

November 2022

Volume 1

C-147 Registration Package for Heisenberg AST Containment & Recycling Facility

Section 3, T14S, R38E, Lea County

- Transmittal Letter
- C-147
- AST Operations and Closure Plans
- Siting Criteria Demonstration & Appendix



The Heisenberg AST Containments are west (up hydrologic gradient) from intensive irrigation in west Texas (about 1 mile east of the ASTs). Pumping of the Ogallala Aquifer has lowered the water table elevation by about 30 feet since 1988.

Prepared for:
Steward Energy II
Frisco, Texas

Prepared by:
R.T. Hicks Consultants, Ltd.
901 Rio Grande NW, Ste F-142
Albuquerque, New Mexico 87104

R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Since 1996

November 11, 2022

Mr. Mike Bratcher
NMOCD - District 2, Supervisor
811 S. First St.
Artesia, NM 88210
Via E-Mail

Ms. Victoria Venegas
NMOCD - District 2
811 S. First St.
Artesia, NM 88210
Via E-Mail

RE: Steward Energy II, LLC Heisenberg AST Containment
Section 12, T9S, R333-E, Lea County

Dear Mr. Bratcher and Ms. Venegas:

On behalf Steward Energy II, LLC, R.T. Hicks Consultants is pleased to submit the C-147 permit for the above-referenced project. An unexpected change in the frac schedule allowed Steward to begin using produced water in lieu of fresh water in this area of development. The Heisenberg Containment will receive treated produced water on or before November 18, 2022. We apologize for the short notice. As indicated below, the review of this submission should be straight-forward.

Volume 1 contains

- Form C-147
- O&M and Closure Plans for ASTs (adapted from Solaris Revelation)
- Siting Criteria Demonstration and Appendix

The location meets the siting criteria of Rule 34. We deleted two paragraphs from the O&M Plan from Revelation as they refer to two check lists that are no longer used and are not required for compliance with Rule 34.

Volume 2 of the C-147 package contains the C-147 Form and the previously approved documents.

- Design/Construction Plan (Chisholm Energy Buffalo AST)
- Engineering Drawings and Liner Specifications (Chisholm Energy Buffalo AST)
- Select Energy Services Manual (Chisholm Energy Buffalo AST)
- Variances for AST Storage Containments and Applicability of Engineering Variances to Variety of Site Conditions in Permian Basin (all Hicks Consultants AST Permits)

The engineering drawings in Volume 1 are for a Rockwater 41,000 bbl. tank. All Rockwater ASTs use the same design/construction techniques, including the proposed 18,000 bbl. and 40,000 bbl. tanks for this project.

Steward Energy will upload this permit to OCD via the OCD.Online portal. In compliance with 19.15.34.10 of the Rule, this submission is copied to the surface owner's representative.

November 11, 2022

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If you have any questions or concerns regarding this C-147 package, please contact me. As always, we appreciate your work ethic and diligence. Like so many recent submissions to OCD, the short notice is due to an ever-changing stimulation schedule. Because OCD has approved the elements of Volume 2 previously and the Siting Criteria Demonstration is rock solid, I advised Steward Energy to move forward with using produced water in lieu of fresh water in the event OCD cannot approve the permit in time.

Sincerely,
R.T. Hicks Consultants

A handwritten signature in black ink, appearing to read "Randall T. Hicks".

Randall T. Hicks PG
Principal

Copy: Steward Energy II, LLC
El Rey Salt Company, Inc., nm@loweland.com , elreysalt@gmail.com

C-147

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

Form C-147
Revised October 11, 2022

<https://www.emnrd.nm.gov/ocd/ocd-e-permitting/>

Recycling Facility and/or Recycling Containment

Type of Facility: ☒ Recycling Facility ☒ Recycling Containment*
Type of action: ☒ Permit ☐ Registration
 ☐ Modification ☐ Extension
 ☐ Closure ☐ Other (explain) _____

*** At the time C-147 is submitted to the division for a Recycling Containment, a copy shall be provided to the surface owner.**

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: Steward Energy II, LLC (For multiple operators attach page with information) OGRID #: 371682
 Address: 2600 North Dallas Parkway, Frisco, Texas 75034
 Facility or well name (include API# if associated with a well): Heisenberg AST Containment
 OCD Permit Number: 1RF-496 (For new facilities the permit number will be assigned by the district office)
 U/L or Qtr/Qtr H&I Section 3 Township 14S Range 38E County: Lea
 Surface Owner: ☐ Federal ☐ State ☒ Private ☐ Tribal Trust or Indian Allotment

2.
☒ **Recycling Facility:**
 Location of recycling facility (if applicable): Latitude 33.132509 Longitude -103.0787236 NAD83
 Proposed Use: ☒ Drilling* ☒ Completion* ☒ Production* ☒ Plugging*
**The re-use of produced water may NOT be used until fresh water zones are cased and cemented*
☐ Other, *requires permit for other uses. Describe use, process, testing, volume of produced water and ensure there will be no adverse impact on groundwater or surface water.*
☒ Fluid Storage
 ☒ Above ground tanks ☒ Recycling containment ☐ Activity permitted under 19.15.17 NMAC explain type _____
 ☐ Activity permitted under 19.15.36 NMAC explain type: _____ ☐ Other explain _____
 ☐ For multiple or additional recycling containments, attach design and location information of each containment
☐ **Closure Report (required within 60 days of closure completion):** ☐ Recycling Facility Closure Completion Date: _____

3.
☒ **Recycling Containment:** Two ASTS - 18,000 and 60,000 bbl
☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)
 Center of Recycling Containment (if applicable): Latitude 33.132509 Longitude -103.0787236 NAD83
☐ For multiple or additional recycling containments, attach design and location information of each containment
☒ Lined ☐ Liner type: Thickness 40 & 30 mil ☒ LLDPE ☐ HDPE ☐ PVC ☐ Other See attached design documents
☐ String-Reinforced
 Liner Seams: ☒ Welded ☐ Factory ☐ Other _____ Volume: 60K & 18K bbl Dimensions: L _____ x W _____ x D _____
☐ Recycling Containment Closure Completion Date: _____

4.

Bonding:

- ☒ Covered under bonding pursuant to 19.15.8 NMAC per 19.15.34.15(A)(2) NMAC (These containments are limited to only the wells owned or operated by the owners of the containment.)
- ☐ Bonding in accordance with 19.15.34.15(A)(1). Amount of bond \$ _____ (work on these facilities cannot commence until bonding amounts are approved)
- ☐ Attach closure cost estimate and documentation on how the closure cost was calculated.

5.

Fencing:

- ☐ Four foot height, four strands of barbed wire evenly spaced between one and four feet
- ☒ Alternate. Please specify See Variance

6.

Signs:

- ☐ 12"x 24", 2" lettering, providing Operator's name, site location, and emergency telephone numbers
- ☒ Signed in compliance with 19.15.16.8 NMAC

7.

Variances:

Justifications and/or demonstrations that the proposed variance will afford reasonable protection against contamination of fresh water, human health, and the environment.

Check the below box only if a variance is requested:

- ☒ Variance(s): Requests must be submitted to the appropriate division district for consideration of approval. If a Variance is requested, include the variance information on a separate page and attach it to the C-147 as part of the application.

If a Variance is requested, it must be approved prior to implementation. See attached variances

8.

Siting Criteria for Recycling Containment

Instructions: The applicant must provide attachments that demonstrate compliance for each siting criteria below as part of the application. Potential examples of the siting attachment source material are provided below under each criteria.

General siting**Ground water is less than 50 feet below the bottom of the Recycling Containment.**

NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells

☐ 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.

☐ Yes ☒ No
☐ NA

- Written confirmation or verification from the municipality; written approval obtained from the municipality

Within the area overlying a subsurface mine.

☐ Yes ☒ No

- Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division

Within an unstable area.

☐ Yes ☒ No

- Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map

Within a 100-year floodplain. FEMA map

☐ Yes ☒ No

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).

☐ Yes ☒ No

- Topographic map; visual inspection (certification) of the proposed site

Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application.

☐ Yes ☒ No

- Visual inspection (certification) of the proposed site; aerial photo; satellite image

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.

☐ Yes ☒ No

- NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site

Within 500 feet of a wetland.

☐ Yes ☒ No

- US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site

9.

Recycling Facility and/or Containment Checklist:


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

- ☒ Design Plan - based upon the appropriate requirements.
- ☒ Operating and Maintenance Plan - based upon the appropriate requirements.
- ☒ Closure Plan - based upon the appropriate requirements.
- ☒ Site Specific Groundwater Data -
- ☒ Siting Criteria Compliance Demonstrations -
- ☒ Certify that notice of the C-147 (only) has been sent to the surface owner(s)

10.

Operator Application Certification:

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

Name (Print): Tim HiltonTitle: Vice President OperationsSignature: Date: 11/09/2022e-mail address: tim.hilton@stewardenergy.netTelephone: 214 297 0506

11.

OCD Representative Signature: Victoria Venegas Approval Date: 11/23/2022Title: Environmental SpecialistOCD Permit Number: 1RF-496☐ OCD Conditions☒ Additional OCD Conditions on Attachment

OPERATIONS AND MAINTENANCE PLAN

CLOSURE PLAN

Operations and Maintenance Plan Above Ground Tank Containment (AST)

General Specifications

This plan provides additional protocols to cause the proposed recycling containments (AST Containments) to conform to NMOCD Rules.

The operator will maintain and operate the recycling containments and facility in accordance with the following plan to contain liquids and maintain the integrity of the liner to prevent contamination of fresh water and protect public health and the environment.

- The operator will use the treated produced water in the containments for drilling, completion (stimulation), producing or processing oil or gas or both. If other uses are planned, the operator will notify the OCD through the submission of a modified C-147.
- For all exploration and production operations that use produced water, the operator will conduct these activities in a manner consistent with hydrogen sulfide gas provisions in 19.15.11 NMAC or NORM provisions in 19.15.35 NMAC, as applicable.
- The operator will address all releases from the recycling and re-use of produced water in accordance with 19.15.29 NMAC.
- The operator will not discharge into or store any hazardous waste in the recycling containments, but they may hold fluids such as freshwater, brackish water, recycled and treated water, water generated by oil or gas processing facilities, or other waters that are gathered for well drilling or completion. The recycling facility will not be used for the disposal of produced water. The operator will maintain the containments free of miscellaneous solid waste or debris.
- The operator will verify that no oil is on the surface of the contained fluid. If oil is observed, the oil shall be removed using an absorbent boom or other device and properly disposed at an approved facility. An absorbent boom or other device will be maintained on site.
- The operator will install and use a header and diverter described in the design/construction plan in

19.15.34.10 B

Recycling containments may hold produced water for use in connection with drilling, completion, producing or processing oil or gas or both.

19.15.34.8 A

(5) All operations in which produced water is used shall be conducted in a manner consistent with hydrogen sulfide gas provisions in 19.15.11 NMAC or NORM provisions in 19.15.35 NMAC, as applicable.

19.15.34.8 A

(6) All releases from the recycling and re-use of produced water shall be handled in accordance with 19.15.29 NMAC.

19.15.34.10 B

Recycling containments may hold produced water for use in connection with drilling, completion, producing or processing oil or gas or both. Such fluids may include fresh water, brackish water, recycled and treated water, fluids added to water to facilitate well drilling or completion, water produced with oil and gas, flowback from operations, water generated by an oil or gas processing facility or other waters that are gathered for well drilling or completion but may not include any hazardous waste.

19.15.34.9 G

Recycling facilities may not be used for the disposal of produced water.

19.15.34.13 B

(1) The operator shall remove any visible layer of oil from the surface of the recycling
(7) The operator shall install, or maintain on site, an oil absorbent boom or other device to contain an unanticipated release.

19.15.34.13 B

(3) The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

Operations and Maintenance Plan Above Ground Tank Containment (AST)

order to prevent damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes during injection or withdrawal of liquids.

- Pursuant to an approved variance, the operator will maintain at least 2-feet of freeboard in each AST containment. Under extenuating circumstances, which will be noted on the inspection log as described below, the operator may temporarily exceed the freeboard mandate.
- If the liner develops a leak or if any penetration of the liner occurs above the liquid's surface, then the operator will repair the damage or initiate replacement of the liner within 48 hours of discovery or will seek a variance from the division district office within this time period.
- If visible inspection suggests that the liner developed a leak or if any penetration of the liner occurs below the liquid's surface, then the operator will remove all liquid above the damage or leak line within 48 hours of discovery. The operator will also notify the district division office within this same 48 hours of the discovery and repair the damage or replace the liner.
- In the event of a leak due to a hole in the liner, the following steps will be followed:
 1. If the source of the fluid is uncertain, comparative field tests may need to be performed on both the water in the containment and that which may have been released (e.g. pH, conductance, and chloride).
 2. If the fluid is found to be coming from the containment, determine the location from which the leak is originating.
 3. Mark the point where the water is coming out of the tank.
 4. Locate the puncture or hole in the liner.
 5. Empty the containment to the point of damage in liner.
 6. Clean area of liner that needs to be repaired.

19.15.34.13 B

(2) The operator shall maintain at least three feet of freeboard at each containment.

19.5.34.13 B

(4) If the containment's primary liner is compromised above the fluid's surface, the operator shall repair the damage or initiate replacement of the primary liner within 48 hours of discovery or seek an extension of time from the division district office.

(5) If the primary liner is compromised below the fluid's surface, the operator shall remove all fluid above the damage or leak within 48 hours of discovery, notify the division district office and repair the damage or replace the primary liner.

Operations and Maintenance Plan Above Ground Tank Containment (AST)

7. Cut out piece of material (patch or tape) to overlay liner.
8. Either weld the patch to the injured area in the liner or apply tape over the rupture.
9. Make sure rupture is completely covered.
10. Monitor as needed.

The operator will inspect and remove, as necessary, surface water run-on accumulated in the secondary containment

Monitoring, Inspections, and Reporting

The containment will contain enough produced water to prevent any shifting of the liner. Weekly inspections shall occur ~~when there is 1 foot depth or more of produced water in the containment. Monthly inspections shall occur when there is less than 1 foot depth of produced water in the containment, as well as when the ASTs are emptied and prior to refilling.~~ An inspection log will be maintained by the operator and will be made available to the division upon request. Inspection may include: freeboard monitoring, leak detection, identifying potential hazards that may have developed, change in site conditions or if the contents of the containment change from the initial use. An "Inspection Form" to be filled out during these routine inspections.

~~The "AST Visual Inspection Checklist" form to be filled out by the operator during periodic inspections. The form provides a list of observations that will enable early detection of uneven tank panel settlement, soil settlement, liner damage, insufficient liner slack, or leaks. The form is reproduced at the end of this section.~~

~~The form "Tank Panel Visual Inspection Check Sheet" will be used by the operator to inspect individual containment panels and connections titled.~~

Monitoring and Inspection Checklist (routine weekly or monthly inspections):

Operations and Maintenance Plan Above Ground Tank Containment (AST)

- Visually inspect the liner. If a liner's integrity is compromised, or if any penetration of the liner occurs below the water surface, then the operator will notify the appropriate Division district office within 48 hours (phone or email).
- Inspect the system for injection or withdrawal of liquids from the ASTs and document that the design prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes is working appropriately.
- Inspect the water surface for visible oil.
- Measure the freeboard.
- Inspect the secondary containment berm around the ASTs to check for erosion and collection of surface water run-on.
- If H₂S is a documented potential issue with the containment, measure H₂S concentrations on the down-wind side of the facility when produced water is present.
- Inspect the secondary containment for evidence of damage and monitor for leakage.
- Inspect the netting for damage or failure. If netting is jeopardized, repair of the netting shall occur within 48 hours.
- At least monthly, inspect netting (may not be used if Mega Blaster Pro avian deterrent is used) for dead wildlife, including migratory birds. Operator shall report the discovery of a dead animal to the appropriate wildlife agency and to the district within 30 days of discovery. Further prevention measures may be required.
- If observed conditions indicate a potential tank failure is imminent, the vicinity will be immediately cleared and the AST will be drained.

19.15.34.12 E

Netting. The operator shall ensure that a recycling containment is screened, netted or otherwise protective of wildlife, including migratory birds. The operator shall on a monthly basis inspect for and, within 30 days of discovery, report the discovery of dead migratory birds or other wildlife to the appropriate wildlife agency and to the division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

Cessation of Operations

If less than 20% of the total fluid capacity is utilized every six months, beginning from the first withdraw, operation of the facility has ceased and the division district office will be notified. The division district may grant an extension not to exceed six months to determine the cessation of operations.

19.15.34.13 C

A recycling containment shall be deemed to have ceased operations if less than 20% of the total fluid capacity is used every six months following the first withdrawal of produced water for use. The operator must report cessation of operations to the appropriate division district office. The appropriate division district office may grant an extension to this determination of cessation of operations not to exceed six months.

Operations and Maintenance Plan Above Ground Tank Containment (AST)

The operator will remove all fluids from the recycling facility within 60 days of cessation of operations. An extension, not to exceed 2 months, may be granted by the district division for the removal of fluids from the facility.

The breakdown of the containments follows the reverse order of the setup steps presented in the set-up manual

19.15.34.14 A

Once the operator has ceased operations, the operator shall remove all fluids within 60 days and close the containment within six months from the date the operator ceases operations from the containment for use. The division district office may grant an extension for the removal of all fluids not to exceed two months.

Inspection Form

Date: _____

☐ Energy - = ☐ AST Containment

Tank ID: _____

Weekly inspection/Fluid level must be maintained > 1 foot

Fluid Level: _____

Tank contents: _____

| Inspection Task | Results | | Remarks, Observations, and/or Remedial Actions |
|---|--|--|--|
| Visible Oil on Surface | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe Action | |
| <i>An absorbent boom or similar device is located on site to remove visible oil from surface.</i> | | | |
| At least 2 3 ft of freeboard | <input type="checkbox"/> Yes | <input type="checkbox"/> No, Measure Freeboard | |
| Evidence of surface water run-on | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| <i>Check for excessive erosion of perimeter berms.</i> | | | |
| Birds or wildlife in net or screen | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| <i>Within 30 days of discovery (immediately if federally protected species) report dead birds or wildlife to the appropriate agency (USFWS, NMDGF) and to NMOCD district division office.</i> | | | |
| Damage to netting or screen | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| Rupture of Liner | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| <i>If rupture is above fluid level, repair within 48 hours. If below fluid level, remove fluid above within 48 hours, notify NMOCD district division office, and repair. Immediately notify BLM of any leak</i> | | | |
| Clips or clamps properly securing liner | <input type="checkbox"/> Yes | <input type="checkbox"/> No, Describe | |
| If low level, enough liner slack on panel wall | <input type="checkbox"/> Yes | <input type="checkbox"/> No, Describe | |
| Uneven gaps between panels | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| Signs of tank settlement | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |

= AST Containment

| | | | |
|---|--|--|--|
| Erosion of soil surrounding tank (10 ft radius) | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| Running water on the ground | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| Unusual ponding of fluid inside berm | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| <i>Field test (pH, Cl-, conductance, etc.) ponded fluid and compare to fluid in tank. If tank is determined as the source, locate and repair rupture within 48 hours. Notify NMOCD district division office and repair. Immediately notify BLM.</i> | | | |
| Rust or corrosion on panels, stairs, or hardware | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |
| Damage to any hardware | <input type="checkbox"/> None Observed | <input type="checkbox"/> Yes, Describe | |

Additional
Observations or
Actions:

Inspected by: _____

Closure Plan Above Ground Tank Containment (AST)

Closure Plan

The containments are 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.

The operator will notify the division district (phone or email) before initiating closure of the containments and/or facility.

Excavation and Removal Closure Plan – Protocols and Procedures

1. Residual fluids in the containments will be sent to disposal at a division-approved facility.
2. The operator will remove all solid contents and transfer those materials to the following division-approved facility:
 Disposal Facility Name: R360
 Permit Number NM 01-0006
3. If possible, geomembrane textiles and liners that exhibit good integrity may be recycled for use as an under liner of tank batteries or other use as approved by OCD.
4. Disassemble the recycling containment infrastructure according to manufacturer's recommendations
5. After the disassemble of the containments and removal of the contents and liners, soils beneath the tanks will be tested as follows
 - a. Collect a five-point (minimum) composite from beneath the liner to include any obviously stained or wet soils, or any other evidence of impact from the containments for laboratory analyses for the constituents listed in Table I of 19.15.34.14 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.
 - c. If all constituents' concentrations are less than or equal to the parameters listed in Table I, then the operator will backfill the facility as necessary using non-waste containing, uncontaminated, earthen material and proceed to reclaim the surface to pre-existing conditions.

19.15.34.14 B

The operator shall close a recycling containment by first removing all fluids, contents and synthetic liners and transferring these materials to a division approved facility.

19.15.34.14 C

The operator shall test the soils beneath the containment for contamination with a five-point composite sample which includes stained or wet soils, if any, and that sample shall be analyzed for the constituents listed in Table I below.

(1) If any contaminant concentration is higher than the parameters listed in Table I, the division may require additional delineation upon review of the results and the operator must receive approval before proceeding with closure.

(2) If all contaminant concentrations are less than or equal to the parameters listed in Table I, then the operator can proceed to backfill with non-waste containing, uncontaminated, earthen material.

Closure Plan Above Ground Tank Containment (AST)

Closure Documentation

Within 60 days of closure completion, the operator will submit a closure report (Form C-147) to the District Division, with necessary attachments to document all closure activities are complete, including sampling results and details regarding backfilling and capping as necessary.

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 closure plan.

Reclamation and Revegetation

The operator will reclaim the surface to safe and stable pre-existing conditions that blends with the surrounding undisturbed area. "Pre-existing conditions" may include a caliche well pad that existed prior to the construction of the recycling containment and that supports active oil and gas operations.

