December 2022

Volume 1
C-147 Registration Package for Ranger AST Containments

Section 22, T20S, R33E, Lea County

- **Transmittal Letter**
- **C-147 Form**
- **O&M Plan and Closure Plan**
- **Siting Criteria Demonstration, Plates & Appendices**

View south from the northwest corner of the proposed pad for the Ranger ASTs. Existing fresh water frac pond is in upper left of image

Prepared for:
Solaris Midstream LLC
9811 Katy Freeway Suite 900
Houston, TX 77024

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

R. T. HICKS CONSULTANTS, LTD.

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

December 5, 2022
REVISED December 21, 2022

Ms. Leigh Barr
EMNRD - Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, NM 87505
Via E-Mail

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

RE: Solaris Water Midstream, LLC, Ranger ASTs Rule 34 Produced Water Containments
Section 22 T20S R33E, Lea County

Dear Ms. Barr and Ms. Venegas:

On behalf Solaris Water Midstream, LLC, R.T. Hicks Consultants is pleased to submit a *revised* C-147 permit application for the above-referenced project. Solaris anticipates that construction of the tow 60,000 bbl. ASTs will commence in Mid-Late December 2022 or February of 2023 with produced water flowing into the containment On January 5, 2023 (earliest). . *This revision contains a new O&M Plan that addresses recent comments from OCD and a Variance Request regarding monitoring AST Containments that are not actively in use.*

Volume 1 of the C-147 package contains:

- The C-147 Form
- Operations & Maintenance Plan (updated) and Closure Plan (previously approved)
- Siting Criteria Demonstration

Volume 2 is all material that OCD has previously approved:

- Design/Construction Plan
- Engineering Drawings and Liner Specifications
- Well Water Services Manual
- Variances for AST Storage Containments

Solaris will transmit the registration package to OCD via the OCD.Online portal. In compliance with 19.15.34.10 of the Rule, this submission is copied to Mr. Carter Cheek, the surface owner's representative. If you have any questions or concerns regarding this permit or the attached C-147, please contact me. As always, we appreciate your work ethic and diligence.

Sincerely,
R.T. Hicks Consultants

Randall T. Hicks PG
Principal

Copy: Solaris Water Midstream, LLC,
ccheek@acefluids.com

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RANGER ABOVE-GROUND STORAGE TANK

Financial Assurance Cost Estimate

Total estimated cost for closure, reclamation, and restoration of the facility (AST, fencing, etc.) pursuant to Rule 34 is **$50,500** based upon the work elements in the spreadsheet (below). We used the same estimate as the 2022 approved cost estimate for Mobley AST Containment. As described in the transmittal letter, the AST Containment will lie on an existing Ace Energy Solutions working pad associated with the adjacent fresh water frac pond. Thus, site reclamation is not the responsibility of Solaris. Items shown with "0" units are costs recommended for certain agencies (e.g. BLM) but are not required in a closure cost estimate for compliance with Rule 34. The estimate was generated by Solaris with input from Hicks Consultants and is equivalent to contractor bids for other AST containments.

ITEM NO.	ITEM DESCRIPTION	UNITS	QTY	UNIT PRICE	Rule 34 TOTAL PRICE
	Ranger AST Containment				
1	Site Containment	0	1	$1,000.00	$0.00
2	Removal of AST and Liner Disposal	1	1	$30,000.00	$30,000.00
3	Removal of Weir Tanks	0	5	$500.00	$0.00
4	Removal of Chemical Trailer	0	1	$50.00	$0.00
5	Removal of Filter Pods	0	1	$200.00	$0.00
6	Removal of pumps, generators, light towers	0	4	$200.00	$0.00
8	Clean Pumps, piping and equipment	0	1	$1,500.00	$0.00
9	Remove Pumps, piping, and equipment	0	3	$1,500.00	$0.00
11	Assess soil for impacts	1	1	$2,500.00	$2,500.00
12	Re-grade and Reclaim Site	1	1	$16,000.00	$16,000.00
,13	Misc. disposal and removal of fencing and cattle guards	0	1	$1,000.00	$1000.00
	Facility Decommision Site Subtotal:				**$50,500.00**

Statement Explaining Why the Applicant Seeks a Variance

The prescriptive mandates of the Rule that are the subject of this variance request are presented below with emphasis **added**:

> D. Fencing.
> (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.
> (2) Recycling containments shall be fenced with a four foot fence that has at least four strands of barbed wire evenly spaced in the interval between one foot and four feet above ground level.
> 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**.**

The subject AST employs netting or sonic bird hazing (Mega Bird X with bird calls specific to the Permian Basin). These methods effectively protect avian species such as waterfowl and bats. OCD and BLM have approved both methods per Rule 34 and by BLM Rules respectively.

The steel structure of the AST is 11-feet high, which obviously encloses the containment "in a manner that deters…[terrestrial] wildlife." Thus, the steel structure meets the mandate of the Rule for enclosure. Thus, netting and the steel structure meet the mandate of Rule 34 for deterring/protecting avian and terrestrial wildlife.

Because AST Containments have a steel stairway between ground surface and the open top, the operator proposes the following deterrent to unauthorized human access:

1. Install gate (e.g. https://www.saferack.com/produ oct/industrial-safety-gates/safety-swing-gates/) or chain across the stairway
2. Place an appropriate sign on the gate or chain to help deter unauthorized human access to the open top of the containment
3. Provide for a mechanism to lock the gate when responsible personnel are not onsite.

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

We believe the proposed protocol provides equal protection of Public Health as a 4-strand barbed wire fence.

Statement Explaining Why the Applicant Seeks a Variance for Monitoring of RANGER Above Ground Storage Tank (AST) Containment

The prescriptive mandates of the Rule that are the subject of this variance request are the following subsections of NMAC 19.15.34

> *19.15.34.13 OPERATIONAL REQUIREMENTS FOR RECYCLING CONTAINMENTS:*
> *A. 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.*

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 open top tanks that employ liners as their primary fluid containment system. The authors of the Rule, and some OCD staff, considered these large ASTs as process tanks, not storage "containments." Yet, the definition of a "containment" caused regulation of these ASTs under the Rule. No Rule is perfect.

With respect to this request for a variance:

- A modular impoundment does not exceed a capacity of 60,000 bbls.
- After E&P processes that employ ASTs are complete, the AST is typically
  - Removed and closed or
  - Placed in a "standby" mode with minimal residual fluid to keep the liner in place for future use

The applicant requests that the RANGER AST Containment when not in use be exempt from weekly inspections per *19.15.34.13(A*) under the following conditions

1. After completion of stimulation, the operator will leave 1-foot or 2-feet of produced water from the AST to provide enough water weight to protect the liner system from wind damage.
2. Every two months after evacuation of most of the water, the operator will record in the inspection log
   a. the fluid level in the AST Containment and
   b. a reading of fluid in the leak detection system
3. The operator will provide a schedule for removal of the AST Containment or the next stimulation event that will use the AST Containment.

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

During what some call a standby period between stimulation events or closure, 1-2 feet of residual fluid in the AST is very small compared to the volume of fluid stored in above-ground containments, for which the Rule is written. Monitoring of the leak detection system every two months in and AST with only 1-2 feet of standing fluid to identify a loss of integrity of the

primary liner provides equal protection of fresh water versus weekly or monthly monitoring of a large in-ground containment. Fewer trips to monitor the leak detection system of a nearly empty AST minimizes travel, thereby providing better protection of public health (fewer road accidents) and the environment (less emissions).

In a typical in-ground containment (200,000+ bbls), weekly monitoring of leak detection is appropriate. In an AST with 1-foot of water weight (6000 bbls), monitoring leak detection every eight weeks provides an equal level of protection.

C-147

State of New Mexico
Energy Minerals and Natural Resources
Department Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505
https://www.emnrd.nm.gov/ocd/ocd-e-permitting/

Form C-147
Revised October 11, 2022

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: Solaris Water Midstream LLC (For multiple operators attach page with information) OGRID #: 371643

Address: 9811 Katy Freeway, Suite 900, Houston, Texas 77024

Facility or well name (include API# if associated with a well): Ranger ASTs (Two 60K ASTs)

OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)

U/L or Qtr/Qtr I&P Section 22 Township 20S Range 33E County: Lea

Surface Owner: ☐ Federal ☐ State ☑ Private ☐ Tribal Trust or Indian Allotment

2.

☑ **Recycling Facility:**

Location of recycling facility (if applicable): Latitude 32.554988 Longitude -103.645183 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:**

☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)

Center of Recycling Containment (if applicable): Latitude 32.554988 Longitude -103.645183 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 _____

☐ String-Reinforced

Liner Seams: ☑ Welded ☐ Factory ☐ Other _____ Volume: _____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.

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. - Written confirmation or verification from the municipality; written approval obtained from the municipality	☐ Yes ☑ No ☐ NA
Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division	☐ Yes ☑ No
Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map	☐ Yes ☑ No
Within a 100-year floodplain. FEMA map	☐ Yes ☑ No
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). - Topographic map; visual inspection (certification) of the proposed site	☐ Yes ☑ No
Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application. - Visual inspection (certification) of the proposed site; aerial photo; satellite image	☐ Yes ☑ No
Within 500 horizontal feet of a spring or a fresh water well used for domestic or stock watering purposes, in existence at the time of initial application. - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site	☐ Yes ☑ No
Within 500 feet of a wetland. - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site	☐ Yes ☐ No

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): Bradley Todd Carpenter Title: Operations Manager.

Signature: Todd Carpenter Date: 12/5/2022

e-mail address todd.carpenter@solarismidstream.com Telephone: 432-413-0918.

11.

OCD Representative Signature: Victoria Venegas **Approval Date:** 01/18/2023

Title: Environmental Specialist **OCD Permit Number:** 1RF-501

- ☒ 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.

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

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.

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.

- 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 though 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.

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.

- The operator will address all releases from the recycling and re-use of produced water in accordance with 19.15.29 NMAC.

19.15.29.6
To prohibit releases and require persons who operate or control the release or the location of the release to report the unauthorized release of oil, gases, produced water, condensate or oil field waste including regulated NORM or other oil field related chemicals, contaminants or mixtures of those chemicals or contaminants that occur during drilling, producing, storing, disposing, injecting, transporting, servicing or processing and to establish procedures for reporting, site assessment, remediation, closure, variance and enforcement.

- The operator will not discharge into or store any hazardous waste in the recycling containments, but they may hold fluids such was 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.

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

- 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.

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

- The operator will install and use a header and diverter described in the design/construction plan in 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.

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.

- The operator shall maintain at least three feet of freeboard at each containment.

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

- 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.

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.

- 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.

(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.

- 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.
  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.

19.15.29.8 B.
Requirements. For all releases regardless of volume, the responsible party shall comply with 19.15.29.8 NMAC and shall remediate the release. For major and minor releases, the responsible party shall also comply with 19.15.29.9, 19.15.29.10, 19.15.29.11, 19.15.29.12 and 19.15.29.13 NMAC.

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

19.15.34.13
(6) The containment shall be operated to prevent the collection of surface water run-on.

Monitoring, Inspections, and Reporting

An inspection log will be maintained by the operator and will be made available to the division upon request. Inspection will 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.

19.15.34.13 A.
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.

Weekly inspections consist of:

- Reading and recording the fluid height of staff gauges and freeboard
- Recording any evidence of visible oil on surface

- Visually inspecting the containments exposed liners
- Checking the leak detection system for any evidence of a loss of integrity of the primary liner
- Inspect any diversion ditches and berms around the containment to check for erosion and collection of surface water run-on.
- Inspect the leak detection system for evidence of damage or malfunction and monitor for leakage.

- Inspect netting (may not be used if Mega Blaster Pro avian deterrent is used) for damage or 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.

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.

Additional monitoring to identify hazards that may have developed, changes in site conditions, tank use, and to enable early detection of structural issues such as uneven tank panel settlement, soil settlement, liner damage, insufficient liner slack or leaks. If changes are noted the AST contractor should be notified

- If observed conditions indicate a potential tank failure is imminent, the vicinity will be immediately cleared and the AST will be drained.

Monthly, the operator will:

- Report to the division, the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148.
- Record sources and disposition of all recycled water.

19.15.34.9 E
The operator of a recycling facility shall keep accurate records and shall report monthly to the division the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148.

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

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

notified. The division district may grant an extension not to exceed six months to determine the cessation of operations.

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.

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.

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.

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

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.

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.

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 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 revegetation 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.

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.

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.

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

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.

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.

19.15.34.14 G
The revegetation 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.

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 revegetation is complete.

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

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 Solaris Water Midstream Ranger ASTs.

Plate 1 is a geologic/ topographic map that shows:

1. The area in with the ASTs will be placed 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 2a 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.
2. Water wells measured by the USGS, the year of the measurement and the calculated elevation of the groundwater surface.
3. Water wells measured by professionals and documented in published reports or by staff of Hicks Consultants (Misc.).

Plate 2b is a larger scale map than Plate 2a that shows all the well data used to generate the potentiometric surface presented in Plate 2a.

Hydrogeology

As shown in Plate 2b, the Triassic Upper Chinle Formation (T(r)cu) crops out in the western area of the map and the Tertiary Ogallala Formation crops out in the southwestern corner The surface geology at the containment sites is Quaternary eolian and piedmont deposits (Qe/Qp).

Seven driller's logs of varying quality are in the NM OSE database around the Ranger location. These are described briefly below and presented in Appendix Well logs (see location map in appendix).

- CP-1865 #1 (20S 33E Sec2) is about 3.5 miles south of the Ranger ASTs. This is a dry monitoring well with a total depth of 105 feet. From 21 feet to total depth the log describes sandy red clay, which is probably the Chinle, and blue clay that is also typical of driller's descriptions of the Chinle.
- CP-1865 #2 (20S 33E Sec 2) is a dry hole that is described similarly to the above.

- CP 748 (20S 33E Sec 1) is also a dry hole to a depth of 280 feet. The log shows unsaturated sand to 36 feet that is underlain by Chinle lithology, which at this location is dominantly clay.
- CP-1884 (21S 32E Sec 1) is a dry hole showing alluvium and caliche from surface to the total depth of 55 feet.
- CP-750 (20S 34E Sec 7) is another dry hole that describes alluvial material to 65 feet underlain by clay and sandstone bedrock that is typical of the Chinle
- CP-1860 (20S 34E Sec 30) is a 112-foot deep hollow stem auger boring that is also dry. We believe the upper 58 feet of the boring is alluvium with Chinle lithology of claystone with thin sandstone unit to total depth.
- CP-317 (20S 33E Sec 5) is/was a producing windmill showing a depth to water in the driller's log of 325 feet. The log describes 110 feet of alluvial material and caliche underlain by Chinle clay to 520 feet. From 520-625 feet is a "water sand" and "Shale and Sand" that may be the Santa Rosa Sandstone, the base of the Chinle. Perhaps the brown and red sand/shale/clay from 625-680 is the Quartermaster Formation.
- Well CP-1151 is mislocated per the stated location in the well log.

The data permit a conclusion that the alluvium and caliche overlying the Chinle Formation in the area around the Ranger ASTs is unsaturated. The water bearing units of the Chinle are deep and confined (artesian).

Groundwater Data

Plate 2a presents groundwater elevation data closest to the Ranger ASTs. Two data points are about 1.5 miles northeast of the ASTs: Misc-121, which was gauged by Hicks Consultants in 2019 and USGS-15528. In our field and aerial image search, we found no evidence of the USGS being located by the latitude/longitude. We are convinced at the Misc-121 is the same well as USGS-15528. Information from the USGS database for USGS-15528 is presented in the Well Log Appendix and shows that for the period of record (1968-1976) four of five depth to water measurements are between 400 and 450 feet below surface (groundwater elevation of 3250-3200). The 1976 USGS measurement is less than 200 feet below surface. Because the Hicks Consultants measurement is 30-feet higher than the USGS data, we contend the 2019 measurement is correct and the most recent USGS measurement (1976) is erroneous.

In our field survey of 2022, we could not locate USGS-15121, but historic aerial imagery on Google Earth contains evidence that a well in this area is probable. The groundwater elevation is like the 2019 measurement of Misc-121, and we believe the sole reading at this location is valid.

USGS-15411 lies about 2 miles northwest of the Ranger ASTs and is a shallow well in saturated alluvium. Saturated alluvium within one mile of Laguna Gatuña is not surprising. Groundwater perched on the clay of the Chinle within closed basins and playas is common. We did not use the data from this well (which is also Misc-120) in the development of the potentiometric surface contours of Plate 2a.

Also shown in Plate 2b are groundwater elevation contours (generated by Hicks Consultants) and locations of USGS well data that provided much of the elevation data for the map.

Plate 2c is reproduced from Plate 1 of ***Geology and ground-water conditions in southern Lea County, New Mexico***[1] and shows the elevation of the top of the Chinle (red beds) is about 3575 feet ASL. Given the elevation of ground surface at the ASTs is about 3610, the alluvium is about (3610-3575=) 35 feet.

We relied upon the most recent data measured by the USGS, published data, and measurements by Hicks Consultants to create Plate 2a and 2b. 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 field surveys and examination of Google Earth images, we are confident that the wells shown on Plate 2a and 2b are close to the plotted points.

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

- Localized, thin, unconfined groundwater zones exist in some closed depressions of the area, such as Laguna Gatuña. The lateral extent of these groundwater zones that are perched upon underlying Chinle Formation clay units is limited to the area of the depression.
- The uppermost groundwater zone beneath the containment resides in thin sandstones of the Chinle or in the basal unit, the Santa Rosa Sandstone
- Alluvium overlying the Chinle around the Ranger ASTs is dry, as is the upper 100+ feet of the Chinle.
- Saturated units within the Chinle beneath the Ranger ASTs are confined.
- The elevation of confined groundwater beneath the Ranger ASTs is 3300-3400 feet ASL.
- The approximate depth to groundwater beneath the AST containments is more than (3610-3400=) 210 feet.

Distance to Municipal Boundaries and Fresh Water Fields

Plate 3 demonstrates that the Ranger 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 Monument, approximately 20 miles northeast.
- The closest mapped public wells belong to the Monument Water Users Coop. These municipal supply wells are about 21 miles to the northeast.

Distance to Subsurface Mines

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

- A caliche pit is less than 1 mile east-northeast (see Plate 8)
- The closest subsurface mine is slightly more than 5 miles southwest

[1] https://geoinfo.nmt.edu/publications/water/gw/6/plates/GW6_Plate1.pdf

Distance to High or Critical Karst Areas

Plate 5 shows the Ranger AST 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 located approximately 10 miles southwest of the proposed containments.
- We observed no evidence of solution voids or unstable ground near the site during the field inspection.

Distance to 100-Year Floodplain

Plate 6 demonstrates that the Ranger AST 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.
- Our field inspection and examination of the topography permits a conclusion that the location is not within any floodplain and has low risk for flooding.
- The nearest mapped flood hazard is about 15 miles southwest and is associated with Red Lake (intermittent lake)

Distance to Surface Water

Plate 7 shows the closest surface water body, a Lake/Pond, plots about 1 mile south of the Ranger ASTS.

- This mapped lake and another in the southeast corner of the Plate are constructed stock ponds.
- The site visit and photographs demonstrate that the recycling project area is not within 300 feet of a continuously flowing watercourse or 200-feet of any other significant watercourse, lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark) or spring.

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 the fresh water frac pond, a well pad and lease roads.
- No residences or other structures are in the area.

Distance to Non-Public Water Supply

Plates 1 and 7 demonstrate that the Ranger AST 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.
- 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 Ranger AST Containments are not within 500 feet of mapped wetlands using the New Mexico database.

- The nearest designated wetland is mapped in a surface depression on top of Hat Mesa about 5 miles southeast. Interestingly, this depression is not mapped as a Lake/Pond on the USGS 7.5-minute quadrangle map as a pond. Hicks Consultant has visited this depression on numerous occasions as it is adjacent to several windmills and a stock tank.
  .

PLATES

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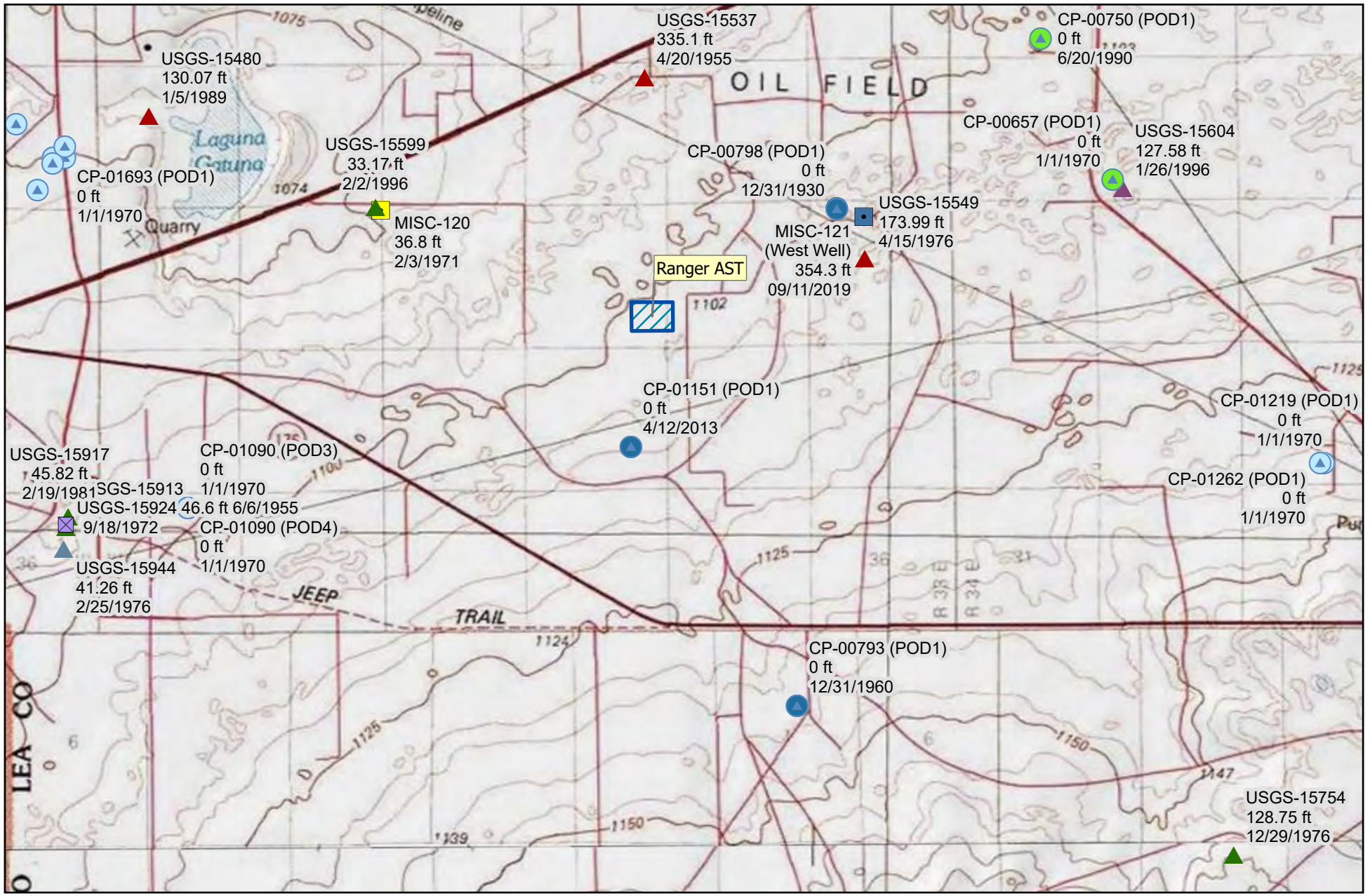

N
W E
S

0 0.5 1 Miles

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Nearby Wells & Groundwater Depth	Plate 1
	Solaris Water Midstream - Ranger ASTs	December 2022

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polygon_spe

Recycling Containment Area

OSE Water Wells (DTW/Date)

Well Depth (ft)

<=150

151-350

351-500

501-1000

<1000

USGS Gauging Station (GW Elev, Date)

Aquifer Code, Well Status

Alluvium/Bolsom

110AVMB, Nearby site that taps the same aquifer had been pumped recently.

Alluvium/Bolsom, Obstruction was encountered in the well (no water level was recorded).

Alluvium/Bolsom, Site had been pumped recently.

Alluviu/Bolsom, Site was being pumped.

Ogallala, Site was being pumped.

Chinle

Chinle, Site had been pumped recently.

Santa Rosa

Not Defined

<Null>, Site was being pumped.

Misc. Water Wells (GW Elev, Date)

Well Depth (ft)

No Data

<= 150

151 - 350

351 - 500

> 500

N W E S

0 1 2 Miles

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Well Data Legend Plates 1 & 2

Solaris Water Midstream - Ranger ASTs

Dec 2022

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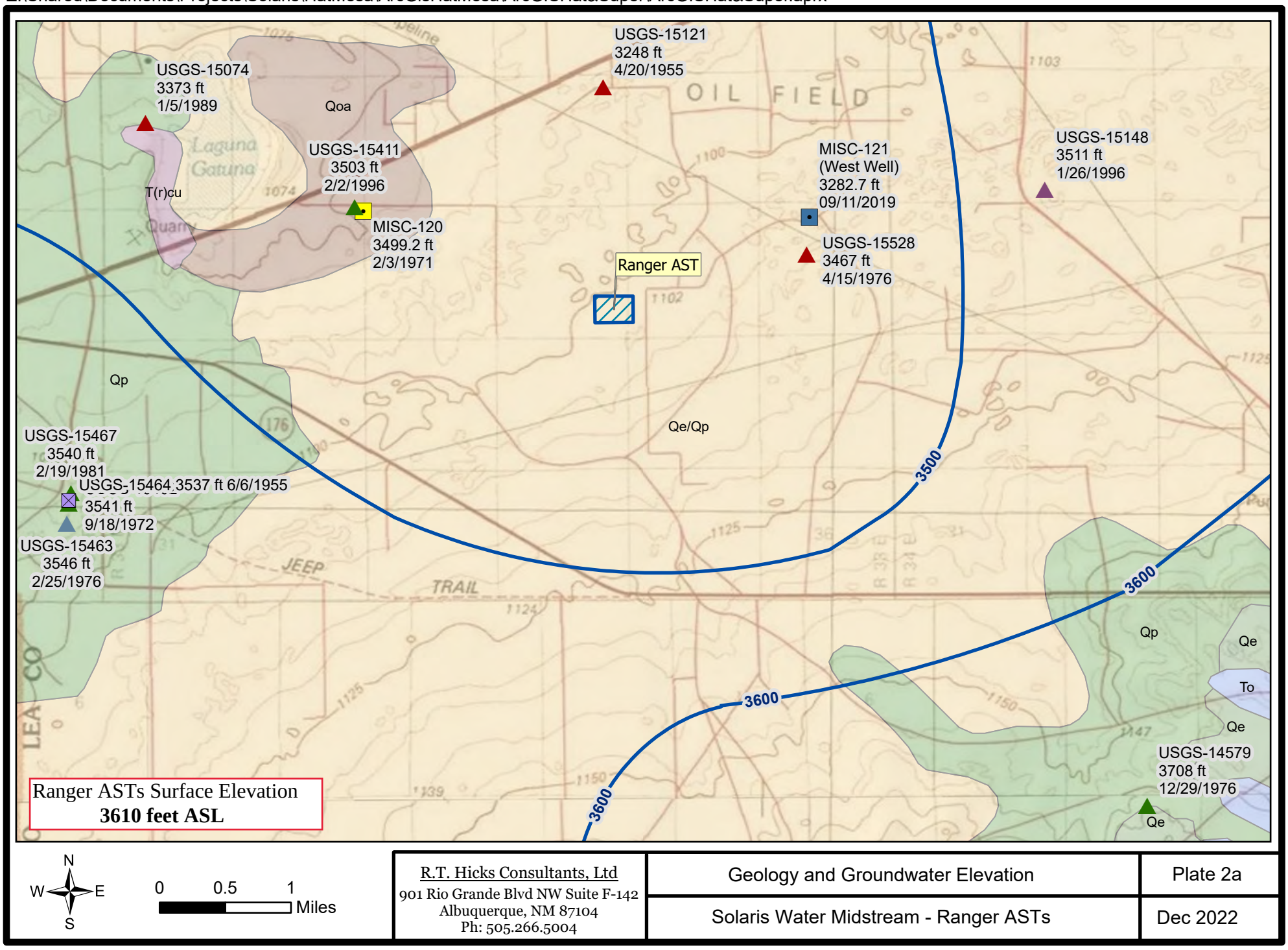

