long-term stability and preservation of surface water flow patterns
C. Reseed in the first favorable growing season following closure

Re-vegetation and reclamation plans imposed by the surface owner will be outlined in communications with the OCD.

The operator will notify the Division when the surface grading work element of reclamation is complete.

The operator will notify the Division when the site meets the surface owner's requirements or exhibits a uniform vegetative cover that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds.

Appendix G
Variance Request

Statement Explaining Why the Applicant Seeks a Variance

The prescriptive mandates of the Rule that are the subject of this variance request are the following subsections of 19.15.17.11.J:

> (4) The primary (upper) liner and secondary (lower) liner shall be geomembrane liners. The geomembrane liner shall consist of 30- mil flexible PVC or 60-mil HDPE liner, or an equivalent liner material that the division's district office approves. The geomembrane liner shall have a hydraulic conductivity no greater than 1 x 10-9 cm/sec. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. Liner compatibility shall comply with EPA SW- 846 Method 9090A or subsequent relevant publication.
>
> (8) The operator shall place a leak detection system between the upper and lower geomembrane liners that consists of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection. The operator may install alternative methods that the appropriate division's district office approves.

With respect to the leak detection system, the current standard of care for lagoon leak detection is synthetic drainage material (not compacted soil), similar to the 200-mil GSE Hypernet which is proposed in this application. The Hypernet is easier to install and is less expensive than the prescribed method of the Rule. This request was recently approved by OCD for the Mack Energy Round Tank Permanent Pit.

With respect to the material of the secondary liner, we propose 30-mil scrim-reinforced LLDPE liner (e.g. K30B) or 30-mil HDPE. The thinner liner material is easier to install, will contain fewer field seams and is less expensive than the prescribed 60-mil HDPE. Please note that the K30B liner is currently being tested for compliance with the mandate shown above to "comply with EPA SW- 846 Method 9090A or subsequent relevant publication". The results will be forwarded to OCD as they become available.

Demonstration That the Variance Will Provide Equal or Better Protection of Fresh Water, Public Health and the Environment.

With respect to the use of the 200-mil Hypernet drainage system in lieu of 2-feet of compacted soil, we believe the table below that contrasts the two systems provides ample demonstration.

Geonet Hypernet	Compacted Soil
Installation does not put strain on secondary liner	Equipment and compaction can stress secondary liner
Hydraulic conductivity is homogeneous and isotropic	Hydraulic conductivity can vary based upon the nature of the compaction and percent fines in a given load of placed soil
Fluid transmissivity is 2×10^{-3} m^2/sec	Mandated transmissivity is 6×10^{-6} m/sec
Settling after loading/unloading pit with fluid should be minimal	Settling after loading/unloading pit with fluid could be measureable, creating liner strain and changes in flow patterns to the detection system

The variance request to use the Hypernet drainage system in lieu of 2-feet of compacted soil is exactly the same as the recently-approved exception request by Mack Energy for the Round Tank Permanent Pit.

With respect to the use of 30-mil geomembrane material for the secondary liner, we believe the following considerations are relevant.

1. The engineering drawings of the Dagger Draw Multi-Well Fluid Management Pit and the Design/Construction Plan require the following foundation characteristics:
    a. 3H:1V interior slopes will consist of a firm, unyielding base that is smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear

b. A roller or comparable equipment will be used to compact the foundation surface using optimal moisture content as recommended by a geotechnical/foundation study
c. Heavy geotextile material (e.g. Marifi 160N or equivalent) will be placed between the compacted foundation surface and the secondary liner to further minimize the potential of tear or puncture

2. The secondary liner is protected by the primary 60-mil HDPE liner from UV degradation and prolonged contact with produced water.
3. The hydraulic head placed against the secondary liner will be minimal as will the timeframe that the secondary liner is exposed to any treated produced water. This is because any observed seepage of treated produced water will be removed (see O&M Plan) and the primary liner will be repaired.

As stated in the attached opinion from Mr. Ronald Frobel (submitted to OCD for the Mack Energy Round Tank Permanent Pit and used by permission in this submittal), these and other characteristics of the proposed MWFM Pit suggest that the prescribed 60-mil HDPE liner is more robust than necessary as a secondary liner. Additional information presented below and in Mr. Frobel's opinion relating to the K30B liner is also germane to the issue of providing equal or better protection of the environment than the 60-mil HDPE material.

A. Prefabrication in factory controlled conditions into very large panels results in ease of installation, less thermal fusion field seams and less on-site Quality Control testing than the 60-mil HDPE.
B. Large prefabricated panels provide better control of thermal fusion welding in a factory environment that will improve the liner system integrity for the long term.
C. The scrim-reinforced LLDPE geomembrane provides lay flat characteristics that are superior to 60-mil HDPE for a secondary liner which allows for more intimate contact with the underlying soil or geotextile as well as overlying materials thus providing better flow characteristics for drainage of water to sump areas.
D. Ease of installation of large prefabricated custom size panels results in a greater reduction of installation time and associated installation costs.
E. The scrim reinforced LLDPE geomembrane is easily repaired (e.g. if damaged during installation) using the same thermal fusion bonding method without the need for special surface grinding/preparation for extrusion welding used in repair of HDPE geomembranes.
F. Due to the reinforcement, the 30-mil scrim-reinforced LLDPE geomembrane will provide superior installation and operation resistance to mechanical damage and is excellent resistant to tear propagation

These considerations permit our conclusion that the proposed 30-mil scrim-reinforced LLDPE secondary liner provides will provide equal or better protection of fresh water, public health and the environment. However, as stated above, the Raven LLDPE material (K30B liner) is undergoing chemical compatibility testing in order to comply with the Pit Rule Mandate (see above), specifically:

> ...The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. Liner compatibility shall comply with EPA SW- 846 Method 9090A or subsequent relevant publication.

Raven Industries is communicating with OCD Environmental Bureau regarding the testing protocols and results. We do not anticipate approval of this variance request until/unless OCD approves the exception request for the Round Tank Permanent Pit.

Because the 30-mil HDPE liner has similar characteristics to those described above for the K30B liner, we believe this liner also provides equal or better protection of fresh water, public health and the environment.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Mr. Randall Hicks, PE
R.T. Hicks Consultants Ltd.
901 Rio Grande Boulevard
Suite F-142
Albuquerque, New Mexico 87104

November 14, 2013

RE: Technical Memorandum
Raven Dura-Skrim K30B
Alternative Secondary Liner
Mack Energy Pits

Dear Mr. Hicks:

Raven Industries has requested that I take a look at the suitability of application for the Raven K30B scrim reinforced geomembrane in the Mack Pits. I have reviewed your C-1445 Supplemental Information Report and the Processed Water Chemical Analysis as well as email correspondence. In consideration of the secondary lining system application, size of impoundments and depth as well as the chemical analysis provided for the processed water, it is my professional opinion that the Raven Dura-Skrim K30B scrim reinforced LLDPE geomembrane will provide the requisite barrier against processed water loss and will function better than 60 mil HDPE as a secondary liner system. In particular, the Raven K30B scrim reinforced LLDPE geomembrane exhibits the following characteristics that are superior to 60 mil HDPE for secondary containment:

- Prefabrication in factory controlled conditions into very large panels (up to 29,000 sf) that results in ease of installation, less thermal fusion field seams and less on site QC and CQA.

- Large prefabricated panels provide better control of thermal fusion welding in a factory environment that will improve the liner system integrity for the long term.

- The scrim reinforcement provides a very dimensionally stable sheet in temperature extremes which results in far less field wrinkles and waves during and after installation.

- The K30B geomembrane provides superior lay flat characteristics for a secondary liner which allows for more intimate contact with the underlying soil or geotextile as well as overlying materials thus providing better flow characteristics for drainage of water to sump areas.

- Ease of installation of large prefabricated custom size panels results in a greater reduction of installation time and associated installation costs.

- The K30B scrim reinforced LLDPE geomembrane is easily repaired using the same thermal fusion bonding method without the need for special surface grinding/preparation for extrusion welding used in repair of HDPE geomembranes.

- Due to the heavy scrim reinforcement, the Raven K30B geomembrane will provide superior installation and operation resistance to mechanical damage and is especially resistant to tear propagation (190 lb tear vs 42 lb tear for HDPE sheet)

In summary, it is my professional opinion that the Raven K30B scrim reinforced LLDPE geomembrane will provide a secondary liner system that is equal to or better than 60 mil HDPE and will provide the requisite protection of fresh water, public health and the environment for many years. With respect to the primary liner, I advise that 60 mil HDPE be used as prescribed in the Rule.

If you have any questions on the above technical memorandum or require further information, give me a call at 303-679-0285 or email geosynthetics@msn.com

Sincerely Yours,

Ronald K. Frobel, MSCE, PE
Principal

References:

C-1445 Supplemental Information
Round Tank # 1 and # 2 Permanent Pits
Mack Energy Corporation
Section 19 T15S R29E Chaves County
September 2013
Prepared by R. T. Hicks Consultants Ltd.

Cardinal Laboratories Analytical Report dated September 2013
Untreated Water/Wastewater
Mack Energy Pits

Attachments:

R. K. Frobel C. V.

RONALD K. FROBEL, MSCE, P.E.