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

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

Federal, state trust land, or tribal lands may impose alternate reclamation and revegetation obligations that provide equal or better protection of fresh water, human health, and the environment. Revegetation and reclamation plans imposed by the surface owner will be outlined in communications with the OCD.

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. The operator will notify the Division when reclamation and re-vegetation is complete.

19.15.34.14 D

Within 60 days of closure completion, the operator shall submit a closure report on form C-147, including required attachments, to document all closure activities including sampling results and the details on any backfilling, capping or covering, where applicable. The closure report shall 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 division rules or directives.

19.15.34.14 E

Once the operator has closed the recycling containment, the operator shall reclaim the containment's location to a safe and stable condition that blends with the surrounding undisturbed area. Topsoils and subsoils shall be replaced to their original relative positions and contoured so as to achieve erosion control, long-term stability and preservation of surface water flow patterns. The disturbed area shall then be reseeded in the first favorable growing season following closure of a recycling containment. The operator shall substantially restore the impacted surface area to the condition that existed prior to the construction of the recycling containment.

19.15.34.14 G

The re-vegetation and reclamation obligations imposed by federal, state trust land or tribal agencies on lands managed by those agencies shall supersede these provisions and govern the obligations of any operator subject to those provisions, provided that the other requirements provide equal or better protection of fresh water, human health and the environment.

19.15.34.14 F

Reclamation of all disturbed areas no longer in use shall be considered complete when all ground surface disturbing activities at the site have been completed, and a uniform vegetative cover has been established 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.

GENERAL SITING CRITERIA DEMONSTRATION AND SITE-SPECIFIC GROUNDWATER DATA

SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS**Distance to Groundwater**

Plate 1, Plate 2, and the discussion below demonstrates that groundwater (fresh water as defined by NMOCD Rules) at the locations is greater than 100 feet beneath the area of interest that will include the location of the Heisenberg AST Containments.

Plate 1 is a geologic/ topographic map that shows:

1. The area of the two containments identified by the blue stippled polygon.
2. Water wells from the OSE database as a blue triangle inside colored. OSE wells are often mislocated in the WATERS database as older wells are plotted in the center of the quarter, quarter, quarter, of the Section Township and Range. Additionally, the OSE database can include locations of proposed wells (i.e., permit applications). The permit data generally show “no date” and “DTW=0” as data. Plate 1 has screened the OSE data and eliminated permit information from Plate 1. We provide no depth to water data for the OSE wells as these data do not represent static water levels and are often misleading.
3. Water wells from the USGS database as large triangles color-coded to the formation from which the well draws water. Depth to water and the date of measurement are presented in the Plate.
4. Water wells, which are not documented in the public databases but were identified by field inspection or other published reports as colored squares (Misc. well database). No wells from the Misc. database are within the area of Plate 1 at the time of writing.

Plate 2 is an area topographic and geologic map that shows:

1. The recycling containment areas identified by the blue stippled polygon with the surface elevation noted in the lower left corner (3800 feet ASL).
2. Water wells measured by the USGS, the year of the measurement and the calculated elevation of the groundwater surface.
3. The geologic unit beneath the AST Containments is Quaternary Older Alluvium overlying the Tertiary Ogallala Formation (Qoa/To).

Hydrogeology

A relatively thin veneer of unsaturated Older Alluvium overlies the Ogallala Formation at the Containments. The Ogallala is the principal water bearing unit and all wells shown in Plates 1 and 2 draw water from the Ogallala Aquifer (aka High Plains Aquifer in some USGS reports).

Two driller's logs of good quality are in the NM OSE database for wells less than 1 mile east and west of the Containments. These are described briefly below and presented in Appendix Well logs. These are:

- L7066 is a well drilled in 2015 and reports groundwater at 60 feet below surface. The reported lithology of caliche, sand, and water sand. This 150-foot boring did not penetrate the underlying Chinle/Dockum red beds.
- L559 is slightly less than a mile east-northeast of the containments. The well log provides lithologic information below 175 feet because the work involved deepening an existing well. The lithologic data suggest the coarse-grained gravel/sand basal unit of the

SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS

Ogallala lies from 225-250 feet below surface. The Chinle/Dockum red beds are 250 feet below the surface.

Note that L521 (0.3 miles west) plots at the same location as L7066 but the location is also provided as 18S 36E 31.444. We believe this well is many miles to the south and west. While we identified other driller's logs in the general area, the two listed provide the best data, closest to the containments.

Groundwater Data

We relied upon the most recent data measured by the USGS to create Plate 2. 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 but were not used to generate groundwater elevations for these Plates. Based upon our examination of Google Earth images, we are confident that the wells shown on Plate 2 are relatively close to the plotted points.

Information from the USGS database is important and is discussed below. The text in italics is reproduced verbatim from the USGS data, as is the graph of the data.

USGS 330718103053201 **14S.38E.09.222221 AKA USGS-12440**

Lea County, New Mexico

Hydrologic Unit Code 12080004

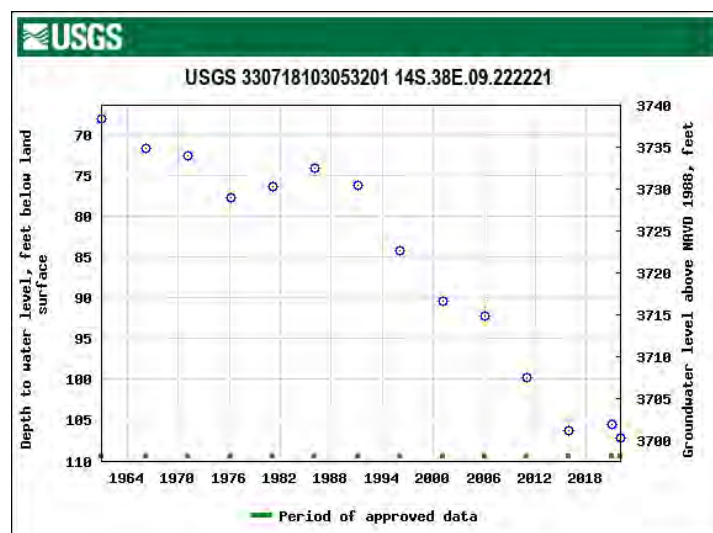
Latitude 33°07'34.4", Longitude 103°05'38.8"
NAD83

Land-surface elevation 3,807 feet above NAVD88

The depth of the well is 165 feet below land surface.

This well is completed in the High Plains aquifer (N100HGHPLN) national aquifer.

This well is completed in the Ogallala Formation (121OGLL) local aquifer.



USGS 330828103041101 13S.38E.35.3343 **AKA USGS-12438**

Lea County, New Mexico

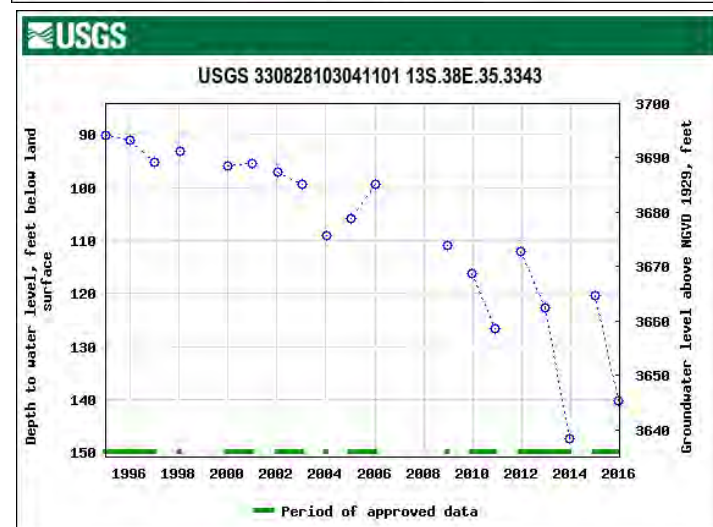
Hydrologic Unit Code 12080004

Latitude 33°08'27.7", Longitude 103°04'33.0"
NAD83

Land-surface elevation 3,785 feet above NGVD29

The depth of the well is 150 feet below land surface.

This well is completed in the High Plains aquifer (N100HGHPLN) national aquifer.



SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS

USGS-12440 is about 1 mile southwest of the ASTs and the USGS data spans about 60 years. In the early 1980s, groundwater elevations declined. From 2006 to 2015, groundwater elevations declined by about 15 feet.

USGS 12438 is about ½ mile northeast of the ASTs and the USGS data span about 30 years. The well is upgradient from center pivot irrigation systems that extend east (down gradient) for miles. We contend that the wide variation of groundwater elevations observed from 2010-2016 is due to the irrigation schedules in the various fields. The 2015 data from this well on Plate 2a and Figure 1 indicate a water elevation of 3645 feet ASL. In 2014, groundwater elevation is about 3665 feet ASL. The 2015 data is influenced by irrigation pumping and the 2014 data less so.



Figure 1 - Location of USGS Well 12438 relative to center pivot irrigation systems.

Plate 2 honors all data that we know are accurate to the best of our knowledge. We employed the most recent data available, and we conclude:

- Due to relatively rapid decline of the water table, only recent data in the area can be used to determine current groundwater elevations: the two wells discussed below
- USGS-12438, which is about ½ mile north-northeast of the containments, records the groundwater elevation in 2015 as 3645 feet ASL, but as discussed above, a static water level is probably about 3665 feet ASL.
- USGS-12440 is about 1 mile southwest of the containments and records groundwater elevation as 3701 in 2015. Thus, groundwater in this well is 36 feet higher than USGS-12438 – using the 2014 data for USGS 12438.
- The distance between these two wells is about 9150 feet, based upon Google Earth images of each well.

SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS

- Figure 2 perpendicularly projects the Heisenberg ASTs on this line as shown, about 4330 feet from USGS-12438 and 4760 feet from USGS-12440
- At this projection point, the elevation of groundwater is predicted with accuracy as $3645 + (36 * (4333 / 9150)) = 3682$
- Based upon Plate 2b, which is reproduced from Tillery, A., 2008, Current (2004-07) conditions and changes in ground-water levels from predevelopment to 2007, Southern High Plains aquifer, southeast New Mexico—Lea County Underground Water Basin: U.S. Geological Survey Scientific Investigations Map 3044¹, groundwater flow at the Heisenberg AST Containments flows northeast. Thus, groundwater elevation contour lines approximate the perpendicular projection line shown in Figure 2.
- Therefore, the groundwater elevation beneath the containments is about 3671 feet ASL.
- Depth to groundwater at the Heisenberg ASTs is $(3800 - 3682) = 118$ feet.



Figure 2 Location of USGS wells and projection used to determine groundwater elevation beneath ASTs

Distance to Municipal Boundaries and Fresh Water Fields

Plate 3 demonstrates that the Heisenberg AST Containments are 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 Tatum, approximately 16 miles northwest.
- The closest mapped public wells are in Tatum.
- Plains, Texas probably has municipal supply wells located about 16 miles west.

¹ <https://pubs.usgs.gov/sim/3044/>

SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS**Distance to Subsurface Mines**

Plate 4 and our reconnaissance of the Heisenberg Containments demonstrate that the nearest mines are caliche pits. This location is not within an area overlying a subsurface mine.

- Two caliche pits are north of East McDonald Road and the plotted locations on Plate 4 are 300-400 feet south of the actual pits.
- There are no subsurface mines in the area shown in Plate 4.

Distance to High or Critical Karst Areas

Plate 5 shows the Heisenberg Containments are not within mapped zone of high or critical Karst with respect to BLM mapped areas.

- The proposed containments are located within a “low” potential karst area.
- The nearest “high” or “critical” potential karst area is more than 50 miles southwest of the proposed containments.

Distance to 100-Year Floodplain

Plate 6 demonstrates that the Heisenberg Containments are within Zone D as designated by the Federal Emergency Management Agency with respect to the Flood Insurance Rate 100-Year Floodplain.

- FEMA describes the location as an area with possible but undetermined flood hazards. No flood hazard analysis has been conducted.
- The nearest mapped flood hazard is in Tatum, NM, about 16 miles northwest

Distance to Surface Water

Plate 7 shows the closest surface water bodies are

- a Lake/Pond that plots slightly more than 1 mile southwest of the Heisenberg AST.
- A second Lake/Pond that is not on the GIS database but appears as an ephemeral lake on the USGS map is about 1.3 miles south.
- A reservoir associated with Elite Beef Producers is slightly more than 1 mile southeast
- McKenzie Draw is in the southwest corner of Plate 7

Distance to Permanent Residence or Structures

Plate 8 and the site visit demonstrates that the location is not within 1000 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 well pads and infrastructure for E&P and agriculture.
- No residences or other structures are in the area.
- The nearest well in the OSE database is more than 1000 feet west. This OSE well is not plotted correctly and probably lies about 900 feet farther west.

Distance to Non-Public Water Supply

Plates 1, 7 and 8 demonstrate that the Heisenberg Containments are not within 500 horizontal feet of a spring or fresh water well used for domestic or stock watering purposes, in existence at the time of initial application.

- Plate 1 shows the locations of all area water wells, active or plugged.

SITING CRITERIA (19.15.34.11 NMAC)
STEWARD ENERGY II – HEISENBERG AST CONTAINMENTS

- There are no domestic water wells located within 1,000 feet of the area of interest.
- No springs were identified within the mapping area (see Plate 7)

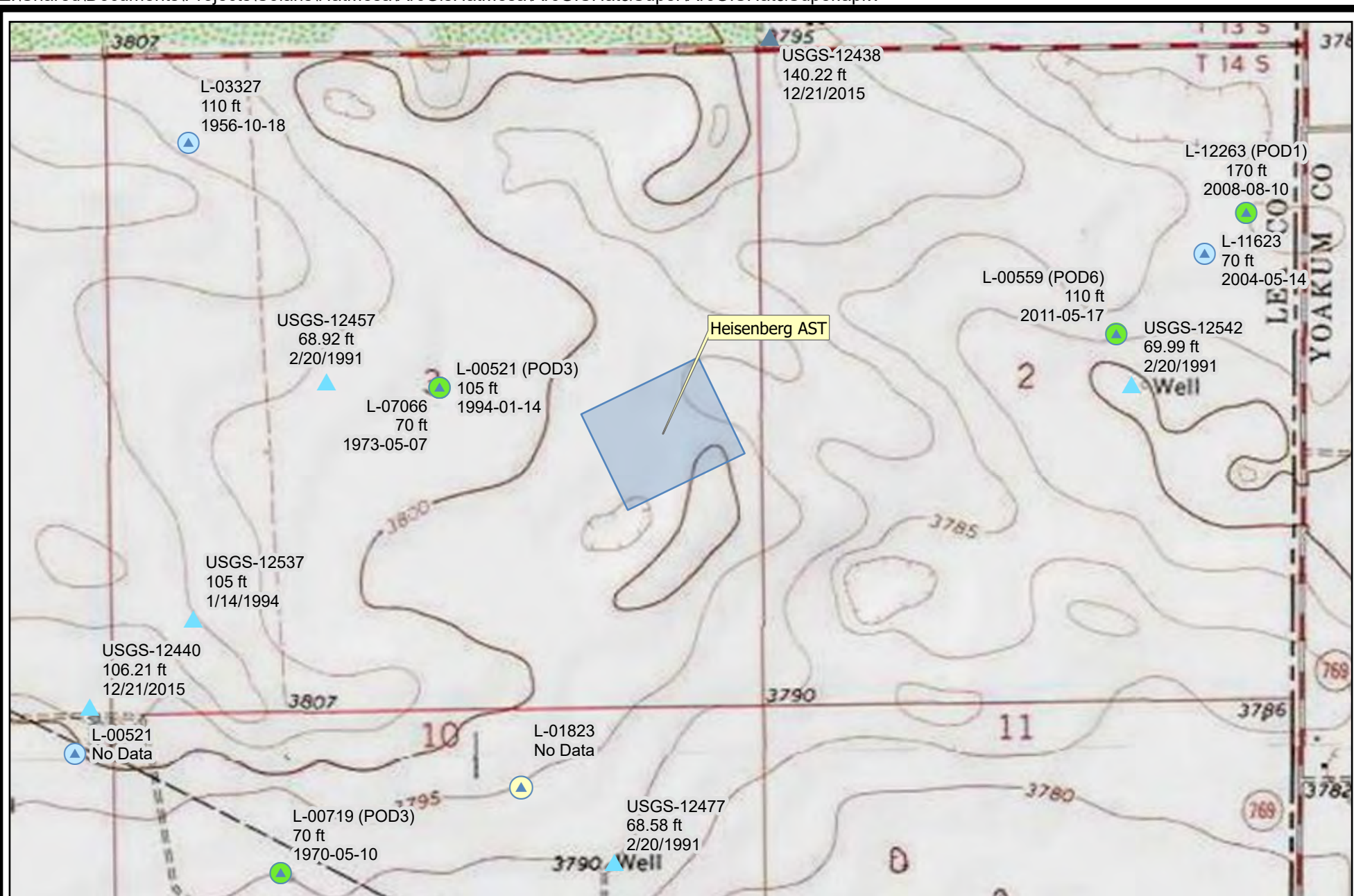
Distance to Wetlands

Plate 9 demonstrates the Heisenberg Containments are not within 500 feet of mapped wetlands using the New Mexico database.

- The nearest designated wetland is mapped in irrigation reservoirs in Texas.
- The USA wetlands database, which relies upon aerial imagery rather than more detailed investigations, identified all the surface water bodies of Plate 7 as wetlands

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R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

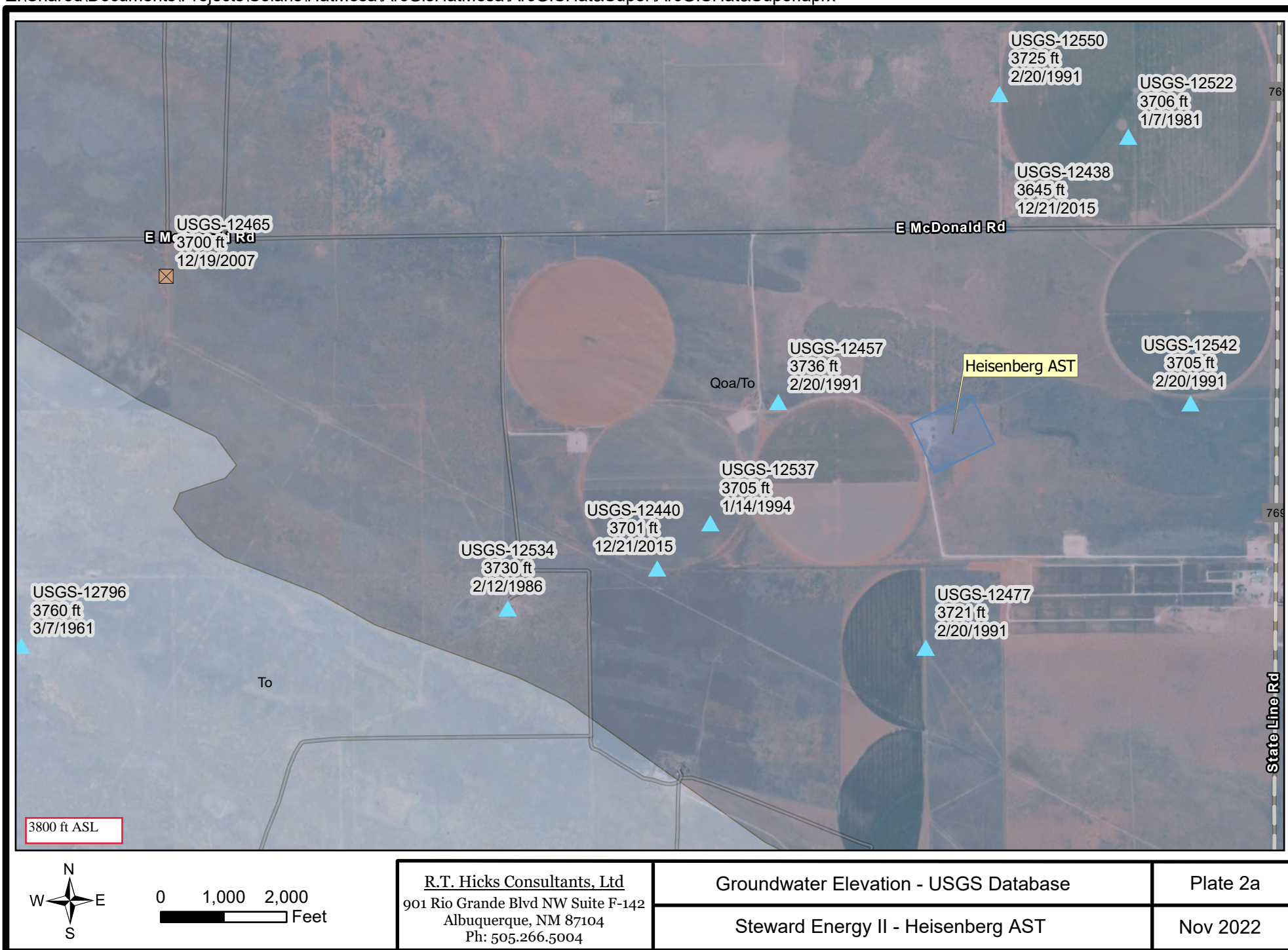
Nearby Wells and Depth to Groundwater

Steward Energy II - Heisenberg AST






















Plate 1

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| | |
|---|--|
| polygon_spe | |
|  | Recycling AST |
| OSE Water Wells (DTW/Date) | |
| Well Depth (ft) | |
|  | <= 150 |
|  | 151-350 |
|  | 351-500 |
|  | Other |
| USGS Gauging Station (GW Elev, Date) | |
| Aquifer Code, Well Status | |
|  | Alluvium/Bolsom |
|  | Ogallala |
|  | Ogallala, Nearby site that taps the same aquifer was being pumped. |
|  | Ogallala, Obstruction was encountered in the well (no water level was recorded). |
|  | Ogallala, Site had been pumped recently. |
|  | Ogallala, Site was being pumped. |
|  | Ogallala, Site was dry (no water level was recorded). |
|  | Ogallala, Well was destroyed (no water level was recorded). |
|  | Not Defined |
| OSE Water Wells (DTW/Date) | |
| Well Depth (ft) | |
|  | <= 150 |
|  | 151-350 |
|  | 351-500 |
|  | Other |
| NM Geology | |
| Map Unit, Description | |
|  | Qe, Quaternary-Eolian Deposits, Qe, Quaternary-Eolian Deposits |
|  | Qoa/To, Quaternary-Older Alluvial Deposits/Ogallala |
|  | To, Tertiary-Ogallala Formation, To, Tertiary-Ogallala Formation |