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Geology and Groundwater Elevation	Plate 2a
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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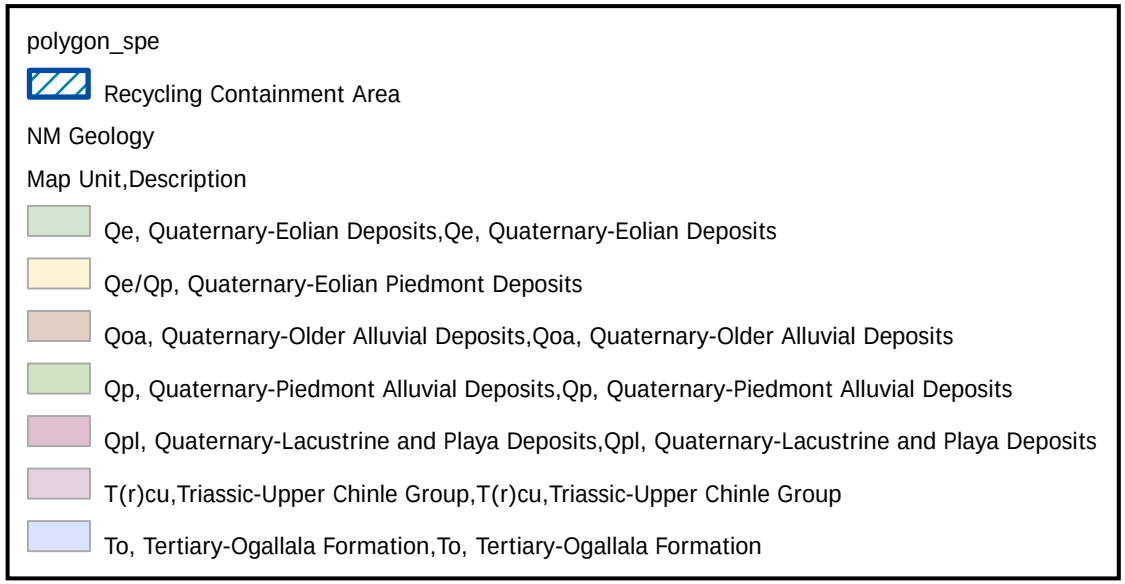

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Geologic Units on Plates 2a &2b	
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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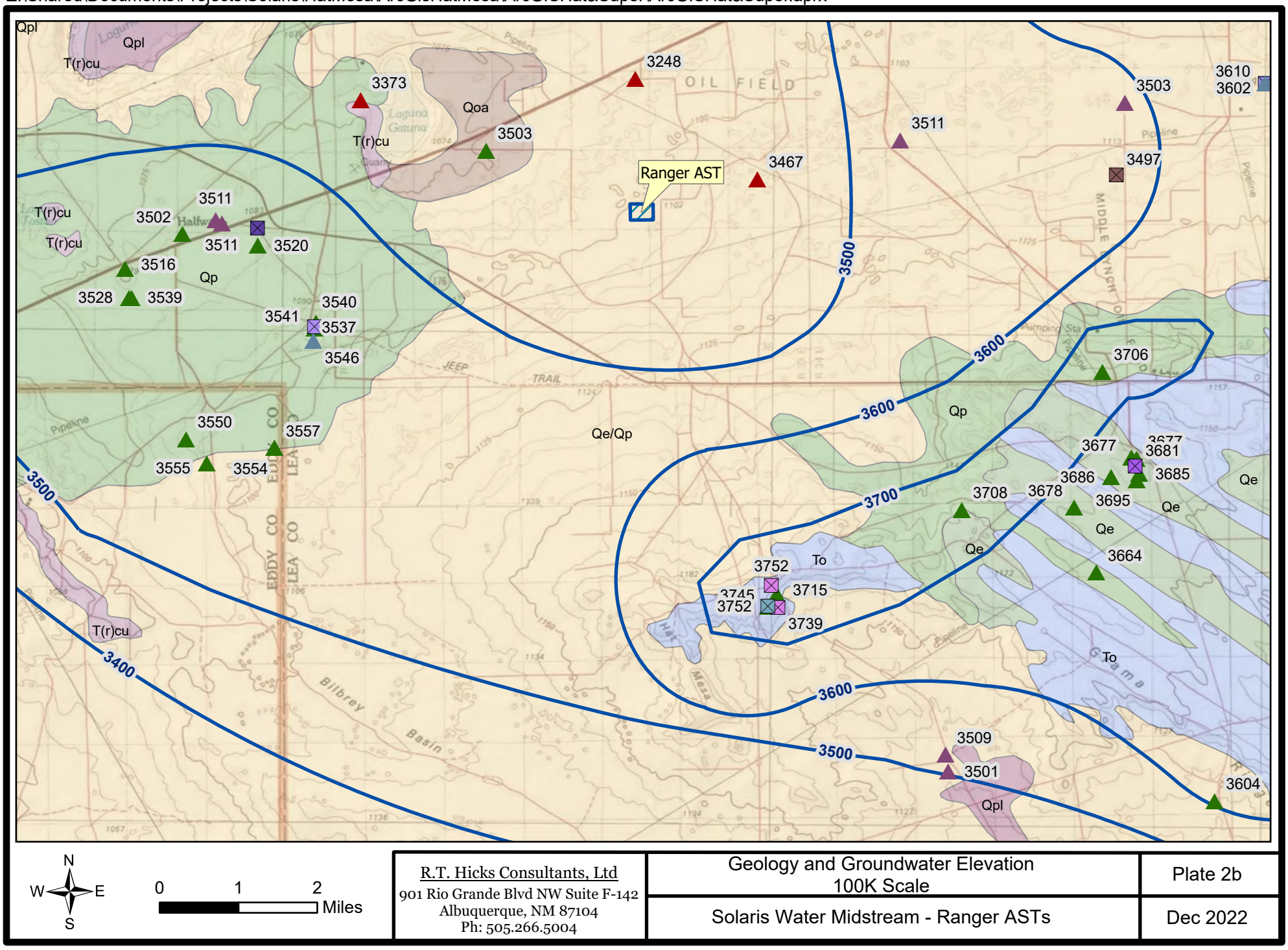

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R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Geology and Groundwater Elevation 100K Scale	Plate 2b
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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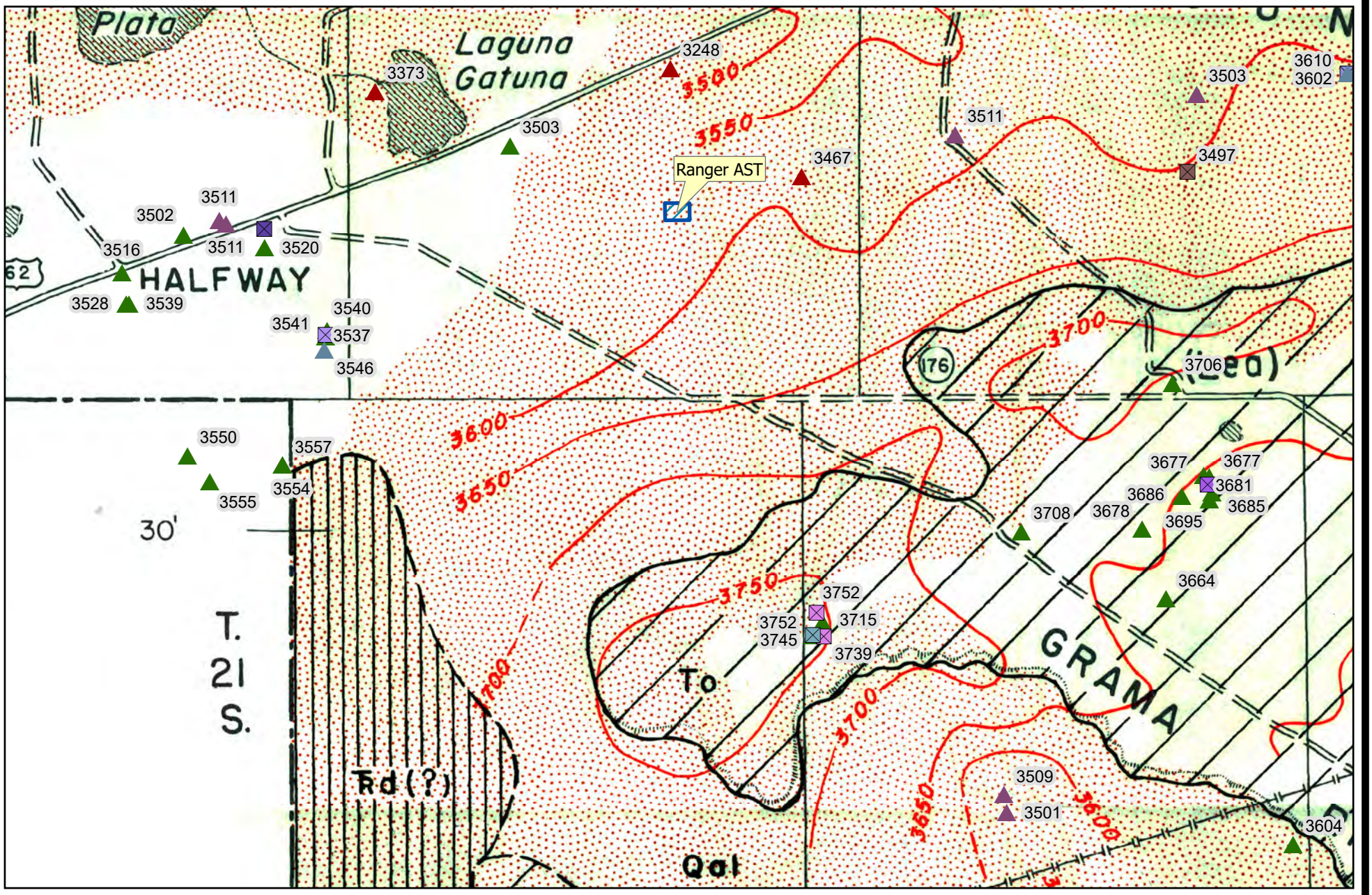

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Elevation of Top of Red Bed (Chinle) 100K Scale	Plate 2c
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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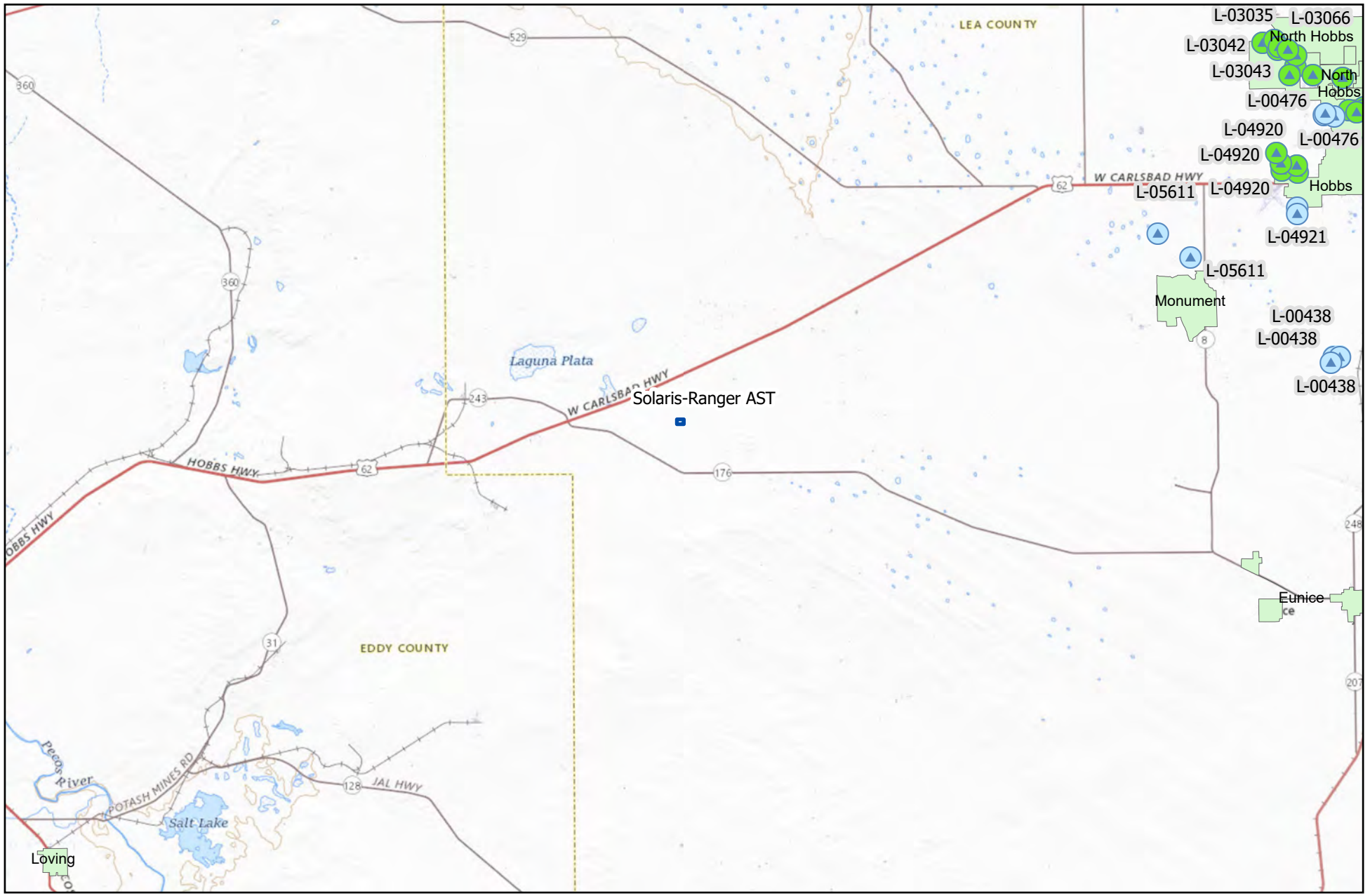

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Municipalities and Public Water Supplies	Plate 3
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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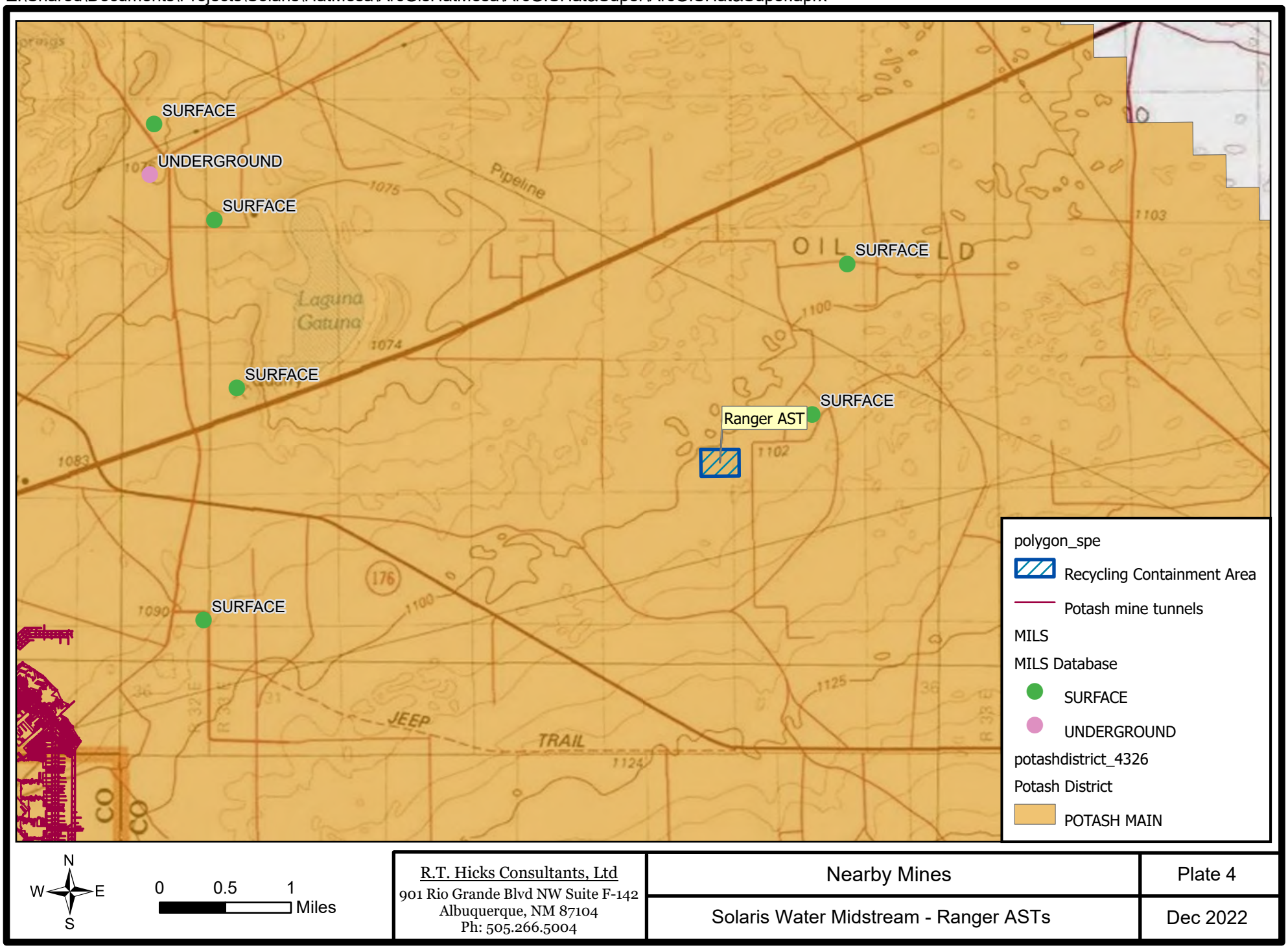

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Nearby Mines	Plate 4
Solaris Water Midstream - Ranger ASTs	Dec 2022

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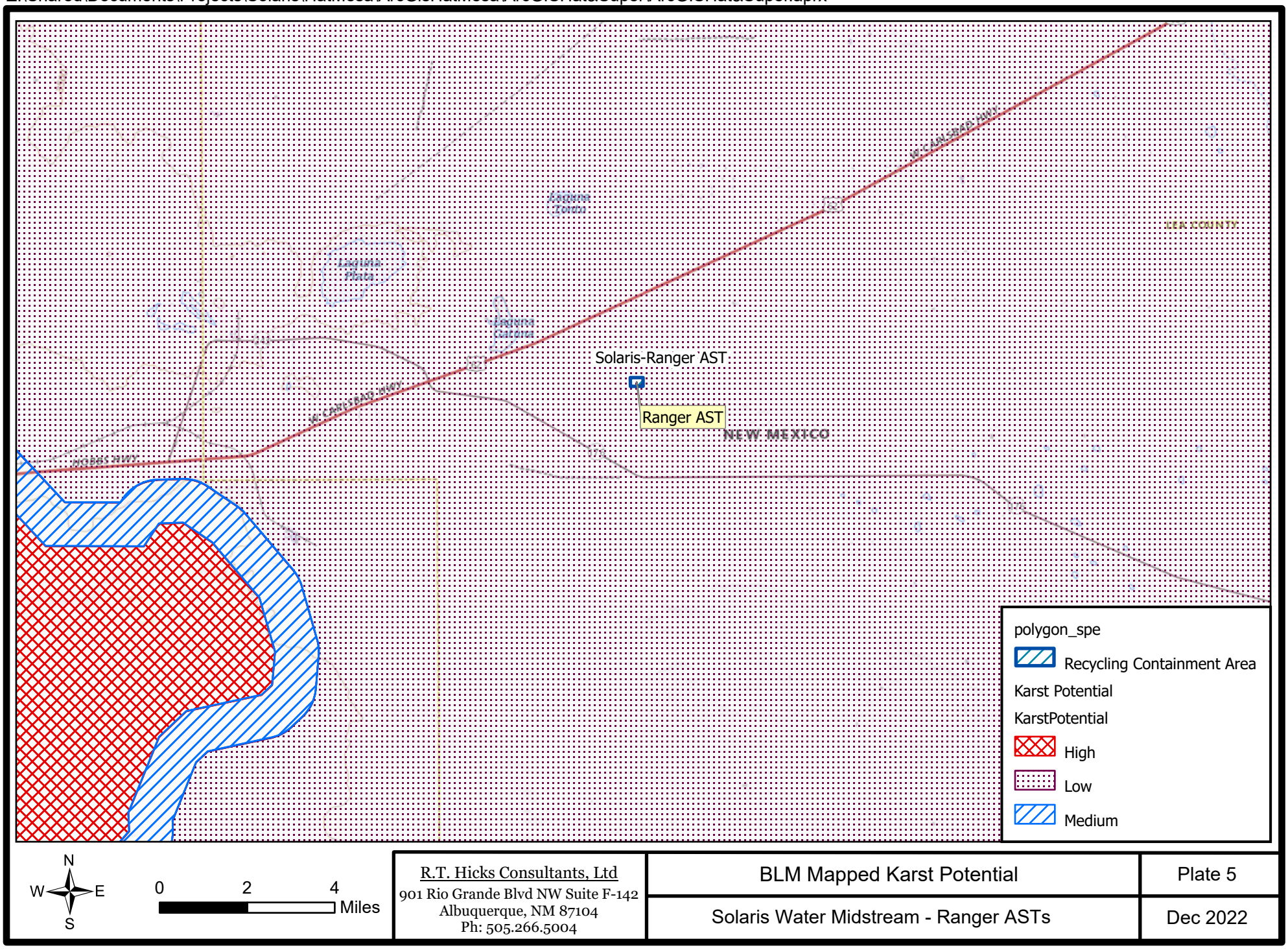

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	BLM Mapped Karst Potential	Plate 5
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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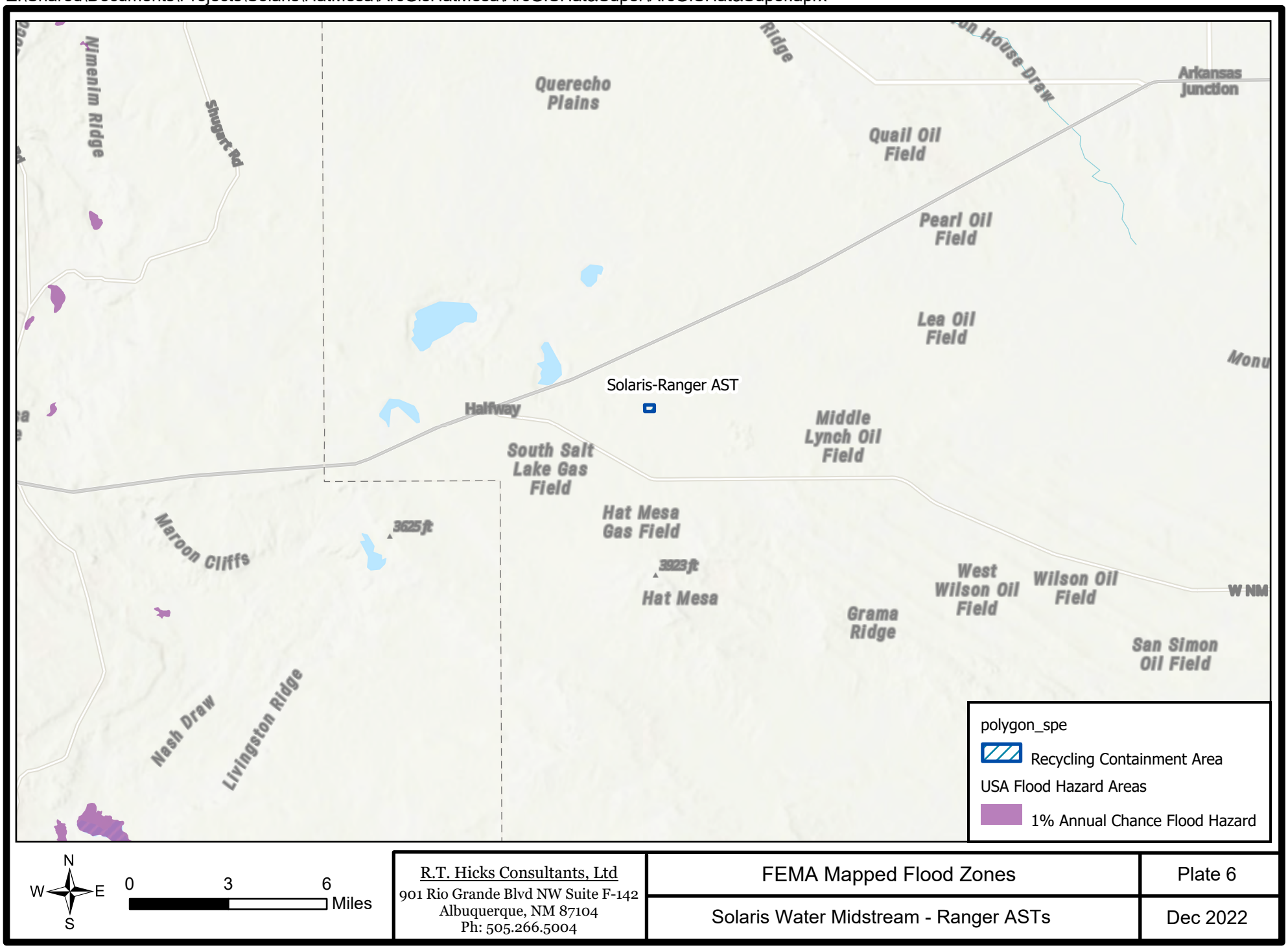

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	FEMA Mapped Flood Zones	Plate 6
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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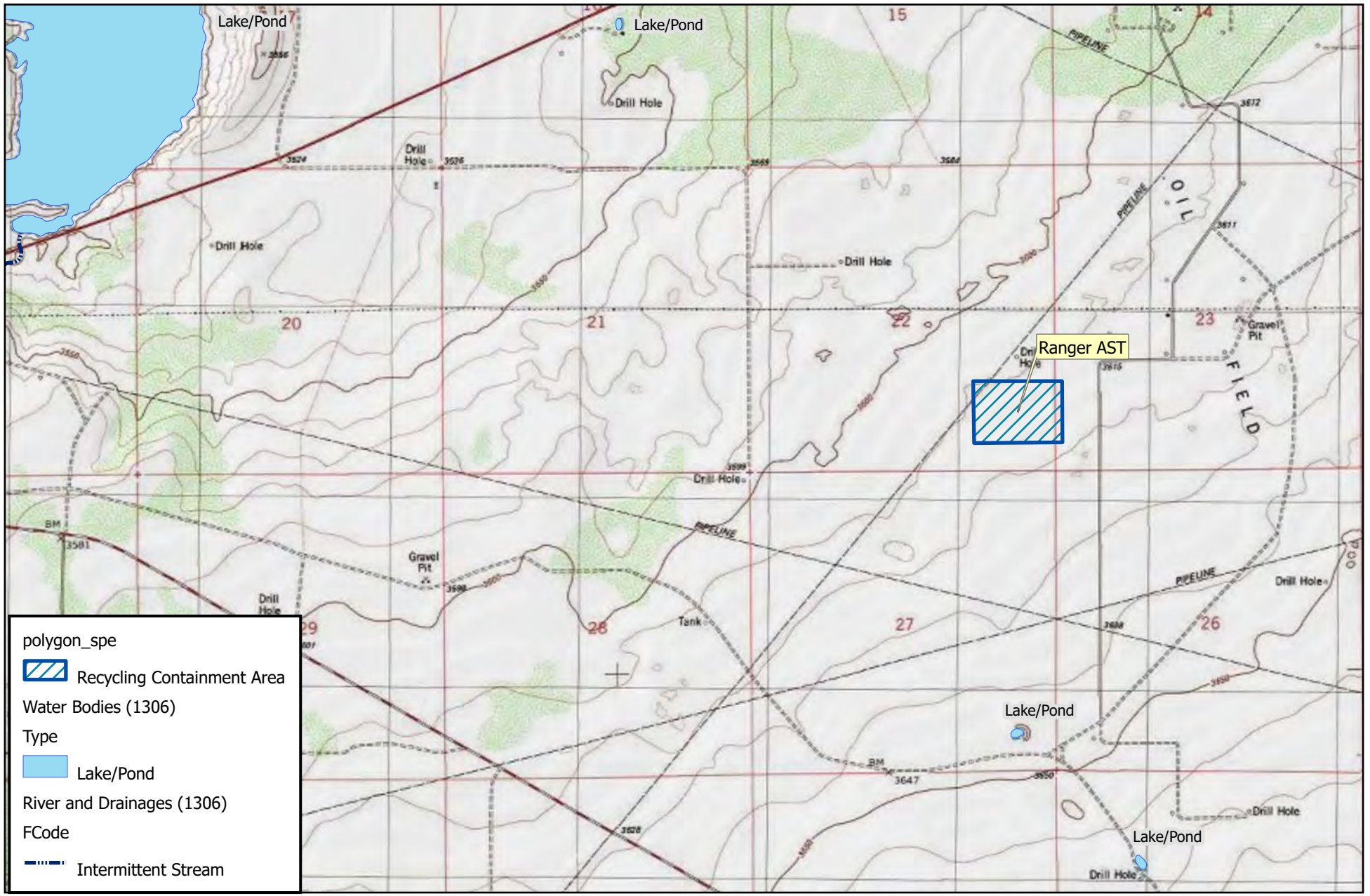

