April 2021

Volume 1
C-147 Registration Package for
Buffalo 12 Containment & Recycling Facility
Section 30, T26-S, R32-E, Lea County

- **Transmittal Letter**
- **C-147**
- **Survey and Driving Directions**
- **AST Operations and Closure Plans**
- **Siting Criteria Demonstration**
- **Appendices**

Prepared for:
Chisholm Energy Operating, LLC
Ft. Worth, Texas

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

R. T. HICKS CONSULTANTS, LTD.

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

April 7, 2021

Mr. Mike Bratcher
NMOCD - District 2, Supervisor811 S. First St.
Artesia, NM 88210Via E-Mail

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

RE: 1RF-464, Chisholm Energy Operating, LLC, Buffalo 12 AST Containment
Section 30, T26-S, R32-E, Lea County, C-147 Volume 1 and Volume 2

Dear Mr. Bratcher and Ms. Venegas:

On behalf of Chisholm Energy Operating, LLC, R.T. Hicks Consultants is pleased submit a permit for the above-referenced project that consists of one (1) AST Containment. We appreciate your timely review and have modified the original submission to meet your comments and answer your questions. Both documents will be transmitted to OCD via the OCD.Online portal.

Volume 1 contains:

- C-147 form signed by the operator,
- Survey showing the location of the AST Containment pad and driving directions,
- AST Operations and Closure Plans (verbatim from the approved Zia Hills AST Containments),
- Siting Criteria Demonstration.

Hicks Consultants affirms that:

- The location meets all siting criteria in the Rule and the location meets thespecified setback criteria,
- An auger boring to 80 feet for a conductor pipe of an oil well on the same pad asthe proposed containment was a dry hole,
- We conducted a foot survey to check that all setback criteria are met,
- The Operation and Maintenance Plan and Closure Plan are consistent with theRule and previously approved by OCD.

Volume 2 contains information specific to the design and construction of the proposed AST and variance requests to cause the AST to conform to Rule 34. Specifically, you will find:

- Engineering drawings for the proposed 40,000 bbl. AST Containment (RockwaterTank) are fully consistent with plans previously approved by OCD,
- The Design/Construction Plan verbatim from the approved Zia Hills ASTContainment
- The manual for AST set up from Select Energy Services
- Variances for AST Storage Containments – all of which have been approved by OCD previously.

In compliance with 19.15.34.10 of the Rule, the original submission was copied to BLM

Carlsbad who is the representative of the owner of the surface upon which the containments will be constructed (i.e., the United States). In order to avoid clogging the BLM email, we will alert Mr. Robert Gomez of BLM that the document and communications with OCD will be available on line.

If you have any questions or concerns regarding this registration or the attached C-147, please contact me. As always, we appreciate your work ethic and attention to detail.

Sincerely,
R.T. Hicks Consultants

Randall T. Hicks PGPrincipal

Copy: Chisholm Energy Operating, LLC

C-147

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

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

Form C-147
Revised April 3, 2017

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: : Chisholm Energy Operating LLC OGRID #: 372137

Address: 801 Cherry St Suite 1200 Unit 20 Fort Worth TX, 76102

Facility or well name (include API# if associated with a well): Buffalo 12 Recycling Facility and Containment

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

U/L or Qtr/Qtr O Section 12 Township 19S Range 33E County: Lea

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

2.

☒ **Recycling Facility:**

Location of (if applicable): Latitude 32.66860 Longitude -103.612516 NAD83 (Approximate)

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 **See Attachment** *(adjacent):* (if applicable) Latitude 32.66860 Longitude --103.612516 NAD83 (Approximate)

☐ For multiple or additional recycling containments, attach design and location information of each containment:

☒ Lined ☐ Liner type: Thickness **See Attachment**: HDPE ☒ LLDPE ☐ HDPE ☐ PVC ☐ Other

Primary liner 2 x 30 mil LLDPE ; Secondary liner 40 mil LLDPE . SEE DESIGN DRAWINGS ☐ String-Reinforced

Liner Seams: ☒ Welded ☐ Factory ☐ Other _ Volume: SEE DESIGN DRAWINGS bbl Dimensions: (Inside dimensions) SEE DESIGN

☐ 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___ _____

6. **Signs:**

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

☒ Signed in compliance with 19.15.16.8 NMAC

7. **Variances:**

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

Check the below box only if a variance is requested:

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

If a Variance is requested, it must be approved prior to implementation. See Volume 2

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 FIGURES 1-2	☐ Yes ☒ No ☐ NA
Within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended. - Written confirmation or verification from the municipality; written approval obtained from the municipality FIGURE 3	☐ Yes ☒ No ☐ NA
Within the area overlying a subsurface mine. - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division FIGURE 4	☐ Yes ☒ No
Within an unstable area. - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map FIGURES 5a-e	☐ Yes ☒ No
Within a 100-year floodplain. FEMA map FIGURE 6	☐ 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 FIGURE 7	☐ 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 FIGURE 8	☐ 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. FIGURES 1 and 7 - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site	☐ Yes ☒ No
Within 500 feet of a wetland. FIGURE 9 - 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): Jennifer Elrod Title: Regulatory

Signature: Jennifer Elrod Date: 04/07/2021

e-mail address jelrod@chisholmenergy.com Telephone: 817 953 3728

11.

OCD Representative Signature: _____ **Approval Date:** _____

Title: _____ **OCD Permit Number:** _____

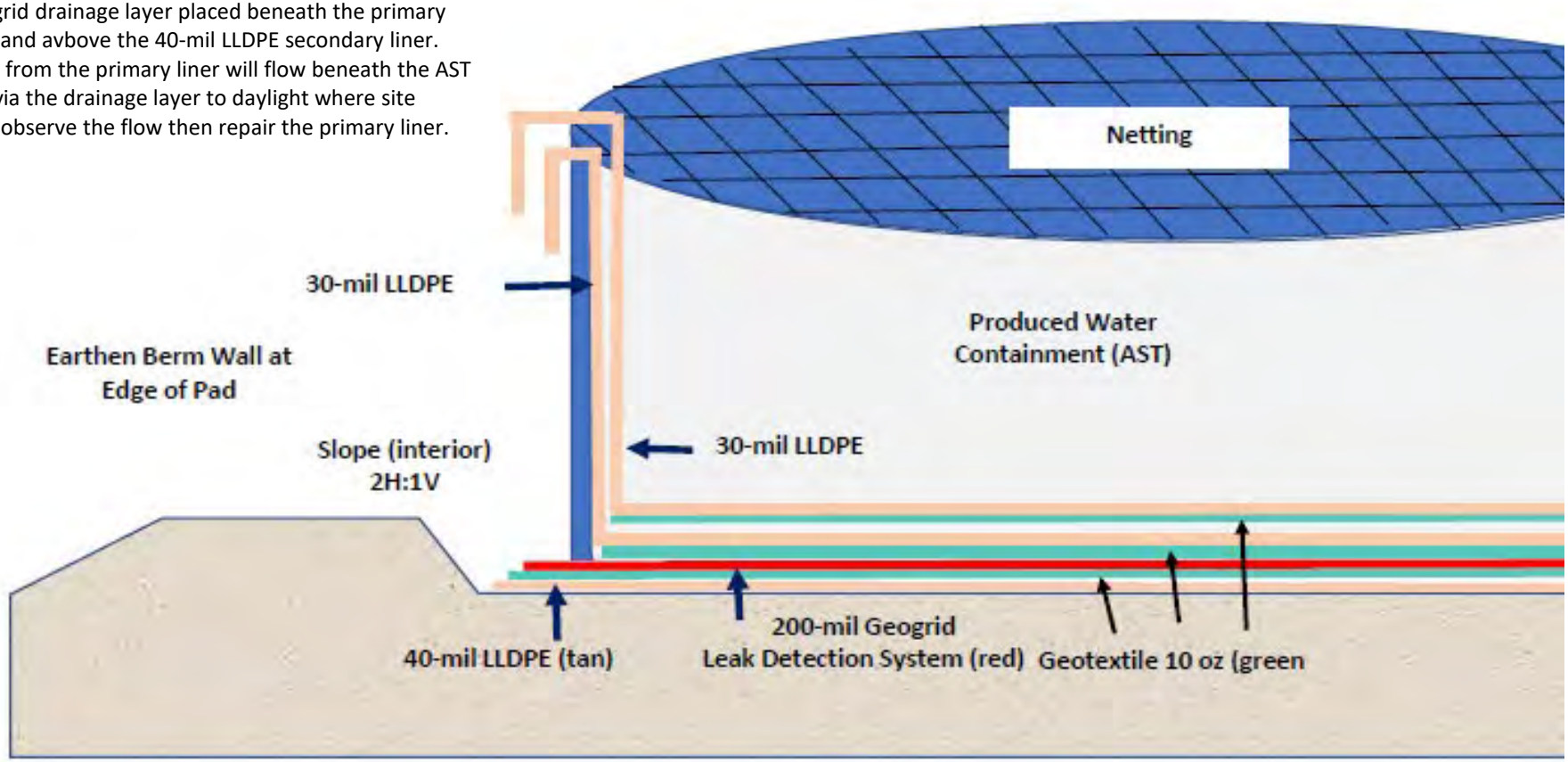
☐ OCD Conditions _____

☐ Additional OCD Conditions on Attachment

Leak Detection Systems

Select Energy employs a proprietary leak detection system between the two 30-mil LLDPE that comprise the primary liner. This system monitors seepage from the uppermost 30-mil LLDPE liner.

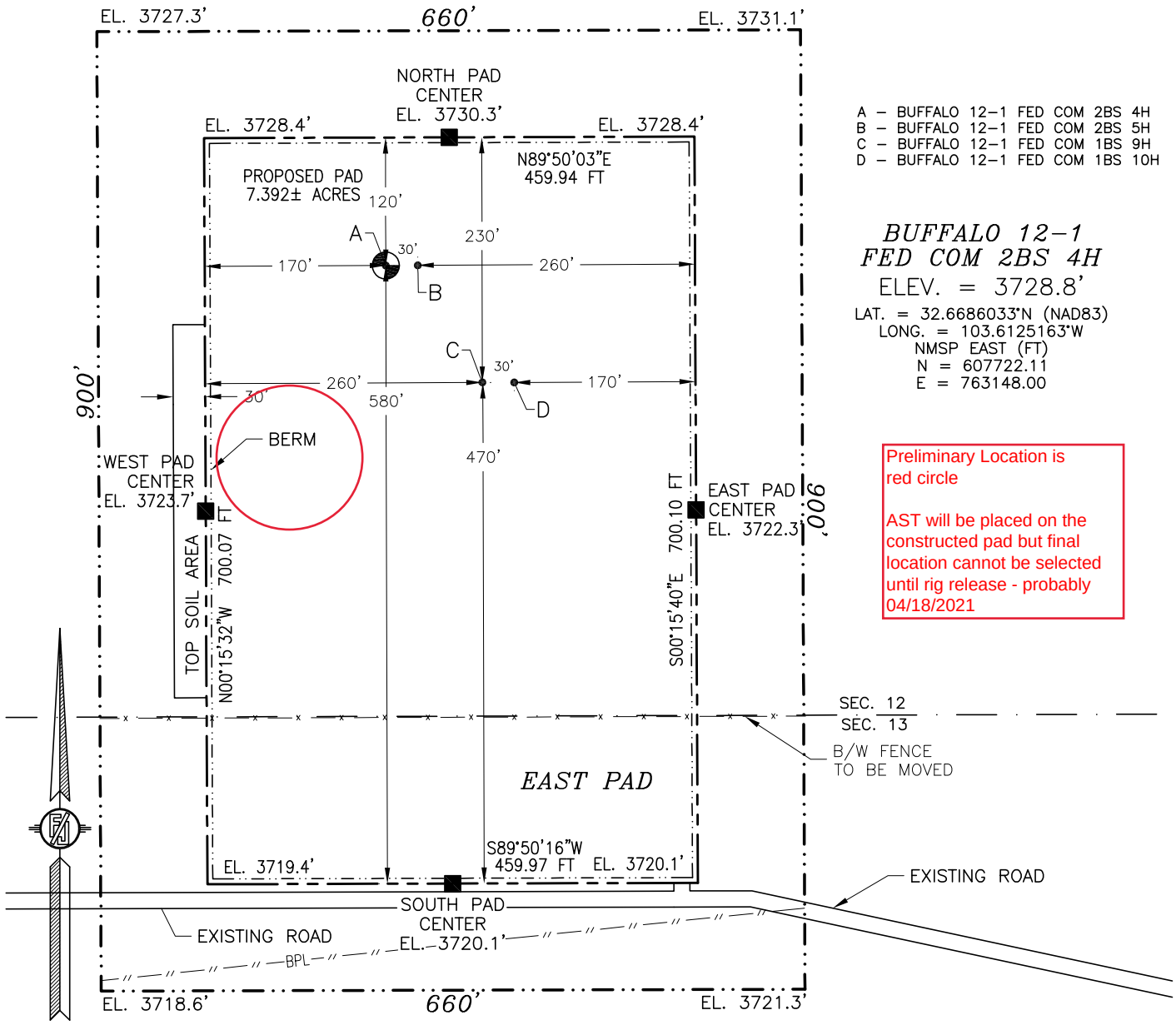
The leak detection system that complies with Rule 34 is the 200-mil geogrid drainage layer placed beneath the primary liner system and avbove the 40-mil LLDPE secondary liner. Any seepage from the primary liner will flow beneath the AST steel frame via the drainage layer to daylight where site workers can observe the flow then repair the primary liner.



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 505-266-5004	**Select AST Schematic**	**Plate 1**
	Chisholm Energy Operating - Buffalo 12	**Mar-21**

SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO
SITE MAP

NOTE: LATITUDE AND LONGITUDE COORDINATES ARE SHOWN USING THE NORTH AMERICAN DATUM OF 1983 (NAD83). LISTED NEW MEXICO STATE PLANE EAST COORDINATES ARE GRID (NAD83). BASIS OF BEARING AND DISTANCES USED ARE NEW MEXICO STATE PLANE EAST COORDINATES MODIFIED TO THE SURFACE



A – BUFFALO 12–1 FED COM 2BS 4H
B – BUFFALO 12–1 FED COM 2BS 5H
C – BUFFALO 12–1 FED COM 1BS 9H
D – BUFFALO 12–1 FED COM 1BS 10H

BUFFALO 12–1 FED COM 2BS 4H

ELEV. = 3728.8'
LAT. = 32.6686033°N (NAD83)
LONG. = 103.6125163°W
NMSP EAST (FT)
N = 607722.11
E = 763148.00

Preliminary Location is red circle

AST will be placed on the constructed pad but final location cannot be selected until rig release - probably 04/18/2021

015 75 150 300
SCALE 1" = 150'

DIRECTIONS TO LOCATION
FROM U.S. HIGHWAY 62–180 AND STATE ROAD 176 GO EAST ON U.S. HIGHWAY 62–180 7.6 MILES, TURN LEFT ON PAVED SMITH RANCH ROAD, GO NORTHWEST 2.1 MILES, TURN RIGHT ON CALICHE ROAD AND GO NORTHEAST 2.02 MILES, TURN LEFT AND GO NORTH 1.9 MILES, TURN LEFT AND GO WEST 0.45 OF A MILE, THEN GO WEST 308' THEN NORTHWEST 1765', THEN WEST 65', THEN NORTH 15' (TOTAL OF 2153') TO THE SOUTHEAST PAD CORNER FOR THIS LOCATION.