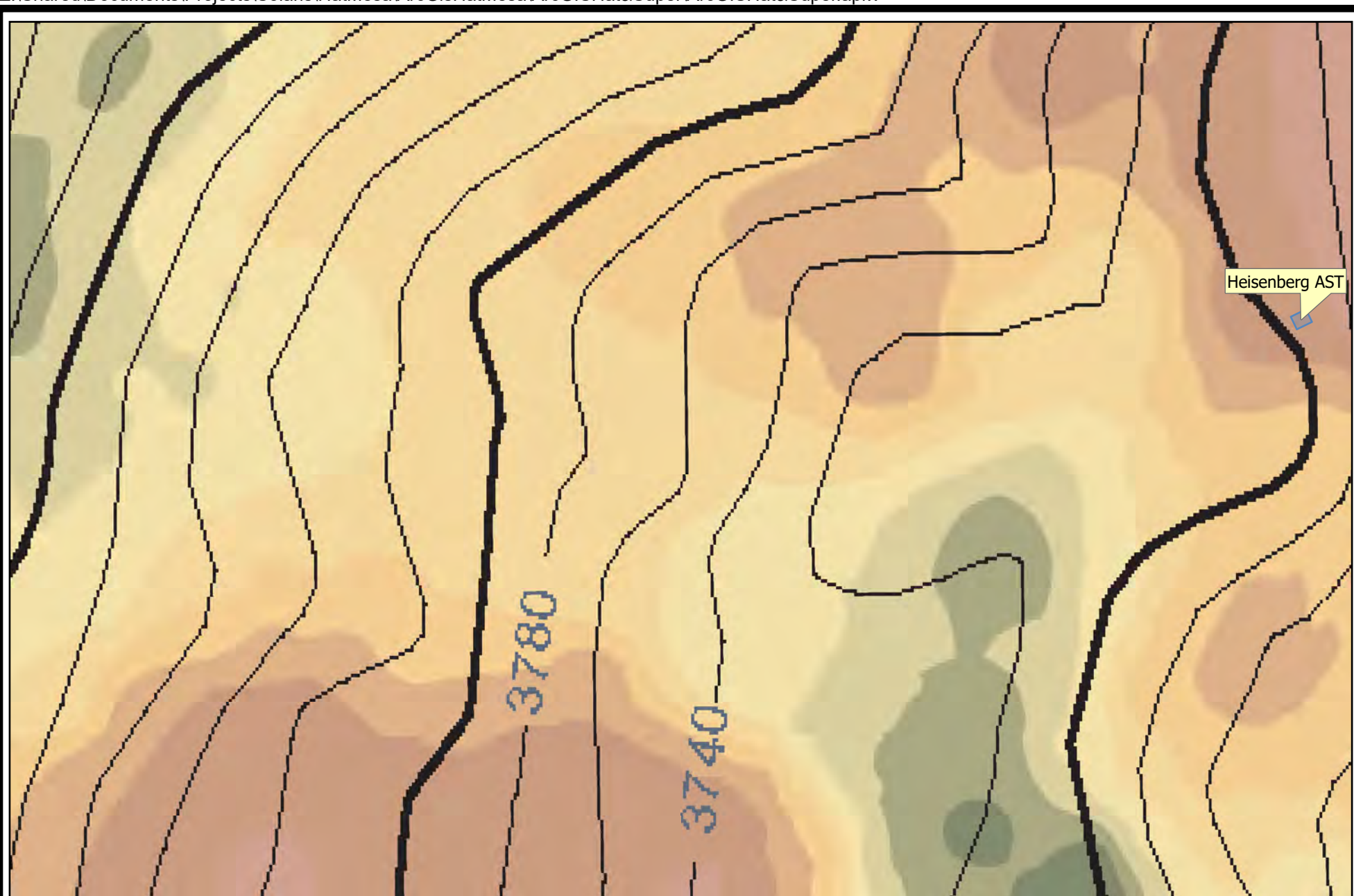
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 Albuquerque, NM 87104
 Ph: 505.266.5004

Legend for Plates 1 and 2a

Steward Energy II - Heisenberg AST

Nov 2022

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Ph: 505.266.5004

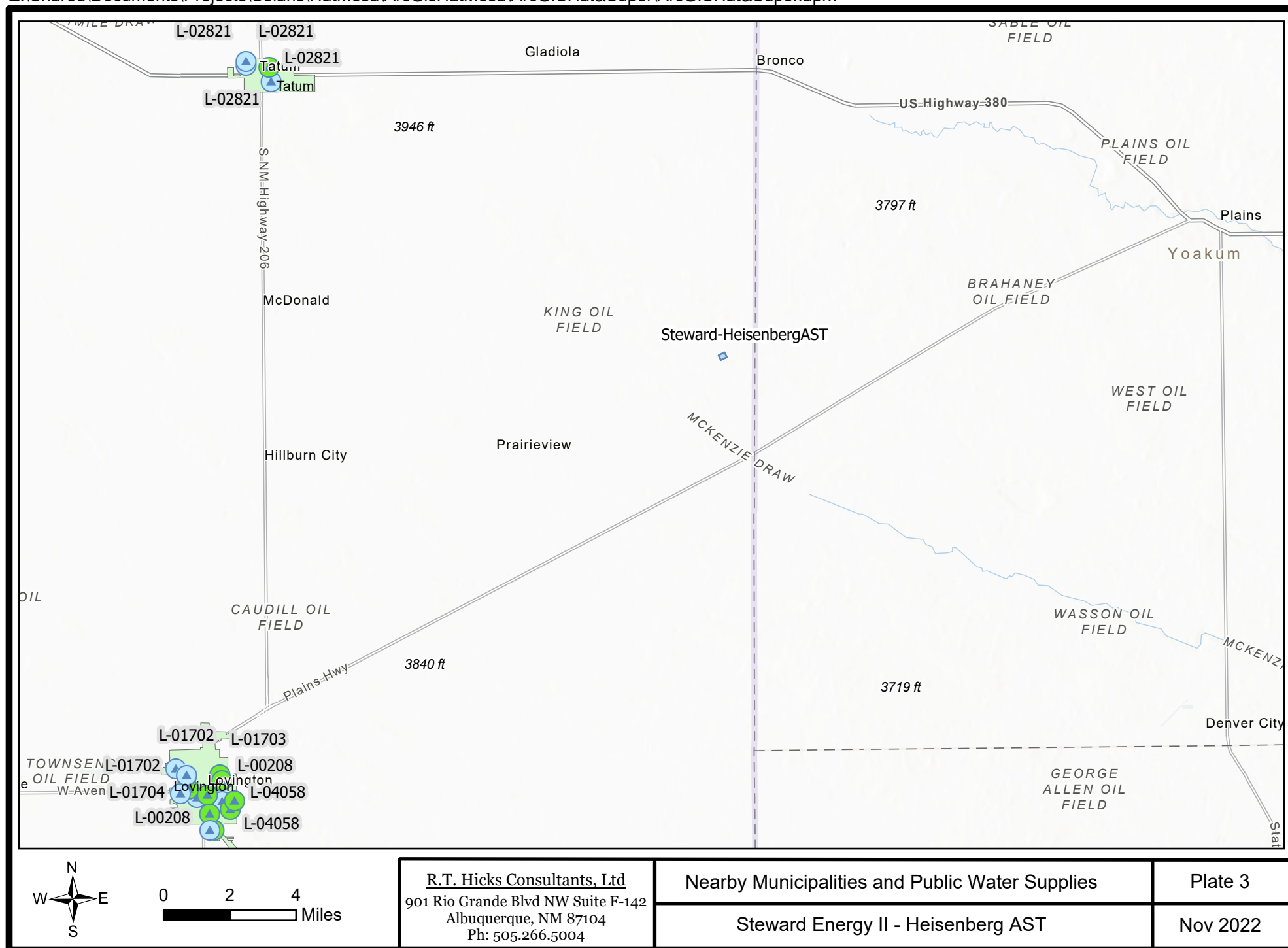
Groundwater Elevation (2004-07)
USGS Scientific Investigations Map 3044

Steward Energy II - Heisenberg AST

Plate 2b

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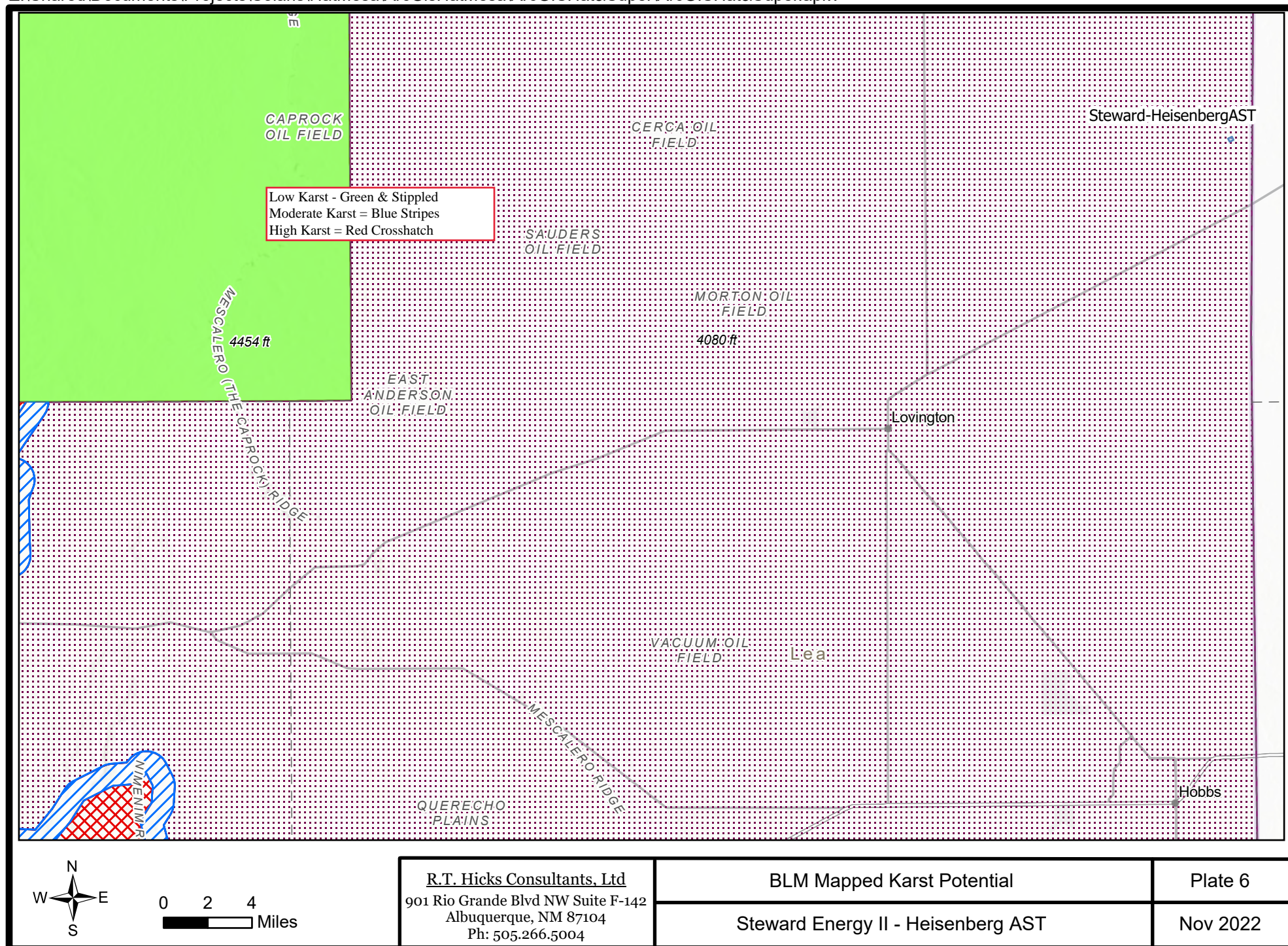
Nearest Mines

Steward Energy II - Heisenberg AST

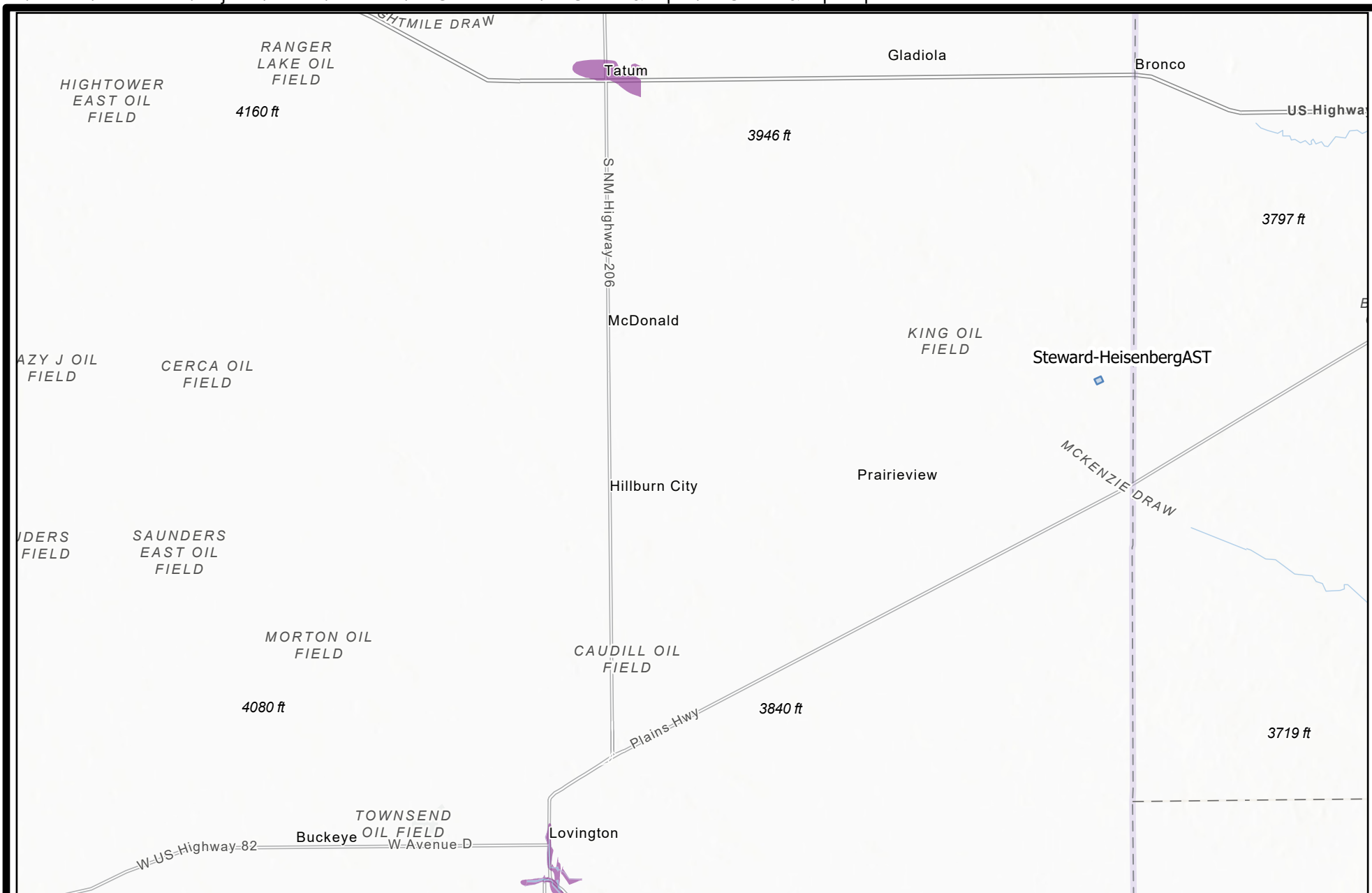
Plate 4

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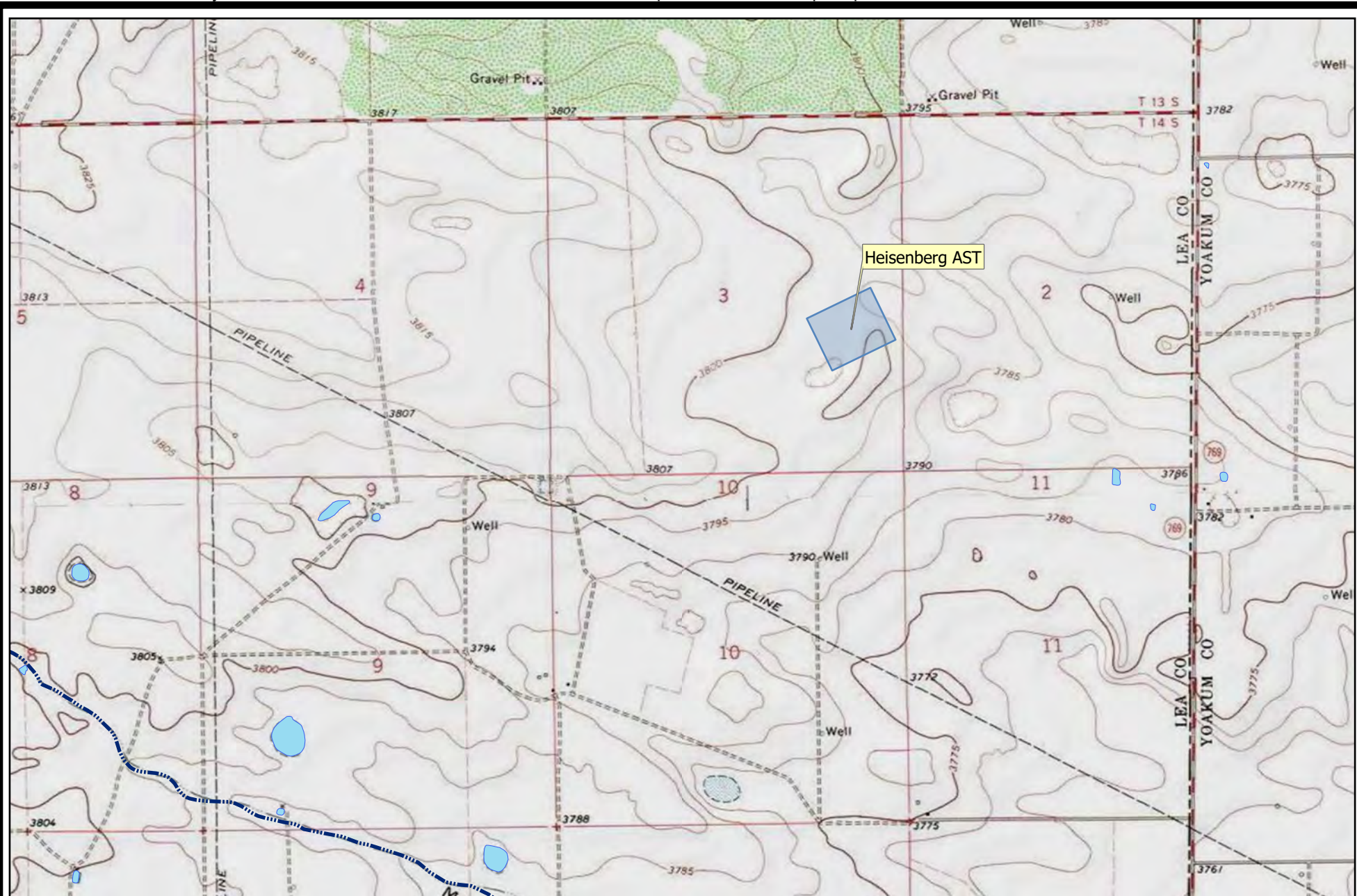
Nearest FEMA Mapped Food Hazards

Steward Energy II - Heisenberg AST

Plate 6

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Albuquerque, NM 87104
Ph: 505.266.5004