CIVIL ENGINEERING
GEOSYNTHETICS
EXPERT WITNESS
FORENSICS

FIRM: R. K. FROBEL & ASSOCIATES
Consulting Civil / Geosynthetics Engineers

TITLE: Principal and Owner

PROFESSIONAL AFFILIATIONS:

American Society for Testing and Materials (ASTM) -
Founding member of Committee D 35 on Geosynthetics
Chairman ASTM D35 Subcommittee on Geomembranes 1985-2000
ASTM Award of Merit Recipient/ASTM Fellow - 1992
ASTM D18 Soil and Rock - Special Service Award - 2000
Transportation Research Board (TRB) of The National Academies
Appointed Member A2K07 Geosynthetics 2000 - 2003
National Society of Professional Engineers (NSPE) - Member
American Society of Civil Engineers (ASCE) - Member
Colorado Section - ASCE - Member
International Society of Soil Mechanics and Foundation Engineers
(ISSMFE) - Member
International Geosynthetics Society (IGS) - Member
North American Geosynthetics Society (NAGS) - Member
International Standards Organization (ISO) - Member TC 221
Team Leader - USA Delegation Geosynthetics 1985 - 2001
European Committee for Standardization (CEN) - USA Observer
EPA Advisory Committee on Geosynthetics (Past Member)
Association of State Dam Safety Officials (ASDSO) – Member
U. S. Committee on Irrigation and Drainage (USCID) - Member
Technical Advisory Committee - Geosynthetics Magazine
Editorial Board - Geotextiles and Geomembranes Journal
Editorial Board - Geotechnical Testing Journal (ASTM)
Co-Chairman International Conference on Geomembranes
Co-Chairman ASTM Symposium on Impermeable Barriers
U.S. Naval Reserve Officer (Inactive)
Registered Professional Engineer – Civil (Colorado)
Mine Safety Health Administration (MSHA) Certified

ACADEMIC BACKGROUND:

University of Arizona: M.S. - Civil Engineering - 1975
University of Arizona: B. S. - Civil Engineering - 1969
Wentworth Institute of Technology: A.S. Architecture – 1966

PROFESSIONAL EXPERIENCE:

R. K. Frobel & Associates - Consulting Engineers
Evergreen, Colorado, Principal and Owner, 1988 - Present

Chemie Linz AG and Polyfelt Ges.m.b.H., Linz, Austria
U. S. Technical Manager Geosynthetics, 1985 - 1988

U.S. Bureau of Reclamation, Engineering and Research Center
Denver, Colorado, Technical Specialist in Construction Materials Research and Application, 1978 - 1985

Water Resources Research Center (WRRC), University of Arizona
Tucson, AZ, Associate Research Engineer, 1975 - 1978

Engineering Experiment Station, University of Arizona
Tucson, AZ, Research Assistant, 1974 - 1975

United States Navy, Commissioned Naval Officer, 1970 - 1973

REPRESENTATIVE EXPERIENCE:

R.K. Frobel & Associates: Civil engineering firm specializing in the fields of geotechnical, geoenvironmental and geosynthetics. Expertise is provided to full service civil/geotechnical engineering firms, federal agencies, municipalities or owners on a direct contract, joint venture or sub-consultant basis. Responsibilities are primarily devoted to specialized technical assistance in design and application for foreign and domestic projects such as the following: Forensics investigations into geotechnical and geosynthetics failures; providing expert report and testimony on failure analysis; providing design and peer review on landfill lining and cover system design, mine waste reclamation, water treatment facilities, hydro-technical canal, dam, reservoir and mining projects, floating reservoir covers; oil and gas waste containment; design of manufacturers technical literature and manuals; development and presentation of technical seminars; new product development and testing; MQA/CQA program design and implementation.

Polyfelt Ges.m.b.H., Linz, Austria and Denver Colorado: As U.S. technical manager, primary responsibilities included technical development for the Polyfelt line of geosynthetics for the U.S. civil engineering market as well as world wide applications.

U.S. Bureau of Reclamation, Denver, Colorado: As technical specialist, responsibilities included directing laboratory research, design and development investigations into geosynthetics and other construction materials for use on large western water projects such as dams, canals, power plants and other civil structures. Included were material research, selection and testing, specification writing, large scale pilot test programs, MQA/CQA program design and supervision of site installations. Prime author or contributor to several USBR technical publications incorporating geosynthetics.

University of Arizona, Tucson, Arizona: As research engineer at the Water Resources Research Center, responsibilities included research, design and development of engineering materials and methods for use in construction of major water projects including potable water reservoirs, canals and distribution systems. Prime author or contributor to several WRRC technical publications.

Northeast Utilities, Hartford, Connecticut: As field engineer for construction at Northeast Utilities, responsibilities included liason for many construction projects including additions to power plants, construction of substations, erection of fuel oil pipe lines and fuel oil storage tanks. Responsibilities also included detailed review, inspection and reporting on numerous construction projects.

U.S. Navy: Commissioned Naval Officer – Nuclear Program

PUBLICATIONS: Over 85 published articles, papers and books.

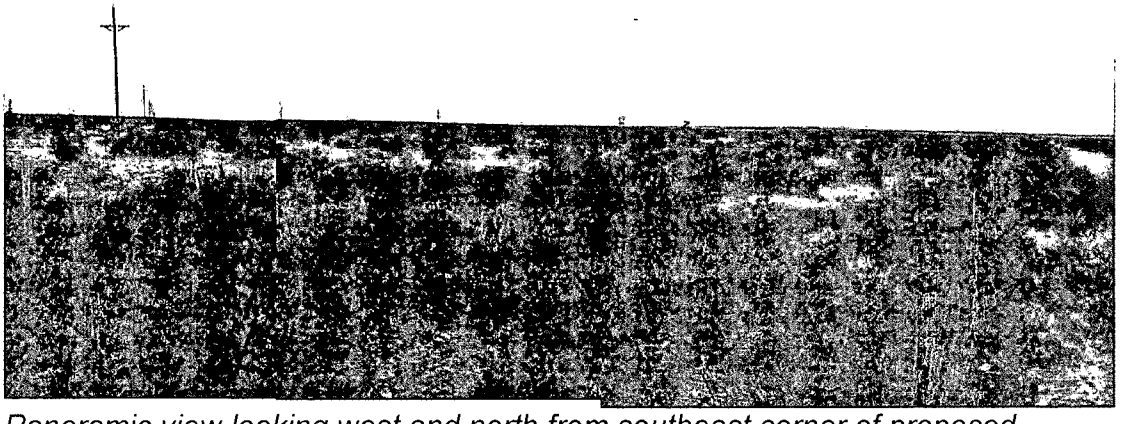
CONTACT DETAILS:

Ronald K. Frobel, MSCE, P.E.
R. K. Frobel & Associates
Consulting Civil/Geosynthetics Engineers
1153 Bergen Parkway
Suite M-240
Evergreen, Colorado 80439 USA
Ph 303-679-0285
Fx 303-679-8955
M 720-289-0300
Email: geosynthetics@msn.com

February 2014

C-144 Permit Package for Dagger Draw Multi-Well Fluid Management Pit #1 Section 16 T19S R25E Eddy County

Appendices A-C



Panoramic view looking west and north from southeast corner of proposed locaton.

Prepared for Yates Petroleum Corporation Artesia, New Mexico

Prepared by
Huitt-Zollars, Inc
333 Rio Rancho Blvd
Suite 101
Rio Rancho, New Mexico

R.T. Hicks Consultants, Ltd.
901 Rio Grande NW
F-142
Albuquerque, New Mexico

Appendix A

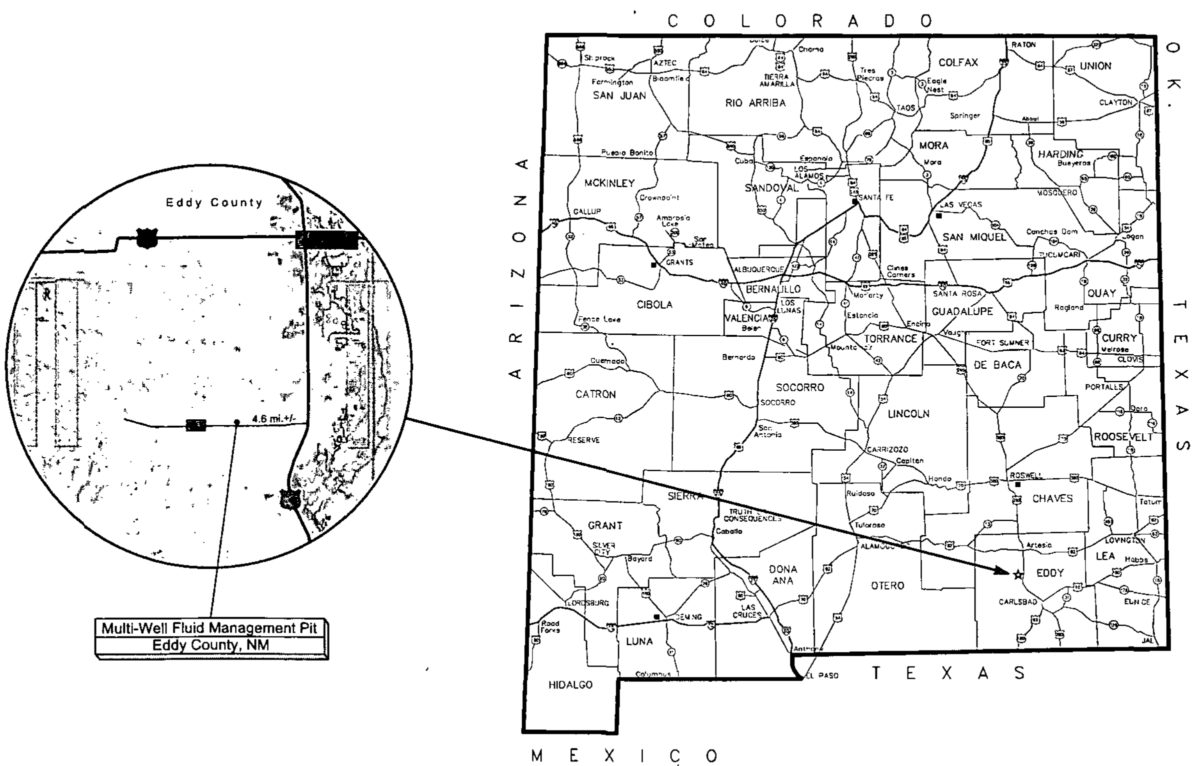
Certified Engineering Drawings

Multi-Well Fluid Management Pit

Section 16, T.19S., R.25E.
Eddy County, New Mexico

CONSTRUCTION PLANS

FEBRUARY 21, 2014



SHEET INDEX

SHEET	SHEET TITLE
C001	PROJECT COVER SHEET
C101	SITE PLAN
C300	DETAILS
C301	DETAILS
C400	SWPPP NOTES
C401	SWPPP

APPROVALS

State of New Mexico Oil Conservation Division — DATE

NO.	DESCRIPTION	DATE	BY
1			
2			
3			
4			
5			
6			
7			

REVISIONS (OR CHANGE NOTICES)