I, FILIMON F. JARAMILLO, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

12797
FILIMON F. JARAMILLO, PLS 12797

CHISHOLM ENERGY OPERATING, LLC
BUFFALO 12–1 FED COM 2BS 4H
LOCATED 423 FT. FROM THE SOUTH LINE AND 1380 FT. FROM THE EAST LINE OF SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

JUNE 5, 2020

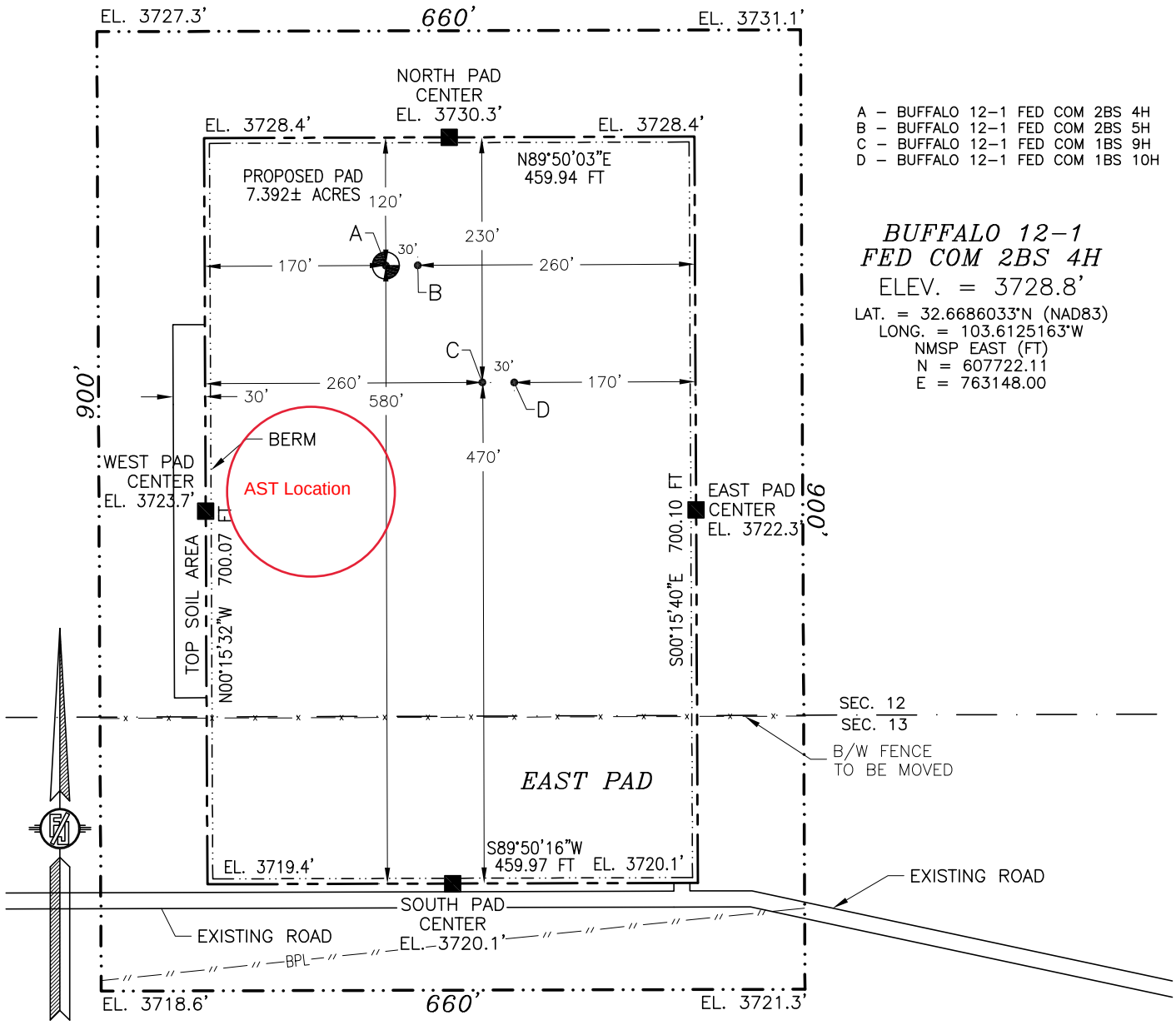
SURVEY NO. 5737F

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SURVEY FOR CONTAINMENT AND RECYCLING FACILITY

SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO
SITE MAP

NOTE: LATITUDE AND LONGITUDE COORDINATES ARE SHOWN USING THE NORTH AMERICAN DATUM OF 1983 (NAD83). LISTED NEW MEXICO STATE PLANE EAST COORDINATES ARE GRID (NAD83). BASIS OF BEARING AND DISTANCES USED ARE NEW MEXICO STATE PLANE EAST COORDINATES MODIFIED TO THE SURFACE



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B – BUFFALO 12–1 FED COM 2BS 5H
C – BUFFALO 12–1 FED COM 1BS 9H
D – BUFFALO 12–1 FED COM 1BS 10H

BUFFALO 12–1 FED COM 2BS 4H

ELEV. = 3728.8'
LAT. = 32.6686033°N (NAD83)
LONG. = 103.6125163°W
NMSP EAST (FT)
N = 607722.11
E = 763148.00

015 75 150 300
SCALE 1" = 150'

DIRECTIONS TO LOCATION

FROM U.S. HIGHWAY 62–180 AND STATE ROAD 176 GO EAST ON U.S. HIGHWAY 62–180 7.6 MILES, TURN LEFT ON PAVED SMITH RANCH ROAD, GO NORTHWEST 2.1 MILES, TURN RIGHT ON CALICHE ROAD AND GO NORTHEAST 2.02 MILES, TURN LEFT AND GO NORTH 1.9 MILES, TURN LEFT AND GO WEST 0.45 OF A MILE, THEN GO WEST 308' THEN NORTHWEST 1765', THEN WEST 65', THEN NORTH 15' (TOTAL OF 2153') TO THE SOUTHEAST PAD CORNER FOR THIS LOCATION.

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LEA COUNTY, STATE OF NEW MEXICO

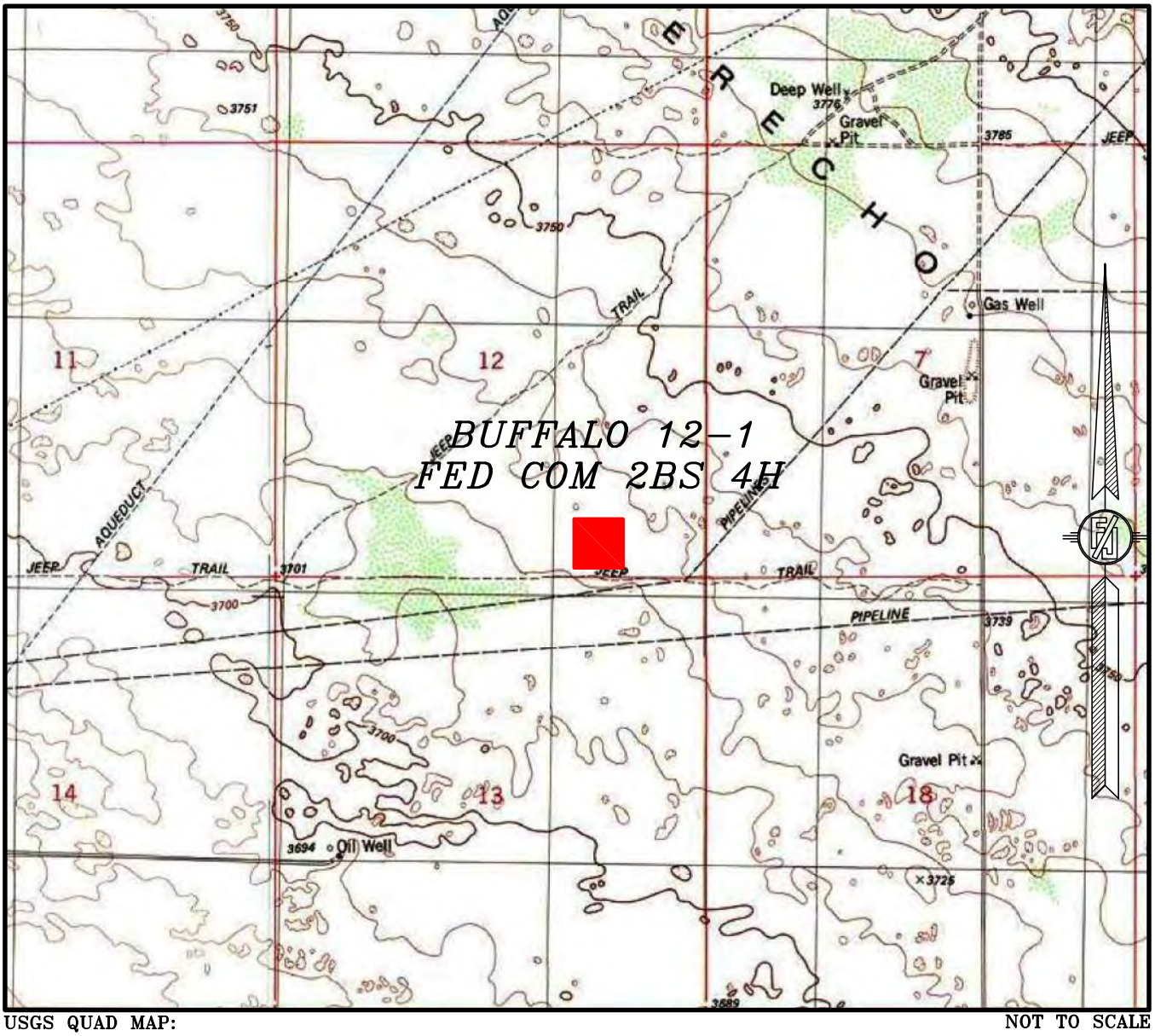
JUNE 5, 2020

SURVEY NO. 5737F

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

LOCATION VERIFICATION MAP



USGS QUAD MAP:
IRONHOUSE WELL

NOT TO SCALE

CHISHOLM ENERGY OPERATING, LLC
BUFFALO 12-1 FED COM 2BS 4H
LOCATED 423 FT. FROM THE SOUTH LINE
AND 1380 FT. FROM THE EAST LINE OF
SECTION 12, TOWNSHIP 19 SOUTH,
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JUNE 5, 2020

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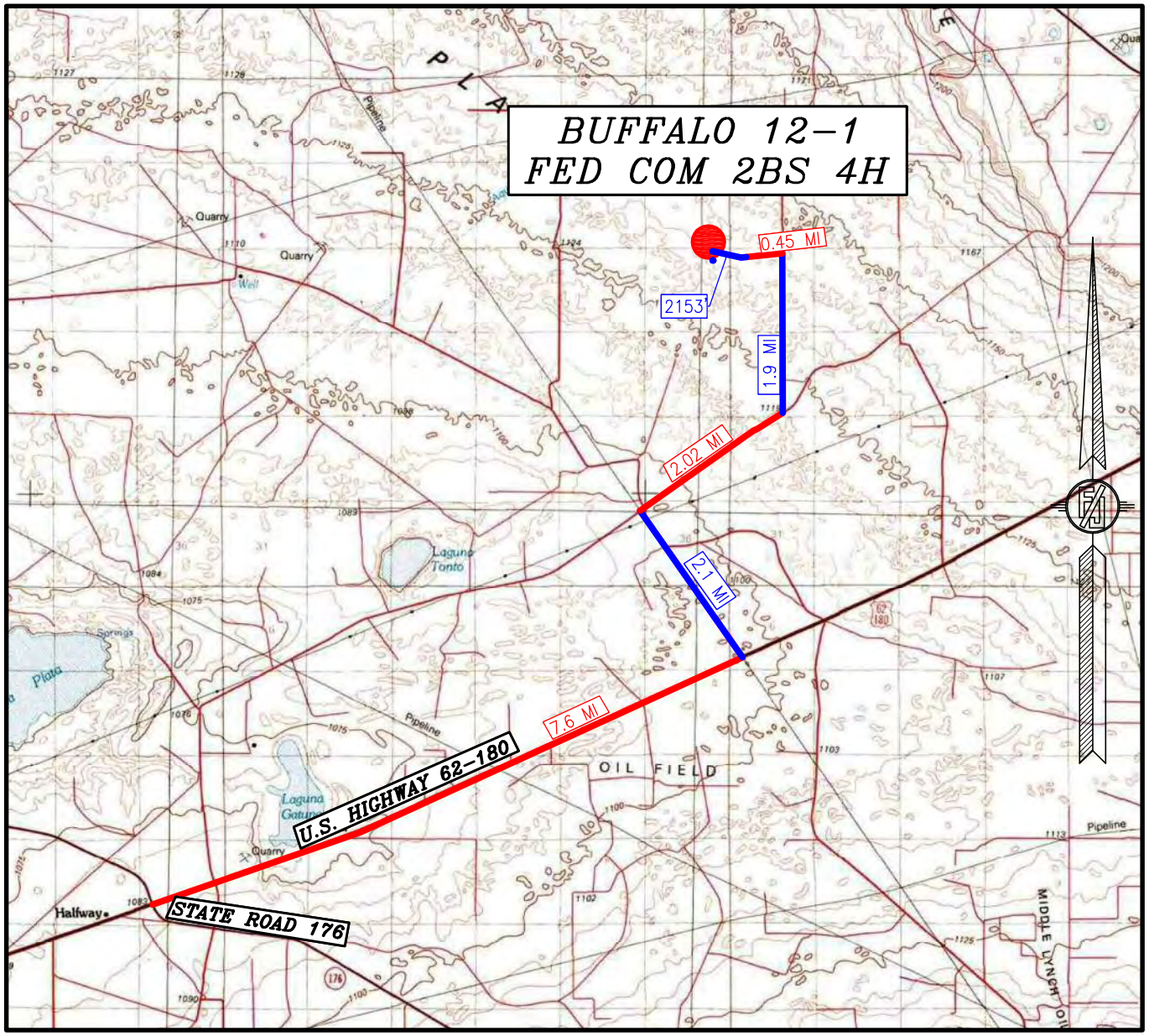
MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

VICINITY MAP



DISTANCES IN MILES NOT TO SCALE

DIRECTIONS TO LOCATION
FROM U.S. HIGHWAY 62-180 AND STATE ROAD 176 GO EAST ON U.S. HIGHWAY 62-180 7.6 MILES, TURN LEFT ON PAVED SMITH RANCH ROAD, GO NORTHWEST 2.1 MILES, TURN RIGHT ON CALICHE ROAD AND GO NORTHEAST 2.02 MILES, TURN LEFT AND GO NORTH 1.9 MILES, TURN LEFT AND GO WEST 0.45 OF A MILE, THEN GO WEST 308' THEN NORTHWEST 1765', THEN WEST 65', THEN NORTH 15' (TOTAL OF 2153') TO THE SOUTHEAST PAD CORNER FOR THIS LOCATION.

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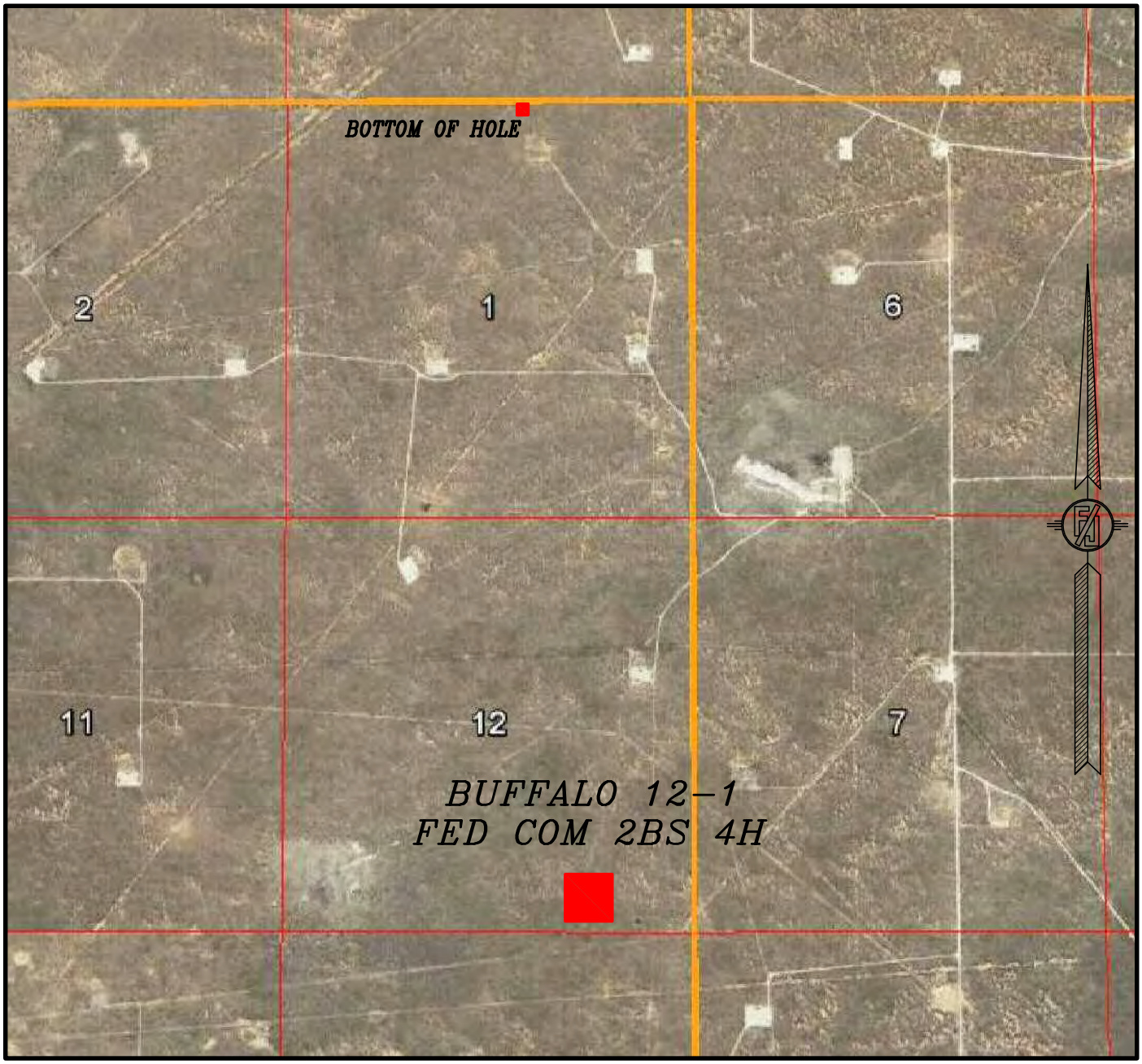
JUNE 5, 2020

SURVEY NO. 5737F

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

AERIAL PHOTO



NOT TO SCALE
AERIAL PHOTO:
GOOGLE EARTH
FEBRUARY 2017

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RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