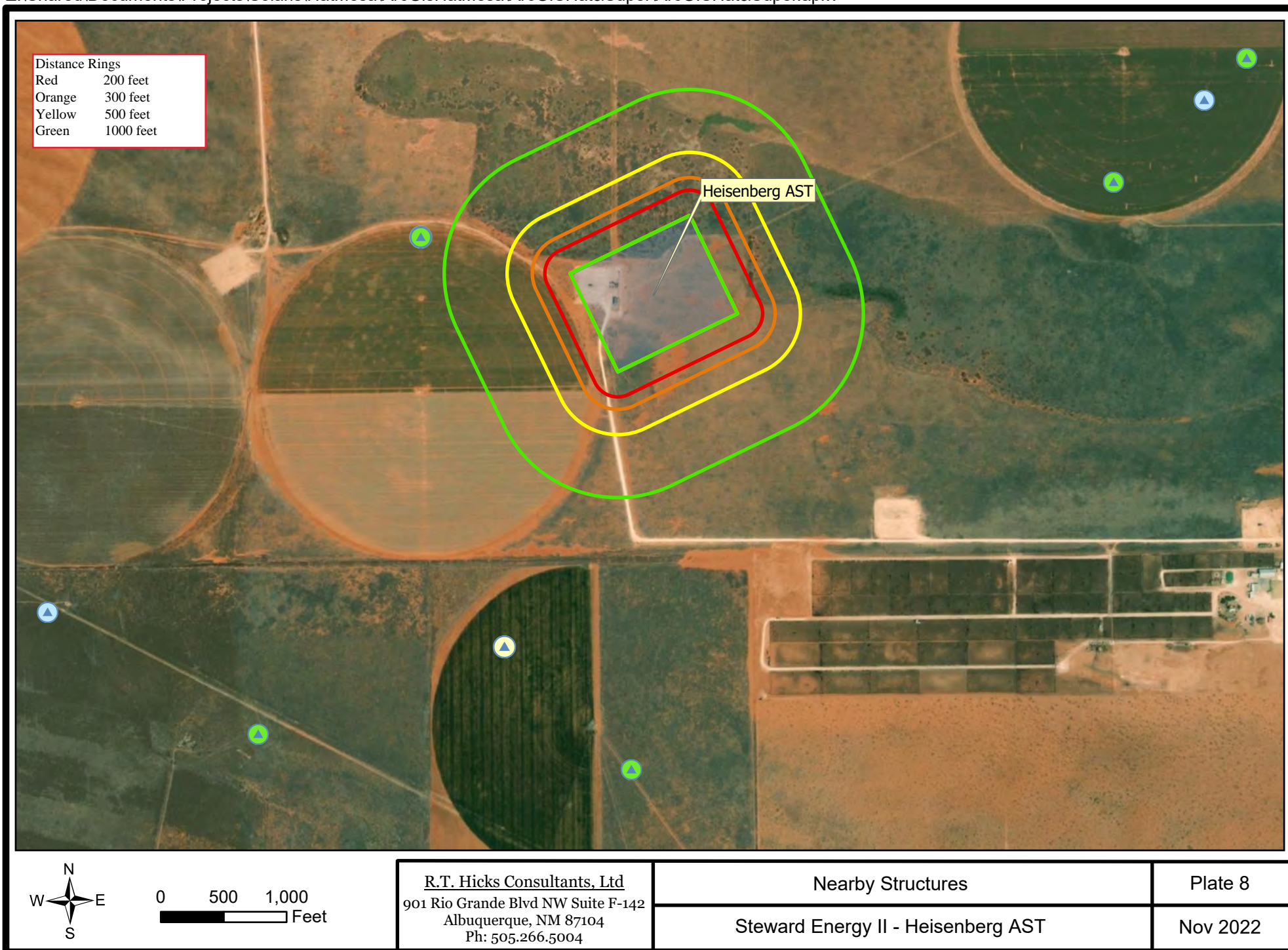
Nearest Mines

Steward Energy II - Heisenberg AST

Plate 7

Nov 2022

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APPENDIX WELL LOGS

Revised June 1972

STATE ENGINEER OFFICE
WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

512154

(A) Owner of well Brady Lowe Owner's Well No. _____
Street or Post Office Address 1500 Broadway
City and State Lubbock, Texas

Well was drilled under Permit No. L 7066 and is located in the:

a. Center $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ of Section 3 Township 14 Range 38E N.M.P.M.
b. Tract No. _____ of Map No. _____ of the _____
c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.
d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service License No. W D-421

Address Box 692 Tatum, NMDrilling Began 5/6/73 Completed 5/7/73 Type tools Cable Size of hole 8 in.Elevation of land surface or _____ at well is _____ ft. Total depth of well 150 ft.Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 71 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

| Depth in Feet | | Thickness in Feet | Description of Water-Bearing Formation | Estimated Yield (gallons per minute) |
|---------------|-----|----------------------|--|---|
| From | To | | | |
| 71 | 150 | 79 | Sand | |
| | | | | |
| | | | | |
| | | | | |

Section 3. RECORD OF CASING

| Diameter (inches) | Pounds per foot | Threads per in. | Depth in Feet | | Length (feet) | Type of Shoe | Perforations | |
|----------------------|--------------------|--------------------|---------------|--------|------------------|--------------|--------------|-----|
| | | | Top | Bottom | | | From | To |
| 6 5/8 | 12 | weld | 1 | 150 | | none | 145 | 150 |
| | | | | | | | | |
| | | | | | | | | |

Section 4. RECORD OF MUDDING AND CEMENTING

| Depth in Feet | | Hole Diameter | Sacks of Mud | Cubic Feet of Cement | Method of Placement |
|---------------|----|------------------|-----------------|-------------------------|---------------------|
| From | To | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Section 5. PLUGGING RECORD

Plugging Contractor _____

Address _____

Plugging Method FO FO FO

Date Well Plugged _____

Plugging approved by FO FO

State Engineer Representative

| No. | Depth in Feet | | Cubic Feet of Cement |
|-----|---------------|--------|-------------------------|
| | Top | Bottom | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

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Date Received

Quad _____ FWL _____ FSL _____

File No. L-7066 Use STK Location No. 14:38.3 center 24333

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STATE ENGINEER OFFICE
ROSWELL, N. M.

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Driller

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Revised June 1972

STATE ENGINEER OFFICE
WELL RECORD

#561800

PDDC

Section 1. GENERAL INFORMATION

(A) Owner of well Nathan Lowe Owner's Well No. L-559 (T)
 Street or Post Office Address 2313 Broadway
 City and State Lubbock, TX 79401

Well was drilled under Permit No. L-559 (T) and is located in the:a. CTR $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 2 Township 14S Range 39E N.M.P.M.b. Tract No. _____ of Map No. _____ of the 33 08 345c. Lot No. _____ of Block No. _____ of the 103 04 016
 Subdivision, recorded in Lca County.d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
 the _____ Grant.(B) Drilling Contractor DURAN DRILLING License No. WD-1607Address Po Box 1561 Serrano TX 79360Drilling Began 5/13/11 Completed 5/17/11 Type tool Cable Tool Size of hole 14 in.Elevation of land surface or _____ at well is _____ ft. Total depth of well 253 ft.Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 110 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

| Depth in Feet | | Thickness in Feet | Description of Water-Bearing Formation | Estimated Yield (gallons per minute) |
|---------------|------------|----------------------|--|---|
| From | To | | | |
| <u>175</u> | <u>185</u> | <u>10</u> | <u>Sand</u> | <u>50</u> |
| <u>210</u> | <u>225</u> | <u>15</u> | <u>Lime Stone</u> | <u>50</u> |
| <u>225</u> | <u>250</u> | <u>25</u> | <u>Sand & Gravel</u> | <u>200</u> |

Section 3. RECORD OF CASING

| Diameter (inches) | Pounds per foot | Threads per in. | Depth in Feet | | Length (feet) | Type of Shoe | Perforations | |
|----------------------|--------------------|--------------------|---------------|------------|------------------|--------------|--------------|------------|
| | | | Top | Bottom | | | From | To |
| <u>10</u> | <u>28</u> | | <u>0</u> | <u>253</u> | <u>253</u> | <u>—</u> | <u>133</u> | <u>253</u> |

Section 4. RECORD OF MUDDING AND CEMENTING

| Depth in Feet | | Hole Diameter | Sacks of Mud | Cubic Feet of Cement | Method of Placement |
|---------------|----|------------------|-----------------|-------------------------|---------------------|
| From | To | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Section 5. PLUGGING RECORD

Plugging Contractor _____
 Address _____
 Plugging Method _____
 Date Well Plugged _____
 Plugging approved by: _____

State Engineer Representative

| No. | Depth in Feet | | Cubic Feet of Cement |
|-----|---------------|--------|-------------------------|
| | Top | Bottom | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

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Quad _____ FWL _____ FSL _____

File No. _____ Use Repair Location No. _____
Deepen

Section 7. REMARKS AND ADDITIONAL INFORMATION

Luis R. Duran.

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STATE ENGINEER OFFICE WELL RECORD

Section 1. GENERAL INFORMATION

488755

Owner of well Nathan Lowe Owner's Well No. L-12263
 Street or Post Office Address 2313 Broadway
 City and State Lubbock, TX 79401

was drilled under Permit No. L-12263 and is located in the:

a. NE $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ of Section 2 Township 14 S Range 38 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
 Subdivision, recorded in Lea County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____
 the _____ Zone in Grant.

Drilling Contractor Robinson Drilling License No. WD-1488

ess PO Box 1582, Seminole, TX 79360

ng Began 7-28-08 Completed 8-10-08 Type tools Cable Tool Rig Size of hole 18 in.

tion of land surface or _____ at well is _____ ft. Total depth of well 170' ft.

leted well is ☒ shallow ☐ artesian. Depth to water upon completion of well 170 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

| Depth in Feet | | Thickness in Feet | Description of Water-Bearing Formation | Estimated Yield (gallons per minute) |
|---------------|-----|-------------------|--|--------------------------------------|
| From | To | | | |
| 105 | 170 | 65' | Sand | -UNK- |
| | | | | |
| | | | | |
| | | | | |

Section 3. RECORD OF CASING

| Diameter (inches) | Pounds per foot | Threads per in. | Depth in Feet | | Length (feet) | Type of Shoe | Perforations | |
|-------------------|-----------------|-----------------|---------------|--------|---------------|--------------|--------------|-----|
| | | | Top | Bottom | | | From | To |
| 14' | — | welded | +1 | 170 | 171 | — | 105 | 170 |
| | | | | | | | | |
| | | | | | | | | |

Section 4. RECORD OF MUDDING AND CEMENTING

| Depth in Feet | | Hole Diameter | Sacks of Mud | Cubic Feet of Cement | Method of Placement |
|---------------|----|---------------|--------------|----------------------|---------------------|
| From | To | | | | |
| 0 | 20 | 18" | 40 | — | mix & Pour |
| | | | | | |
| | | | | | |

Section 5. PLUGGING RECORD

ing Contractor _____
 ss _____
 ing Method NA
 /ell Plugged _____
 ing approved by: _____

State Engineer Representative

| No. | Depth in Feet | | Cubic Feet of Cement |
|-----|---------------|--------|----------------------|
| | Top | Bottom | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

FOR USE OF STATE ENGINEER ONLY

Received 06/24/09

Quad _____ FWL _____ FSL _____

No. L-12263 Use Explosive Location No. 14.38.2.4

#409515

Section 7. REMARKS AND ADDITIONAL INFORMATION

Keith Conner
Driller

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Revised June 1972

STATE ENGINEER OFFICE
WELL RECORD

A92610

Section 1. GENERAL INFORMATION

Owner of well MONTY PAXTON/Larry Lowe Owner's Well No. 302454
Street or Post Office Address 2313 Broadway File # L11623
City and State Lubbock TX 79401

Well was drilled under Permit No. 302454 and is located in the:
a. NE ¼ SW ¼ NE ¼ of Section 2 Township 14S Range 38E N.M.P.M.
b. Tract No. _____ of Map No. _____ of the _____
c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.
d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in
the _____ Grant.

(B) Drilling Contractor M+W License No. WD1477
Address 523 W. Ave I LOVINGTON NM 88260
Drilling Began 5-12-04 Completed 5-14-04 Type tools Rotary Size of hole 8 3/4" in.
Elevation of land surface or _____ at well is _____ ft. Total depth of well 150' ft.
Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 70' ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

| Depth in Feet | | Thickness in Feet | Description of Water-Bearing Formation | Estimated Yield (gallons per minute) |
|---------------|-----|----------------------|--|---|
| From | To | | | |
| 80 | 88 | 8 | FINE SAND (LOW YIELD) | UNTESTED |
| 115 | 145 | 30 | FINE TO COARSE SAND | UNTESTED |
| | | | | |
| | | | | |

Section 3. RECORD OF CASING

| Diameter (inches) | Pounds per foot | Threads per in. | Depth in Feet | | Length (feet) | Type of Shoe | Perforations | |
|----------------------|--------------------|--------------------|---------------|--------|------------------|--------------|--------------|-----|
| | | | Top | Bottom | | | From | To |
| 5 | | give | +2 | 150 | 152 | NONE | 110 | 150 |
| | | | | | | | | |
| | | | | | | | | |

Section 4. RECORD OF MUDDING AND CEMENTING

| Depth in Feet | | Hole Diameter | Sacks of Mud | Cubic Feet of Cement | Method of Placement |
|---------------|----|------------------|-----------------|-------------------------|---------------------|
| From | To | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
Date Well Plugged _____
Plugging approved by: _____

| No. | Depth in Feet | | Cubic Feet of Cement |
|-----|---------------|--------|-------------------------|
| | Top | Bottom | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

State Engineer Representative

Date Received 5-18-04 FOR USE OF STATE ENGINEER ONLY 302454

Quad _____ FWL _____ FSL _____

File No. BEA L-11623 Use STOCK Location No. 14.38.2.232

[illegible]



Section 7. REMARKS AND ADDITIONAL INFORMATION

Drilled through Hard Rock in this AREA.

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

belief, the foregoing is a true and correct record of the above

Robert M. [Signature]
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this  is used as a plugging record, only Section 1  and Section 5 need be completed.



WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.osc.state.nm.us

| 1. GENERAL AND WELL LOCATION | OSE POD NUMBER (WELL NUMBER) L-521 POD5 | | | | OSE FILE NUMBER(S) L-521-C | | | | | | | | | | | | | | | | | |
|---|---|---------|--|---|--------------------------------------|--|--------------------------------|--|--|----------|----|----|----|---|-----------|-----|----|----|---|--|--|--|
| | WELL OWNER NAME(S) Kenyon Burns | | | | PHONE (OPTIONAL) | | | | | | | | | | | | | | | | | |
| | WELL OWNER MAILING ADDRESS PO Box 1244 | | | | CITY STATE ZIP Lovington NM 88260 | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr> <th>WELL LOCATION (FROM GPS)</th> <th>DEGREES</th> <th>MINUTES</th> <th>SECONDS</th> <th></th> </tr> <tr> <td>LATITUDE</td> <td>32</td> <td>41</td> <td>48</td> <td>N</td> </tr> <tr> <td>LONGITUDE</td> <td>103</td> <td>23</td> <td>11</td> <td>W</td> </tr> </table> | | | | WELL LOCATION (FROM GPS) | DEGREES | MINUTES | SECONDS | | LATITUDE | 32 | 41 | 48 | N | LONGITUDE | 103 | 23 | 11 | W | * ACCURACY REQUIRED: ONE TENTH OF A SECOND * DATUM REQUIRED: WGS 84 | | |
| WELL LOCATION (FROM GPS) | DEGREES | MINUTES | SECONDS | | | | | | | | | | | | | | | | | | | |
| LATITUDE | 32 | 41 | 48 | N | | | | | | | | | | | | | | | | | | |
| LONGITUDE | 103 | 23 | 11 | W | | | | | | | | | | | | | | | | | | |
| DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS - PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE | | | | | | | | | | | | | | | | | | | | | | |
| 2. DRILLING & CASING INFORMATION | LICENSE NUMBER WD1626 | | NAME OF LICENSED DRILLER Roy Taylor | | | NAME OF WELL DRILLING COMPANY Eco/Enviro Drilling LLC | | | | | | | | | | | | | | | | |
| | DRILLING STARTED 10-21-15 | | DRILLING ENDED 10-28-15 | | DEPTH OF COMPLETED WELL (FT) 190 | | BORE HOLE DEPTH (FT) 190 | DEPTH WATER FIRST ENCOUNTERED (FT) 60 | | | | | | | | | | | | | | |
| | COMPLETED WELL IS: <input type="checkbox"/> ARTESIAN <input type="checkbox"/> DRY HOLE <input checked="" type="checkbox"/> SHALLOW (UNCONFINED) | | | | | | | STATE WATER LEVEL IN COMPLETED WELL (FT) 60 | | | | | | | | | | | | | | |
| | DRILLING FLUID: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> MUD <input type="checkbox"/> ADDITIVES - SPECIFY: | | | | | | | | | | | | | | | | | | | | | |
| | DRILLING METHOD: <input checked="" type="checkbox"/> ROTARY <input type="checkbox"/> HAMMER <input type="checkbox"/> CABLE TOOL <input type="checkbox"/> OTHER - SPECIFY: | | | | | | | | | | | | | | | | | | | | | |
| | DEPTH (feet bgl) | | BORE HOLE DIAM (inches) | CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen) | CASING CONNECTION TYPE | CASING INSIDE DIAM (inches) | CASING WALL THICKNESS (inches) | SLOT SIZE (inches) | | | | | | | | | | | | | | |
| | FROM | TO | | | | | | | | | | | | | | | | | | | | |
| | 0 | 130 | 15 | PVC | Glue | 10 | 0.375 | NA | | | | | | | | | | | | | | |
| | 130 | 19 | 15 | PVC | Glue | 10 | 0.375 | 0.085 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| 3. ANNULAR MATERIAL | DEPTH (feet bgl) | | BORE HOLE DIAM (inches) | LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL | AMOUNT (cubic feet) | METHOD OF PLACEMENT | | | | | | | | | | | | | | | | |
| | FROM | TO | | | | | | | | | | | | | | | | | | | | |
| | 10 | 190 | 14 | 3/8 Artesian | 59.4 | Hand | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 06/08/2012)

| | | | | | |
|-------------|---------|------------|---|------------|--------|
| FILE NUMBER | L-521-C | POD NUMBER | 5 | TRN NUMBER | 591003 |
|-------------|---------|------------|---|------------|--------|

LOCATION: 18S.36E.31.4.4.4

Irrigation

November 2022

Volume 2

C-147 Registration Package for Heisenberg AST Containment & Recycling Facility Section 3, T14-S, R38-E, Lea County

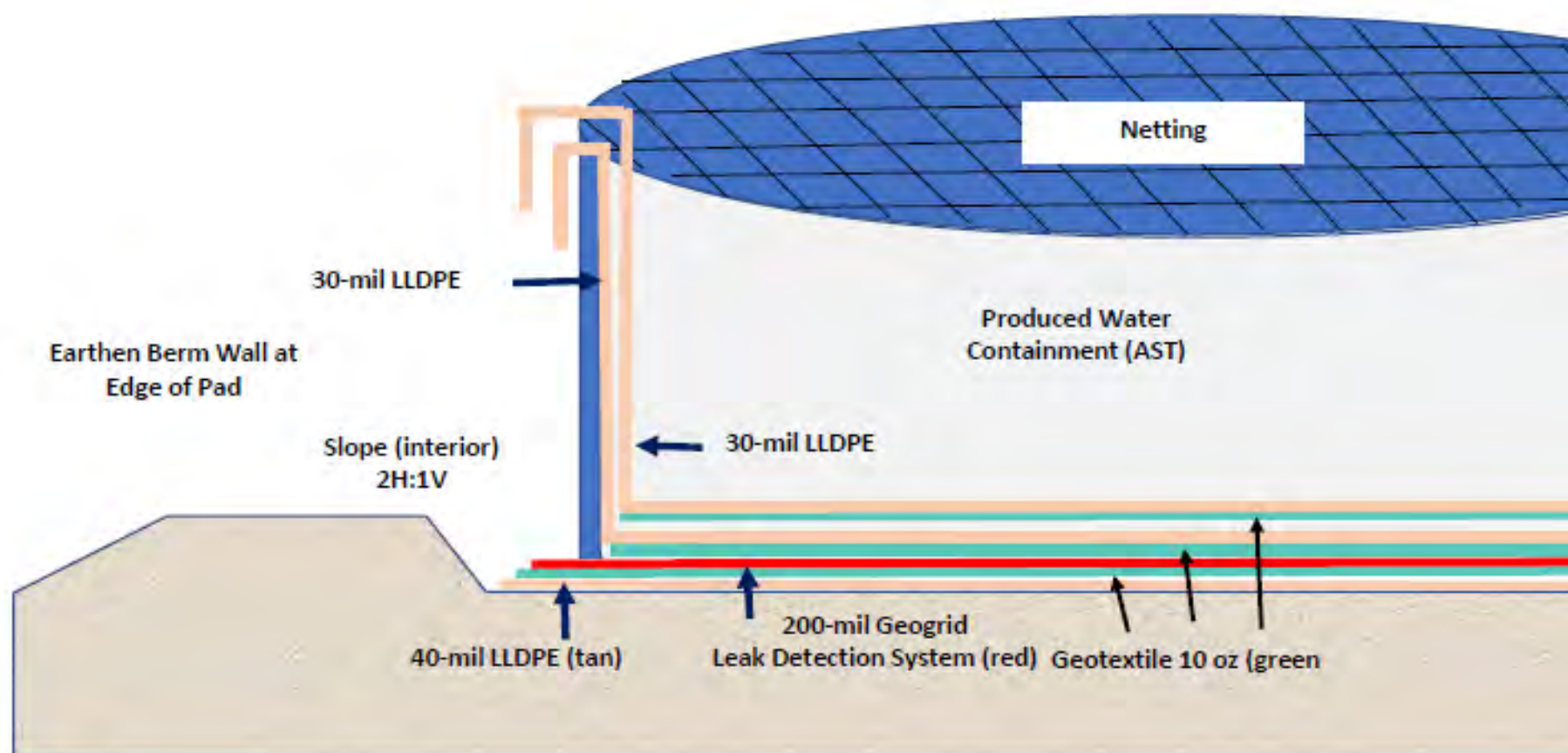
**Engineering Drawings and Liner Specifications
Design/Construction Plan
Select Energy Services Manual
Variances for AST Storage Containments
Applicability of Engineering Variances to Variety of
Site Conditions in Permian Basin**



Aerial view showing in-ground containments designed by Magrym Consulting and permitted by Hicks Consultants. Also shown are two 60,000 bbl above-ground storage tank containments permitted by Hicks Consultants. Photograph by permission from Magrym Consulting.