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Nearby Surface Water

Plate 7

Solaris Water Midstream - Ranger ASTs

Dec 2022

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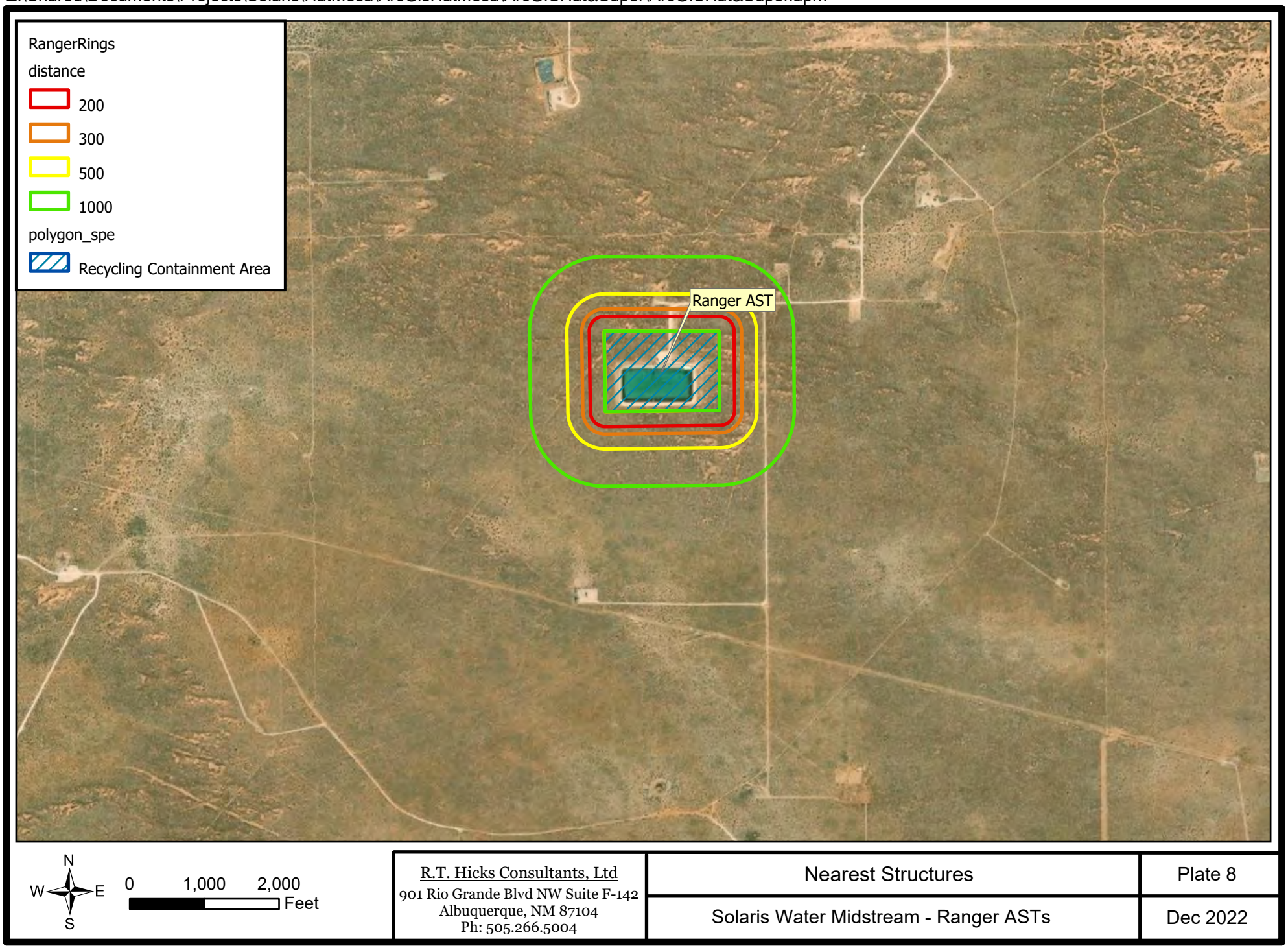

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Nearest Structures	Plate 8
	Solaris Water Midstream - Ranger ASTs	Dec 2022

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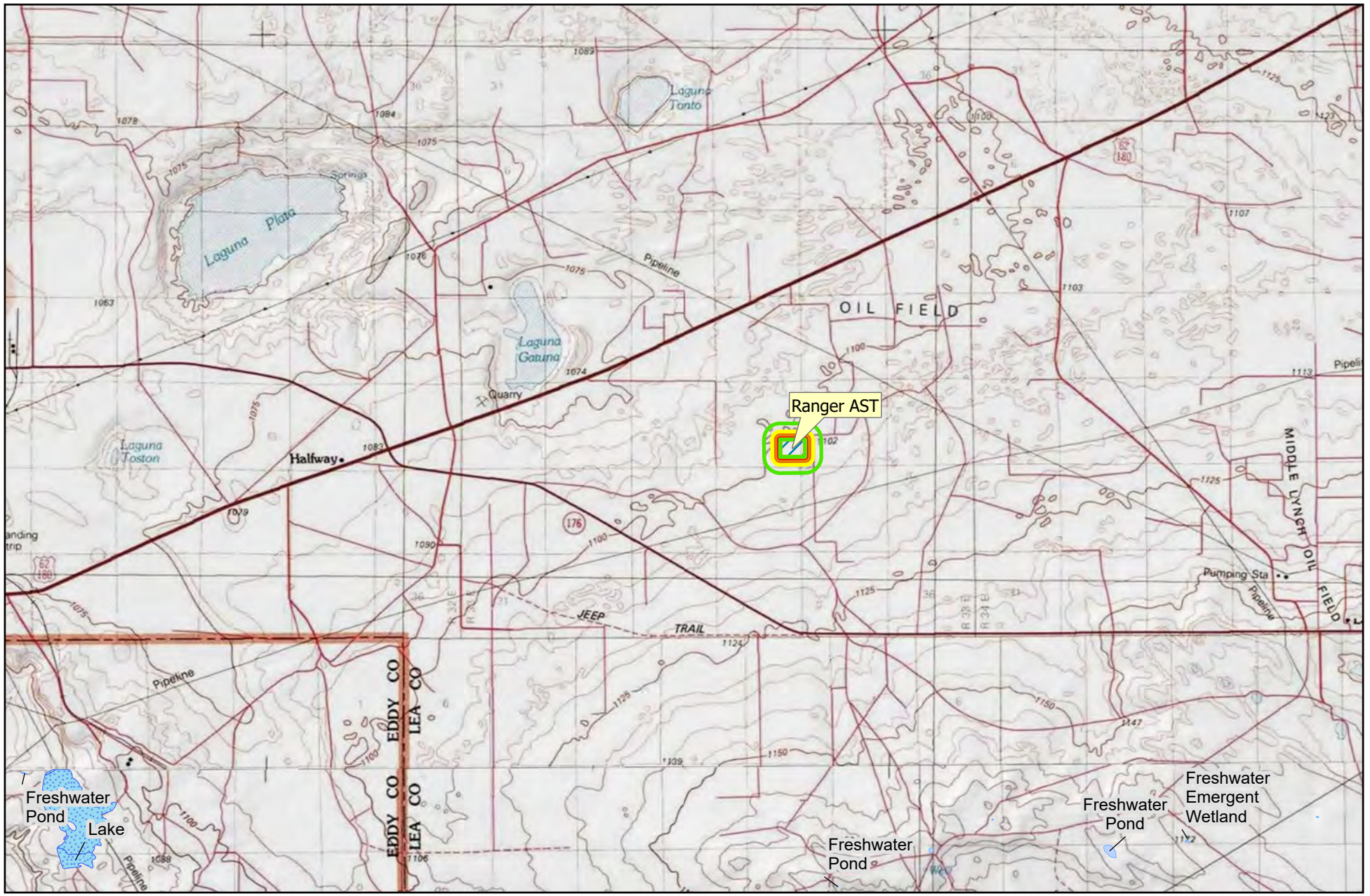
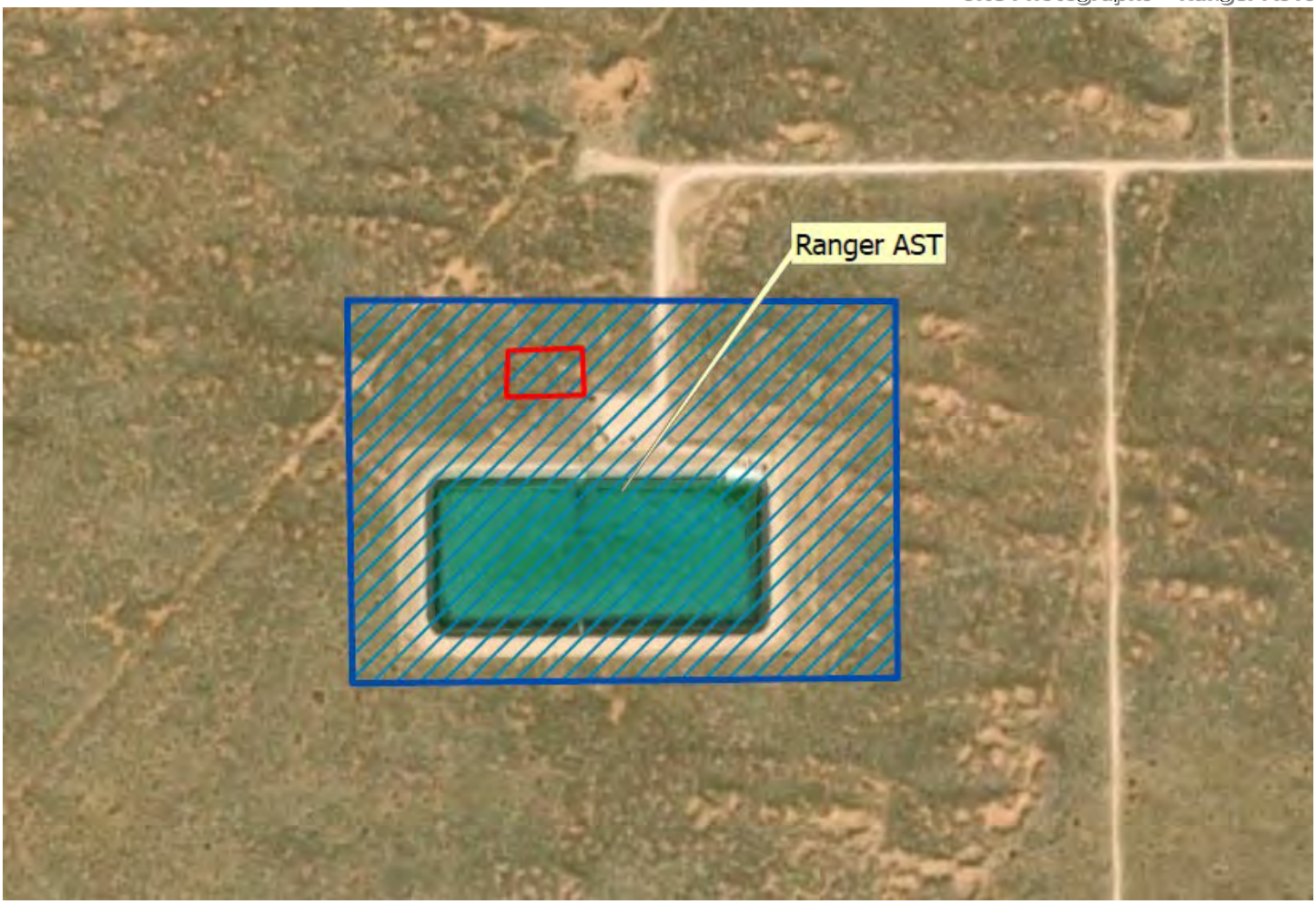


R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Nearest Wetlands	Plate 9
	Solaris Water Midstream - Ranger ASTs	Dec 2022

SITE PHOTOGRAPHS



Location for site photos. The working pad for the Ranger ASTs is shown by the red rectangle.

SP1 – Image looking north from northwest corner of existing working pad associated with fresh water frac pond. Ranger ASTs will be placed on a new pad to the northwest of the existing pad.

Site Photographs – Ranger ASTs

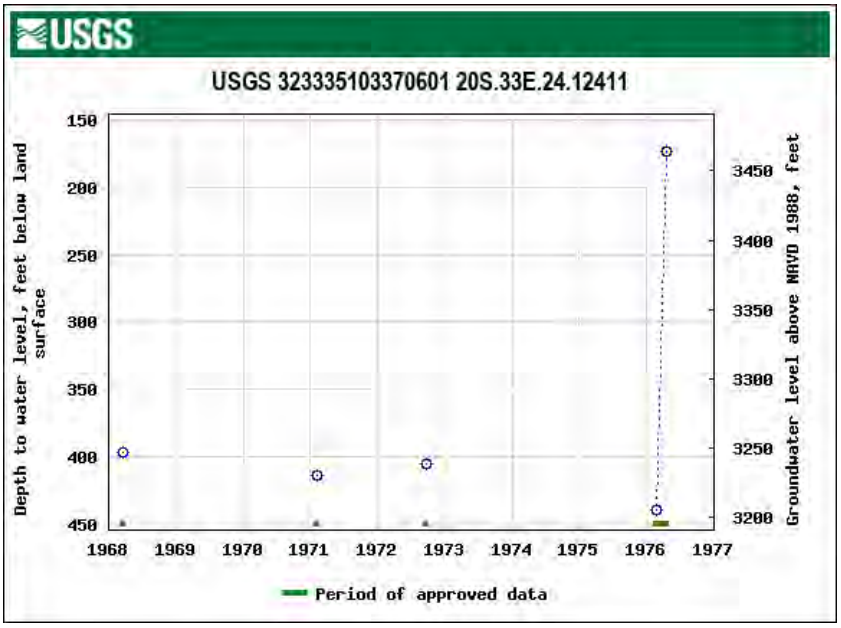
SP2 – View west from the existing working pad. Ranger ASTs will be northwest of the location of this image (right)

SP3 – Image looking east from the southwest corner of the proposed pad for the Ranger ASTs. The surface is comprised of low, vegetated dunes and blow sand. The northern levee of the fresh water frac pond is in the upper right corner of the image.

Appendix
USGS Data and WELL LOGS

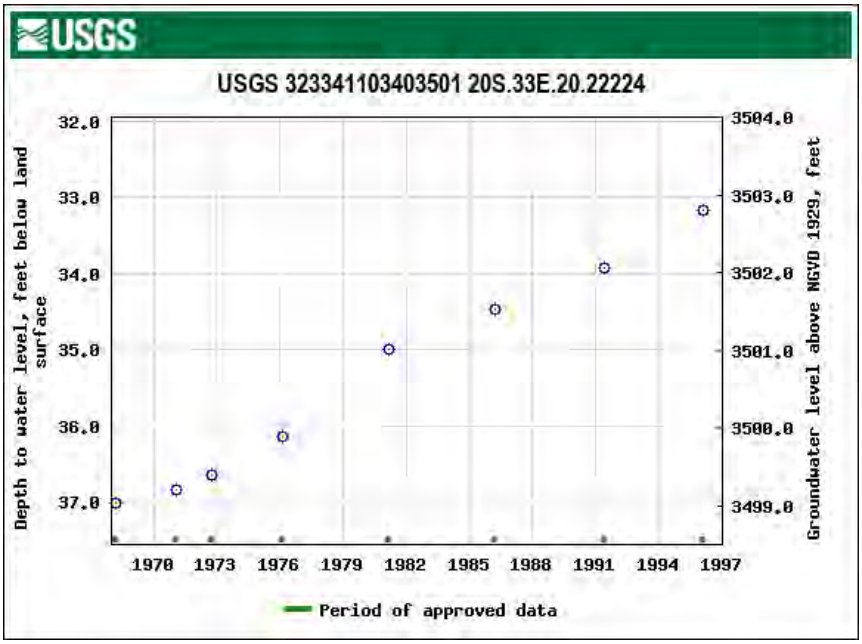
USGS 323335103370601 20S.33E.24.12411 AKA USGS-15528

Lea County, New Mexico
Hydrologic Unit Code 13060011
Latitude 32°33'35", Longitude 103°37'06"
NAD27
Land-surface elevation 3,641 feet above NAVD88
The depth of the well is 676 feet below land surface.
This well is completed in the Other aquifers (N9999OTHER) national aquifer.
This well is completed in the Santa Rosa Sandstone (231SNRS) local aquifer.



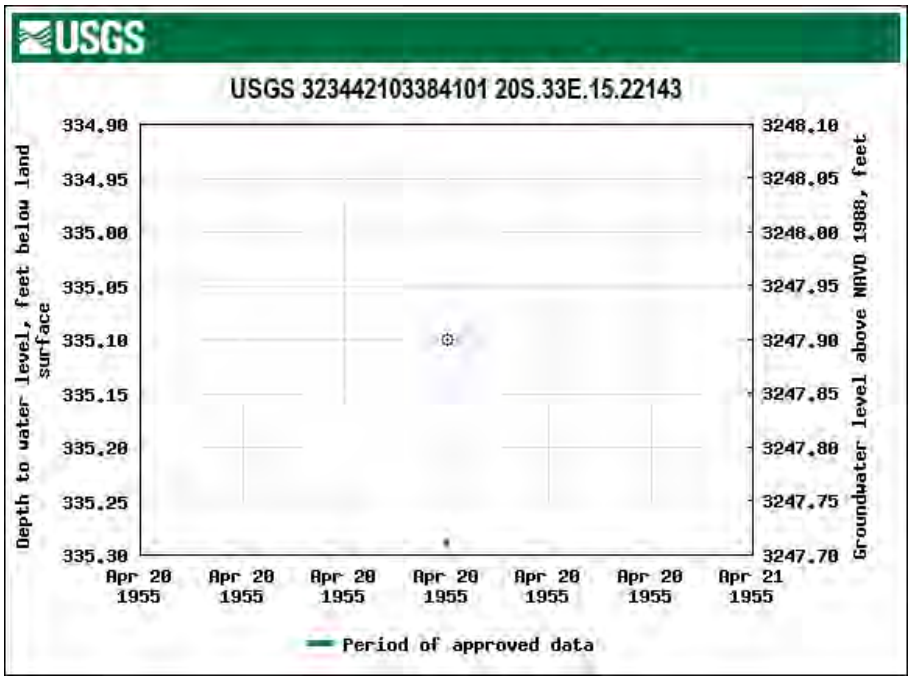
USGS 323341103403501 20S.33E.20.22224 AKA USGS-15411

Lea County, New Mexico
Hydrologic Unit Code 13060011
Latitude 32°33'55", Longitude 103°40'38"
NAD27
Land-surface elevation 3,536.00 feet above NGVD29
The depth of the well is 52 feet below land surface.
This well is completed in the Other aquifers (N9999OTHER) national aquifer.
This well is completed in the Alluvium, Bolson Deposits and Other Surface Deposits (110AVMB) local aquifer.



USGS 323442103384101 20S.33E.15.22143 AKA USGS-15121

Lea County, New Mexico
Hydrologic Unit Code 13060011
Latitude 32°34'42", Longitude 103°38'41" NAD27
Land-surface elevation 3,583 feet above NAVD88
This well is completed in the Other aquifers (N9999OTHER) national aquifer.
This well is completed in the Santa Rosa Sandstone (231SNRS) local aquifer.



CP-00883 (POD1)
0 ft
1/1/1970

CP-00074
0 ft
1/1/1970

L-07023
185 ft
11/15/1970

CP-00748 (POD1)
0 ft
6/2/1990

L-07213
110 ft
5/5/1974

CP-00317
325 ft
2/17/1966

CP-00653 (POD1)
0 ft
1/1/1970

CP-00656 (POD1)
0 ft
1/1/1970

CP-00961 (POD1)
0 ft
1/1/1970

CP-00750 (POD1)
0 ft
6/20/1990

CP-00655 (POD1)
0 ft
1/1/1970

CP-01693 (POD1)
0 ft
1/1/1970

CP-00798 (POD1)
0 ft
12/31/1930

CP-00657 (POD1)
0 ft
1/1/1970

CP-00800 (POD1)
0 ft
12/31/1930

Ranger AST

CP-00567 (POD1)
0 ft
1/1/1970

CP-00815
0 ft
1/1/1970

CP-01090 (POD4)
0 ft
1/1/1970

CP-01090 (POD3)
0 ft
1/1/1970

CP-01090 (POD1)
0 ft
1/1/1970

CP-01151 (POD1)
0 ft
4/12/2013

CP-01262 (POD1)
0 ft
1/1/1970

CP-00942 (POD1)
0 ft
1/1/1970

CP-00793 (POD1)
0 ft
12/31/1960

CP-00579
100 ft
11/22/1979

CP-01317 (POD1)
1025 ft
5/15/2014

CP-00796 (POD1)
0 ft
12/31/1940

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
POD1 (BH-01)	n/a	CP-1884

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Ascent Energy	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
P.O Box 270983	Littleton	CO	80127

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	30	3.18	N
	LONGITUDE	103	38	10.22	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

SW SW SW Sec. 01 T21S R32E

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
1249	Jackie D. Atkins	Atkins Engineering Associates, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
09/08/2021	09/08/2021	temporary well material	55	n/a

COMPLETED WELL IS: ☐ ARTESIAN ☑ DRY HOLE ☐ SHALLOW (UNCONFINED) — STATIC WATER LEVEL IN COMPLETED WELL (FT): n/a

DRILLING FLUID: ☐ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: Hollow Stem Auger

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	55	±6.5	Boring- HSA	--	--	--	--

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT

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FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 06/30/17)

FILE NO. CP-1884	POD NO. 1	TRN NO. 699871	
LOCATION 21S-32E-01 333		WELL TAG ID NO. N/A	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	9	9	Sand, Medium/fine, with some caliche, Red	Y ✓ N	
9	14	5	Sand, Medium/fine, with some caliche, Brown	Y ✓ N	
14	24	10	Caliche with Medium/fine sannd, Off white	Y ✓ N	
24	34	10	Sand, Medium/fine, with some caliche, Brown	Y ✓ N	
34	55	21	Caliche with Medium/fine sannd, Off white	Y ✓ N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☐ OTHER – SPECIFY:

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Temporary well materials removed and the soil boring backfilled using drill cuttings from total depth to ten feet below ground surface, then hydrated bentonite chips from ten feet below ground surface to surface.

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Shane Eldridge, Cameron Pruitt and Carmelo Trevino

OSE DII SEP 28 2021 PM3:01

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

Jack Atkins — Jackie D. Atkins — 09/27/2021

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 06/30/2017)

FILE NO. CP-1884	POD NO. 1	TRN NO. 699871	
LOCATION 21S-32E-01 333		WELL TAG ID NO. N/A	PAGE 2 OF 2

OSE DIT JUL 22 2021 PM2:05

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
POD2 CP-1865		CP-01865

WELL OWNER NAME(S)	PHONE (OPTIONAL)
BTA OIL PRODUCERS, LLC	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
104 S PECOS ST	MIDLAND	TX	79701

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	35	59	N
	LONGITUDE	-103	38	30.4	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

LEA SECTION 2 TOWNSHIP 20S RANGE 33E

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1753	JACOB FRIESSEN	VANGURD

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
2-8-21	2-8-21	105	105	0

COMPLETED WELL IS: ☐ ARTESIAN ☑ DRY HOLE ☐ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 0

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
-1	99	4.5	BLANK PVC	THREAD 2.375	2	.187	
99	105	4.5	SCREEN PVC	THREAD 2.375	2	.187	.02

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	99	4.5	GROUT	8	POURED
99	105	4.5	SILICA SAND	.5	POURED

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 04/30/19)

FILE NO. C-1865	POD NO. 2	TRN NO. 686912	
LOCATION 20S-33E-02 3.1.B		WELL TAG ID NO. NA	PAGE 1 OF 2

OSE DIT JUL 22 2021 PM2:05

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	2	2	TOPSOIL	Y ✔ N	
2	21	19	CALICHE	Y ✔ N	
21	48	27	SAND	Y ✔ N	
48	66	18	RED CLAY	Y ✔ N	
66	77	11	SAND	Y ✔ N	
77	89	12	RED CLAY	Y ✔ N	
89	105	16	BLUE CLAY	Y ✔ N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☑ BAILER ☐ OTHER – SPECIFY:

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST: TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION:

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

PETE LOEWEN

6. SIGNATURE

BY SIGNING BELOW, I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED WELL. I ALSO CERTIFY THAT THE WELL TAG, IF REQUIRED, HAS BEEN INSTALLED AND THAT THIS WELL RECORD WILL ALSO BE FILED WITH THE PERMIT HOLDER WITHIN 30 DAYS AFTER THE COMPLETION OF WELL DRILLING.

JACOB FRIESSEN — SIGNATURE OF DRILLER / PRINT SIGNEE NAME

7-13-21 — DATE

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 04/30/2019)

FILE NO. C-1865	POD NO. 2	TRN NO. 686912	
LOCATION 20S.33E.02 3-1-3		WELL TAG ID NO. NA	PAGE 2 OF 2

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

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OSE DIT JUL 22 2021 PM2:05

1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
POD1 CP-1865		CP-01865

WELL OWNER NAME(S)	PHONE (OPTIONAL)
BTA OIL PRODUCERS, LLC	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
104 S PECOS ST	MIDLAND	TX	79701

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	36	12.5	N
	LONGITUDE	-103	37	54	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

LEA SECTION 2 TOWNSHIP 20S RANGE 33E

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1753	JACOB FRIESSEN	VANGURD

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
2-8-21	2-8-21	105	105	0

COMPLETED WELL IS: ☐ ARTESIAN ☑ DRY HOLE ☐ SHALLOW (UNCONFINED)

STATIC WATER LEVEL IN COMPLETED WELL (FT): 0

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☑ ROTARY ☐ HAMMER ☐ CABLE TOOL ☐ OTHER – SPECIFY:

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
-1	99	4.5	BLANK PVC	THREAD 2.375	2	.187	
99	105	4.5	SCREEN PVC	THREAD 2.375	2	.187	.02

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	99	4.5	GROUT	8	POURED
99	105	4.5	SILICA SAND	.5	POURED

FOR OSE INTERNAL USE

WR-20 WELL RECORD & LOG (Version 04/30/19)

FILE NO. C-1865	POD NO. 1	TRN NO. 686912	
LOCATION 20S-33E-02	2-3-4	WELL TAG ID NO. NA	PAGE 1 OF 2

OSE DIT JUL 22 2021 RECEIVED

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	1	1	TOPSOIL	Y ✔ N	
1	21	20	SAND	Y ✔ N	
21	81	61	SANDY RED CLAY	Y ✔ N	
81	105	24	BLUE CLAY	Y ✔ N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☑ BAILER ☐ OTHER – SPECIFY:

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION:

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

PETE LOEWEN

6. SIGNATURE

BY SIGNING BELOW, I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED WELL. I ALSO CERTIFY THAT THE WELL TAG, IF REQUIRED, HAS BEEN INSTALLED AND THAT THIS WELL RECORD WILL ALSO BE FILED WITH THE PERMIT HOLDER WITHIN 30 DAYS AFTER THE COMPLETION OF WELL DRILLING.