JUNE 5, 2020

SURVEY NO. 5737F

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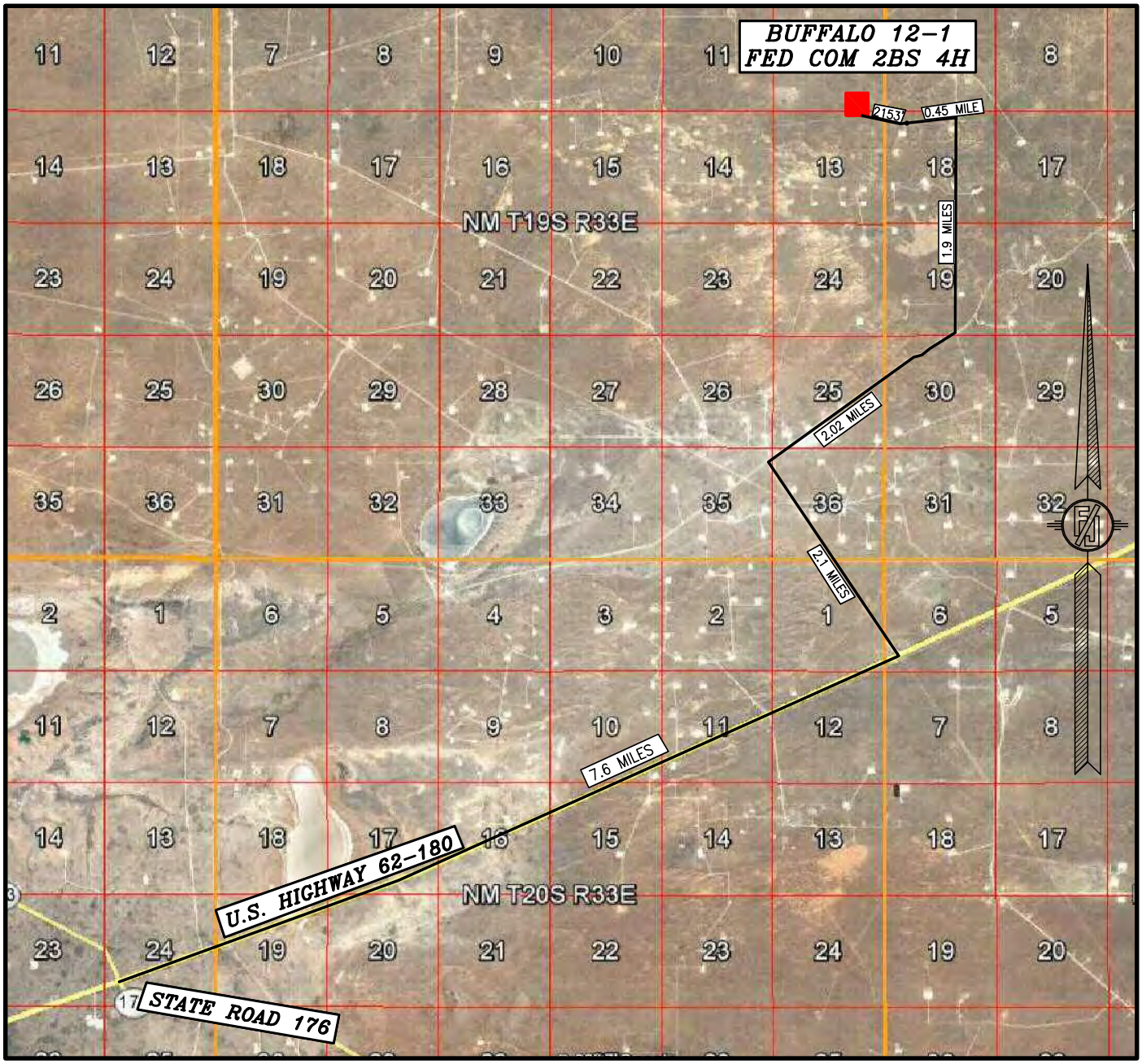
SECTION 12, TOWNSHIP 19 SOUTH, RANGE 33 EAST, N.M.P.M.
LEA COUNTY, STATE OF NEW MEXICO

ACCESS AERIAL ROUTE MAP



NOT TO SCALE
AERIAL PHOTO:
GOOGLE EARTH
FEBRUARY 2017

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JUNE 5, 2020

SURVEY NO. 5737F

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

AST Operations and Closure Plans

Operations and Maintenance Plan
Above Ground Tank Containment (AST)

General Specifications

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

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

- The operator will use the treated produced water in the containments for drilling, completion (stimulation), producing or processing oil or gas or both. If other uses are planned, the operator will notify the OCD 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.
- The operator will address all releases from the recycling and re-use of produced water in accordance with 19.15.29 NMAC.
- The operator will not discharge into or store any hazardous waste in the recycling containments, but they may hold fluids such 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.
- The operator will verify that no oil is on the surface of the contained fluid. If oil is observed, the oil shall be removed using an absorbent boom or other device and properly disposed at an approved facility. An absorbent boom or other device will be maintained on site.
- The operator will install and use a header and diverter described in the design/construction plan in

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

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

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

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

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

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

19.15.34.13 B
(3) The injection or withdrawal of fluids from the containment shall be accomplished through a header, diverter or other hardware that prevents

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

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

damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

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

19.5.34.13 B
(4) If the containment's primary liner is compromised above the fluid's surface, the operator shall repair the damage or initiate replacement of the primary liner within 48 hours of discovery or seek an extension of time from the division district office.
(5) If the primary liner is compromised below the fluid's surface, the operator shall remove all fluid above the damage or leak within 48 hours of discovery, notify the division district office and repair the damage or replace the primary liner.

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.

Water should NEVER go below 12 inches at the lowest level of the tank to prevent impact from high winds.

If the tank is drained, it should be secured from wind impacts and the liner inspected and reposition (to provide sufficient slack during filling) prior to refilling, per direction of SOP.

The operator will report releases of fluid in a manner consistent with NMAC 19.15.29, as well as immediately notify BLM.

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

Monitoring, Inspections, and Reporting

Inspections are to routinely be performed, as well as when the ASTs are emptied and prior to refilling.
An "Inspection Form" meeting requirements according to NMAC 19.15.34, as well as BLM COA, is to be filled out during these routine inspections and is included at the end of this section.

Weekly inspections consist of

- reading and recording the fluid height of staff gauges, freeboard
- recording any evidence that the AST Containment surface shows visible oil,
- visually inspecting the containment's 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 the containment for dead migratory birds and other wildlife. Within 30 days of discovery (24 hours if federally protected), 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.

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.

As stated above, if a liner's integrity is compromised, or if any penetration of the liner occurs, then the operator will take appropriate action within 48 hours as noted above, including immediate notification of BLM.

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.

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, they should be communicated to the AST contractor (WWS Manager/Field Supervisor)

The operator will maintain a log of all inspections and make the log available for the appropriate Division district office's review upon request.

Cessation of Operations

If less than 20% of the total fluid capacity is utilized

every six months, beginning from the first withdraw, operation of the facility has ceased and the division district office will be notified. The division district may grant an extension not to exceed six months to determine the cessation of operations and the operator may request a *variance from this mandate to close for good cause and has been included in Volume 3*.

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

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

Inspection Form

Date: _____

Chisholm Energy Buffalo 12 AST Containment

Tank ID: _____

Weekly inspection/Fluid level must be maintained > 1 foot

Fluid Level: _____ Tank contents: _____

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

ConocoPhillips

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

Additional Observations or Actions: _____

Inspected by: _____

Closure Plan

After operations cease, the operator will remove all fluids and commence reclamation efforts immediately. Final reclamation to be completed within 3 months from the date the operator ceases operations from the containment for use.

The surface owner will impose a closure design that conforms to their needs for the site. The operator understands that a variance will be submitted to OCD to allow for any alternative closure protocol (BLM requirements will supersede OCD rules if equal or better for protection of freshwater, human health and the environment).

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 and BLM (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

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

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.

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.

Reclamation and Re-vegetation

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.

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.

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:

a. The operator will reclaim the containment's location to a safe and stable condition that blends with the surrounding undisturbed area.

b. 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.

c. The disturbed area shall then be reseeded with BLM defined seed mixture within the first 3 months following closure of a recycling containment in accordance with BLM requirements.

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

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

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

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. (As surface owner, BLM will determine satisfactory completion of reclamation).

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 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.

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.

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.

SITING CRITERIA DEMONSTRATION

Discussion
Figures

Distance to Groundwater

Figure 1a, 1b and 2, their associated legends, and the discussion presented below demonstrate that groundwater (fresh water, as defined by NMOCD Rules) at the location is greater than the required 50 feet below the proposed Buffalo 12 Above-Ground Storage Tank Containment (Buffalo 12 AST). Specifically, the estimated depth to water is greater than 80 feet.

Geology of Buffalo 12 AST Containment

The proposed site for the Buffalo 12 AST is located approximately 29 miles due west of Hobbs, New Mexico and 5 miles north of 62/180. The area near the proposed AST containment is relatively flat with a surface covering of low sand dunes stabilized with vegetation consisting of native grasses, mesquite, and yucca. According to the New Mexico State Geologic Map (Figures 1 and 2), the Buffalo 12 AST is in an area where the surface unit is Quaternary age piedmont deposits overlain by Quaternary age eolian deposits (Qe/Qp).

The Ogallala Formation is present northeast of the AST location and erosion has either removed or reworked the Ogallala from beneath the site. The USGS reports that wells nearest to the AST location are completed in Alluvium/Bolson deposits (i.e., piedmont) or the underlying Chinle/Santa Rosa Sandstone, according to their database. In the southwest corner of Figures 1a and 1b is a small outcrop of the upper Chinle Formation (T(r)cu).

According to Ground Water Report #6[1], the elevation of the contact between the alluvial deposits and underlying Chinle (red beds) at the AST site is approximately 3660 feet ASL, as shown in Figure 1b. Because the elevation of the AST site is 3729 feet ASL, the base of the alluvial deposits would be about 70 feet below surface. We examined well log data from the NM OSE database for wells near the location, and identified two well logs of interest:

- CP-1672, about 6 miles southeast, which indicates the red bed/alluvial contact is 68 feet below the surface (3715 ASL) resulting in an elevation of the contact of 3647 and
- CP-677, about 8 miles northwest, suggesting the red bed/alluvium contact is about 116 feet below surface (3770 feet AST surface), which calculates to an elevation of the top of the red beds of 3654.

Figure 1b shows the elevation of the red bed contact at Well CP-1672 as 3675 ft ASL and at CP-677, the elevation of the contact is about 3650. The 1961 report is obviously not perfect, but it remains an excellent source of reasonable data. In addition to the two referenced OSE well logs, Ready Drill provided us with data from the 80-foot auger boring from an oil well at the location that suggests alluvial material is at least 80-feet deep at the location.

[1] https://geoinfo.nmt.edu/publications/water/gw/6/GW6.pdf

Depth to Water Data and Nearby Wells

Figure 1 is a topographic map overlain by transparent geologic map of the state of New Mexico and associated legends that displays the following:

- A green circle with a call out showing the location of the Buffalo 12 AST.
- Water wells from the USGS database as green, cyan, and purple triangles. The colors indicate the principal water-bearing unit for each well: Alluvium/Bolsom, Ogallala, and Chinle, respectively. The well number as defined in the database, recorded depth to water value, and the date the water level measurement was recorded is displayed next to the corresponding well point.
- Miscellaneous water wells from public and non-public databases were identified by field inspection or other published documents are represented by yellow, cyan, and green squares with black dots in the center. The colors correspond to the depth to water and date the depth to water value was recorded are also displayed.
- Water wells from the Office of the State Engineer WATERS database as light blue, green, dark blue, and beige circles with colored triangles in the center. These symbols indicate the depth to water measured in the well. Well ID and documented in the OSE Waters database, depth to water value, and the date the value was recorded is displayed next to the corresponding well point.

Depth to groundwater in wells nearest to the Buffalo 12 AST in wells that were measured by professionals during static condition range from 177 to 231 feet in Chinle wells (northwest and southeast along the elevation contour) and about 90 feet in alluvial wells located about 4 miles south (and downhill). The on-site auger boring was a dry hole, thus depth to water at the site is at least 80 feet below surface.

Figure 2 is a topographic map overlain by a transparent geologic map of the state of New Mexico and associated legend the displays the following:

- The Buffalo 12 Site is represented by the green circle and call out.
- Water wells from the USGS database as green, cyan, and purple triangles. The colors indicate the principal water-bearing unit for each well: Alluvium/Bolsom, Ogallala, and Chinle, respectively. The well number as defined in the database, recorded depth to water value, and the date the groundwater elevation was recorded is displayed next to the corresponding well point.
- Miscellaneous water wells from public and non-public databases were identified by field inspection or other published documents are represented by yellow, cyan, and green squares with black dots in the center. The colors correspond to the depth to water and date the depth to water value was recorded are also displayed.

In the area of the Buffalo 12 AST, two groundwater zones are present. Wells completed in the alluvial deposits occur about 4 miles south of the location and wells that draw groundwater from the underlying Chinle or Santa Rosa occur throughout the mapped area, exclusive of the northeastern quadrant (Ogallala Aquifer). Mixing data from these two groundwater units results in a somewhat puzzling map. Therefore, we elected to avoid

drawing a potentiometric surface. With a high degree of certainty, based upon the data, we conclude:

- Depth to groundwater is at least 80 feet based upon the site-specific drilling record.
- The elevation of the groundwater surface of the Chinle/Santa Rosa zone is about 3530 feet ASL, plus or minus 50 feet.
- Data from well logs and Ground Water Report #6 (Figure 1b) demonstrate the contact between the alluvial material and underlying red beds (Chinle) is about 3660.
- The alluvial material beneath the Buffalo 12 AST is dry
- The depth to the shallowest groundwater zone (Chinle) is about (3729-3530=) 199 feet, plus or minus 50 feet.

Distance to Municipal Boundaries and Freshwater Fields

Figure 3 demonstrates that the area of interest is not within incorporated municipal boundaries or within defined municipal freshwater well fields covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended.

- The nearest freshwater well field is 12.1 miles to the northwest and is owned by the Continental Oil (L-2770) and probably supplies one or more natural gas processing plants.
- The nearest municipality is the City of Hobbs, which is about 25 miles due east.

Distance to Subsurface Mines

Figure 4 and our general reconnaissance of the area demonstrate the absence of subsurface mines in the area.

- The Buffalo 12 site is not in an area where subsurface mines exist.
- The nearest surface mines identified in the MILS database are 0.9 miles to the northeast and southeast.

Distance to High or Critical Karst Areas

Figure 5 illustrates the Buffalo 12 site absence of mapped areas of high or critical karst potential.

- The Buffalo 12 site is not located within high or critical karst potential areas.
- Our field investigation saw no evidence of karst features such as sinkholes.

Distance to 100-Year Floodplain

Figure 6 demonstrates the absence of 100-year flood plains with respect to the proposed location for the Buffalo 12 AST site.

- The nearest 100- year flood plain is in and around the City of Hobbs.
- Our field investigation found no evidence of flooding potential.

Distance to Surface Water

Figure 7 and the site visit demonstrate the that the Buffalo 12 AST site is outside of the setback distances for a continuously flowing watercourse or the next lower order tributary, lakebed, sinkhole, playa lake (measured from the ordinary high-water mark) or spring.

- The nearest surface water feature is Laguna Tonto, a lake/pond about 2.39 miles to the southeast.
- No watercourses or springs were mapped or observed near the site.

Distance to Permanent Residences or Structures

Figure 8 demonstrates that the proposed site for the Buffalo 12 AST is not within the setback distances of an occupied permanent residence, school, hospital, institution, church, or other structure at the time of the initial application.

- The only structures near the proposed site are the well pads and pipelines.
- The site foot survey identified new oilfield structures not shown on Figure 8.

Distance to Non-Public Water Supply

Figures 1 and 7 demonstrate the Buffalo 12 location is not within the setback distances of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application.

- Figure 1 shows the location of all area water wells. The nearest well, C-02313, is located approximately 1.37 miles to the west of the proposed site.
- No domestic water wells are located within 1,000 feet of the recycling area.
- No springs were identified in the area.
- The facility is not within 500 feet of a spring or freshwater well used for domestic or stock watering purposes, in existence at the time of initial application.

Distance to Wetlands

Figure 9 demonstrates that the proposed site of the Buffalo 12 site is not within the 300-foot setback distance of a wetland.

- The nearest mapped wetland is Laguna Tonto, freshwater pond that is about 5 miles to the southwest.
- The site foot survey found no evidence of wetlands.