Prepared for:
Steward Energy II, LLC
Frisco, Texas

Prepared by:
R.T. Hicks Consultants, Ltd.
901 Rio Grande NW, Ste F-142
Albuquerque, New Mexico 87104



R.T. Hicks Consultants, Ltd
 901 Rio Grande Blvd NW Suite F-142
 Albuquerque, NM 87104
 505-266-5004

AST Schematic

Plate 1

Chisholm Energy Operating - Buffalo 12

Mar-21

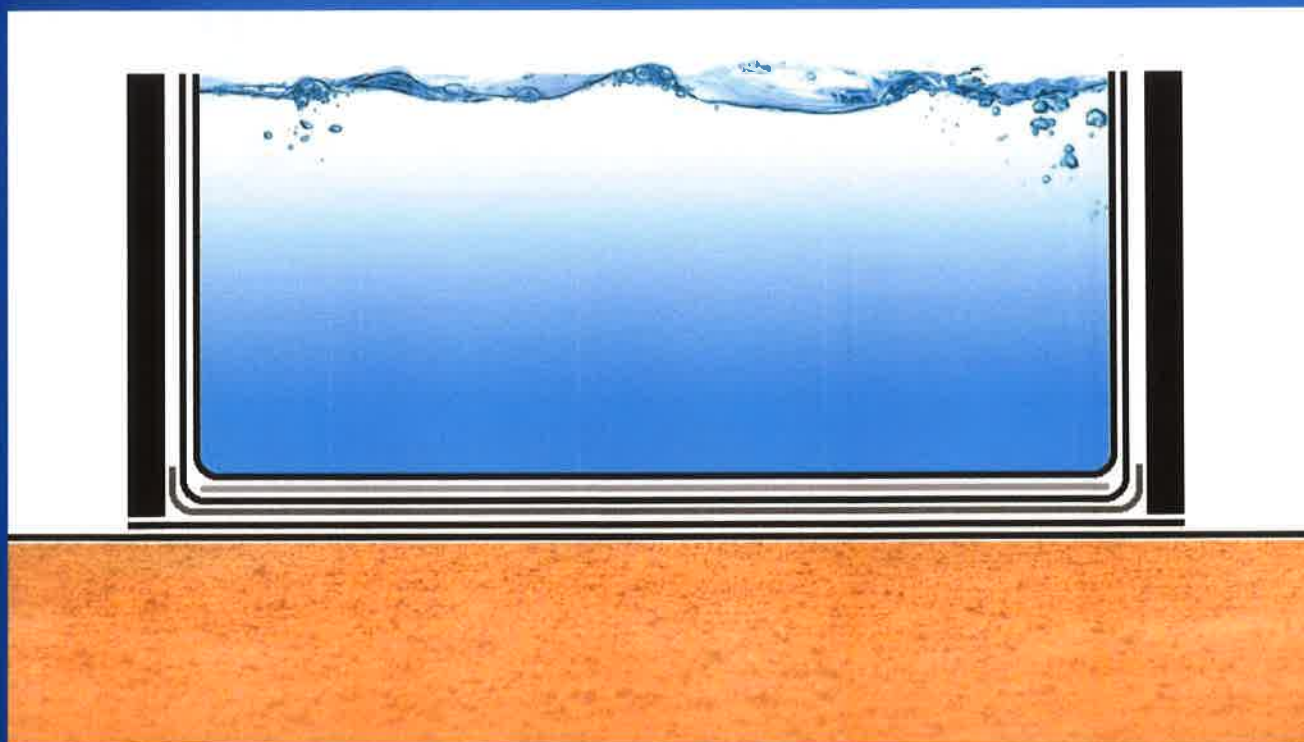
Select Tank Specifications

15 Panel Above-ground Storage Tank

Footprint: 157.0' diameter

Capacity: 41,290 barrels

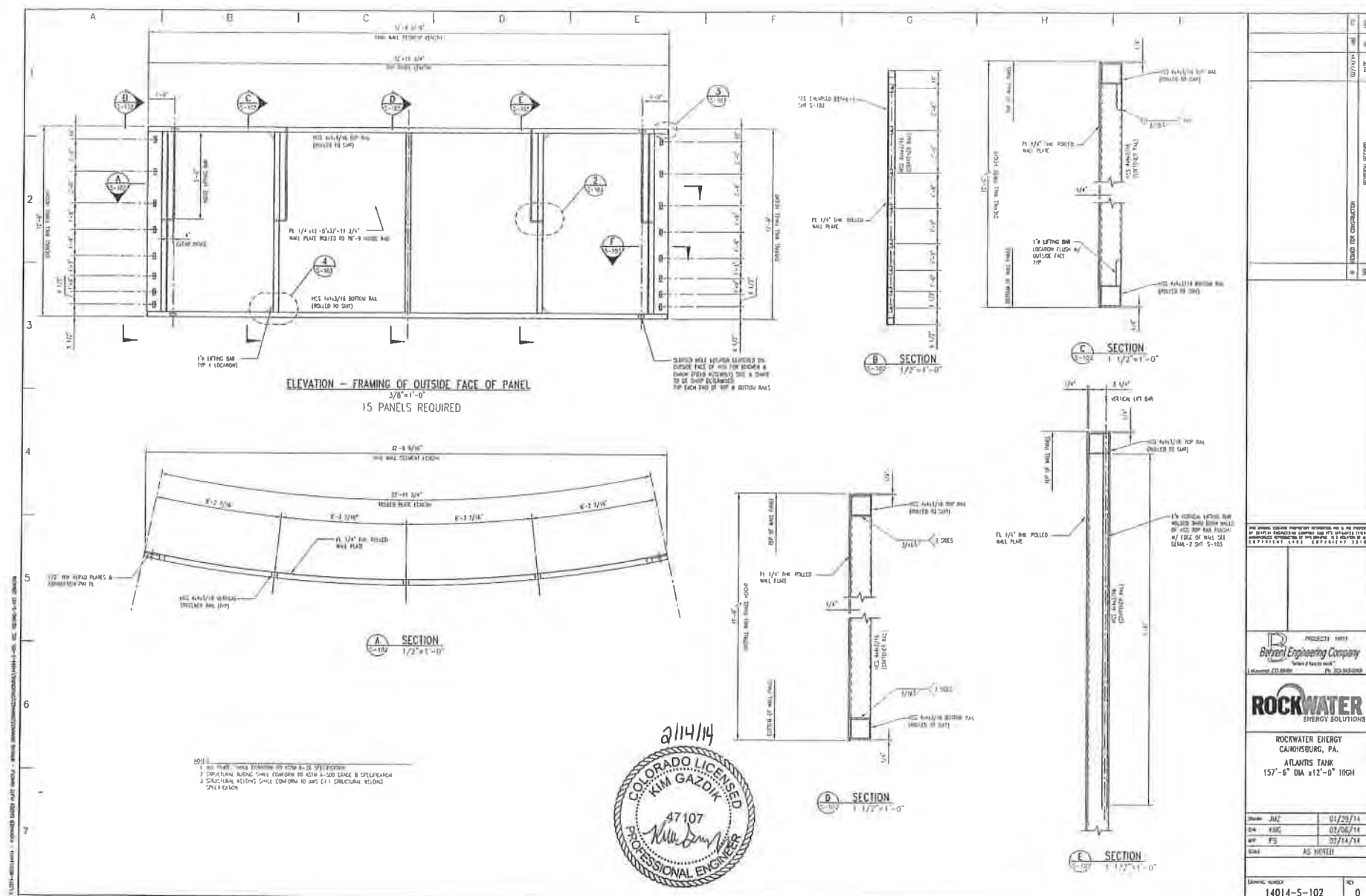
➤ 24" of freeboard for Produced Water totals 34,408 bbl storage



Tank Layers:

- Protective Net
- 30 mil Liner
- Leak Detection
- 30 mil Liner
- Geo Felt
- Geo Mesh
- 40 mil Containment









TECHNICAL DATA SHEET

Geomembrane 30mil LLDPE

| Property | Test Method | Frequency (A) | Unit Metric | Solmax 130-2000 |
|--|-------------|----------------|-------------|--------------------|
| Thickness (min. avg.) | ASTM D 5199 | Every roll | mm | 0.75 |
| Thickness (min.) | ASTM D 5199 | Every roll | mm | 0.68 |
| Resin Density | ASTM D 1505 | 1/Batch | g/cc | <0.926 |
| Melt Index-190/2.16(max) | ASTM D1238 | 1/Batch | g/10min | 1.0 |
| Sheet Density (C) | ASTM D1505 | Every 2 rolls | g/cc | <0.939 |
| Carbon Black Content (D) | ASTM D 4218 | Every 2 rolls | % | 2.0 - 3.0 |
| Carbon Black Dispersion | ASTM D 5596 | Every 6 rolls | Category | Cat. 1 / Cat. 2 |
| Oxidative Induction Time (min. avg) | ASTM D3895 | 1/Batch | min | 100 |
| Tensile Properties (min. avg)(B) | ASTM D 6693 | Every 2 rolls | | |
| Strength as Break | | | kN/m | 20 |
| Elongation at Break | | | % | 750 |
| 2% Modulus (max.) | ASTM D 5323 | PerFormulation | kN/m | 315 |
| Tear Resistance (min. avg.) | ASTM D 1004 | Every 6 rolls | N | 70 |
| Puncture Resistance (min. avg.) | ASTM D 4833 | Every 6 rolls | N | 200 |
| Dimensional Stability | ASTM D 1204 | Every 6 rolls | % | +/- 2 |
| Multi-Axial Tensile (min.) | ASTM D 5617 | PerFormulation | % | 90 |
| Oven Aging-% retained after 90 days | ASTM D 5721 | PerFormulation | | |
| STD OIT (min. avg.) | ASTM D 3895 | | % | 35 |
| HP OIT (min. avg.) | ASTM D 5885 | | % | 60 |
| UV Resistance-% retained after 1600 hr | GRI-GM-11 | PerFormulation | | |
| HP-OIT (min. avg.) | ASTM D 5885 | | % | 35 |

Note;

(A) Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).

(B) Machine Direction (MD) and Cross Machine Direction (XMD or TD) average values should be on the basis of 5 specimens each direction.

(C) Correlation table is available for ASTM D792 vs. ASTM D1505. Both methods give the same results.

(D) Correlation table is available for ASTM D1603 vs. ASTM D4218. Both methods give the same results.

*All values are nominal test results, except when specified as minimum or maximum.

* The information contained herein is provided for reference purposes only and is not intended as warranty of guarantee. Final determination of suitability for use contemplated is the sole responsibility of the user. Solmax along with Inland Tarp & Liner assumes no liability in connection with the use of this information.



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Phone (706) 336-7000 Fax (706) 336-7007
e-mail: info@skaps.com

**SKAPS TRANSNET™ (TN)
HDPE GEOCOMPOSITE 220**

SKAPS TRANSNET™ geocomposite consists of SKAPS GeoNet made from HDPE resin with non-woven polypropylene geotextile fabric heat bonded on both sides of the the geonet.

| Property | Test Method | Unit | Required Value | | | Qualifier |
|-----------------------------|--------------------------|----------------------|--------------------|--------------------|--------------------|-------------------|
| | | | With 6 oz. | With 8 oz. | With 10 oz. | |
| Geonet | | | | | | |
| Thickness | ASTM D 5199 | mil. | 220±20 | 220±20 | 220±20 | Range |
| Carbon Black | ASTM D 4218 | % | 2 to 3 | 2 to 3 | 2 to 3 | Range |
| Tensile Strength | ASTM D 5035 | lb/in | 45 | 45 | 45 | Minimum |
| Melt Flow | ASTM D 1238 ³ | g/10 min. | 1 | 1 | 1 | Minimum |
| Density | ASTM D 1505 | g/cm ³ | 0.94 | 0.94 | 0.94 | Minimum |
| Transmissivity ¹ | ASTM D 4716 | m ² /sec. | 2x10 ⁻³ | 2x10 ⁻³ | 2x10 ⁻³ | MARV ² |
| Composite | | | | | | |
| Ply Adhesion (Minimum) | ASTM D7005 | lb/in | 0.5 | 0.5 | 0.5 | MARV |
| Ply Adhesion (Average) | ASTM D7005 | lb/in | 1 | 1 | 1 | MARV |
| Transmissivity ¹ | ASTM D 4716 | m ² /sec | 1x10 ⁻⁴ | 1x10 ⁻⁴ | 9x10 ⁻⁵ | MARV |
| Geotextile | | | | | | |
| Fabric Weight | ASTM D 5261 | oz/yd ² | 6 | 8 | 10 | MARV |
| Grab Strength | ASTM D 4632 | lbs | 160 | 225 | 270 | MARV |
| Grab Elongation | ASTM D 4632 | % | 50 | 50 | 50 | MARV |
| Tear Strength | ASTM D 4533 | lbs | 65 | 90 | 100 | MARV |
| Puncture Resistance | ASTM D 4833 | lbs | 95 | 130 | 165 | MARV |
| CBR Puncture | ASTM D 6241 | lbs | 475 | 650 | 825 | MARV |
| Water Flow Rate | ASTM D 4491 | gpm/ft ² | 125 | 100 | 75 | MARV |
| Permittivity | ASTM D 4491 | sec ⁻¹ | 1.63 | 1.26 | 0.94 | MARV |
| Permeability | ASTM D 4491 | cm/sec | 0.3 | 0.3 | 0.3 | MARV |
| AOS | ASTM D 4751 | US Sieve | 70 | 80 | 100 | MARV |

Notes:

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of 10000 psf between stainless steel plates after 15 minutes. Values may vary between individual labs.
2. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.
3. Condition 190/2.16

This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.



Premium Quality - Built To Last

www.inlandtarp.com

Geotextile Product Description Sheet 8oz ONG Nonwoven Geotextile

8oz ONG is a needle-punched nonwoven geotextile made of 50% polypropylene and 50% polyester staple fibers, which are formed into a random network for dimensional stability.

PROPERTY TEST METHOD UNIT

| | |
|---|-------------|
| Weight (Typical) ASTM D 5261 oz/yd ² (g/m ²) | 7.75 (220) |
| Thickness ASTM D 4491 mils (mm) | 87 (2.21) |
| Grab Tensile ASTM D 4632 lbs (kN) | 151 (0.673) |
| Grab Elongation ASTM D 4632 | 80% |
| Trapezoid Tear Strength ASTM D 4533 lbs (kN) | 65 (0.287) |
| CBR Puncture Resistance ASTM D 6241 lbs (kN) | 351 (1.56) |
| Permittivity* ASTM D 4491 sec-1 | 1.57 |
| AOS* ASTM D 4751 US Sieve (mm) | 140 (0.102) |
| UV Resistance ASTM D 4355 %/hrs | 70/500 |

PACKAGING

Roll Dimensions (W x L) – ft 15 x 300

Square Yards Per Roll 500

Estimated Roll Weight - lbs 250

* At the time of manufacturing. Handling may change these properties.

This information is provided for reference purposes only and is not intended as a warranty or guarantee. SKAPS assumes no liability in connection with the use of this information.

U.S. Fabrication & Distribution Centers

Moses Lake, Washington . . . 4172 North Frontage Road E, Moses Lake, WA 98837 • 800.346.7744 • Fax 509.766.0414

Fostoria, Ohio . . . 1600 North Main Street, Fostoria, OH 44830 • 888.377.5640 • Fax 419.436.6007

Odessa, Texas . . . 8784 W. Interstate 20, Odessa, TX 79763 • 432.272.9413



(1)

ATARFIL LTM-LTMT V1

Raw Material

Linear Low Density Polyethylene

ATARFIL LTM-LTMT is a structured geomembrane manufactured from maximum quality linear low density polyethylene LLDPE resins, duly contrasted, that comply with the most rigorous requirements established for their use.

ATARFIL LTM-LTMT contains 97,5% of pure polymer, and approximately 2,5% of Carbon Black, antioxidants and thermal stabilizers. The product does not contain plasticizers or fillers that can migrate over time.

The geomembrane **ATARFIL LTM-LTMT** is manufactured under rigorous quality controls.

| Surface | TM Structured 1 side TMT Structured 2 sides | Colour | Black |
|---------|--|----------|-------|
| | | RAL Code | - |

| | Tested Property | Unit | Test Method | Value |
|-----------------------------|--|-------------------|----------------------------|-------------|
| Raw Material Identification | Density of Raw Material | g/cm ³ | ASTM D 792 | 0.915-0.926 |
| | Density of Geomembrane | g/cm ³ | ASTM D 792 | 0.925-0.939 |
| | Melt Flow Index | g/10 min | ASTM D 1238 (300°C/2,5 Kg) | < 10 |
| | Carbon Black Content | % | ASTM D 4218 | 2.0-2.5 |
| | Carbon Black Dispersion | - | ASTM D 5596 | Note (2) |
| Durability | Oxidative Induction Time (OIT) Standard OIT | min | ASTM D 3895 (200°C) | ≥ 100 |
| | High Pressure OIT | | ASTM D 5885 | ≥ 400 |
| | Oven aging at 85°C | % | ASTM D 5721 | ≥ 60 |
| | HP OLT, % retained after 90 days | | ASTM D 5885 | ≥ 60 |
| | UV Resistance, HP OIT, % retained after 1800 hrs | % | ASTM D 7238 ASTM D 5885 | ≥ 35 |

| | Tested Property | Unit | Test Method | Value |
|-----------------------|--|-------------------------------------|---------------------|-----------------------|
| Functional Properties | Low Temperature Brittleness (t _g , -40°C) | - | ASTM D 746 | No cracks |
| | Water Permeability | m ³ /m ² -day | EN 1450 | < 1·10 ⁻⁶ |
| | Coefficient of Linear Thermal Expansion | 1/K | ASTM D 696 | 2,15·10 ⁻⁴ |
| | Water Absorption | % | ASTM D 570 (24h) | ≤ 0,2 |
| | | | ASTM D 570 (6 days) | ≤ 1 |
| | Asperity Height | mils | ASTM D 7486 | ≥ 35 |
| | Friction Angle ⁽³⁾ | ° | ISO 12957-1 | ≥ 29 |
| | Spikes Density | spikes/ft ² | - | 7775 |

| Strength Characteristics Quality of Final Product | Tested Property | Unit | Test Method | Value | | | | |
|---|--|-------------------------|--------------------------------------|---------|---------|-----------|-----------|-----------|
| | Thickness | mils | ASTM D 5994 | 40 | 60 | 80 | 100 | 120 |
| | Tolerance | % | | -10 | | | | |
| | Mechanical Properties | | | | | | | |
| | Tensile strength at Break ⁽¹⁾ | lb/in | ASTM D 6693 (Type IV), lo: 2.0 in | 64 (60) | 95 (90) | 125 (120) | 152 (150) | 185 (180) |
| | Elongation at Break | % | | ≥ 250 | | | | |
| | Tear Resistance | lb | ASTM D 1004 | ≥ 21 | ≥ 32 | ≥ 43 | ≥ 53 | ≥ 64 |
| | Puncture Resistance | lb | ASTM D 4833 | ≥ 42 | ≥ 64 | ≥ 85 | ≥ 112 | ≥ 128 |
| | 2% Modulus | lb/in | ASTM D 5323 | ≤ 2400 | ≤ 3600 | ≤ 4800 | ≤ 6000 | ≤ 7200 |
| | Axi-Symmetric Break Resistance Strain | % | ASTM D 5617 | ≥ 30 | | | | |
| Dimensional Stability | % | ASTM D 1204 (100°C, 1h) | ± 1,5 | | | | | |

| 140717 PRESENTATION (Standard Sizes) | Parameter | Units | 40 | | 60 | | 80 | | 100 | | 120 | |
|--------------------------------------|-------------|-----------------|------------|--------|----------|---------|---------|---------|---------|---------|---------|---------|
| | | | LTM | LTMT | LTM | LTMT | LTM | LTMT | LTM | LTMT | LTM | LTMT |
| | | | Roll width | ft | 19.7 | 19.7 | 19.7 | 19.7 | 19.7 | 19.7 | 19.7 | 19.7 |
| | Roll Length | ft | 864 | 570 | 669 | 495 | 504 | 432 | 405 | 384 | 339 | 333 |
| | Surface | ft ² | 17,020.8 | 11,229 | 13,179.3 | 9,751.5 | 9,928.8 | 8,510.4 | 7,978.5 | 7,564.8 | 6,678.3 | 6,560.1 |

⁽¹⁾ Values indicated are MEDIUM. In brackets minimum values.

⁽²⁾ Certificates belonging to the Environmental and Quality Integrated System of Atarfil.

⁽³⁾ Carbon black dispersion form near spherical agglomerates for 18 different views; 9 in Categories 1 or 2 and 1 in Category 3.

⁽⁴⁾ Using a polypropylene geotextile of 1000gr

This information is provided for reference purposes. ATARFIL assumes no liability in connection with the use of this information or the final use of the product. It may be revised at any time or at least every two years, so it is subject to change permanently.



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Middle East: P.O. Box 263 122 - Jebel Ali - DUBAI - U.A.E.

USA Branch: Telf: +1 7578483431

www.atarfil.com

Design and Construction Plan Above Ground Tank (AST) Containments

General

Examination of the engineering drawings and the SOP for set-up (Engineering Drawings, Liner Specifications, Set Up) plus the history of solid performance of these AST Containments demonstrates that the AST Containment is designed and will be assembled to ensure the confinement of produced water, to prevent releases and to prevent overtopping due to wave action or rainfall. As the AST Containments are generally less than 190 feet in diameter, wave action is not a meaningful consideration.

These AST Containments are constructed of 12-foot high steel panels, are netted (netting no larger than 1.5 inch per square per BLM COA) ~~and employ the Mega Blaster Pro avian deterrent system~~ to prevent ingress of migratory birds. AST Containments will be enclosed by a 4-strand barbed wire fence or better. Thus, complies with the Rule to fence or enclose a recycling containment in a manner that deters unauthorized wildlife and human access and shall maintain the fences in good repair.

The operator shall post an upright sign no less than 12 inches by 24 inches with lettering not less than two inches in height in conspicuous places surrounding the containment. 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.

Site Preparation

Foundation for AST Containment

Preparation of the soils on site is required to form a dependable base for the AST Containment in accordance with NMAC 19.15.34 and the SOP and is the responsibility of the operating company. If the location of the AST Containment is on an existing pad, the operator has stripped and stockpiled the topsoil for use as the final cover or fill at the time of closure. If the pad is new construction, the operator will strip and stockpile the soil for reclamation upon cessation of site activities.