Designed By:
HUITT-ZOLLARS
Huitt-Zollars, Inc. Rio Rancho
333 Rio Rancho Drive NE, Suite 101
Rio Rancho, New Mexico 87124
Phone (505) 892-5141 Fax (505) 892-3259

Designed For:
YATES PETROLEUM CORPORATION

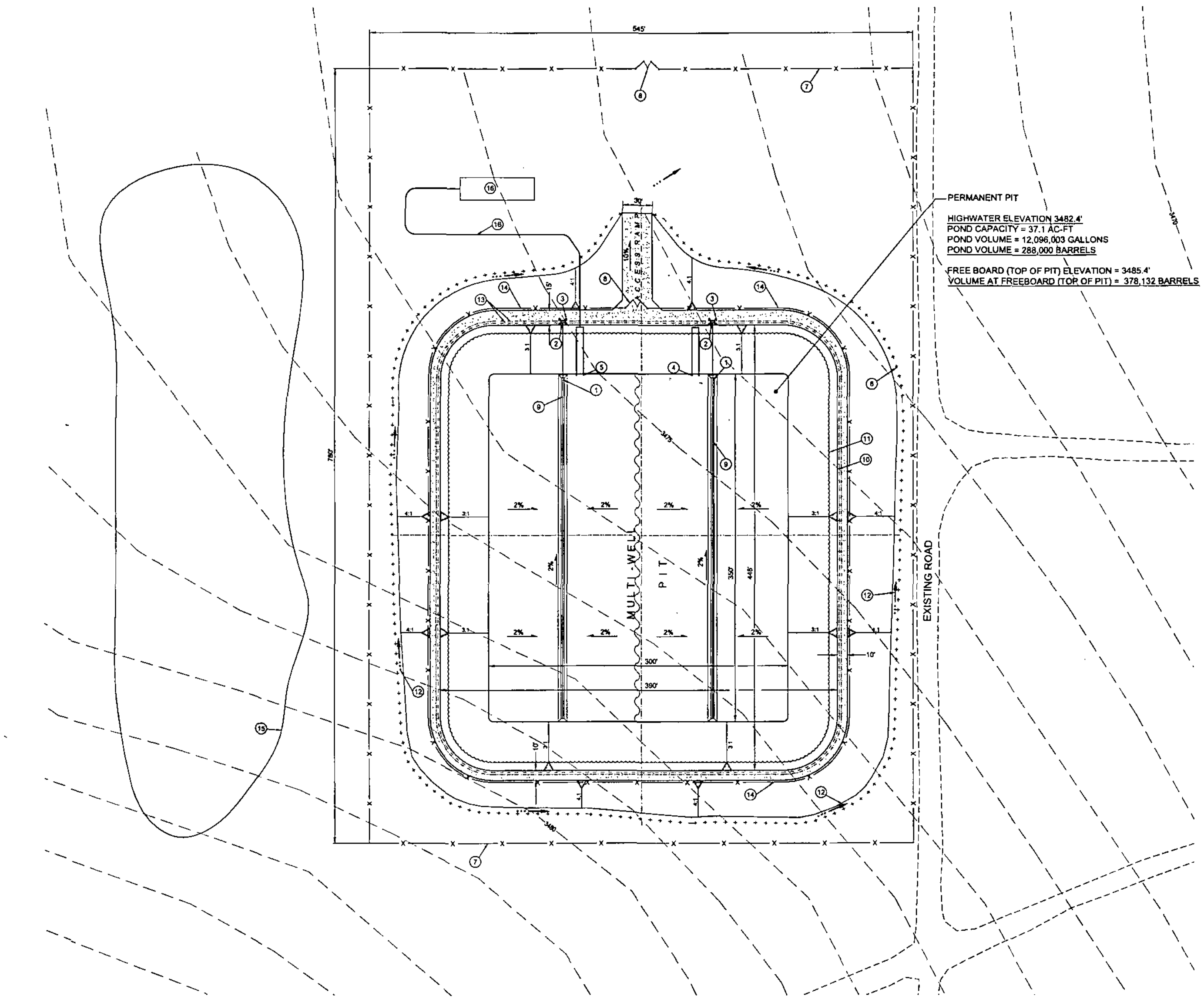
PROJECT COVER SHEET

Multi-Well Fluid Management Pit
SECTION 16, T.19S, R.25E.
EDDY COUNTY, NM

SCOTT A. EDDINGS
NEW MEXICO
12868
REGISTERED PROFESSIONAL ENGINEER

PROJECT NO.	R170976.02
DESIGNED BY:	SAE
DRAWN BY:	MS
CHECKED BY:	SAE
DATE:	FEB. 7, 2014
DPW CHK:	

SHEET: C001



SITE PLAN

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT CONSTRUCTION PLANS, SPECIFICATIONS, AND APPROVED PERMIT.
2. OWNER AND CONTRACTOR ARE RESPONSIBLE TO DEVELOP, PERMIT, IMPLEMENT AND MAINTAIN THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) IN ACCORDANCE WITH FEDERAL AND STATE REQUIREMENTS. SWPPP IS INCIDENTAL TO THE PROJECT.
3. BOTTOM OF PIT SHALL BE SLOPED AT 2% AS SHOWN.
4. PERIMETER OF THE PIT SHALL BE ENCLOSED WITH A BARBED WIRE FENCE.
5. STRIP AND STOCKPILE TOPSOIL FOR FUTURE CLOSURE USE. OWNER SHALL DIRECT LOCATION OF STOCKPILE.
6. EARTHWORK SHALL BE WETTED TO OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% ASTM D-1557.

○ SHEET KEYNOTES

1. 3'x3' SUMP, SEE DETAIL A, SHEET C300.
2. 3'x4.5' SUMP ACCESS. SEE DETAIL B, SHEET C301.
3. BOLLARDS. SEE DETAIL C, SHEET C300.
4. PIPE SUCTION & DISCHARGE PIT INFLOW SIDE. SEE DETAIL G, SHEET C301.
5. PIPE SUCTION & DISCHARGE PIT OUTFLOW SIDE. SEE DETAIL H, SHEET C301.
6. LIMITS OF DISTURBANCE.
7. 4 STRAND BARBED WIRE FENCE. SEE DETAIL I, SHEET C301.
8. 12-FOOT SWING GATE (FENCE HEIGHT AND GUARD TO MATCH). TWO EACH
9. LEAK DETECTION SYSTEM PIPING - 4" SCHEDULE 80 PVC.
10. 3' FREEBOARD DEPTH.
11. MAXIMUM WATER SURFACE ELEVATION.
12. EROSION PROTECTION DITCH: 3' WIDTH AND 6" DEPTH.
13. ANCHOR TRENCH. SEE DETAIL A, SHEET C301.
14. GAME FENCE W/ 36" HIGH "CHICKEN WIRE" FIRMLY ATTACHED TO BOTTOM.
15. STOCKPILE AREA.
16. SKID MOUNTED PUMP AND SUCTION LINE.