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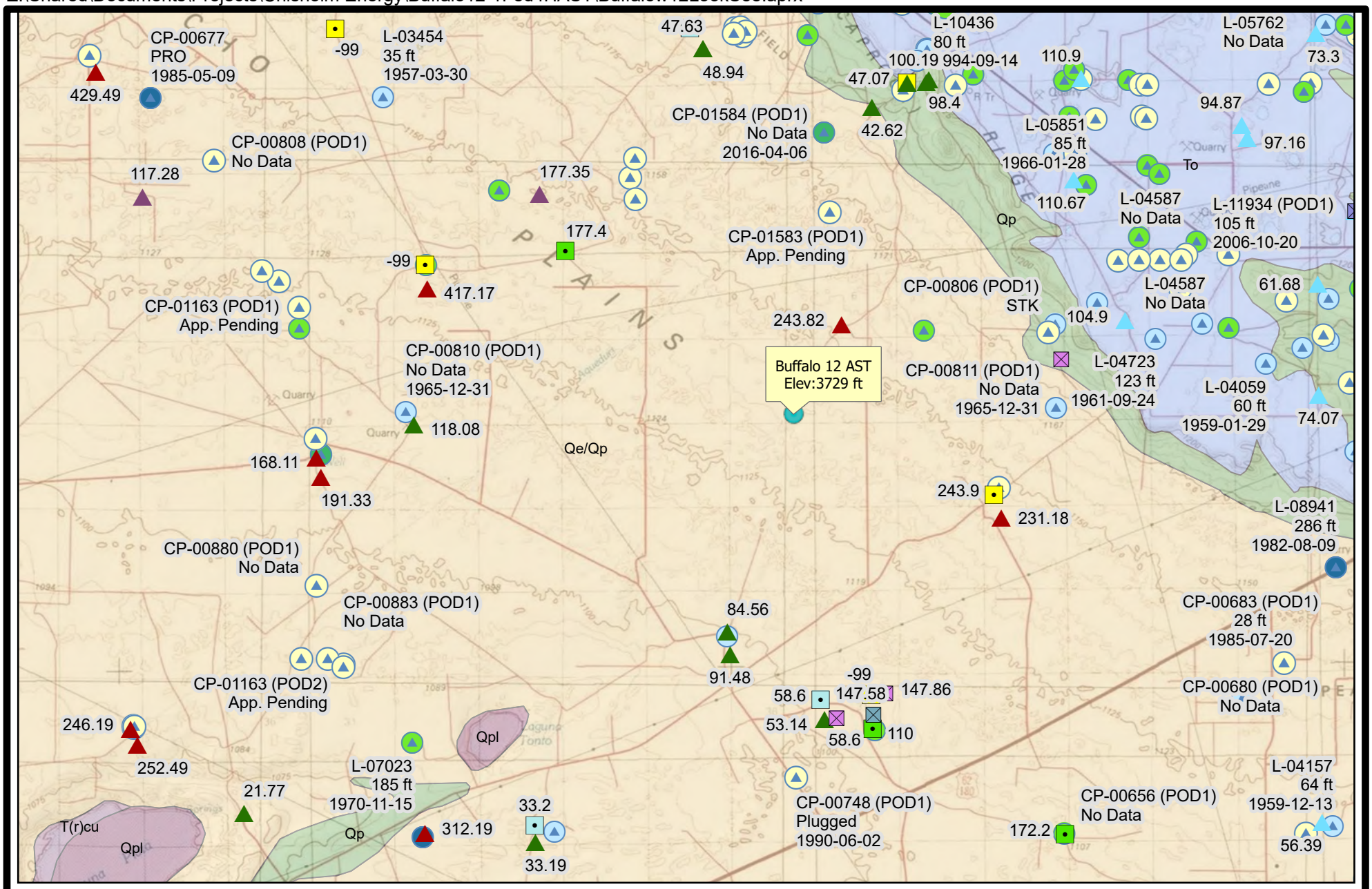

N
W E
S

0 1 2 Miles

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearby Wells	Figure 1a
	Chisholm Energy Operating LLC	March 2021

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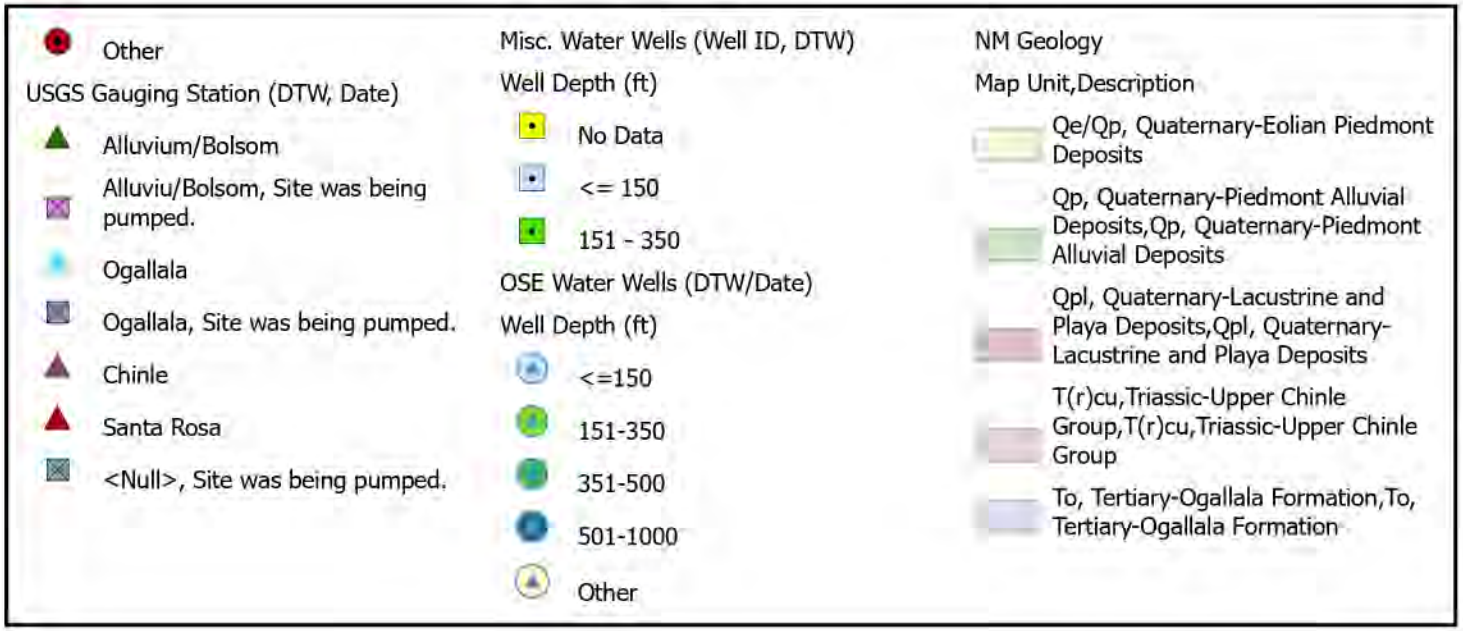

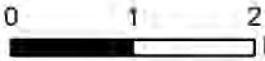

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearby Wells Legend	Figure 1a
	Chisholm Energy Operating LLC	March 2021

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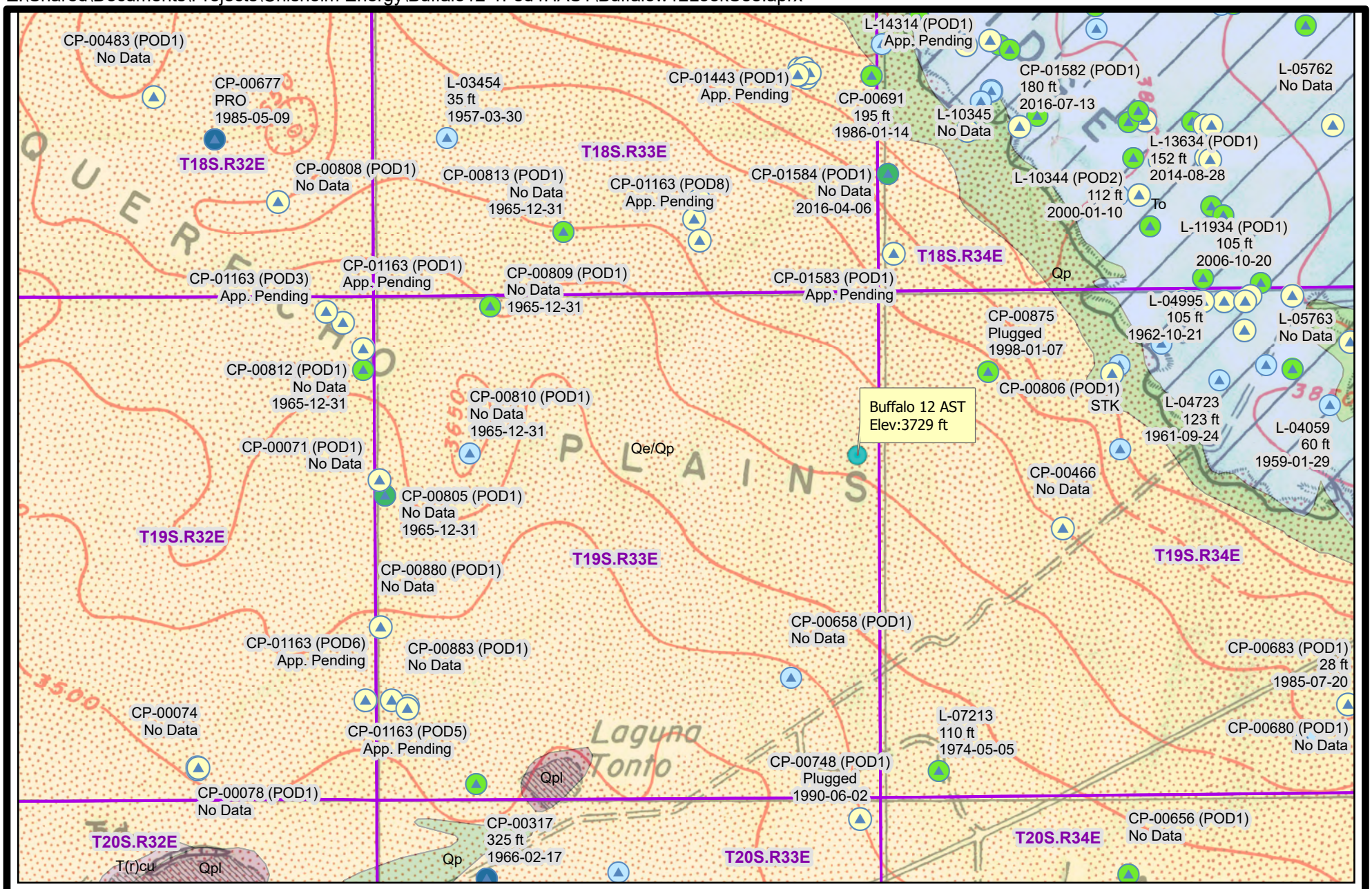

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Top of Redbeds	Figure 1b
	Chisholm Energy Operating LLC	March 2021

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Other

USGS Gauging Station (DTW, Date)

Alluvium/Bolsom

Alluviu/Bolsom, Site was being pumped.

Ogallala

Chinle

Santa Rosa

<Null>, Site was being pumped.

Misc. Water Wells (Well ID, DTW)

Well Depth (ft)

No Data

<= 150

151 - 350

OSE Water Wells (DTW/Date)

Well Depth (ft)

<=150

151-350

351-500

501-1000

Other

NM Geology

Qe/Qp, Quaternary-Eolian Piedmont Deposits

Qp, Quaternary-Piedmont Alluvial Deposits,Qp, Quaternary-Piedmont Alluvial Deposits

Qpl, Quaternary-Lacustrine and Playa Deposits,Qpl, Quaternary-Lacustrine and Playa Deposits

T(r)cu,Triassic-Upper Chinle Group,T(r)cu,Triassic-Upper Chinle Group

To, Tertiary-Ogallala Formation,To, Tertiary-Ogallala Formation

N W E S

0 1 2 Miles

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

Buffalo 12 AST Containment Top of Redbeds Legend

Figure 1b

Chisholm Energy Operating LLC

March 2021

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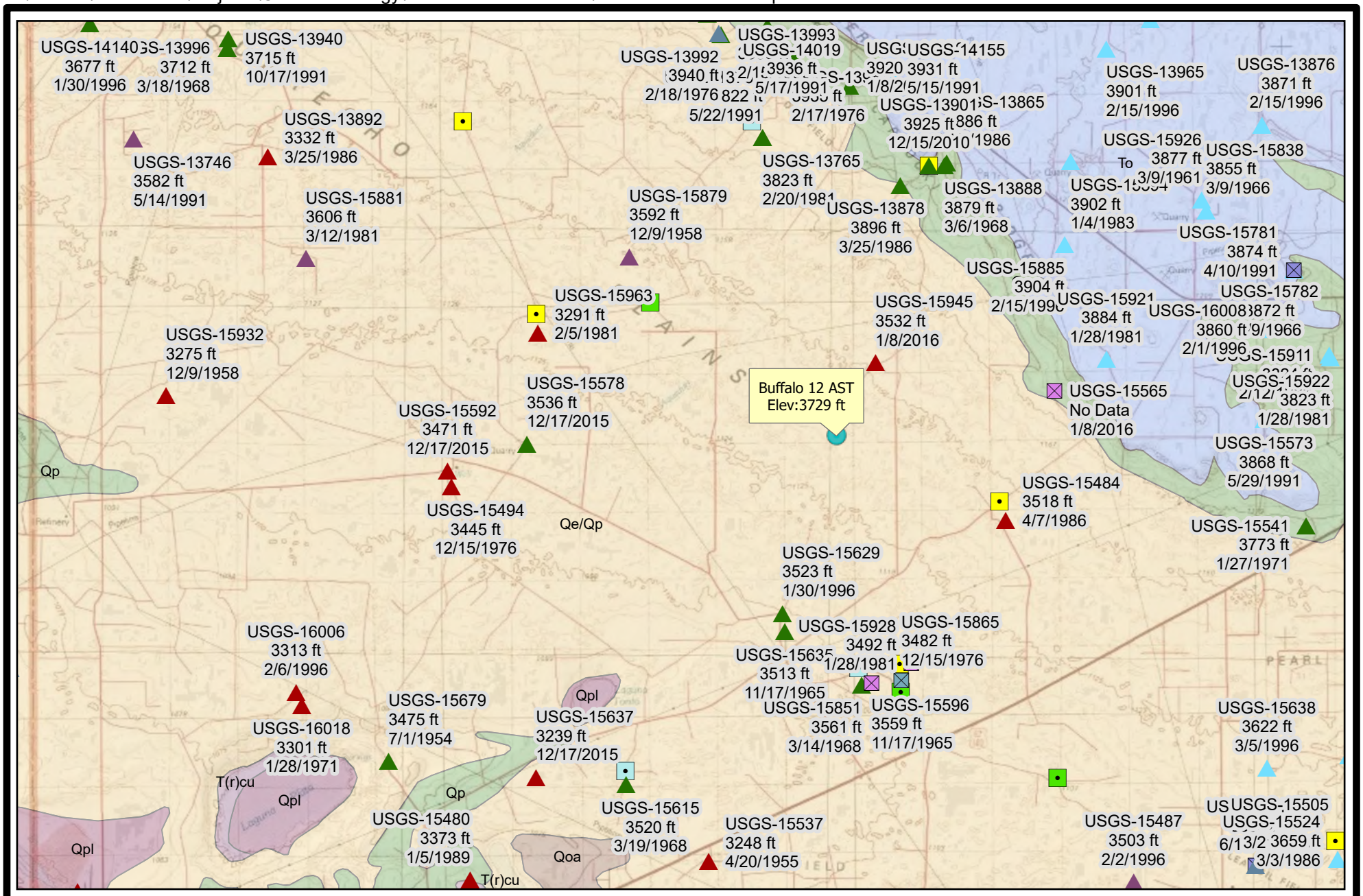

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Groundwater Elevation	Figure 2
	Chisholm Energy Operating LLC	March 2021