JACOB FRIESSEN — SIGNATURE OF DRILLER / PRINT SIGNEE NAME

7-13-21 — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 04/30/2019)

FILE NO. C-1865	POD NO. 1	TRN NO. 686917	
LOCATION 20S.33E.02.2.3.4		WELL TAG ID NO. NA	PAGE 2 OF 2

WELL RECORD & LOG

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1. GENERAL AND WELL LOCATION

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
POD1 (BH-01)	n/a	C-1860 CP-1860

WELL OWNER NAME(S)	PHONE (OPTIONAL)
XTO Energy (Kyle Littrell)	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
6401 Holiday Hill Dr.	Midland	TX	79707

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32°	32'	15.33"	N
	LONGITUDE	-103°	35'	56.38"	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS – PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

SW SE Sec. 30 T20S R34E

2. DRILLING & CASING INFORMATION

LICENSE NO.	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
1249	Jackie D. Atkins	Atkins Engineering Associates, Inc.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
02/25/2021	02/25/2021	temporary well material	112	n/a

COMPLETED WELL IS: ☐ ARTESIAN ☑ DRY HOLE ☐ SHALLOW (UNCONFINED) — STATIC WATER LEVEL IN COMPLETED WELL (FT): n/a

DRILLING FLUID: ☐ AIR ☐ MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: Hollow Stem Auger

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM (inches)	CASING MATERIAL AND/OR GRADE (include each casing string, and note sections of screen)	CASING CONNECTION TYPE (add coupling diameter)	CASING INSIDE DIAM. (inches)	CASING WALL THICKNESS (inches)	SLOT SIZE (inches)
0	112	±6.5	Boring- HSA	--	--	--	--

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT

OSE JAN 11 2021 RECEIVED

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 06/30/17)

FILE NO. CP-1860	POD NO. 1	TRN NO. 682530	
LOCATION 32 3 T20S R34E Sec 30		WELL TAG ID NO. NA	PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	2	2	Caliche, tan, off-white, no odor, no stain, gravel, dry	Y ✓ N	
2	6	4	Sand, brown, no odor,no stain, m-f,well sorted, trace silt, dry	Y ✓ N	
6	15	9	Sandy clay,brown, moist, no odor, no stain, m-f, well sorted, no plasticty, no coh	Y ✓ N	
15	21	6	Clayey sand, tan-brown, moist, no odor, no stain, m-f, well sorted, cohesive, low	Y ✓ N	
21	--	--	Caliche w/ sand, tan, off-white, no odor, no stain, m-f grain, well sorted, dry	Y ✓ N	
--	40	19	23-gravel caliche 37-increase in sand content	Y ✓ N	
40	44	44	Sand w/ caliche, tan, brown, m-f grain, well sorted, no odor, no stain, dry	Y ✓ N	
44	58	14	Sandstone, mod. consolidation, m-f grain, increasing caliche tan/brown, dry,	Y ✓ N	
58	65	7	Clayey sand, brown, dry, m-f grain, well sorted, cohesive, medium plasticity	Y ✓ N	
65	78	13	Claystone, no odor, no stain, high plasticity, cohesive,brown, moist	Y ✓ N	
78	79	2	med-f grain sand stringer	Y ✓ N	
79	108	29	Claystone, no odor, no stain, high plasticity, cohesive,brown, moist	Y ✓ N	
108	109	1	fine grain sand stringer	Y ✓ N	
109	112	3	Claystone, no odor, no stain, high plasticity, cohesive,brown, moist	Y ✓ N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	
				Y N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA:

☐ PUMP ☐ AIR LIFT ☐ BAILER ☐ OTHER – SPECIFY:

TOTAL ESTIMATED WELL YIELD (gpm): 0.00

5. TEST; RIG SUPERVISION

WELL TEST: TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION: Temporary well materials removed and the soil boring backfilled using drill cuttings from total depth to ten feet below ground surface, then hydrated bentonite chips from ten feet below ground surface to surface. Logs adapted from WSP on-site geologist.

OSE DII MAR 11 2021 PM4:28

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

Shane Eldridge

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 30 DAYS AFTER COMPLETION OF WELL DRILLING:

Jack Atkins — Jackie D. Atkins — 03/09/2021

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 06/30/2017)

FILE NO.	CP - 1860	POD NO.	1	TRN NO.	682530	
LOCATION	323 T20S R34E Sec30			WELL TAG ID NO.	NA	PAGE 2 OF 2

John R. D Antonio, Jr., P.E.
State Engineer

Roswell Office
1900 WEST SECOND STREET
ROSWELL, NM 88201

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Trn Nbr: 682530
File Nbr: CP 01860
Well File Nbr: CP 01860 POD1

Apr. 08, 2021

TACOMA MORRISSEY
WSP USA
3300 NORTH A STREET
BLDG 1 #222
MIDLAND, TX 79705

Greetings:

The above numbered permit was issued in your name on 12/01/2020.

The Well Record was received in this office on 03/11/2021, stating that it had been completed on 02/25/2021, and was a dry well. The well is to be plugged according to 19.27.4.30 NMAC.

Please note that another well can be drilled under this permit if the well is completed and the well log filed on or before 12/01/2021.

If you have any questions, please feel free to contact us.

Sincerely,

Andrew Dennis
(575)622-6521

drywell

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

STATE ENGINEER OFFICE

1. GENERAL AND WELL LOCATION

OSE POD NUMBER (WELL NUMBER): 1	OSE FILE NUMBER(S): CP-1151
WELL OWNER NAME(S): Caza Operating LLC, Richard Wright	PHONE (OPTIONAL):
WELL OWNER MAILING ADDRESS: 200 North Loraine	CITY: Midland, STATE: Tx, ZIP: 79701

WELL LOCATION (FROM GPS)

	DEGREES	MINUTES	SECONDS	
LATITUDE	32	32	0.446	N
LONGITUDE	-103	38	3827	W

* ACCURACY REQUIRED: ONE TENTH OF A SECOND
* DATUM REQUIRED: WGS 84

DESCRIPTION RELATING WELL LOCATION TO STREET ADDRESS AND COMMON LANDMARKS - PLSS (SECTION, TOWNSHIP, RANGE) WHERE AVAILABLE

N½ Sec. 32 Township 22S Range 36E

2. DRILLING & CASING INFORMATION

LICENSE NUMBER	NAME OF LICENSED DRILLER	NAME OF WELL DRILLING COMPANY
WD-1292	Billy J. Bentle	Bentle Water Well Ser.

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
2-21-13	4-12-13		823	

STATIC WATER LEVEL IN COMPLETED WELL (FT):

COMPLETED WELL IS: ( ) ARTESIAN (•) DRY HOLE ( ) SHALLOW (UNCONFINED)

DRILLING FLUID: ( ) AIR (•) MUD ADDITIVES – SPECIFY:

DRILLING METHOD: ( ) ROTARY ( ) HAMMER (•) CABLE TOOL ( ) OTHER – SPECIFY:

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	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)
+1	6	18	A-53 B	PE	12¼	.250	—
0	823	6	none dry hole				

3. ANNULAR MATERIAL

DEPTH (feet bgl) FROM	DEPTH (feet bgl) TO	BORE HOLE DIAM. (inches)	LIST ANNULAR SEAL MATERIAL AND GRAVEL PACK SIZE-RANGE BY INTERVAL	AMOUNT (cubic feet)	METHOD OF PLACEMENT
0	6	18	Cement	3	Tremie
0	823	6	Cement	340	Tremie

FOR OSE INTERNAL USE

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

FILE NUMBER	CP-1151	POD NUMBER	1	TRN NUMBER	520275
LOCATION	OWD	22S.35E.35.222			PAGE 1 OF 2

4. HYDROGEOLOGIC LOG OF WELL

DEPTH (feet bgl) FROM	TO	THICKNESS (feet)	COLOR AND TYPE OF MATERIAL ENCOUNTERED - INCLUDE WATER-BEARING CAVITIES OR FRACTURE ZONES (attach supplemental sheets to fully describe all units)	WATER BEARING? (YES / NO)	ESTIMATED YIELD FOR WATER-BEARING ZONES (gpm)
0	3	3	Top Soil	○ Y ● N	
3	11	8	Caliche	○ Y ● N	
11	20	9	Sandy Clay	○ Y ● N	
20	28	8	Dry Sand	○ Y ● N	
28	31	3	Rock	○ Y ● N	
31	53	22	Red Sandy Clay	○ Y ● N	
53	131	78	Red Bed	○ Y ● N	
131	162	31	Lime	○ Y ● N	
162	193	31	Sand	○ Y ● N	
193	260	67	Red Bed	○ Y ● N	
260	336	76	Rock	○ Y ● N	
336	484	148	Red Bed w/sand stringers	○ Y ● N	
484	519	35	Red & Blue Clay	○ Y ● N	
519	529	10	Sand	○ Y ● N	
529	543	14	Hard Red & Blue Clay	○ Y ● N	
543	638	95	Red & Blue clay w/tight sand stringers	○ Y ● N	
638	730	92	Red & Blue Clay	○ Y ● N	
730	732	2	Rock	○ Y ● N	
732	823	95	Red Bed	○ Y ● N	
				○ Y ○ N	
				○ Y ○ N	

METHOD USED TO ESTIMATE YIELD OF WATER-BEARING STRATA: ○ PUMP ● AIR LIFT ○ BAILER ○ OTHER – SPECIFY:

TOTAL ESTIMATED WELL YIELD (gpm): Dry

5. TEST; RIG SUPERVISION

WELL TEST — TEST RESULTS - ATTACH A COPY OF DATA COLLECTED DURING WELL TESTING, INCLUDING DISCHARGE METHOD, START TIME, END TIME, AND A TABLE SHOWING DISCHARGE AND DRAWDOWN OVER THE TESTING PERIOD.

MISCELLANEOUS INFORMATION:

!!!!!!!!!!!!!

PRINT NAME(S) OF DRILL RIG SUPERVISOR(S) THAT PROVIDED ONSITE SUPERVISION OF WELL CONSTRUCTION OTHER THAN LICENSEE:

6. SIGNATURE

THE UNDERSIGNED HEREBY CERTIFIES THAT, TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF, THE FOREGOING IS A TRUE AND CORRECT RECORD OF THE ABOVE DESCRIBED HOLE AND THAT HE OR SHE WILL FILE THIS WELL RECORD WITH THE STATE ENGINEER AND THE PERMIT HOLDER WITHIN 20 DAYS AFTER COMPLETION OF WELL DRILLING:

Billy Bantle 4-21-13

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

FOR OSE INTERNAL USE — WR-20 WELL RECORD & LOG (Version 06/08/2012)

FILE NUMBER	CP-1151	POD NUMBER	1	TRN NUMBER	520275
LOCATION	OWD	225.35E.35.222			PAGE 2 OF 2

Locator Tool Report

General Information:

Application ID:29 Date: 02-24-2017 Time: 10:27:10

WR File Number: CP-01151
Purpose: POINT OF DIVERSION

Applicant First Name: RANDALL
Applicant Last Name: HICKS

GW Basin: CAPITAN
County: LEA

Critical Management Area Name(s): NONE
Special Condition Area Name(s): NONE
Land Grant Name: NON GRANT

PLSS Description (New Mexico Principal Meridian):

SE 1/4 of SE 1/4 of NW 1/4 of SE 1/4 of Section 27, Township 20S, Range 33E.

Coordinate System Details:

Geographic Coordinates: Well Drillers Lat and Long

Latitude:	32 Degrees	32 Minutes	26.8 Seconds	N
Longitude:	103 Degrees	38 Minutes	49.6 Seconds	W

Universal Transverse Mercator Zone: 13N

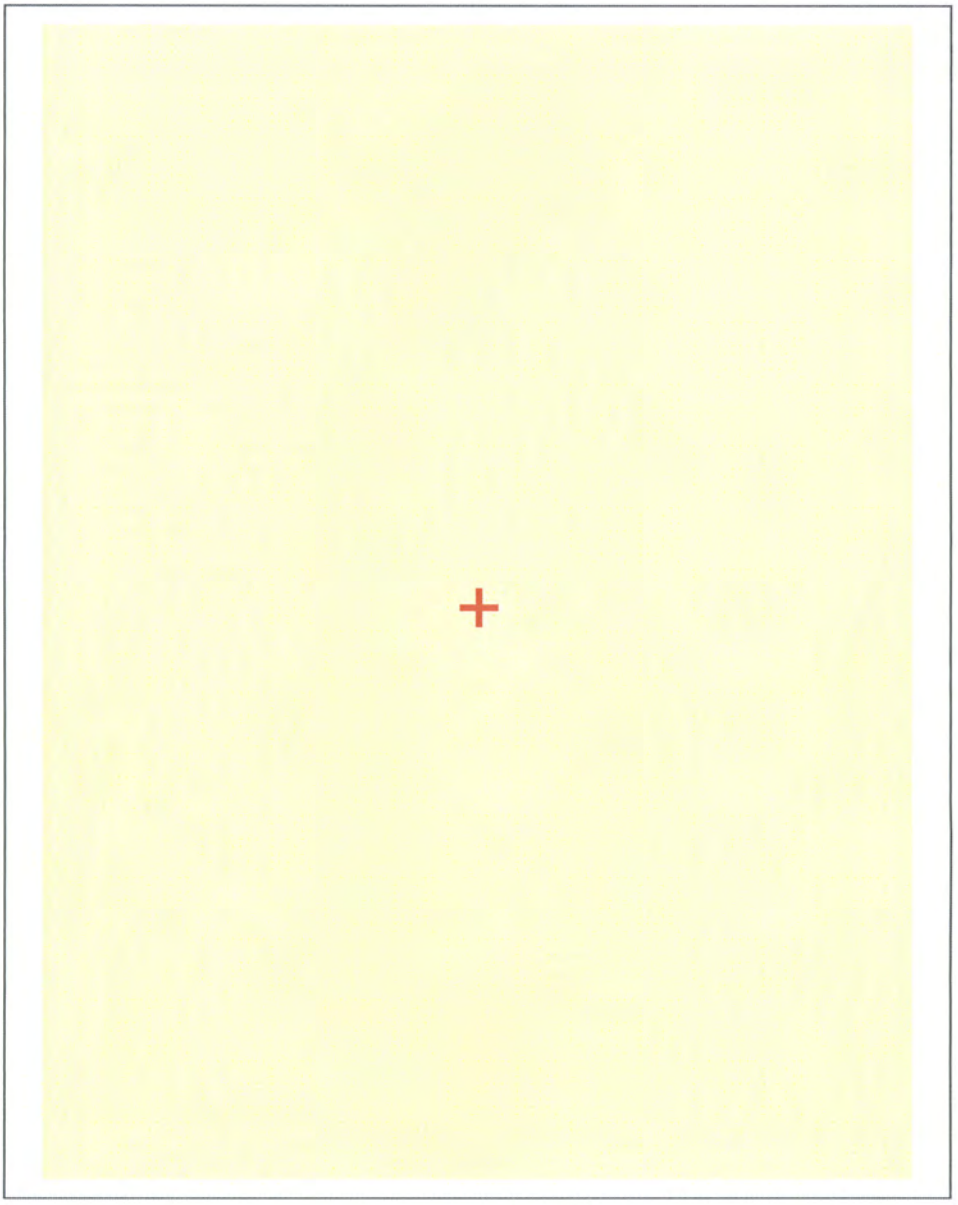
NAD 1983(92) (Meters)	N: 3,601,185	E: 627,036
NAD 1983(92) (Survey Feet)	N: 11,814,888	E: 2,057,202
NAD 1927 (Meters)	N: 3,600,982	E: 627,086
NAD 1927 (Survey Feet)	N: 11,814,223	E: 2,057,363

State Plane Coordinate System Zone: New Mexico East

NAD 1983(92) (Meters)	N: 171,037	E: 229,454
NAD 1983(92) (Survey Feet)	N: 561,143	E: 752,801
NAD 1927 (Meters)	N: 171,018	E: 216,902
NAD 1927 (Survey Feet)	N: 561,081	E: 711,620

NEW MEXICO OFFICE OF STATE ENGINEER

Locator Tool Report



WR File Number: CP-01151 Scale: 1:57,473

Northing/Easting: UTM83(92) (Meter): N: 3,601,185 E: 627,036

Northing/Easting: SPCS83(92) (Feet): N: 561,143 E: 752,801

GW Basin: Capitan

Print Date: 02/24/2017

Scott A. Verhines, P.E.
State Engineer

well Office
1900 WEST SECOND STREET
ROSWELL, NM 88201

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Trn Nbr: 520275
File Nbr: CP 01151
Well File Nbr: CP 01151 POD1

Apr. 29, 2013

RANDALL T HICKS
CAZA OPERATING LLC
901 RIO GRANDE NW, F-142
ALBUQUERQUE, NM 87104

Greetings:

The above numbered permit was issued in your name on 01/22/2013.

The Well Record was received in this office on 04/24/2013, stating that it had been completed on 04/12/2013, and was a dry well. The well is to be plugged or capped or otherwise maintained in a manner satisfactory to the State Engineer.

Please note that another well can be drilled under this permit if the well is completed and the well log filed on or before 01/31/2014.

If you have any questions, please feel free to contact us.

Sincerely,

Yolanda Mendiola
(575)622-6521

Revised June 1972

STATE ENGINEER OFFICE
WELL RECORD

475954

Section 1. GENERAL INFORMATION

(A) Owner of well TXO Prod. Owner's Well No. _____
Street or Post Office Address c/o Glenn's Water Well Service,
City and State P.O. Box 692 Tatum, N.M. 88267

Well was drilled under Permit No. CP-750 and is located in the:

a. _____ ¼ _____ ¼ SW ¼ SE ¼ of Section 7 Township 20-S. Range 34-E. 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, Inc. License No. WD 421

Address P.O. Box 692 Tatum, N.M. 88267

Drilling Began 6/20/90 Completed 6/20/90 Type tools rotary Size of hole 7 7/8 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 320 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
			dry hole	

STATE ENGINEER OFFICE ROSWELL, NEW MEXICO 90 JUL 26 AM 8 29

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To

Section 4. RECORD OF MUDDING AND CEMENTING

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

STATE ENGINEER OFFICE SANTA FE, NEW MEXICO 90 SEP 7 AM 10 02

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method well was plugged with dirt
Date Well Plugged _____
Plugging approved by:
_____
State Engineer Representative

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

FOR USE OF STATE ENGINEER ONLY

Date Received July 26, 1990 Quad _____ FWL _____ FSL _____

File No. CP-750 Use OWD Location No. 20.34.7.4300

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	6	6	sand
6	16	10	caleche
16	20	4	sand
20	22	2	rock (soft)
22	32	10	sand
32	65	33	sandy clay
65	102	37	red clay
102	107	5	blue sand rock
107	118	11	brown shale
118	127	9	blue sand rock
127	130	3	brown shale
130	154	24	blue sand rock
154	159	5	limestone hard
159	178	19	red clay
178	191	13	brown shale
191	210	19	red clay
210	235	25	brown shale
235	278	43	brown shale (some light blue)
278	295	17	purple shale (some light blue)
295	306	11	yellow and blue clay
306	320	14	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

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.

Corky Gibson
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 to be used for domestic purposes or is used as a public water supply record. only Section 1(a) and Section 5 need be completed.

Revised June 1972

475940

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Grace Drilling Co. Owner's Well No. _____

Street or Post Office Address P.O. Box 13480

City and State Odessa, TX 79768

'91 JUN 5 AM 10 47

STATE ENGINEER OFFICE
SANTA FE, NEW MEXICO

Well was drilled under Permit No. CP 748 and is located in the:

a. NE ¼ ____ ¼ ____ ¼ ____ ¼ of Section 1 Township 20 Range 33E 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 West Texas Water Well Service License No. WK 1184

Address 3432 W. University Odessa, TX 79764

Drilling Began 6-1-90 Completed 6-2-90 Type tools Air rotary Size of hole 8 3/4 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
NO	CASING							

Section 4. RECORD OF MUDDING AND CEMENTING

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

Section 5. PLUGGING RECORD

Plugging Contractor West Texas Water Well Service

Address _____

Plugging Method Pumped grout - neat cement

Date Well Plugged 6-2-90

Plugging approved by:

_____
State Engineer Representative

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

FOR USE OF STATE ENGINEER ONLY

Date Received **June 19, 1991**

Quad _____ FWL _____ FSL _____

File No. **CP-748** Use **OWD** Location No. **20.33.1.2414**

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	12	12	Topsoil
12	20	8	Caliche
20	36	16	Sand
36	96	60	Red clay
96	100	4	Sand
100	120	20	Red shale
120	160	40	Red shale w/streaks of sandstone
160	280	120	Red shale w/streaks of blue shale

Section 7. REMARKS AND ADDITIONAL INFORMATION

Dry hole - plugged back w/neat cement

No casing was instaled

'91 JUN 19 AM 10-29
STATE ENGINEER OFFICE
ROSWELL, NEW MEXICO

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.

Robert E. Collis
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, plugged, or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

SANTA FE

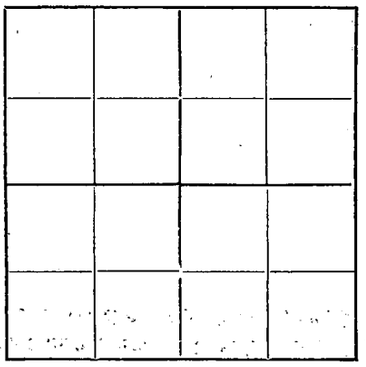
Form WR-23 STATE ENGINEER OFFICE

Little Eddy Unit WW #1
Fed. Lease LC-069944

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest 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 form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1



(Plat of 640 acres)

(A) Owner of well Pan American Petroleum Corporation
Street and Number Box 68 - Hobbs, New Mexico
City Hobbs State New Mexico
Well was drilled under Permit No. CP-317 and is located in the
SW ¼ SE ¼ SW ¼ of Section 5 Twp. 20S Rge. 33E
(B) Drilling Contractor License No.
Street and Number
City State
Drilling was commenced 19
Drilling was completed 19

Elevation at top of casing in feet above sea level Total depth of well
State whether well is shallow or artesian Depth to water upon completion

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1				
2				
3				
4				
5				

1967 MAY -4 AM 9:52
STATE ENGINEER OFFICE
SANTA FE, N. M.

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used

Section 5 PLUGGING RECORD

Name of Plugging Contractor Pan American Petroleum Corporation License No.
Street and Number Box 68 City Hobbs State New Mexico
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Welded steel cap Date Plugged April 20, 19 67
Plugging approved by: James A. Wright
Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

RECEIVED
STATE ENGINEER OFFICE
1967 APR 27 AM 8:10

Date Received

0 & 1 State Engr.
1 - File

File No. CP-317 Use D.W.D. Location No. 20.33.5.343

Section 6

LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered

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 well.

Well Driller

Form WR-23

SANTA FE

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest 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 form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well Pan American Pet. Corp.
Street and Number Box 68
City Hobbs, State N. M.
Well was drilled under Permit No. CP-317 and is located in the
SW ¼ SE ¼ SW ¼ of Section 5 Twp. 20 Rge. 33
(B) Drilling Contractor Abbott Bros. License No. WD-46
Street and Number Box 637
City Hobbs State N. M.
Drilling was commenced Feb. 5 1966
Drilling was completed Feb. 17 1966

Elevation at top of casing in feet above sea level ____ Total depth of well 680'
State whether well is shallow or artesian shallow Depth to water upon completion 325'

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1	520	540	20	Brown Water Sand
2	625	645	20	Brown Water Sand
3	660	675	15	Brown Water Sand
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
7"	23	10	0	575	575	none	515	575

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used

STATE ENGINEER OFFICE SANTA FE, N. M. 1966 MAR 22 AM 9:21

Section 5 PLUGGING RECORD

Name of Plugging Contractor ____ License No. ____
Street and Number ____ City ____ State ____
Tons of Clay used ____ Tons of Roughage used ____ Type of roughage ____
Plugging method used ____ Date Plugged ____ 19____
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received ✓

STATE ENGINEER OFFICE DISTRICT II ROSWELL, N. MEX. 1966 FEB 24 AM 8:36

File No. CP-317 Use owd Location No. 20.33.5.343

Section 6 LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
0	2	2	Brown	Sand
2	20	18	White	Caliche
20	110	90	Brown	Sand
110	520	410	Red	Clay & Shale
520	540	20	Brown	Water Sand
540	625	85	Red	Shale & Sand
625	645	20	Brown	Water Sand
645	660	15	Red	Shale
660	675	15	Brown	Water Sand
675	680	5	Red	Clay

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 well.

Elbott Bros. By Murrell Elbott
Well Driller

December 2022

Volume 2

C-147 Registration Package for Ranger AST Containments

Section 22, T20S, R33E, Lea County

Design/Construction Plan
Engineering Drawings and Liner Specifications
Well Water 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:
Franklin Mountain Energy LLC
Denver, Colorado

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

Box 9

Design and Construction Plan

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)**

Design and Construction Plan
Above Ground Tank (AST) Containments

General

Examination of the engineering drawings and the SOP for set-up (Appendix 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.

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.

These AST Containments are constructed of 12-foot high steel panels and are netted or 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. 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.

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.

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.

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.

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 the SOP. 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 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.

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.

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.

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 requested variance*.

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.

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.

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] approved by OCD pursuant to a variance.* The liner system is presented in an earlier section of this submission.

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

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

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.

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 also the subject of requested variance.*

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.

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 design sketch).

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 x 10-5 cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection.

The 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.

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.

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. Factory welded seams shall be used where possible. AST Containment contractor will employ field seams in

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

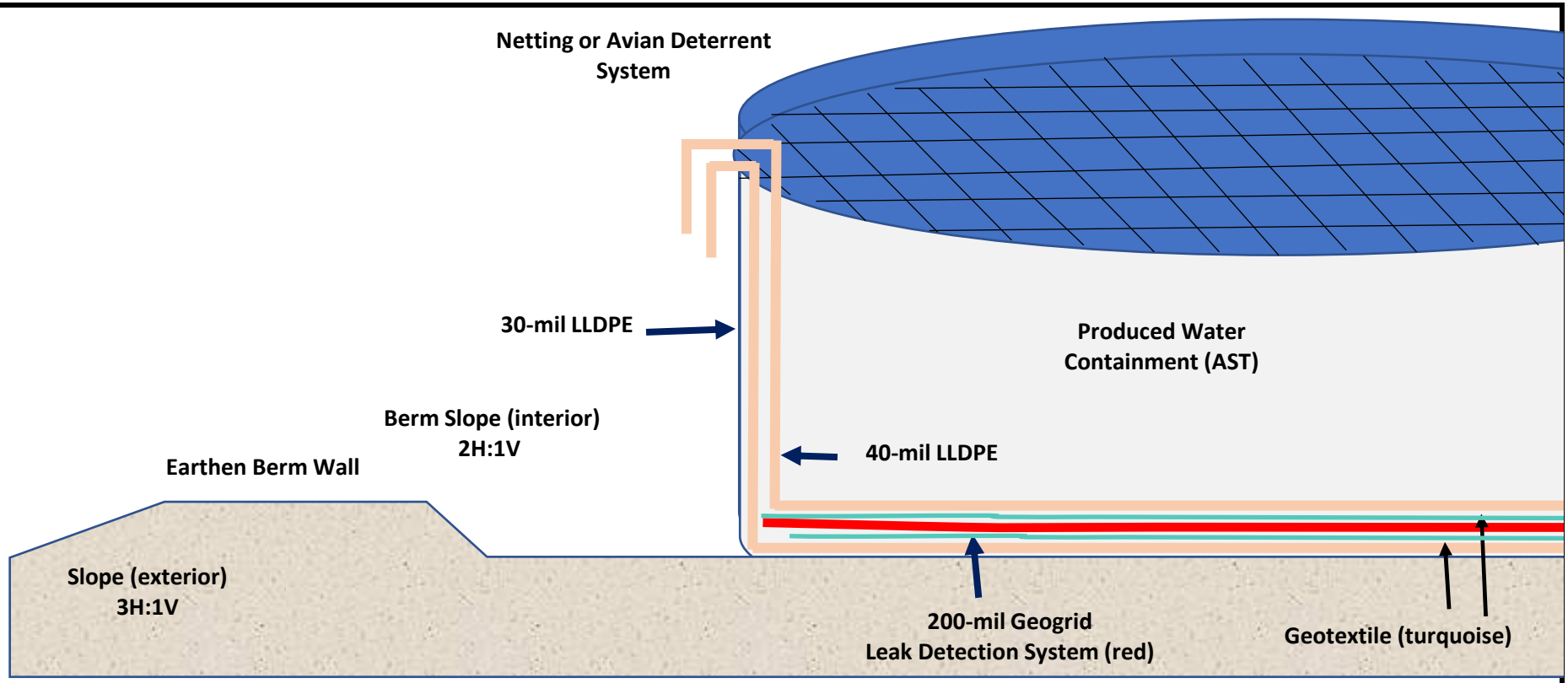
geosynthetic material that are thermally seamed. Prior to field seaming, AST Containment contractor shall overlap liners four to six inches and minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the AST Containment bottom.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

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.

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.

19.15.34.13 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.



