

January 2021

C-147 Registration Package for Catalina Containment and Recycling Facility Section 30, T20S, R27E, Eddy County



View west-northwest from the center of the mapped watercourse south of the proposed containment. The production pad in the background intrudes into the northern half of the natural swale shown in this image. Because there is no evidence of water flow, a bed, or bank, the swale does not meet the definition of a watercourse. During a 100-year or 500-year precipitation event, water would flow in this area. The proposed containment is about 400-feet north of this photograph.

**Prepared for:
Tascosa Energy LLC
901 W. Missouri,
Midland, Texas 79701**

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

R. T. HICKS CONSULTANTS, LTD.

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

January 31, 2021

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

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

RE: Tascosa Energy Partners, Catalina Recycling Facility and Containments, Section 30 T20S R27E
Registration per Rule 34

Dear Mr. Bratcher and Ms. Venegas:

On behalf of Tascosa Energy Partners, Hicks Consultants is pleased to submit the C-147 registration for the Catalina Recycling Facility and Containment in Eddy County, New Mexico. Rule 34 requires no variances for the containment. Specifically,

- Tascosa will install a 4-strand barbed wire fence over the proposed game fence to comply with the specific language of the Rule if requested by the District Office,
- The 40-mil HDPE secondary liner is “equivalent with a hydraulic conductivity no greater than 1×10^{-9} cm/sec” and meets or exceeds the “EPA SW-846 method 9090A or subsequent relevant publications” and is therefore consistent with the criteria of the Rule,
- The Mega Blaster Pro Sonic Bird Repeller “is otherwise protective of wildlife, including migratory birds” and is therefore consistent with the criteria of the Rule,
- In compliance with 19.15.34.10, the C-147 is copied to the surface owner, the State of New Mexico.

I affirm as a Professional Geologist with more than 30 years of experience with NMOCD permits, hearings, rulemaking, and field work in the Permian Basin of New Mexico, that the siting criteria demonstration is consistent with the Rule and the location meets the specified siting criteria. The containment lies within an area mapped by the BLM as high karst potential. The submission addresses the potential of unstable ground in detail. We also carefully examined a channel that drains to a nearby mapped watercourse and determined that it does not meet the NMOCD definition of a watercourse. In the Pleistocene, when the climate was quite different than today, this channel may have exhibited a bed and bank. Nevertheless, the design engineer provided for a diversion (see construction plans) if excess stormwater flow occurs down this channel.

The Design/Construction Plan, Operation and Maintenance Plan and Closure Plan are consistent with the Rule. Unless instructed by OCD, we will employ the analytical tests for closure listed in the Rule. Please contact me if you have any questions or concerns and we look forward to working with you. Your assignment of a 2RF-# will facilitate submission of the requisite C-148 forms. Happy New Year!

Sincerely,
R.T. Hicks Consultants



Randall Hicks, PG
Principal

Copy: Tascosa Energy Partners LLC
State Land Office

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: Tascosa Energy Partners, LLC OGRID #: 329748
Address: 901 W. Missouri, Midland, Texas 79701
Facility or well name (include API# if associated with a well): Catalina Containment
OCD Permit Number: _____ (For new facilities the permit number will be assigned by the district office)
U/L or Qtr/Qtr E _____ Section 30 Township 20S Range 27E County: Eddy
Surface Owner: ☐ Federal ☒ State ☐ Private ☐ Tribal Trust or Indian Allotment

2.

☒ **Recycling Facility:**
Location of (if applicable): Latitude 32.546820, -104.32684 Longitude _____
Proposed Use: ☒ Drilling* ☒ Completion* ☒ Production* ☒ Plugging *
**The re-use of produced water may NOT be used until fresh water zones are cased and cemented*
☐ Other, *requires permit for other uses. Describe use, process, testing, volume of produced water and ensure there will be no adverse impact on groundwater or surface water.*
☒ Fluid Storage
☒ Above ground tanks ☒ Recycling containment ☐ Activity permitted under 19.15.17 NMAC explain type _____
☐ Activity permitted under 19.15.36 NMAC explain type: _____ ☐ Other explain _____
☐ For multiple or additional recycling containments, attach design and location information of each containment
☐ **Closure Report (required within 60 days of closure completion):** ☐ Recycling Facility Closure Completion Date: _____

3.

☒ **Recycling Containment:** Two (2) in-ground containments
☐ Annual Extension after initial 5 years (attach summary of monthly leak detection inspections for previous year)
Center of Recycling Containment (if applicable) Pond Lat 32.547427 Long -104.326842 (approx.) NAD 83
☒ For multiple or additional recycling containments, attach design and location information of each containment
☒ Lined ☐ Liner type: Thickness Secondary 40 mil Primary 60- mil ☐ LLDPE ☒ HDPE ☐ PVC ☐ Other _____
☐ String-Reinforced
Liner Seams: ☒ Welded ☐ Factory ☐ Other Volume: _____ Dimensions See Attachment ..1
☐ 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 \$ __ See Transmittal Letter __ (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: Game fence to protect terrestrial wildlife

6.

Signs:

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

7.

Variances:

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

Check the below box only if a variance is requested:

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

8.

Siting Criteria for Recycling Containment

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

General siting

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

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

☐ Yes ☒ No
☐ NA

- Written confirmation or verification from the municipality; written approval obtained from the municipality **FIGURE 3**

Within the area overlying a subsurface mine.

☐ Yes ☒ No

- Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division **FIGURE 4**

Within an unstable area.

☐ Yes ☒ No

- Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map **FIGURE 5**

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).

☐ Yes ☒ No

- Topographic map; visual inspection (certification) of the proposed site **FIGURE 7**

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

☐ Yes ☒ No

- Visual inspection (certification) of the proposed site; aerial photo; satellite image **FIGURE 8**

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**

☐ Yes ☒ No

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

Within 500 feet of a wetland. **FIGURE 9**

☐ Yes ☒ No

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

9.

Recycling Facility and/or Containment Checklist:

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

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

10.

Operator Application Certification:

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

Name (Print): Kevin HerrmannTitle: EngineerSignature: Date: 3/1/21e-mail address kherrmann@tascosaep.comTelephone: 432-696-6970

11.

OCD Representative Signature: _____ Approval Date: _____

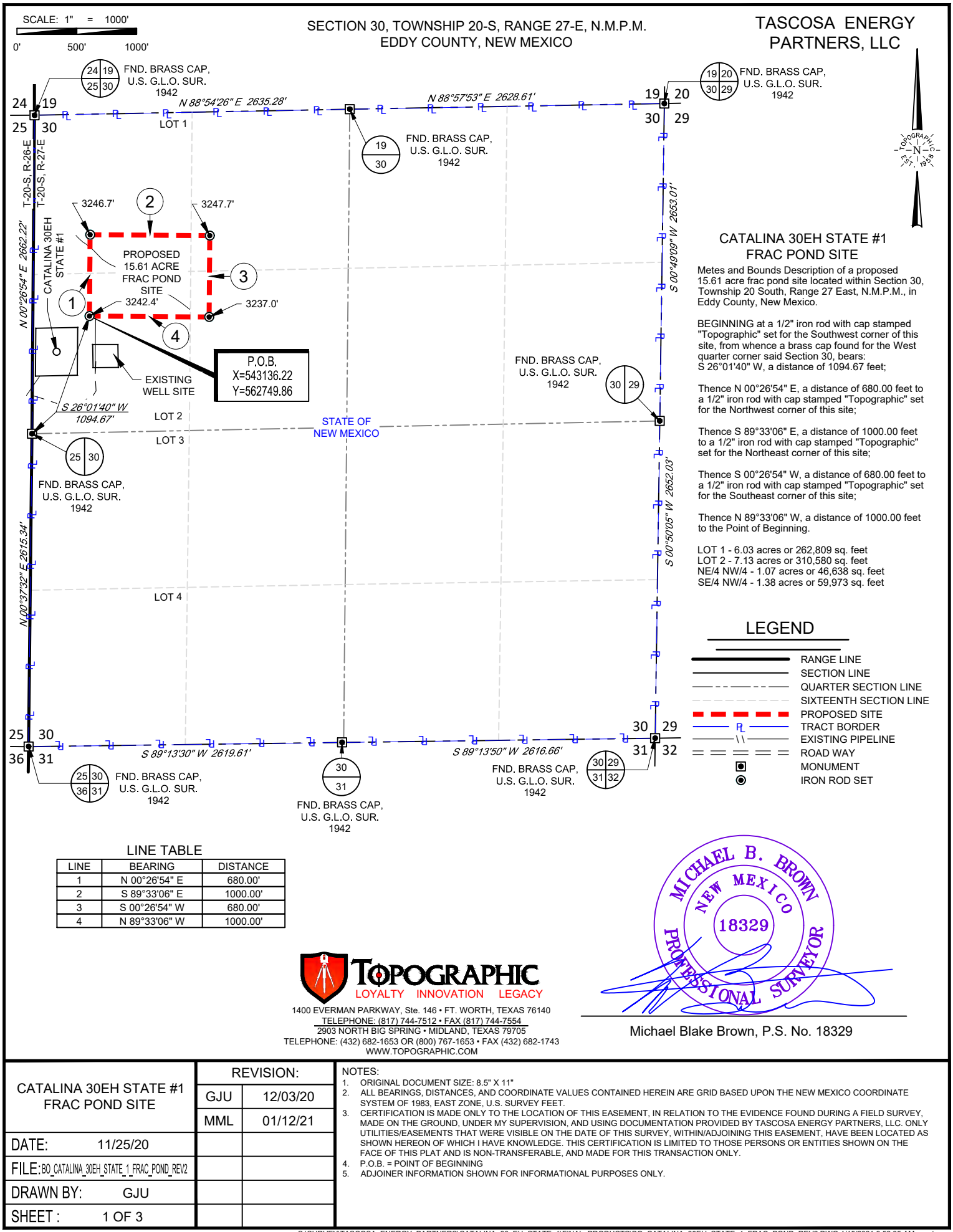
Title: _____

OCD Permit Number: _____

☐ OCD Conditions _____☐ Additional OCD Conditions on Attachment _____

A solid blue vertical bar runs along the left edge of the page.

SURVEY FOR CONTAINMENT AND RECYCLING FACILITY



SCALE: 1" = 300'
0' 150' 300'

SECTION 30, TOWNSHIP 20-S, RANGE 27-E, N.M.P.M.
EDDY COUNTY, NEW MEXICO

TASCOSA ENERGY
PARTNERS, LLC

500' PROXIMITY

STATE OF
NEW MEXICO

PROPOSED
15.61 ACRE
FRAC POND
SITE

LOT 1

LOT 2

CATALINA 30EH
STATE #1

EXISTING
WELL SITE

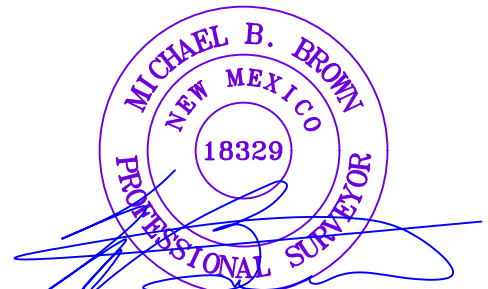
LEGEND

- RANGE LINE
- 500' OFFSET
- PROPOSED SITE
- SIXTEENTH SECTION LINE
- TRACT BORDER
- ROAD WAY
- EXISTING PIPELINE
- PROPOSED ROAD
- IRON ROD SET



TOPOGRAPHIC
LOYALTY INNOVATION LEGACY

1400 EVERMAN PARKWAY, Ste. 146 • FT. WORTH, TEXAS 76140
TELEPHONE: (817) 744-7512 • FAX (817) 744-7554
2903 NORTH BIG SPRING • MIDLAND, TEXAS 79705
TELEPHONE: (432) 682-1653 OR (800) 767-1653 • FAX (432) 682-1743
WWW.TOPOGRAPHIC.COM



Michael Blake Brown, P.S. No. 18329

CATALINA 30EH STATE #1
FRAC POND SITE

REVISION:

REVISED BY	DATE
GJU	12/03/20
MML	01/12/21

NOTES:

1. ORIGINAL DOCUMENT SIZE: 8.5" X 11"
2. ALL BEARINGS, DISTANCES, AND COORDINATE VALUES CONTAINED HEREIN ARE GRID BASED UPON THE NEW MEXICO COORDINATE SYSTEM OF 1983, EAST ZONE, U.S. SURVEY FEET.
3. CERTIFICATION IS MADE ONLY TO THE LOCATION OF THIS EASEMENT, IN RELATION TO THE EVIDENCE FOUND DURING A FIELD SURVEY, MADE ON THE GROUND, UNDER MY SUPERVISION, AND USING DOCUMENTATION PROVIDED BY TASCOSA ENERGY PARTNERS, LLC. ONLY UTILITIES/EASEMENTS THAT WERE VISIBLE ON THE DATE OF THIS SURVEY, WITHIN/ADJOINING THIS EASEMENT, HAVE BEEN LOCATED AS SHOWN HEREON OF WHICH I HAVE KNOWLEDGE. THIS CERTIFICATION IS LIMITED TO THOSE PERSONS OR ENTITIES SHOWN ON THE FACE OF THIS PLAT AND IS NON-TRANSFERABLE, AND MADE FOR THIS TRANSACTION ONLY.
4. P.O.B. = POINT OF BEGINNING
5. ADJOINER INFORMATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.

DATE: 11/25/20

FILE: BO_CATALINA_30EH_STATE_1_FRAC_POND_REV2

DRAWN BY: GJU

SHEET: 2 OF 3

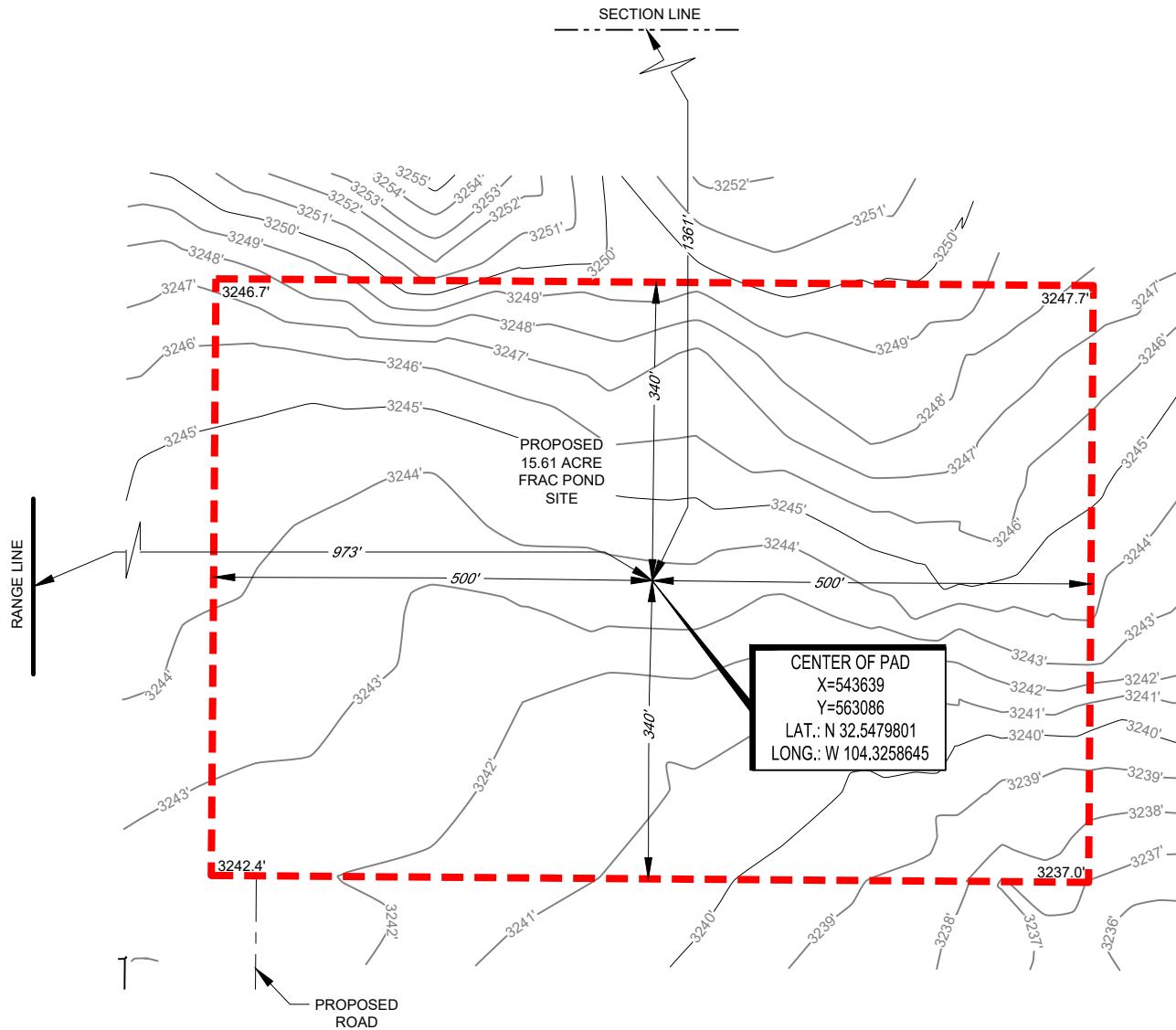
LEGEND

- RANGE LINE
- SECTION LINE
- PROPOSED SITE
- PROPOSED ROAD

TASCOSA ENERGY PARTNERS, LLC

SECTION 30, TOWNSHIP 20-S, RANGE 27-E, N.M.P.M.
EDDY COUNTY, NEW MEXICO

SCALE: 1" = 200'
0' 100' 200'



CENTER OF PAD IS 1361' FNL & 973' FWL

Michael Blake Brown, P.S. No. 18329

ALL BEARINGS, DISTANCES, AND COORDINATE VALUES CONTAINED HEREON ARE GRID BASED UPON THE NEW MEXICO COORDINATE SYSTEM OF 1983, EAST ZONE, U.S. SURVEY FEET. ELEVATIONS USED ARE NAVD88, OBTAINED THROUGH AN OPUS SOLUTION.

THIS PROPOSED PAD SITE LOCATION SHOWN HEREON HAS BEEN SURVEYED ON THE GROUND UNDER MY SUPERVISION AND PREPARED ACCORDING TO THE EVIDENCE FOUND AT THE TIME OF SURVEY, AND DATA PROVIDED BY TASCOSA ENERGY PARTNERS, LLC. ONLY THE DATA SHOWN ABOVE IS BEING CERTIFIED TO, ALL OTHER INFORMATION WAS INTENTIONALLY OMITTED. THIS PLAT IS ONLY INTENDED TO BE USED FOR A PERMIT AND IS NOT A BOUNDARY SURVEY. THIS CERTIFICATION IS MADE AND LIMITED TO THOSE PERSONS OR ENTITIES SHOWN ON THE FACE OF THIS PLAT AND IS NON-TRANSFERABLE. THIS SURVEY IS CERTIFIED FOR THIS TRANSACTION ONLY.