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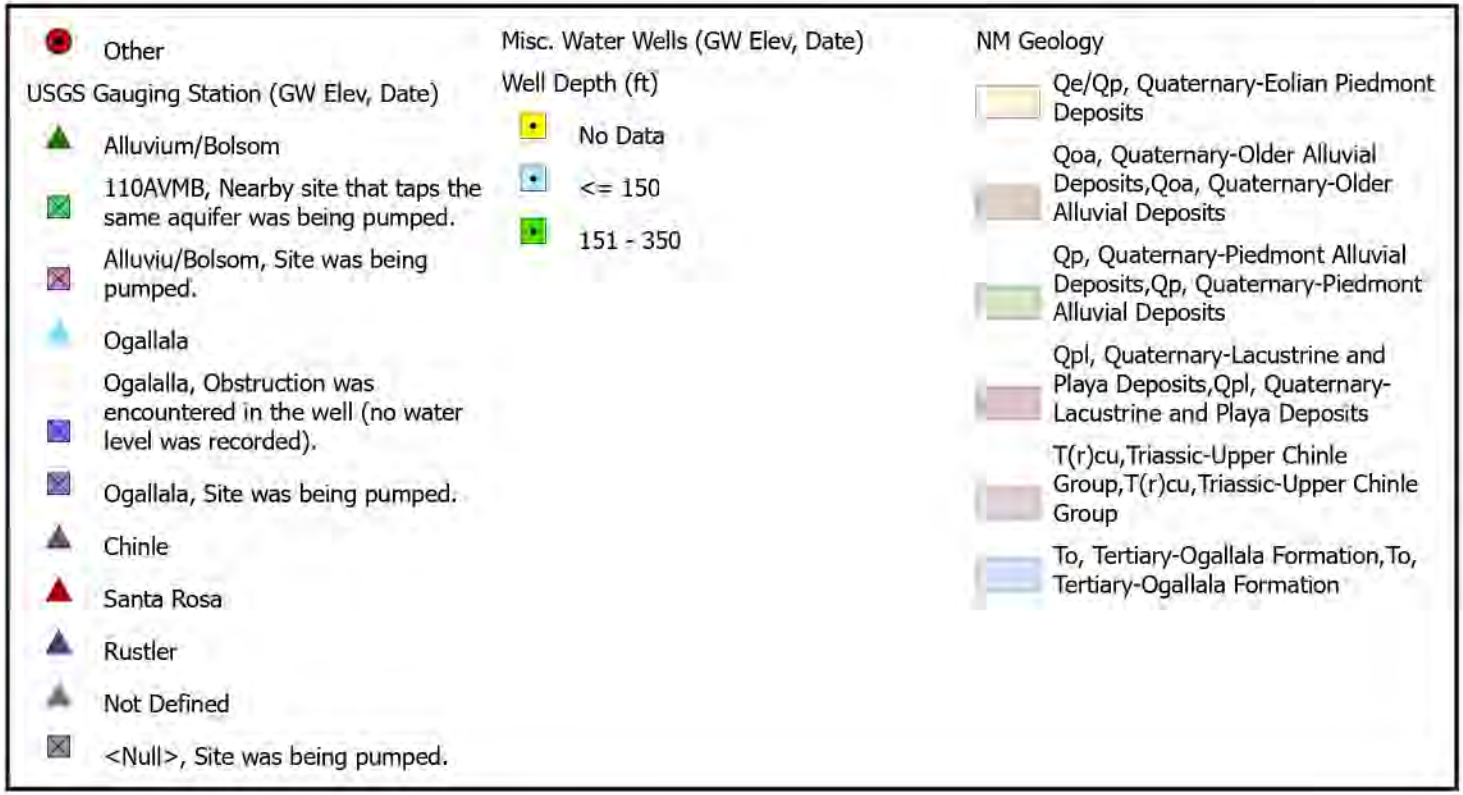

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R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Groundwater Elevation Legend	Figure 2
	Chisholm Energy Operating LLC	March 2021

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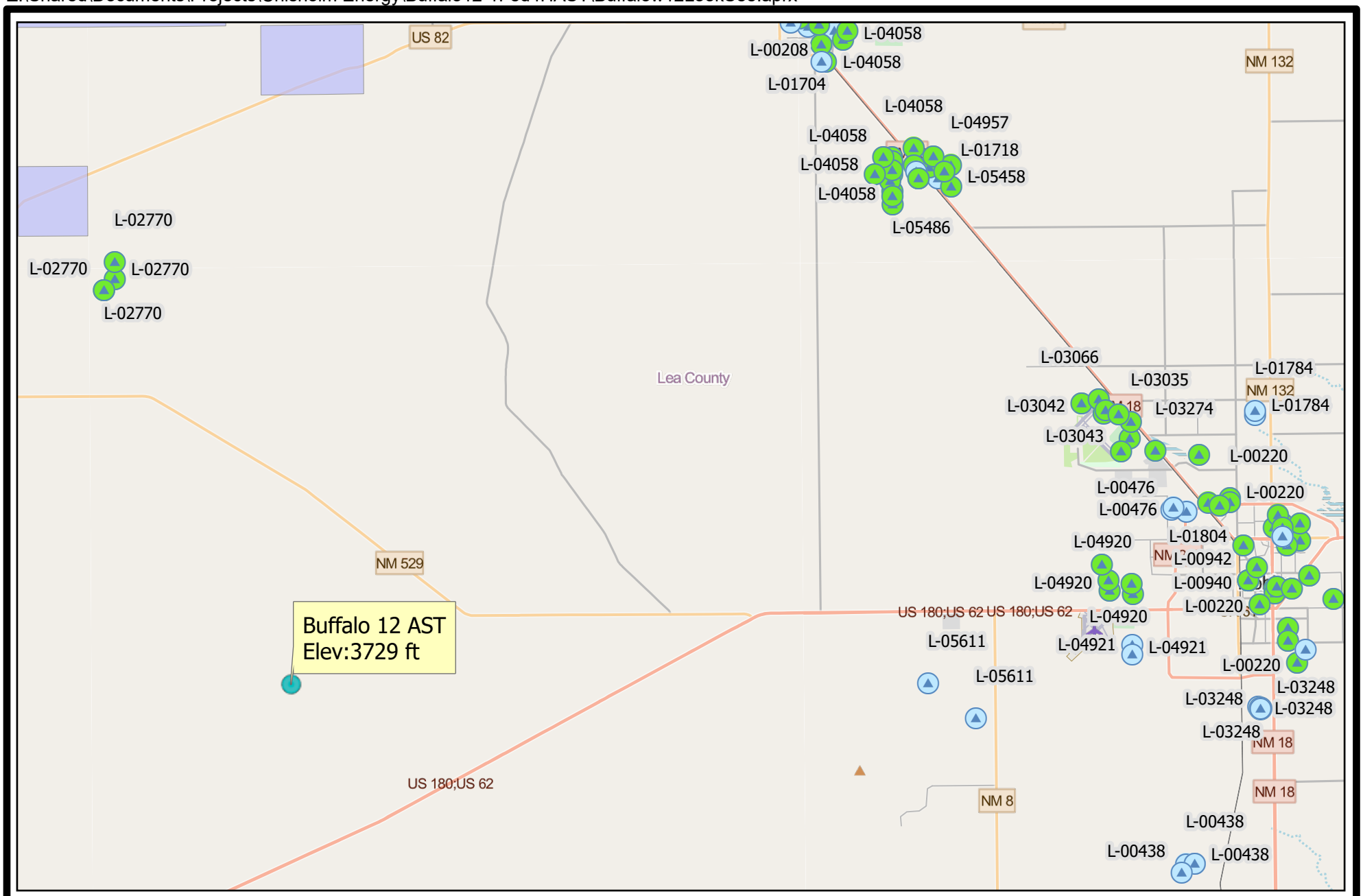

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearby Well Fields and Municipalities	Figure 3
	Chisholm Energy Operating LLC	March 2021

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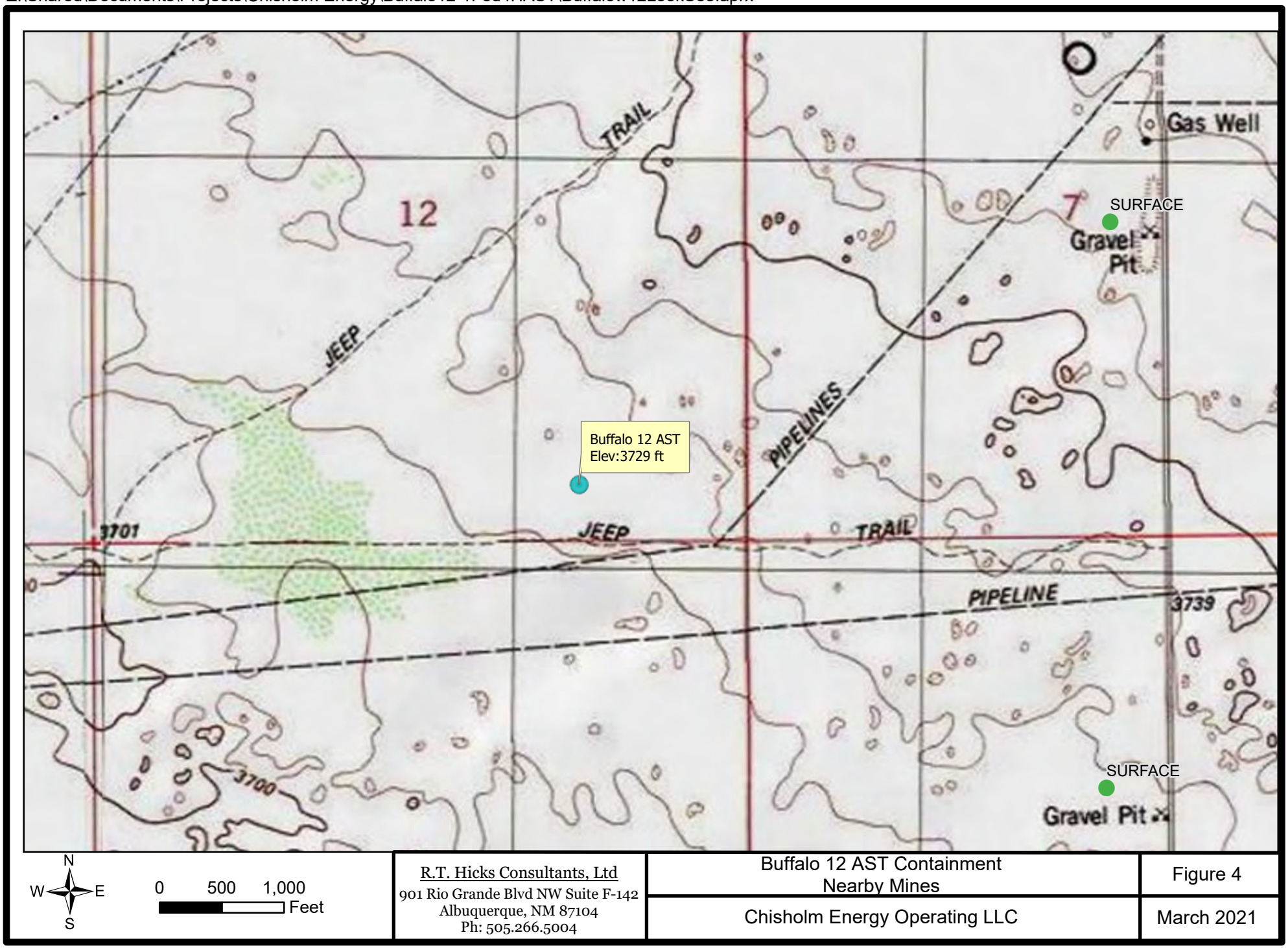

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearby Mines	Figure 4
	Chisholm Energy Operating LLC	March 2021

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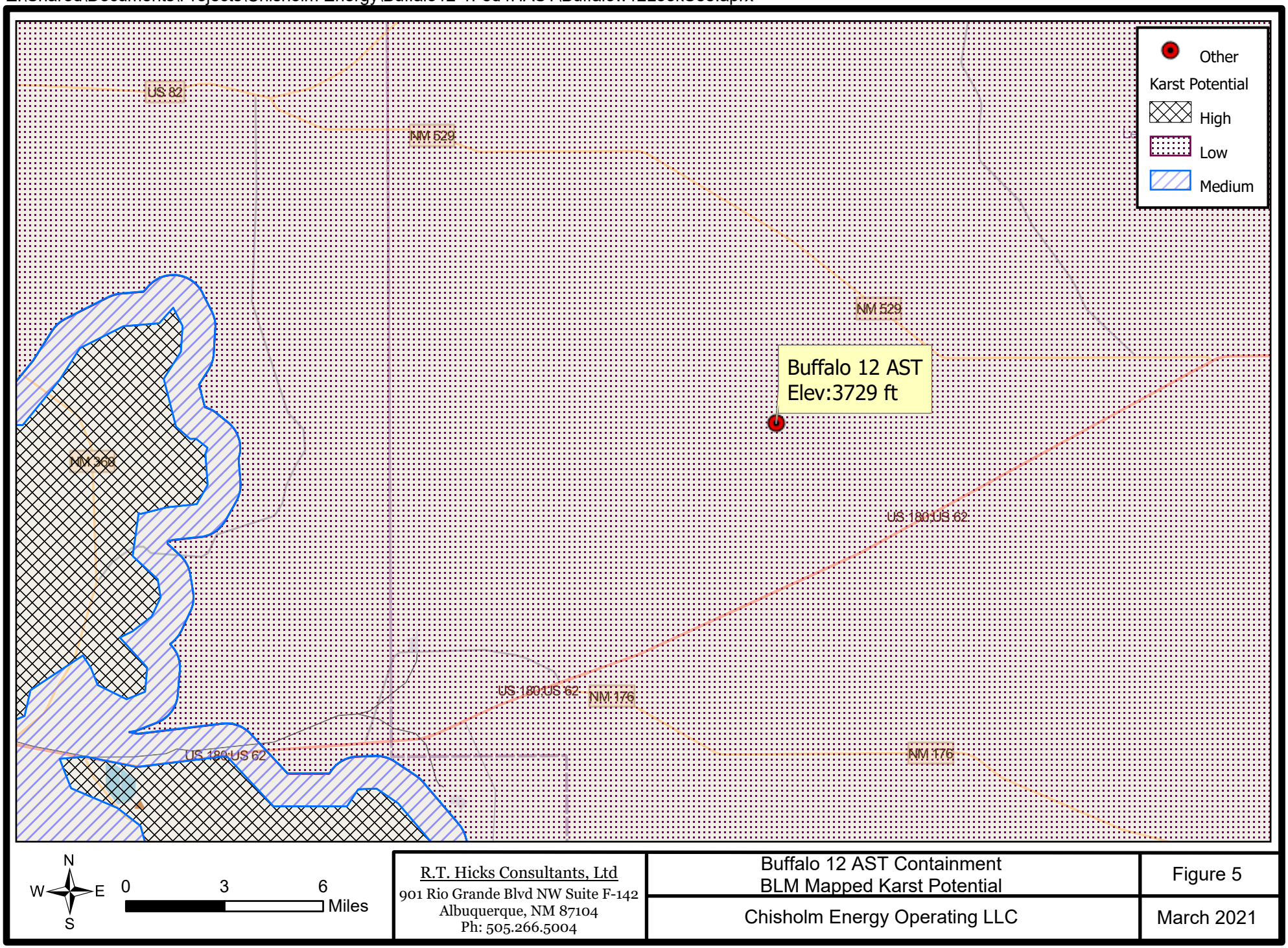

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment BLM Mapped Karst Potential	Figure 5
	Chisholm Energy Operating LLC	March 2021

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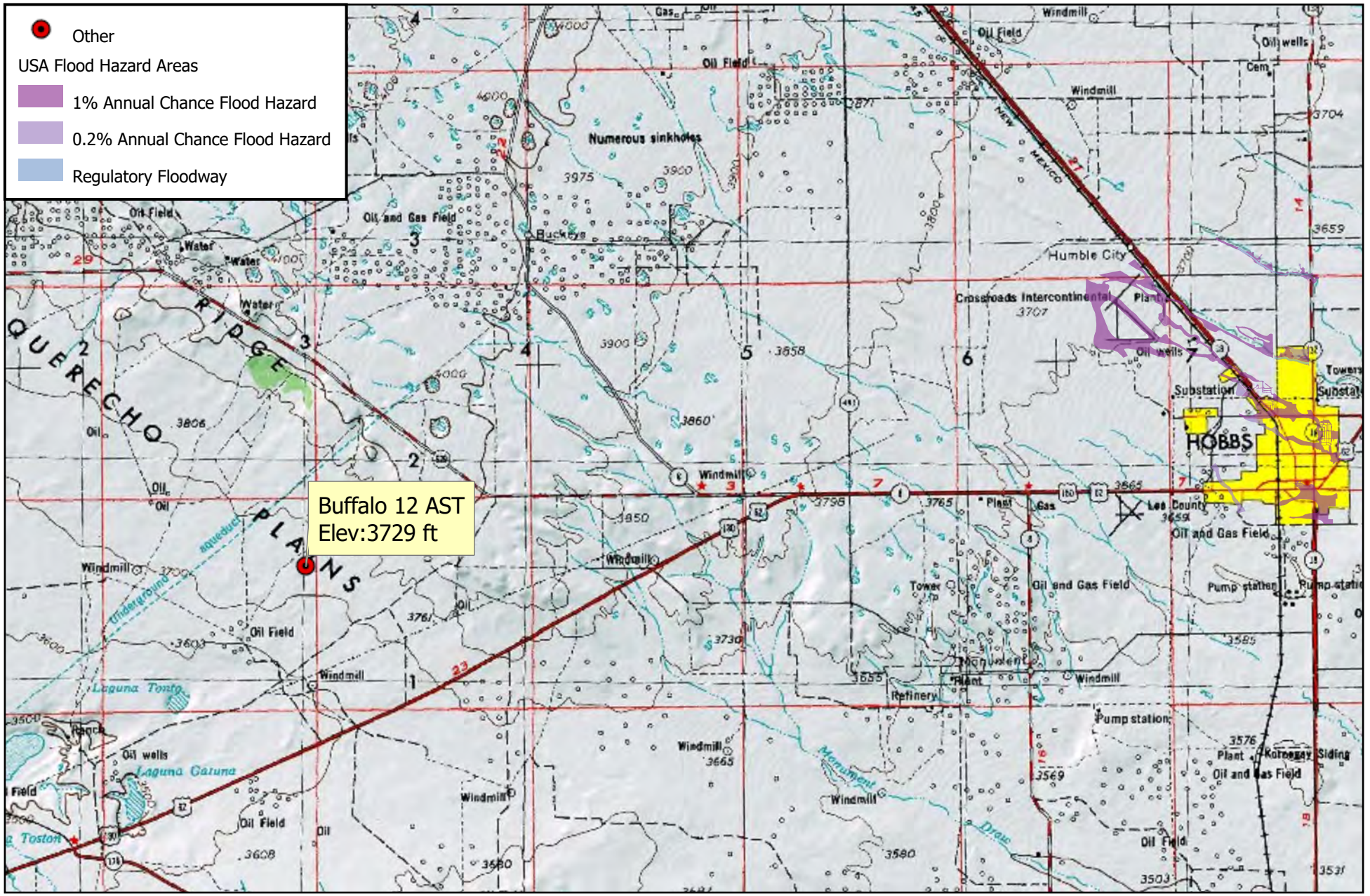