19.15.34.12 A

(1) The operator shall design and construct a recycling containment to ensure the confinement of produced water, to prevent releases and to prevent overtopping due to wave action or rainfall.

19.15.34.12 D

(1) The operator shall fence or enclose a recycling containment in a manner that deters unauthorized wildlife and human access and shall maintain the fences in good repair. The operator shall ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.

19.15.34.12 C

Signs. The operator shall post an upright sign no less than 12 inches by 24 inches with lettering not less than two inches in height in a conspicuous place on the fence surrounding the containment. 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.

19.15.34.12 B

Stockpiling of topsoil. Prior to constructing containment, the operator shall strip and stockpile the topsoil for use as the final cover or fill at the time of closure.

Design and Construction Plan Above Ground Tank (AST) Containments

The foundation soils must be roller compacted. Compaction characteristics must meet or exceed 95% of Standard Proctor Density in accordance with ASTM D 698 or modified Proctor Test (ASTM Standard D1557).

Examination of the SOP shows that the AST Containment contractor will conform to the following mandates of the Rule:

- the AST Containment will have a properly constructed compacted earth foundation and interior slopes (vertical steel) consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear.
- Geotextile will be placed under the liner where needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity.
- If the AST containment is within a levee, the inside grade is no steeper than two horizontal feet to one vertical foot (2H: 1V) and the outside grade no steeper than three horizontal feet to one vertical foot (3H: IV). The vertical steel walls of the AST Containment are the subject of a *variance included in Volume 3* of this submission. OCD.

The Operator will ensure that at a point of discharge into or suction from the recycling containment, the liner is protected from excessive hydrostatic force or mechanical damage and external discharge or suction lines shall not penetrate the liner.

Liner and Leak Detection Materials

The liner and geotextile specifications show that all primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. All primary liners shall be *an equivalent liner [to that stated in Rule 34] and are pursuant to a requested variance*. The liner system is presented in an earlier section of this submission.

All secondary liners shall be *an equivalent liner [to that stated in Rule 34] approved by OCD pursuant to a*

19.15.34.12 A

(2) A recycling containment shall have a properly constructed foundation and interior slopes consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. Geotextile is required under the liner when needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity. The operator shall construct the containment in a levee with an inside grade no steeper than two horizontal feet to one vertical foot (2H:1V). The levee shall have an outside grade no steeper than three horizontal feet to one vertical foot (3H:1V). The top of the levee shall be wide enough to install an anchor trench and provide adequate room for inspection and maintenance.

19.15.34.12 A

(6) At a point of discharge into or suction from the recycling containment, the operator shall insure that the liner is protected from excessive hydrostatic force or mechanical damage. External discharge or suction lines shall not penetrate the liner.

19.15.34.12 A

(4) All primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. All primary liners shall be 30-mil flexible PVC, 45-mil LLDPE string reinforced or 60-mil HDPE liners. Secondary liners shall be 30-mil LLDPE string reinforced or equivalent with a

Design and Construction Plan Above Ground Tank (AST) Containments

variance. The liner system is presented in an earlier section of this submission.

Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

Variance request for liner system (two 40 mil LLDPE for primary and secondary liners) included in Volume 3.

The AST Containment will have a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet to facilitate drainage.

Install Secondary Liner, Leak Detection System and Secondary Containment

All AST containments holding produced water will have a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. The rule states that the edges of all secondary liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep. The lack of an anchor trench with an AST Containment *is pursuant to a requested variance*.

The AST Containment Contractor will cause the recycling containment will have a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet 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 (see attached drawing).

The presence of the secondary containment levee ~~or pre-fabricated secondary containment~~ meets the OCD Rule mandate that a recycling containment shall design the containment to prevent run-on of surface water. The containment shall be surrounded by a berm, ditch or other diversion to prevent run-on of surface water.

AST Containment Setup

As with the secondary liner, AST Containment contractor will minimize liner seams and orient them up and down, as much as possible, not across, a slope.

hydraulic conductivity no greater than 1×10^{-9} cm/sec. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

19.15.34.12 A

(3) Each recycling containment shall incorporate, at a minimum, a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.

19.15.34.12 A

(7) The operator of a recycling containment shall place a leak detection system between the upper and lower geomembrane liners that shall consist of 200-mil geonet or two feet of compacted soil with a saturated hydraulic conductivity of 1×10^{-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.

19.15.34.12 A

(8) The operator of a recycling containment shall design the containment to prevent run-on of surface water. The containment shall be surrounded by a berm, ditch or other diversion to prevent run-on of surface water.

Design and Construction Plan Above Ground Tank (AST) Containments

Factory welded seams shall be used where possible. AST Containment contractor will employ field seams in geosynthetic material that are thermally seamed. Prior to field seaming, AST Containment contractor shall overlap liners four to six inches and minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the AST Containment bottom. Qualified personnel shall perform field welding and testing.

Fluid Injection/Withdrawal Flow Diverter

The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

19.15.34.12 A

(5) The operator of a recycling containment shall minimize liner seams and orient them up and down, not across, a slope of the levee. Factory welded seams shall be used where possible. The operator shall ensure field seams in geosynthetic material are thermally seamed. Prior to field seaming, the operator shall overlap liners four to six inches. The operator shall minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the slope's toe. Qualified personnel shall perform field welding and testing.

19.15.34.13 B

(3) The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

Select SOP

BEST MANAGEMENT PRACTICES FOR ABOVE GROUND STORAGE TANKS



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BEST MANAGEMENT PRACTICE FOR ABOVE GROUND STORAGE TANKS**TABLE OF CONTENTS**

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Section 1.0 Introduction and Summary

1.1 Introduction and Purpose

Select Energy Services, LLC (and all its affiliated and subsidiary companies, hereinafter collectively referred to as “Select”) is committed to providing its employees a safe working environment and avoiding injury to our contractors, customers, and neighbors. As part of our overall commitment to safety, Select seeks to prevent acts or conditions that could result in injury and/or illness to any employee, customer, contractor, neighbor, and/or the environment.

In an effort to prevent potentially harmful acts or conditions, Select has developed this **Best Management Practice** (BMP) that focuses on above ground storage tank (AST) systems including planning, set up, operations, and take down. This BMP will discuss steps to be taken to promote a safe process, as well as a list of potential hazards that should be identified and remediated prior to beginning this procedure.

1.2 Background

AST is the industry term for an above ground storage tank. At Select, AST's are used for a variety of field applications within the fluids management operations. AST's can be used in place of traditional tank farms and in-ground water impoundments, and are suitable for fresh water as well as production water. At Select, AST's are available in several standard sizes, ranging from 4,500 barrel (bbl) capacity to 62,000 bbl capacities. Select currently uses three basic styles of AST's. One is referred to as a “pin” tank that uses large diameter steel pins to attach tank panels together. The second type of AST is a “plate” tank. Steel panels of a plate tank are attached using steel plates. Lastly, the “bolt” tank that connects using one-inch diameter bolts.

1.3 Intended Use

This BMP will be part of training provided to all affected employees when they begin their employment with Select and any time the plan is changed. This BMP will also be reviewed with an employee if his/her responsibilities change under the plan. A written copy of this plan will remain in the regional Safety Office, and will be available for employee review. The Vice-President of Health Safety and Environment, or his agents, may be contacted by any employee if he/she needs additional information about this BMP.

This BMP has been developed to assist affected employees with the operational steps that may be used to complete the task safely. **It must be noted, however, that the experience and background of a trained containment employee is essential to the success of any project or task.**

Nothing contained in this BMP is a substitute for each employee's individual judgment in any given situation. In the event that any employee believes that any task outlined in any BMP cannot be completed safely, then that employee should immediately halt the performance of such task and notify their direct supervisor.

This BMP may also be used to inform customers about Select's typical equipment and procedures for setting up an AST system. This BMP will be reviewed and revised on an ongoing basis to keep pace with best oilfield practices and applicable OSHA regulations.

1.4 Customer Environmental Health and Safety Programs

This BMP recognizes that oil and gas operating companies have developed their own health, safety, and environmental (HSE) programs that contractors who work at customer's sites like Select, must comply with. In addition to this BMP, Select personnel will strictly observe the policies and procedures of each operating company.

1.5 Summary

This BMP is divided into four separate phases, each organized in chronological order. First is the planning phase that includes a customer-Select meeting and close coordination to be sure Select complies with all of customer's

Health, safety, and environmental requirements and that **the site is ready for the AST setup**. This BMP then presents the specific tasks and safety requirements during the second phase - the AST setup phase. The third phase is the AST operation during which periodic checks of the tank are made per customer's requirements. The fourth phase addresses AST takedown during which all materials are removed from the site.

Section 2.0 Planning for AST Rig-Up

The planning phase for AST systems includes several important activities that can impact the safety and success of an AST project. Step by step procedures are presented below for each of the following activities during the planning phase of an AST project:

- AST order information
- Customer meeting
- Site soil and pad preparation (by customer)
- Pre-mobilization on-site meeting
- Notifications
- Job Safety Analysis(JHA)
- AST material deliveries

2.1 AST Order Information

Select AST Manager/Account Representative will record general AST order information including the customer's site location information (911 Address, NOT only coordinates), specific tank requirements (size, number, liner type, candy canes, etc), desired schedule, customer's order reference number, and site specific customer contact information. The AST Manager/Account Representative provides this information, along with customer's contractual and safety requirements, to the appropriate personnel.

2.2 Customer Meeting

Prior to finalizing the delivery schedule, a meeting or conference call is held with Select and customer representatives including the customer's purchase agent and the customer's health, safety, and environmental (HSE) representative.

This meeting is best done in person, but must at least be covered in a phone call, followed up by a brief email confirming the AST order details, delivery schedule, and noting special conditions, safety requirements, **verification of pad preparation**, etc.

The following key topics will typically be discussed.

- Select site specific staff/roles
- Review AST intended use and customer safety requirements.
- Review AST scope of work, what is normally included, what is not.
- Permitting for AST (as needed)
- Site access and truck route requirements
- Time line for AST to be operational
- Confirm AST size(s) to be used
- AST layout on pad

NOTE: It is preferable to maintain a 30' clear work area around the perimeter of the tank to provide access for equipment. Regardless of manufacturer, the minimum footprint should be a circle with a radius of at least 24' greater than the radius of the tank.

Current site conditions, status/schedule for site preparation, and soil preparation requirements.

Responsibility for filling the tank, to a minimum of 2 feet deep, immediately after it is set up to protect from wind.

Responsibility for AST inspections during AST operation, any time tank is fully emptied, and the frequency of inspections.

Conditions that could result in standby time charges or additional charges, and what prior customer approvals are required.

Confirm customer is responsible for the used liner, residual solids left in the tank, and site reclamation.

Understand customer's OSHA Process Safety Management – Contractor safety and notification requirements for all activities on customer controlled sites.

Note any special PPE or safety requirements at site.

Notifications: Establish a list of notifications/communications that Select will be responsible for and timing for each. Select standard procedure is to notify owners of buried utilities in the AST site area using state-wide or Canadian Province "one-call" services at least one week in advance of AST setup. Identify any other notifications that Select will need to make (e.g. Truck routes, neighbors, etc). Also identify customer's procedures for notifying them if conditions arise that could impact scope, schedule, cost) and get email addresses as needed.

Other Topics

Any additional site preparation to be completed by customer prior to setup

Underground material needs to be taken into account for site preparation.

Other Activities: Discuss AST site activities that will be ongoing during the AST set up. Select personnel will be aware and courteous of simultaneous operations at all times. **However, Select prefers very limited, if any, simultaneous operations near AST during set-up phase.**

Follow Up

After customer meeting, Select will document any changes to the AST scope of work, as needed, for the specific AST site and customer requirements in a brief email.

2.3 Site Soil Preparation

Preparation of the soils on site is required to form a dependable base for the AST. **Preparation of the tank pad is solely the responsibility of the customer/operating company.** The key requirements are:

Select requires a minimum soil compaction of 95% compaction. Soil testing results shall be shared with Select. In order to meet industry standards, site preparation requirements must be deemed satisfactory by a Select representative.

Select recommends soil compaction testing to be conducted via Standard Proctor Test (American Society for Testing and Materials {ASTM} Standard D698) or Modified Proctor Test (ASTM Standard D1557).

Compaction test results must be provided to Select prior to the commencement of AST construction.

A proof roll test may be used if observed and documented by qualified Select personnel.

Grade AST footprint and 30 ft work area to 0.25 % or 3" drop per 100 feet, toward sump location.

Site shall be graveled and rolled prior to tank installation, utilizing gravel size 2B or smaller. (3/4" road grade preferred, or coarse sand with minimum thickness of 4 inches).

Do not use crushed rock as sharp edges could puncture the tank liner.

After completion of these steps the tank setup can be approved.

2.4 Pre-Mobilization Onsite Meeting

Select's AST team and customer will conduct a pre-mobilization onsite meeting that documents the customer requirements for the specific pad location and AST system.

2.5 Notifications

Even though the customer or their subcontractor may have already called for utility locates for the sump hole, the AST Manager/Assistant should call the local or state underground utility location service again at least one week in advance before construction/digging begins. Select AST Manager/Assistant should document the ticket or reference number provided by the one-call service.

The following web site has contacts for all the states and provinces.

<http://www.call811.com/state-specific.aspx>. The website link below is provided for smart phones:



Call 811 in United States

2.6 AST Material Deliveries

Once the delivery route and schedule are established and the pre-project onsite inspection is completed, the AST materials can be delivered. Notifications will be made as agreed to during the customer meeting. Select delivery personnel should unload all materials safely and taking care to avoid damage to liners, plates, and all other AST components. They will also stay out of the way of ongoing site activities, and notify the AST Manager/Assistant if site conditions are not suitable for delivery.

Section 3.0 AST Setup

The Crew Leader will fill out the “AST Post Inspection Checklist” during and after the set up of the AST system. The checklist can be found in iScout under forms.

3.1 Job Hazard Analysis (JHA)

A job hazard analysis must be completed on site prior to beginning work. The JHA will be completed following Select approved procedures. Customer’s safety requirements will also be communicated during the JHA. All Select personnel, 3rd party contractors, and customer representatives are expected to participate and sign the JHA when the JHA is completed. Please refer to iScout for the digital JHA.

3.2 Check Soil Condition

Preparation of the tank pad is solely the responsibility of the customer. However, weather and rain/snow events can change the soil conditions quickly. Therefore, Select will check soil compaction prior to setting up the AST.

3.3 Tank Layout

- ☐ Check proposed AST site to confirm a 30’ clear work area around the perimeter of the tank is possible to provide access for equipment and laydown area for AST materials and erection equipment.
- ☐ Check that the minimum distances to existing wells, power lines, etc. are met.
- ☐ Regardless of manufacturer, the minimum footprint should be a circle of at least 24’ or greater than that of the radius of the tank.
- ☐ Establish final location for the suction tube(s) and stairs.

3.4 Equipment (Select provided)

All equipment is subject to daily inspection. (Check condition, rigging, oil, water, fuel and cleanliness.) Here is a list of the recommended equipment needed to set a tank. Actual equipment used will vary among region and specific projects.

- ☐ Two 40’ and/or 60’ extending straight boom man-lifts.
- ☐ 10,000 lb or greater capacity, rough terrain forklift (telehandler).
- ☐ 17,000 pound or greater excavator with bucket and thumb attachment.

- ☐ Skid steer

3.5 Hand Tools Recommended

All hand tools are subject to daily inspection.

- ☐ Two 16' ladders
- ☐ Four 4 lb. sledgehammers
- ☐ 100' or 200' tape measure
- ☐ 1 case of marking paint – minimum
- ☐ Set of wrenches ¼" – 1 ½"
- ☐ Set of sockets ¼" – 1 ½"
- ☐ Two 36" pry bars
- ☐ 8' rock bar (digging bar)
- ☐ Five safety harnesses with retractable tethers (Select owned)
- ☐ Five retractable lanyards
- ☐ 100' of 3/8" rope
- ☐ Duct tape
- ☐ Covered hook bladed knife
- ☐ Three 40' lifting straps (minimum of 5,000 lb capacity)
- ☐ Three 20' 3/8" chains (must have visible certification tags)
- ☐ Two rolling head pry bars
- ☐ 150' strap
- ☐ Two ½" impact guns
- ☐ Two sets of rigging chains
- ☐ Patch tape
- ☐ Rubbing alcohol
- ☐ Patch roller
- ☐ Leather gloves
- ☐ Wire brush or wheel with 4" angle grinder
- ☐ Generator
- ☐ Steel toed rubber boots
- ☐ Fire retardant clothing (FRs)

3.6 AST Tank Setup Steps

- ☐ There must be a Select company representative on site the day prior to setup in order to approve everything for setup.

Tank Layout

- ☐ Determine center of tank and mark with paint. Place a non-abrasive item on the center point; preferably a sandbag. This will be used to find the center of tank after liners have been placed.
- ☐ Measure and double check minimum distance from tank center to existing wells.
- ☐ Measure and paint a line to mark the circumference of tank for panel placement.
- ☐ Also mark the circumference of the liner laid out flat to ensure the liner is properly placed.

Suction Pit

- ☐ Determine where tank suction is to be placed.

- Dig at least 6' wide x 6' long x 24" deep sump hole for the suction tube to set in and taper the edges so there are no sharp corners of the excavation.
- Remove any sharp stones and add at least one layer of geotextile.
- If multiple suction manifolds are required, the sumps should have a minimum of 8' of separation.

Attention!

Barricade any sump pit with appropriate cones, tape, equipment, and/or have a hole watch if left open.

- All tank set-ups will require the use of a Select approved underlayment and liner. Depending on situational factors, 10oz or 16oz geotextile and 30 mil or 40 mil liner will be used. Additionally, multiple layers of each may be installed in both freshwater and produced water situations.
- Check customer specifications and regulatory permit liner and containment requirements for ASTs that may hold produced water.
- The crew walks the entire tank base area to pick up any sharp stones or other sharp debris that could damage the liner.
- Lay out the geo pad prior to the liner.
- Perform a visual inspection of the liner – repair any defects as necessary.
- Place the liner and align to the center of the tank and painted line for the tank walls. The preferred 30 ft area around tank allows the liner to be laid out flat so that fold back can be uniform.
- Secure liner from wind using sand bags.
- Fold the liner toward inside the painted tank edge line to allow placement tank panel walls.

Tank Wall Erection

- Ensure all tank parts and pieces are accounted for.
- Crew Leader will complete a visual inspection of each panel as it is prepared to be placed.
- Stand the first tank panel in place and secure it with the excavator bucket with thumb attachment. Keep connected to the excavator until the last panel is being set.
- Monitor equipment and first panel closely to ensure they remain stable, especially during higher wind situations.
- Begin placing the remaining panels in place.

- Personnel secured on man lift or using a ladder (depending on customer policies) then secure the panels in place with 4 pins each (for pin tanks) or (for plate tanks) with the connecting plates and lug busses, secured with chained cotter pins. Bolt tanks are connected using 1" diameter bolts.

ATTENTION: Proper hand and foot placement is crucial when connecting AST panels. Keep hands and feet a safe distance from pinch points. Discuss where these pinch points are located when reviewing the JHA. Proper ergonomics is required. Keep the joints in mid-range; i.e. palms are located between waist and shoulders. Create an awareness that never goes away and designate one individual to enforce the awareness when setting panels.

- Roll up excess geo pad into minimum 6" diameter cylinders around the inside of the tank ring to help support the liner at the base of the tank wall as the tank is being filled.
- Prior to lifting liner into place against inside panel, add geo strips over all panel gaps for plate and bolt type tanks.
- Prior to covering sump with the geo pad or liner, confirm sump excavation has smooth sides and corners, and that no sharp stones are present.

Liner Placement and Securing Top with Clamps

- After 4 or 5 panels are set, and all liner protection as described above is in place, unfold the liner in sections, toward the base of each panel, making sure the rolled up geo pad will provide padding at the base of the inside of each panel.
- Crew of 2 inside the tank wall unfolds and pulls the liner toward each panel (final connection of last panel will not be made until all liner to that point is pulled and secured to avoid confined space, all personnel must be out of tank before walls are closed). Working in small liner sections, this inside crew works with a crew of 2 on a man lift located outside and above each tank panel to pull the liner edge up and over the top of each panel. The man lift crew lifts the liner edge using ropes/straps gently lowered and attached (by the inside crew). The man lift crew lifts a small liner section to the top of the panel and folds it over the top of the panel, being sure there is enough slack in the liner inside the panel wall.

ATTENTION: Never place hands on the railing of the man basket that faces the AST panel. Proper hand placement would be the side or back rail.

- Once a section of liner is positioned properly (with liner slack inside the tank) and over the top of each panel wall, the man lift crew secures the top of the liner with clamps. (Tools in basket secured with tool lanyards) NOTE: A minimum of 5 clamps or more are required at the top of each tank panel to secure the liner. Add additional clamps as needed to secure liner.
- Both inside and man lift crews continue this process, working around the tank, one or two panels at a time, until the entire liner is in place.
- NOTE: The crew must allow sufficient slack in the liner at the wall to allow for liner movement during filling and draining.

Stairs, Fill Tubes, and Suction Tubes

- Install safety stair system, fill tubes, and suction tubes. Ensure that stair system and tubes are appropriately secured to the tank walls with 2" ratchet straps or 3/8" chains and ratchet binders.

Final Steps, Filling, and Inspection

- Close final panel and secure with pins, plates, or bolts as needed.
- Trim liner and allow approximately 3' of liner to hang over edge of tank.
- Secure liner with sufficient clamps and be sure a 2" seatbelt strap (supplied with liner) is installed around the cut

edge of liner on the outside of tank. Pull tight with a ratchet.