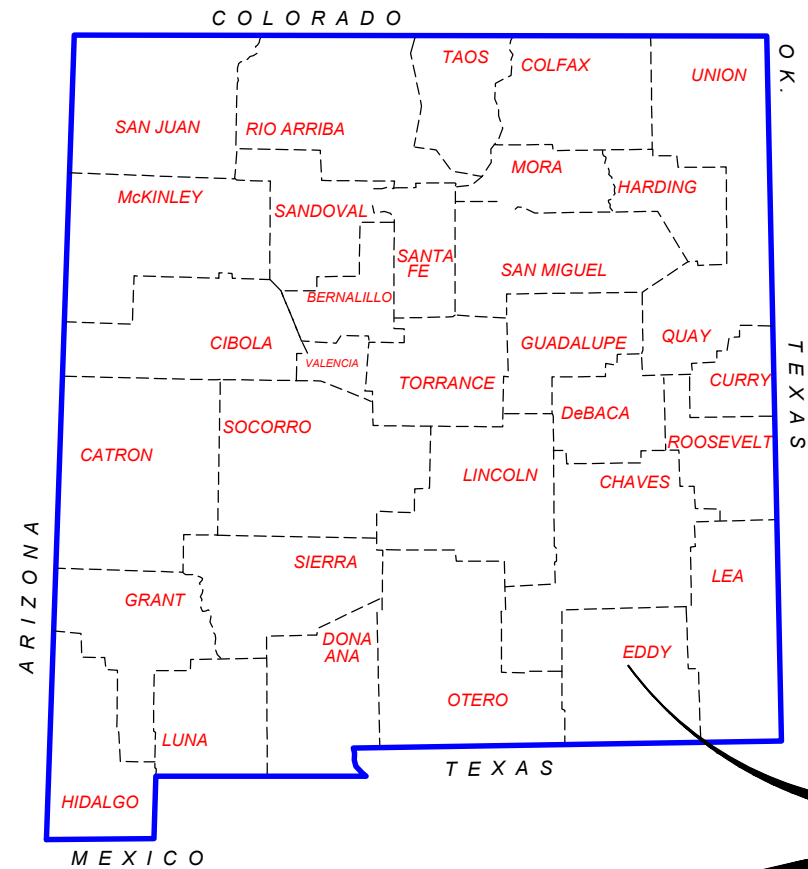
ORIGINAL DOCUMENT SIZE: 8.5" X 11"

RECYCLING CONTAINMENT DESIGN DRAWINGS

40-MIL HDPE SPECIFICATIONS

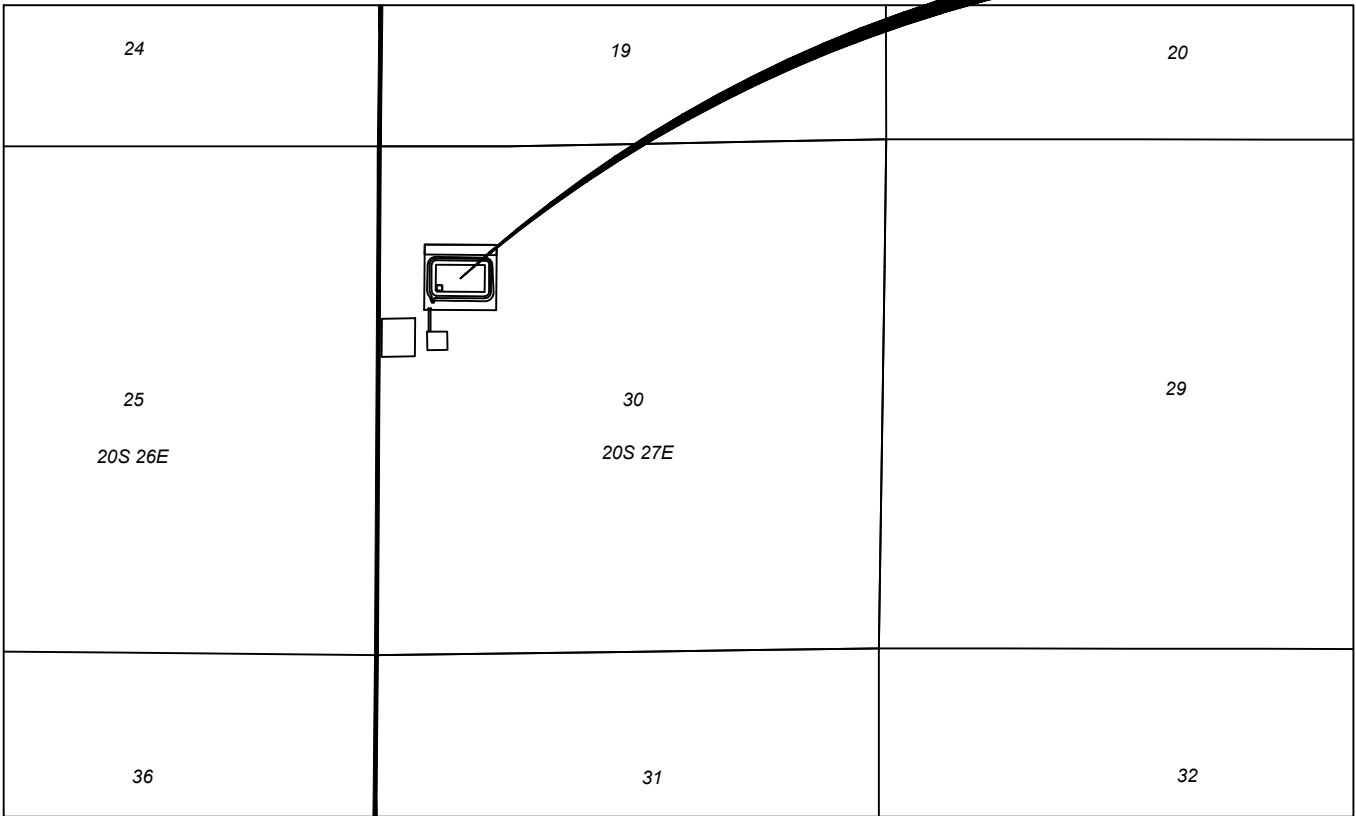
EQUIVALENCY DEMONSTRATION OF 40-MIL HDPE

AVIAN SPECIES HAZING EQUIPMENT



TASCOSA
CATALINA 30EH

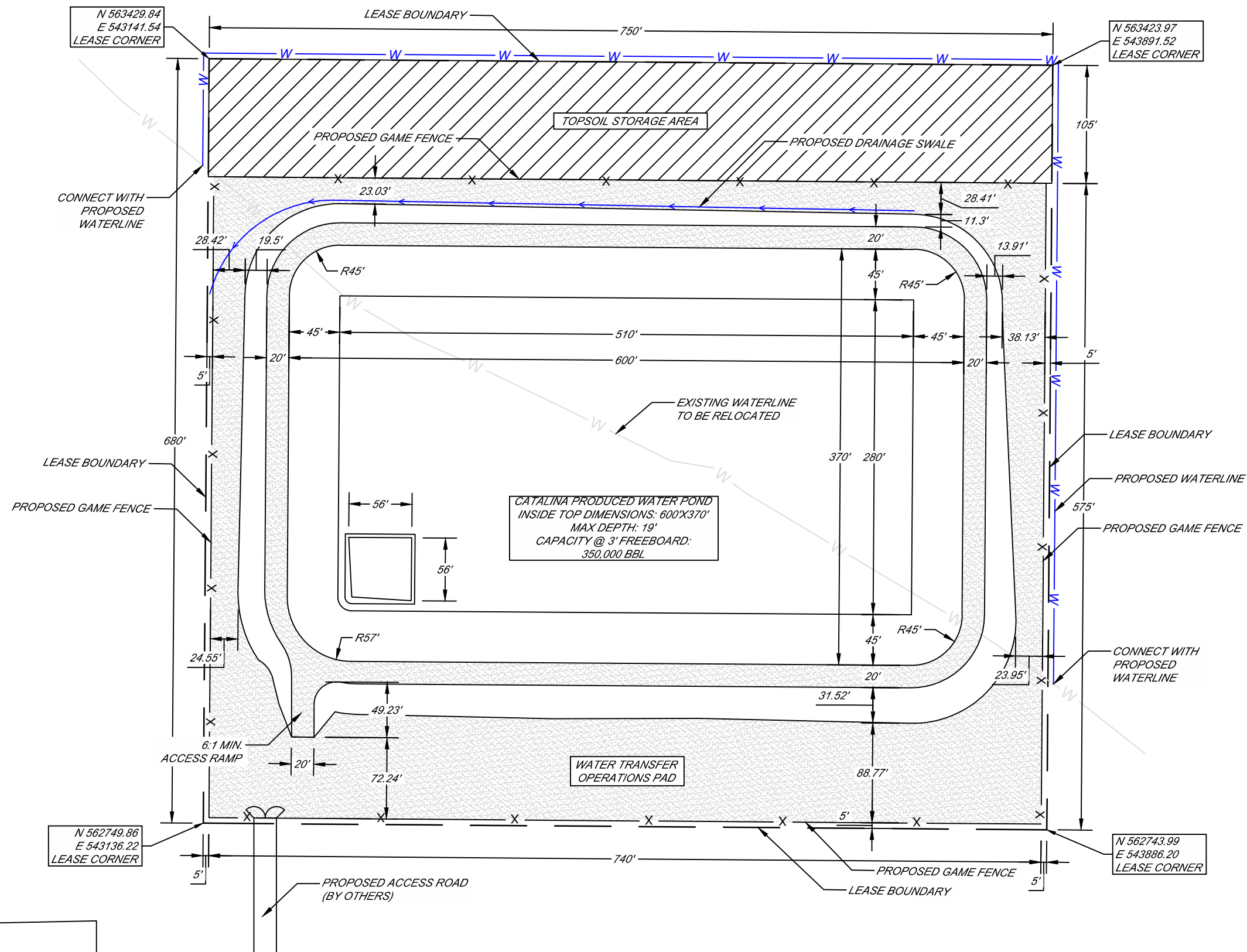
TASCOSA ENERGY PARTNERS, LLC
CATALINA 30 EH STATE #1
PRODUCED WATER RECYCLING FACILITY
S30, T20S, R27E
EDDY COUNTY, NEW MEXICO



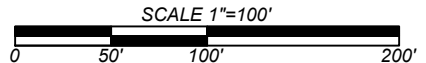
INDEX OF SHEETS

- C-100 - COVER SHEET
- C-101 - SITE PLAN
- C-102 - LINER AND FENCE PLAN
- C-103 - SUMMARY OF QUANTITIES AND GENERAL NOTES
- C-104 - GRADING PLAN
- C-105 - CROSS SECTIONS
- C-106 - LEAK DETECTION SYSTEM DETAILS
- C-107 - MISCELLANEOUS DETAILS
- C-108 - LEVEE AND PAD DETAILS
- C-109 - FENCE DETAILS
- C-110 - ESCAPE LADDER GAGE DETAILS





01/10/2021
SCALE 1"=100'



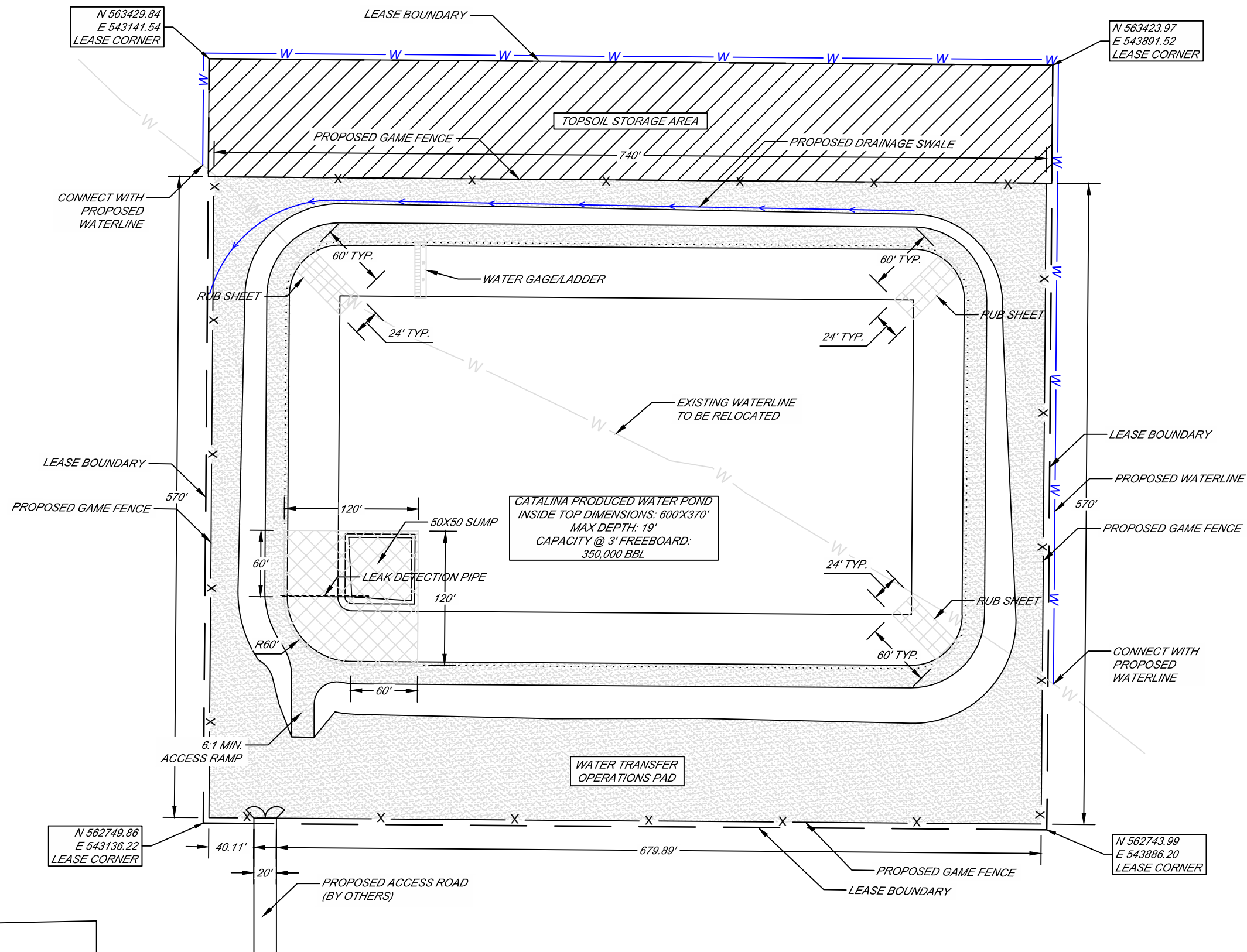
Magrym Consulting, Inc.
110 W. Louisiana Ave. Ste 314
Midland, TX 79701
(432) 999-2737
www.magrym.com

IFC	ISSUED FOR CONSTRUCTION	1/10/21	CSC
R-X	DESCRIPTION	DATE	BY
REVISIONS (OR CHANGE NOTICES)			

Tascosa Energy Partners, LLC
901 W. Missouri Avenue
Midland, TX 79701

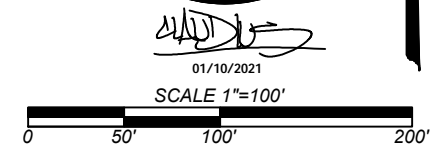
CATALINA PRODUCED WATER RECYCLING FACILITY
T20S R27E S30
EDDY COUNTY, NEW MEXICO
TASCOSA ENERGY PARTNERS, LLC

SITE PLAN	
HORIZONTAL SCALE: 1"=100'	VERTICAL SCALE: NTS
PRINT DATE: 1/10/2021	DESIGNED BY: CSC
PROJECT NO. 20-150	CHECKED BY: EMH
SUBSET: CIVIL	SHEET: C-101



LEGEND

PROPOSED 8' GAME FENCE	—○—○—
EXISTING WATERLINE	—W—W—
PROPOSED WATERLINE	—W—W—
PROPOSED LEASE BOUNDARY	—X—X—
PROPOSED DRIVING SURFACE	—X—X—
PROPOSED RUB SHEET	—X—X—
EDGE OF ANCHOR TRENCH	—X—X—
DRAINAGE SWALE	—>—>—



Magrym Consulting, Inc.
110 W. Louisiana Ave. Ste 314
Midland, TX 79701
(432) 999-2737
www.magrym.com

IFC	ISSUED FOR CONSTRUCTION	1/10/21	CSC
R-X	DESCRIPTION	DATE	BY
REVISIONS (OR CHANGE NOTICES)			

Tascosa Energy Partners, LLC
901 W. Missouri Avenue
Midland, TX 79701

CATALINA PRODUCED WATER RECYCLING FACILITY
T20S R27E S30
EDDY COUNTY, NEW MEXICO
TASCOSA ENERGY PARTNERS, LLC

LINER AND FENCE PLAN	
HORIZONTAL SCALE: 1"=100'	VERTICAL SCALE: NTS
PRINT DATE: 1/10/2021	DESIGNED BY: CSC
PROJECT NO. 20-150	CHECKED BY: EMH
SUBSET: CIVIL	SHEET: C-102

GENERAL NOTES

1. NEW MEXICO ADMINISTRATIVE CODE TITLE 19, CHAPTER 15, PART 34, DESIGN CRITERIA FOR RECYCLING CONTAINMENTS SHALL APPLY TO THIS PROJECT.
2. ALL BOUNDARY, TOPOGRAPHIC AND UTILITY INFORMATION SHOWN ARE BASED ON SURVEY INFORMATION FURNISHED BY TASCOSA ENERGY PARTNERS, LLC.
3. THE CONTRACTOR SHALL IDENTIFY AND LOCATE UTILITY LINES, MONITORING WELLS, SURVEY MONUMENTS, AND OTHER NEARBY STRUCTURES PRIOR TO PERFORMING WORK.
4. COORDINATE INFORMATION IS BASED ON STATE PLANE COORDINATES, NEW MEXICO EAST FOOT, NAD 83. THE CONTRACTOR SHALL IDENTIFY ANY DISCREPANCIES PRIOR TO PROCEEDING WITH CONSTRUCTION.

LINER NOTES

1. INSTALLER TO SIGN SUBGRADE ACCEPTANCE FORM (PROVIDED BY OWNER REPRESENTATIVE) DAILY PRIOR TO INSTALLATION.
2. CONTRACTOR TO PROVIDE SUBMITTAL OF LINER PANEL LAYOUT.
3. A 3' DIAMETER MINIMUM PIECE OF 40MIL LINER SHALL BE EXTRUDED WELDED WHERE THE PIE SHAPED CORNER SECTIONS MEET FOR SEAM REINFORCEMENT.
4. INSTALL A FULL DOUBLE WIDTH SECTION OF BLACK OR WHITE 60 MIL TEXTURED HDPE GEOMEMBRANE RUB SHEET. EXTRUDE WELD TO LINER. WELDS SHALL BE 2" LONG AND SPACED EVERY 12" ALONG BOTH SIDES OF THE SHEET. DO NOT WELD END EDGES. SECTION SHALL EXTEND FROM SUMP AND INSTALLED INTO LINER ANCHOR TRENCH AS SHOWN.
5. CONTRACTOR SHALL PLACE SANDBAGS ON LINER DURING INSTALLATION AS REQUIRED TO PREVENT WIND UPLIFT UNTIL POND IS FILLED TO A DEPTH OF 3 FEET.
6. CONTRACTOR SHALL INSPECT GRADED SURFACE FOR DEBRIS, ROCKS OR OTHER MATERIAL THAT MAY DAMAGE THE LINER.
7. CONTRACTOR SHALL ROLL SURFACE WITH A SMOOTH ROLLER TO ELIMINATE RUTS.
8. CONTRACTOR SHALL USE BLACK 60 MIL HDPE SMOOTH GEOMEMBRANE AS THE PRIMARY LINER AND BLACK 40 MIL HDPE SMOOTH GEOMEMBRANE AS THE SECONDARY LINER.
9. LINER TO BE INSTALLED PER MANUFACTURER'S RECOMMENDING PROCEDURES (GSI INSTALLATION QUALITY ASSURANCE MANUAL AND THE GSI DROP-IN SPECIFICATIONS FOR GEOMEMBRANES.)
10. ALL SEAMS MUST BE WELDED WITH A 6" MINIMUM OVERLAP.
11. CONTRACTOR SHALL NON-DESTRUCTIVELY TEST ALL SEAMS THEIR FULL LENGTH USING AN AIR PRESSURE OR VACUUM TEST, THE PURPOSE OF THIS TEST IS TO CHECK THE CONTINUITY OF THE SEAM PER THE INSTALLATION QUALITY ASSURANCE MANUAL.
12. FOR AIR PRESSURE TESTING (ASTM 5820), THE FOLLOWING PROCEDURES ARE APPLICABLE TO THE SEAMS WELD WITH DOUBLE SEAM FUSION WELDER.

a. THE EQUIPMENT USED SHALL CONSIST OF AN AIR TANK OR PUMP CAPABLE OF PRODUCING A MINIMUM 30 PSI AND A SHARP NEEDLE WITH A PRESSURE GAUGE ATTACHED TO INSERT INTO THE AIR CHAMBER.

b. SEAL BOTH ENDS OF THE SEAM BY HEATING AND SQUEEZING THEM TOGETHER. INSERT THE NEEDLE WITH THE GAUGE INTO THE AIR CHANNEL. PRESSURIZE THE AIR CHANNEL TO A MINIMUM OF 35 PSI. NOTE TIME STARTS AND WAIT A MINIMUM OF 5 MINUTES TO CHECK. IF PRESSURE AFTER 5 MINUTES HAD DROPPED LESS THAN 2 PSI THE TEST IS SUCCESSFUL (THICKNESS OF MATERIAL MAY CAUSE VARIANCE).

c. CUT OPPOSITE SEAM END AND LISTEN FOR PRESSURE RELEASE TO VERIFY FULL SEAM HAS BEEN TESTED.

d. IF THE TEST FAILS, FOLLOW THESE PROCEDURES.

i. WHILE CHANNEL IS UNDER PRESSURE WALK THE LENGTH OF THE SEAM LISTENING FOR A LEAK.

ii. WHILE CHANNEL IS UNDER PRESSURE APPLY A SOAPY SOLUTION TO THE SEAM EDGE AND LOOK FOR BUBBLES FORMED BY AIR ESCAPING.

iii. RE-TEST THE SEAM IN SMALLER INCREMENTS UNTIL THE LEAK IS FOUND.

e. ONCE LEAK IS FOUND USING ONE OF THE PROCEDURES ABOVE, CUT OUT THE AREA AND RETEST THE PORTIONS OF THE PORTIONS OF THE SEAMS BETWEEN THE LEAK AREAS PER 6A AND 6B ABOVE. CONTINUE THIS PROCEDURE UNTIL ALL SECTIONS OF THE SEAM PASS THE PRESSURE TEST.

f. REPAIR THE LEAK WITH A PATCH AND VACUUM TEST.

13. ALL NON-DESTRUCTIVE TESTS WILL BE NOTED IN THE NON-DESTRUCTIVE LOGS.

14. LINER SHALL BE PROTECTED WITH A 8 OZ. NONWOVEN GEOTEXTILE IF ROCK OR OTHER ANGULAR MATERIALS WITH A DIMENSION GREATER THAN 3/4 INCH ARE PRESENT.

15. SUMPS SHALL BE BACKFILLED WITH NON-ANGULAR MAXIMUM 3/8 INCH SIZED PEA GRAVEL.

16. LINER GAS VENTS SHALL BE SPACED ALONG THE INSIDE SLOPE AT APPROXIMATELY 100 FEET ON CENTER OR MINIMUM 2 VENTS PER SIDE.

17. WHEN ANY PIPING EQUIPMENT, INLET, OR OUTLET IS IN DIRECT CONTACT WITH THE LINER, AN APRON CONSISTING OF 60 MIL HDPE MATERIAL SHALL BE INSTALLED BENEATH THE EQUIPMENT OR STRUCTURE TO PROTECT THE PRIMARY LINER SYSTEM.