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearest Flood Hazard Areas	Figure 6
	Chisholm Energy Operating LLC	March 2021

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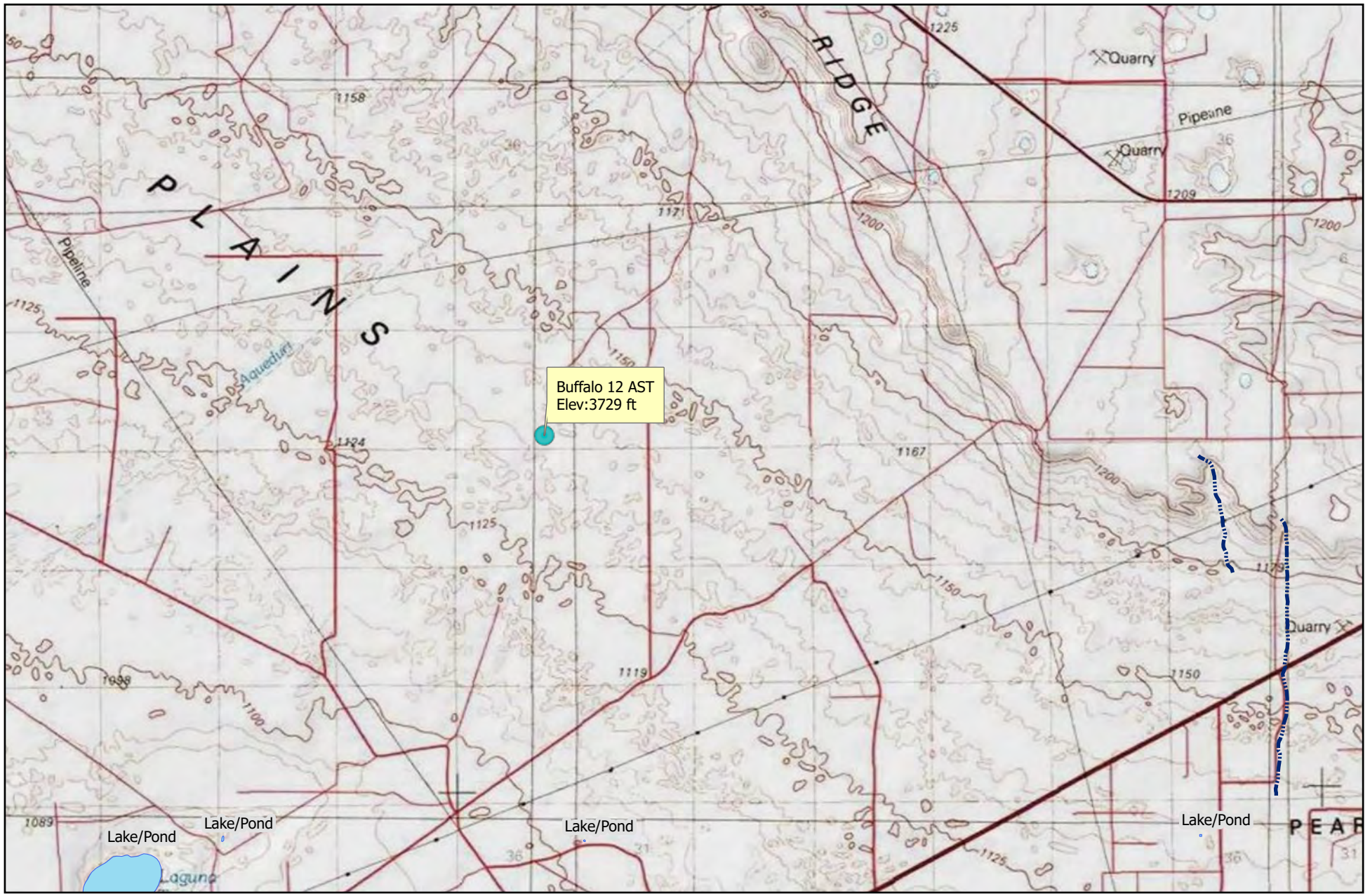

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearest Surface Water	Figure 7
	Chisholm Energy Operating LLC	March 2021

Z:\Shared\Documents\Projects\Chisholm Energy\Buffalo12-1Fed4HAST\Buffalow12LookSee.aprx

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Buffalo 12 AST Containment Nearby Structures	Figure 8
	Chisholm Energy Operating LLC	March 2021

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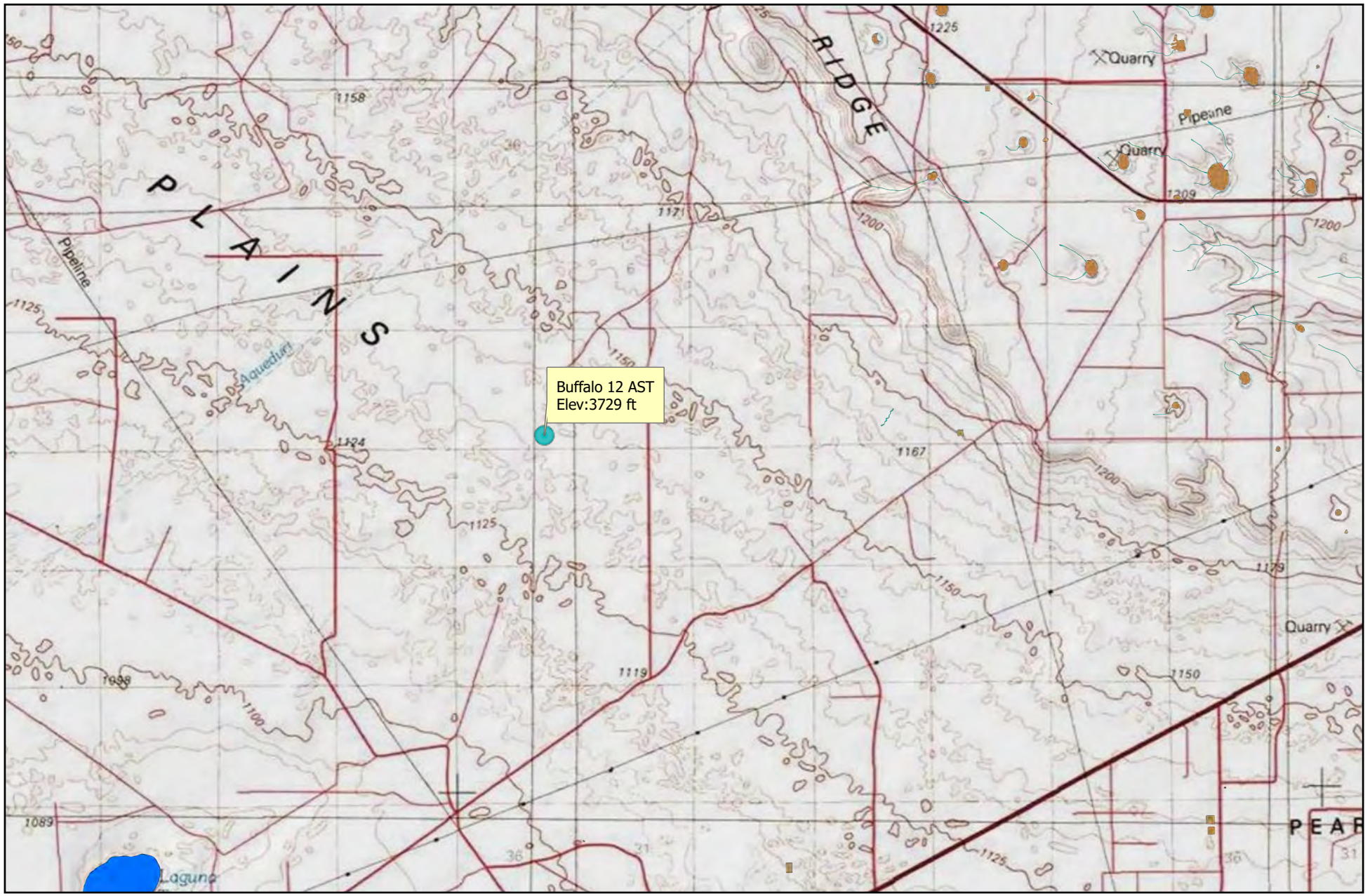


N
W E
S

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	Buffalo 12 AST Containment Nearest Mapped Wetlands	Figure 9
	Chisholm Energy Operating LLC	March 2021

APPENDIX WELL LOGS

r@rthicksconsult.com

From: Jerid Hight <jhight@byrdoilfield.com>
Sent: Thursday, March 11, 2021 8:48 AM
To: Randall Hicks; Chad
Cc: readydrill_chad@hotmail.com; 'Joel Hall'
Subject: RE: Chisum - Buffalo 4h and 5H - Lea Co NM - need some data if you have it

The Buffalo 4h and 5h was a sand and clay mix. The hole was dry all the down to 80ft and no mud was used on this drill.

Let me know if anything else is needed

Thanks

JERID HIGHT
BYRD OILFIELD SERVICES
OPERATIONS MANAGER
JHIGHT@BYRDOILFIELD.COM
(325) 669-4480 CELL
(432) 385-7635 OFFICE

From: Randall Hicks <r@rthicksconsult.com>
Sent: Thursday, March 11, 2021 7:10 AM
To: Jerid Hight <jhight@byrdoilfield.com>; Chad <chad@readydrill.com>
Cc: readydrill_chad@hotmail.com; 'Joel Hall' <JHall@chisholmenergy.com>
Subject: Chisum - Buffalo 4h and 5H - Lea Co NM - need some data if you have it

Chad

Chisholm told me that Byrd drilled the 2 ratholes at the location shown in the attached maps – and I hope you may have had a hand in that project.

We are seeking some data that would help us determine that the depth to groundwater at/near this location is greater than 50 feet. I am hoping that a work ticket, invoice, penetration rate log, driller's notes or something else may help us in this effort.

In the past, we were able to use a work ticket that showed the depth of the boring and that drilling mud was not used in the rathole. The work ticket combined with an email from Ready Drill that said "we did not encounter water during the drilling of the rathole" may be all that we need.

Call me with any questions and thanks in advance.

I hope you are well and please stay safe.

Randall T. Hicks PG
R.T.Hicks Consultants LTD
901 Rio Grande Blvd. NW F-142
Albuquerque, NM 87104

505-238-9515 (mobile and best contact)
505-266-5004 (office land line)

STATE ENGINEER OFFICE
ROSWELL, NEW MEXICO

2017 SEP -6 PM 4:05

WELL RECORD & LOG

OFFICE OF THE STATE ENGINEER

www.ose.state.nm.us

OSE POD NO. (WELL NO.)	WELL TAG ID NO.	OSE FILE NO(S).
POD 1 (Site BL-2)	N/A	CP-1672

WELL OWNER NAME(S)	PHONE (OPTIONAL)
Trainer Partners LTD c/o Atkins Engineering Assoc	

WELL OWNER MAILING ADDRESS	CITY	STATE	ZIP
2904 W. 2nd Street	Roswell	NM	88201

WELL LOCATION (FROM GPS)		DEGREES	MINUTES	SECONDS	
	LATITUDE	32	37	7.8	N
	LONGITUDE	103	31	16.2	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

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

DRILLING STARTED	DRILLING ENDED	DEPTH OF COMPLETED WELL (FT)	BORE HOLE DEPTH (FT)	DEPTH WATER FIRST ENCOUNTERED (FT)
8/29/2017	8/29/2017	N/A	100.80	Dry

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

STATIC WATER LEVEL IN COMPLETED WELL (FT): Dry

DRILLING FLUID: ☑ AIR ☐ MUD ADDITIVES – SPECIFY: Switched to Air Rotary at 44 ft bgs

DRILLING METHOD: ☐ ROTARY ☐ HAMMER ☐ CABLE TOOL ☑ OTHER – SPECIFY: Hollow Stem Auger (HSA) and Air Rotary

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)
-	-	± 6.00	N/A	N/A	N/A	N/A	-

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	10	±6.00	Baroid Hole Plug/Bentonite Chips	±2.1	from surface
10	44	±6.00	Native Fill	±6.7	from surface
44	100.80	±3.125	Native Fill	±3.6	from surface

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

FILE NO. CP-1672	POD NO. 1	TRN NO. 610609	
LOCATION 19S.34E.36.131		WELL TAG ID NO. —	PAGE 1 OF 2

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		Sand, medium to coarse grain sand, fine roots, brown, dry	Y ✓ N	
9	19		Sandy loam, fine grain sand, light brown, dry	Y ✓ N	
19	20		Sand, very fine to fine grain sand, caliche streaks, brown, dry	Y ✓ N	
20	20.5		Caliche, tan, dry	Y ✓ N	
20.5	24		Sand, very fine to fine grain sand, caliche streaks, brown, dry	Y ✓ N	
24	29		Sandy loam, fine to medium grain sand, light brown, dry	Y ✓ N	
29	34		Sandy clay, fine grain sand, caliche streaks, brown, hard, dry	Y ✓ N	
34	44		Lean clay, brown, some black mottling, dry	Y ✓ N	
44	48		Clay, brown to red, hard, dry	Y ✓ N	
48	68		Sandy clay, coarse grain sand, 5-10mm rounded gravel, brown to red, hard, dry	Y ✓ N	
68	100.80		Clay, red to brown, hard, dry/*@ 88-93 ft bgs: some caliche streaks	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

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: Dry. Borehole was not converted to a monitoring well.
See attached Plugging Record for details.

RECEIVED
2017 SEP -6 P 4:08
OSE ROSWELL, NM

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

Guadalupe Leyba

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:

Jackie D. Atkins — 09/06/2017

SIGNATURE OF DRILLER / PRINT SIGNEE NAME — DATE

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

FILE NO. CP-1672	POD NO. 1	TRN NO. 610609	
LOCATION 19S.34E.36.131		WELL TAG ID NO. —	PAGE 2 OF 2

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

475430

Section 1. GENERAL INFORMATION

(A) Owner of well T X O Prod. Owner's Well No. _____
Street or Post Office Address c/o Glenn's Water Well Service, Inc.
City and State Box 692 Tatum, New Mexico 88267

Well was drilled under Permit No. CP-677 and is located in the:

a. _____ ¼ W½ ¼ NW ¼ NW ¼ of Section 26 Township 18-S. Range 32-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 License No. WD 421

Address Box 692 Tatum, New Mexico 88267

Drilling Began 5/9/85 Completed 5/9/85 Type tools Rotary Size of hole 7 7/8 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 700 ft.

Completed well is [X] 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	

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
	well was pluged	with sand	and mud		

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
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 May 15, 1985

Quad _____ FWL _____ FSL _____

File No. CP-677 Use OWD Location No. 18.32.26.11143

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	sand-loose
12	24	12	clay
24	47	23	caleche
47	58	11	sand
58	84	26	sandy clay
84	102	18	red clay sticky
102	116	14	sand and gravel
116	142	26	red clay sticky
142	315	173	brown clay
315	325	10	purple clay
325	378	53	red clay
378	408	30	pink red clay
408	440	32	brown shale and blue streaks
440	500	60	brown shale-grainey
500	530	30	sand rock -fine
530	545	15	brown shale
545	605	60	sand rock-medium
605	616	11	brown shale
616	675	59	sand rock
675	700	25	red shale

Section 7. REMARKS AND ADDITIONAL INFORMATION

MAY 15 8 28 AM '05
STATE ENGINEER
ROSWELL, NM

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.

Driller

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

APPENDIX SITE PHOTOGRAPHS

Figure 1- View east from NW corner of pad showing 1-4 foot high stabilized dunes. North side of pad is in the "cut".

Figure 2- View south from NW corner of pad. Rig is drilling a Stetson well on south side of pad.

Figure 3 - View south to SW corner of pad showing lease road and in background stabilized dunes and buried pipeline. South side of pad is built in "fill".

Figure 4 - View northeast from SW corner of pad with lease road in foreground and built-up pad. Rig is drilling one of the Stetson wells on the south side of the pad.

Figure 5- View south near SW corner of pad showing stabilized low dunes. Buried pipeline shown in Figure 2 is in upper right corner of image.