Description of Leak Detection System

- 40-mil LLDPE comprise primary liner and 30-mil LLDPE comprise the secondary liner
- 200-mil geogrid drainage layer lies between the primary and secondary liner per Plate 2
- Geotextile between the geogrid and each liner
- > 3-inch deep sump excavated on down slope side of AST per Sump Design Drawing
- A small hose runs from the collection sump to top of AST via tube (see Section D)
- Every week, a portable self-priming peristaltic pump connects to the leak detection system.
- The self-priming pump discharge hose runs back into the AST, on top of the primary liner
- If fluid is detected, it is tested for conductance to determine the origin of the water (i.e. produced water or condensation)

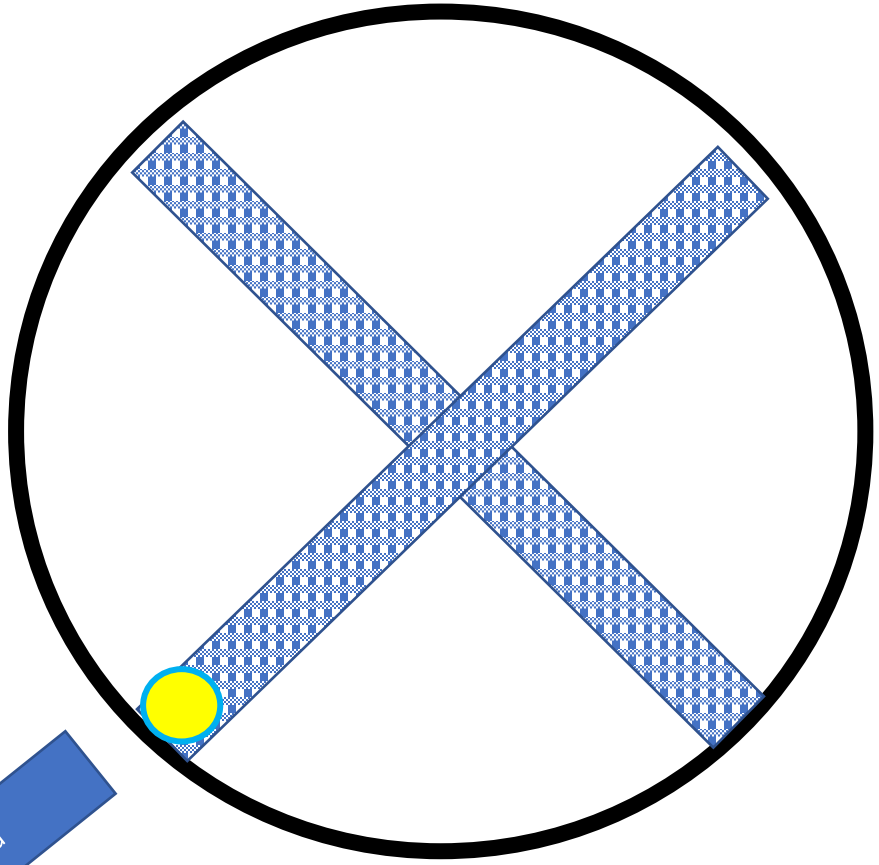
R.T. Hicks Consultants Albuquerque, NM	**Design Sketch**	**Plate 1**
	Well Water Solutions	**May-21**

~~Use laser level to determine slope of pad and low point of AST~~

200 mil geogrid placed
above 8-oz geotextile and 30-mil secondary liner
inside of AST after set up, before install of primary liner
below 40-mil primary liner

8-oz geotextile is placed
over the 30-mil LLDPE liner inside the steel AST ring
under the 40-mil primary liner inside the AST

Sump at lowest point of the AST set up



Sump Location

0 50 100

R.T. Hicks Consultants Albuquerque, NM	**Layout of Geogrid Drainage Mat**	**Plate 2**
	WWS - North Olympus AST	**June 2021**

C 147 – Box 3
Recycling Containment Design Drawings
Set Up SOP
Liner Specifications

PILLAR STRUCTURAL ENGINEERING

June 4, 2021

Well Water Solutions and Rental, Inc.
2130 W. 40th
Casper, WY 82604
Attn: Sean Lovelace

Re: Portable Frac Tank Certification – Pinned Seams

Dear Mr. Lovelace:

Per your request our office has performed a structural analysis of the portable frac tanks as well as the associated accessories. This analysis was performed to determine that the tanks meet the required strength criteria under operating conditions according to the AISC Manual of Steel Construction.

The tanks range in diameter from approximately 60 to 217 feet and are 11 feet, 8 inches in height and are designed to store water. They are constructed of individual steel reinforced panels that are connected together with a patent pending steel pin system.

The following tanks sizes were included in the analysis:

- 6,000 BBL – Approximately 60'Ø
- 10,000 BBL – Approximately 81'Ø
- 20,000 BBL – Approximately 108'Ø
- 30,000 BBL – Approximately 135'Ø
- 33,000 BBL – Approximately 142'Ø
- 36,000 BBL – Approximately 148'Ø
- 40,000 BBL – Approximately 156'Ø
- 43,000 BBL – Approximately 162'Ø
- 47,000 BBL – Approximately 169'Ø
- 50,000 BBL – Approximately 176'Ø
- 55,000 BBL – Approximately 183'Ø
- 60,000 BBL – Approximately 190'Ø
- 80,000 BBL – Approximately 217'Ø

PILLAR STRUCTURAL ENGINEERING
1964 East 1st Street
Casper, WY 82601
PHONE (307) 265-3900
FAX (307) 265-3559
WEB SITE http://www.pillarse.com

The tanks are constructed of the following materials:

- Tank Panels – ASTM A36, 36 ksi Steel Plate
- Horizontal & Vertical Framing – ASTM A500, Grade B, 46 ksi Structural Steel Tubing
- Connecting Pins - ASTM A36, 36 ksi Steel Round Bar

Our office has determined that the portable frac tanks, as described herein, are capable of supporting the operating load conditions in conformance with the AISC Manual of Steel Construction.

Calculations of this analysis can be provided upon request.

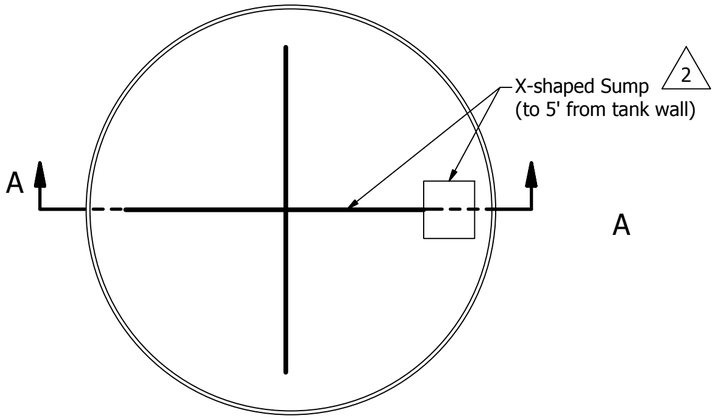
If you have any questions or require additional information please contact our office.

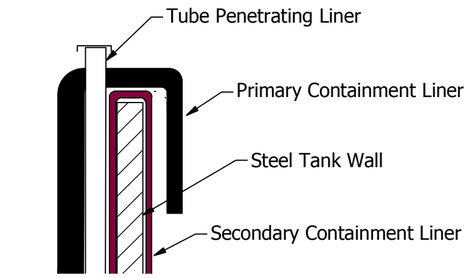
Sincerely,

Bryan Prosinski, P.E., S.E.
Pillar Structural Engineering
Principal – Vice President

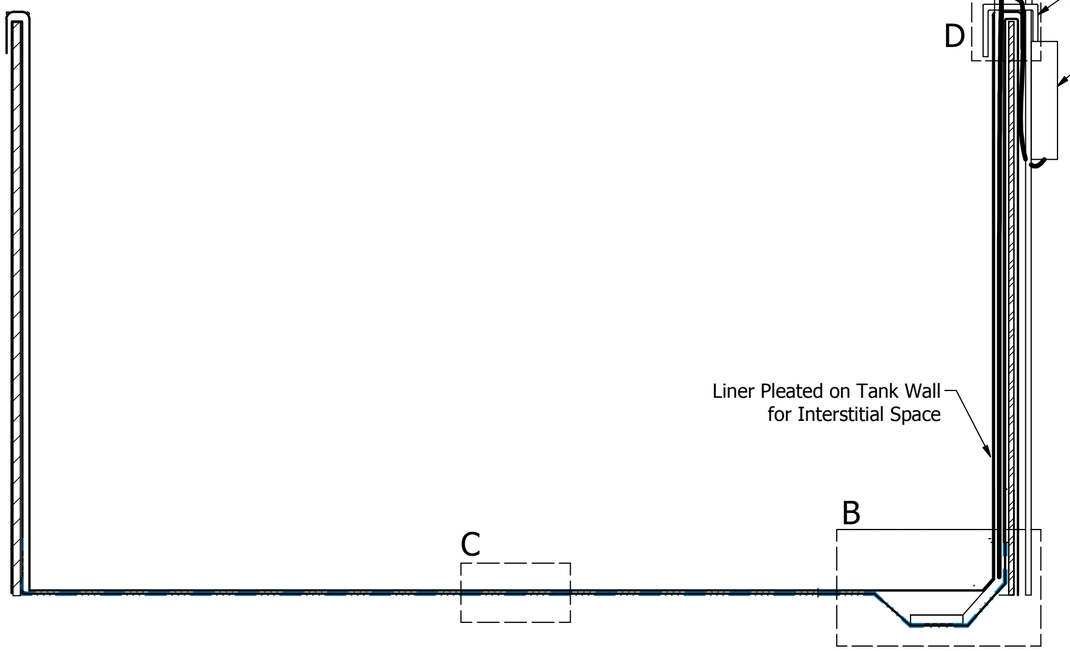
PILLAR
STRUCTURAL
ENGINEERING

WWS DOUBLE-LINED FRAC WATER TANK SYSTEM

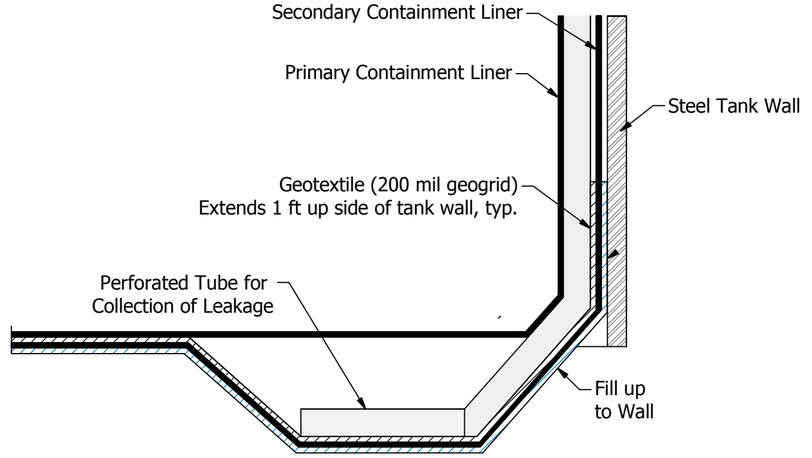




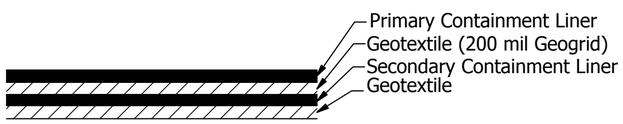
SECTION D
TUBE DETAIL
(Automated Leak Detection System Removed for Clarity)



VIEW A-A
TANK DETAIL



SECTION B
SUMP DETAIL



SECTION C
LINER DETAIL

LUCID
DRAFTING & DESIGN LLC
sarah@luciddrafting.com 307.752.7388

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
0	INITIAL DWG	10/29/2015	SES
1	ADDED LEAK DETECTION SYSTEM	11/6/2015	SES
2	REVISED SUMP	11/6/2015	SES
3	ADDED GEOTEXTILE UNDER AND BETWEEN LINERS	11/24/15	SES

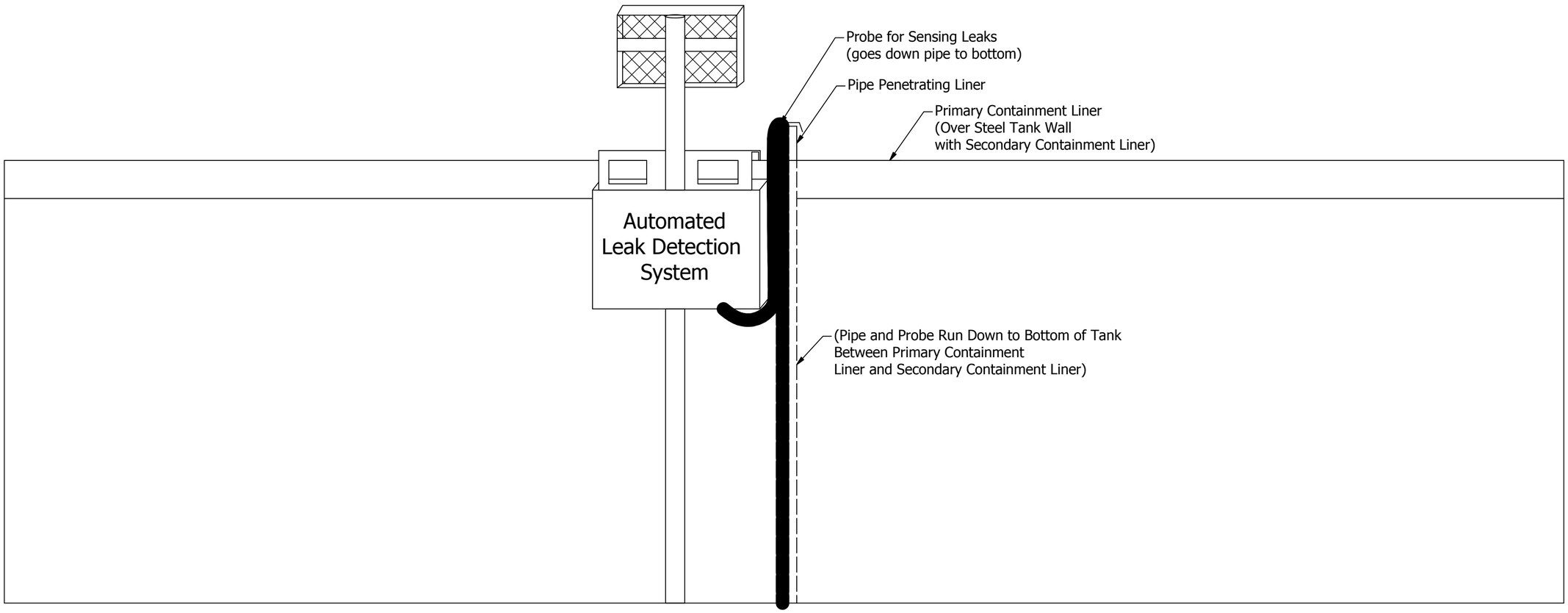
TITLE	Double-Lined Frac Tank System
CUSTOMER	
PROJECT/JOB	WWS Double-Lined Tank System
APPROVAL	
DRAFTER	SES
DATE	10/28/2015

WELL WATER SOLUTIONS AND RENTALS, INC.

SIZE	DWG NO	REV
C	LDD15-WWS-02	3

SHEET 1 OF 2

1 AUTOMATED LEAK DETECTION SYSTEM



TITLE	Double-Lined Frac Tank System
CUSTOMER	
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DRAFTER	SES
DATE	10/28/2015

WELL WATER SOLUTIONS AND RENTALS, INC.

SIZE	DWG NO	REV
C	LDD15-WWS-02	3

SHEET 2 OF 2

2020

Well Water Solutions and Rentals Inc.

STANDARD OPERATING PROCEDURE (SOP)

TABLE OF CONTENTS

Section 1.01 Introduction

1) About

Well Water Solutions and Rentals Inc. aka (WWS), is the original pioneer of the portable Above Ground Storage Tank industry. The above ground storage tanks or AST's have become an integral part in saving cost in the oil and gas and industrial industries. WWS has been supplying and servicing these portable tanks for longer than any other company in the USA. We have focused our time and experience on providing the best tank products at the highest safety standards. We continue to learn and adapt every-day in our industry to make sure our employees are safe and our customers are happy.

Standard Operating Procedures or (SOPs) are a staple for safety and quality here at WWS. Our SOP for our above ground storage tank (AST) systems including planning, rig up, operations, and rig down. This SOP will discuss steps to be taken to promote the safest process, as well as list the potential hazards that should be identified and reviewed during our JSA prior to beginning the work process.

2) Background

WWS has over 170 AST's that are used for a variety of oil field and industrial applications within the fluid management operations. AST's can be used in place of traditional 500 BBL trailer tank farms and in-ground water impoundments, and are suitable for fresh water as well as production water. WWS tanks have standard sizes, ranging from 6,000 barrel (bbl) capacity to 60,000 bbl capacities. Through intensive design criteria WWS secured a patented design on the strongest possible design for as AST tank. We analyzed many methods to secure the panels together and all other methods failed our criteria. We have also set a standard in the industry for safe movement of the panels with our patented adaptor plate for a quick attach telehandler. We were able to successful submit engineering documentation to the Oshkosh Corporation, which owns JLG and they have stamped and approved our adaptor plate.

3) SOP Purpose

WWS will extensively review this SOP with all new hire employees to assure proper understanding of all procedures. This SOP will also be reviewed with an employee if his/her responsibilities change under the plan. An electronic copy of this plan will be available at all WWS regional offices.

Training our employees to follow our SOP is the first step to a safe and successful work environment. We also need all our employees to treat everyone with respect and follow the lead of their supervisor to make sure every day is safe.

STOP WORK authority and who has the power to use it is another tool we use to help everyone stay involved in the safety process. We highly encourage all employees to feel comfortable in rising awareness of any unsafe situation happening or providing suggestions to help make any task safer as well. This helps everyone grow to be a stronger team.

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

4) EH&S Programs

This SOP 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 WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with.

5) Summary

This SOP 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 WWS, must comply with. In addition to this SOP, WWS personnel will strictly observe the policies and procedures of each operating company they are to do work with

Section 1.02 AST Planning and Preparations

1) Planning

Proper planning and documentation will help assure a successful AST rig up and rig down. The following steps can be utilized to fully, safely, and accurately perform the tank rig up or rig down:

- AST Order Information
- Customer Meeting
- Soil Conditions and Pad Preparation (Completed by Customer)
- Pre-Mobilization and On-site Meeting
- Notifications
- Job Safety Analysis (JSA)
- AST material requirements for delivery

2) Required AST Order Information

WWS Manager or Field Supervisor will record general AST order information including the following:

- Site location directions and coordinates
- Customer Contact Name, Phone, and Email
- Emergency Medical Contacts
- Special Safety Requirements
- Tank Utilization Dates
- Tank size and Accessories
- Special piping requests

3) Site Meeting or Scheduling Call

Prior to finalizing the delivery schedule, a meeting or conference call is held with WWS and our customers required personnel to make sure all parties are coordinating well and have the same and accurate information.

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.

KEY MEETING TOPICS:

- Introduce all WWS key personnel to our customer's key personnel
- Review what tanks are needed and what use they will be needing them for
- Review AST scope of work, what is normally included, what is not
- Confirm AST size(s) to be used
- Assure a 20' working space around each tank for safe working area
- Permitting for AST (as needed)
- Current site conditions and soil preparation requirements
- Site access and truck route requirements, and any weather-related issues that could affect them
- Time line for rig up and rig down of the AST
- Detailed drawings of the location layout for tank and piping placement
- Details on "Fresh Water" source to fill the tank on the day of the set up
- Assure a minimum of 24" of water the day of the setup to quickly and safely complete the job
- Identify what other charges could be incurred by the customer and result in standby time or additional charges
- Confirm customer is responsible for the used liner, residual solids left in the tank, removal of all radioactive NORM materials, and site reclamation
- Review any and all additional safety requirements the customer may have
- WWS to follow up with an email to review all changes made

4) 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.
WWS Soil Requirements are:

- Minimum soil compaction of 95% compaction
- Soil testing results shall be shared with WWS if requested
- Site must be cleared and free of debris such as sticks, sharp rocks, and trash etc.
- WWS 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 WWS prior to the commencement of AST construction upon request
- Proof roll testing maybe be used if there is doubt of site compaction standards
- Grade of the inner AST area to be a maximum of .25% or 3" drop per 100' towards 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

Completions of all these steps will assure a smooth, safe, and seamless tank set up.

5) Pre-Mobilization Onsite Meeting

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

6) CALL BEFORE YOU DIG "811"

Even though the customer or their subcontractor may have already called for utility locates for the sump hole, the WWS field supervisor should call the local or state underground utility location service again at least 3 days in advance before construction/digging begins. The ticket or reference number provided by the one-call service will then be documented.
The following web site has contacts for all the states and provinces.
http://www.call811.com/state-specific.aspx.
Call 811 in United States

7) 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. Updates and notifications will be made as agreed to during the customer meeting. WWS delivery personnel will use a spotter for the equipment driver and should unload all materials safely taking extra care to avoid damage to liners, plates, and all other AST components. Should any problem arise during the scope of operations the WWS field supervisor will notify to correct customer contact to remedy the issue.

Section 1.03 WWS AST Pre Rig Up Requirements

1) Loading Requirements

WWS will have the field supervisor complete a "**Dispatch Load In Load Out Sheet**" before and after the set-up and rig down of the AST system. This sheet will identify all the needed parts and accessories to complete the AST Rig Up. During Rig Down the "Dispatch load in load out sheet" is also filled out to ensure all parts and accessories are accounted for and in good working condition. In the event parts or accessories are missing and/or damaged the customer will assume full responsibility and be billed back for the parts and accessories.

2) Job Safety Analysis (JSA)

A job safety analysis (JSA) must be completed on-site prior to the beginning of any work. The JSA will be completed according to WWS protocol and safety programs. Customer's safety requirements will also be communicated during the JSA. All personnel, third party contractors, and customer representatives are expected to participate and sign the JSA when the JSA is completed.

3) Check Soil Conditions

Preparation of the tank pad is solely the responsibility of the customer.
However, bad weather such as wind, rain, and snow events can change the soil conditions quickly. If soil conditions change the WWS field supervisor will notify the proper customer contact.

4) Proper Tank Positioning

- Check proposed AST site to confirm that a 20' 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 setback distances to existing wells, power lines, etc. are met
- Mark out the tank location using WWS marking equipment
- Establish and mark out final location for the fill and suction tube(s) and stairs

5) Equipment (WWS 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.

- One 40' and/or 60'extending straight or z boom man-lift
- 10,000 lb. or greater capacity, rough terrain forklift (JGL 10-43A is preferred telehandler)
- Backhoe or small excavator with bucket
- Skid steer

6) 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"
- One small pry bar
- 8' rock bar (digging bar)
- Five safety harnesses with retractable tethers
- Five retractable lanyards
- 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
- 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
- All personnel must have Fire retardant clothing (FRs) Safety Hard Hats, Safety Glasses, crush resistant gloves and any safety requirements from customer

Section 1.04 AST Tank Rig Up Procedure

WWS Field Supervisor will double check all paper work and location prior to setup to assure everything is correct and ready to set the AST.

1) 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 or other set backs
- Measure and paint a line to mark the circumference of tank for panel placement using WWS special design marking tool
- Also mark 15' outside the tank circumference as this will show where the liner should reach once fully stretched flat. This will assure enough liner is present to go over tank walls once placed

2) Initial Tank Erection Process

- Determine where suction pipe is to be located in the tank
- Dig at least 4' wide x 6' long x 16" deep sump hole for over the wall suction pipe to set into and taper the edges so there are no sharp corners of the excavation. Or dig 3' wide x 12' long x 10" deep sump hole for undermount suction pipe
- Remove any sharp stones and debris for the digging process
- If multiple suction manifolds are required, the sumps should have a minimum of 15' 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 utilize a standard 10oz geotextile that will be laid on the grounds surface to act as a padded protector for the liner
- A Standard LLDPE 30 mil or 40 mil liner will then be used as the primary containment, but may also be used as a secondary containment within the tank upon request.
- Check customer specifications and regulatory permitting to assure proper liner and containment requirements are meet for ASTs
- Organized crew inspection walks for the entire tank base area will be performed to pick up any sharp stones or other sharp debris that could damage the liner
- The geotextile pad can now be deployed out fully at this point. It should reach beyond the tank circumference paint lines by 1'-4'
- Once geotextile is completed the liner can be fully deployed. Crews will double check that the liner will reach to the 15' marks beyond the tank circumference
- Crews will then perform a visual inspection of the liner and repair any defects as necessary
- Fold the liner towards the middle of the tank until tank circumference paint line is fully exposed

3) Secondary Containment Liners and Installation

- If tank system requires a secondary liner and leak detection system this will be installed on top of the first liner
- WWS Field Supervisor will direct the installation of the various parts and layers of the secondary containment system

- For example, a 220-mil geo grid mesh (Reference Section 1.16 for Spec) or other suitable approved spacer material can be installed between the top and bottom liner layers to provide a separation for to water flow. Installation of inspection pipes into to the designed low points of the tank will later be used for leak inspections
- Install any other customer required components for the leak inspections if needed
- Unroll top liner over geo grid to completed the secondary containment system
- Follow the same setup guidelines for a one liner system for the two-liner system, and make sure to complete the components installation fully once the first liner is clamped.

4) Tank Wall Erection

- Field Supervisor will complete a visual inspection of each panel as it is prepared to be placed
- The first tank panel will be placed and secured using the backhoe bucket
- Once backhoe fully secures the panel the telehandler can then get the next panel. Crews will continuously provide operators with spotters during all operations
- If higher winds exist crews are cautioned to pay special close attention to all operations
- Crews will repeat the panel placement process until entire tank is erected
- Personnel secured on man lift or using a ladder (depending on customer policies) then secure the panels in place with 14 retainer pins per panel.

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 JSA. 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 connections points and use spray glue to secure in place
- 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.

5) Proper Liner Placement and Clamping

- After 3 or more panels are set, and all liner protections are complete, crews inside the tank can begin to hand liner up to crews outside the tank that are in the manlift
- 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)
- The inside crew of 2 works with the manlift crew of 2 located outside to pull the liner up and over the top of each panel. The man lift crew lifts the liner 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

- Proper slack or excess liner on the vertical wall can be tested by the inside crew. The crew will pin the liner to the bottom of the wall with their boot and pull liner at chest level outwards away from the wall. There should be about 3' from wall to liner when being pulled. This is the appropriate amount of slack. If crew ever has doubt that the liner slack may not be enough WWS's experience has proven more slack the better, so just give it a little more slack if needed

NOTE: The crew must allow sufficient slack in the liner at the wall to allow for liner movement during filling and draining.

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: Each clamp is notched where D-rings on the top of each panel are located. This notch acts as an added safety retainer once clamps are fully tightened. Each panel will receive 2 liner clamps
- Crews will continue to clamp until they have reached the final panel. Crews will leave this small area of liner down until all internal piping is completed

6) Installing Tank Accessories

- Install safety stair system, fill piping, and suction piping. Ensure that stair system and piping are appropriately secured to the tank walls with ratchet straps of chains
- Assemble all interior piping and assure any connections or sharp points are fully wrapped in geo material for protection

7) AST Completion Steps

- Close final panel and secure with pins
- Lift liner and secure at the closure point to finish clamping process
- Trim liner and allow approximately 2' of liner to hang over edge of tank.
- Begin to fill the tank with water and monitor filling process
- Inspect all connections and equipment, confirming at least 2 liner clamps 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
- Water should NEVER go below 12 inches at the LOWEST level in the tank. (Mark liner as a caution).

NOTE: Filling process may begin as early as ¾ of the tank wall panels are set. Only fresh water can be used if filling while personnel is in the tank. Reasons for early filling is to assist with windy days as the water weight help to hold liner in place. It is recommended no personnel be in the take with more than 6" of water.

Section 1.05 AST In Use Operations

1) Inspections and Monitoring

weekly

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 WWS Manager/Field Supervisor.

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.

2) Initial Leak Detection and Liner Repair

Notify BLM and NMOCD if leak reaches the ground

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.

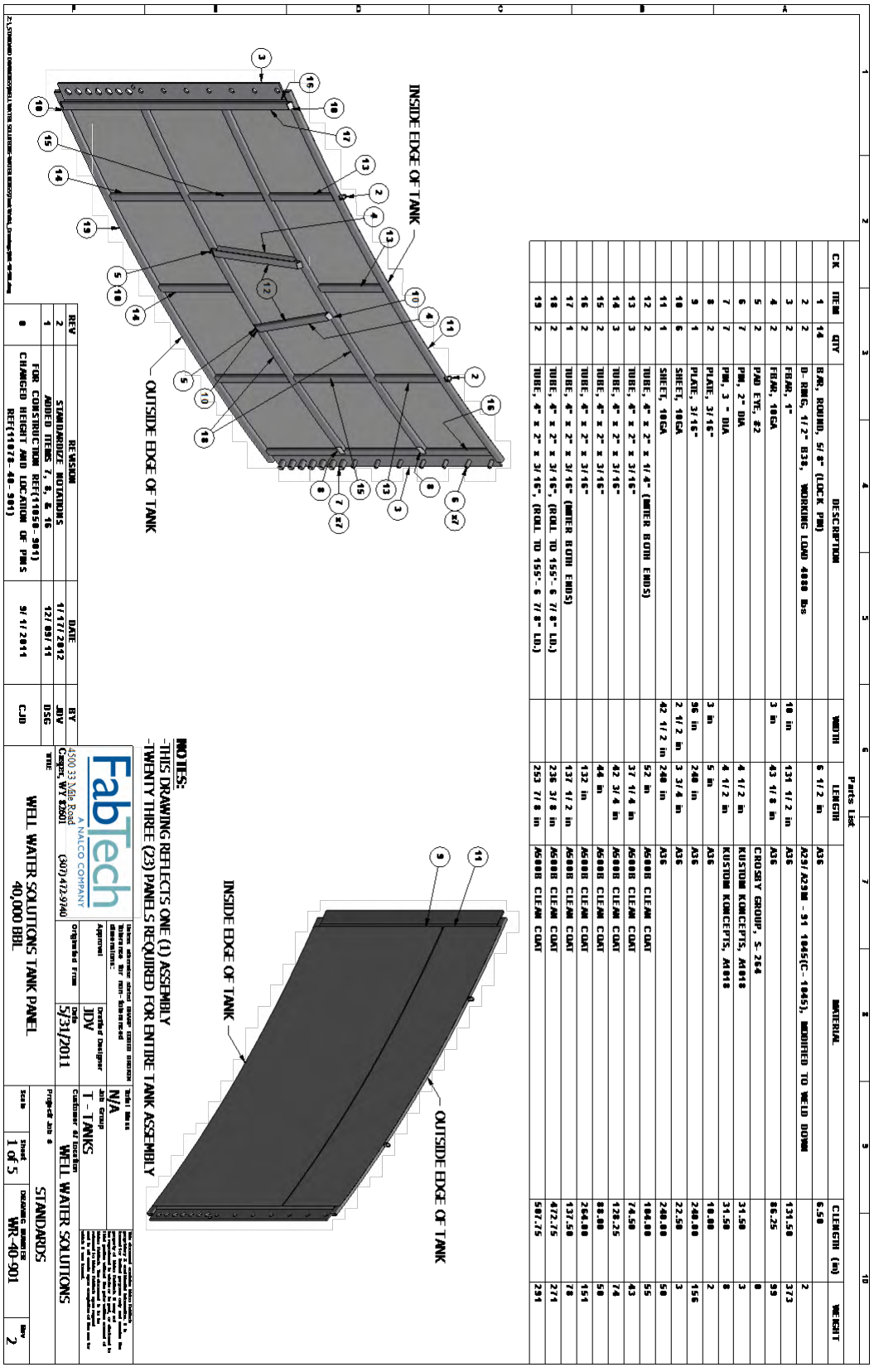
Section 1.06 WWS AST Rig Down Procedure

The AST breakdown follows the reverse order of the setup steps presented in the AST Rig Up Procedure 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.