18. LAY BOTH LINERS IN ANCHOR TRENCH. BACKFILL ANCHOR TRENCH IN 2 LIFTS AND COMPACT.

EARTHWORK NOTES

1. FILL FOR LEVEES SHALL BE PLACED AND COMPACTED IN HORIZONTAL LIFTS WITH MAXIMUM LOOSE LIFT THICKNESS OF 10 INCHES, OR AS DIRECTED BY ENGINEER. CONSTRUCT EACH LAYER CONTINUOUSLY AND APPROXIMATELY HORIZONTAL FOR THE WIDTH AND LENGTH OF THE DIKE. FILL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DRY DENSITY DETERMINED BY THE ASTM D698 AND AT MOISTURE CONTENT WITHIN +2% TO -2% OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY A STANDARD PROCTOR SOILS TEST ON SAMPLES FROM THE SOURCE AREA.
2. FILL SHALL NOT BE PLACED AND COMPACTED WHEN THE MATERIALS ARE TOO WET TO PROPERLY COMPACT. MATERIAL WHICH IS TOO WET SHALL BE SPREAD ON THE FILL AREA AND PERMITTED TO DRY, ASSISTED BY HARROWING IF NECESSARY, UNTIL THE MOISTURE CONTENT IS REDUCED TO ALLOWABLE LIMITS. IF THE ENGINEER DETERMINED THAT ADDED MOISTURE IS REQUIRED, WATER SHALL BE APPLIED UNIFORMLY OVER THE AREA TO BE TREATED, AND GIVE COMPLETE AND ACCURATE CONTROL OF THE AMOUNT OF WATER TO BE USED. IF TOO MUCH WATER IS ADDED, THAT AREA SHALL BE PERMITTED TO DRY BEFORE COMPACTION IS CONTINUED.
3. PERFORM ONE NUCLEAR DENSITY GAGE TEST PER 2500 CY OR AS DIRECTED BY ENGINEER.
4. EARTHWORK CONTRACTOR SHALL PERFORM A VISUAL INSPECTION OF THE FINISHED COMPACTED POND BOTTOM AND SIDE SLOPES BEFORE HDPE LINER INSTALLATION, REMOVING ALL DEBRIS, SHARP OBJECTS AND GRAVEL LARGER THAN 3/4 INCH.

STAGE STORAGE	
PRODUCED WATER POND ELEVATION (FT)	PRODUCED WATER POND VOLUME (BBL)
3233	0
3234	186
3235	805
3236	4,775
3237	21,117
3238	46,965
3239	73,665
3240	101,226
3241	129,658
3242	158,970
3243	189,173
3244	220,276
3245	252,289
3246	285,222
3247	319,084
3248	353,886
3249	389,638
3250	426,348
3251	464,027
3252	502,685



SUMMARY OF QUANTITIES			
ITEM NUMBER	ITEM	UNIT	QTY
1	CLEARING AND GRUBBING	ACRE	10
2	ESTIMATED TOPSOIL (6" AVERAGE)	CUBIC YARD	8,056
3	ESTIMATED CUT (INCLUDING TOPSOIL)	CUBIC YARD	43,021
4	ESTIMATED FILL (ABOVE EXISTING GRADE)*	CUBIC YARD	34,690
5	DRAINAGE SWALE	LINEAR FEET	668
6	8' GAME FENCE	LINEAR FEET	2,646
7	20' DOUBLE GATE	EACH	1
8	RUB SHEET 60 MIL HDPE GEOMEMBRANE (TEXTURED)**	SQUARE FEET	18,614
9	PRIMARY 60 MIL HDPE GEOMEMBRANE (SMOOTH)**	SQUARE FEET	233,570
10	200 MIL GEONET**	SQUARE FEET	233,570
11	SECONDARY 40 MIL HDPE GEOMEMBRANE (SMOOTH)**	SQUARE FEET	233,570
12	8 OZ. GEOTEXTILE**	SQUARE FEET	233,570
13	6" HDPE DR11 PIPE WITH PERFORATIONS IN SUMP	LINEAR FEET	168
14	GAGE LADDER	EACH	1
15	DRAIN ROCK	CUBIC YARD	1
16	ANCHOR TRENCH	LINEAR FEET	1,895
17	RELOCATE EXISTING PIPELINE	LUMP SUM	1

NOTES:
* 15% FILL FACTOR APPLIED. CUT AND FILL QUANTITIES PERTAIN TO THE ENTIRE SITE. PAD AND LEVEE MATERIAL ARE INCLUDED IN FILL QUANTITY.
** COMPLETE-IN-PLACE QUANTITIES. OVERLAP, SCRAPS AND/OR SPOIL QUANTITIES NOT INCLUDED.



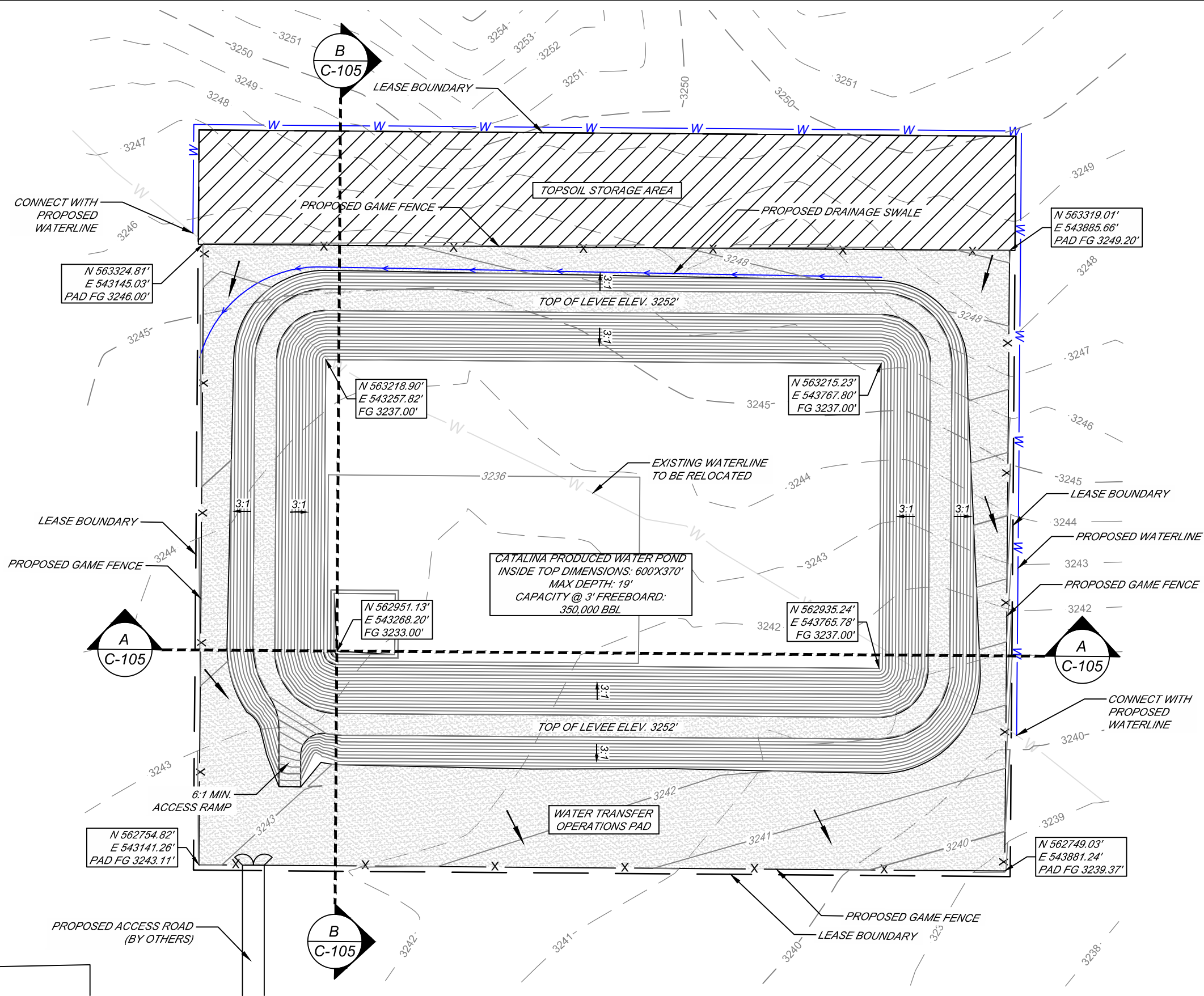
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SUMMARY OF QUANTITIES AND GENERAL NOTES	
HORIZONTAL SCALE: NTS	VERTICAL SCALE: NTS
PRINT DATE: 1/10/2021	DESIGNED BY: CSC
PROJECT NO. 20-150	CHECKED BY: EMH
SUBSET: CIVIL	SHEET: C-103

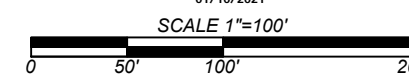


LEGEND

PROPOSED 8' GAME FENCE	
EXISTING WATERLINE	
PROPOSED WATERLINE	
PROPOSED LEASE BOUNDARY	
PROPOSED DRIVING SURFACE	
PROPOSED RUB SHEET	
EDGE OF ANCHOR TRENCH	
EXISTING GRADE CONTOURS	
FINISHED GRADE CONTOURS	
SLOPE DIRECTION	
DRAINAGE SWALE	
FINISHED GRADE FG	



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SCALE 1"=100'



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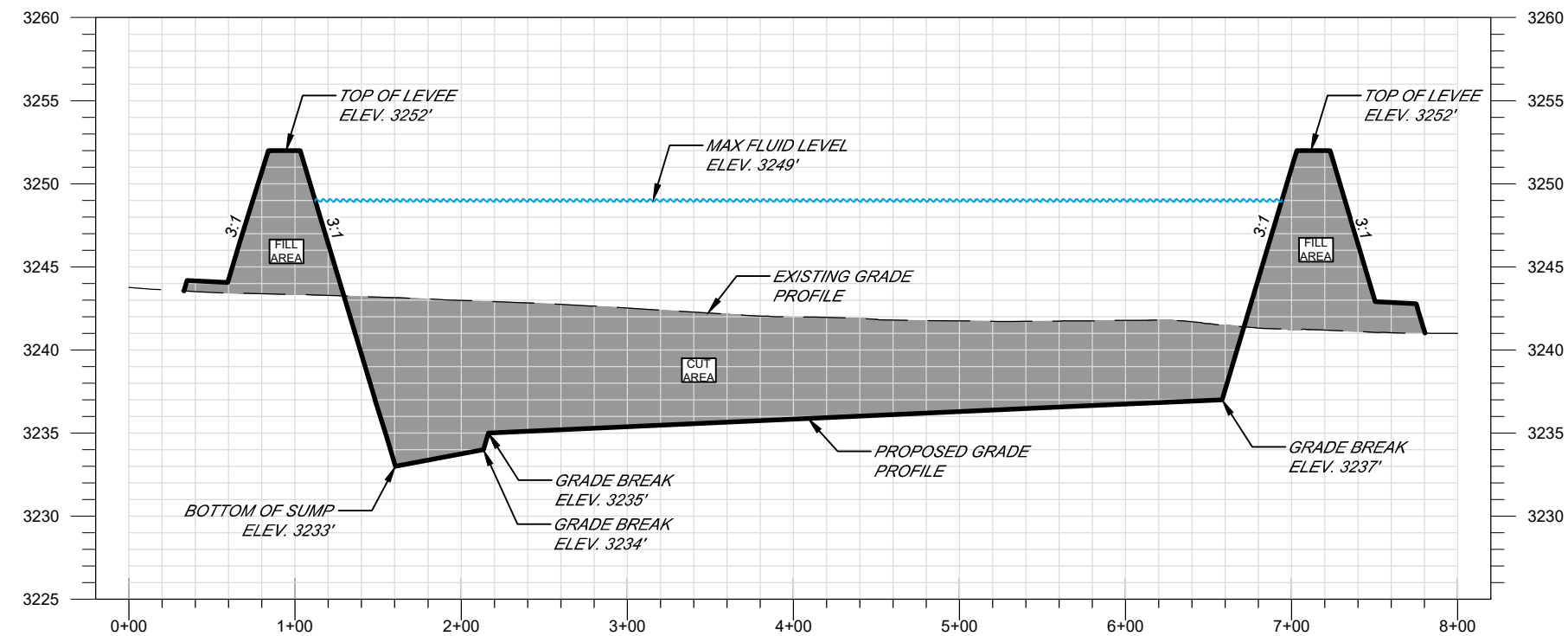
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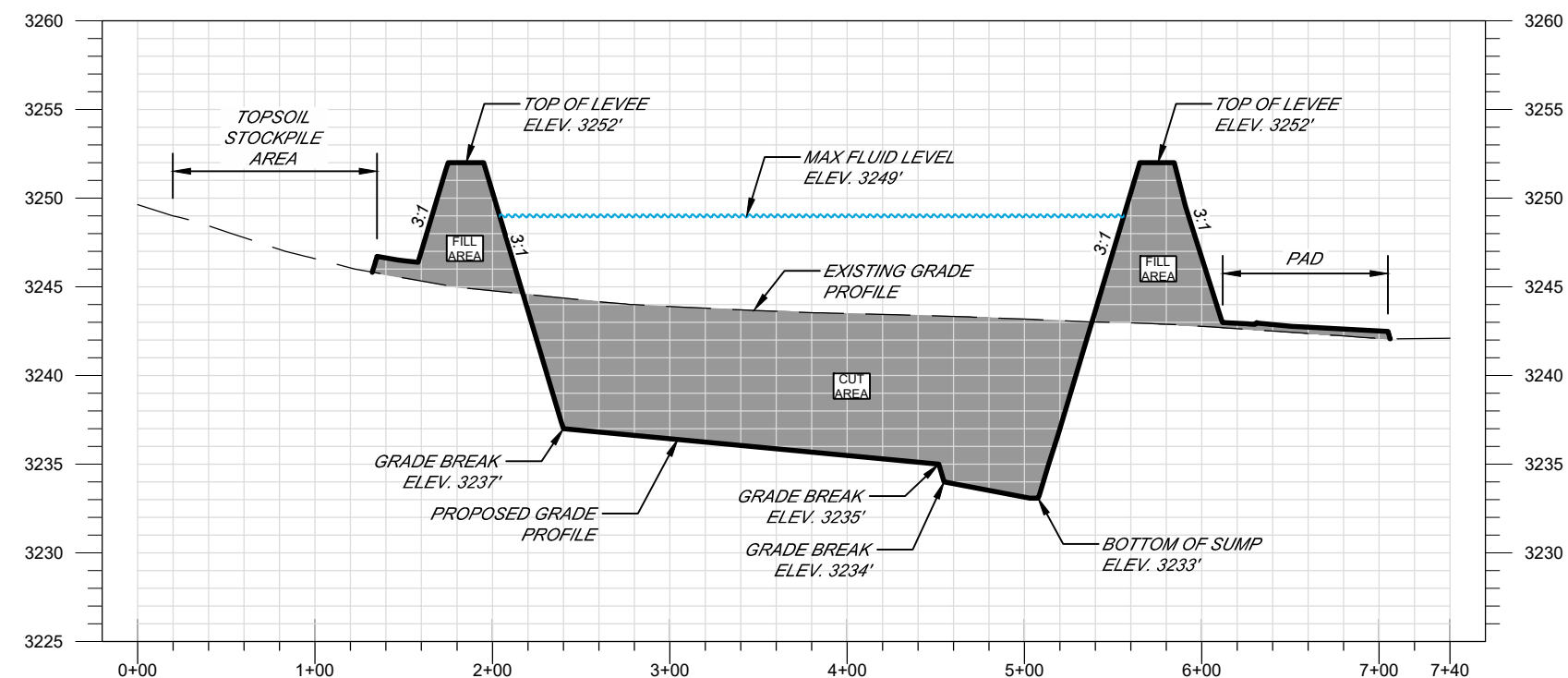
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SUBSET: CIVIL	SHEET: C-104

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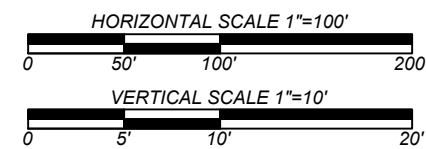
SECTION A



SECTION B



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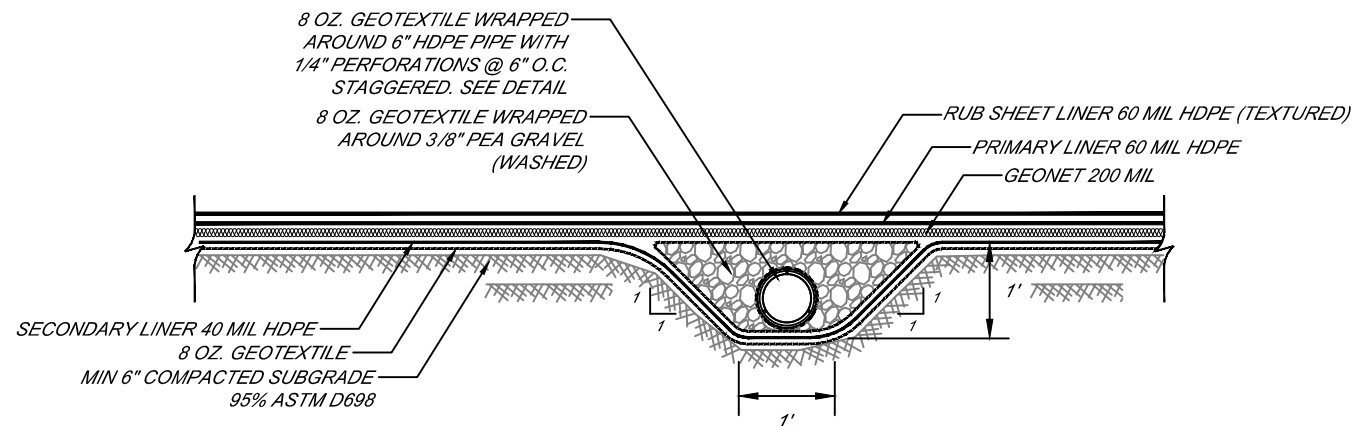
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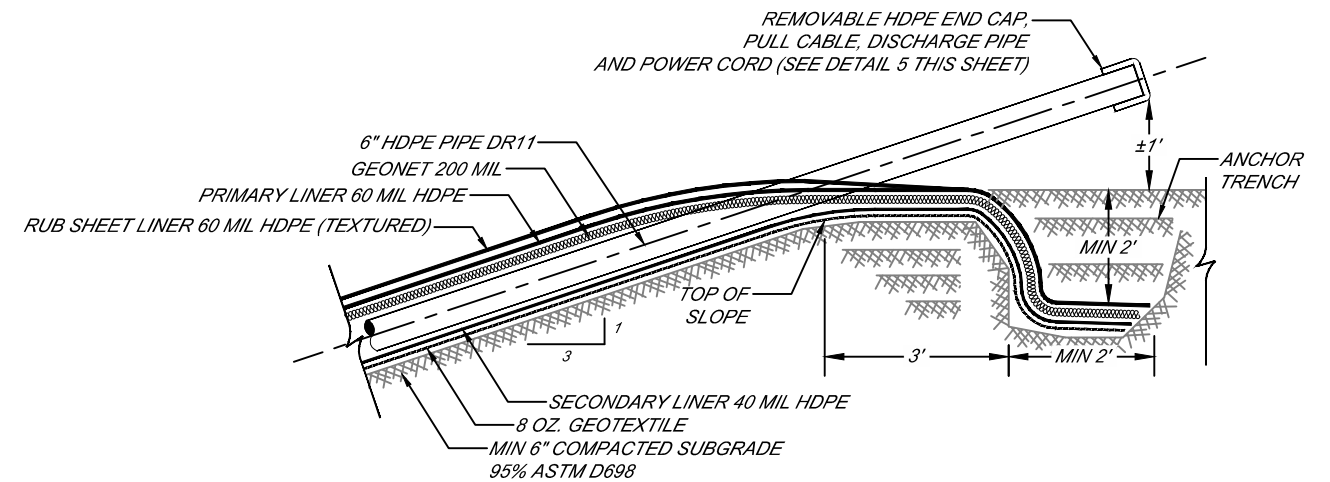
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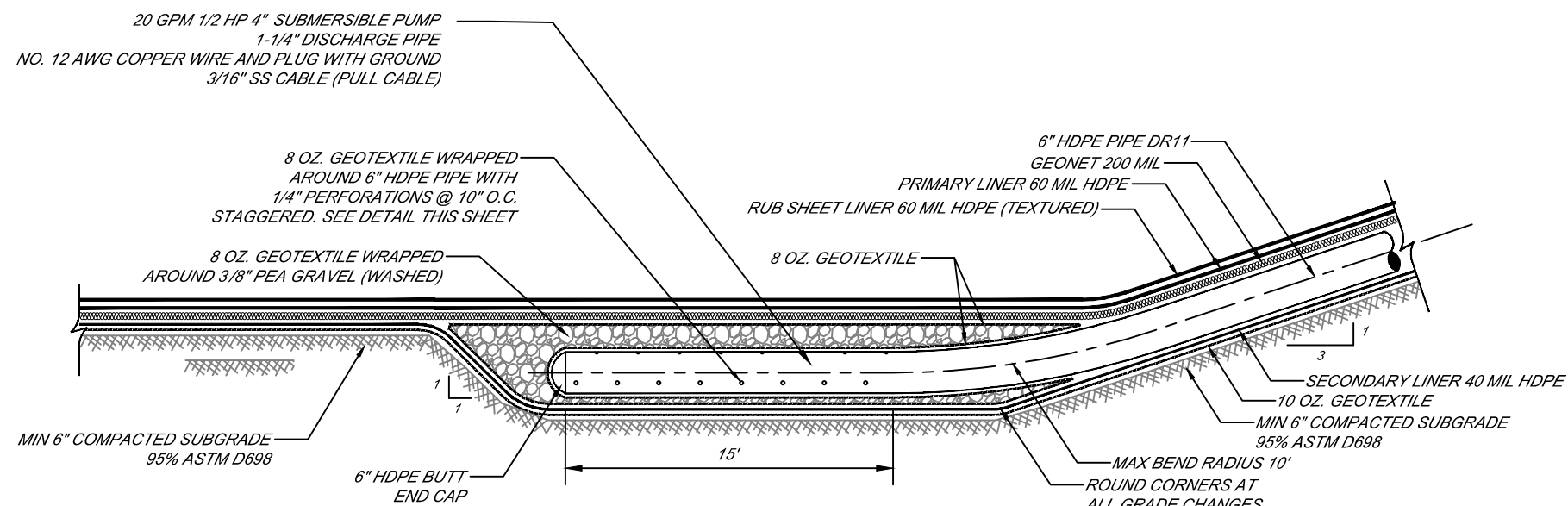
CROSS SECTIONS	
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PRINT DATE: 1/10/2021	DESIGNED BY: CSC
PROJECT NO. 20-150	CHECKED BY: EMH
SUBSET: CIVIL	SHEET: C-105