March 2021

Volume 2
C-147 Registration Package for Buffalo 12 Containment & Recycling Facility Section 30, T26-S, R32-E, Lea County

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

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

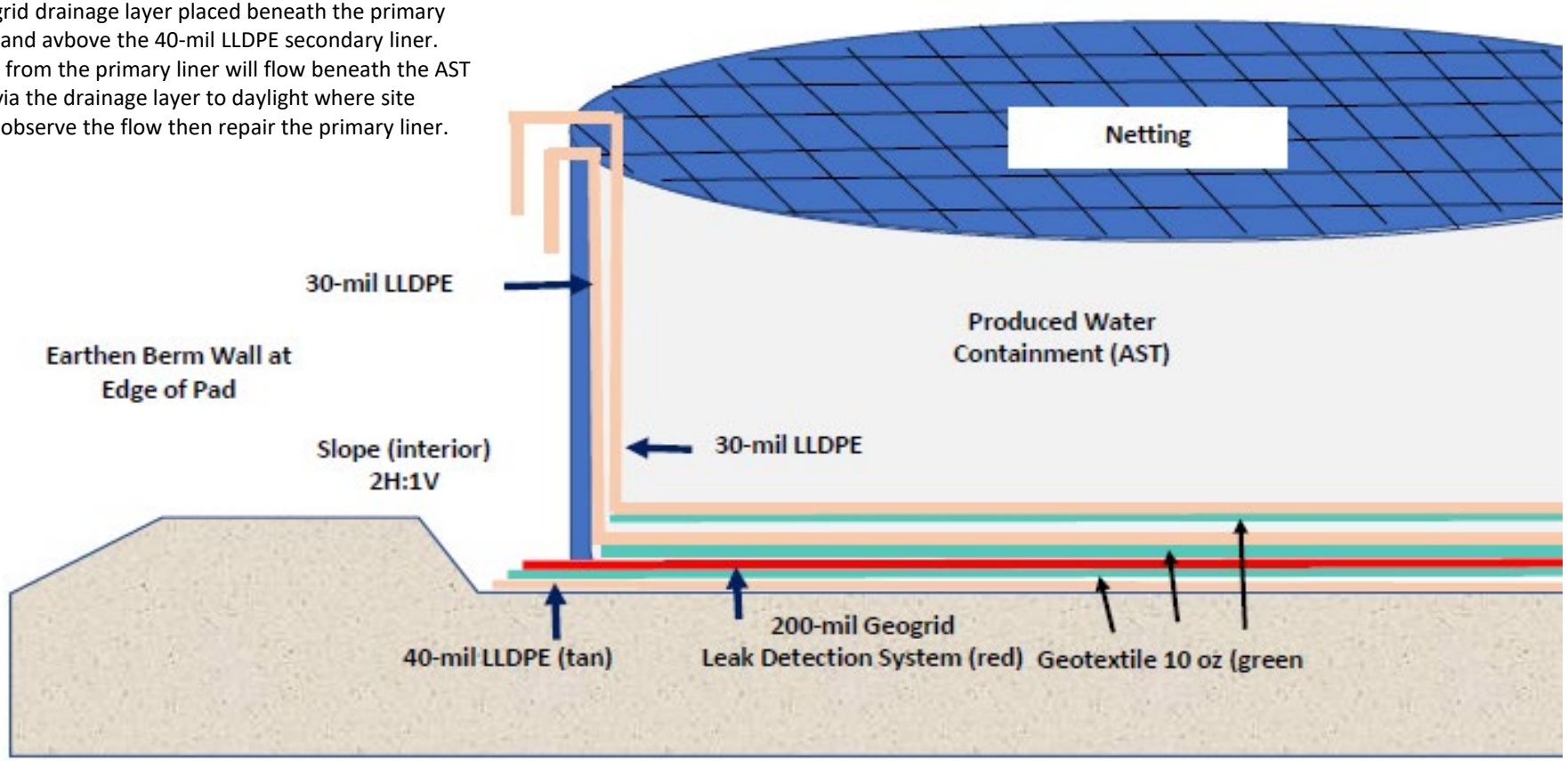
Prepared for:
Chisholm Energy Operating, LLC
Ft. Worth, Texas

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

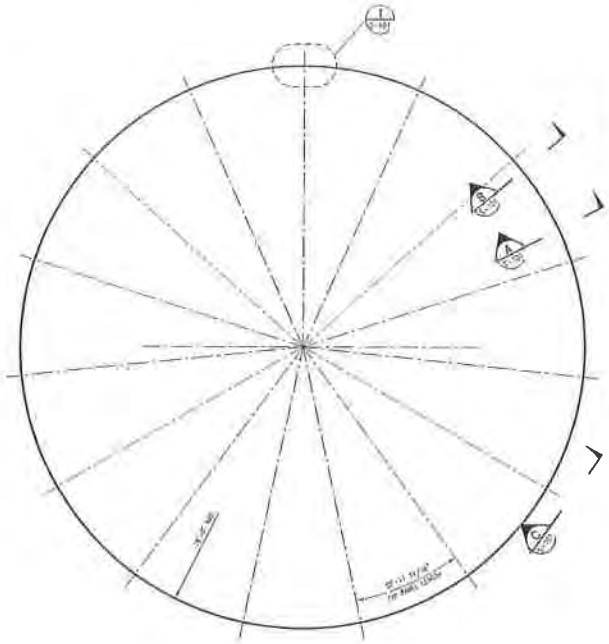
Leak Detection Systems

Select Energy employs a proprietary leak detection system between the two 30-mil LLDPE that comprise the primary liner. This system monitors seepage from the uppermost 30-mil LLDPE liner.

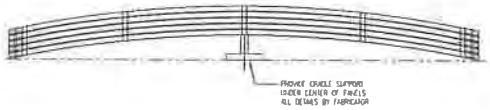
The leak detection system that complies with Rule 34 is the 200-mil geogrid drainage layer placed beneath the primary liner system and avbove the 40-mil LLDPE secondary liner. Any seepage from the primary liner will flow beneath the AST steel frame via the drainage layer to daylight where site workers can observe the flow then repair the primary liner.



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 505-266-5004	**Select AST Schematic**	**Plate 1**
	Chisholm Energy Operating - Buffalo 12	**Mar-21**

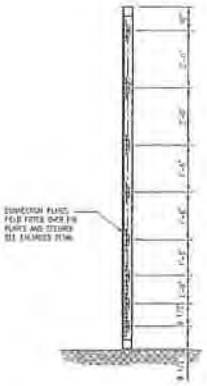


TANK LAYOUT PLAN
1/16"=1'-0"

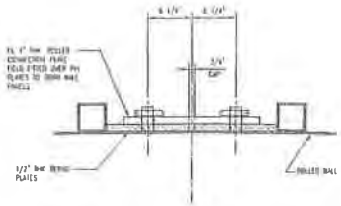


TRANSPORT AND STORAGE DETAILS
1/8"=1'-0"

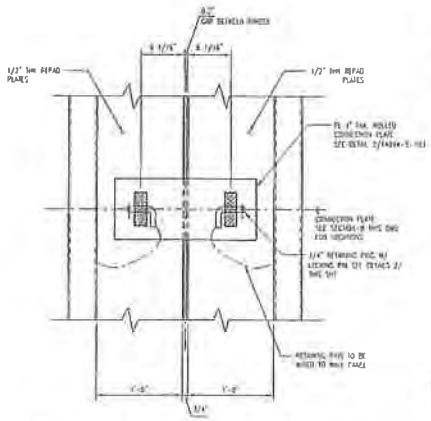
A TYPICAL TANK WALL SECTION
1/2"=1'-0"



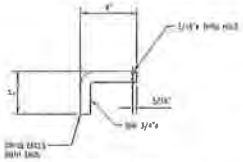
B SECTION AT WALL PANEL JOINT
1/2"=1'-0"



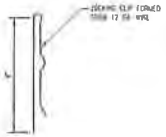
1 DETAIL AT WALL PANEL JOINT
1 1/2"=1'-0"



C ENLARGED SECTION AT WALL PANEL JOINT
1 1/2"=1'-0"



2 DETAIL RETAINING PIN
3"=1'-0"
16 REQUIRED PER PANEL



3 DETAIL LOCKING CLIP
3"=1'-0"
16 REQUIRED PER PANEL

2/14/14
COLORADO LICENSED
KIM GAZDIK
47107
PROFESSIONAL ENGINEER

NOTES:
1 CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE STRUCTURE AND FOR THE SAFETY OF ALL PERSONS DURING ASSEMBLY AND DISASSEMBLY. ALL WORK SHALL BE IN ACCORDANCE WITH OSHA.
2 THE CONTRACTOR SHALL ENSURE ALL THE PANELS ARE ADEQUATELY SUPPORTED OR BRACED UNTIL THE ENTIRE STRUCTURE IS ASSEMBLED
3 ALL POISON SUBSTANCES SUCH AS NOT SOIL DEBRIS OR OTHER DELETERIOUS MATERIALS SHALL BE REMOVED FROM THE TANK SITE
4 THE FINISHED GRADES ALONG THE PERIMETER OF THE TANK SHALL BE LEVEL AND TRUE TO PLANE. THE MAXIMUM ELEVATION DIFFERENCE ACROSS ANY TWO DIAMETRICAL POINTS SHALL BE LESS THAN 10".
5 THE MAXIMUM DEVIATION FROM PLANE OVER ANY 10'-0" OF CIRCUMFERENCE SHALL BE LESS THAN 1/4" AND LESS THAN 1/2" OVER ANY 20'-0" OF CIRCUMFERENCE
6 THE AREA SURROUNDING THE TANKS SHALL BE GRADED TO DIRECT SURFACE WATER AWAY FROM TANK.
7 THE EDGE OF ANY (EXCAVATED) SUMP SHALL BE A MINIMUM OF 3'-0" FROM THE EDGE OF THE TANK WALL.
8 THE PANELS SHALL BE ERECTED PLUMB. THE MAXIMUM OUT-OF-PLUMBNESS OF THE TOP OF THE PANEL RELATIVE TO THE BOTTOM SHALL BE LESS THAN 1"
9 THE MAXIMUM DEVIATION FROM THE THEORETICAL RADIUS SHALL BE LESS THAN 2" AT ANY POINT ALONG THE WALL
10 THE LINER SHALL BE STRAIGHT ANCHORED TO THE TOP OF EACH PANEL ACCORDANCE WITH THE LINER'S MANUFACTURER'S RECOMMENDATIONS. THE LINER SHALL BE INSTALLED WITH SUFFICIENT SLACK AT THE BASE OF THE PANEL TO PREVENT ANY TENSION IN THE LINER
11 THE VERTICAL LIFTING BARS SHALL ONLY BE USED TO LIFT THE PANELS INTO THE VERTICAL POSITION, THE LIFT MUST BE WITHIN 10" OF THE TOP RAIL PRIOR TO LIFTING THE PANEL
12 A MINIMUM 12" FREEBOARD SHALL BE PROVIDED WHEN TANK IS FILLED, FOR SAME FILLED DEPTH OF 11

NOTES:
1 BOLTS, SHALL CONFORM TO ASTM A-325 SPECIFICATION
2 STRUCTURAL TUBING SHALL CONFORM TO ASTM A-500 GRADE B SPECIFICATION
3 STRUCTURAL WELDING SHALL CONFORM TO AWS D1.1 STRUCTURAL WELDING SPECIFICATION

Bekrent Engineering Company

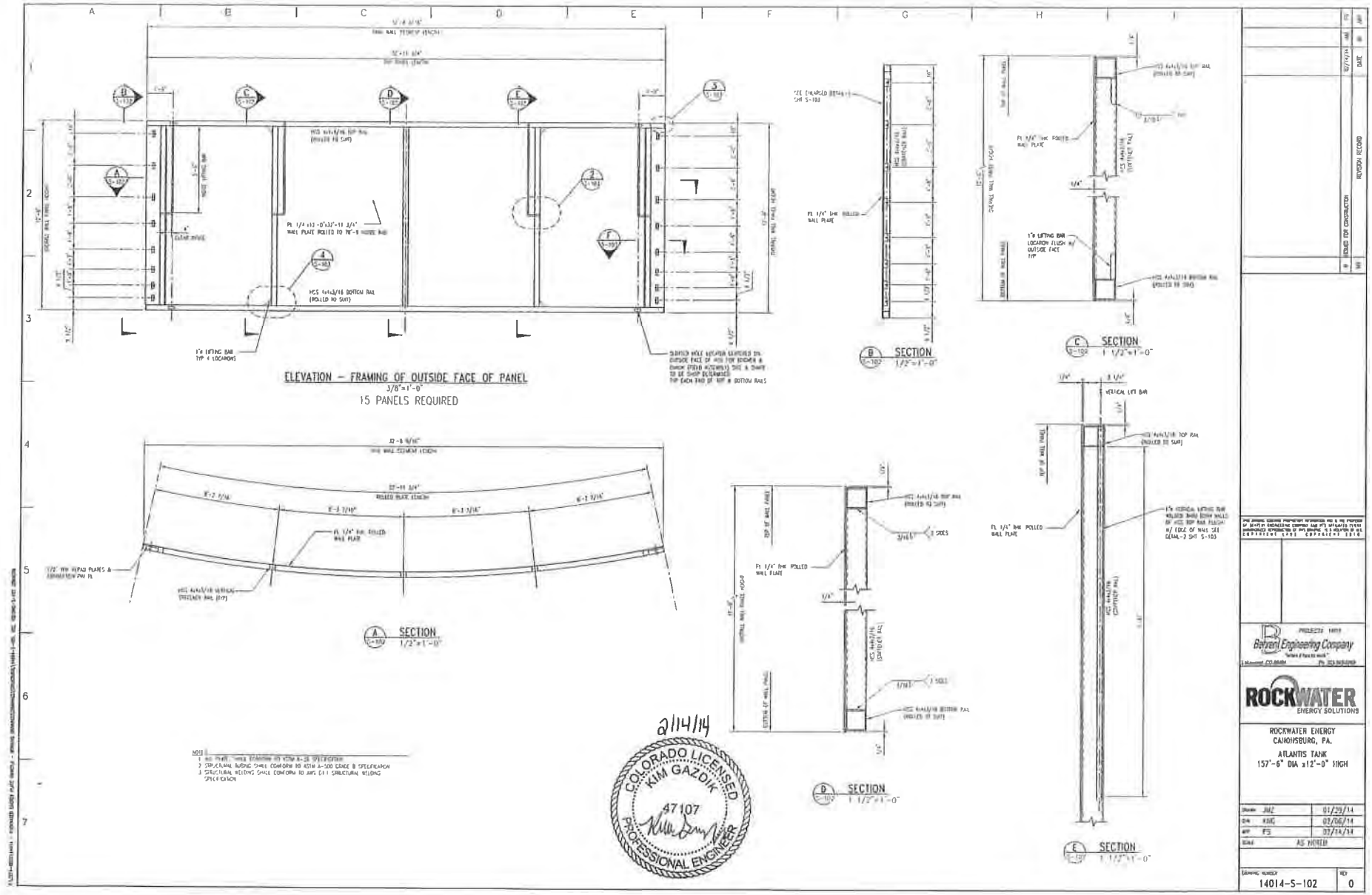
ROCKWATER ENERGY SOLUTIONS

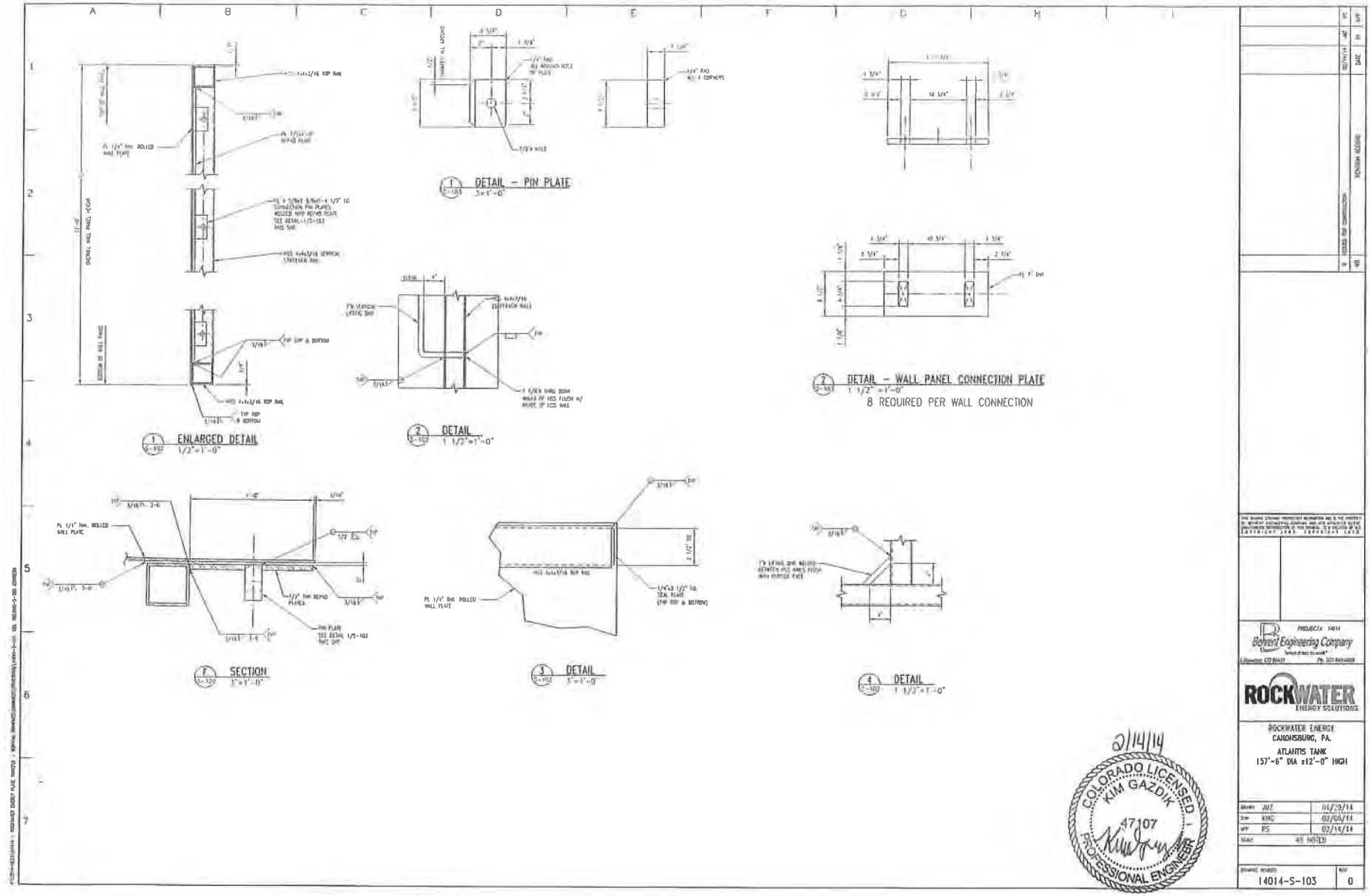
ROCKWATER ENERGY
CANONSBURG, PA.