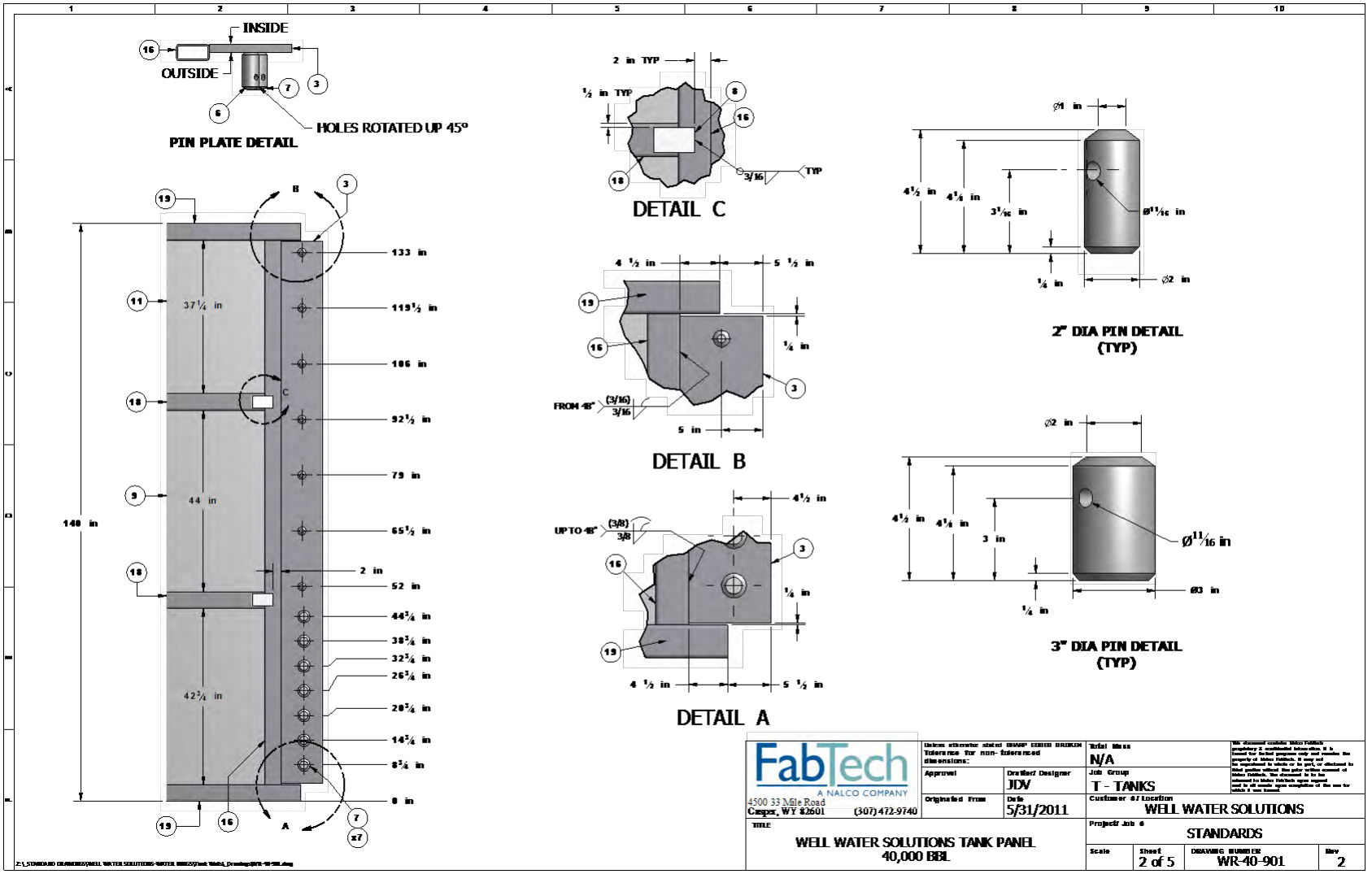
Customer is responsible for any removal of radioactive NORM materials before WWS crews can rig down any tank.

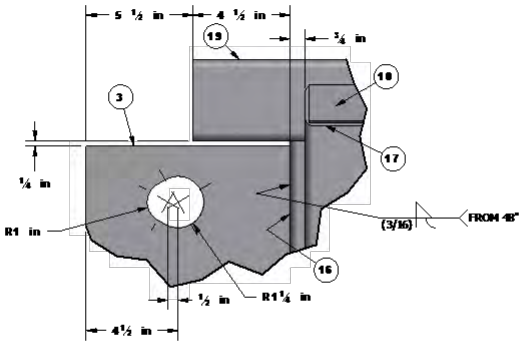
Section 1.08 WWS AST Engineering Specs



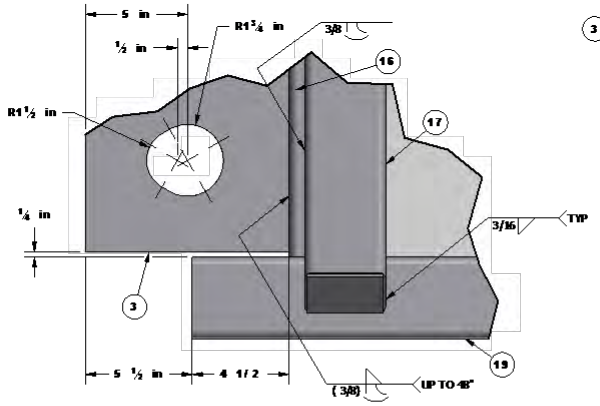
C.K.	ITEM	QTY	DESCRIPTION	WIDTH	LENGTH	MATERIAL	CLENGTH (in)	WEIGHT
	1	14	BAR, ROUND, 5/8" (LOCK PIN)		6 1/2 in	A36	6.50	
	2	2	D- RING, 1/2" B38, WORKING LOAD 4000 lbs			A29/A29M - 91 1045(C-1045), MODIFIED TO WELD DOWN		2
	3	2	FBAR, 1"	10 in	131 1/2 in	A36	131.50	373
	4	2	FBAR, 10GA	3 in	43 1/8 in	A36	86.25	99
	5	2	PAD EYE, #2			CROSBY GROUP, S-264		8
	6	7	PIN, 2" DIA		4 1/2 in	KUSTOM KONCEPTS, A668	31.50	3
	7	7	PIN, 3 " DIA		4 1/2 in	KUSTOM KONCEPTS, A668	31.50	8
	8	2	PLATE, 3/16"	3 in	5 in	A36	10.00	2
	9	1	PLATE, 3/16"	96 in	240 in	A36	240.00	156
	10	6	SHEET, 10GA	2 1/2 in	3 3/4 in	A36	22.50	3
	11	1	SHEET, 10GA	42 1/2 in	240 in	A36	240.00	50
	12	2	TUBE, 4" x 2" x 1/4" (WATER BOTH ENDS)		52 in	A500B CLEAN COAT	104.00	55
	13	3	TUBE, 4" x 2" x 3/16"		37 1/4 in	A500B CLEAN COAT	74.50	43
	14	3	TUBE, 4" x 2" x 3/16"		42 3/4 in	A500B CLEAN COAT	128.25	74
	15	2	TUBE, 4" x 2" x 3/16"		44 in	A500B CLEAN COAT	88.00	50
	16	2	TUBE, 4" x 2" x 3/16"		132 in	A500B CLEAN COAT	264.00	151
	17	1	TUBE, 4" x 2" x 3/16" (WATER BOTH ENDS)		137 1/2 in	A500B CLEAN COAT	137.50	78
	18	2	TUBE, 4" x 2" x 3/16", (ROLL TO 155°- 6 7/8" LD.)		236 3/8 in	A500B CLEAN COAT	472.75	271
	19	2	TUBE, 4" x 2" x 3/16", (ROLL TO 155°- 6 7/8" LD.)		253 7/8 in	A500B CLEAN COAT	507.75	291

REV	REVISION	BY	DATE
2	STANDARDIZE NOTATIONS	JDV	11/17/2012
1	ADDED ITEMS 7, 8, & 16	JDV	12/ 03/ 11
0	FOR CONSTRUCTION REF(11058-901) CHANGED HEIGHT AND LOCATION OF PINS REF(11078-40-901)	CJD	9/ 1/ 2011





DETAIL E
(x7 TYP)



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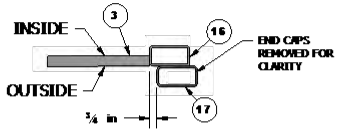
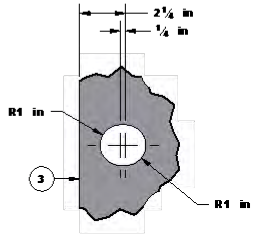


PIN-HOLE PLATE
DETAIL



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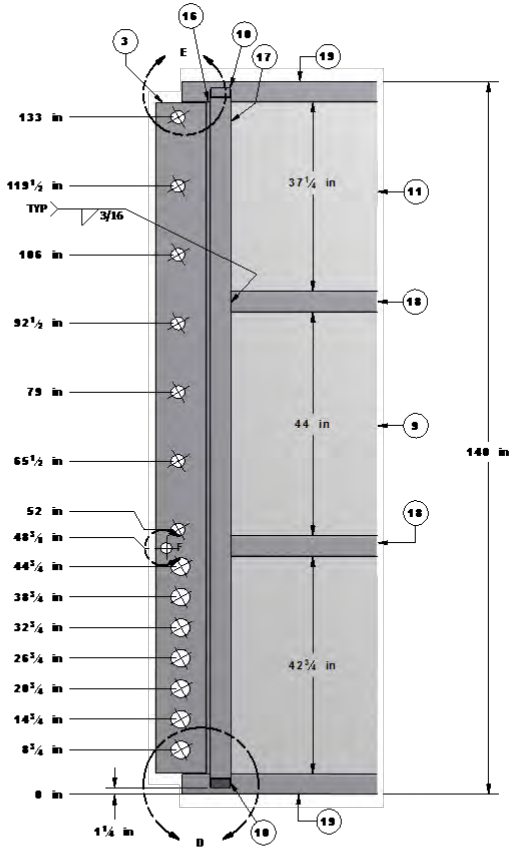
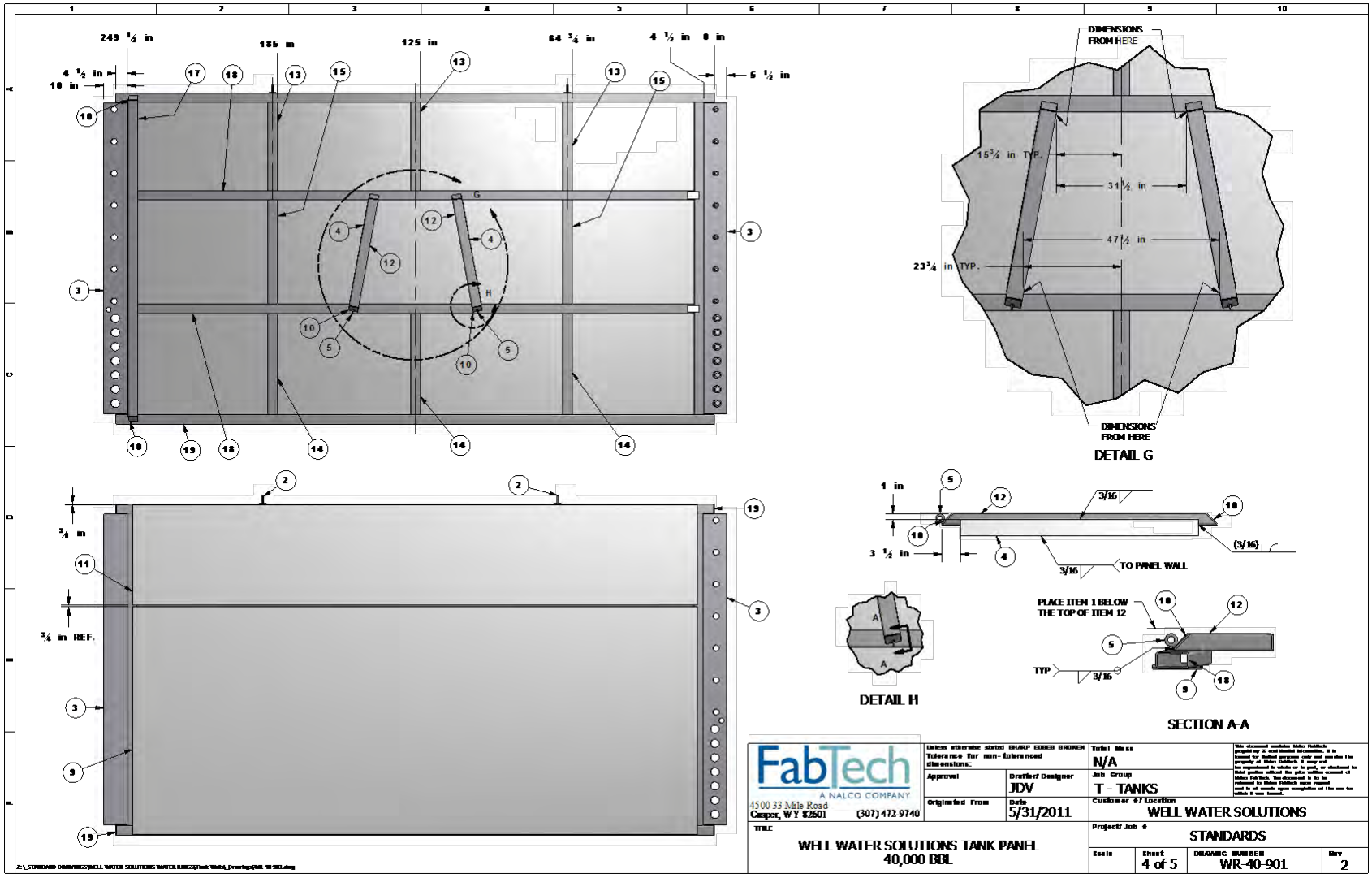
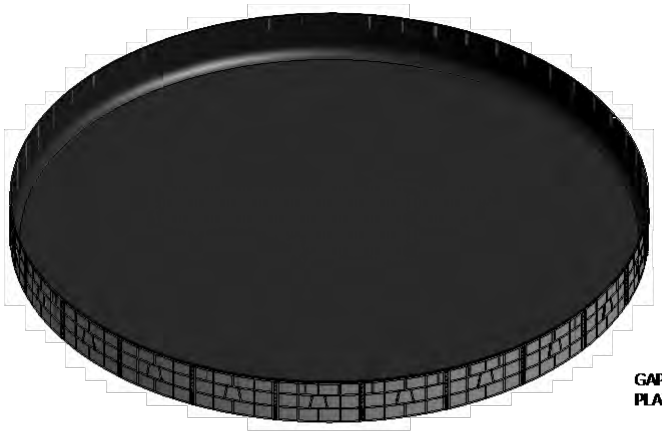
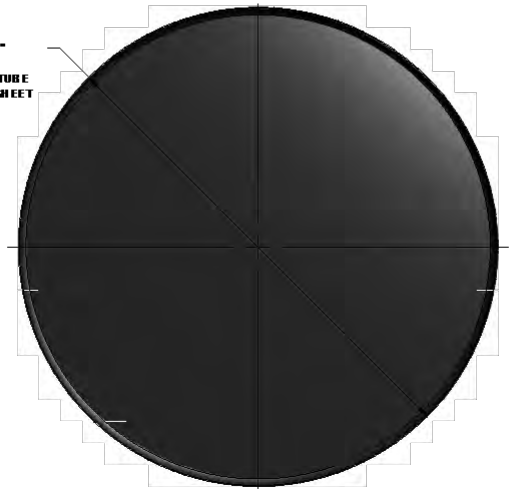
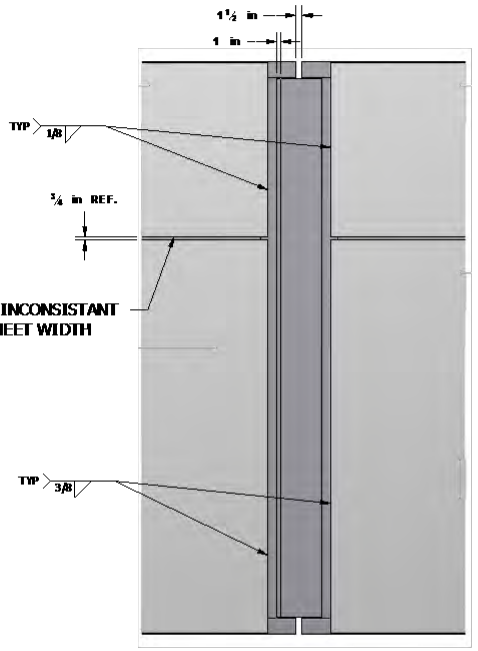


FabTech, A NALCO COMPANY 4500 33 Mile Road Casper, WY 82601 (307) 472-9740	Unless otherwise stated SHARP EDGES BROKEN Tolerance for non-toleranced dimensions:	Total Mass: N/A	This document contains Fabtech proprietary & confidential information. It is issued for limited purposes only and remains the property of Fabtech. It may not be reproduced in whole or in part, or disclosed to third parties without the prior written consent of Fabtech. The document is to be returned to Fabtech upon request, and in all events upon completion of the use for which it was issued.
	Approval / Drafter/ Designer: JDV	Job Group: T - TANKS	
	Originated From / Date: 5/31/2011	Customer & Location: WELL WATER SOLUTIONS	
TITLE: WELL WATER SOLUTIONS TANK PANEL 40,000 BBL		Project# Job #: STANDARDS	
		Scale / Sheet: 3 of 5	DRAWING NUMBER: WR-40-901 / Rev: 2









SEAM DETAIL
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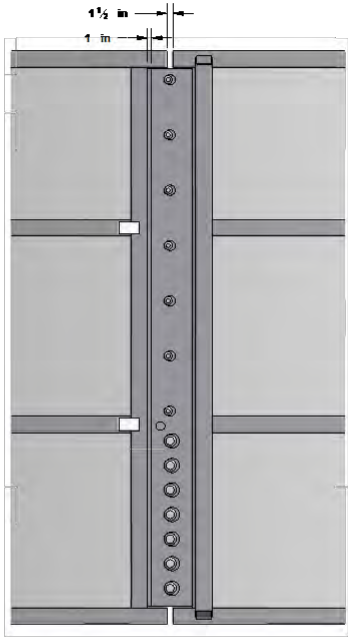


SEAM DETAIL
(OUTSIDE-IN)

FabTech
A NALCO COMPANY
4500 33 Mile Road
Casper, WY 82601 (307) 472-9740

Unless otherwise stated GRIND EDGES BROKEN
Tolerance for non-toleranced dimensions:

Approved | Drafter/ Designer: JDV | Originated From | Date: 5/31/2011

Total Mass: N/A

Job Group: T - TANKS

Customer of location: WELL WATER SOLUTIONS

Project Job #: STANDARDS

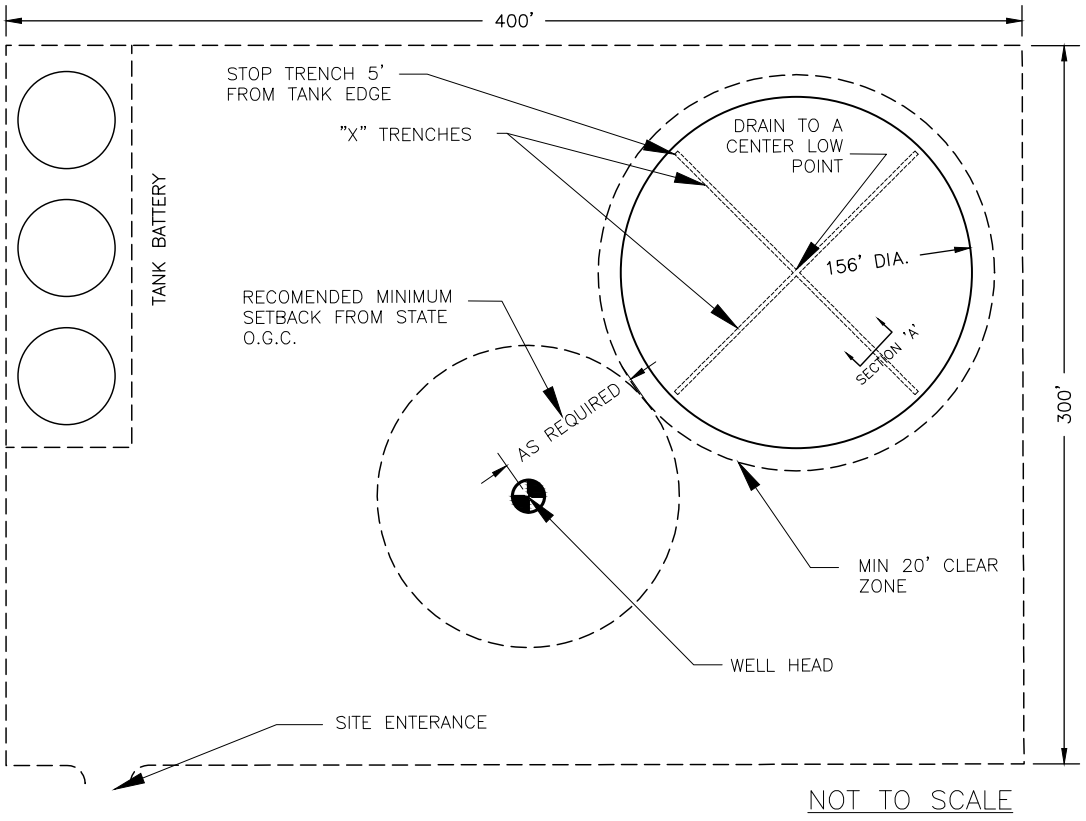
TITLE: WELL WATER SOLUTIONS TANK PANEL
40,000 BBL

Scale | Sheet: 5 of 5 | DRAWING NUMBER: WR-40-901 | Rev: 2

Z:_STANDARD DRAWINGS\WELL WATER SOLUTIONS-WATER BBES\Tank Walls_Drawings\WR-40-901.dwg

Section 1.09 Proper AST Setback and Location Sample

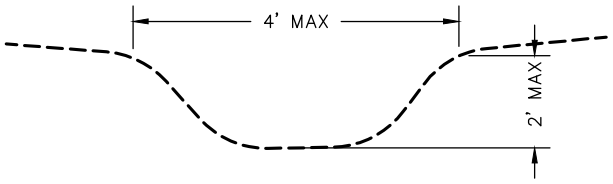
DATE: 06/30/14 DWG BY: MDW SHEET NO: 1 OF 1	MLVT LOCATION STANDARD MAP	FOR: WELL WATER SOLUTIONS & RENTALS ATTN: SEAN LOVELACE PO BOX 2105 CASPER, WYOMING 82602



TRENCH NOTES:

1. TRENCHES SHALL HAVE A MAXIMUM DEPTH OF 2' AND MAXIMUM WIDTH OF 4'.
2. TRENCHES SHALL BE CONSTRUCTED A MINIMUM DISTANCE OF 5' FROM TANK WALLS.
3. TRENCHES SHALL BE GRADED TO A COMMON CENTER SUCTION POINT.
4. TRENCH EDGES SHALL BE SMOOTH AND ROUNDED.