- ☐ Inspect all connections and equipment, confirming at least 5 liner clamps (or more as needed) are in place on top of each panel.
- ☐ Have a minimum of 24 inches of water put in the tank to hold liner in place.
- ☐ Fill tank and monitor.
- ☐ Perform periodic inspections of the tank to ensure everything is in proper working order.
- ☐ Every time a tank is fully emptied and refilled, an inspection must be performed.
- ☐ Visibly inspect all tank panels and stairs for cracking, dents, burrs on the inside of the panels, chipping paint on welds or sharp edges on panels.
- ☐ Look for any cracked or broken valves, damage on pipes and tubes, missing D-Rings, damage to chains or ratchets, and bent clips.
- ☐ Pay close attention to hinge plates for chipping paint and cracking.
- ☐ Water should not go below 12 inches at the LOWEST level in the tank. (Mark liner as a caution).

Section 4.0 AST Operation

4.1 Inspections and Monitoring

AST Operation Phase includes periodic AST monitoring, leak detection, and identifying potential hazards that may have developed, change on-site conditions or tank use. If the tank is drained, it should be secured from wind impacts and the liner inspected and re-positioned (to provide sufficient slack during filling) prior to refilling. Specifically, it may be necessary to rearrange the liner folds at the walls prior to refilling if the wind has shifted the liner folds when the tank was empty.

If changes are noted, they should be communicated to the Select AST Manager/Assistant Manager.

CAUTION – If conditions are observed that could indicate an imminent tank failure, clear the area immediately. Advise others in the vicinity to do so also and contact the customer to drain the tank.

4.2 Initial Leak Detection and Liner Repair

In the event of a leak in the tank due to a hole in the liner, the following steps should be followed.

- ☐ If there is a question that it is in fact a leak from the AST, a dye test or a pH balance test may need to be performed on both the water in the tank and on the ground using approved dye or a properly calibrated pH meter. Third party test results are recommended.
- ☐ If the leak is found to be coming from the tank, narrow down from which panel the leak is originating.
- ☐ Use a strap or rope to mark the point where the water is coming out of the tank.
- ☐ Determine if the water is coming out high or low on the tank.
- ☐ Locate the puncture or hole in the liner.
- ☐ Empty the tank to the point of damage in liner if necessary.
- ☐ Clean area of liner that needs to be repaired.
- ☐ Cut out piece of material (patch or tape) to overlay liner.
- ☐ Either weld the patch to the injured area in the liner or stick the tape (2 types – dry or underwater) over the leak.
- ☐ Make sure puncture is completely covered.
- ☐ Monitor as needed.

Section 5.0 AST Breakdown

The AST breakdown follows the reverse order of the setup steps presented in Section 3.0 above. The sump will be filled in with the same material taken out during excavation.

The customer is responsible for draining and disposing of all liquids and residual solids that have accumulated in the tank. Additionally, the customer is responsible for proper off site management or recycling of the liner and geo pad materials, and final grading and/or reclamation of AST site.

The Crew Leader will perform a visual inspection of AST panels and accessories for defects.

Attachment 1



Above-Ground Storage Tank (AST) Reference Chart

Pin Style Panels

| | Panels | D (ft) | R(ft) | Trim Line (R+18') | Top of Wall (R+13') | Total V (bbls) | 2' FB (bbls) | bbls/in | bbls/ft | Liner Size | Geo Size |
|--|--------|---------|--------|-------------------|---------------------|----------------|--------------|---------|---------|-------------|-------------|
| 9600k 20.08' Width 12'4" Height 5040lbs | 12 | 76.7' | 38.35' | 56.35' | 51.35' | 10151.32 | 8505.16 | 68.59 | 823.08 | 118' x 118' | 98' x 98' |
| | 13 | 83.09' | 41.55' | 59.55' | 54.55' | 11915.83 | 9983.24 | 80.51 | 966.12 | 124' x 124' | 104' x 104' |
| | 14 | 89.48' | 44.74' | 62.74' | 57.74' | 13819.07 | 11577.88 | 93.37 | 1120.44 | 130' x 130' | 110' x 110' |
| 24k 18.77' Width 12' 4" Height 5040lbs | 20 | 119.5' | 59.75' | 77.75' | 72.75' | 24646.95 | 20649.72 | 166.53 | 1998.36 | 160' x 160' | 140' x 140' |
| | 22 | 131.45' | 65.76' | 83.76' | 78.76' | 29822.81 | 24986 | 201.5 | 2418 | 172' x 172' | 152' x 152' |
| | 23 | 137.43' | 68.72' | 86.72' | 81.76' | 32597.98 | 27312.24 | 220.26 | 2643.12 | 178' x 178' | 158' x 158' |
| | 24 | 143.4' | 71.7' | 89.7' | 84.7' | 35491.62 | 29736.44 | 239.81 | 2877.72 | 184' x 184' | 164' x 164' |
| 40k 17.46' Width 12' 4" Height 5040lbs | 24 | 153' | 76.5' | 94.5' | 89.5' | 40402.69 | 33850.9 | 272.99 | 3275.88 | 193' x 193' | 173' x 173' |
| | 28 | 178' | 89' | 107' | 102' | 54316.00 | 45508.00 | 367.99 | 4415.93 | 218' x 218' | 198' x 198' |
| | 30 | 193' | 96.5' | 114.5' | 109.5' | 62000.00 | 50270.27 | 418.91 | 5027.02 | 233' x 233' | 200' x 200' |

Plate Style Panels

| | Panels | D (ft) | R(ft) | Trim Line (R+18') | Top of Wall (R+13') | Total V (bbls) | 2' FB (bbls) | bbls/in | bbls/ft | Liner Size | Geo Size |
|---|--------|---------|---------|-------------------|---------------------|----------------|--------------|---------|---------|-------------|-------------|
| 9k (T) 32.72' Width 12'2" Height 5480lbs | 7 | 73' | 36.5' | 54.5' | 49.5' | 9056.00 | 7457 | 62.9 | 754.7 | 113' x 113' | 93' x 93' |
| | 8 | 84' | 42' | 60' | 55' | 11843.55 | 9869.62 | 82.2 | 986.96 | 124' x 124' | 104' x 104' |
| 18k (P) 32.72' Width 12' 2" Height 5310lbs | 9 | 94.58' | 47.29' | 65.29' | 60.29' | 15014.88 | 12512.4 | 104.27 | 1251.24 | 135' x 135' | 115' x 115' |
| | 10 | 105' | 52.5' | 70.5' | 65.5' | 18427.0 | 15356.0 | 128 | 1535.6 | 145' x 145' | 125' x 125' |
| | 11 | 115.6' | 57.8' | 75.8' | 70.8' | 22430.0 | 18692.08 | 155.77 | 1869.21 | 156' x 156' | 136' x 136' |
| 26.5k-41k (A) 32.72' Width 12' 2" Height 6500lbs | 12 | 126' | 63' | 81' | 76' | 26660.57 | 22216.8 | 185.14 | 2221.67 | 166' x 166' | 146' x 146' |
| | 13 | 136.62' | 68.31' | 86.31' | 81.31' | 31329.39 | 26107.83 | 217.57 | 2610.78 | 177' x 177' | 157' x 157' |
| | 14 | 147.13' | 73.565' | 91.565' | 86.565' | 36340.00 | 30283.33 | 252.36 | 3028.33 | 188' x 188' | 168' x 168' |
| | 15 | 157' | 78.5' | 96.5' | 91.5' | 41382.0 | 34485.0 | 287.40 | 3448.5 | 197' x 197' | 177' x 177' |
| | 16 | 168.15' | 84.075' | 102.075' | 97.075' | 47464.49 | 39553.74 | 329.61 | 3955.37 | 209' x 209' | 189' x 189' |
| | 18 | 188.6' | 94.3' | 112.3' | 107.3' | 59721.00 | 49774.00 | 415.08 | 4976.75 | 229' x 229' | 209' x 209' |

Variances and/or Equivalency Demonstrations for Above Ground Steel Tank Modular Recycling Storage Containments

- **Slope and Anchor Trench**
- **Freeboard**
- **40 mil LLDPE for Primary and Secondary Liners**
- **Applicability of Variances for Modular AST
Containments in the Permian Basin of New Mexico**

***Slope and Anchor Variance Request for Above Ground
Steel Tank Modular Recycling Storage Containments***

STATEMENT EXPLAINING WHY THE APPLICANT SEEKS A VARIANCE FOR SLOPE AND ANCHOR FOR MODULAR STEEL AST CONTAINMENT

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 NMAC 19.15.34.12.

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT:

A. An operator shall design and construct a recycling containment in accordance with the following specifications.

(2) A recycling containment shall have a properly constructed foundation and interior slopes consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. Geotextile is required under the liner when needed to reduce localized stress-strain or protuberances that otherwise may compromise the liner's integrity. *The operator shall construct the containment in a levee with an inside grade no steeper than two horizontal feet to one vertical foot (2H:1V). The levee shall have an outside grade no steeper than three horizontal feet to one vertical foot (3H:1V).* The top of the levee shall be wide enough to install an anchor trench and provide adequate room for inspection and maintenance.

(3) Each recycling containment shall incorporate, at a minimum, a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. *The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.*

The applicant requests a variance to prescribed slope and anchor in the setting of above ground modular steel containments.

With respect to storage of produced water for use in lieu of fresh water, Rule 34 is written for earthen, lined pits, not free-standing modular impoundments that employ liners as their primary fluid containment system. A modular impoundment consists of a professionally designed steel tank ring with vertical walls. There is no slope to consider as the segmental steel sections are set vertical.

There is no anchor trench as envisioned by the Rule, liners are anchored to the top of the steel walls with clips, no anchor trench is required.

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

The following technical memorandum provides supportive data to demonstrate equal or better protection of fresh water, public health and the environment by providing the requisite containment and protection.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: Slope and Anchor Trench Variance for Above Ground Steel Modular Containments

NMAC 19.15.34.12 A (2), (3)

Side Slope

The design of soil side slope (inclination) is a geotechnical engineering design consideration. Liquid impoundments such as fresh water or process water containments are usually built within an excavation or with raised earthen embankments. For a liquid impoundment with an exposed liner system, the slope soils and construction dictate slope inclination and very detailed slope stability analysis may be required to determine if slope failure within the embankment will occur once loaded with impounded water. Slope failure may also occur during construction or when the impoundment is empty. A maximum slope is usually specified and is dependent on soil type and cohesive strength, saturated or unsaturated conditions, etc. Detailed analysis for slope stability can be found in "Designing with Geosynthetics" by R.M Koerner as well as many geotechnical books.

A modular impoundment, on the other hand, consists of a professionally designed steel tank ring with vertical walls. *There is no slope to consider as the segmental steel sections are set vertical.* Design of steel tanks, in regard to hydrostatic loading, wind loading, seismic loads, etc. are thoroughly referenced with detailed procedures in the design code - American Petroleum Institute (API) 650-98 "Welded Steel Tanks for Oil Storage". *There are no requirements for maximum slope inclination other than perhaps 90 degrees or vertical wall.*

Anchor Trench

All earthen impoundments with a geomembrane lining system require some form of top of slope anchor, the most common of which is an excavated and backfilled anchor trench usually set back at least 3 ft from the top of slope. Again, there are detailed procedures for anchor trench design in "Designing with Geosynthetics" by R.M Koerner.

A Modular Impoundment requires mechanical anchoring of the geomembrane at the top of the vertical steel wall using standard liner clips that prevent the geomembrane or geomembrane layers from slipping down the side wall. These are detailed in the Tank Installation Manual. *There are no requirements for an "anchor trench" as this is not an in-ground impoundment.*

In summary, based on the design and specifications of a modular steel impoundment, there is no requirement for a maximum interior slope angle of 2H:1V due to the fact that this impoundment is a steel tank with vertical walls. Additionally, there is no requirement for an anchor trench as the geomembrane is attached to the top of the Modular Impoundment vertical walls with large steel clips. This provides the requisite protection of fresh water, public health and the environment for many years.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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,

R K Frobel

Ronald K. Frobel, MSCE, PE



References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

American Petroleum Institute (API) 650-98 "Welded Steel Tanks for Oil Storage"

Koerner, R.M., 2005 "Designing With Geosynthetics" Prentice Hall Publishers

Attachments:

R. K. Frobel C.V.

***Freeboard Variance Request for Above Ground Steel Tank
Modular Recycling Storage Containments***

STATEMENT EXPLAINING WHY THE APPLICANT SEEKS A VARIANCE FOR FREEBOARD FOR MODULAR STEEL AST CONTAINMENT

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 NMAC 19.15.34.13

19.15.34.13 OPERATIONAL REQUIREMENTS FOR RECYCLING CONTAINMENTS:

B. The operator shall maintain and operate a recycling containment in accordance with the following requirements.

(2) The operator *shall maintain at least three feet of freeboard at each containment.*

The applicant requests variance to allow for a freeboard of 2 feet as opposed to the prescribed 3 feet in the setting of an above ground steel tank modular system.

Rule 34 did not take into consideration above ground steel tank modular containment systems. With respect to lined earthen impoundments that may hold 25-acre feet of produced water, a 3-foot freeboard stipulation makes sense. For example, wave action and other factors could focus stress on the upper portion of the levee or the liner system in these large impoundments. The smaller diameter steel tank (modular impoundment) does not share the same characteristics as these large earthen pits.

We believe 3-feet of freeboard is not necessary – especially during active hydraulic stimulation of wells when maximum storage volume provides the highest value. Moreover, meeting the 3-foot freeboard requirement at all times significantly reduces the storage capacity of a single modular impoundment – negatively impacting the economics of using produced water in lieu of fresh water for E&P activities.

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

The attached technical memorandum by Ron Frobels, PE, describes how the proposed 2-foot freeboard limit in the permit application for the modular impoundment provides the same protection afforded by the 3-foot freeboard mandate for a large earthen pit. The attached equations and supporting email from Mr. Jason Henderson, PE, shows that a 2-foot freeboard limit on the steel impoundment meets the manufacturer's design criteria.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

**Freeboard Requirements for Above Ground Steel Tank Modular
Recycling Storage Containments**

NMAC 19.15.34.13 B (2)

Liquid impoundments such as fresh water or process water containments are usually built within an excavation or with raised earthen embankments. For a liquid impoundment with an exposed liner system, the slope soils and construction dictate slope inclination and very detailed slope stability analysis may be required to determine if slope failure within the embankment will occur once loaded with impounded water. Freeboard or the vertical height between the maximum water surface elevation and the top of slope is important for earthen impoundments. Specified freeboard requirements take into consideration high precipitation events and prevent wave run-up on slopes that result in over-topping and potential saturation of embankments. This is particularly important on large earthen impoundments. Detailed design considerations including freeboard requirements for lined earthen impoundments can be found in "Designing with Geosynthetics" by R.M Koerner as well as other publications on reservoir design.

A modular impoundment, on the other hand, consists of a professionally designed steel tank ring with vertical walls. There is no slope to consider as the segmental steel sections are set vertical. Design of steel tanks as regards hydrostatic loading, wind loading, seismic loads, etc. are thoroughly referenced with detailed procedures in the design code - American Petroleum Institute (API) 650-98 "Welded Steel Tanks for Oil Storage". There are requirements for operational freeboard to prevent over-topping but due to the relatively small surface area and fetch of cylindrical tanks, wave heights are much less than large earthen impoundments. Thus, freeboard is usually within the range of 0.5 to 2 ft. I have reviewed the Tank Design Calculation Summary and regarding the structural stability of the tank walls, a freeboard of 0.5 ft was assumed. Thus, the variance request of 2.0 ft for a Modular Impoundment is well within the Tank Design requirements.

In summary, it is my professional opinion that the design freeboard of 2.0 ft will provide requisite storage volume and prevent overtopping due to wind and wave action, potential seismic events and high precipitation.

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,

R K Frobel

Ronald K. Frobel, MSCE, PE

References:

NMAC 19.15.34.13 OPERATIONAL REQUIREMENTS FOR RECYCLING CONTAINMENTS



R.K. FROBEL & ASSOCIATES
Consulting Engineers

American Petroleum Institute (API) 650-98 "Welded Steel Tanks for Oil Storage"

Koerner, R.M., 2005 "Designing With Geosynthetics" Prentice Hall Publishers

Attachments:

R. K. Frobel C.V.

The modular impoundment is designed for use with fluids that are 8.34 pounds/gallon (62.4 pounds per cubic foot) or lighter. Exceeding this specification for fluid weight at full tank capacity (12') could lead to failure at the connection plate(s).

Assuming a freeboard of 0.5 ft (minimum modular impoundment freeboard requirement) the Hydro Pressure (p) of water is 718 pounds per square foot (psf), where

$$\begin{aligned}
 p &= \text{Design Density} \times \text{Height} \\
 &= 62.4 \text{ PCF} \times 11.5 \text{ ft} \\
 (\text{design density} &= 8.34 \frac{\text{lb}}{\text{gal}} \times 7.48 \frac{\text{ft}^3}{\text{gal}})
 \end{aligned}$$

The density of the conditioned produced water is 9.3 pounds/gallon. Assuming a freeboard of 3-ft (19.15.17.12.F(3) NMAC) , the Hydro Pressure (p) of conditioned produced water is 626 psf, where

$$\begin{aligned}
 p &= \text{Design Density} \times \text{Height} \\
 &= 69.64 \text{ PCF} \times 9 \text{ ft} \\
 (\text{design density} &= 9.3 \frac{\text{lb}}{\text{gal}} \times 7.48 \frac{\text{ft}^3}{\text{gal}})
 \end{aligned}$$

Using conditioned produced water with the Pit Rule freeboard requirements of 3-feet results in a Hydro Pressure 92 psf less than the engineered design.

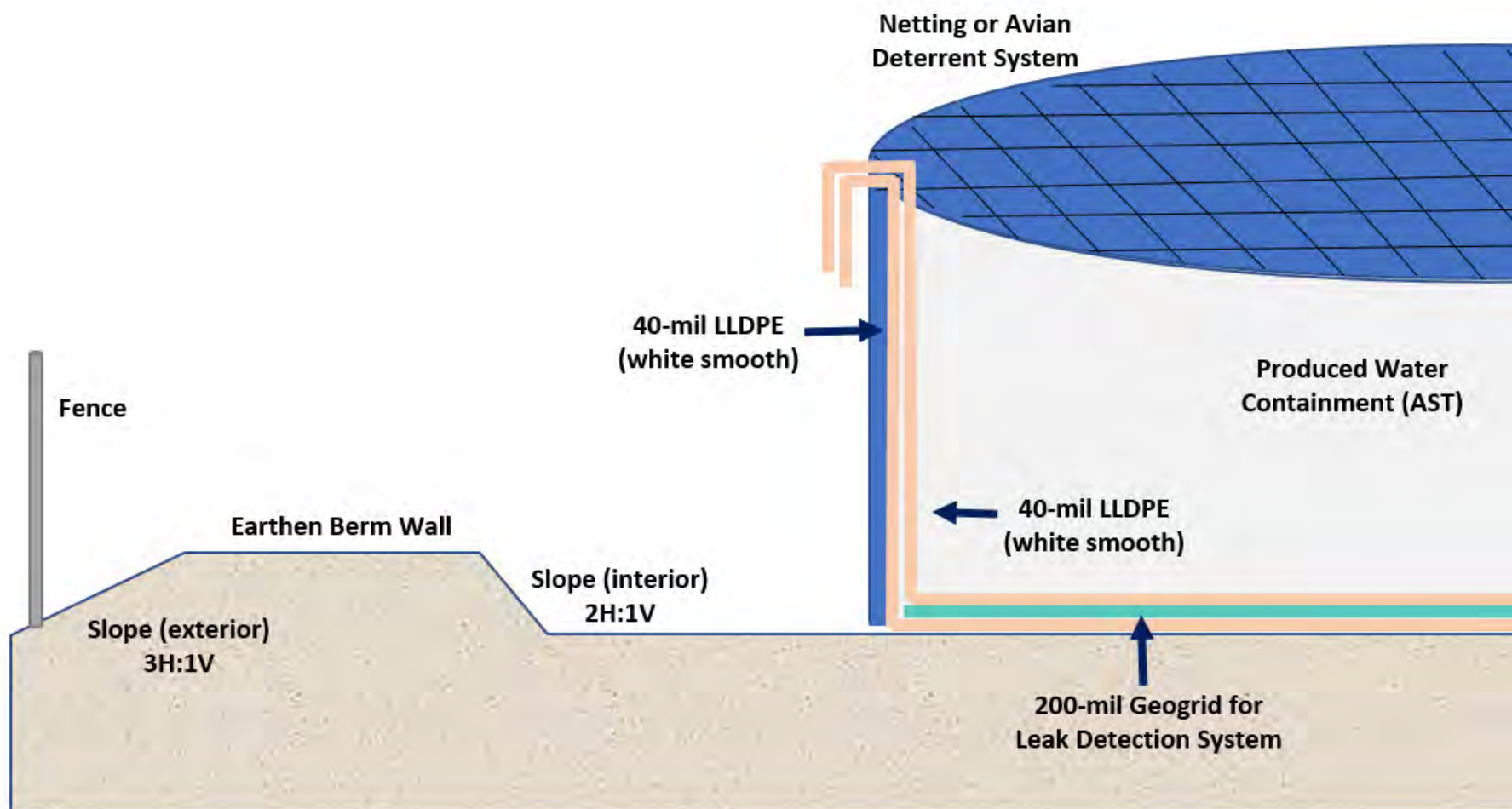
The operator asks the District Division to allow for a 2-foot freeboard, which yields a Hydro Pressure (p) of 696.4 psf, where

$$\begin{aligned}
 p &= \text{Design Density} \times \text{Height} \\
 &= 69.64 \text{ PCF} \times 10 \text{ ft} \\
 (\text{design density} &= 9.3 \frac{\text{lb}}{\text{gal}} \times 7.48 \frac{\text{ft}^3}{\text{gal}})
 \end{aligned}$$

March 2020

**Variances and/or Equivalency Demonstrations for
Above Ground Steel Tank Modular Recycling
Storage Containments (AST) Primary and
Secondary Liners**

Two 30-mil Non-reinforced LLDPE Liner as Alternate Primary Liner and 40-mil LLDPE as Secondary Liner for Above Ground Steel Tank Modular Recycling Storage Containments



R.T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW Suite F142 Albuquerque, NM 87104
Office Ph: 505.266.5004

AST Schematic

Typical Mustang-Extreme AST

Plate 1

June 2019

STATEMENT EXPLAINING WHY THE APPLICANT SEEKS A VARIANCE FOR TWO 30 MIL LLDPE NON-REINFORCED GEOMEMBRANES AS AN ALTERNATIVE PRIMARY LINER AND 40-MIL LLDPE NON-REINFORCED GEOMEMBRANE AS AN ALTERNATIVE SECONDARY LINER FOR MODULAR STEEL AST IMPOUNDMENT

The prescriptive mandates of the Rule that are the subject of this variance request are the following subsections of NMAC 19.15.34.12

NMAC 19.15.34.12 A DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

(4) All primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. *All primary liners shall be 30-mil flexible PVC, 45-mil LLDPE string reinforced or 60-mil HDPE liners.* Secondary liners shall be 30-mil LLDPE string reinforced or equivalent with a hydraulic conductivity no greater than 1×10^{-9} cm/sec. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

The applicant proposes that two 30 mil LLDPE non-reinforced geomembranes will provide a primary liner system the is equal to or better than a single 60 mil HDPE, 30 mil PVC or 45 Mil reinforced LLDPE liner as prescribed in the Rule and a 40-mil LLDPE non-reinforced geomembrane is equivalent to the 30-mil LLDPEr liner described in the text of the Rule.