LINER NOTES

LINER INSTALLATION

THE LINERS WILL BE INSTALLED IN A MANNER CONSISTENT WITH THE MANUFACTURE'S SPECIFICATIONS, WHICH ARE FOUND IN APPENDIX B. AS OUTLINED IN APPENDIX B, PROTOCOLS FOR LINER INSTALLATION INCLUDE MEASURES TO:

- MINIMIZE LINER SEAMS AND ORIENT THEM UP AND DOWN, NOT ACROSS A SLOPE.
- USE FACTORY WELDED SEAMS WHERE POSSIBLE (AS IDENTIFIED IN APPENDIX A NOTES)
- OVERLAP LINERS FOUR TO SIX INCHES AND ORIENT SEAMS PARALLEL TO THE LINE OF MAXIMUM SLOPE, I.E., ORIENTED ALONG, NOT ACROSS, THE SLOPE, PRIOR TO *ANY FIELD SEAMING (AS IDENTIFIED IN APPENDIX A NOTES)*
- MINIMIZE THE NUMBER OF WELDED FIELD SEAMS IN COMERS AND IRREGULARLY SHAPED AREAS.
- UTILIZE ONLY QUALIFIED PERSONNEL TO WELD FIELD SEAMS (AS IDENTIFIED IN APPENDIX A NOTES)
- AVOID EXCESSIVE STRESS-STRAIN ON THE LINER (AS IDENTIFIED IN APPENDIX A NOTES)
- PLACE GEOTEXTILE UNDER THE LINER WHERE DIRECTED BY THE INDEPENDENT FIELD INSPECTOR (PETTIGREW ENGINEERS) TO REDUCE LOCALIZED STRESS-STRAIN OR PROTUBERANCES THAT MAY OTHERWISE COMPROMISE THE LINER'S INTEGRITY (AS IDENTIFIED IN APPENDIX A NOTES)
- ANCHOR THE EDGES OF ALL LINERS IN THE BOTTOM OF A COMPACTED EARTH-FILLED TRENCH THAT IS AT LEAST 18 INCHES DEEP (AS IDENTIFIED IN APPENDIX A NOTES)

LEGEND

— —3740— —	EXISTING MAJOR CONTOUR
— — — —	EXISTING MINOR CONTOUR
——3745——	PROPOSED MAJOR CONTOUR
————	PROPOSED MINOR CONTOUR
——X——	PROPOSED BARBED WIRE FENCE
════	LEAK DETECTION PIPING
+ + + + + +	LIMITS OF DISTURBANCE
～～～～	HIGH WATER ELEVATION
←···	DITCH & FLOW DIRECTION

50' 25' 0 50' 100'
SCALE: 1"=50'

NO.	DESCRIPTION	DATE	BY
7			
6			
5			
4			
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

Designed By
HUITT-ZOLLARS
Huitt-Zollars, Inc. Rio Rancho
333 Rio Rancho Drive NE, Suite 101
Rio Rancho, New Mexico 87124
Phone (505) 892-5141 Fax (505) 892-3259

Designed For:
YATES PETROLEUM CORPORATION

SITE PLAN

Multi-Well Fluid Management Pit
SECTION 16, T.19S., R.25E.
EDDY COUNTY, NM

SCOTT A. EDDINGS 12800 REGISTERED PROFESSIONAL ENGINEER 2/21/14

PROJECT NO.	R170976.02
DESIGNED BY:	SAE
DRAWN BY:	MS
CHECKED BY:	SAE
DATE:	FEB. 21, 2014
DPW CHK:	
SHEET:	C101

Plotted: 2/21/2014 11:06:37 AM, By: Eddings, Scott
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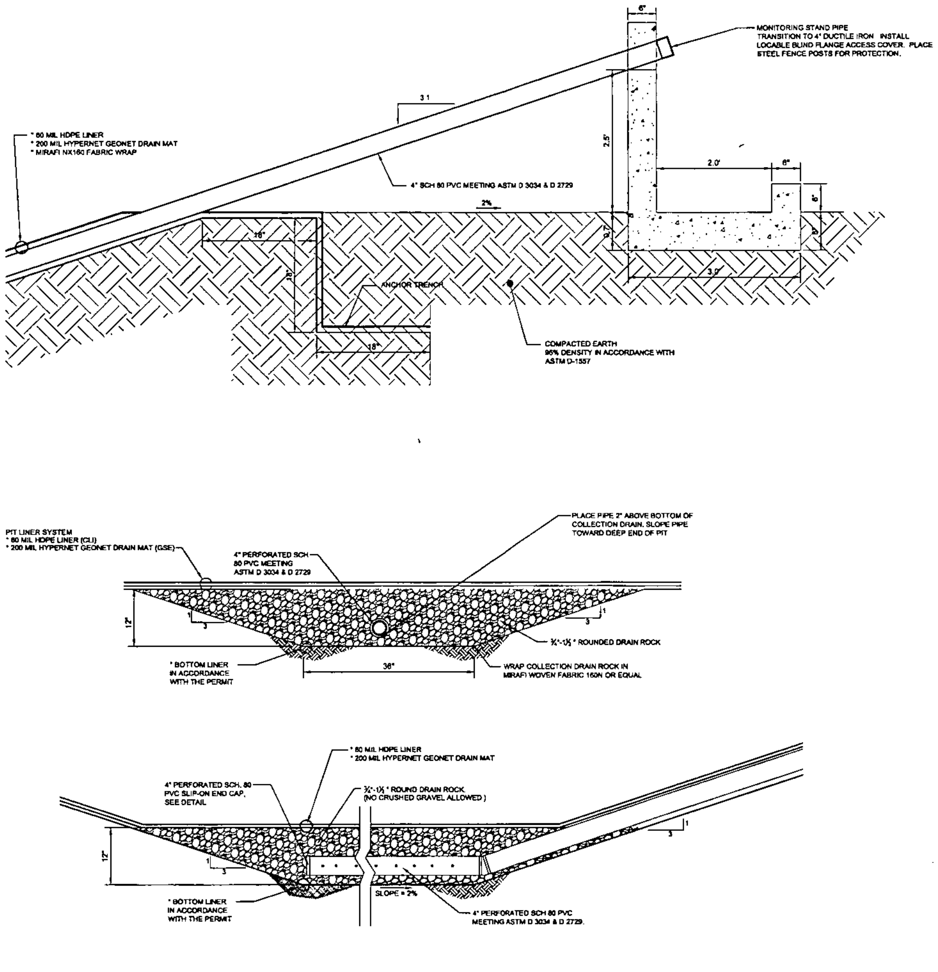

LINER & LEAK DETECTION SYSTEM (A)
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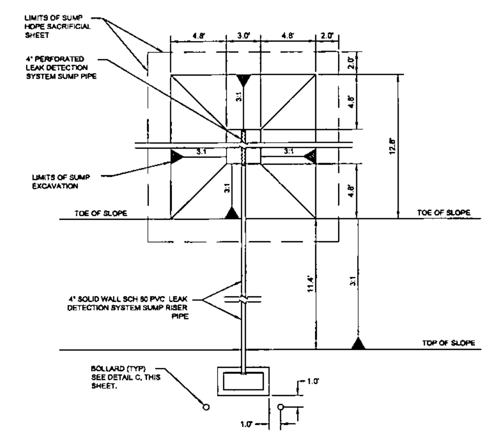

SUMP DETAIL (B)
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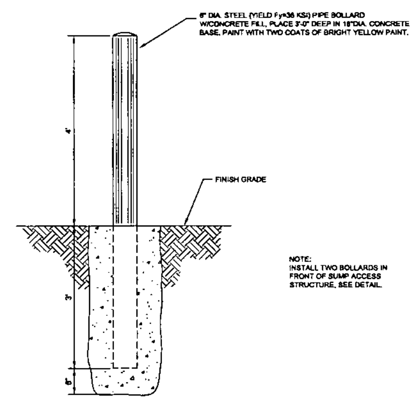


BOLLARD DETAIL (TYP) (C)
Scale: N.T.S.

NO.	DESCRIPTION	DATE	BY
1			
2			
3			
4			
5			
6			
7			

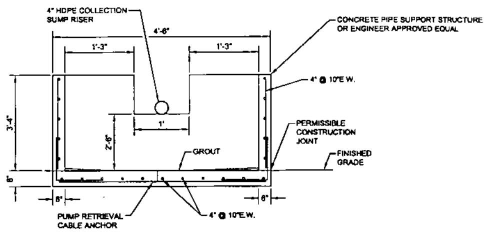
REVISIONS (OR CHANGE NOTICES)

Designed By: HUITT-ZOLLARS
Huitt-Zollars, Inc. Rio Rancho
333 Rio Rancho Drive NE, Suite 101
Rio Rancho, New Mexico 87124
Phone (505) 892-5141 Fax (505) 892-3259
Designed For: YATES PETROLEUM CORPORATION

DETAILS

Multi-Well Fluid Management Pit
SECTION 16, T.19S., R.25E.
EDDY COUNTY, NM

PROJECT NO. R170976.02
DESIGNED BY: SAE
DRAWN BY: MS
CHECKED BY: SAE
DATE: FEB. 21, 2014
DPW CHK:
SHEET: C300



LEAK DETECTION SYSTEM SUMP ACCESS STRUCTURE SECTION (A)
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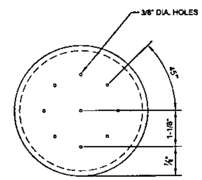

LEAK DETECTION SYSTEM COLLECTION SUMP PERFORATED END CAP DETAIL (B)
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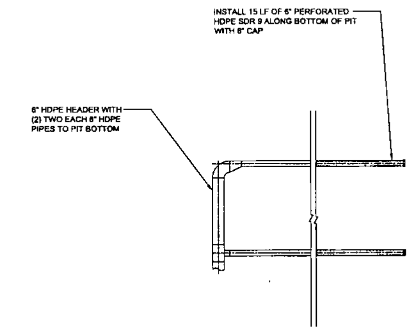

PIPE SUCTION & DISCHARGE INFLOW SIDE (G)
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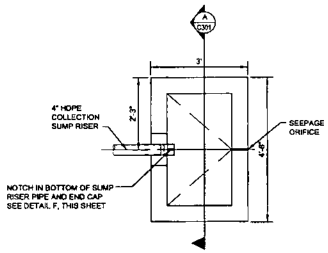

LEAK DETECTION SYSTEM SUMP ACCESS STRUCTURE PLAN (C)
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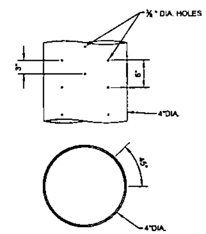