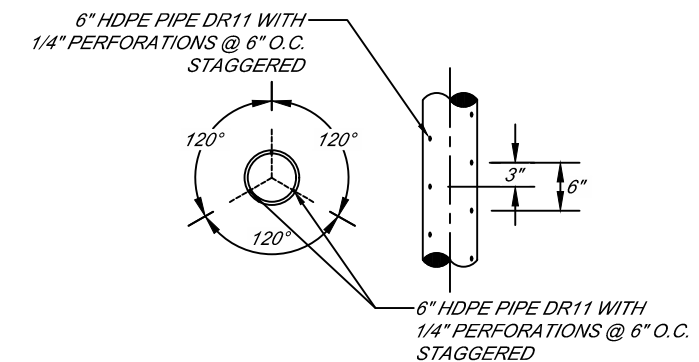
1 LEAK DETECTION SYSTEM SECTION A
C-106 NOT TO SCALE



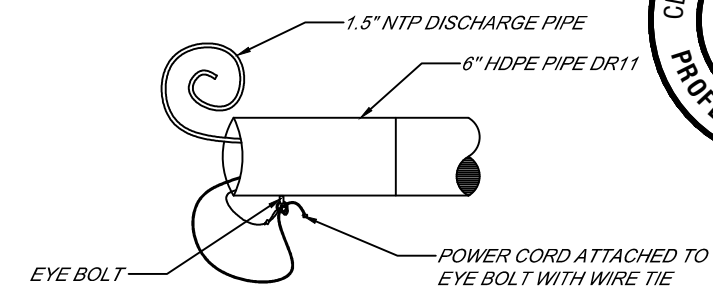
2 LEAK DETECTION SYSTEM PIPE RISER
C-106 NOT TO SCALE



3 LEAK DETECTION SYSTEM SECTION B
C-106 NOT TO SCALE

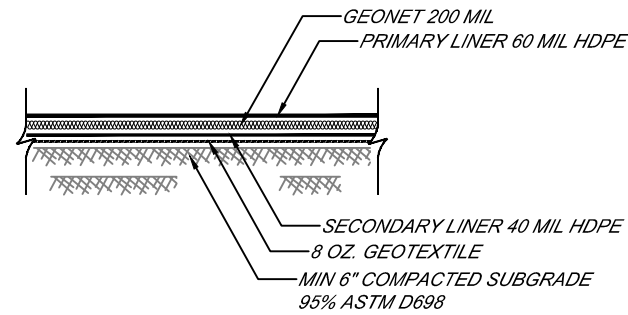


4 LEAK DETECTION SYSTEM PERFORATED PIPE
C-106 NOT TO SCALE

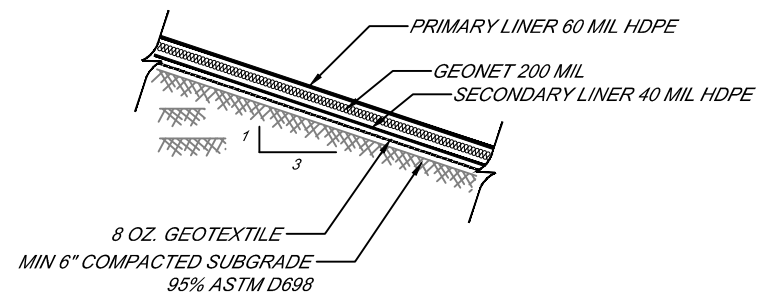


5 DISCHARGE PIPE, PULL CABLE AND POWER CORD
C-106 NOT TO SCALE

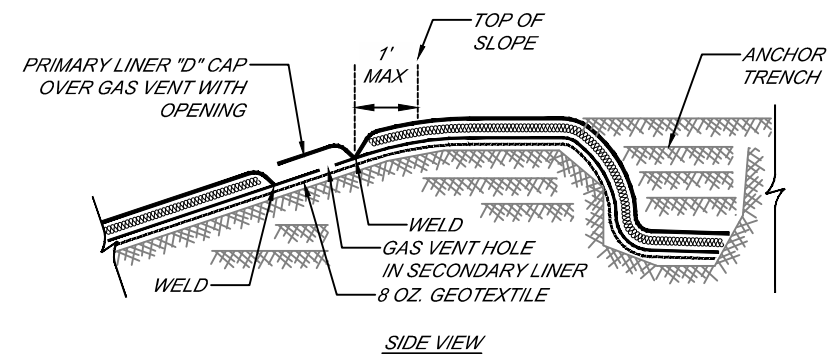
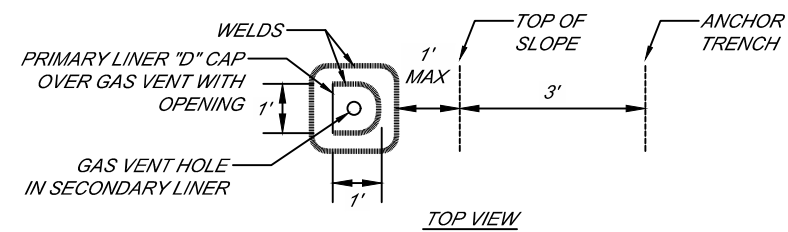




1
C-107
TYPICAL POND BOTTOM LINER
NOT TO SCALE

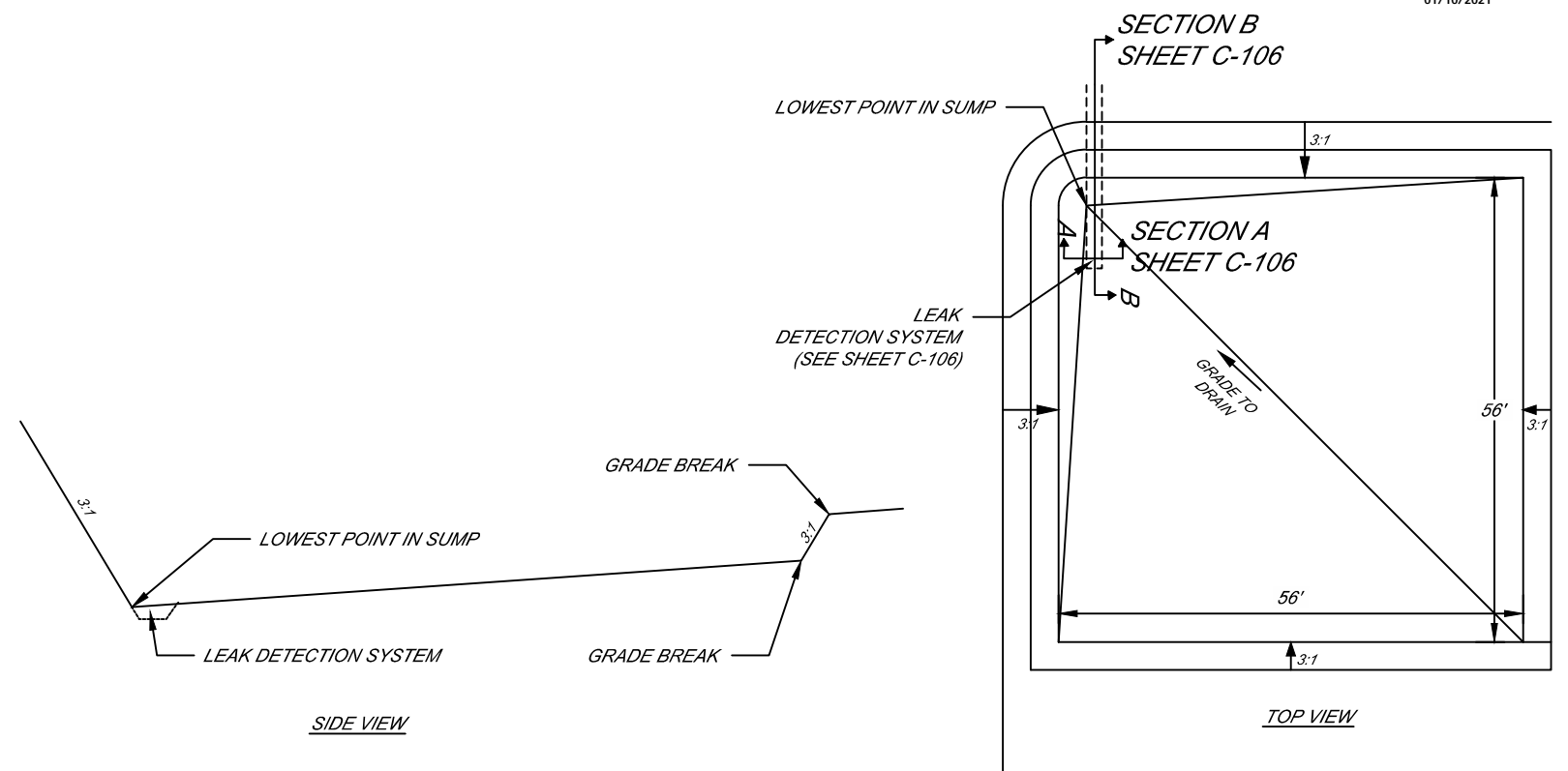


2
C-107
TYPICAL POND SLOPE LINER
NOT TO SCALE



NOTE:
GAS VENT SPACING SHALL BE INSTALLED
PER MANUFACTURER'S RECOMMENDATIONS

3
C-107
TYPICAL GAS VENT
NOT TO SCALE



4
C-107
SUMP DETAIL
NOT TO SCALE



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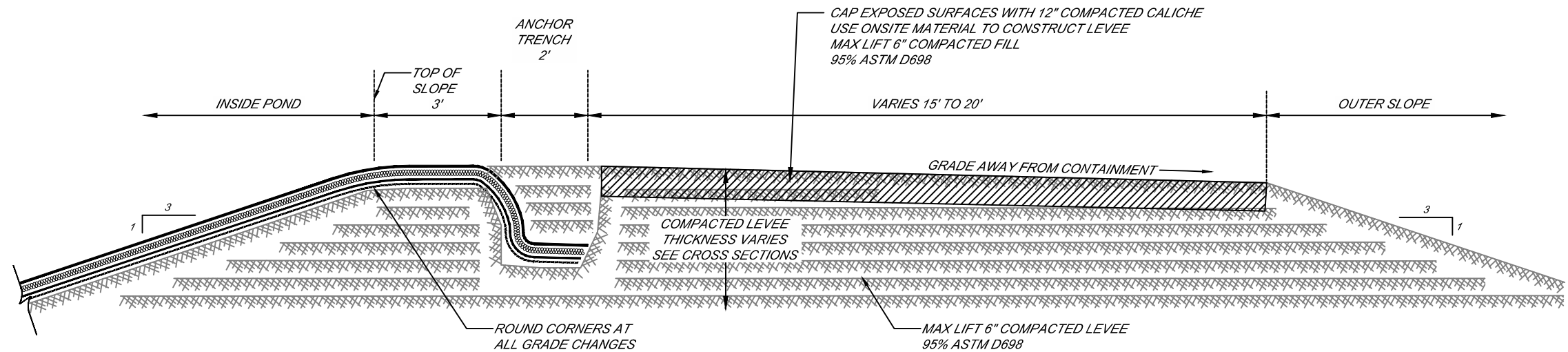
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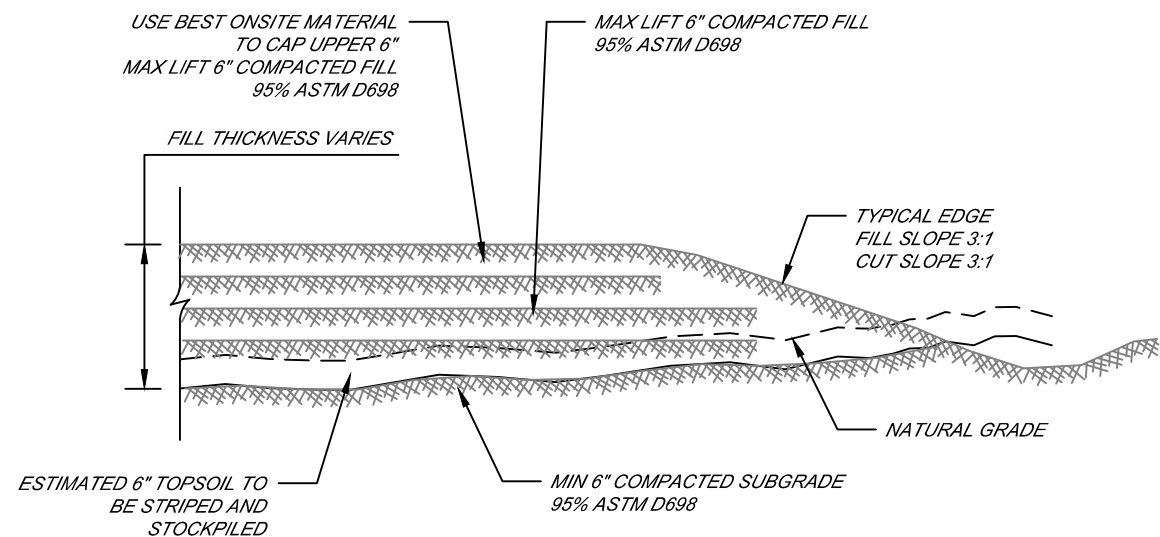
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MISCELLANEOUS DETAILS

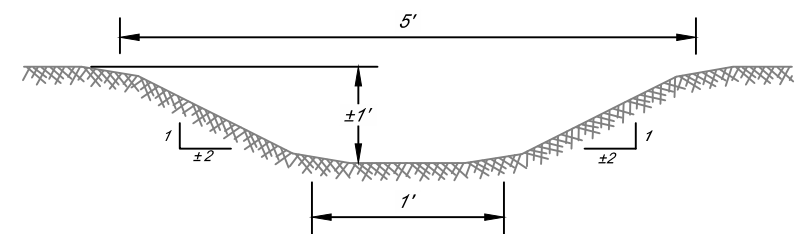
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PRINT DATE: 1/10/2021	DESIGNED BY: CSC
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SUBSET: CIVIL	SHEET: C-107



1
C-108
TYPICAL LEVEE SECTION
NOT TO SCALE



2
C-108
TYPICAL PAD EDGE SECTION
NOT TO SCALE



3
C-108
TYPICAL DRAINAGE DICH
NOT TO SCALE



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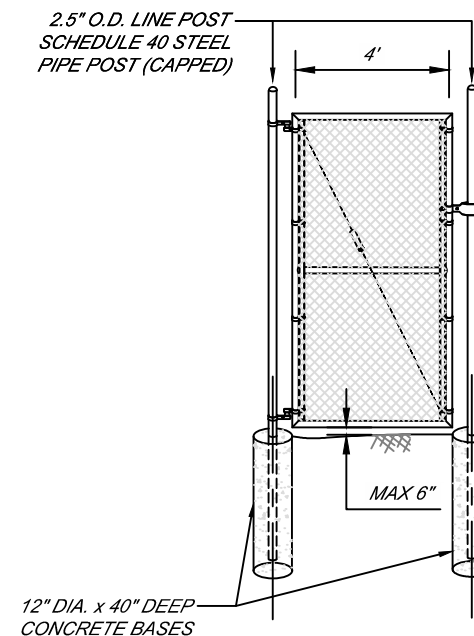
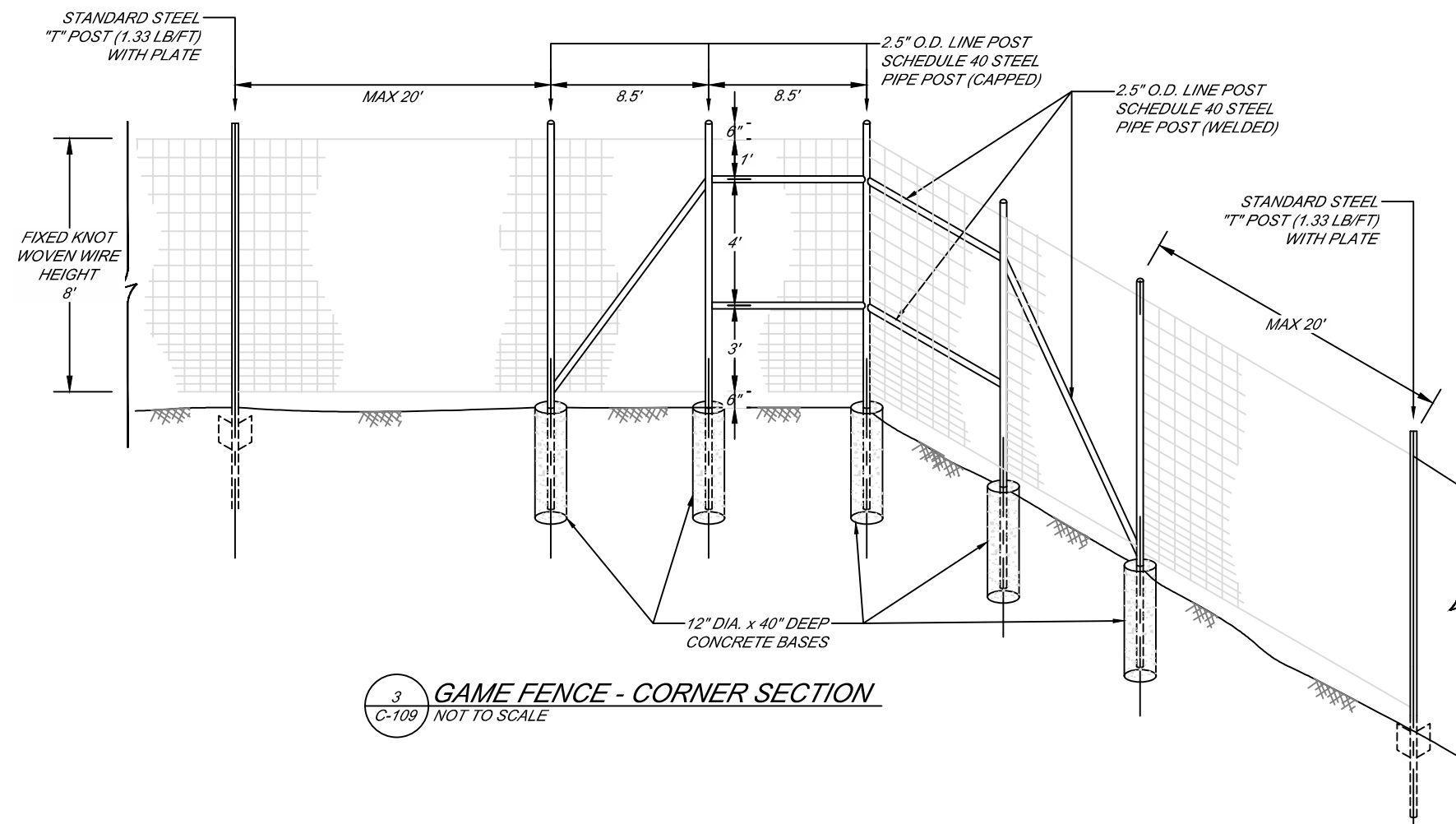
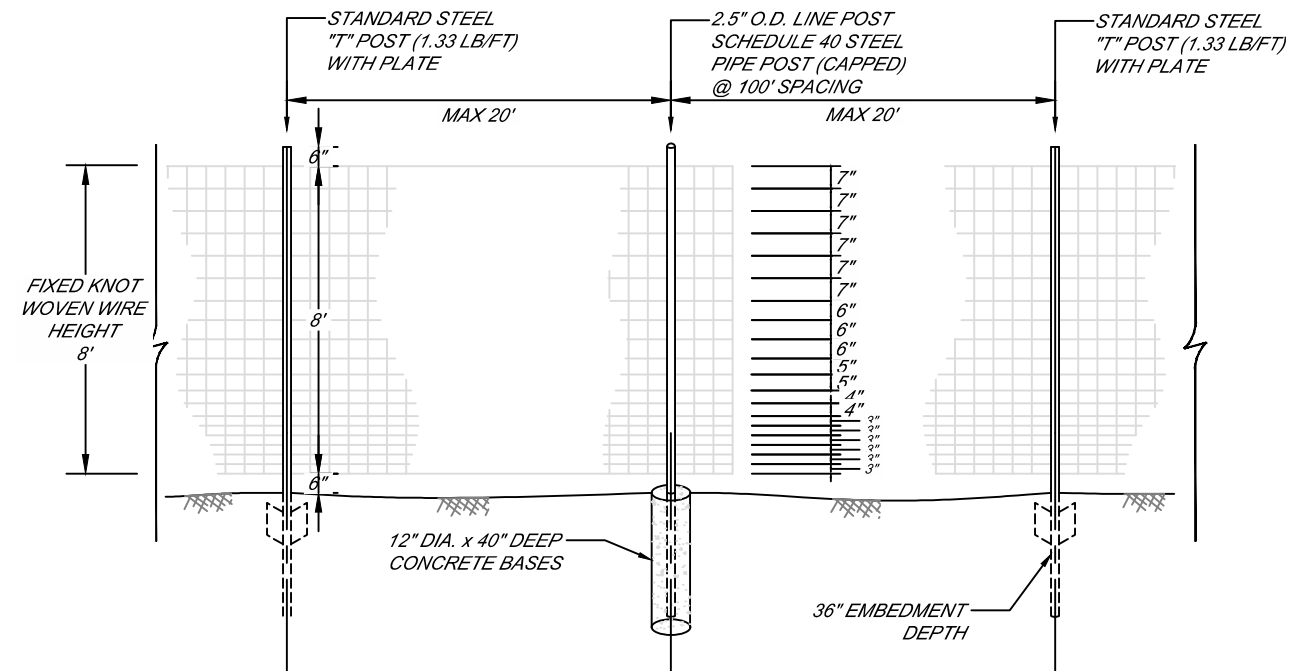
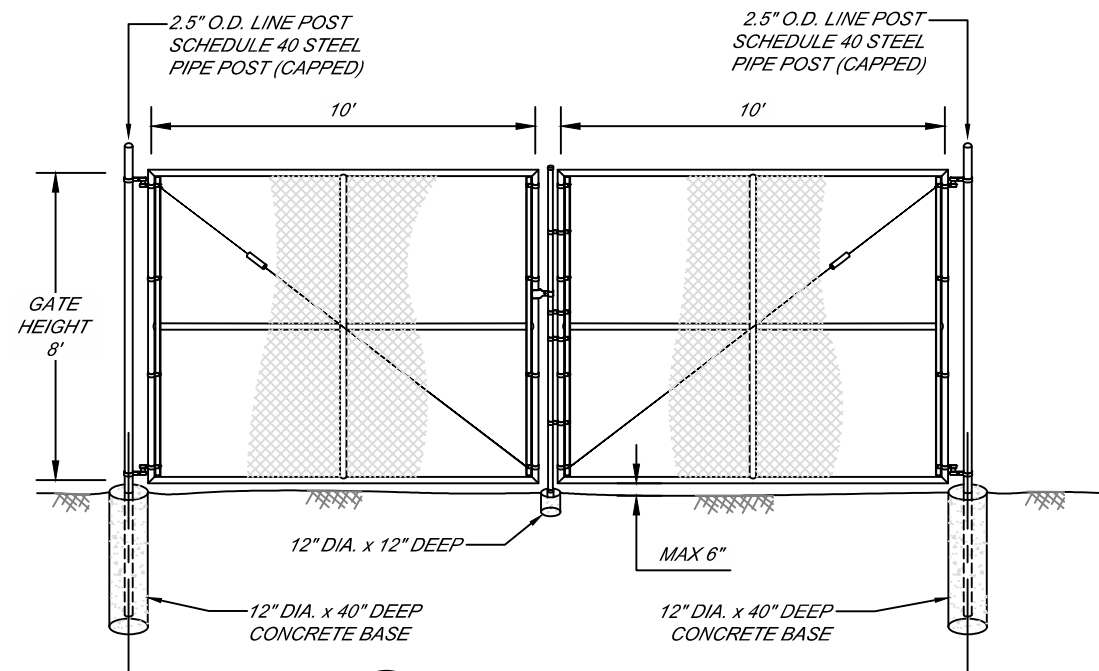
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LEVEE AND PAD DETAILS