Rule 34 did not consider Above Ground Steel Storage Tanks that employ liners as a primary or secondary containment method. Due to the vertical steel walls, 60-mil HDPE, 45-mil LLDPE string reinforced and 30-mil flexible PVC primary liners are not sufficiently flexible for use in these modular containments.

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

The following technical documents provide supportive data to demonstrate equal or better protection of fresh water, public health and the environment by providing the requisite containment and protection. Technical comparison of the proposed material is compared to what is advised through Rule 34 is discussed. A second memorandum provides clarification that the engineering requirements for site preparation, which ensures functionality of the liner system, is crosscutting to varied locations within the Permian Basin. Siting criteria and stamped plans from design engineer confirm applicability of this liner system to this specific site.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: 30 mil and 40 mil LLDPE Geomembranes as Alternative Primary/Secondary Liner System in a Modular Steel AST Recycling Containment
NMAC 19.15.34.12 A (4)

In consideration of the lining system application for Above Ground Modular Steel Impoundment (AST), size and depth of the impoundment, design details for modular tanks as well as estimated length of up to five years of service time, it is my professional opinion that two 30 mil LLDPE geomembranes with geonet and 40 mil LLDPE base liner will provide the requisite barrier against processed water loss. *The two 30 mil LLDPE liners and 40 mil base liner will function equal to or better than 60 mil HDPE, 30 mil PVC or 45 mil LLDPE (primary) and 30 mil LLDPE string reinforced (secondary) as a primary/secondary liner system.* The following are discussion points that will exhibit the attributes for using two 30 mil LLDPE geomembranes when used as the primary and a 40 mil LLDPE as the secondary lining system:

The nature and formulation of LLDPE resin is very similar to HDPE. The major difference is that LLDPE is lower density, lower crystallinity (more flexible and less chemical resistant). LLDPE will, however, resist aging and degradation and remain intact for many years in exposed conditions. Although the lifetime of LLDPE in covered conditions (i.e., secondary liner) will be somewhat reduced with respect to HDPE, a secondary liner of LLDPE will outlast an exposed HDPE liner. In fact, according to the Geosynthetic Research Institute (GRI) study on lifetime prediction (GRI Paper No. 6), the half-life of HDPE (GRI GM 13) exposed is > 36 years and the half-life of LLDPE (GRI GM 17) exposed is approximately 36 years. It is understood that in order to ensure compliance of materials, 60 mil HDPE must meet or exceed GRI GM 13. Likewise, the primary or secondary liner must meet or exceed GRI GM 17 for non-reinforced LLDPE. Adhering to the minimum requirements of the GRI Specifications, two 30 mil LLDPE geomembranes when used as a primary and a 40 mil LLDPE as a secondary liner system will be equally as protective as a 60 mil HDPE liner primary and 30 mil LLDPE string reinforced secondary.

Flexibility Requirements. 30 and 40 mil LLDPE geomembranes are less stiff and far more flexible than HDPE or 45 mil reinforced LLDPE and in this regard are preferred for installations in vertical wall tanks (AST). LLDPE provides a very flexible sheet that enables it to be fabricated into large panels, folded for shipping and installed on vertical walls transitioned to flat bottom. LLDPE will conform to the tank dimensions under hydrostatic loading.

Thermal Fusion Seaming Requirements. Thermal seaming and QC seam test requirements for geomembranes are product specific and usually prescribed by the sheet manufacturer. Both dual wedge and single wedge thermal fusion welding is commonly used on LLDPE and QC testing by air channel (ASTM D 5820) or High Pressure Air Lance (ASTM D 4437) is fully acceptable and recognized as industry standards. In this regard, there should be no exception or recommended practice for seaming and QC

R.K. FROBEL & ASSOCIATES
Consulting Engineers

testing in the OCD rules. This would be fully covered in comprehensive specifications for both the Primary and Secondary geomembranes that would be reviewed by OCD.

Potential for Leakage through the Primary Liners. Leakage through geomembrane liners is directly a function of the height of liquid head above any hole or imperfection. The drainage media provides immediate drainage to a low point or outside the Modular Impoundment and thus no hydrostatic head or driving gradient is available to push leakage water through a hole. In this regard, secondary geomembrane materials can be (and usually are) much less robust in both thickness and polymer type.

Leakage through any Primary geomembrane is driven by size of hole and depth and will be detected by the increase of wastewater in the drainage system and the volume being pumped out of the secondary containment. In this regard and for this variance, the AST liner system consists of 2 layers of 30 mil LLDPE geomembrane on the tank walls which will outperform a single layer of HDPE or LLDPE for potential leakage. Thus, if a leak occurs through the top layer, it will be effectively contained by the second layer and drained via the geonet drainage media. If required, location of holes in the Primary can be found by Electrical Leak Location Survey (ELLS) using a towed electrode (ASTM D 7007). Holes found can then be repaired and thus water seepage into the Secondary will be kept to a minimum. Dependent on OCR requirements for Action Leakage Rate (ALR), the leakage volumes may only be monitored. For example, a typical ALR is < 20 gpad whereas a rapid and large leak (RLL) may be > 100 gpad. Most states specify maximum ALR values for wastewater impoundments usually in the range of 100 to 500 gpad. However, New Mexico does not specify any ALR for wastewater impoundments (GRI Paper No. 15).

HDPE cannot be prefabricated into large panels and thus 30 and 40 mil LLDPE offers the following for Primary and Secondary Liners in AST Modular Containment:

- Prefabrication in factory-controlled conditions into very large panels (up to 35,000 sf) results in ease of installation, less or no thermal fusion field seams and less on site QC and CQA.
- Large prefabricated panels of LLDPE will provide better control of thermal fusion welding in a factory environment that will improve the liner system integrity for the long term.
- The LLDPE geomembrane provides superior flexibility, lay flat characteristics and conformability which allows for more intimate contact with the underlying drainage media and tank walls.
- Two layers of the 30 mil LLDPE provide redundancy. Additionally, the bottom layer and geonet provides protection for the top layer during installation as well reduction in leakage due to pinholes (no driving head on the lower 30 mil liner)

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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

In summary, it is my professional opinion that the double 30 mil LLDPE geomembrane with geonet as well as 40 mil LLDPE base liner will provide a Primary and Secondary liner system that is equal to or better than a single 60 mil HDPE, 30 mil PVC or 45 mil reinforced LLDPE liner (primary liner) and 30 mil LLDPE string reinforced (secondary liner) and will provide the requisite protection of fresh water, public health and the environment for many years.

If you have any questions on the above technical memorandum or require further information, give me a call at 720-289-0300 or email geosynthetics@msn.com

Sincerely Yours,

RK Frobel

Ronald K. Frobel, MSCE, PE

References:

C-147 Supplemental Information
Chisholm Energy AST Impoundment
Prepared by Hicks Consultants

Title 19, Chapter 15, Part 34 NMAC (2015 Revision)

Geosynthetic Research Institute (GRI) Published Standards and Papers 2018

ASTM Standards 2020

Attachments:

R. K. Frobel C. V.

January 2020

***Applicability of Variances for Modular AST Containments
in the Permian Basin of New Mexico***

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: Applicability of Variances for Modular AST Containments in the Permian Basin of New Mexico
NMAC 19.15.34.12 A (2)

I have reviewed the most recent historical variances for AST Containments in the document titled "Variances for C-147 Registration Packages Permian Basin of New Mexico" (January 2020) and examined the applicable design drawings and permits for the following modular AST containments located in the Permian Basin of New Mexico.

- C-147 Registration Package for Myox Above Ground Storage Tank Section 32, T25S, R28E, Eddy County (January 20, 2020)
- C-147 Registration Package for Fez Recycling Containment and Recycling Facility Area (100+ acres) Section 8, T25-S, R35-E, Lea County, Volume 2 – Above-Ground Storage Tank Containments
- Hackberry 16 Recycling Containments and Recycling Facility Section 16, T19S, R31E, Eddy County

Locations of the modular containments range from west of the Pecos River to slightly west of Jal, NM. All locations exhibit different surface and subsurface geology, different topography and are of various sizes and volumes. *However, in regard to structural integrity of the base soils that support the AST and in particular the geomembrane containment system, the specification requirements are the same.* The foundation soils must be roller compacted smooth and free of loose aggregate over ½ inch. Compaction characteristics must meet or exceed 95% of Standard Proctor Density in accordance with ASTM D 698. This specification requirement is specific and causes the general or earthworks contractor to meet this standard regardless of the site- specific geology or topography. Provided that the design drawings and associated specifications call out the minimum requirements for subsoils compaction (i.e., 95% Standard Proctor Density – ASTM D 698), the design engineer or owners representative will carry out soils testing on the foundation materials to provide certainty to the AST containment owner that the earthworks contractor has met these obligations.

Thus, provided that the contractor meets the minimum specified requirements for foundation soils preparation and density, the location, geology or depth to groundwater will make no difference in regard to geomembrane liner equivalency as demonstrated by the AST variances presented in this volume and are considered valid for meeting NMOCD Rule 34 requirements for all locations within the Permian Basin of New Mexico.

If you have any questions on the above technical memorandum or require further information, give me a call at 720-289-0300 or email geosynthetics@msn.com

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Sincerely Yours,

R.K. Frobel

Ronald K. Frobel, MSCE, PE

References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A
RECYCLING CONTAINMENT

ASTM Standards 2019



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
Fabricated Geomembrane Institute (FGI) – Board of Directors
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

RONALD K. FROBEL, MSCE, P.E.

Page 2

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, geo-environmental 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 worldwide applications.

RONALD K. FROBEL, MSCE, P.E.

Page 3

U.S. Bureau of Reclamation, Denver, Colorado: As technical specialist, responsibilities included directing laboratory research, design and development investigations into geosynthetics and 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 liaison for many construction projects including additions to power plants, construction of substations, erection of fuel oil pipelines 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:

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Additional VARIANCE FOR RECYCLING STORAGE CONTAINMENTS (Inground and AST)

- **Alternative Testing Methods**

Request for OCD Approval of Alternative Test Methods to Analyze Concentrations of TPH and Chloride

The prescriptive mandates of the Rule that are the subject of this request are the following subsections of NMAC 19.15.17.13 [emphasis added], 19.15.34.14 and 19.15.29. 12 D

19.15.17.13 CLOSURE AND SITE RECLAMATION REQUIREMENTS:

D.(5) The operator shall collect, at a minimum, a five point composite of the contents of the temporary pit or drying pad/tank associated with a closed-loop system to demonstrate that, after the waste is solidified or stabilized with soil or other non-waste material at a ratio of no more than 3:1 soil or other non-waste material to waste, the concentration of any contaminant in the stabilized waste is not higher than the parameters listed in Table II of 19.15.17.13 NMAC.

The referenced Table II, which is reproduced in part below, notes the Method with asterisk signifying: “*Or other test methods approved by the division”.

| Table II Closure Criteria for Burial Trenches and Waste Left in Place in Temporary Pits | | | |
|---|-------------|----------------------------|--------------|
| Depth below bottom of pit to groundwater less than 10,000 mg/l TDS | Constituent | Method* | Limit** |
| 25-50 feet | Chloride | EPA Method 300.0 | 20,000 mg/kg |
| | TPH | EPA SW-846 Method 418.1 | 100 mg/kg |

19.15.34.14 CLOSURE AND SITE RECLAMATION REQUIREMENTS FOR RECYCLING CONTAINMENTS:

C. The operator shall test the soils beneath the containment for contamination with a five-point composite sample which includes stained or wet soils, if any, and that sample shall be analyzed for the constituents listed in Table I below.

(1) If any contaminant concentration is higher than the parameters listed in Table I, the division may require additional delineation upon review of the results and the operator must receive approval before proceeding with closure.

The referenced Table I, which is reproduced in part below, notes the Method with asterisk signifying: “*Or other test methods approved by the division”.

| Table I Closure Criteria for Recycling Containments | | | |
|---|----------------------|----------------------------|--------------|
| Depth below bottom of containment to groundwater less than 10,000 mg/l TDS | Constituent | Method* | Limit** |
| 51 feet - 100 feet | Chloride | EPA 300.0 | 10,000 mg/kg |
| | TPH (GRO+DRO+MRO) | EPA SW-846 Method 8015M | 2,500 mg/kg |

After sampling solids of more than 50 drilling pits in the Permian Basin, we have observed and reported to OCD on numerous occasions significant problems with non-petroleum drilling additives (e.g. starch) interfering with the laboratory method 418.1. It is not surprising that in many instances we found no correlation between the laboratory results using 418.1 and the results using Method 8015.

We request approval of Method 8015 (GRO + DRO + MRO) for Method 418.1.

19.15.29.12 D. CLOSURE REQUIREMENTS. The responsible party must take the following action for any major or minor release containing liquids.

(1) The responsible party must test the remediated areas for contamination with representative five-point composite samples from the walls and base, and individual grab samples from any wet or discolored areas. The samples must be analyzed for the constituents listed in Table I of 19.15.29.12 NMAC or constituents from other applicable remediation standards.

The referenced Table I, is reproduced in part below.

| Table I Closure Criteria for Soils Impacted by a Release | | | |
|---|-------------------|----------------------------------|-----------|
| Minimum depth below any point within the horizontal boundary of the release to ground water less than 10,000 mg/l TDS | Constituent | Method* | Limit** |
| ≤ 50 feet | Chloride*** | EPA 300.0 or SM4500 Cl B | 600 mg/kg |
| | TPH (GRO+DRO+MRO) | EPA SW-846 Method 8015M | 100 mg/kg |
| | BTEX | EPA SW-846 Method 8021B or 8260B | 50 mg/kg |
| | Benzene | EPA SW-846 Method 8021B or 8260B | 10 mg/kg |

We request approval of EPA 300.0 or SM4500 for the analysis of chloride.

Demonstration that OCD Approval Will Provide Equal or Better Protection of Fresh Water, Public Health and the Environment

The purpose of TPH analyses in the Pit Rule is to measure total petroleum hydrocarbons not all non-polar compounds, such as starch or cellulose that can interfere with Method 418.1. While Method 418.1 may provide some useful data for transportation of crude oil or condensate spills to disposal, the addition of non-polar organic materials in drilling fluids, especially for horizontal wells, renders Method 418.1 highly problematic to determine compliance with the Rule. Using Method 8015 for TPH (GRO+DRO+MRO) provides a better measurement of what we believe the Commission intended operators to measure.

In hearings before the Oil Conservation Commission technical arguments were presented regarding the use of SM4500 in lieu of EPA 300.00 for chloride analysis for Rule 29. The Division and the Commission agreed that these two methods provide equal or better protection of fresh water, public health and the environment.

Venegas, Victoria, EMNRD

From: Venegas, Victoria, EMNRD
Sent: Wednesday, November 23, 2022 2:03 PM
To: 'Vanessa Lopez'; 'Tim Hilton'; Bill McMann
Cc: r@rthicksconsult.com
Subject: 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138]
Attachments: C-147 1RF-496 - HEISENBERG AST CONTAINMENT.pdf

1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138]. Conditions of Approval.

Good afternoon Ms. Lopez,

NMOCD has reviewed the recycling containment permit application and related documents, submitted by [371682] STEWARD ENERGY II, LLC on November 18, 2022, for 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] in Unit Letter I, Section 03, Township 14S, Range 38E, Lea County, New Mexico. [371682] STEWARD ENERGY II, LLC requested variances from 19.15.34 NMAC for 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138].

The following variances have been approved:

- The variance to 19.15.34.14 NMAC Table I for the use of alternate analytical method 8015/8015M for total petroleum hydrocarbons (TPH) is approved.
- The variance to 19.15.34.14 NMAC Table I for the use of alternate analytical method EPA 300.0 or SM4500 for the analysis of chloride is approved.
- The variance to 19.15.34.12.A.(2) NMAC for the no side-slope requirement for the AST containment with vertical walls is approved.
- The variance to 19.15.34.12.A.(3) NMAC for the liners to be anchored to the top of the AST steel walls and no anchor trenches is approved.
- The variance to 19.15.34.12 A (4) NMAC for the installation on the AST containment of two 30-mil non-reinforced LLDPE as the primary liner system and a 40-mil non-reinforced LLDPE secondary liner with a 200-mil geogrid drainage layer is approved.

The following variance has been denied:

- The variance to 19.15.34.13.B.(2) NMAC for a 2-feet freeboard has been denied. All containments must operate with the 3-feet freeboard as specified by rule.

The form C-147 and related documents for 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] is approved with the following conditions of approval:

- The purpose of this permit is for oil and gas activities regulated under the NMAC 19.15.34.3 STATUTORY AUTHORITY: 19.15.34 NMAC is adopted pursuant to the Oil and Gas Act, Paragraph (15) of Section 70-2-12(B) NMSA 1978, which authorizes the division to regulate the disposition of water produced or used in connection with the drilling for or producing of oil and gas or both and Paragraph (21) of Section 70-2-12(B) NMSA 1978 which authorizes the regulation of the disposition of nondomestic wastes from the exploration, development, production or storage of crude oil or natural gas.
- [371682] STEWARD ENERGY II, LLC shall construct, operate, maintain, close, and reclaim 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] in compliance with NMAC 19.15.34 NMAC.

- 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] is approved for five years of operation from the date of permit application.
- 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] permit expires on November 18, 2027. If [371682] STEWARD ENERGY II, LLC wishes to extend operations past five years, an annual permit extension request must be submitted using an OCD form C-147 through [OCD Permitting](#) by October 18, 2027.
- Water reuse and recycling from 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] consisting of one (1) above ground storage tank (AST) of 60,000 BBL of capacity and (1) above ground storage tank (AST) of 18,000.00 BBL, is limited to wells owned or operated by [371682] STEWARD ENERGY II, LLC.
- [371682] STEWARD ENERGY II, LLC shall notify OCD when construction of 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] commences.
- [371682] STEWARD ENERGY II, LLC shall notify NMOCD when recycling operations commence and cease at 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138].
- A minimum of 3-feet freeboard must be maintained at 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] at all times during operations.
- If less than 20% of the total fluid capacity is utilized every six months, beginning from the first withdrawal, operations of the facility is considered ceased and a notification of cessation of operations should be sent electronically to [OCD Permitting](#). A request to extend the cessation of operation, not to exceed six months, may be submitted using a C-147 form through [OCD Permitting](#).
- [371682] STEWARD ENERGY II, LLC shall submit monthly reports of recycling and reuse of produced water, drilling fluids, and liquid oil field waste on OCD form C-148 via [OCD Permitting](#) even if there is zero activity.
- **Please note that NMOCD has updated Form C-148. The new Form C-148 can be found at:**
<https://www.emnrd.nm.gov/oed/wp-content/uploads/sites/6/Revised-C-148-Form-January-2022.pdf>.
- The operator shall inspect the recycling containment and associated leak detection systems weekly while it contains fluids. The operator shall maintain a current log of such inspections and make the log available for review by the division upon request as per 19.15.34.13.A.
- [371682] STEWARD ENERGY II, LLC shall comply with 19.15.29 NMAC Releases in the event of any release of produced water or other oil field wastes at 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138].

Please reference number 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] in all future communications.

Regards,

Victoria Venegas • Environmental Specialist

Environmental Bureau

EMNRD - Oil Conservation Division

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Energy, Minerals and Natural Resources
Oil Conservation Division
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CONDITIONS

Action 160032

CONDITIONS

| | |
|--|---|
| Operator: STEWARD ENERGY II, LLC 2600 Dallas Parkway Frisco, TX 75034 | OGRID: 371682 |
| | Action Number: 160032 |
| | Action Type: [C-147] Water Recycle Long (C-147L) |

CONDITIONS

| Created By | Condition | Condition Date |
|------------|---|----------------|
| vvenegas | NMOCD has reviewed and approved the recycling containment permit application and related documents, submitted by [371682] STEWARD ENERGY II, LLC on November 18, 2022, for 1RF-496 - HEISENBERG AST CONTAINMENT FACILITY ID [fVV2232735138] in Unit Letter I, Section 03, Township 14S, Range 38E, Lea County, New Mexico | 11/23/2022 |