4" DIA. LEAK DETECTION SYSTEM SUMP PIPE PERFORATION DETAIL (D)
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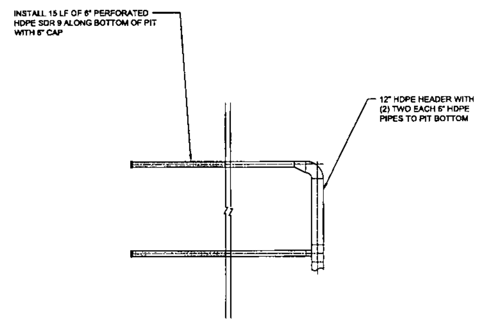
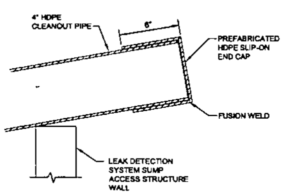
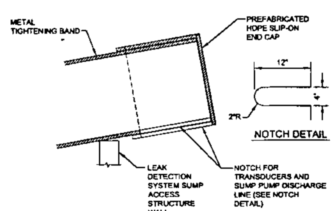


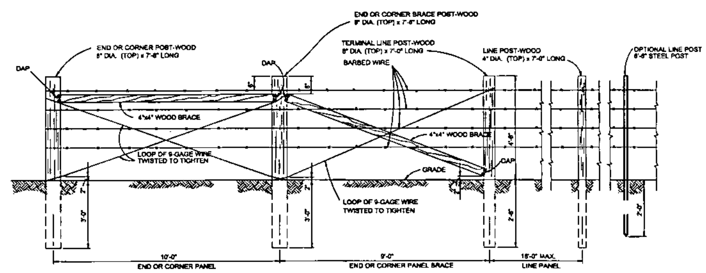
PIPE SUCTION & DISCHARGE OUTFLOW SIDE (H)
Scale: N.T.S.



CLEANOUT RISER END (E)
Scale: N.T.S.



SUMP RISER END CAP (F)
Scale: N.T.S.



4 STRAND BARBED-WIRE FENCE (I)
Scale: N.T.S.
"GAME FENCE SIMILAR - 8' HIGH 6" OPENING CLASS III NO. 16 WIRE

NO.	DESCRIPTION	DATE	BY
1			
2			
3			
4			
5			
6			
7			

REVISIONS (OR CHANGE NOTICES)

Designed by: HUITT-ZOLLARS
Huitt-Zollars, Inc. Rio Rancho
Rio Rancho, New Mexico
Phone (505) 892-5141 Fax (505) 892-3259

Designed For: YATES PETROLEUM CORPORATION

DETAILS

Multi-Well Fluid Management Pit
SECTION 16, T.19S., R.25E.
EDDY COUNTY, NM

PROJECT NO.	R170976.02
DESIGNED BY:	SAE
DRAWN BY:	MS
CHECKED BY:	SAE
DATE:	FEB. 21, 2014
DPW CHK:	
SHEET:	C301

SITE DESCRIPTION

PROJECT NAME AND LIMITS: MULTI WELL FLUID MANAGEMENT PIT.
PROJECT IS LOCATED IN PORTIONS OF SECTION 16 T19S R25E.

PROJECT DESCRIPTION: CONSTRUCTION OF A PERMANENT PIT.

EXISTING CONDITIONS: THE SITE IS UNDEVELOPED RANGELAND.

MAJOR SOIL DISTURBING ACTIVITIES: CONSTRUCTION ACTIVITIES INCLUDE HEAVY DIRT MOVING AND LINER CONSTRUCTION.

TOTAL PROJECT AREA: 6.0 ARES

TOTAL AREA TO BE DISTURBED: 7.0 ACRES

WEIGHTED RUNOFF COEFFICIENT (AFTER CONSTRUCTION): 0.33

EXISTING CONDITION OF SOIL AND VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

NAME OF RECEIVING WATERS: THE SITE IS GENTLY SLOPING TO THE WEST; SURFACE SOILS ON THIS PORTION OF THE SITE ARE BROWN LOAMY FINE SANDS. SITE SOILS ARE OF A POOR QUALITY FOR VEGETATION PRODUCTION. SITE VEGETATION CONSISTS OF SPARSE DESERT SHRUBS. THE SOILS ARE MODERATELY TO VERY PERMEABLE AND SUSCEPTIBLE TO BLOWING.

OWNER CERTIFICATION

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHERED AND EVALUATED THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.

OWNER: SIGNED ______ DATE

OWNER: NAME ______ DATE

TITLE ______ DATE

EROSION AND SEDIMENT CONTROL

SOIL STABILIZATION PRACTICES

- ____ TEMPORARY SEEDING
- ____ PERMANENT PLANTING, SODDING, OR SEEDING
- ____ MULCHING
- ____ SOIL RETENTION BLANKET
- X BUFFER ZONES
- X PRESERVATION OF NATURAL RESOURCES

OTHER:

STRUCTURAL PRACTICES:

- X SILT FENCES
- ____ HAY BALES
- ____ ROCK BERMS
- ____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- X DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ____ DIVERSION DIKE AND SWALE COMBINATION
- ____ PIPE SLOPE DRAINS
- ____ CONCRETE FLUMES
- ____ ROCK BEDDING AT CONSTRUCTION EXIT
- ____ TIMBER MATTING AT CONSTRUCTION EXIT
- ____ CHANNEL LINERS
- ____ SEDIMENT TRAPS
- ____ SEDIMENT BASINS
- ____ STORM INLET SEDIMENT TRAP
- ____ STONE OUTLET STRUCTURES
- ____ CURBS AND GUTTERS
- ____ STORM DRAINS
- ____ VELOCITY CONTROL DEVICES
- ____ VEGETATED SWALES & NATURAL DEPRESSIONS

OTHER: NEW EARTHEN SWALE

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

1. CONSTRUCT TEMPORARY EROSION CONTROLS INCLUDING DITCHES AND FILTER FENCES.
2. STRIP AND STOCKPILE TOPSOIL IN DESIGNATED AREAS. CONSTRUCT APPROPRIATE EROSION CONTROLS TO MAINTAIN NATURAL DRAINAGE PATTERNS TO THE EXTENT POSSIBLE.
3. EXCAVATE TO THE ELEVATIONS SHOWN ON THE ENCLOSED GRADING PLAN AND STOCKPILE SOIL IN DESIGNATED AREAS.
4. CONSTRUCT A COMPOSITE LINER IN ACCORDANCE WITH THE SOIL LINER QUALITY CONTROL PLAN
5. PLACE CALICHE GRAVELS ON POND LEVEE.

GENERAL CONTRACTOR CERTIFICATION

I CERTIFY UNDER PENALTY OF LAW THAT I UNDERSTAND THE TERMS AND CONDITIONS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT THAT AUTHORIZES STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY FROM THE CONSTRUCTION SITE IDENTIFIED AS PART OF THIS CERTIFICATION.

SIGNED:		COMPANY:	
NAME:		ADDRESS:	
TITLE:		TELEPHONE:	
		DATE:	

SUB - CONTRACTOR CERTIFICATION

I CERTIFY UNDER PENALTY OF LAW THAT I WILL COORDINATE, EITHER THROUGH THE GENERAL CONTRACTOR, OWNER, OR DIRECTLY, WITH THE CONTRACTOR(S) AND/OR SUBCONTRACTOR(S) IDENTIFIED IN THE POLLUTION PREVENTION PLAN HAVING RESPONSIBILITY FOR IMPLEMENTING STORM WATER CONTROL MEASURES TO MINIMIZE ANY IMPACT MY ACTIONS MAY HAVE ON THE EFFECTIVENESS OF THESE STORM WATER CONTROL MEASURES.

SIGNED:		SIGNED:	
NAME:		NAME:	
TITLE:		TITLE:	
COMPANY:		COMPANY:	
ADDRESS:		ADDRESS:	
TELEPHONE:		TELEPHONE:	
DATE:		DATE:	

BEST MANAGEMENT PRACTICES CONTROLS

I. WASTE MATERIALS:

ALL WASTE MATERIALS, INCLUDING CONSTRUCTION DEBRIS, SHALL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. NO CONSTRUCTION WASTE MATERIAL SHALL BE BURIED ON SITE. THE TRANSIT DUMPSTER SHALL COMPLY WITH ORDINANCE 18.52.010 (ENCLOSURE AND REMOVAL OF WASTE MATERIALS DURING CONSTRUCTION). THE DUMPSTER SHALL BE EMPTIED AS NECESSARY OR AS REQUIRED BY ORDINANCE 9.04 (SOLID WASTE MANAGEMENT) AND THE TRASH SHALL BE HAULED TO A LICENSED LANDFILL.

II. HAZARDOUS WASTE:

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES SHALL BE CONSIDERED HAZARDOUS: PAINT, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SPILL STABILIZATION, CURING COMPOUNDS AND ADDITIVES. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE CONTRACTOR SHALL TAKE IMMEDIATE ACTION AND CONTACT THE FIRE DEPT. AND NMED.

III. SANITARY WASTE:

ALL SANITARY WASTE SHALL BE COLLECTED FROM THE CONSTRUCTION PORTABLE UNITS AS NECESSARY OR AS REQUIRED, CHAPTER 18.08 (BUILDING CODE), BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR. ALL WASTE MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

IV. SPILL PREVENTION:

THE FOLLOWING PRACTICES SHALL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURES OF MATERIALS TO STORM WATER RUNOFF.