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- NOTES:**
1. FOR WOVEN WIRE, TOP AND BOTTOM STRANDS SHALL BE 12½ GAUGE OR HEAVIER; INTERMEDIATE STRANDS SHALL BE 14½ GAUGE OR HEAVIER.
 2. ALL WIRE SHALL HAVE CLASS III GALVANIZATION.
 3. STANDARD WOVEN WIRE FENCES MAY HAVE LINE POSTS SPACED UP TO 15 FEET APART. HI-TENSILE WOVEN WIRE FENCE MAY HAVE LINE POSTS SPACED UP TO 20 FEET APART. CLOSER SPACING IS REQUIRED WHERE NEEDED FOR INCLINES OR CHANGES IN TOPOGRAPHY.
 4. CONCRETE FOOTINGS SHALL HAVE TOPS CROWNED.
 5. TO PREVENT WIRE FROM SLIPPING ON STEEL POST, DOUBLE WRAP ALL WIRE AROUND STEEL POST OR WELD CHAIN LINK LOOPS.



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4				
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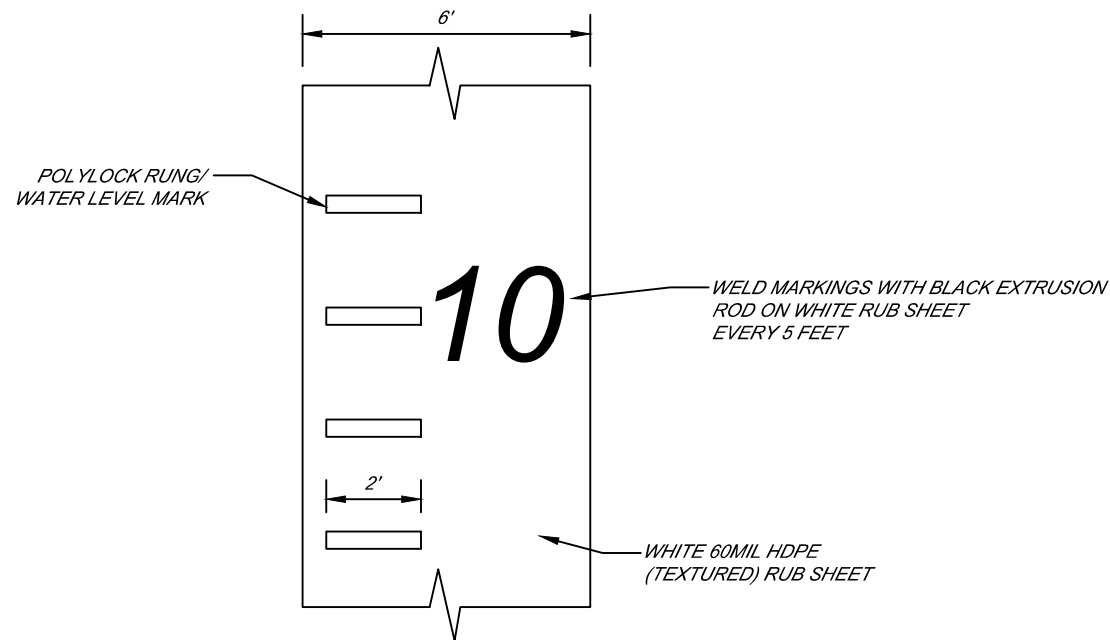
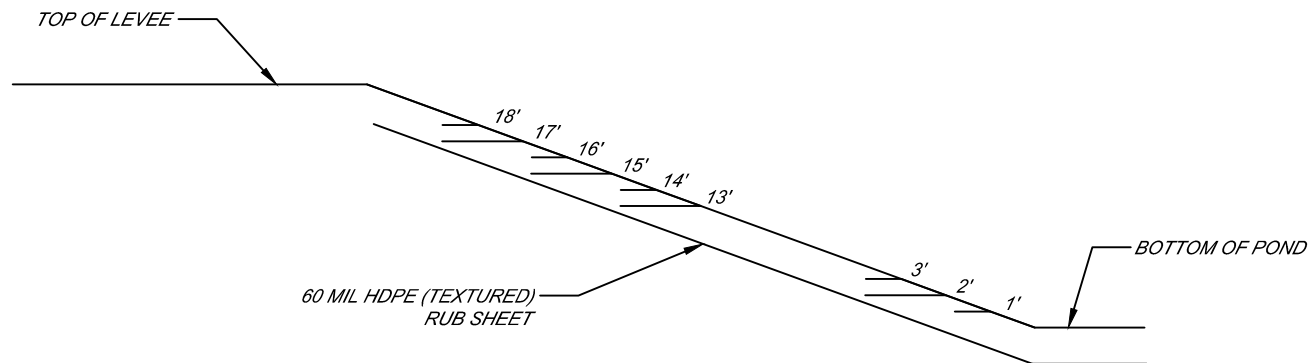
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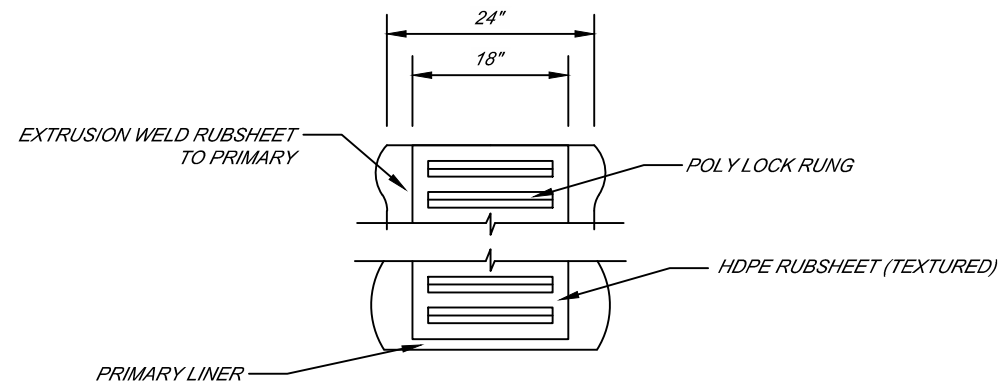
FENCE DETAILS

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SUBSET: CIVIL	SHEET: C-109

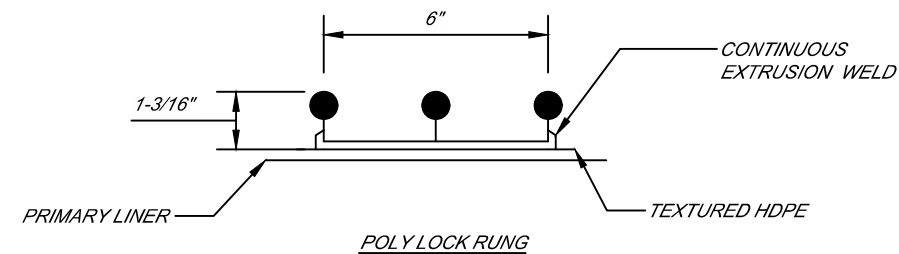
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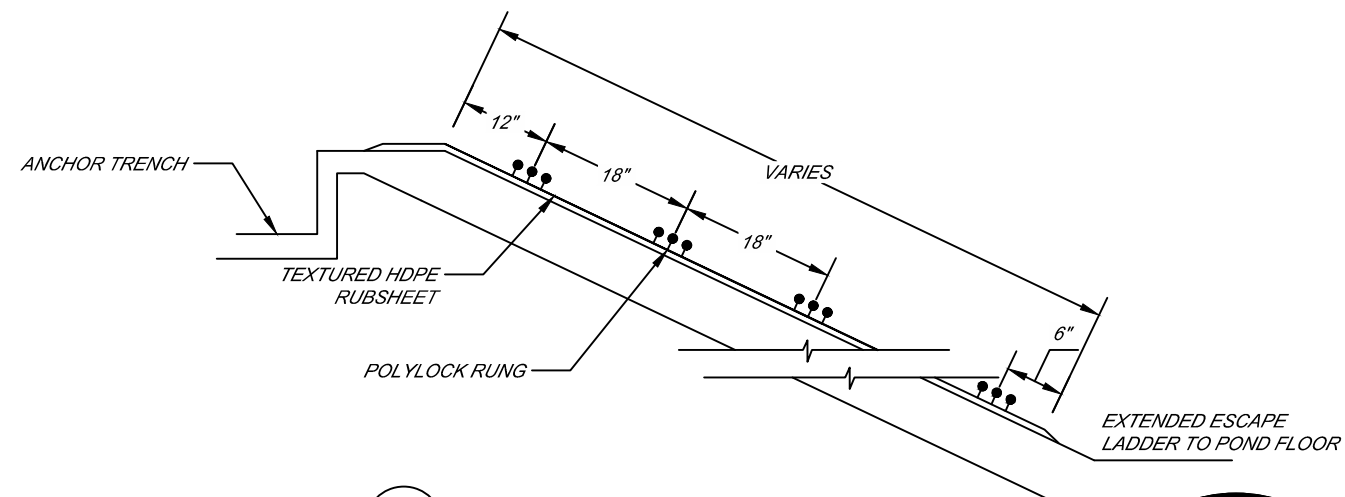
1 **WATER LEVEL MARKS**
C-110 NOT TO SCALE



ESCAPE LADDER FRONT VIEW



POLY LOCK RUNG



2 **ESCAPE LADDER DETAILS**
C-110 NOT TO SCALE



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ESCAPE LADDER AND GAGE DETAILS

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PROJECT NO. 20-150	CHECKED BY: EMH
SUBSET: CIVIL	SHEET: C-110

PROPERTY	TEST METHOD	FREQUENCY ⁽¹⁾	UNIT Imperial	
SPECIFICATIONS				
Thickness (min. avg.)	ASTM D5199	Every roll	mils	40.0
Thickness (min.)	ASTM D5199	Every roll	mils	36.0
Melt Index - 190/2.16 (max.)	ASTM D1238	1/Batch	g/10 min	1.0
Sheet Density (8)	ASTM D792	Every 10 rolls	g/cc	≥ 0.94
Carbon Black Content	ASTM D4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	Every 10 rolls	Category	Cat. 1 & Cat. 2
OIT - standard (avg.)	ASTM D3895	Per formulation	min	160
HPOIT - High Pressure (avg)	ASTM D5885	Per formulation	min	800
Tensile Properties (min. avg) (2)	ASTM D6693	Every 2 rolls		
Strength at Yield			ppi	84
Elongation at Yield			%	13
Strength at Break			ppi	152
Elongation at Break			%	750
Tear Resistance (min. avg.)	ASTM D1004	Every 5 rolls	lbf	28
Puncture Resistance (min. avg.)	ASTM D4833	Every 5 rolls	lbf	85
Dimensional Stability	ASTM D1204	Certified	%	± 2
Stress Crack Resistance (SP-NCTL) (avg.)	ASTM D5397	1/Batch	hr	1000
Multi-Axial Tensile (min. avg.)	ASTM D5617	Per formulation	%	15
Oven Aging - % retained after 90 days	ASTM D5721	Per formulation		
HP OIT (min. avg.)	ASTM D5885		%	80
UV Res. - % retained after 1600 hr	ASTM D7238	Per formulation		
HP-OIT (min. avg.)	ASTM D5885		%	80
SUPPLY SPECIFICATIONS (Roll dimensions may vary ±1%)				

NOTES

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

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

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

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Mustang Extreme

December 9, 2019

Attn: Mr. Steven Roeder
Re: 40 mil HDPE Geomembrane – Hydraulic Conductivity

Dear Mr. Roeder:

Hydraulic Conductivity of HDPE geomembranes can be indirectly obtained through ASTM E96 method (Designing with Geosynthetics, page 437, fifth edition – Robert Koerner).

Based on our test results and the method pointed out in the above reference, it can be concluded that Solmax HDPE geomembranes have a typical Hydraulic Conductivity no higher than 10^{-12} cm/s

Should you need further information, please do not hesitate to contact us.

Sincerely,

A handwritten signature in blue ink, appearing to read "M. Ossa", with a long horizontal flourish extending to the right.

Mauricio Ossa
Senior Technical Manager
Houston- Texas

● T +1 800 435-2008



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R.K. FROBEL & ASSOCIATES
Consulting Engineers

Technical Memorandum: 40-mil HDPE as Alternative Secondary Liner System for In Ground Recycling Containment Facilities
NMAC 19.15.34.12 A

I have investigated the suitability of application for 40 mil HDPE geomembrane as an equivalent secondary liner to 30 mil scrim reinforced LLDPE (LLDPEr) in the application for In Ground Recycling Containment facilities. *In summary, it is my professional opinion that the specified 40 mil HDPE geomembrane will provide a secondary liner system that is equal to or better than 30 mil scrim reinforced LLDPEr and will provide the requisite protection of fresh water, public health and the environment for many years when engineering design provides requisite site/soil/slope preparation and when used in concert with requisite primary liners and drainage layers.*

It is understood that the lining system under discussion is composed of a 60 mil HDPE Primary liner, geonet drainage layer and a 40 mil HDPE Secondary liner. *In consideration of the secondary lining system application, size of impoundment and depth, design details as well as the chemical nature of typical processed water, it is my professional opinion that the 40 mil HDPE geomembrane will provide the requisite barrier against processed water loss and will function effectively as a secondary liner.*

The following are discussion points that hopefully will exhibit the equivalency of a 40 mil HDPE secondary liner to that of a 30 mil LLDPEr.

The nature and formulation of the 40 mil HDPE resin is the same as the Primary 60 mil HDPE. The major difference is that the 40 mil HDPE is lower in thickness (more flexible and less puncture resistant). However, in covered conditions, HDPE will resist aging and degradation and remain intact for many decades. In fact, a secondary liner of 40 mil HDPE will outlast an exposed 60 mil HDPE liner. 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 HDPE covered or buried is greater than 100 years. It is understood that in order to ensure compliance of materials, the primary 60 mil HDPE to be used must meet or exceed GRI GM 13 Standards. Likewise, the secondary liner that is not exposed to the same environmental and chemical conditions must meet or exceed GRI GM 13 for non-reinforced HDPE. Adhering to the minimum requirements of the GRI Specifications, 40 mil HDPE when used as a secondary liner will be equally as protective as the primary 60 mil HDPE liner (reference: www.geosynthetic-institute.org/grispecs) and equally as protective as a 30 mil scrim reinforced LLDPEr liner.

Durability of Geomembranes is directly affected by exposure conditions. Buried or covered geomembranes are not affected by the same degradation mechanisms (UV, Ozone, Chemical, Stress, Temperature, etc) as are fully exposed geomembranes. In this regard, the secondary liner material and thickness can be much less robust than the fully exposed primary liner which in this case is 60 mil HDPE. This is also the case for

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Consulting Engineers

landfill lining systems where the secondary geomembrane in a bottom landfill cell may be 40 mil HDPE.

Thermal Fusion Seaming Requirements. Thermal seaming and QC seam test requirements for geomembranes are product specific and usually prescribed by the sheet manufacturer. Dual wedge thermal fusion welding is commonly used on HDPE and QC testing by air channel (ASTM D 5820) is fully acceptable and recognized as an industry standard. In this regard, there should be no exception requirement for seaming and QC testing as both the Primary and Secondary geomembranes are HDPE. This is fully covered in comprehensive specifications for both the Primary and Secondary geomembranes (Reference: www.ASTM.org/Standards).

Potential for Leakage through the Primary and Secondary Liners. Leakage through geomembrane liners is directly a function of the height of liquid head above any hole or imperfection. The geonet drainage media provides immediate drainage to a low point or sump and thus no hydrostatic head or driving gradient is available to push leakage water through a hole in the secondary liner. In this regard, secondary geomembrane materials can be (and usually are) much less in thickness and also polymer type. Hydraulic Conductivity through the 40 mil HDPE liner material is extremely low due to the polymer type, structure and crystallinity and exceeds requirements of EPA SW-846 Method 9090A.

Chemical Attack. Chemical attack to polymeric geomembranes is directly a function of type of chemical, temperature and exposure time. Again, the HDPE Primary provides the chemically resistant liner and is QC tested to reduce potential defects or holes. If there is a small hole, the geonet drain takes any leakage water immediately to the sump for extraction. Thus, exposure time is very limited on a secondary liner in addition to low temperature, little volume and virtually no head pressure. In this regard, a chemically resistant geomembrane material such as 40 mil HDPE can be specified for the secondary and is a fully acceptable alternate to 30 mil scrim reinforced LLDPEr.

Mechanical Properties Characteristics. Geomembranes of different polymer and/or structure (i.e., reinforced vs non-reinforced) cannot be readily compared using such characteristics as tensile stress/strain, tear, puncture and polymer requirements. For a 40 mil HDPE liner material to function as a Secondary liner it should meet or exceed the manufacturers minimum requirements for Density, Tensile Properties, Tear, Puncture as well as other properties such as UV resistance. The sheet material must also meet or exceed GRI GM 13 minimum requirements. *In this regard, a 40 mil HDPE will be equivalent to a 30 mil LLDPEr as a secondary liner for the conditions listed below:*

- *The subgrade or compacted earth foundation will be smooth, free of debris or loose rocks, dry, unyielding and will support the lining system.*
- *The side slopes for the containment shall be equal to or less than 3H:1V.*
- *The physical properties and condition of the subgrade or liner foundation*

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Consulting Engineers

(i.e., density, slope, moisture) will be inspected and certified by a Professional Engineer that it meets or exceeds specification requirements.

- Immediately prior to installation, the installation contractor shall inspect and sign off on the subgrade conditions that they meet or exceed the HDPE manufacturer and installers requirements.
- A protective geotextile will be placed on the finished and accepted subgrade between subgrade and the 40 mil HDPE Secondary liner.
- A 200 mil geonet will be placed over the 40 mil HDPE Secondary Liner.
- A 60 mil HDPE Primary liner will be placed over the 200 mil geonet drainage layer.

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

Sincerely Yours,

RK Frobel

Ronald K. Frobel, MSCE, PE



References:

NMAC 10-15-34-12 A DESIGN AND CONSTRUCTION SPECIFICATIONS FOR A RECYCLING-CONTAINMENT

Geosynthetic Research Institute (GRI) Published Standards and Papers 2017
www.geosynthetic-institute.org

ASTM Geosynthetics' Standards 2017
www.ASTM.org/Standards

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- Crystal-Clear Digital Sounds

- Laughing Gull
- Ring-Billed Gull
- Herring Gull
- California Gull
- Black-Headed Gull
- Glaucous-Winged Gull
- Double Crested Cormorant
- Marsh Hawk

**Perfect for Landfills, Airfields, Fish Farms,
Farm Fields or any multi-acre facility.**

Our most powerful system features two high-output amplifiers that drive our specially-designed 20 speaker tower. The intense sound output covers up to 30 acres (12 hectares).

It features solid-state electronics mounted inside a NEMA-type control box, suitable for most any application.

The generating unit mounts easily to a post or pole using the included hardware. The unit comes pre-recorded in four different configurations for the most common bird infestations.

Choose any or all of the 8 sounds, including predators to give the birds even more of a sense of danger. Customize by choosing volume and silent time between sounds.

Mega Blaster PRO

Complete system includes the generating unit with two built-in high-output amplifiers, 20-speaker tower with audio cables, 40 watt solar panel, battery clips and all mounting hardware.