SECTION 'A'



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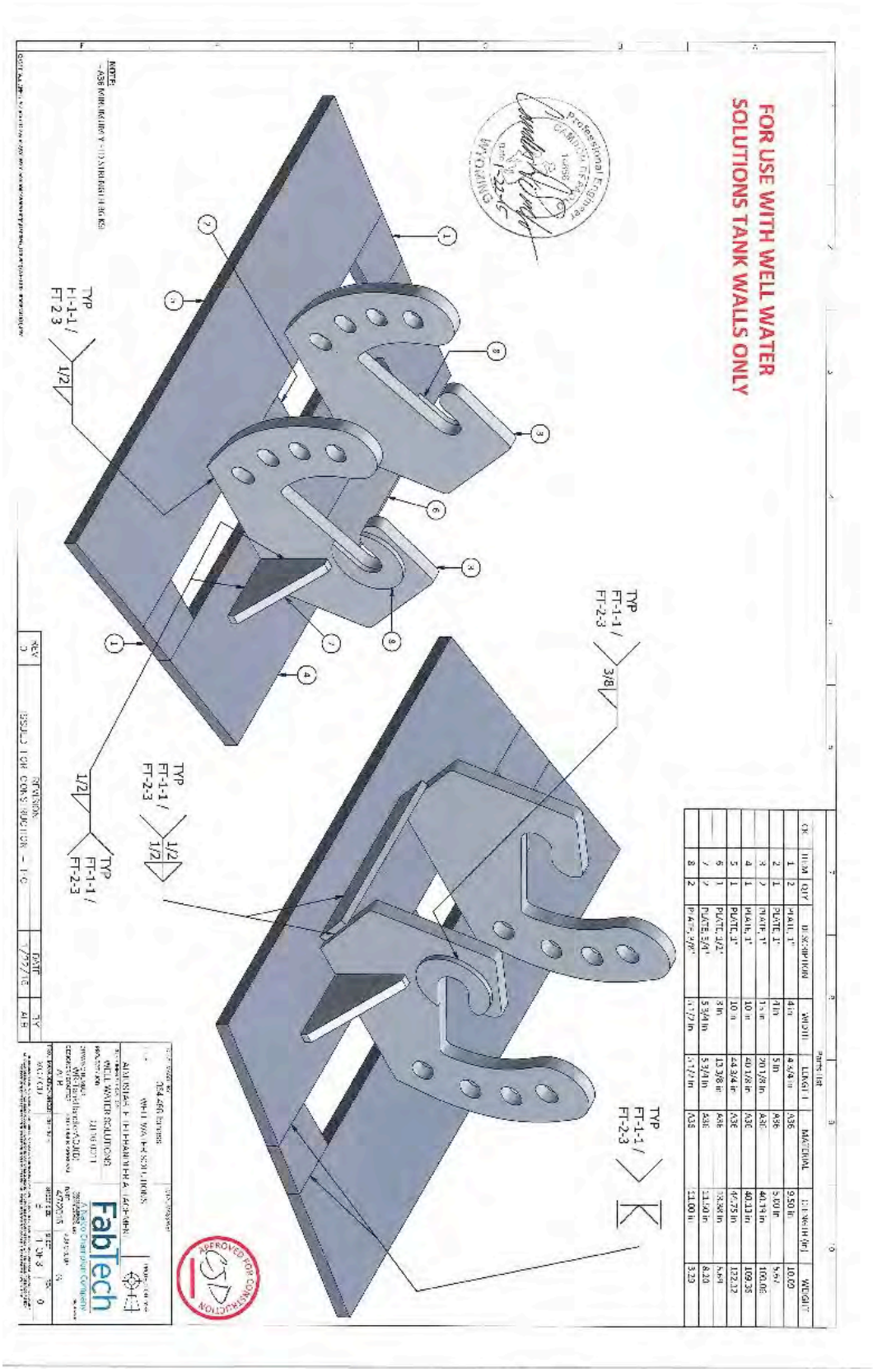
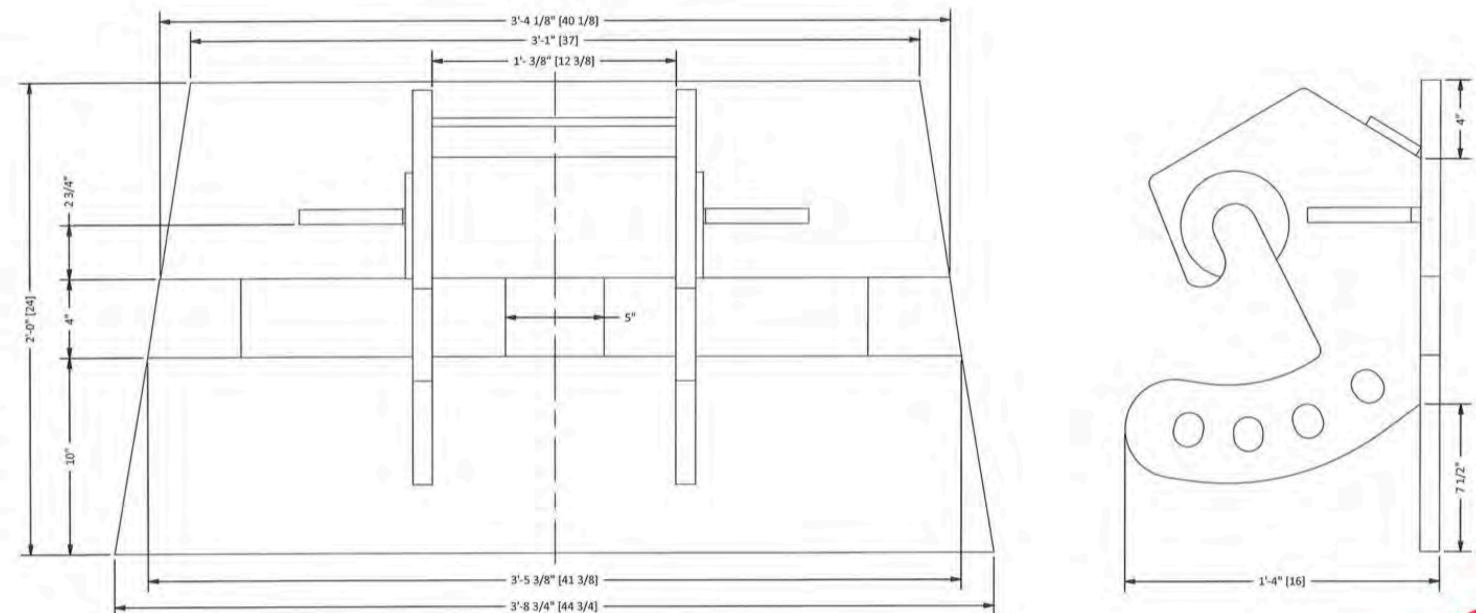
200 PRONGHORN, CASPER, WY. 82601

Section 1.10 JGL Approved Telehandler Attachment with Load Chart





APPROVED FOR CONSTRUCTION

TOTAL MASS DRY: 364.488 lbmass	TOTAL MASS WET	
TITLE: WELL WATER SOLUTIONS ADJUSTABLE TELEHANDLER ATTACHMENT		PROJECTION TYPE
CUSTOMER / LOCATION: WELL WATER SOLUTIONS	FabTech A Nalco Champion Company	
PROJECT / JOB: QT16-0011		
DRAWING NUMBER: WR-TankHandlerADJ(B)		
DESIGNER / DRAFTER: ALB	CUSTOMER APPROVAL	DATE: 4/7/2015 · JOB GROUP: G
PROJ. MANAGER/ENGINEER: MC / CD	CHECKER	SHEET SIZE: B · SHEET: 2 OF 3 · REV.: 0

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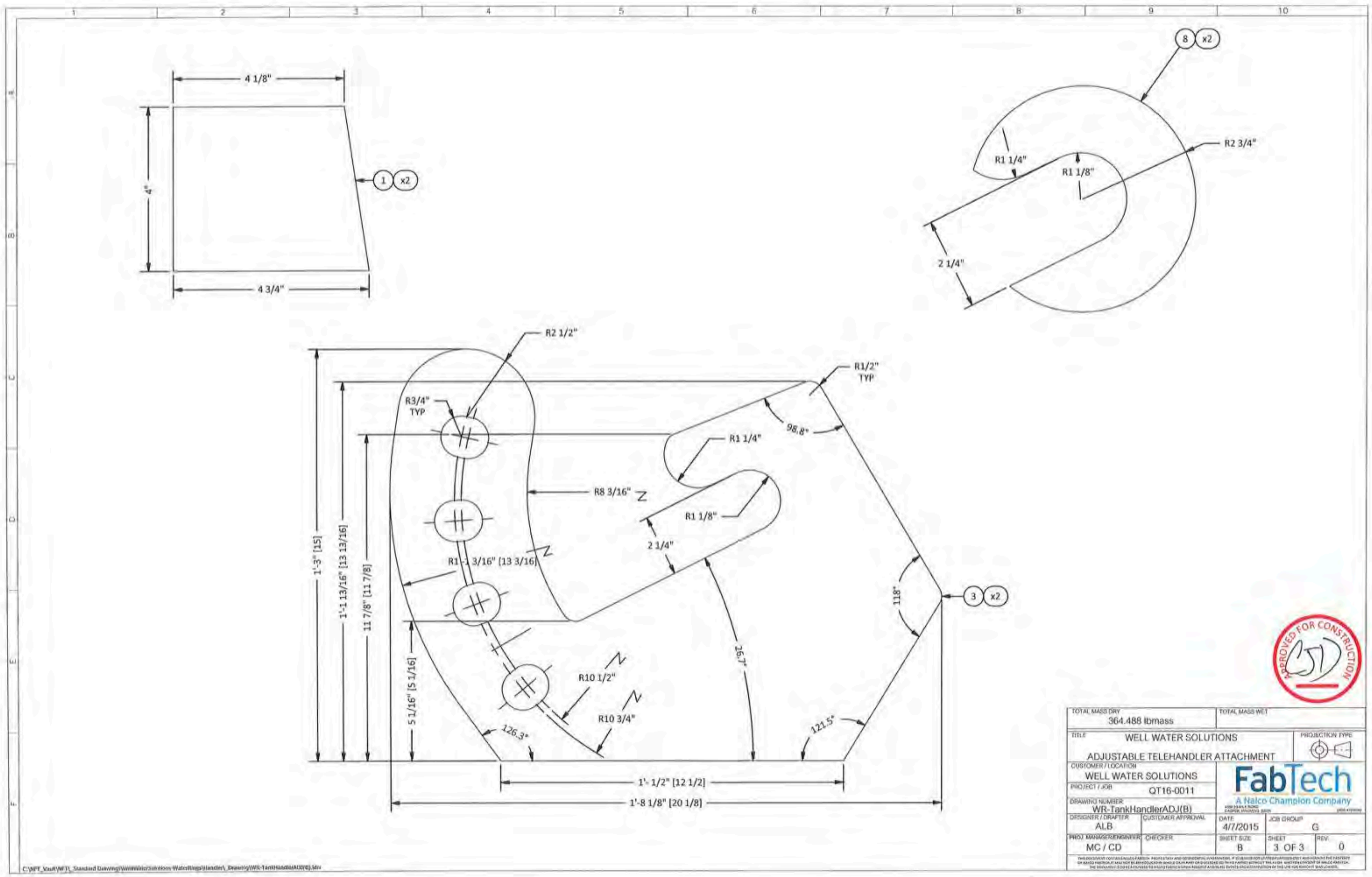

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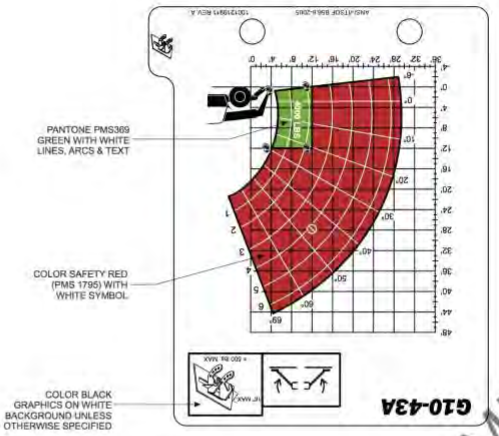
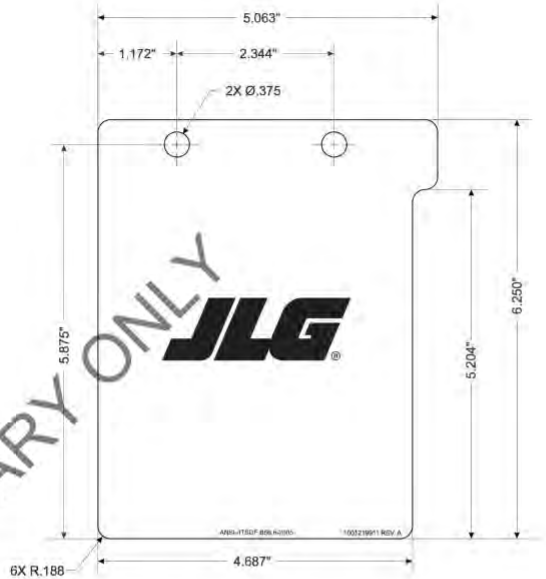


BACK



FRONT

NOTES:

1. VENDOR TO OBTAIN ELECTRONIC ART FILE FROM JLG INDUSTRIES, INC.
2. DECAL TO BE WHITE BACKGROUND WITH BLACK OR COLOR PRINTING. ALL COLORS TO BE PER JLG SPEC.4150024, UNLESS OTHERWISE SPECIFIED.
3. MATERIAL - .030 THICK WHITE GLOSS VINYL.

DRAWINGS CREATED IN COREL.
UNLESS OTHERWISE SPECIFIED, ALL
DIMENSIONS ARE IN INCHES.

REV	ZONE	DATE	BY	DESCRIPTION	PAR	ER NO	CHKD

REVISIONS

SPECIFICATIONS DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994 JLG TORQUE CHART 5000059 APPLIES TO ITEMS WITHIN ALL WELDING TO STRUCTURAL WELD CODE-STEEL ANSI/AWS D1.1 NEXT ASSY 1001219910 DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED ALL TOLERANCES ARE: ± .020 ALL ANGLES ±1° UNLESS OTHERWISE SPECIFIED THIRD ANGLE PROJECTION	DRAWN BY : S. ORUMPATI DATE : 14JUN16 CHK'D. BY : J. BOYLAN DATE : 14JUN16 E.R. NO. : 161657 FINISH: REF. DWG. : MACH. SURF 125 MAX	TITLE: LOAD, WELL WATER ATTACH,G10-43A,DOWN MATERIAL: SEE NOTES SIZE C | CAGE CODE: 1YHH8 | DWG NO. 1001219911 | REV A SCALE: 1/1 | EST WT: .050 LB/.023 kg | SHEET: 1 OF 1

Section 1.13 Geomembrane Fabrication Manual and Testing Chart

MLVT GEOMEMBRANE PANEL FABRICATION MANUAL

Well Water Solutions, Inc.

Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com

TERMINOLOGY

The following definitions will be used throughout this document.

Geomembrane Manufacturer- The party responsible for compounding resin into geomembrane roll goods.

Geomembrane Fabricator- The party who is responsible for welding the geomembrane roll goods, through factory fabrication using controlled welding methods, into geomembrane panels. **Colorado Lining International – 800-524-8672**

Geomembrane Installer -The party responsible for placing and/or joining geomembrane panels in the field or on the job site.

Geomembrane Sheet -The product of the Geomembrane manufacturer, provided on rolls to the fabricator.

Geomembrane or Panels or Geomembrane Panels -The term applied to multiple geomembrane sheets that have been welded together, through factory fabrication, under controlled conditions. The actual size of the panels will depend upon weight, mil thickness, and design configurations.

Sample -The piece of liner or seam section taken for testing. It is usually large enough to contain specimens for a series of tests.

Seam -The completed process of welding two geomembrane sheets together.

Specimen -The term applied to an individual part of a sample. Specimens are used to test peel and shear values of a welded seam.

Welding -The process whereby two sheets or panels of geomembrane are joined together.

MLVT – Modular Large Volume Tank

MLVT Geomembrane Liner – One or more factory fabricated Geomembrane Panel(s) for placement inside an engineered containment ring.

1.0 GENERAL

1.1 Products

A. The geomembrane material shall be 30 to 60 mils thick, as specified. The geomembrane shall be manufactured consisting of first quality ingredients. The finished compound shall be uniform in color, thickness, size and surface texture.

1.2 Markings

A. In the case of round tanks, panels shall include a highly visible "cross hair" style marking denoting the center point of the panel to coincide with the center point of the tank. Radial spoke-like markings will be painted on the panel surface to assist with field measures to assure vertical alignment up the tank walls.

2.0 Subgrade Preparation

A. The Earthwork Contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of MLVT Geomembrane Panel. Any damage to the surface caused by weather conditions or other conditions must be repaired prior to MLVT Geomembrane Panel deployment. The installer will submit, prior to installing the MLVT Geomembrane Panel, written approval of the subgrade surface on which the MLVT Geomembrane Panel will be installed.

B. All surfaces in contact with the MLVT Geomembrane Panel must be free of sharp stones, stones over 3/8" in diameter, sticks and other debris that can puncture or tear the MLVT Geomembrane Panel. No standing water, mud, snow or excessive moisture should be on the subgrade when the MLVT Geomembrane Panel is deployed. Subgrade should be constructed of a firm stable material compacted to a 95% proctor.

3.0 Deployment of MLVT Geomembrane Panels

A. The MLVT Geomembrane Panel shall be placed at the edge of the tank layout and be lined up with the centerline of the tank layout. Unroll the MLVT Geomembrane Panel down the centerline of the tank layout. Verify the markings on the MLVT Geomembrane Panel line up with the tank layout. If needed adjust the placement of the MLVT Geomembrane Panel prior to proceeding with installation.

B. The MLVT Geomembrane Panel is then unfolded in the perpendicular direction to which it was unrolled in one direction. The next step is to unfold the MLVT Geomembrane Panel in the opposite direction of the first unfold direction.

C. See sketch at end of document for clarification of these steps.

4.0 MLVT Geomembrane Representative Welds

A. At the start of each day's work and once every 4 hours thereafter, before any welding machine shall be deployed on a liner panel, a sample of a representative seam shall be produced and evaluated for each welding machine to be utilized.

Representative welds shall also be required if there is a change in environmental conditions. Representative samples shall be prepared non-destructively using strips of geomembrane cut from excess sheets of liner being seamed. Peel and sheer samples are to be tested with a calibrated tensiometer. Field seam welding shall commence only after successful representative seam test results are achieved by each machine.

B. Test results shall be representative of subsequently made seams on an actual liner fabricated after the test. There shall be one representative seam evaluation made every four hours and on each machine utilized. Representative welds shall be recorded on the CLI Seam Quality Control Form which shall be available to customers upon request.

5.0 Seam Testing Criterion

Samples shall be non-destructive, not requiring patching of fabricated panels. Four test specimens (2 shear and 2 peel) shall be cut from each seam sample and tensiometer tested for bonded seam strength and peel adhesion. All test results shall be recorded in the Seam Quality Control Form.

A. Tensiometer Peel Strength Test:

Peel adhesion shall be in accordance with ASTM D 7747. In seam samples when tested in peel, failure shall occur resulting in a Film Tearing Bond (or "FTB"). The tensiometer peel test provides a numerical value for the peel strength achieved in addition to visually inspection for film tearing bonds. Samples should be 1" wide centered over the seam.

B. Tensiometer Tensile Strength Test:

Samples shall be tested with a tensiometer and evaluated for bonded seam strength (shear) using method ASTM D 7749.

C. Shear and peel test results shall conform to either GRI GM 19 requirements or to the manufacturer's requirements.

D. All Field Seams shall be 100% tested by high pressure air lance in accordance with ASTM D 4437.

6.0 Field Thermal Wedge Weld Seaming Procedures

4 to 6 inches per NMOCD Rule

A. Adjacent MLVT Geomembrane Panels shall be overlapped by approximately 4" for fusion welding. Panel edges to be seamed shall be clean of all foreign matter or debris before seaming commences. Welding can occur once the sheets to be joined have been cleaned and brought into their exact position.

B. When starting a new weld, the machine shall be manually placed into the overlapped sheet of material.

C. Welder alignment and temperature shall be monitored during the seaming process and adjustments will be made as necessary. The welded seams must be 100% visually inspected as welding machinery advances.

D. All cross seams or "T" intersections caused by material roll splices where 3 layers of membrane material occur shall be patched where they intersect with 3" or larger diameter patches of the MLVT Geomembrane material. Patches shall be applied by use of a hand held heat gun and seam roller. All patches and repairs shall be 100% tested by high pressure air lance or vacuum box in accordance with ASTM D 4437 and ASTM D 5641.

E. Should a defective seam be found, welding shall be ceased until the cause of the defect is determined and rectified and the seam is repaired. Documentation of the defect and repair shall be recorded on the Seam Quality Control Form.

7.0 Fold back of MLVT Geomembrane Panels

A. Once all field seaming is completed the outer limits of the MLVT Geomembrane Panels need to be folded back on top of themselves far enough to provide enough room for assembly of the steel tank sections without damage to the system.

8.0 MLVT Geomembrane Panel final deployment

A. Once the steel walls are assembled they need to be inspected for any sharp surfaces that could damage the MLVT Geomembrane Panels and there needs to be a support material placed as a chamfer at the transition from the wall to the subgrade to eliminate the possibility of stressing the MLVT Geomembrane panel at the 90 degree transition. This support material can be sand tubes, precut foam, etc.

B. Next the MLVT Geomembrane Panels need to be placed up and over the walls. This step is completed with the assistance of equipment used to lift the edge of the MLVT Geomembrane Panel up the height of the steel wall. Enough material should be lifted up and over the wall to create the proper overhang so the liner does not fall back off the wall while the clamping system is installed.

C. The MLVT Geomembrane Panels shall be protected at all times from damage and all equipment and methods used to lift, place and clamp shall not damage the MVLT GEomembrane Panel and shall not impart excess stress in the MVLT Geomembrane Panels and thermally welded seam areas.

D. ALL tank panel erection, assembly, placement and lifting of MVLT GEomembrane Panel is by others. CLI shall not be responsible for damages to the MVLT Geomembrane Panel after delivery / customer pickup or once installation is completed, if performed by CLI.

End of Specification

Quality Control Air Testing

Project:
Owner:
Engineer:
Contractor:
Supervisor:
Material:

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test													

COLORADO LINING INTERNATIONAL
1062 Singing Hills Road Parker, Colorado 80138 / 1-800-524-8672 / 303-841-2022 / Fax 303-841-5780 / www.coloradolining.com

Section 1.14 Geomembrane Installation Manual

MLVT GEOMEMBRANE PANEL INSTALLATION MANUAL

Well Water Solutions, Inc.

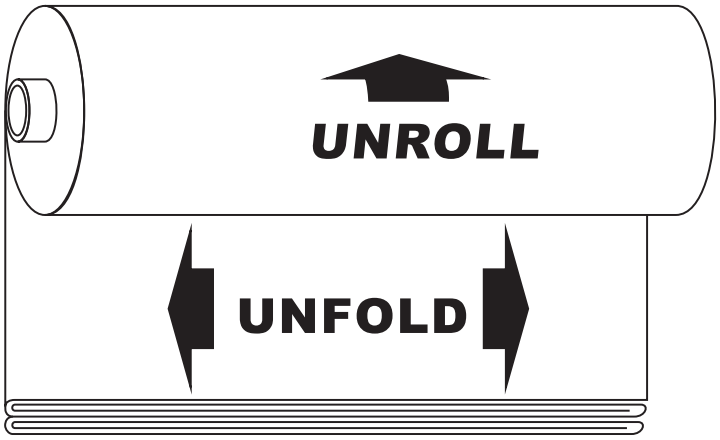
COLORADO LINING INTERNATIONAL

Colorado Lining International
Parker CO 80138
800-524-8672/303-841-2022
Fax: 303-841-5780
www.coloradolining.com

COLORADO LINING INTERNATIONAL
www.coloradolining.com

DEPLOYMENT OF DUAL DIRECTION ACCORDION FOLDED PANELS

(SHEET 1 OF 2)

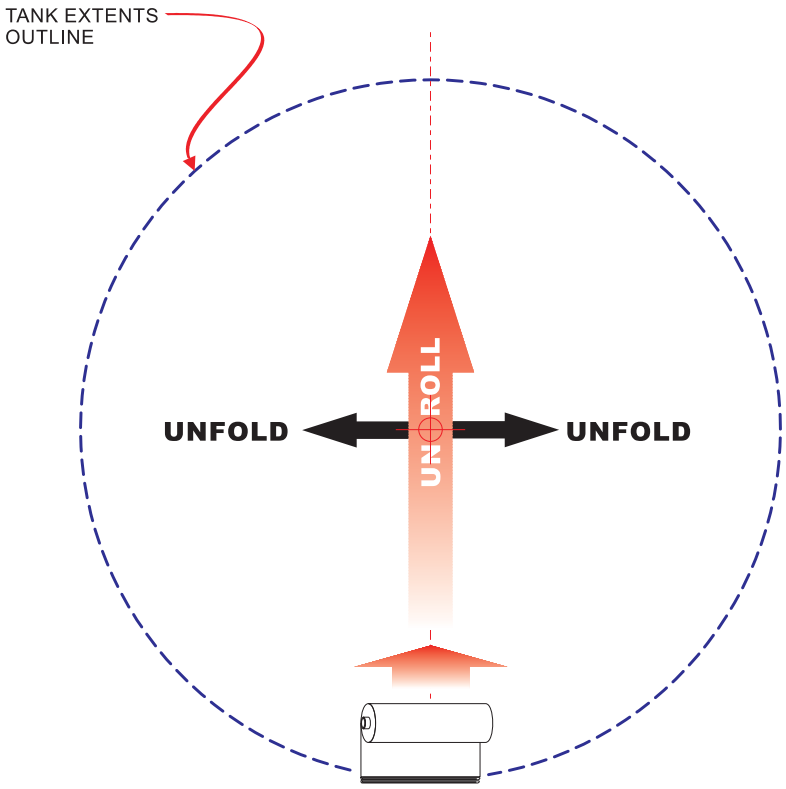


COLORADO LINING INTERNATIONAL
www.coloradolining.com

DEPLOYMENT OF DUAL DIRECTION ACCORDION FOLDED PANELS

(SHEET 2 OF 2)

CLI FABRICATES FRAC TANK PANEL LINERS AND UNDERLAYMENTS IN A DUAL DIRECTION ACCORDION FOLDED MANNER SO THAT THE PANELS CAN BE DEPLOYED ON THE TANK'S CENTERLINE. AFTER THE INITIAL UN-ROLLING THE PANELS ARE THEN UN-FOLDED IN PERPENDICULAR DIRECTIONS



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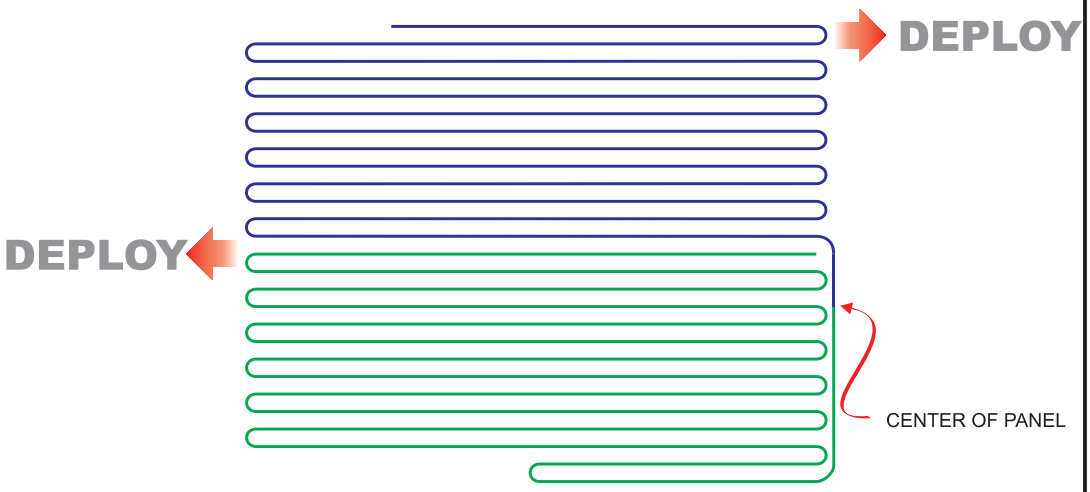
DOUBLE DIRECTION ACCORDION FOLDED PANEL SCHEMATIC

(SHEET 2 OF 2)



EXAMPLE OF A 26 SHEET B-40 TANK LINER

Section 1.15 WWS Preferred Liner Spec or Comparable Substitute

19103 Gundle Road
Houston, TX 77073
281 230 8650 Fax
www.gseworld.com

January 22, 2018

Western ProLine
184 Hwy 59 North
Miles City, MT 59301

RE: GSE LLDPE Geomembrane Permeability

Certification of Compliance

The undersigned, being qualified and authorized to do so, hereby certifies that GSE High Performance 30 mil Nominal and GSE High Performance 40 mil Nominal UltraFlex LLDPE Geomembranes will meet a permeability of $\leq 1 \times 10^{-12}$ cm/s when tested per ASTM E96.

Sincerely,

Miguel Garcia
GSE Technical Support

MG18-0005

TECHNICAL NOTE

Chemical Resistance Chart

GSE is the world's leading supplier of high quality, polyethylene geomembranes. GSE polyethylene geomembranes are resistant to a great number and combinations of chemicals. Note that the effect of chemicals on any material is influenced by a number of variable factors such as temperature, concentration, exposed area and duration. Many tests have been performed that use geomembranes and certain specific chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for, and various criteria may be used to judge performance. Reported performance ratings may not apply to all applications of a given material in the same chemical. Therefore, these ratings are offered as a guide only.

Medium	Concentration	Resistance at:	
		20° C (68° F)	20° C (140° F)
A			
Acetic acid	100%	S	L
Acetic acid	10%	S	S
Acetic acid anhydride	100%	S	L
Acetone	100%	L	L
Adipic acid	sat. sol.	S	S
Allyl alcohol	96%	S	S
Aluminum chloride	sat. sol.	S	S
Aluminum fluoride	sat. sol.	S	S
Aluminum sulfate	sat. sol.	S	S
Alum	sol.	S	S
Ammonia, aqueous	dil. sol.	S	S
Ammonia, gaseous dry	100%	S	S
Ammonia, liquid	100%	S	S
Ammonium chloride	sat. sol.	S	S
Ammonium fluoride	sol.	S	S
Ammonium nitratesat. sol.		S	S
Ammonium sulfate	sat. sol.	S	S
Ammonium sulfide	sol.	S	S
Amyl acetate	100%	S	L
Amyl alcohol	100%	S	L
B			
Barium carbonate	sat. sol.	S	S
Barium chloride	sat. sol.	S	S
Barium hydroxide	sat. sol.	S	S
Barium sulfate	sat. sol.	S	S
Barium sulfide	sol.	S	S
Benzaldehyde	100%	S	L
Benzene	—	L	L
Benzoic acid	sat. sol.	S	S
Beer	—	S	S
Borax (sodium tetraborate)	sat. sol.	S	S
Boric acid	sat. sol.	S	S
Bromine, gaseous dry	100%	U	U
Bromine, liquid	100%	U	U
Butane, gaseous	100%	S	S
1-Butanol	100%	S	S
Butyric acid	100%	S	L
C			
Calcium carbonate	sat. sol.	S	S
Calcium chlorate	sat. sol.	S	S
Calcium chloride	sat. sol.	S	S
Calcium nitrate	sat. sol.	S	S
Calcium sulfate	sat. sol.	S	S
Calcium sulfide	dil. sol.	L	L
Carbon dioxide, gaseous dry	100%	S	S
Carbon disulfide	100%	L	U
Carbon monoxide	100%	S	S
Chloracetic acid	sol.	S	S
Carbon tetrachloride	100%	L	U
Chlorine, aqueous solution	sat. sol.	L	U
Chlorine, gaseous dry	100%	L	U
Chloroform	100%	U	U
Chromic acid	20%	S	L
Chromic acid	50%	S	L
Citric acid	sat. sol.	S	S
Copper chloride	sat. sol.	S	S
Copper nitrate	sat. sol.	S	S
Copper sulfate	sat. sol.	S	S
Cresylic acid	sat. sol.	L	—
Cyclohexanol	100%	S	S
Cyclohexanone	100%	S	L
D			
Decahydronaphthalene	100%	S	L
Dextrine	sol.	S	S
Diethyl ether	100%	L	—
Dioctylphthalate	100%	S	L
Dioxane	100%	S	S
E			
Ethanediol	100%	S	S
Ethanol	40%	S	L
Ethyl acetate	100%	S	U
Ethylene trichloride	100%	U	U
F			
Ferric chloride	sat. sol.	S	S
Ferric nitrate	sol.	S	S
Ferric sulfate	sat. sol.	S	S
Ferrous chloride	sat. sol.	S	S
Ferrous sulfate	sat. sol.	S	S
Fluorine, gaseous	100%	U	U
Fluorosilicic acid	40%	S	S
Formaldehyde	40%	S	S
Formic acid	50%	S	S
Formic acid	98-100%	S	S
Furfuryl alcohol	100%	S	L
G			
Gasoline	—	S	L
Glacial acetic acid	96%	S	L
Glucose	sat. sol.	S	S
Glycerine	100%	S	S
Glycol	sol	S	S
H			
Heptane	100%	S	U
Hydrobromic acid	50%	S	S
Hydrobromic acid	100%	S	S
Hydrochloric acid	10%	S	S
Hydrochloric acid	35%	S	S
Hydrocyanic acid	10%	S	S
Hydrofluoric acid	4%	S	S
Hydrofluoric acid	60%	S	L
Hydrogen	100%	S	S
Hydrogen peroxide	30%	S	L
Hydrogen peroxide	90%	S	U
Hydrogen sulfide, gaseous	100%	S	S
Lactic acid	100%	S	S
Lead acetate	sat. sol.	S	—
Magnesium carbonate	sat. sol.	S	S
Magnesium chloride	sat. sol.	S	S
Magnesium hydroxide	sat. sol.	S	S
Magnesium nitrate	sat. sol.	S	S
Maleic acid	sat. sol.	S	S
Mercuric chloride	sat. sol.	S	S
Mercuric cyanide	sat. sol.	S	S
Mercuric nitrate	sol.	S	S

GSE ENVIRONMENTAL™

Section 1.16 Geo Grid Mesh Spec

SKAPS Industries
571 Industrial Parkway
Commerce, GA 30529 (U.S.A.)
Phone (706) 336-7000 Fax (706) 336-7007
e-mail: info@skaps.com

SKAPS TRANSNET™ (TN)
HDPE GEONET 220

SKAPS TRANSNET™ Geonet consists of SKAPS GeoNet made from HDPE resin.