V. GOOD HOUSEKEEPING:

A. STORE ONLY ENOUGH PRODUCTS REQUIRED TO DO THE JOB
B. NEATLY STORE MATERIALS ON-SITE IN AN ORDERLY MANNER
C. KEEP PRODUCTS IN THEIR ORIGINAL CONTAINER
D. DO NOT MIX SUBSTANCES WITH ONE ANOTHER, UNLESS OTHERWISE RECOMMENDED BY THE MANUFACTURER
E. USE ENTIRE CONTENTS OF A PRODUCT BEFORE DISPOSING THE CONTAINER
F. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL

VI. HAZARDOUS PRODUCTS:

PRACTICES USED TO REDUCE RISKS:

A. KEEP PRODUCTS IN THEIR ORIGINAL CONTAINER IF AT ALL POSSIBLE
B. RETAIN ORIGINAL LABELS, PRODUCT INFORMATION AND MATERIAL SAFETY DATA SHEETS (MSDS)
C. DISPOSE SURPLUS PRODUCT IN ACCORDANCE WITH MANUFACTURER'S OR LOCAL & STATE RECOMMENDED METHODS

VII. PETROLEUM PRODUCTS:

ALL ON-SITE VEHICLES SHALL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS SHALL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT SUBSTANCES USED ON-SITE SHALL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATION.

VIII. SPILL CONTROL PRACTICES:

A. MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP SHALL BE CLEARLY POSTED AND SITE PERSONNEL SHALL BE MADE AWARE OF THE PROCEDURES:
B. MATERIALS AND EQUIPMENT NECESSARY FOR CLEANUP SHALL BE KEPT IN THE MATERIAL STORAGE AREA ON-SITE:
C. ALL SPILLS SHALL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY
D. SPILL AREA SHALL BE WELL VENTILATED AND APPROPRIATE CLOTHING WILL BE WORN:
E. ANY SPILL SHALL BE REPORTED TO THE APPROPRIATE GOVERNMENTAL AGENCY
F. MEASURES SHALL BE TAKEN TO PREVENT A SPILL FROM REOCCURRING

IX. MAINTENANCE AND INSPECTION PROCEDURES:

ALL POLLUTION PREVENTION MEASURES SHALL BE INSPECTED AT LEAST ONCE A MONTH OR WITHIN 24-HOURS PRIOR TO ANTICIPATED STORM EVENT AND FOLLOWING A STORM EVENT OF 0.5 INCHES OR MORE. INSPECTION IN FINAL STABILIZED AREAS OR DURING ARID PERIODS WILL BE CONDUCTED MONTHLY, BEST MANAGEMENT PRACTICES AND POLLUTION CONTROL PROCEDURES SHALL BE INSPECTED FOR ADEQUACY.

X. REMARKS:

DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAMBED. CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS. ALL WATERWAYS SHALL BE CLEANED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK, PILING DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

XI. OFFSITE VEHICLE TRACKING:

IN ADDITION TO THE STABILIZED CONSTRUCTION ENTRANCES, THE FOLLOWING MEASURES SHALL BE OBSERVED DURING CONSTRUCTION:

- HAUL ROADS SHALL BE DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS SHALL BE COVERED WITH TARPAULIN
- EXCESS DIRT ON ROAD SHALL BE REMOVED IMMEDIATELY
- STABILIZED CONSTRUCTION ENTRANCE
- OTHER:

MISCELLANEOUS

- X *NO BATCH PLANT*
- X NO ENDANGERED SPECIES

STATE OF NEW MEXICO OIL CONSERVATION DIVISION

NO.	DESCRIPTION	DATE	BY
7			
6			
5			
4			
3	-		-
2	-	-	-
1		-	-

REVISIONS (OR CHANGE NOTICES)

Designed By:
HUITT-ZOLLARS
Huitt-Zollars, Inc. Rio Rancho
333 Rio Rancho Drive NE, Suite 101
Rio Rancho, New Mexico 87124
Phone (505) 892-5141 Fax (505) 892-3259

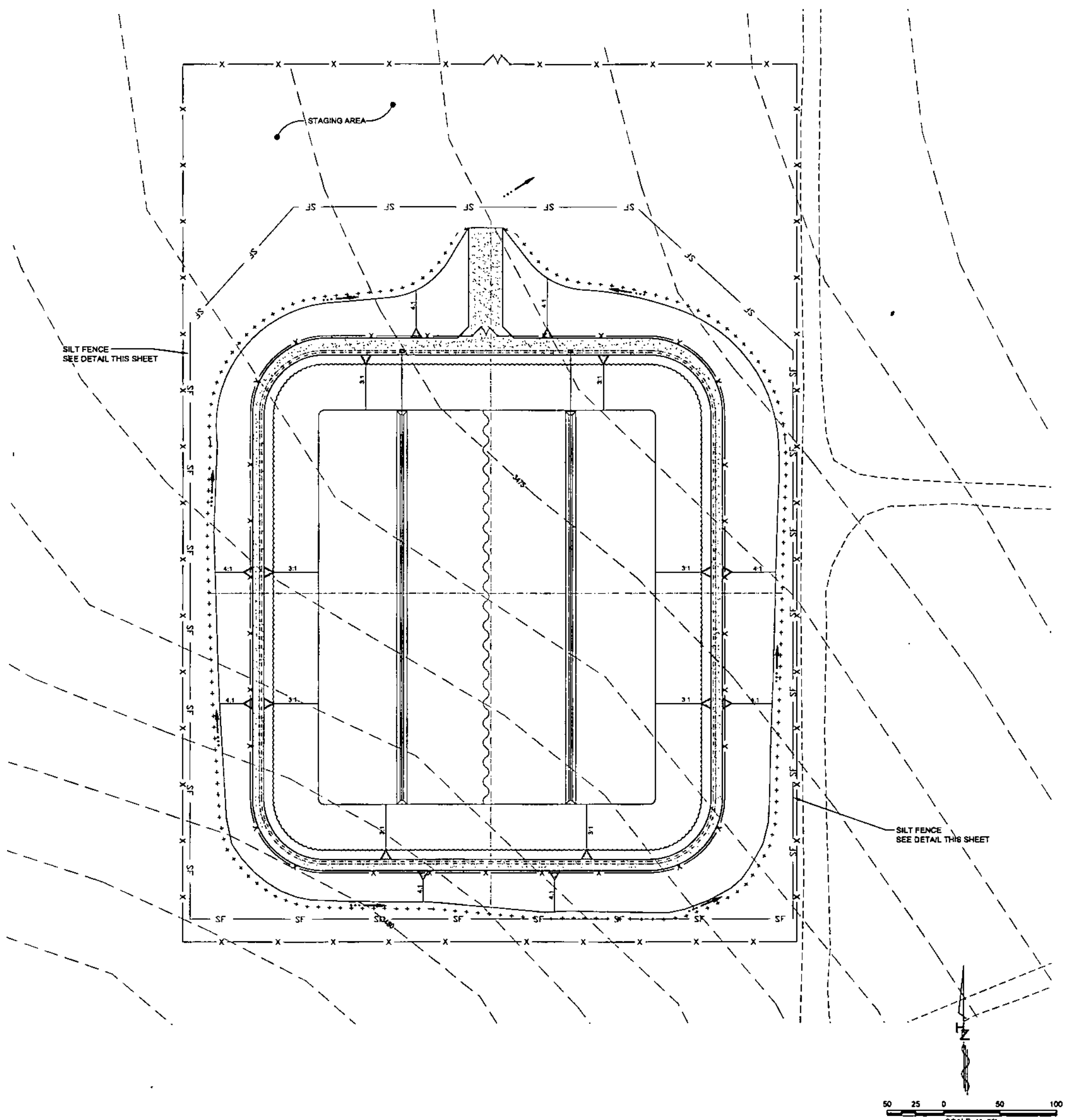
Designed For:
YATES PETROLEUM CORPORATION

SWPPP NOTES

Multi-Well Fluid Management Pit
SECTION 16, T.19S., R.25E.
EDDY COUNTY, NM

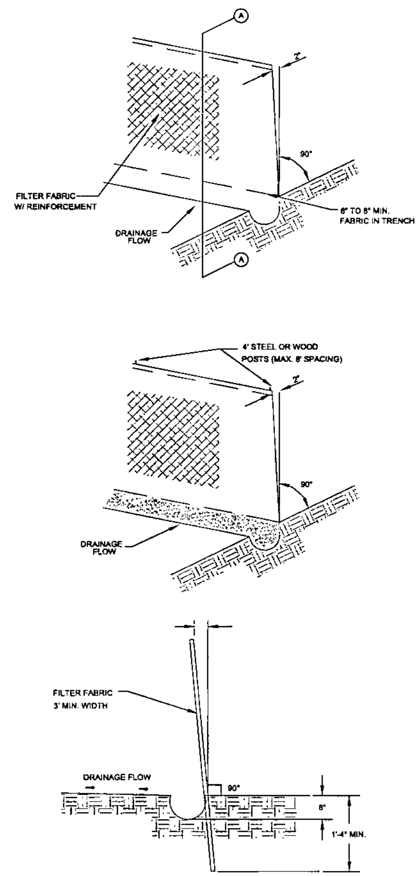
SCOTT A. EDDINGS 12886 REGISTERED PROFESSIONAL ENGINEER 2/21/14

PROJECT NO.	R170976.02
DESIGNED BY:	SAE
DRAWN BY:	LRT
CHECKED BY:	SAE
DATE:	FEB. 21, 2014
DPW CHK:	-
SHEET:	C400



EROSION CONTROL

1. PIT SHALL BE SITED OUTSIDE OF ANY POSSIBILITY TO BE IMPACTED BY CONCENTRATED STORM WATER FLOWS.
2. STORM WATER SHEET FLOWS SHALL BE ROUTED AROUND PERIMETER OF PIT WITHIN AN EARTHEN SWALE. THE SWALE SHALL BE INSTALLED FROM THE HIGH POINT AND EXTEND TO THE LOW POINT. GRADES WITHIN SWALE SHALL NOT EXCEED 2% WITHOUT ADDITIONAL ARMORMING OF FLOWLINE AND SIDE SLOPES.
3. STOCKPILE TOPSOIL AS SHOWN ON SITE PLAN.
4. SEDIMENT SHALL BE FILTERED FROM SWALE IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN.
5. ALL DISTURBED AREAS SHALL BE SEEDED WITH NATVIE SEEDS AND STRAW CRIMPED UNLESS NOTED OTHERWSE.