CONFIGURATIONS AVAILABLE:

- Agricultural
MEGA-AG
- Crow / Raven
MEGA-CROW
- Woodpecker
MEGA-WP
- Marine / Gull
MEGA-MAR



The Bird Control 'X'-Perts

NOTE: This unit is capable of sound output up to 125 decibels. **HEARING PROTECTION IS RECOMMENDED.**

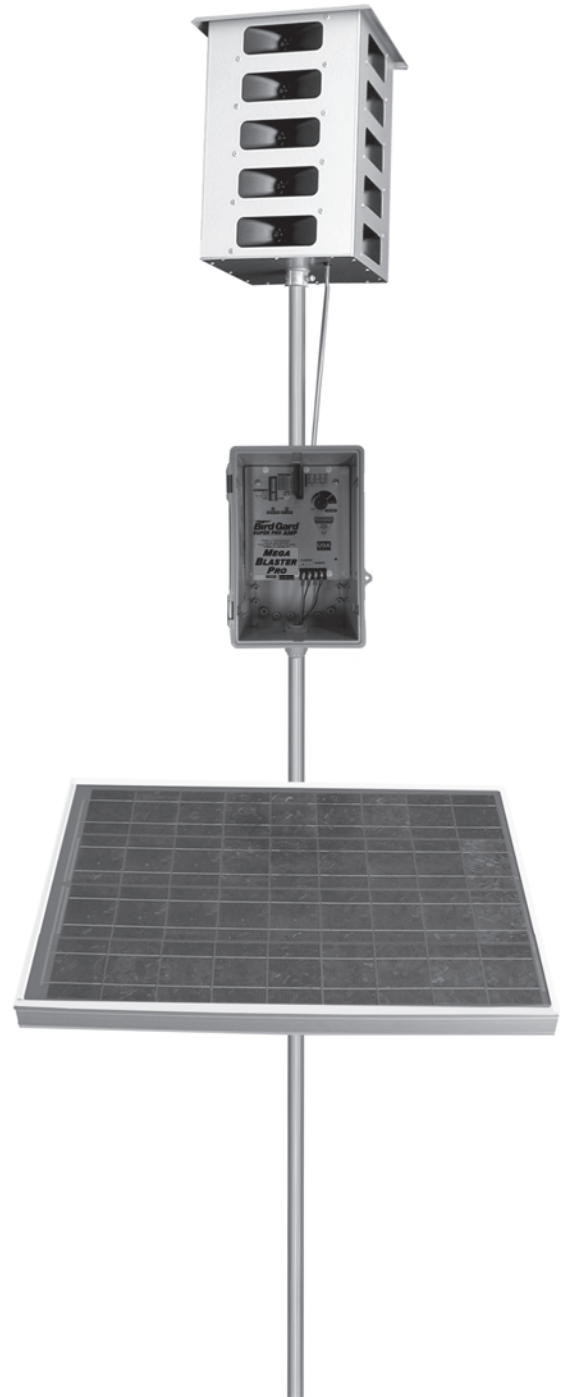


MEGA BLASTER PRO



User's Manual

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Overview

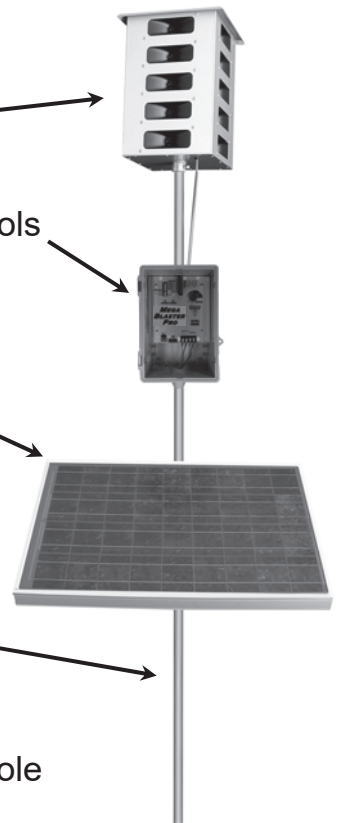
The Bird-X Mega Blaster Pro utilizes the innate power of the natural survival instincts of birds to effectively repel them. Digital recordings of distressed and alarmed birds, along with the sounds made by their natural predators are broadcast through high fidelity weather-resistant speakers over the top of areas. This action triggers a primal fear and flee response. Pest birds soon relocate to where they can feed without feeling threatened.

Your Bird-X Mega Blaster Pro system consists of:

20-Speaker Tower broadcasts the bird sounds

Control Unit produces the bird sounds and contains all operational controls

Solar Panel recharges the 12-volt deep cycle battery



Items needed but not included:

- (1) **Mounting Pole** or **Mast** tall enough to raise the 20-Speaker Tower at least 5 feet above the top of the areas, trees or other obstructions
- (1) **12-volt Deep Cycle Battery** (RV/Marine) Group 27 or larger wet cell
- (1) **T-Post** or similar (Optional) may be needed to support the mounting pole
- (1) **Bailing Wire** or **zip-tie** (Optional) to secure the Mounting Pole to the T-Post

CAUTION: THE MEGA BLASTER PRO IS CAPABLE OF PRODUCING SOUNDS UP TO 125 DECIBELS. PROPER HEARING PROTECTION MUST BE WORN ANYTIME THE UNIT IS TURNED ON.



Bird Control Management Guidelines

An active bird control management program is a key to successfully repelling pest birds. Bird feeding patterns may take several days or weeks to break. Follow all suggestions for maximum effectiveness. Read all instructions prior to installation.

For best results:

- **It is extremely important to fully protect your entire area from birds.** Any areas not fully protected will allow birds to begin feeding at the fringes of the sound coverage. They will soon become bolder and learn the sounds are nothing to fear. This will cause the effectiveness to diminish. Complete Bird-X product coverage forces birds to leave the area entirely.
- Install the Mega Blaster Pro unit at least two weeks before birds are attracted to your area. It is much easier to keep birds away before they have found a food source than it is to repel them once they have developed a feeding pattern.
- Most birds begin feeding from the perimeter of an area. Place Mega Blaster Pro units so the sound protection covers past the edges of the area.
- Birds will often use tall trees for roosting and observation. If birds are in bordering trees it is necessary to position the units so the sound protection covers the trees as well.
- Mount the 20-Speaker Tower at least five feet above trees, areas and structures for maximum coverage. The higher the better. Sound will disperse or reflect off structures or foliage. Mount control unit out of direct sun, if possible.
- When first installed, run Mega Blaster Pro units at FULL volume and on SHORT time off periods. This ensures maximum “bird stress” and creates a hostile environment.
- Watch for changes in bird activity and adjust the location of your Mega Blaster Pro unit if needed.
- **Check the battery and unit settings often to insure continuous bird control. Be certain that the system is not turned down or has a dead battery. Field hands or harvesters may turn down the volume.**
- Changing settings and switches often helps to prevent bird habituation. Periodically change the switch settings of the eight sounds (turning them ON or OFF). NEVER turn OFF the distress calls of the target birds you are trying to repel and always keep at least one predator bird sound turned ON.
- If different bird species enter the protected area and begin causing damage contact us immediately for an updated Sound Recording Card designed to repel the new invading birds.
- Remember that the Mega Blaster Pro system is a management tool, and should be used as part of your overall bird control strategy, sometimes in conjunction with other bird control techniques and devices.

Be aware that under extreme drought or other adverse conditions, birds will disregard all deterrents and risks in order to survive

DESIGN AND CONSTRUCTION PLAN OPERATION AND MAINTENANCE PLAN CLOSURE PLAN

9.

Recycling Facility and/or Containment Checklist:

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

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

Design and Construction Plan In Ground Containments

This plan addresses construction of the earthen containments.

Magrym Engineers is providing the design of the containment and their plans are presented in this submission.

Dike Protection and Structural Integrity

The design and operation provide for the confinement of produced water, prevention of releases and prevention of overtopping due to wave action or rainfall. Additionally, the design prevents run-on of surface water as the containment is surrounded by an above-grade levee (a berm) and/or diversion ditch (between the levee and the soil stockpile) to prevent run-on of surface water.

Stockpile Topsoil

Where topsoil is present, prior to constructing containment, the operator will strip and stockpile the topsoil for use as the final cover or fill at the time of closure.

Signage

The operator will place 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 sign is posted in a manner and location such that a person can easily read the legend. The sign will provide the following information:

- the operator's name,
- the location of the site by quarter-quarter or unit letter, section, township and range, and
- emergency telephone numbers

Fencing

The operator will provide for a fence to enclose the recycling containment in a manner that deters unauthorized wildlife and human access. As specified in the design drawings, the operator will employ a chain-link or game fence in addition to a four foot, four-strand wire fence. Because feral pigs, javelina and deer are present in the area, a chain link or game fence is required in order to comply with Section 19.15.34.12 D.1 of the Rule because pigs will move beneath the lower strand of a 4-strand, 4-foot high barbed wire fence and deer will jump over. However, 19.15.34.12 D.2 requires "a four-foot fence that has at least four strands of barbed wire evenly spaced in the interval between one foot and four feet above ground level". Therefore, the barbed wire specification is added to the game fence to avoid a variance.

As stated in the O&M plan, the operator will ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.

19.15.34.12 A Design and Construction Specifications

(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.
(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

19.15.34.12 B. 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

19.15.34.12 C. Signs.

The operator shall post an upright sign no less than 12 inches by 24 inches with lettering not less than two inches in height in a conspicuous place on the fence surrounding the containment. The operator shall post the sign in a manner and location such that a person can easily read the legend. The sign shall provide the following information: the operator's name, the location of the site by quarter-quarter or unit letter, section, township and range, and emergency telephone numbers

19.15.34.12 D. Fencing

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

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

Netting and Protection of Wildlife

The perimeter game/chain-link fence will be effective in excluding stock and most terrestrial wildlife. If requested by the surface owner, the game fence can include a fine mesh from the base to 1 foot above the ground to exclude the small reptiles (e.g. dune sagebrush lizard).

The recycling containment will be protective of wildlife, including migratory birds through the implementation of an Avian Protection Plan, routine inspections and the perimeter fence.

The avian protection plan includes the use of a Bird-X Mega Blaster Pro as a primary hazing program for avian species. The device will be equipped with sounds suitable for the Permian Basin environment. In addition to this sonic device, staff will routinely inspect the containment for the presence of avian species and, if detected, may use a blank cartridge or shell in a handgun, starter pistol or shotgun as additional hazing if necessary. Decoys of birds of prey may be placed on the game fence and other roosts around the open water to provide additional hazing.

The O&M plan calls for the operator to 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.

This Avian Protection Plan meets the specific language of Rule 34 as it is "otherwise protective of wildlife, including migratory birds".

Earthwork

The containment will 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.

This volume provides the stamped drawings for the containment with the following design/construction specifications:

- a) levee has inside grade no steeper than two horizontal feet to one vertical foot (2H: 1V).
- b) levee outside grade is no steeper than three horizontal feet to one vertical foot (3H: 1V)

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.

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...

19.15.34.12 A

(2) ...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

Design and Construction Plan In Ground Containments

- c) top of the levee is wide enough to install an anchor trench and provide adequate room for inspection and maintenance.
- d) The containment floor design calls for a slope toward the sump in the corner(s).

Liner and Drainage Geotextile Installation

The containment has a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions.

The primary (upper) liner is a geomembrane liner composed of an impervious, synthetic material that is resistant to ultraviolet light, petroleum hydrocarbons, salts and acidic and alkaline solutions. It is 60-mil HDPE.

The secondary liner is specified in the design drawings and is 40-mil HDPE or thicker. Attached to the engineering drawings are specifications for this material, a professional opinion regarding the equivalency of 40-mil HDPE to 30-mil LLDPE, and information on hydraulic conductivity. As stated in that opinion, liner compatibility meets or exceeds a subsequent relevant publication to EPA SW-846 method 9090A.

The recycling containment design has a leak detection system between the upper and lower geomembrane liners of 200-mil geonet to facilitate drainage. The leak detection system consists 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 containment floor design calls for a slope toward the sump in the corner(s) of the containment, as shown in the design drawings. This slope combined with the highly transmissive geonet drainage layer provide for rapid leak detection.

The liners and drainage material will be installed consistent with the Manufacturer's specifications. In addition to any specifications of the Manufacturer, protocols for liner installation include measures to:

- i. minimizing liner seams and orient them up and down, not across, a slope of the levee.
- ii. use factory-welded seams where possible.
- iii. use field seams in geosynthetic material that are thermally seamed and prior to field seaming, overlap liners four to six inches.
- iv. minimize the number of field seams and comers and irregularly shaped areas.
- v. provide for no horizontal seams within five feet of the

to install an anchor trench and provide adequate room for inspection and maintenance.

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.

19.15.34.12 A

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

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.

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...

19.15.34.12 A

(5) ...The operator shall minimize the number of field seams and corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the slope's toe. Qualified personnel shall perform field welding and testing.

19.15.34.12 A

- slope's toe.
- vi. use qualified personnel to perform field welding and testing.
- vii. avoid excessive stress-strain on the liner
- viii. The edges of all liners are anchored in the bottom of a compacted earth-filled trench that is at least 18 inches deep

At points of discharge into the lined earthen containment the pipe configuration effectively protects the liner from excessive hydrostatic force or mechanical damage during filling.

The design shows that at any point of discharge into or suction from the recycling containment, the liner is protected from excessive hydrostatic force or mechanical damage. External discharge or suction lines do not penetrate the liner.

Pumping from the containment to hydraulic fracturing operations is the responsibility of stimulation contractors. Typically, lines are permanently placed in the containment with floats attached to prevent damage to the liner system. The containment may be equipped with permanent HDPE stinger (supported by a sacrificial liner or geotextile) for withdrawal of fluid if the owner deems necessary during operations.

Leak Detection and Fluid Removal System Installation

The leak detection system, contains the following design elements

- a. The 200-mil HyperNet Geonet drainage material between the primary and secondary liner that is sufficiently permeable to allow the transport of fluids to the observation ports (Appendix A).
- b. The containment floor is sloped towards the monitoring riser pipe to facilitate the earliest possible leak detection of the containment bottom. A pump may be placed in the observation port to provide for fluid removal.
- c. Piping will withstand chemical attack from any seepage, structural loading from stresses and disturbances from overlying water, cover materials, equipment operation or expansion or contraction (see Appendix A).

(3) The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.

19.15.34.12 A

(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.

Operation and Maintenance Plan In Ground Containments

Overview

The operator will operate and maintain the lined earthen containment to contain liquids and solids (blow sand and minimal precipitates from the produced water) and maintain the integrity of the liner system in a manner that prevents contamination of fresh water and protects public health and the environment as described below. The purpose of the lined earthen containment is to facilitate recycling, reuse and reclamation of produced water derived from oil and gas wells. During periods when water for E&P operations is not needed, produced water will discharge to injection wells or to a pipeline for transfer to another recycling facility. The containment will not be used for the disposal of produced water or other oilfield waste.

The operation of the containment is summarized below.

- A. Produced water generated from nearby oil and gas wells is delivered to a treatment system located as indicated in the C-147.
- B. Unless specified in the transmittal letter, after treatment, the produced water discharges into the containment.
- C. When required, produced water is removed from the containment for E&P operations. At this time, produced water will be used for drilling beneath the freshwater zones (beneath surface casing), for well stimulation (e.g. hydraulic fracturing) and other E&P uses as approved by OCD.
- D. Whenever the maximum fluid capacity of the containment is reached, treatment and discharge to the containment ceases (see Freeboard and Overtopping Plan, below).
- E. The operator will keep accurate records and shall report monthly to the division the total volume of water received for recycling, with the amount of fresh water received listed separately, and the total volume of water leaving the facility for disposition by use on form C-148 (see attached example).
- F. The operator will maintain accurate records that identify the sources and disposition of all recycled water that shall be made available for review by the division upon request.

19.15.34.10 D

Recycling containments may not be used for the disposal of produced water or other oilfield wastes.

19.15.34.9 E

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

19.15.34.9 F

The operator of a recycling facility shall maintain accurate records that identify the sources and disposition of all recycled water that shall be made available for review by the division upon request.

Operation and Maintenance Plan In Ground Containments

- G. The 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 will 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 operation of the lined earthen containment will follow the mandates listed below:

1. The operator will not discharge into or store any hazardous waste (as defined by 40 CFR 261 and NMAC 19.15.2.7.H.3) in the containments.
2. If the containment's primary liner is compromised above the fluid's surface, the operator will 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.
3. If the primary liner is compromised below the fluid's surface, the operator will 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.
4. If any penetration of the containment liner is confirmed by sampling of fluid in the leak detection system (see Monitoring, Inspection, and Reporting Plan; below), the operator will:
 - a. Begin and maintain fluid removal from the leak detection/pump-back system,
 - b. Notify the district office within 48 hours (phone or email) of the discovery,
 - c. Identify the location of the leak, and
 - d. Repair the damage or, if necessary, replace the containment liner.
5. The operator will install, or maintain on site, an oil absorbent boom or other device to contain an unanticipated release and the operator will remove any visible layer of oil from the surface of the recycling containment.
6. The operator will report releases of fluid in a manner consistent with NMAC 19.15.29
7. The containment will be operated to prevent the collection of surface water run-on.

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.

19.15.34.13 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.

19.15.34.13 B

(7) The operator shall install, or maintain on site, an oil absorbent boom or other device to contain an unanticipated release.

(1) The operator shall remove any visible layer of oil from the surface of the recycling containment.

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.

19.15.34.13

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

Operation and Maintenance Plan In Ground Containments

8. The operator will maintain the containment free of miscellaneous solid waste or debris.
9. The operator will maintain at least three feet of freeboard for the containment and will use a free-standing staff gauge to allow easy determination of the required 3-foot of freeboard.
10. As described in the design/construction plan, the injection or withdrawal of fluids from the containment is accomplished through hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.
11. The operator shall ensure that all gates associated with the fence are closed and locked when responsible personnel are not onsite.
12. The operator will maintain the fences in good repair.

Monitoring, Inspection, and Reporting Plan

The operator will inspect the recycling containment and associated leak detection systems weekly while it contains fluids. The operator shall maintain a current log of such inspections and make the log available for review by the division upon request.

Weekly inspections consist of:

- reading and recording the fluid height of staff gauges,
- recording any evidence that the pond 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 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.

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, based on if above or below water surface, as noted above.

19.15.34.13 B

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

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.

19.15.34.12 D

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

19.15.34.13 A

The operator shall inspect the recycling containment and associated leak detection systems weekly while it contains fluids. The operator shall maintain a current log of such inspections and make the log available for review by the division upon request.

Operation and Maintenance Plan In Ground Containments

Monthly, the operator will:

- A. Inspect the containment for dead migratory birds and other wildlife. 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.
- B. 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.
- C. Record sources and disposition of all recycled water.

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

Freeboard and Overtopping Prevention Plan

The method of operation of the containment allows for maintaining freeboard with very few potential problems. When the capacity of the containment is reached (3-feet of freeboard), the discharge of produced water ceases and the produced water generated by nearby oil and gas wells is managed by an injection well(s).

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

- I. Cease discharging produced water to the containment.
- II. Accelerate re-use of the produced water for purposes approved by the Division.
- III. Transfer produced water from the containment to injection wells.

The reading of the staff gauge typically occurs daily when treatment operations are ongoing and weekly when discharge to the containment is not occurring.

19.15.34.12 E

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.

19.15.34.9 E

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

19.15.34.9 F

The operator of a recycling facility shall maintain accurate records that identify the sources and disposition of all recycled water that shall be made available for review by the division upon request.

Protocol for Leak Detection Monitoring, Fluid Removal and Reporting

As shown in Appendix A, the leak detection system includes a monitoring system. Any fluid released from the primary liner will flow to the collection sump, where fluid level monitoring is possible at the monitoring riser pipe associated with the leak detection system.

Staff may employ a portable electronic water level meter to determine if fluid exists in the monitoring riser pipe. Obtaining accurate readings of water levels in a sloped pipe beneath a containment can be a challenge. An electrician's wire snake may be required to push the probe to the bottom of the port and the probe may be fixed in a 2-inch pipe "dry housing" to avoid false readings due to water condensation on the pipe. There are many techniques to determine the existence of water in the sumps – including low flow pumps and a simple small bailer affixed to an electrician's snake. The operator will use the method that works best for this containment.

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

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

Operation and Maintenance Plan In Ground Containments

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

Quarterly Inspection Log Sheet - Containment

Inspect weekly while fluids present (>1 foot); Monthly when fluids <1 foot							
Inspection	Inspector	Describe any			Report Fluid Freeboard	Leak Detection System Functioning (yes/no)	Comments
Date	(Initials)	1. Tear of Liner 2. Break in Berms and Run-on of Stormwater 3. Dead Wildlife 4. Oil on Fluid					
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		
			None Observed		Yes Describe		

Weekly inspections consist of:

- reading and recording the fluid height of staff gauges,
- recording any evidence that the pond 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 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.

Monthly, the operator will:

- A. Inspect the containment for dead migratory birds and other wildlife. 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.
- B. 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.
- C. Record sources and disposition of all recycled water.

Overview

After operations cease, the operator will 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 operator shall substantially restore the impacted surface area to

- a. the condition that existed prior to the construction of the recycling containment or
- b. to a condition imposed by federal, state trust land or tribal agencies on lands managed by those agencies as these provisions govern the obligations of any operator subject to those provisions,

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.

Excavation and Removal Closure Plan – Protocols and Procedures

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

1. The operator will remove all liquids from the containment and either:
 - a. Dispose of the liquids in a division-approved facility, or
 - b. Recycle, reuse or reclaim the water for reuse in drilling and stimulation.
2. The operator will close the recycling containment by first removing all fluids, contents and synthetic liners and transferring these materials to a division approved facility.
3. After the removal of the containment contents and liners, soils beneath the containment will be tested by collection of a five-point (minimum) composite sample which includes stained or wet soils, if any, and that sample shall be analyzed for the constituents listed in Table I of 19.15.34.14.
4. After review of the laboratory results:
 - a. If any contaminant concentration is higher than the parameters listed in Table I, additional delineation may be required, and the operator must receive approval before proceeding with closure.