Property	Test Method	Unit	Required Value	Qualifier
Geonet				
Thickness	ASTM D 5199	mil.	220±20	Range
Carbon Black	ASTM D 4218	%	2 to 3	Range
Tensile Strength	ASTM D 7179	lb/in	45	Minimum
Melt Flow	ASTM D 1238[3]	g/10 min.	1	Maximum
Density	ASTM D 1505	g/cm^3	0.94	Minimum
Transmissivity[1]	ASTM D 4716	$m^2/sec.$	$2x10^{-3}$	MARV[2]

Notes:
1. Transmissivity measured using water at 21 ± 2ºC (70 ± 4ºF) 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.

Section 1.17 Patents and Patent Protections

US008376167B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.: US 8,376,167 B2**
(45) **Date of Patent: Feb. 19, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,883**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0223073 A1 Sep. 6, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**
B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17**; 220/4.16; 220/693; 220/567; 220/4.12

(58) **Field of Classification Search** 220/1.6, 220/4.12, 4.16, 4.17, 9.4, 23.9, 495.06, 495.08, 220/567, 681, 693
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,875,666	A *	9/1932	Schwemlein	220/693
3,233,251	A *	2/1966	Barrera	52/245
3,648,303	A *	3/1972	Stewart et al.	52/5
4,124,907	A *	11/1978	Laven	52/169.7

FOREIGN PATENT DOCUMENTS

CA	2692016	7/2010

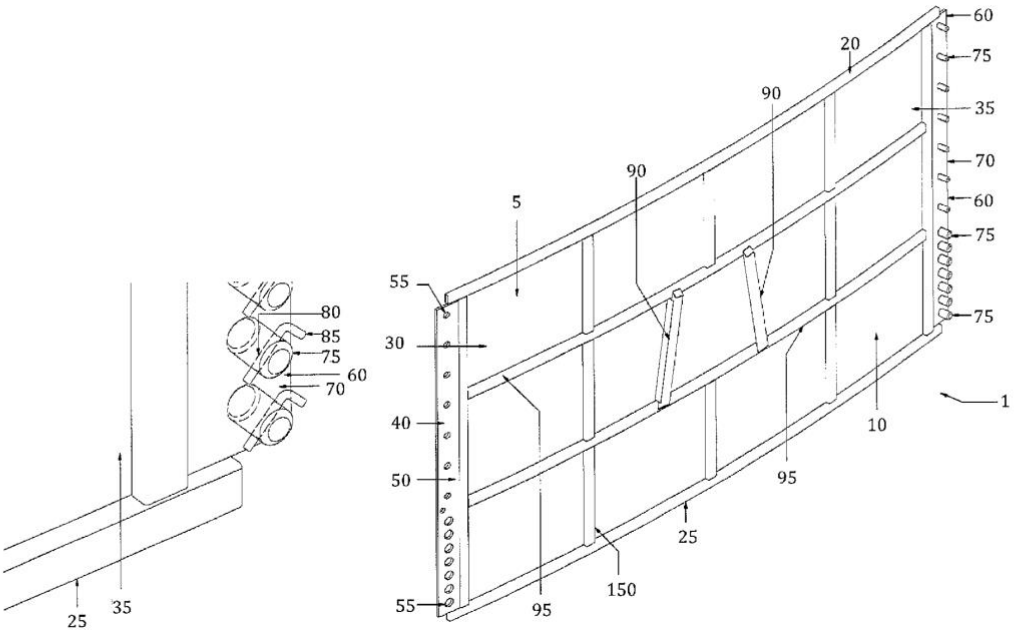
* cited by examiner

Primary Examiner — Anthony Stashick
Assistant Examiner — Christopher McKinley
(74) *Attorney, Agent, or Firm* — Gordon Silver, Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame composed of interlocking panels secured by a series of flanges having holes and pegs. An inner liner to hold liquid inside the reservoir frame is presented.

16 Claims, 11 Drawing Sheets



US008365937B2

(12) **United States Patent**
Lovelace et al.

(10) **Patent No.: US 8,365,937 B2**
(45) **Date of Patent: Feb. 5, 2013**

(54) **PORTABLE RESERVOIR FRAME**

(75) Inventors: **Sean Michael Lovelace**, Casper, WY (US); **Christopher Jason Songe**, Casper, WY (US)

(73) Assignee: **Energy Innovations, LLC**, Casper, WY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/469,845**

(22) Filed: **May 11, 2012**

(65) **Prior Publication Data**

US 2012/0234829 A1 Sep. 20, 2012

Related U.S. Application Data

(63) Continuation of application No. 13/426,286, filed on Mar. 21, 2012, which is a continuation-in-part of application No. 13/245,492, filed on Oct. 21, 2011.

(51) **Int. Cl.**
B65D 6/00 (2006.01)

(52) **U.S. Cl.** **220/4.17**; 220/4.16; 220/693; 220/567; 220/4.12

(58) **Field of Classification Search** 220/565, 220/567, 1.6, 4.16, 4.12, 9.4, 495.06, 495.08, 220/23.9, 4.17, 693, 681

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,076,382	A *	10/1913	Maloney	220/4.17
1,875,666	A *	9/1932	Schwemlein	220/693
2,123,035	A *	7/1938	Ashley	220/693
2,914,149	A *	11/1959	Walker	52/394
3,233,251	A *	2/1966	Barrera	52/245
3,562,822	A *	2/1971	Wall	52/245
3,648,303	A *	3/1972	Stewart et al.	52/5
3,736,599	A *	6/1973	Kessler et al.	52/169.7
3,793,651	A *	2/1974	Pitti et al.	52/169.7
3,819,079	A *	6/1974	Levens	220/4.13
4,048,773	A *	9/1977	Laven	52/169.7
4,124,907	A *	11/1978	Laven	52/169.7
4,223,498	A *	9/1980	Ventrice	52/249
4,240,562	A *	12/1980	Holschlag	220/565
4,860,914	A *	8/1989	Derni et al.	220/4.28
4,932,558	A *	6/1990	Katavolos	220/666
5,054,135	A *	10/1991	Dallaire et al.	4/506
5,161,264	A *	11/1992	Dugas	4/506
5,294,019	A *	3/1994	Looker	220/683
6,071,213	A *	6/2000	Raasch et al.	482/29
7,311,827	B2 *	12/2007	Clark et al.	210/232
7,766,184	B2 *	8/2010	Avery et al.	220/573.1
7,918,764	B2 *	4/2011	VanElverdinghe	482/27
2009/0127255	A1 *	5/2009	Rood, Jr.	220/1.5

FOREIGN PATENT DOCUMENTS

CA	2692016	7/2010

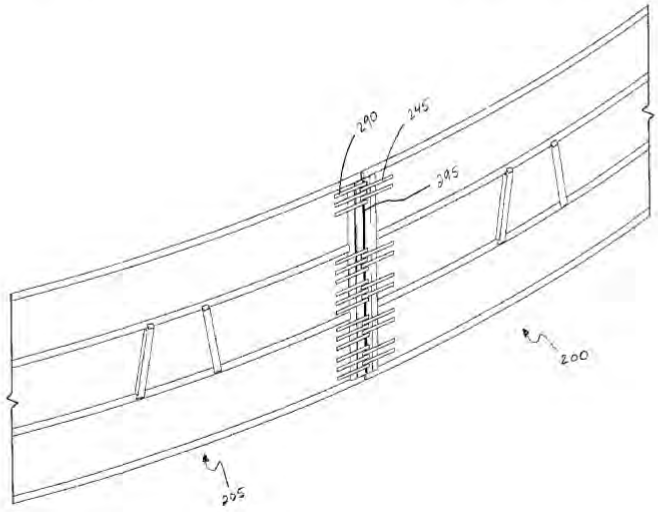
* cited by examiner

Primary Examiner — Anthony Stashick
Assistant Examiner — Christopher McKinley
(74) *Attorney, Agent, or Firm* — Gordon Silver Ltd.; Ronald C. Gorsché

(57) **ABSTRACT**

A portable reservoir frame having a number of interlocking panels secured by a plurality of interleaved knuckle members is provided.

20 Claims, 20 Drawing Sheets



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TECHNICAL DATA SHEET
Geomembrane 40mil LLDPE

Property	Test Method	Frequency (A)	Unit Metric		Solmax 140-7000
Thickness (Nominal +/- 10%) (E)	ASTM D 5199	Every roll	mm		1.00
Resin Density	ASTM D 1505	1/Batch	g/cc		<0.926
Melt Index-190/2.16(max)	ASTM D 1238	1/Batch	g/10min		1.0
Sheet Density (C)	ASTM D 1505	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		23
Elongation at Break			%		800
2% Modulus (max.)	ASTM D 5323	PerFormulation	kN/m		420
Tear Resistance (min. avg.)	ASTM D 1004	Every 6 rolls	N		85
Puncture Resistance (min. avg.)	ASTM D 4833	Every 6 rolls	N		215
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.
(E) The minimum average thickness is +/- 10% of the nominal value.

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

March 2020

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

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

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

The prescriptive mandates of the Rule that are the subject of this variance request are the following subsections of 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 x 10-9 cm/sec. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.*

The applicant proposes one layer of 40-mil LLDPE non-reinforced as a primary liner and a secondary liner comprised of one layer of 30-mil LLDPE non-reinforced material

Rule 34 did not consider Above Ground Steel Storage Tanks that employ liners as a primary and secondary containment method.

This material is more readily available than the prescribed liners in the Rule and provides superior flexibility and conformity characteristics. Due to the vertical steel walls, 60-mil HDPE, 45 or 30-mil LLDPE string reinforced liners and 30-mil PCV liners are not sufficiently flexible for use in these modular containments.

All liners will have a hydraulic conductivity no greater than 1 x 10 -9 cm/sec and meet or exceed EPA SW-846 method 9090A.

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 that this liner system *(with integrated leak detection system)* provides equal or better protection of fresh water, public health and the environment by providing the requisite containment and protection. Attached is a technical comparison of the proposed material is compared to what is advised through Rule 34. A second memorandum provides clarification that the engineering requirements for site preparation, which ensures functionality of the liner system, is crosscutting to varied locations/sites within the Permian Basin. Liner specifications are also included in submission.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: 40-mil LLDPE as Alternative Primary with 30-mil LLDPE as Alternative Secondary Liner System for Modular Steel AST Recycling Containment

NMAC 19.15.34.12 A (4)

In consideration of the liner application for modular AST impoundments, size and depth of the AST, design details for modular tanks as well as estimated length of at least five years of service time, it is my professional opinion that a 40 mil LLDPE (non-reinforced) and a 30 mil LLDPE (non-reinforced) geomembrane system will provide the requisite barrier against produced water loss as an alternative primary and secondary liner system. *The two proposed liners, 40 mil LLDPE as Primary liner and 30 mil LLDPE Secondary liner, will function equal to or better than 45 mil String Reinforced LLDPE, 30 mil PVC, or 60 mil HDPE liners as a primary liner and 30 mil LLDPE string reinforced as a secondary liner system. Additionally, this two-layer system with integrated leak detection system, will provide requisite protection for the environment that is equal to or better than the above primary and secondary liner systems referenced in OCD rule 34.* The following are discussion points that will exhibit the attributes of a 40 mil/30 mil LLDPE 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). However, LLDPE will resist aging and degradation and remain intact for many years in exposed conditions. The LLDPE resin is virtually the same for non-reinforced 30 or 40 mil LLDPE and string reinforced 30 or 45 mil LLDPE geomembranes and both will provide requisite containment and be equally protective for this application, enduring UV and chemical degradation in the produced water environment.

Flexibility Requirements. Non-reinforced LLDPE geomembranes are less stiff and far more flexible than string reinforced geomembranes as well as 60 mil HDPE and in this regard are preferred for installations in vertical wall tanks such as this proposed installation. 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. Non-reinforced LLDPE sheet will conform better than a string reinforced LLDPE to the tank dimensions under hydrostatic loading and will exhibit less wrinkling and creasing during and after installation.

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, either non-reinforced LLDPE or string-reinforced LLDPE will be acceptable as far as QC and thermal fusion seaming methods are concerned.

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Ph 303-679-0285 Fx 303-679-8955 geosynthetics@msn.com

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Potential for Leakage through the Primary and Secondary Liners. Leakage through geomembrane liners is directly a function of the height of liquid head above any hole or imperfection. The geonet drainage media between the primary and secondary LLDPE geomembranes at the base of the AST in this application provides immediate drainage to a low point or outside the Modular AST Impoundment and thus no hydrostatic head or driving gradient is available to push leakage water through a hole in the Secondary LLDPE liner .

Leakage through any Primary geomembrane is driven by size of hole and depth and will be detected by the increase of water in the drainage system and the volume being pumped out of the secondary containment. In this regard and for this variance, the Primary consists of 40 mil LLDPE geomembrane which will perform equal to or better than a single layer of string reinforced LLDPE for potential leakage. Thus, if a leak occurs through the top layer, it will be effectively contained by the second layer of 30 mil LLDPE geomembrane. 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 leakage collection and drainage system 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 waste and process water impoundments usually in the range of 100 to 500 gpad. However, New Mexico does not specify an ALR for waste or process water impoundments (GRI Paper No. 15).

LLDPE (and string reinforced LLDPE) can be prefabricated into large panels and thus both types offer the following for Containment:

- Prefabrication in factory-controlled conditions into very large panels (up to 30,000 sf) results in ease of installation, less thermal fusion field seams and less on site QC and CQA. (It should be noted that HDPE cannot be prefabricated into panels and requires considerably more on-site welding and QC).

- Large prefabricated panels will provide better control of thermal fusion welding in a factory environment that will improve the liner system integrity for the long term. Ease of installation of large prefabricated custom size panels results in a greater reduction of installation time and associated installation and QC costs

- The Non-reinforced LLDPE geomembrane provides superior lay flat characteristics and conformability which allows for more intimate contact with the underlying soil, geonet, or geotextile and tank walls as well as overlying materials thus providing better flow characteristics for drainage of water. String reinforced LLDPE exhibits more wrinkling and when overlaid or in contact with a geonet drain, wrinkles tend to form pockets and dams affecting drainage of any leakage water to the exterior of the Modular AST Impoundment.

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- Both types of LLDPE geomembrane are easily repaired using the same thermal fusion bonding method without the need for special surface grinding preparation for extrusion welding as is typically used in repair of HDPE geomembranes. However, string reinforced LLDPE requires that all cut edges with exposed scrim must be encapsulated with extrusion bead. No encapsulation is required on non-reinforced LLDPE.

In summary, it is my professional opinion that the liner system of 40 mil non-reinforced LLDPE geomembrane as Primary liner and 30 mil non reinforced LLDPE Secondary liner, with integrated leak detection system, will provide protection that is equal to or better than 45 mil string reinforced LLDPE, 30 mil PVC, 60 mil HDPE (primary liner) and 35 mil LLDPEr (secondary liner) and meets requirements as defined by the rule as an alternative liner system (resistance to UV and chemical exposure and required hydraulic conductivity). Additionally, this liner system will provide a superior installation in the AST environment and function better than liners referenced in the OCD rule and will provide the requisite protection of fresh water, public health and the environment for at least 5 years in the produced water recycling environment.

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,

R K Frobel

Ronald K. Frobel, MSCE, PE

References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

Geosynthetic Research Institute (GRI) Published Standards and Papers 2018

ASTM Standards 2018

Attachments:

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

The prescriptive mandates of the Rule that are the subject of this variance request are the following subsections of 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 x 10-9 cm/sec*. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

The applicant proposes one layer of 40-mil LLDPE as a primary liner and a secondary liner comprised of one layer of 40-mil LLDPE material.

Rule 34 did not consider Above Ground Steel Storage Tanks that employ liners as a primary and secondary containment method.

This material is more readily available than the prescribed liners in the Rule and provides superior flexibility and conformity characteristics. Due to the vertical steel walls, 60-mil HDPE, 45 or 30-mil LLDPE string reinforced liners and 30-mil PCV 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. Stamped plans from design engineer confirm applicability of this liner system to this specific site.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: 40-mil LLDPE as Alternative Primary/Secondary Liner System for Modular Steel AST Recycling Containment

NMAC 19.15.34.12 A (4)

In consideration of the Primary lining application (modular AST impoundment), size of the AST and depth, design details for modular tanks as well as estimated length of up to five years of service time, it is my professional opinion that a 40 mil LLDPE geomembrane will provide the requisite barrier against processed water loss. It should be noted that the 40 mil LLDPE exceeds the OCD mandate for a Secondary lining system. *The two proposed 40 mil LLDPE liners will function equal to or better than 45 mil String Reinforced LLDPE, 30 mil PVC, or 60 mil HDPE liners as a primary liner and 30 mil LLDPE string reinforced as a secondary liner system. Additionally, the 40 mil LLDPE in a two-layer system will provide requisite protection for the environment that is equal to or better than the above primary and secondary liner systems referenced in OCD rule 34.* The following are discussion points that will exhibit the attributes of a 40 mil LLDPE 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). However, LLDPE will resist aging and degradation and remain intact for many years in exposed conditions. The LLDPE resin is virtually the same for non-reinforced 40 mil LLDPE and string reinforced 45 mil LLDPE geomembranes and both will provide requisite containment and be equally protective for this application.

Flexibility Requirements. Non-reinforced LLDPE geomembranes are less stiff and far more flexible than string reinforced geomembranes as well as 60 mil HDPE and in this regard are preferred for installations in vertical wall tanks such as this proposed installation. 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. Non-reinforced LLDPE sheet will conform better than a string reinforced LLDPE to the tank dimensions under hydrostatic loading and will exhibit less wrinkling and creasing during and after installation.

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, either non-reinforced LLDPE or string-reinforced LLDPE will be acceptable as far as QC and thermal fusion seaming methods are concerned.

Potential for Leakage through the Primary and Secondary Liners. Leakage through geomembrane liners is directly a function of the height of liquid head above any hole or imperfection. The geonet drainage media between the primary and secondary LLDPE

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geomembranes at the base of the AST in this application provides immediate drainage to a low point or outside the Modular AST Impoundment and thus no hydrostatic head or driving gradient is available to push leakage water through a hole in the Secondary LLDPE liner .

Leakage through any Primary geomembrane is driven by size of hole and depth and will be detected by the increase of water in the drainage system and the volume being pumped out of the secondary containment. In this regard and for this variance, the Primary consists of 40 mil LLDPE geomembrane which will perform equal to or better than a single layer of string reinforced LLDPE for potential leakage. Thus, if a leak occurs through the top layer, it will be effectively contained by the second layer of 40 mil LLDPE geomembrane. 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 leakage collection and drainage system 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 waste and process water impoundments usually in the range of 100 to 500 gpad. However, New Mexico does not specify an ALR for waste or process water impoundments (GRI Paper No. 15).

Both non-reinforced LLDPE and string reinforced LLDPE can be prefabricated into large panels and thus both types offer the following for Containment:

- Prefabrication in factory-controlled conditions into very large panels (up to 30,000 sf) results in ease of installation, less thermal fusion field seams and less on site QC and CQA. (It should be noted that HDPE cannot be prefabricated into panels and requires considerably more on-site welding and QC).

- Large prefabricated panels will provide better control of thermal fusion welding in a factory environment that will improve the liner system integrity for the long term. Ease of installation of large prefabricated custom size panels results in a greater reduction of installation time and associated installation and QC costs

- The Non-reinforced LLDPE geomembrane provides superior lay flat characteristics and conformability which allows for more intimate contact with the underlying soil, geonet, or geotextile and tank walls as well as overlying materials thus providing better flow characteristics for drainage of water. String reinforced LLDPE exhibits more wrinkling and when overlaid or in contact with a geonet drain, wrinkles tend to form pockets and dams affecting drainage of any leakage water to the exterior of the Modular AST Impoundment.

- Both types of LLDPE geomembrane are easily repaired using the same thermal fusion bonding method without the need for special surface grinding/preparation for extrusion welding as is typically used in repair of HDPE geomembranes.

R.K. FROBEL & ASSOCIATES
Consulting Engineers

However, string reinforced LLDPE requires that all cut edges with exposed scrim must be encapsulated with extrusion bead. No encapsulation is required on non-reinforced LLDPE.

In summary, it is my professional opinion that the two layers of 40 mil non-reinforced LLDPE geomembranes will provide a Primary/Secondary liner system that is equal to or better than 45 mil string reinforced LLDPE, 30 mil PVC, 60 mil HDPE (primary liner) and 35 mil LLDPEr (secondary liner). Additionally, the two layers of 40 mil LLDPE will provide a superior installation and function better than liners referenced in the OCD rule. The two layers of 40 mil non- reinforced LLDPE will provide the requisite protection of fresh water, public health and the environment for at least 5 years in the frack water environment.

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,

R K Frobel

Ronald K. Frobel, MSCE, PE

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References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

Geosynthetic Research Institute (GRI) Published Standards and Papers 2018

ASTM Standards 2018

Attachments:

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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.

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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.

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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 Frobel, 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

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References:

NMAC 19.15.34.13 OPERATIONAL REQUIREMENTS FOR RECYCLING CONTAINMENTS

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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 Hyrdo Pressure (p) of water is 718 pounds per square foot (psf), where

$$p = Design\ Density\ X\ Height$$

$$= 62.4\ PCF * 11.5\ ft$$

$$(design\ density = 8.34\ \frac{lb}{gal}\ X\ 7.48\ \frac{ft^3}{gal})$$

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 Hyrdo Pressure (p) of conditioned produced water is 626 psf, where

$$p = Design\ Density\ X\ Height$$

$$= 69.64\ PCF * 9\ ft$$

$$(design\ density = 9.3\ \frac{lb}{gal}\ X\ 7.48\ \frac{ft^3}{gal})$$

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

$$p = Design\ Density\ X\ Height$$

$$= 69.64\ PCF * 10\ ft$$

$$(design\ density = 9.3\ \frac{lb}{gal}\ X\ 7.48\ \frac{ft^3}{gal})$$

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

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Sincerely Yours,

R K Frobel

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References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

ASTM Standards 2019

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RONALD K. FROBEL, MSCE, P.E.

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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

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.

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 liason 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, January 18, 2023 2:42 PM
To: 'Chad Gallagher'; Michael Incerto; 'Todd Carpenter'
Cc: ccheek@acefluids.com; r@rthicksconsult.com
Subject: 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497]
Attachments: C-147 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497].pdf

1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497]

Good afternoon Mr. Gallagher,

NMOCD has reviewed the recycling containment permit application and related documents, submitted by [371643] SOLARIS WATER MIDSTREAM LLC on January 16, 2023, for 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] in Unit Letter I, Section 22, Township 20S, Range 33E, Lea County, New Mexico. [371643] SOLARIS WATER MIDSTREAM LLC requested variances from 19.15.34 NMAC for 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497].

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 a 40-mil non-reinforced LLDPE primary liner and a 30-mil non-reinforced LLDPE secondary liner with a 200-mil geogrid drainage layer is approved.
- The variance to 19.15.34.12 A (4) NMAC for the installation on the AST containment of a 40-mil non-reinforced LLDPE primary liner and a 40-mil non-reinforced LLDPE secondary liner with a 200-mil geogrid drainage layer is approved.
- The variance to NMAC 19.15.34.12.D to install a gate or chain across the stairway between the ground surface and the open-top of the AST containment is approved. The operator shall place an appropriate sign on the gate or chain to prevent unauthorized human access to the open top of the containment and provide a mechanism to lock the gate when responsible personnel are not onsite.

The following variances have been denied:

- The variance to 19.15.34.13.B.(2) NMAC for a 2-feet freeboard has been denied. 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] must operate with the 3-feet freeboard as specified by rule.
- The requested variance that the 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497], when not in use, be exempt from weekly inspections per 19.15.34.13(A) is denied.
- **[371643] SOLARIS WATER MIDSTREAM LLC must inspect the 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] recycling containment and associated leak detection systems weekly while it contains fluids per 19.15.34.13(A). [371643] SOLARIS WATER MIDSTREAM LLC shall maintain a current log of such inspections and make the log available for review by the division upon request**.

The form C-147 and related documents for 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] 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.
- [371643] SOLARIS WATER MIDSTREAM LLC shall construct, operate, maintain, close, and reclaim 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] in compliance with NMAC 19.15.34 NMAC.
- 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] is approved for five years of operation from the date of permit application.
- 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] permit expires on January 16, 2028. If [371643] SOLARIS WATER MIDSTREAM 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 December 16, 2027.
- Per Rule 19.15.34.15.A.(1) operators without existing financial assurance pursuant to 19.15.8 NMAC shall furnish financial assurance acceptable to the division in the amount of the recycling containment's estimated closure cost. The total closure cost estimate 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] consisting of two (2) above ground storage tanks (AST) of 60,000 BBL of capacity each in the amount of $50,500.00, satisfies the requirements of NMAC 19.15.34.15.A.(1).
- The financial assurance should be mailed to Oil Conservation Division; Bonding and Compliance; 1220 South St Frances Drive; Santa Fe, NM 87505.
- [371643] SOLARIS WATER MIDSTREAM LLC shall notify OCD, through OCD Permitting, when construction of 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] commences.
- [371643] SOLARIS WATER MIDSTREAM LLC shall notify NMOCD when recycling operations commence and cease at 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497].
- A minimum of 3-feet freeboard must be maintained at 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] 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 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] 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.
- **If after that 6-month extension period, the 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] is not utilized at a minimum of 20% fluid capacity, no additional extensions would be granted, and the operator would be directed to remove all fluids and proceed with the closure requirements.**
- [371643] SOLARIS WATER MIDSTREAM 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.
- NMOCD has updated Form C-148. The new Form C-148 can be found at: https://www.emnrd.nm.gov/ocd/wp-content/uploads/sites/6/Revised-C-148-Form-January-2022.pdf.
- [371643] SOLARIS WATER MIDSTREAM LLC 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.
- [371643] SOLARIS WATER MIDSTREAM LLC shall comply with 19.15.29 NMAC Releases in the event of any release of produced water or other oil field waste at 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497].

Please reference number 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] in all future communications.
Regards,

Victoria Venegas ● Environmental Specialist
Environmental Bureau
EMNRD - Oil Conservation Division
(575) 909-0269 | Victoria.Venegas@emnrd.nm.gov
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District III
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Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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

CONDITIONS

Action 176241

CONDITIONS

Operator: SOLARIS WATER MIDSTREAM, LLC 907 Tradewinds Blvd, Suite B Midland, TX 79706	OGRID: 371643
	Action Number: 176241
	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 [371643] SOLARIS WATER MIDSTREAM LLC on January 16, 2023, for 1RF-501 - RANGER ASTs FACILITY ID [fVV2301837497] in Unit Letter I, Section 22, Township 20S, Range 33E, Lea County, New Mexico. [371643] SOLARIS WATER MIDSTREAM LLC must comply with the conditions of approval for permit 1RF-501 - RANGER AST FACILITY ID [fVV2301837497].	1/18/2023