REINFORCEMENT AND FILTER FABRIC TO BE DIRECTED BY THE ENGINEER

SILT FENCE STRUCTURE SECTION (A)
Scale: N.T.S.

NOTE: POULTRY NETTING SHALL NOT BE ALLOWED AS A REINFORCEMENT MATERIAL. CONTRACTOR SHALL POST NOTICE OF INTENT AT SITE ENTRANCE.

NO.	DESCRIPTION	DATE	BY
1	-	-	-
2	-	-	-
3	-	-	-
4			
5			
6			
7			

REVISIONS (OR CHANGE NOTICES)

Designed By: HUITT-ZOLLARS
Huitt-Zollars, Inc Rio Rancho
333 Rio Rancho Drive NE, Suite 101
Rio Rancho, New Mexico 87124
Phone (505) 892-5141 Fax (505) 892-3259

Designed For: YATES PETROLEUM CORPORATION

SWPPP

Multi-Well Fluid Management Pit
SECTION 16, T.19S., R.25E.
EDDY COUNTY, NM

PROJECT NO. R170976.02
DESIGNED BY: SAE
DRAWN BY: LRT
CHECKED BY: SAE
DATE: FEB. 21, 2014
DPW CHK: -

SHEET: C401

Appendix B

Design/Construction Plan

C-144 Supplemental Information: Design and Construction Plan
Multi-Well Fluid Management Pit

This plan addresses construction of MWFM pits. Appendix A presents Certified Engineering Design Plans. Also included in Appendix A is an erosion control plan that is not required by NMOCD Rules, and the leak detection design, which is the subject of the the Variance Request of Appendix G. Separate from this application are additional documents relating to the design/construction. These are available for examination by OCD if desired. One of these documents is the Quality Plan for the construction of the pit that calls for conducting a geotechnical investigation to provide foundation design/construction recommendations that are specific to this site and this pit.

Appendix F provides liner and geotextile specifications including documentation on the compatibility of the materials with the stored water chemistry

Field conditions may create the need for minor modification of the pit design (e.g. changing the length, width or depth). If field conditions dictate the need to modify the design, the operator will notify NMOCD of the proposed changes and provide justification. Any design change that does not conform to the prescriptive mandates of NMOCD Rules or the approved permit will be the subject of a modification request submitted to the OCD for review and approval.

Dike Protection and Structural Integrity

As part of the Quality Plan, these design elements will be specifically addressed in the foundation recommendations prepared by a New Mexico Registered Professional Engineer (Pettigrew and Associates). The recommendations will be based on site-specific data. The operator and the project P.E. will review the recommendations prior to beginning the earthwork and will adhere to the specific recommendations of the foundation study. Neither the Quality Plan nor the geotechnical study are permit requirements for Multi-Well Fluid Management Pits.

Stockpile Topsoil

Prior to constructing the pit the qualified contractor will strip and stockpile the topsoil for use as the final cover or fill at the time of closure. The topsoil will be stockpiled adjacent to the, west side of the perimeter fence surrounding the pit. Until vegetation is established on the stockpile, the topsoil will be protected from wind erosion by placement of silt fences on the stockpile.

Signage

The operator shall post an upright sign not less than 12 inches by 24 inches with lettering not less than two inches in height on the fence at the entrance(s) to the pit. The operator shall post the sign in a manner and location such that a person can easily read the legend. The sign shall provide the following information: the operator's name; the location of the site by quarter-quarter or unit letter, section, township and range; and emergency telephone numbers.

Fencing:

As the pit is not located within 1000 feet of a permanent residence, school, hospital, institution or church, a chain-link fence is not required. The design plan shows a game

fence around the pit to exclude wildlife. This fence is significantly more robust than the required barbed wire fence with four strands evenly spaced in the interval between one foot and four feet above ground level. A perimeter fence of 4-strand barbed wire is also proposed to exclude stock from the working area around the pit.

Netting and Protection of Wildlife

The proposed game fence on the edge of the pit will be effective in excluding antelope, coyotes and most other terrestrial wildlife. Stock is excluded from the working area of the site by the 4-strand barbed wire perimeter fence.

As the size of the proposed MWFM pit is about 450 feet by 400 feet, installation of an effecting net over the pit is feasible, but may not be necessary. The pit will contain treated produced water that will not pose a threat to birds due to hydrogen sulfide gas or floating, free-phase hydrocarbons. With respect to protection of birds, we propose a observe then act approach to ensuring that the Dagger Draw MWFM Pit #1 does not create a threat to waterfowl and other avian species.

Since 2007, Yates Petroleum has implemented an Avian Protection Plan. This plan describes how Yates protects birds from E&P activities. The plan includes requirements to track and report bird mortality and it discusses methods to address identified problems, such as retro-fitting equipment. This plan is the most important element of working to ensure the pit is not hazardous to waterfowl or other avian species. Consistent with the avian protection plan, the operator will implement the daily and monthly monitoring and reporting plan for the pit, which includes observations of bird mortality and avian activity at/on the water.

If the monthly reports present mortality data that show an obvious need to exclude birds from the stored water, the operator will install bird netting. If the monitoring data suggest that netting is not acutely necessary, the operator will submit annual reports to OCD that discuss the results of the monitoring program and provide an evaluation of the need to exclude avian species from the pit via netting.

The design of the MWFM Pit allows for retro-fitting for netting.

Earthwork

As part of the QA/QC plan, a professional engineer registered in New Mexico (Pettigrew and Associates) will provide recommendations regarding the foundation for the pit liner. The pit will have a properly constructed foundation and interior slopes consisting of a firm, unyielding base that is smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear.

Appendix A shows the

a. inside grade of the levee is no steeper than two horizontal feet to one vertical foot (3H:1V).
b. levee has an outside grade no steeper than three horizontal feet to one vertical foot (4H:1V).

c. levee's top is wide enough to install an anchor trench that is at least 18-inches deep and provide adequate room for inspection and maintenance.
d. pit contains a primary (upper) liner and a secondary (lower) liner with a leak detection system between the upper and lower geomembrane liners that is appropriate to the site's conditions and is equivalent to the liner material prescribed in the Rule (see Appendix F).
e. caliche gravel placed on the levee (see sheet C-400) provides additional erosion control.

As always, field conditions may create the need for changes to the design. Any changes to the construction or grade requirements due to unforeseen conditions will be reviewed and approved by the PE then reported to OCD at least 10-days prior to initiating installation of the secondary liner and leak-detection system.

Liner Installation

The liners will be installed in a manner consistent with the Manufacture's specifications, which are found in Appendix F. As outlined in Appendix F, protocols for liner installation include measures to:

i. minimize liner seams and orient them up and down, not across a slope (Section 7.0 Raven and Section 2.3.1 In-Line).
ii. use factory welded seams where possible (as identified in Appendix A notes)
iii. overlap liners four to six inches and orient seams parallel to the line of maximum slope, i.e., oriented along, not across, the slope, prior to any field seaming (as identified in Appendix A notes)
iv. minimize the number of welded field seams in comers and irregularly shaped areas (Section 7.0 Raven K30B and 2.3.1 In-Line 60-mil HDPE)
v. utilize only qualified personnel to weld field seams (as identified in Appendix A notes)
vi. avoid excessive stress-strain on the liner (as identified in Appendix A notes)
vii. place geotextile under the liner where directed by the independent field inspector (Pettigrew Engineers) to reduce localized stress-strain or protuberances that may otherwise compromise the liner's integrity (as identified in Appendix A notes)
viii. anchor the edges of all liners in the bottom of a compacted earth-filled trench that is at least 18 inches deep (as identified in Appendix A notes)

At points of discharge into or suction from the lined MWFM pit the pipe configuration (see Appendix A) effectively protects the liner from excessive hydrostatic force or mechanical damage during filling or evacuation of fluids. External discharge or suction lines do not penetrate the liner.

Leak Detection and Fluid Removal Installation

The leak detection system, which is the subject of an variance request, contains the following design elements

a. Geotextile drainage material between the primary and secondary liner that is sufficiently permeable to allow the transport of fluids to the drainage pipes and observation ports (Appendices A and F).
b. The pit floor is sloped towards the center perforated pipe/swale to facilitate the earliest possible leak detection of the pit bottom. A pump may be placed in an observation port to provide for fluid removal.
c. Piping will withstand chemical attack from any seepage; structural loading from stresses and disturbances from overlying water, cover materials, equipment operation or expansion or contraction (see Appendix A).
d. The slope of the interior sub-grade and of drainage lines and laterals is at least a two percent grade, i.e., two feet vertical drop per 100 horizontal feet.
e. The piping collection system is comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80 (Appendix A).