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.

19.15.34.14 E

The operator shall substantially restore the impacted surface area to the condition that existed prior to the construction of the recycling containment.

19.15.34.14 G

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

19.15.34.14 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.

19.15.34.14 C

(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.

- b. If all contaminant concentrations are less than or equal to the parameters listed in Table I, then the operator will proceed to
 - i. backfill with non-waste containing, uncontaminated, earthen material - Or
 - ii. undertake an alternative closure process pursuant to a variance request after approval by OCD.

Reclamation and Re-vegetation

- 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 in the first favorable growing season following closure of a recycling containment.

Closure Documentation

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.

The operator shall notify the division when reclamation and re-vegetation are complete. Specifically the notice will document that all ground surface disturbing activities at the site have been completed, and a uniform vegetative cover has been established that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds.

19.15.34.14 C

(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.

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.

19.15.34.14 D

Within 60 days of closure completion, the operator shall submit a closure report on form C-147, including required attachments, to document all closure activities including sampling results and the details on any backfilling, capping or covering, where applicable. The closure report shall certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in division rules or directives.

19.15.34.14 H

The operator shall notify the division when reclamation and re-vegetation are complete.

19.15.34.14 F

Reclamation of all disturbed areas no longer in use shall be considered complete when all ground surface disturbing activities at the site have been completed, and a uniform vegetative cover has been established that reflects a life-form ratio of plus or minus fifty percent (50%) of pre-disturbance levels and a total percent plant cover of at least seventy percent (70%) of pre-disturbance levels, excluding noxious weeds.

GENERAL SITING CRITERIA DEMONSTRATION AND SITE SPECIFIC GROUNDWATER DATA

<u>Siting Criteria for Recycling Containment</u>	
<i>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.</i>	
<u>General siting</u>	
<p><u>Ground water is less than 50 feet below the bottom of the Recycling Containment.</u> NM Office of the State Engineer - iWATERS database search; USGS; Data obtained from nearby wells FIGURES 1-2</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA
<p>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.</p> <ul style="list-style-type: none"> - Written confirmation or verification from the municipality; written approval obtained from the municipality FIGURE 3 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA
<p>Within the area overlying a subsurface mine.</p> <ul style="list-style-type: none"> - Written confirmation or verification or map from the NM EMNRD-Mining and Minerals Division FIGURE 4 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>Within an unstable area.</p> <ul style="list-style-type: none"> - Engineering measures incorporated into the design; NM Bureau of Geology & Mineral Resources; USGS; NM Geological Society; topographic map FIGURE 5 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>Within a 100-year floodplain. FEMA map FIGURE 6</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>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).</p> <ul style="list-style-type: none"> - Topographic map; visual inspection (certification) of the proposed site FIGURE 7 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>Within 1000 feet from a permanent residence, school, hospital, institution, or church in existence at the time of initial application.</p> <ul style="list-style-type: none"> - Visual inspection (certification) of the proposed site; aerial photo; satellite image FIGURE 8 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>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</p> <ul style="list-style-type: none"> - NM Office of the State Engineer - iWATERS database search; visual inspection (certification) of the proposed site 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>Within 500 feet of a wetland. FIGURE 9</p> <ul style="list-style-type: none"> - US Fish and Wildlife Wetland Identification map; topographic map; visual inspection (certification) of the proposed site 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Geology

According to the State of New Mexico Geologic Map¹, Permian Age Tansill and Yates Formations (Pty) are exposed at the location of the proposed Catalina containment with Quaternary Alluvium (Qa) overlying Permian Salado Formation south of the containment location (Figure A1). In the northwest corner of the map, the map shows exposed Permian Seven Rivers Formation exposed on the south and eastern shore of (former) Lake McMillan. The Permian Salado Formation, which overlies the Tansill, is exposed along the east of the map. Also shown in Figure A1 are the Major Johnson Springs, along the Pecos River downstream from (former) Lake McMillan. Figure A2 shows Brantley Dam, Brantley Lake, and the absence of Lake McMillan on a recent air photograph.

The Lake McMillan South 7.5-minute geologic quadrangle map² presents a slightly different interpretation of the geology and the differences are best understood by examining Figures 1a and 1b. The quadrangle map shows the containment is adjacent to and south of outcropping Tansill formation (Pt) and is within Quaternary (Pleistocene?) alluvium and eolian deposits. North of the containment location, the quadrangle map suggests the aeolian and alluvium is a thin veneer over the Tansill Formation (Qaes/Pt) and, further to the northwest, the veneer overlies the mixed gypsiferous facies of the Yates Formation (Pymg). In the eastern third of Figure 1b, the map shows the aeolian and alluvium overlying the Permian Salado Formation (Qaes/Ps) as well as exposed Salado. The contact between the Salado and underlying Tansill Formation (beneath the Quaternary veneer) is shown as a dashed line that runs through the northern boundary of the containment area.

The quadrangle map suggests that beneath the Quaternary deposits south of the proposed containment is probably the Salado Formation or the lower Rustler Formation – as the map does not differentiate between these two units in the legend. The legend describes these undifferentiated units as:

Irregular masses of gypsum, dolomite (Prc), and salt in large blocks scattered on surface and outcrops with chaotic bedding orientations. Exposed in eastern and southern part of quadrangle.

Finally, south of the containment area the map shows an elongated exposure of Quaternary (Pleistocene) alluvial gravel (Qqg). Our examination of this exposure confirms the presence of alluvial material that is consistent with the map description of Qagp2, which is presented below:

Qagp2-alluvial sand and gravel piedmont (Pleistocene) Gray to yellow gravel, poorly sorted, angular to subrounded dolomite clasts. Sand composed of quartz and locally carbonate cemented. Thickness 0-~75 m.

Figure SP-1 and SP-2 (Site Photographs) show the nature of the exposed alluvial material. Qagp2.

¹ <https://geoinfo.nmt.edu/publications/maps/geologic/state/home.cfm>

²

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKewjeoZGvofHtAhUDOs0KHRHgAx4QFjAAegQIBBAC&url=https%3A%2F%2Fgeoinfo.nmt.edu%2Fpublications%2Fmaps%2Fgeologic%2Fofgm%2Fdownloads%2F97%2FLakeMcMillanSouthReport.pdf&usg=AOvVaw1f9T38Bdxz0Sb37DnQTc71>

An important feature of the Tansill, Yates and Seven Rivers Formations is the two different depositional and therefore hydrogeologic facies that exist between Lake McMillan and Carlsbad. All of these stratigraphic units are composed dominantly of carbonate rocks adjacent to but northwest of the Capitan Reef (beneath Carlsbad). Further north and west of the Capitan Reef, which was a barrier reef of the deeper marine environment of the Delaware Basin, each of these three “back-reef” formations transition from shallow water carbonates rocks to shallower water shelf evaporites of the marine shelf that surrounds the basin. In the immediate area of the Catalina containment, the Tansill contains carbonate rocks (dolomite) and gypsum-rich siltstones, suggesting a transition or mix between the two facies.

We logged the cuttings of a 120-foot auger-drilled boring for the conductor pipe of the Catalina oil well that is adjacent to the proposed containment. The log of the boring is presented in Appendix Well Logs, and is presented below:

10-18 feet	Alluvium: brown, fine sand; caliche
18-63 feet	Tan, loose siltstone with 10-30% interbedded green-gray dolomite. Dolomite beds are massive (1 mm-5 cm vesicles observed at 40 ft, most filled with siltstone)
63-68 feet	Red, massive clay; minor tan silt, loose
68-74 feet	Red, massive clay; clast and veins of white and clear gypsum/selenite
74-94 feet	Massive purple-red clay interbedded with white and pink gypsum; <5% green “sugar” dolomite clasts
94-110 feet	Loose, medium red silt interbedded; 30% green/gray/yellow vesicular (1-2 mm) dolomite
110-113 feet	Red-brown silt with thin layers of red-brown siltstone and gypsum (1-2 mm thick)
113-120 feet	Dark red silt interbedded with 40% dolomite, green-gray, massive
120 feet	Dust dry cuttings

The geology of the area near the containment is also described in the Karst section of this submission.

Distance to Groundwater

Figures 1a, 1b, 2a and 2b, with the discussion below demonstrates that groundwater (fresh water as defined by NMOCD Rules) at the location is greater than 100 feet beneath the containment. A boring located several hundred feet due south of the proposed containment verify that groundwater is greater than 120 feet below land surface.

Figure 1a is topographic map with the New Mexico state geologic map that shows:

1. The Catalina containment identified by the turquoise square.
2. Water wells from the OSE database as a blue triangle inside colored circles that indicate well depth (CP and C). OSE wells are often miss-located in the WATERS database as older wells are plotted in the center of the quarter, quarter, quarter, of the Section Township and Range.
3. Water wells from the USGS database as large triangles color-coded to the formation from which the well draws water.

4. Water wells, which are not documented in the public databases but were identified by field inspection or other published reports as colored squares (MISC).
5. The depth-to-water from the most recent available measurement for each well is provided adjacent to the well symbol.

Figure 1b shows the same data as Figure 1a on a recent aerial photograph that shows Brantley Dam, Brantley Lake, and the absence of Lake McMillan.

Figure 2a is a water table elevation map that reproduces Plate 4 of in *Geology and Hydrology Between Lake McMillan and Carlsbad Springs Eddy County, New Mexico, Water Supply Paper 1828, 1967*³. Note that the two “zones” (2 and 4) are identified east of the Pecos River on the map between Lake McMillan (now silted in due to the development of Brantley Lake) and Lake Avalon.

Zone 2 is described in WSP 1828 as a karst aquifer in the evaporite facies of the Seven Rivers Formation that captures seepage from Lake McMillan, via sinkholes in some areas near and beneath the lake and transmits the water to Major Johnson Springs. WSP 1828 states that the eastern boundary of Zone 2 is defined by the transition from the evaporite facies to the carbonate facies of the Seven Rivers Formation. Because the hydraulic conductivity of the carbonate facies is many times lower than the karstic aquifer of the evaporite facies, groundwater water levels are almost 100 feet lower in wells to the southeast of the Zone 2 boundary, in Zone 6 and Zone 4. The transition zone between evaporite facies and carbonate facies of the Seven Rivers Formation is the location of Brantley Dam. The Bureau of Reclamation selected this location in order to minimize water loss via the karst aquifer of the Seven Rivers Formation. Zone 2 is not materially important to understanding the groundwater system beneath the Catalina containment.

The Catalina containment is within Zone 4, which is described as groundwater in the Yates and Tansill Formations between Major Johnson Springs (now Brantley Dam) and Lake Avalon. WSP 1828 indicates that the Tansill is above the regional water table and groundwater in the Yates flows generally through solution channels.

USGS-10009, plots 1.5 miles west of the Catalina containment. This location is in the USGS database, in WSP 1828, and was measured in 2015, but we found no evidence of this well on Google Earth. For reasons explained below, we believe this well does exist near the location plotted on the maps.

Figure 2b is the 7.5-minute quadrangle geologic map that shows:

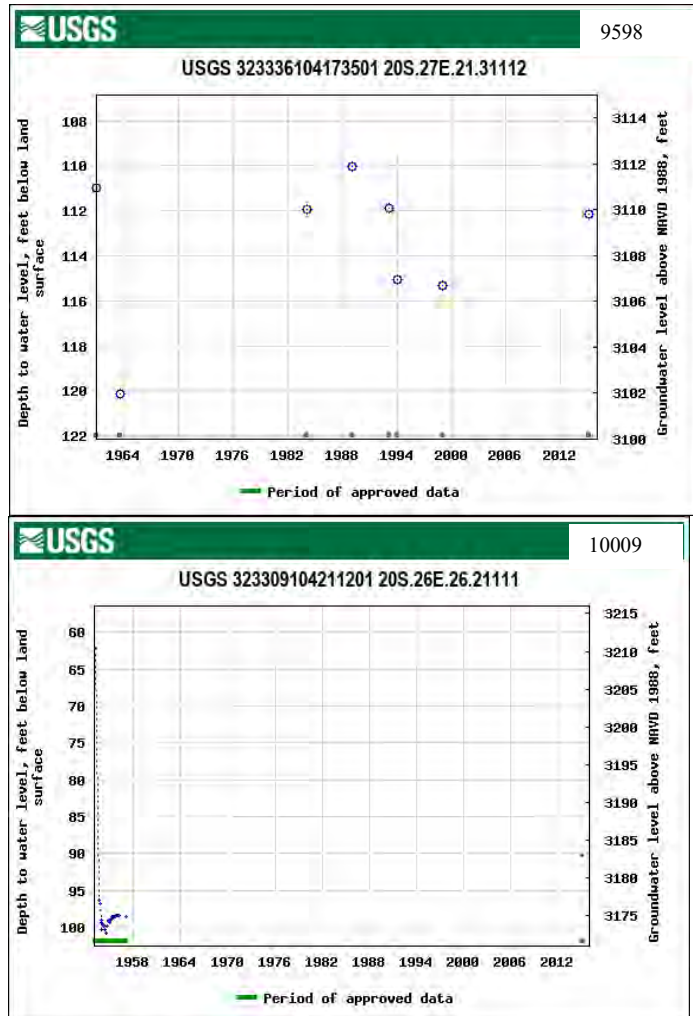
1. The Catalina containment identified by the turquoise square with a measured surface elevation of 3242.
2. Water wells measured by the USGS, the year of the measurement and the calculated elevation of the groundwater surface.
3. Isocontour lines displaying the elevation of the groundwater surface in Permian the Yates and Tansill Formations east of the Pecos River. Note that the contour interval is 10 feet.

³ <https://pubs.er.usgs.gov/publication/wsp1828>

We relied upon the most recent data measured by the USGS and published data. Field examination of wells with older measurements indicated that a current measurement of depth to groundwater was not feasible. Water level data from the OSE database rely upon observed water levels by drillers during the completion of the water well. The OSE dataset provides some useful data in certain areas but these data were not used to develop the groundwater elevation data of Figure 2b. Based upon our field survey and examination of Google Earth images, we are confident that the wells shown Figure 2b are located less than ¼ mile of the plotted point, except as noted above for USGS-1009.

Because much of the groundwater elevation data on Figure 2b are decades old, we evaluated historical data from USGS-9598⁴, which is presented in the graph to the right. The water elevation in this well varies by 10 feet over the 55-year measurement record. Because Figure 2b presents a contour interval of 10 or 60 feet, this variation of measurement observed in USGS-9598 is not material.

As indicated above, we could not find USGS-10009 in the field. The graph below shows that historic observations agree with detailed water level measurements required in advance of selection of a location for Brantley Dam. The measurements also show, with the exception of the first measurement in March of 1953 (which we suspect was obtained immediately after drilling this well), that groundwater levels vary by 10 feet between the early measurements and the 2015 measurement. Like well USGS-10009, groundwater elevations are stable over time.



These data and the 120-foot-deep auger boring conducted for the conductor pipe for the oil well adjacent to the containment (see Appendix Well Logs) allow us to confidently conclude:

1. Groundwater elevation beneath the proposed containment is lower than 3115 feet above sea level.
2. The surface elevation of the 120-foot conductor pipe boring for the Catalina 30 EH State 1H is 3244.

⁴ https://nwis.waterdata.usgs.gov/nwis/gwlevels/?site_no=323336104173501

3. At 120-feet, the auger boring cuttings were dust dry.
4. The containment is located north (uphill) of this well.
5. The depth from the proposed bottom of a 25-foot-deep containment is greater than 120 feet.

Distance to Municipal Boundaries and Fresh Water Fields

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

- The closest municipality is Carlsbad, NM approximately 12.5 miles to the south.
- The closest public well is CP-0076 and is located 6.9 miles to the southeast.
- The closest well fields are west of Carlsbad.

Distance to Subsurface Mines

Figure 4 and our general reconnaissance of the area demonstrate the proximity of surface mines to the containment. This location is not within an area overlying a subsurface mine.

- The nearest mapped surface mine is approximately 3.3 miles to the southwest of the Catalina containment.

Distance to High or Critical Karst Areas

The presence of karst features within an area proposed for the storage of treated recycle water for E&P (e.g., hydraulic stimulation) can be problematic for two reasons. First, as suggested in Part 34.11 of OCD Rules, a produced water recycling containment must be located within a stable area. For the benefit of our clients, a portion of Part 34 is presented below with **emphasis added**:

19.15.34.11 SITING REQUIREMENTS FOR RECYCLING CONTAINMENTS:

*A. An operator shall **not locate a recycling containment**:*

*(8) **within an unstable area unless the operator demonstrates that it has incorporated engineering measures into the design to ensure that the containment's integrity is not compromised**;*

Unstable area is defined in 19.15.2.7 as

*U.(6) "Unstable area" means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a division-approved facility's structural components. **Examples of unstable areas are areas of poor foundation conditions, areas susceptible to mass earth movements and karst terrain areas where karst topography is developed as a result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features of karst terrain include sinkholes, sinking streams, caves, large springs, and blind valleys.***

In addition to potential instability of the containment foundation, karst features, such as sinkholes, open fractures or other conduits can provide a direct link between the surface and groundwater. Thus, a release from the containment within an area of high karst could introduce a large volume of saline water to an underlying water table aquifer over a relatively short time.

Caverns, interconnected cavities, sinkholes, and strata deformation due to dissolution of the limestone, dolomite, and gypsum are described in *Geology and Hydrology Between Lake McMillan and Carlsbad Springs Eddy County, New Mexico, Water Supply Paper 1828, 1967* within all of the Permian strata in the area of the proposed containment. WSP 1828 describes groundwater flow through interconnected karst features in the Seven Rivers Formation in the area that is now covered by Brantley Lake. WSP 1828 states that interconnected solution

features in carbonate rocks of the Tansill and Yates Formations transmit groundwater between Major Johnson Springs (now beneath Brantley Lake) and Lake Avalon and thence to Carlsbad Springs. However, WSP 1828 also indicates that the Tansill Formation is generally above the water table in the area north and west of Lake Avalon, except where perched water may exist in drainages, such as Dagger Draw.

The area of the proposed containment is correctly mapped by the BLM as high karst potential as it relates to drilling surface casing for an oil well and the potential for lost circulation into open fractures or cavities. However, the data and discussion below permit a conclusion that geologic evidence does not support a classification of this area as “high karst potential” as it applies to the two characteristics described above: near-surface ground instability and conduits between the ground surface and groundwater.

Figures 5a and 5b show the location of the Catalina storage containment with respect to BLM Karst areas. The proposed containment is located within an area mapped by BLM as “high” potential karst area (Figure 5a). About 1.5 miles east of the proposed containment BLM maps the area as moderate potential karst and critical karst is about 2 miles south. Figure 5a shows the containment within the exposed Permian Tansill and underlying Yates Formations (Pty). East of the containment, the Permian Salado Formation (Psl) is exposed. The Permian Seven Rivers Formation underlies the Yates Formation and is mapped in the northwest quadrant of Figure 5a. Quaternary Alluvium is in the Pecos River Valley and the Dagger Draw, which are south and east of the proposed containment. The large-scale State of New Mexico geologic map is the source of the data for Figure 5a.

Figure 5b shows the geology from the Lake McMillan South 7.5-minute geologic map⁵, which is a more detailed presentation than the state map. The boundaries between High, Moderate and Critical karst areas are also shown on the map. On Figure 5b, the containment lies on the contact between the upper Tansill and overlying Salado Formation. North and west (down section) from the containment, the map shows Quaternary alluvial and eolian deposits are a relatively thin veneer over the Tansill (Pt) and Yates Formations (Pymg, mixed silty gypsiferous facies). In the northwestern corner of Figure 5b the Azotea Tongue dolomite crops out.

With respect to ground instability and susceptibility of a water table aquifer to deleterious impacts from the containment, the nature of the Tansill Formation is most important and, to a lesser degree, the overlying alluvium, and underlying Yates Formation. The lithology of the two Permian bedrock units is described below verbatim from the Lake McMillan South geologic map.

Ptmsg---Tansill Formation—mixed silty gypsiferous facies (Guadalupean)--Mixed dolomite, sandy siltstone, and gypsum. White to light gray dolomite, thinly to medium bedded, vesicular, associated with yellow sandy dolomite and dolomitic sandstones in float. Well sorted, sublitharenite, chert grains, orange-red, interbedded with gypsum and white to light gray dolomite. Poorly exposed.

5

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKewiumJKZkNbtAhWVKM0KHaw9AmsQFjABegQIBRAC&url=https%3A%2F%2Fgeoinfo.nmt.edu%2Fpublications%2Fmaps%2Fgeologic%2Fofgm%2Fdetails.cfm%3Fvolume%3D97&usg=AOvVaw1IIvDIrDSQn8s2aB_s5yfN

Pymg---Yates Formation—mixed gypsiferous facies (Guadalupian)--Gypsum with minor dolomite, siltstone, and sandstone. green to white to red gypsiferous siltstone to silty gypsum to pure gypsum in 2-m-thick intervals interbedded with orange-red siltstone or dolomite. Gypsum is typically massive or has fibrous radiating crystals up to cms in dia. Locally brecciated. Gypsum is also interbedded with dolomite in thin beds. Gypsum veins also present. Dolomite is pink to salmon to very light gray, massive to vesicular, thinly bedded, and exhibits local chicken wire textures, rippenstein weathering, and crinkly laminations. Sandstone is yellow, locally silica cemented. Gypsum interbedded with dol and siltstone on a m scale. Folded into domes and basins. This facies makes up the strike valley and low hills paralleling, and SE of, the Lake McMillan escarpment. Forms caverns.