ATLANTIS TANK
157'-6" DIA x12'-0" HIGH

DRAWN	JAH	01/29/14
CHK	KMG	02/06/14
APP	PS	02/14/14
SCALE	AS NOTED	

DRAWING NUMBER: 14014-S-101 REV: 0


ELEVATION – FRAMING OF OUTSIDE FACE OF PANEL
3/8"=1'-0"
15 PANELS REQUIRED
SECTION
1 1/2"=1'-0"
SECTION
1 1/2"=1'-0"
SECTION
1 1/2"=1'-0"
SECTION
1 1/2"=1'-0"
SECTION
1 1/2"=1'-0"
2/14/14
COLORADO LICENSED
KIM GAZDIK
47107
PROFESSIONAL ENGINEER
ROCKWATER ENERGY SOLUTIONS
ROCKWATER ENERGY
CANONSBURG, PA.
ATLANTIS TANK
157'-6" DIA x 12'-0" HIGH
14014-5-102
0


1 DETAIL – PIN PLATE
3/4" = 1'-0"
1 ENLARGED DETAIL
1/2" = 1'-0"
2 DETAIL
1 1/2" = 1'-0"
2 DETAIL – WALL PANEL CONNECTION PLATE
1 1/2" = 1'-0"
8 REQUIRED PER WALL CONNECTION
7 SECTION
3" = 1'-0"
3 DETAIL
3" = 1'-0"
4 DETAIL
1 1/2" = 1'-0"
2/14/14
COLORADO LICENSED
KIM GAZDIK
47107
PROFESSIONAL ENGINEER
Behrent Engineering Company
ROCKWATER ENERGY SOLUTIONS
ROCKWATER ENERGY
CANONSBURG, PA.
ATLANTIS TANK
157'-6" DIA x 12'-0" HIGH
JMT 01/29/14
KMC 02/06/14
PS 02/14/14
AS NOTED
14014-S-103
0

RTHC Note:
LLDPE spec is for Solmax LLDPE 30 mil see also
https://www.solmax.com/uploads/pdfs/c872c09979bde15306f50919d96f815a.pdf

Inland TARP & LINER

GENERAL DATA SHEET
Solmax 30mil LLDPE

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

Note;

(A) Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar)
(B) Machine Direction (MD) and Cross Machine Direction (XMD or TD) average values should be on the basis of 5 specimens each direction
(C) Correlation table is available for ASTM D792 vs. ASTM D1505 Both methods give the same results.
(D) Correlation table is available for ASTM D1603 vs ASTM D4218 Both methods give the same results

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

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

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 GEOCOMPOSITE 220

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

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

Notes:
1. Transmissivity measured using water at 21 ± 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

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Visit our Web site at www.skaps.com

Inland TARP & LINER

Premium Quality - Built To Last

www.inlandtarp.com

Geotextile Product Description Sheet
8oz ONG Nonwoven Geotextile

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

PROPERTY	TEST METHOD	UNIT
Weight (Typical)	ASTM D 5261	oz/yd$_2$ (g/m$_2$) 7.75 (220)
Thickness	ASTM D 4491	mils (mm) 87 (2.21)
Grab Tensile	ASTM D 4632	lbs (kN) 151 (0.673)
Grab Elongation	ASTM D 4632	80%
Trapezoid Tear Strength	ASTM D 4533	lbs (kN) 65 (0.287)
CBR Puncture Resistance	ASTM D 6241	lbs (kN) 351 (1.56)
Permittivity*	ASTM D 4491	sec-1 1.57
AOS*	ASTM D 4751	US Sieve (mm) 140 (0.102)
UV Resistance	ASTM D 4355	%/hrs 70/500

PACKAGING

Roll Dimensions (W x L) – ft 15 x 300
Square Yards Per Roll 500
Estimated Roll Weight - lbs 250

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

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U.S. Fabrication & Distribution Centers

Moses Lake, Washington . . . 4172 North Frontage Road E, Moses Lake, WA 98837 • 800.346.7744 • Fax 509.766.0414
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Odessa, Texas . . . 8784 W. Interstate 20, Odessa, TX 79763 • 432.272.9413

Select SOP

BEST MANAGEMENT PRACTICES FOR

ABOVE GROUND STORAGE TANKS

Select Energy Services
1820 N I-35
Gainesville TX 76240

BEST MANAGEMENT PRACTICE FOR ABOVE GROUND STORAGE TANKS

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Section 1.0 Introduction and Summary

1.1 Introduction and Purpose

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

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

1.2 Background

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

1.3 Intended Use

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

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

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

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

1.4 Customer Environmental Health and Safety Programs

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

1.5 Summary

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

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

Section 2.0 Planning for AST Rig-Up

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

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

2.1 AST Order Information

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

2.2 Customer Meeting

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

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

The following key topics will typically be discussed.

Select site specific staff/roles

Review AST intended use and customer safety requirements.

Review AST scope of work, what is normally included, what is not.

Permitting for AST (as needed)

Site access and truck route requirements

Time line for AST to be operational

Confirm AST size(s) to be used

AST layout on pad

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

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

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

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

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

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

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

Note any special PPE or safety requirements at site.

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

Other Topics

Any additional site preparation to be completed by customer prior to setup
Underground material needs to be taken into account for site preparation.
Other Activities: Discuss AST site activities that will be ongoing during the AST set up. Select personnel will be aware and courteous of simultaneous operations at all times. **However, Select prefers very limited, if any, simultaneous operations near AST during set-up phase.**

Follow Up

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

2.3 Site Soil Preparation

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

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

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

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

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

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

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

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

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

2.4 Pre-Mobilization Onsite Meeting

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

2.5 Notifications

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

The following web site has contacts for all the states and provinces.
http://www.call811.com/state-specific.aspx. The website link below is provided for smart phones:

Call 811 in United States

2.6 AST Material Deliveries

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

Section 3.0 AST Setup

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

3.1 Job Hazard Analysis (JHA)

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

3.2 Check Soil Condition

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

3.3 Tank Layout

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

3.4 Equipment (Select provided)

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

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

- Skid steer

3.5 Hand Tools Recommended

All hand tools are subject to daily inspection.

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

3.6 AST Tank Setup Steps

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

Tank Layout

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

Suction Pit

- Determine where tank suction is to be placed.

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

Attention!

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

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

Tank Wall Erection

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

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

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

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

Liner Placement and Securing Top with Clamps

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

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

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

Stairs, Fill Tubes, and Suction Tubes

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

Final Steps, Filling, and Inspection

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

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

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

Section 4.0 AST Operation

4.1 Inspections and Monitoring

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

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

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

4.2 Initial Leak Detection and Liner Repair

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

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

Section 5.0 AST Breakdown

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

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

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

Attachment 1

SELECT ENERGY SERVICES

Above-Ground Storage Tank (AST) Reference Chart

Pin Style Panels

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

Plate Style Panels

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

Design and Construction Plan
Above Ground Tank (AST) Containments

General

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

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

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 infom1ation: 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 NMAC 19.15.34 and the SOP and is the responsibility of the operating company. If the location of the AST Containment is on an existing pad, the operator has stripped and stockpiled the topsoil for use as the final cover or fill at the time of closure. If the pad is new construction, the operator will strip and stockpile the soil for reclamation upon cessation of site activities.

19.15.34.12 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 Compaction characteristics must meet or exceed 95% of Standard Proctor Density in accordance with ASTM D 698 or modified Proctor Test (ASTM Standard D1557).

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

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

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.

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] and are pursuant to a requested 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

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

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.

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

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

Install Secondary Liner, Leak Detection System and Secondary Containment

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

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 drawing).

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 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.

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

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.

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

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

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

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

Statement Explaining Why the Applicant Seeks a Variance

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

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT:

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

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

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

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

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

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

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

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

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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

NMAC 19.15.34.12 A (2), (3)

Side Slope

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

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

Anchor Trench

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

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

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

32156 Castle Court / Suite 211 / Evergreen, CO 80439
Ph 303-679-0285 Fx 303-679-8955 geosynthetics@msn.com

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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

Sincerely Yours,

R K Frobel

Ronald K. Frobel, MSCE, PE

References:

NMAC 19.15.34.12 DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT

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

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

Attachments:

R. K. Frobel C.V.

32156 Castle Court / Suite 211 / Evergreen, CO 80439
Ph 303-679-0285 Fx 303-679-8955 geosynthetics@msn.com

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

References:

NMAC 19.15.34.13 OPERATIONAL REQUIREMENTS FOR RECYCLING CONTAINMENTS

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

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

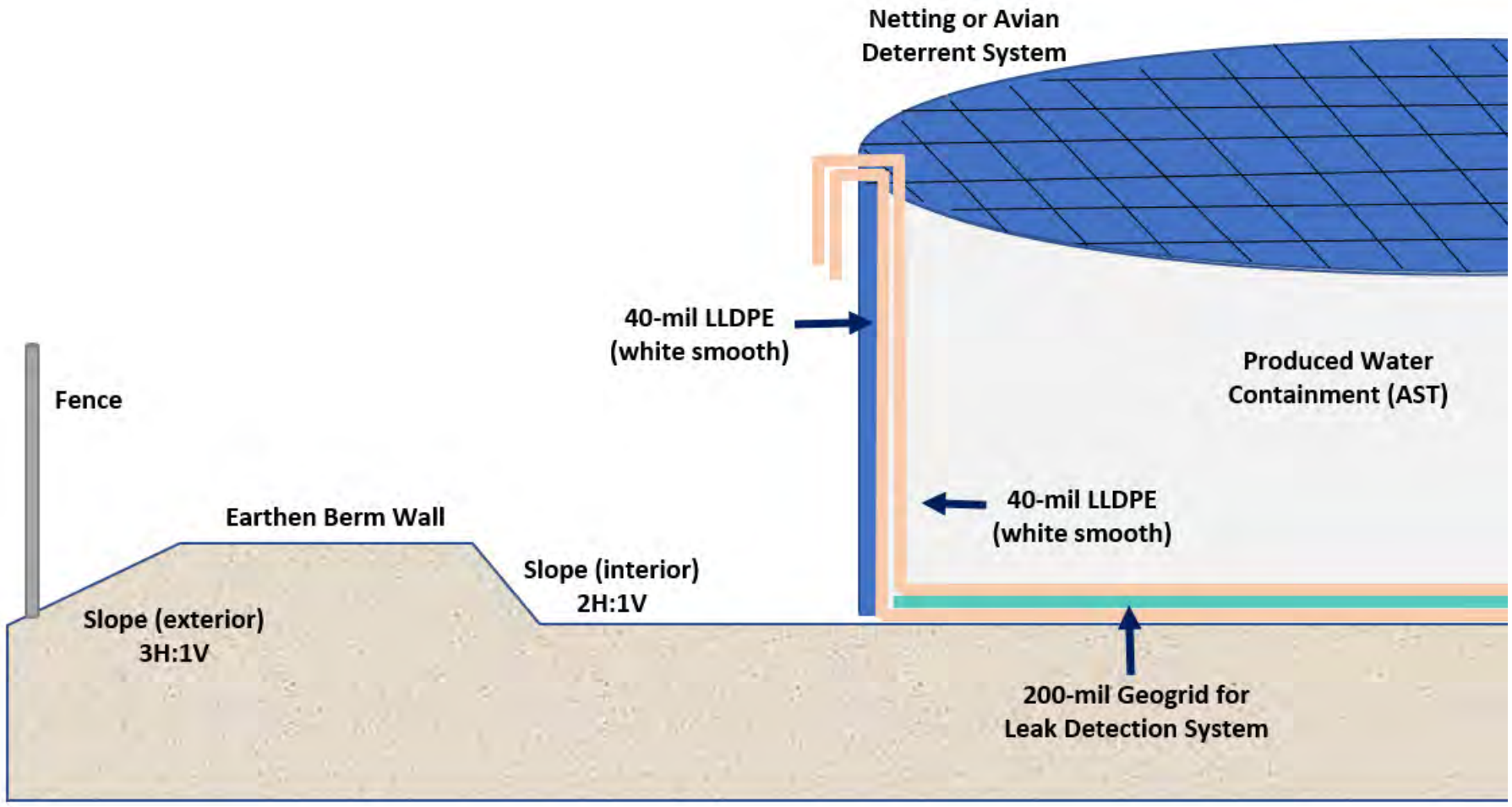
$$= 69.64\ PCF * 10\ ft$$

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

March 2020

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

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



Not to Scale

R.T. HICKS CONSULTANTS, LTD. 901 Rio Grande Blvd NW Suite F142 Albuquerque, NM 87104 Office Ph: 505.266.5004	AST Schematic	Plate 1
	Typical Mustang-Extreme AST	June 2019

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

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

NMAC 19.15.34.12 A DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING CONTAINMENT
(4) All primary (upper) liners in a recycling containment shall be geomembrane liners composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. *All primary liners shall be 30-mil flexible PVC, 45-mil LLDPE string reinforced or 60-mil HDPE liners.* Secondary liners shall be 30-mil LLDPE string reinforced or equivalent with a hydraulic conductivity no greater than 1 x 10-9 cm/sec. Liner compatibility shall meet or exceed the EPA SW-846 method 9090A or subsequent relevant publications.

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

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

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

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

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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

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

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

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

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

32156 Castle Court / Suite 211 / Evergreen, CO 80439
Ph 303-679-0285 Fx 303-679-8955 geosynthetics@msn.com

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

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

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

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

- Prefabrication in factory-controlled conditions into very large panels (up to 35,000 sf) results in ease of installation, less or no thermal fusion field seams and less on site QC and CQA.

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

- The LLDPE geomembrane provides superior flexibility, lay flat characteristics and conformability which allows for more intimate contact with the underlying drainage media and tank walls.

- Two layers of the 30 mil LLDPE provide redundancy. Additionally, the bottom layer and geonet provides protection for the top layer during installation as well reduction in leakage due to pinholes (no driving head on the lower 30 mil liner)

R.K. FROBEL & ASSOCIATES
Consulting Engineers

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

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

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

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

Sincerely Yours,

R K Frobel

Ronald K. Frobel, MSCE, PE

References:

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

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

Geosynthetic Research Institute (GRI) Published Standards and Papers 2018

ASTM Standards 2020

Attachments:

R. K. Frobel C. V.

January 2020

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

R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: Applicability of Variances for Modular AST Containments in the Permian Basin of New Mexico

NMAC 19.15.34.12 A (2)

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

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

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

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

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

32156 Castle Court / Suite 211 / Evergreen, CO 80439
Ph 303-679-0285 Fx 303-679-8955 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

ASTM Standards 2019

32156 Castle Court / Suite 211 / Evergreen, CO 80439 Ph
303-679-0285 Fx 303-679-8955 geosynthetics@msn.com

RONALD K. FROBEL, MSCE, P.E.

CIVIL ENGINEERING
GEOSYNTHETICS
EXPERT WITNESS
FORENSICS

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

TITLE: Principal and Owner

PROFESSIONAL AFFILIATIONS:

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

ACADEMIC BACKGROUND:

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

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:

Ronald K. Frobel, MSCE, P.E.
R. K. Frobel & Associates
Consulting Civil/Geosynthetics Engineers
PO Box 2633
Evergreen, Colorado 80439 USA
Phone 720-289-0300
Email: geosynthetics@msn.com

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.

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
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 23514

CONDITIONS OF APPROVAL

Operator:			OGRID:	Action Number:	Action Type:
CHISHOLM ENERGY OPERATING, LLC	801 Cherry Street	Fort Worth, TX76102	372137	23514	C-147L

OCD Reviewer	Condition
vvenegas	NMOCD has reviewed the recycling containment permit application and related documents, submitted by CHISHOLM ENERGY OPERATING, LLC [372137] on April 8, 2021, for the proposed Buffalo 12 Recycling Facility and Containment in Unit Letter O, Section 12, T-19S, R-33E, in Lea County, New Mexico. The form C-147 and related documents for the proposed 1RF-464 Buffalo 12 Recycling Facility and Containment, is approved with conditions. https://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=