Appendix C
Material Specifications

Herculine
Smooth Geomembranes

Herculine^{Sigma} Smooth HDPE Product Specifications

Properties	Test Method	Minimum Average Values				
		12 mil	20 mil	30 mil	40 mil	60 mil
Thickness*, mil Lowest individual reading	ASTM D 5199	12 10	20 18	30 27	40 36	60 54
Density, g/cm^3	ASTM D 1505	.940	.940	.940	.940	.940
Tensile Properties (Each Direction) Strength at Break, lb/in width (N/mm) Strength at Yield, lb/in width (N/mm) Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV	 42 (7) 23 (4) 700 12	 76 (13) 42 (7) 700 12	 114 (20) 63 (11) 700 12	 152 (27) 84 (15) 700 12	 228 (40) 126 (22) 700 12
Tear Resistance, lb. (N)	ASTM D 1004	7 (33)	13 (59)	21 (93)	28 (125)	42 (187)
Puncture Resistance, lb. (N)	ASTM D 4833	19 (86)	34 (152)	54 (240)	72 (320)	108 (480)
Carbon Black Content, % (minimum)	ASTM D 1603	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 5596	Note [1]	Note [1]	Note [1]	Note [1]	Note [1]

[1] 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.

*Custom material thicknesses also available.

IN-LINE PLASTICS, LC | 8615 Golden Spike Lane Houston, TX USA | (281) 272 1660 | www.In-LinePlastics.com

PRODUCT DATA SHEET

GSE HyperNet Geonet

GSE HyperNet geonet is a synthetic drainage material manufactured from a premium grade high density polyethylene (HDPE) resin. The structure of the GSE HyperNet geonet is formed specifically to transmit fluids uniformly under a variety of field conditions. The geonet is formulated to be resistant to ultraviolet light for a period of time necessary to complete the installation.

AT THE CORE:
A synthetic geonet engineered specifically to transmit fluids consistently under a variety of field conditions.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value			
			HyperNet	HyperNet HF	HyperNet HS	HyperNet UF
Transmissivity[1], gal/min/ft (m^2/sec)	ASTM D 4716	1/540,000 ft^2	9.66 (2 x 10^{-3})	14.49 (3 x 10^{-3})	28.98 (6 x10^{-3})	38.64 (8 x 10^{-3})
Density, g/cm^3	ASTM D 1505	1/50,000 ft^2	0.94	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 5035/7179	1/50,000 ft^2	45	55	65	75
Carbon Black Content, %	ASTM D 1603[3]/4218	1/50,000 ft^2	2.0	2.0	2.0	2.0
NOMINAL ROLL DIMENSIONS						
Geonet Thickness, mil	ASTM D 5199	1/50,000 ft^2	200	250	275	300
Roll Width[2], ft			15	15	15	15
Roll Length[2], ft			330	290	270	250
Roll Area, ft^2			4,950	4,350	4,050	3,750

NOTES:
- [1]Gradient of 0.1, normal load of 10,000 psf, water at 70° F, between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- [2]Roll widths and lengths have a tolerance of ±1%.
- [3]Modified.

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.

GSE ENVIRONMENTAL™

DURABILITY RUNS DEEP

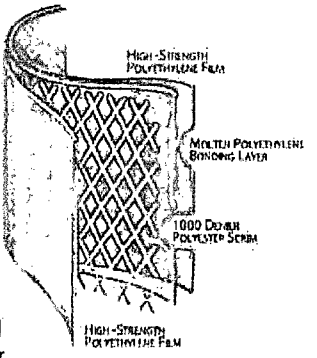
For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

DURA•SKRIM® R20BDV

Scrim Reinforced Polyethylene

Product Description

DURA•SKRIM® R20BDV consists of virgin outer layers of high-strength polyethylene film laminated together with hot molten polyethylene. DURA•SKRIM® R20BDV is black on one side and gray on the other for added versatility. The outer layers are formulated with thermal and UV stabilizers to assure long outdoor life. A layer of polyester scrim reinforcement placed between these plies greatly enhances tear resistance and increases service life. DURA•SKRIM's heavy-duty diamond reinforcement responds to tears immediately by surrounding and stopping the tear.

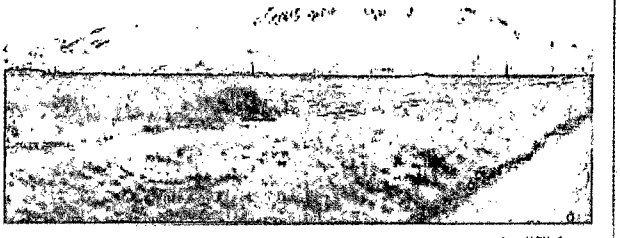


Product Use

DURA•SKRIM® R20BDV is used in applications that require exceptional outdoor life and demand high puncture and excellent barrier properties. DURA•SKRIM® R20BDV is manufactured from a very chemical-resistant, virgin polyethylene.

Size & Packaging

DURA•SKRIM® R20BDV is available in a variety of widths and lengths. Panel sizes up to 57,000 square feet are available. All panels are accordion folded every six feet and tightly rolled on a heavy-duty core for ease of handling and time-saving installation.



Landfill Cover

Product	Part #
DURA•SKRIM	R20BDV

APPLICATIONS

- Underslab Vapor Retarders
- Modular Tank Liners
- Daily Landfill Covers
- Remediation Liners
- Earthen Liners
- Interim Landfill Caps
- Remediation Covers
- Erosion Control Covers

DURA•SKRIM® R20BDV

ISO 9001:2008

Scrim Reinforced Polyethylene

PROPERTIES	TEST METHOD	DURA•SKRIM R20BDV	
		IMPERIAL	METRIC
APPEARANCE		Black/Gray	
THICKNESS, NOMINAL		20 mil	0.51 mm
WEIGHT		74 lbs/MSF 10.7 oz./yd²	361 g/m²
CONSTRUCTION		Extrusion laminated with scrim reinforcement	
TENSILE STRENGTH lbf/in. (N/cm) (SCRIM BREAK)	ASTM D7003	75 lbf	131 N
ELONGATION AT PEAK STRENGTH	ASTM D7003	20%	20%
ELONGATION AT BREAK (SCRIM BREAK)	ASTM D7003	700%	700%
GRAB TENSILE	ASTM D7004	114 lbf	507 N
PUNCTURE RESISTANCE	ASTM D4833	40 lbf	178 N
*TRAPEZOID TEAR	ASTM D4533	70 lbf	311 N
MULLEN BURST	ASTM D751	140 psi	965 kPa
HIGH PRESSURE OIT (HPOIT)	ASTM D5885	> 1400 min	
MAXIMUM USE TEMPERATURE		180°F	82°C
MINIMUM USE TEMPERATURE		-70°F	-57°C
WVTR	ASTM E96 Method A	0.023 g/100in²/day	0.354 g/m²/day
PERM RATING	ASTM E96 Method A	0.052 Perms grains/(ft²·hr·in·Hg)	0.034 Perms g/(24hr·m²·mm Hg)

*Tests are an average of diagonal directions.

DURA•SKRIM® R20BDV is a black/gray four-layer reinforced laminate. The outer layers consist of high-strength, polyethylene film manufactured using virgin grade resins and is formulated with thermal and UV stabilizers to assure long outdoor life. DURA•SKRIM® R20BDV is reinforced with 1000 denier (minimum) scrim reinforcement laid in a diagonal pattern spaced 3/8" apart with an additional machine direction scrim every 3" across the width to provide excellent tear resistance and increased service life. The individual plies are laminated together with molten polyethylene.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage.

WT PLASTICS, LTD.
P.O. Box 60004 • 11701 County Road 125 W
Midland, TX 79711
Ph: (432) 563-4005 • Fx: (432) 561-5209

Toll Free: 800-583-6005
www.wtplastics.com

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TENCATE GEOSYNTHETICS
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Mirafi® 160N

Drainage | Separation

Mirafi® 160N is a needlepunched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi® 160N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. Mirafi® 160N meets AASHTO M288-06 Class 2 for Elongation > 50%.

TenCate Geosynthetics Americas Laboratories are accredited by a2La (The American Association for Laboratory Accreditation) and Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP). NTPEP Number: GTX-2012-01-003

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D4632	lbs (N)	160 (712)	160 (712)
Grab Tensile Elongation	ASTM D4632	%	50	50
Trapezoid Tear Strength	ASTM D4533	lbs (N)	60 (267)	60 (267)
CBR Puncture Strength	ASTM D6241	lbs (N)	410 (1825)	
Apparent Opening Size (AOS)[1]	ASTM D4751	U.S. Sieve (mm)	70 (0.212)	
Permittivity	ASTM D4491	sec^{-1}	1.5	
Flow Rate	ASTM D4491	$gal/min/ft^2$ ($l/min/m^2$)	110 (4481)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70	

[1] ASTM D4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Unit	Typical Value[2]
Roll Dimensions (width x length)	ft (m)	15 x 300 (4.5 x 91)
Roll Area	yd^2 (m^2)	500 (418)
Estimated Roll Weight	lb (kg)	199 (90)

[2] ASTM D4439 Standard Terminology for Geosynthetics: typical value, *n—for geosynthetics*, the mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with an specific property.

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365 South Holland Drive
Pendergrass, GA 30567

Tel 706 693 2226
Tel 888 795 0808

Fax 706 693 4400
www.tencate.com

FG8000361
ETQR83

Brawler Industries, LLC
PO Box 60004
Midland, TX 79711

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ACCREDITED
Testing Lab 1291.01 & 1291.02