(Pyms or) Psd---(Yates Formation—mixed facies or) Azotea Tongue dolomite (of Kelley 1971) (Guadalupian)--Dolomite with interbedded siltstone, sandstone, and gypsum. Dolomite is thinly to thickly bedded, massive, yellow to light gray to pink to orange, vesicular, silty, clayey, very finely crystalline to sugary, undulose bedding, paper lams, crinkly lams, interbedded with thin to medium beds of pink dolomitic siltstone or green shale or yellow sandstone. Some very thin beds of gypsum.

As stated above, caverns form in the Yates Formation within the Lake McMillan South map. The description does not suggest caverns within the Tansill Formation. The map description indicates the lithology of the Tansill is dolomite and sandy siltstone with (probably) a lesser volume of more soluble gypsum. The boring to 120-feet agrees with the map description. Gypsum is the dominant lithology of the upper Yates Formation. Thicknesses of these two units are not provided in the legend for the Lake McMillan South map. However, the geologic cross-section with the map suggests the Tansill Formation is about 200 feet thick and the thickness of the underlying Yates Formation is approximately 300 feet.

The alluvium mapped in Figure 5b that is relevant to this analysis is Qaes and Qag. As indicated in the geology section, Qagp2 is exposed south of the containment and the description of this unit is repeated below.

Qagp2-alluvial sand and gravel piedmont (Pleistocene) Gray to yellow gravel, poorly sorted, angular to subrounded dolomite clasts. Sand composed of quartz and locally carbonate cemented. Thickness 0-~75 m.

The alluvium mapped as Qaes is described below from the Lake McMillan South Geologic Map. Qaes-alluvial and eolian deposits (Pleistocene (?) to Holocene)-Brown (7.5 YR 6/4), silty clay to silt to sand, well sorted, subangular to subrounded grains composed of 70% quartz and 30% carbonate and chert. Unit locally weathers into badlands and exhibits piping. Common veneer on nearly all Quaternary deposits in the map area and commonly overlies Psg and Pymg. Thickness ≤10 m.

As suggested in the title, *Geology and Hydrology Between Lake McMillan and Carlsbad Springs Eddy County, New Mexico, Water Supply Paper 1828, 1967* provides some good information regarding the geohydrology of the area. However, the geologic map of this report does not agree with the 7.5-minute quadrangle referenced above or the New Mexico state geologic map. The location of the containment, Section 30 (20S 27E), is shown as underlain by the Yates Formation in WSP 1828 and the Tansill Formation in the 7.5-minute quadrangle and the state geologic map.

While we are skeptical of the mapping and cross-section provided in WSP 1828, we believe the lithologic descriptions, which appear to be based upon outcrop, are accurate. We are confident that the descriptions of the different facies of the Tansill and Yates Formations are accurate as it would be based upon previous studies of others and observations within the area of study. Moreover, the description of the two facies, carbonate and evaporite, make perfect sense with respect to their depositional environment. However, the location of the facies changes for the various formations described in the report cannot be accurate, because the geologic mapping is not accurate.

WSP 1828 accurately describes how the facies of the Tansill and underlying Yates formation change from a dominate carbonate lithology in the shelf immediately behind the Capitan barrier reef complex that defines the margin of the Delaware Basin to a shallow water evaporite facies that is dominated by calcium sulfate evaporites (e.g., gypsum). As the lithologic descriptions presented above testify, around the proposed containment, the Tansill is comprised of dolomite, siltstone, and gypsum (mixed silty gypsiferous facies) and the underlying upper Yates is dominantly gypsum (mixed gypsiferous facies).

As stated earlier, the lithology of the boring is consistent with the description of the Tansill Formation mixed silty gypsiferous facies from the South McMillan Lake 7.5-minute geologic quadrangle map. The boring did not encounter any large voids. We believe the description of the underlying Yates Formation from the 7.5-minute quadrangle map (above) is accurate. The boring also confirms that depth to groundwater near the containment exceeds 120 feet from ground surface.

Although solution cavities in dolomite (carbonate facies) of the Tansill Formation transmit groundwater from Lake Avalon to Carlsbad Springs, WSP 1828 indicates that the containment lies within the carbonate facies of the Tansill and is obviously below the water table.

Our surface investigation found no evidence of karst geomorphology overlying the Tansill Formation or the Quaternary deposits.

The discussion above supports the following conclusions regarding the area near the proposed containment Section 30 (20S 27E):

1. About 20 feet of alluvium and caliche overlie the Tansill Formation at the site of the containment
2. At least 100-feet of unsaturated Tansill Formation exist beneath the Quaternary deposits.
3. The depth to groundwater near the containment is greater than 120 feet.
4. The interbedded dolomite, siltstone, and gypsum of the Tansill do not exhibit any open solution features that could transmit water from near surface to groundwater.
5. There is no evidence from examination of the ground surface, or the lithology observed in the boring that Permian Tansill Formation
 - a. is or could be unstable.
 - b. Does not exhibit solution features that could transmit fluid from the surface to groundwater.

The State Land Office requested an examination of the area south of the proposed containment for near-surface karst features where Tascosa proposes a natural gas pipeline between the new well and larger pipeline system. The presence of the sand and gravel outcrop (Qagp2) near the proposed pipeline testifies to the presence, probably in the Pleistocene, of a water flow. The sub-rounded dolomite cobbles observed in the gravel match the dolomite observed in the mapped exposure of Salado Formation to the east. Alluvial sand and gravel overlying the lowermost Salado Formation suggests to us that Pleistocene surface water flow or groundwater flow dissolved and removed any soluble constituents of the Salado in this area. Thus, it is not surprising that we found no evidence of subsidence or unstable ground in this area of the proposed pipeline.

We conclude with a high degree of scientific certainty that the proposed right of way for the pipeline lies within stable ground.

Distance to 100-Year Floodplain

Figure 6 demonstrates that the location is not located in a 100-year floodplain.

- The nearest 100-year floodplain is located approximately 1 mile to the east.

Distance to Surface Water

OCD Rule 34 establishes a 200-foot setback distance from “significant watercourse”, which is defined in Rule 17 as:

P. “Significant watercourse” means a watercourse with a defined bed and bank either named or identified by a dashed blue line on a USGS 7.5-minute quadrangle map or the next lower order tributary with a defined bed and bank of such watercourse.

And 19.15.2.7 of OCD Rules define watercourse as:

(4) “Watercourse” means a river, creek, arroyo, canyon, draw or wash or other channel having definite banks and bed with visible evidence of the occasional flow of water.

The USGS defines bank in https://water.usgs.gov/water-basics_glossary.html as:

Bank - The sloping ground that borders a stream and confines the water in the natural channel when the water level, or flow, is normal.

The USGS Glossary provides no definition for streambed. Definitions that use the term bed or stream bed, which are presented below, assume a “stream bed or streambed is the channel bottom of a stream or river, the physical confine of the normal water flow”. The definition in quotations is from Wikipedia and the terms in the USGS glossary that employ “streambed” are:

- Bed material - Sediment composing the streambed.
- Bed sediment - The material that temporarily is stationary in the bottom of a stream or other watercourse.
- Bedload - Sediment that moves on or near the streambed and is in almost continuous contact with the bed.

We understand that the USGS employs topographic maps, aerial photographs, and general knowledge of the various areas of the United States to map ephemeral streams. EPA noted that

the mapping protocol can underestimate the number of ephemeral streams. In New Mexico, Hicks Consultants ground surveys identified several instances where the USGS mapping was not accurate. As discussed below, we conclude the mapped watercourse in the area of concern is one such error in mapping.

We carefully examined the mapped watercourse on the ground in November 2020 paying special attention to areas of concern for siting of containments. The subject area of field investigation includes one mapped watercourse shown in Figure 7a. This topographic map shows the drainage basin and the mapped watercourse. About 220 feet north of the watercourse is the area where Tascosa Energy will construct the in-ground Catalina containment and potentially place an AST Containment in the future. Figure 7b is large.r scale image of a recent air photograph showing the mapped watercourse and an erosional channel to the east

Figures SP-3 and SP-4 in the Site Photos Appendix show the nature of the lowest elevation areas of the mapped watercourse. No bed or bank exists and there is no evidence of water flow. We conclude that the USGS mapping of an ephemeral stream in this channel is incorrect. Stormwater flows in the channel only during large precipitation events. Nevertheless, the area in of the containment(s) meets the 200-foot setback requirement of Rule 34.

Figure SP-5 shows the nature of an area that appears on Google Earth as a possible “next order tributary” of the mapped watercourse. The swale in which the cattle track lies is barely perceptible and there is no evidence of flow. During a 100-year or 500-year precipitation event, some water may flow in this swale. The engineering design diverts possible flow from this swale to the north, into a larger swale that is also a cattle track.

Distance to Permanent Residence or Structures

Figure 8 and the site visit demonstrates that the location is not within 1000 feet from an occupied permanent residence, school, hospital, institution, church, or other structure in existence at the time of initial application.

- No occupied permanent residences, schools, hospitals, institutions, churches, or other structures are located within 1000 feet of the site.

Distance to Non-Public Water Supply

Figures 1 and 7 demonstrates that the location is not within 500 horizontal feet of a spring or fresh water well used for domestic or stock watering purposes, in existence at the time of initial application.

- Figure 1 shows the locations of all area water wells, active or plugged.
- The nearest well is USGS-9938, which is located .85 miles northwest of the site.
- There are no known domestic water wells located within 1,000 feet of the proposed pits.
- No springs were identified within the mapping area (see Figure 7)

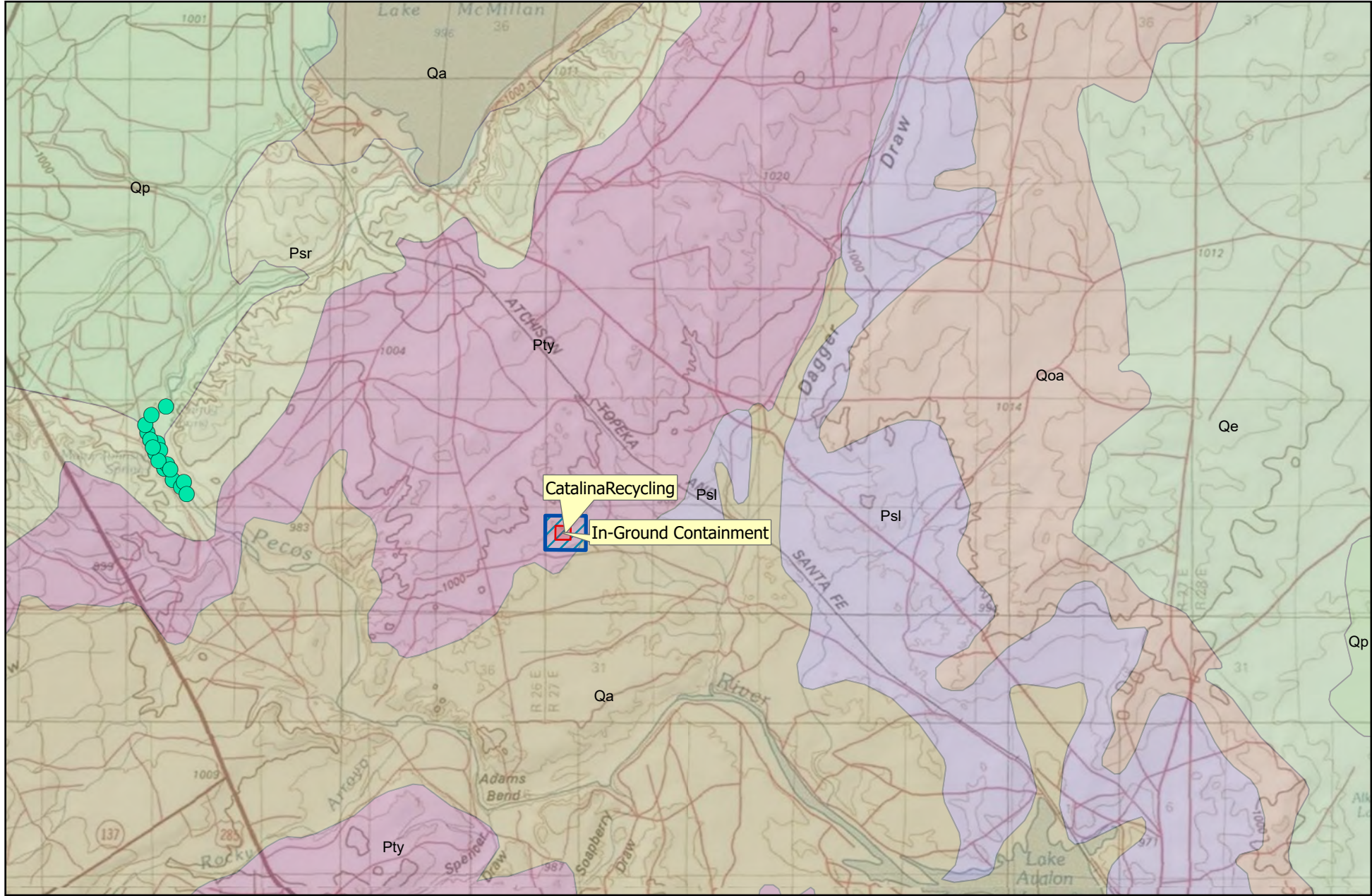
Distance to Wetlands

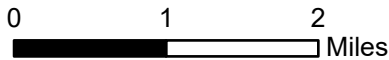
Figure 9 demonstrates the location is within 300 feet of wetlands.

- The nearest designated wetland is a “riverine” wetland. It is approximately 250 feet north of the northwestern corner of the containment.



Figures





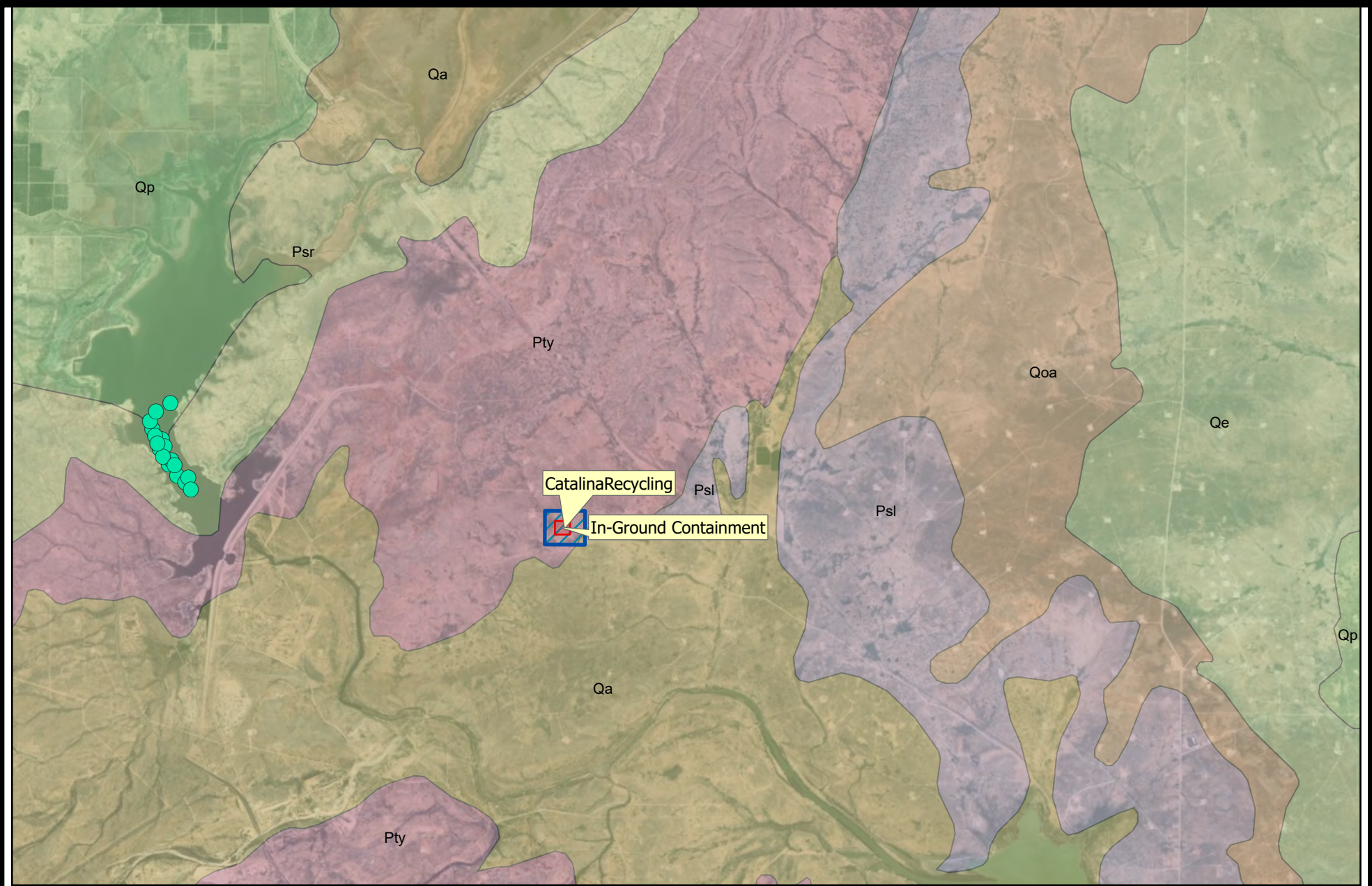
R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Regional Geology over 1978 Topographic Map Legend

Tascosa Energy - Catalina Containment

Figure A1

January 2021



0 1 2 Miles

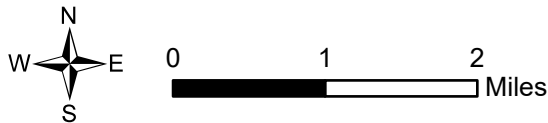
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Albuquerque, NM 87104
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Regional Geology over Aerial Map

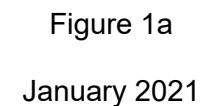
Tascosa Energy - Catalina Containment

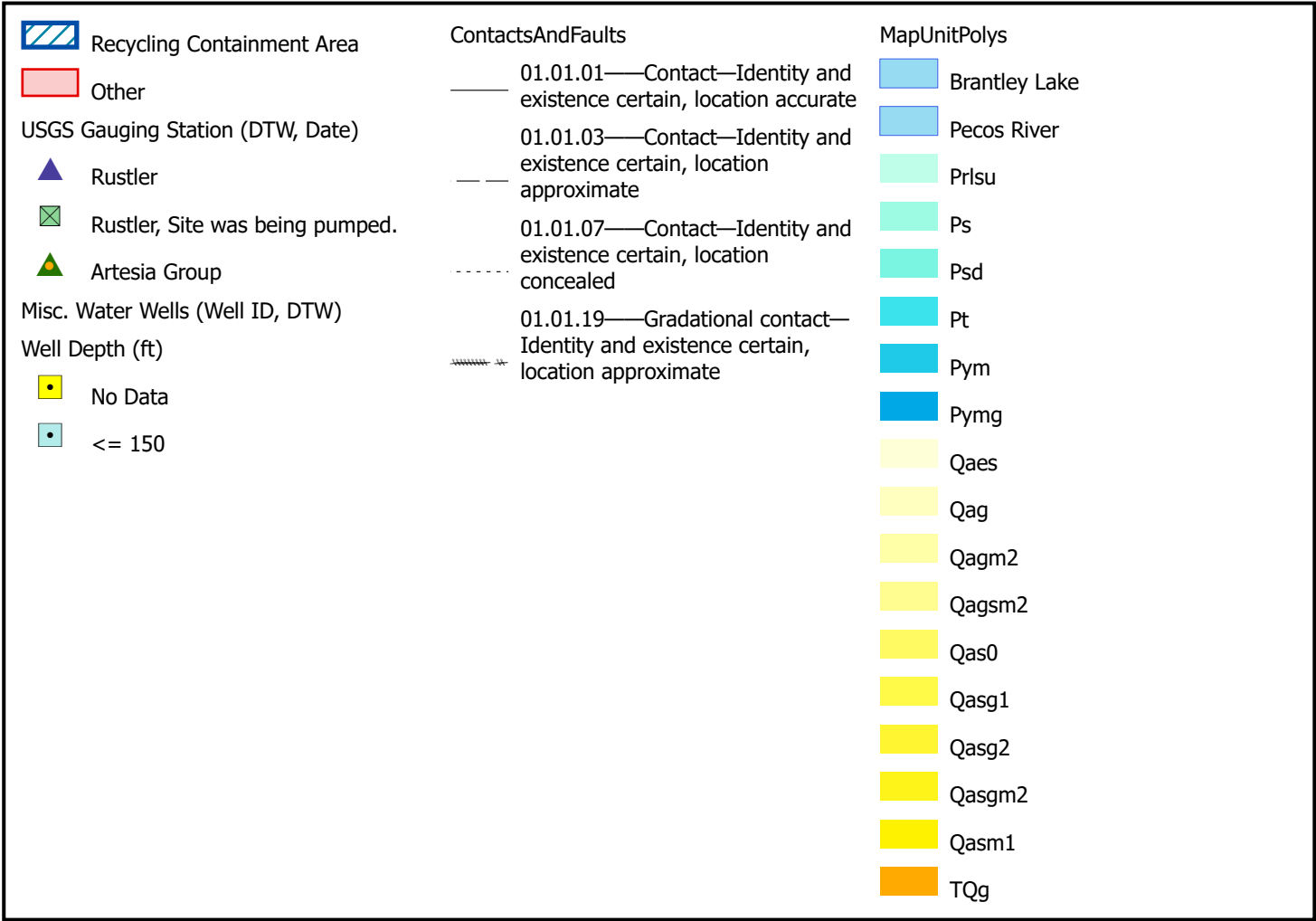
Figure A2

January 2021



<u>R.T. Hicks Consultants, Ltd</u> 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Regional Geology over Aerial Map Legend	Figure A2
	Tascosa Energy - Catalina Containment	January 2021





0 2,640 5,280
US Feet

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Wells, Depth to Groundwater, Geology Legend
Tascosa Energy LLC - Catalina Recycling Project

Figure 1a
January 2021

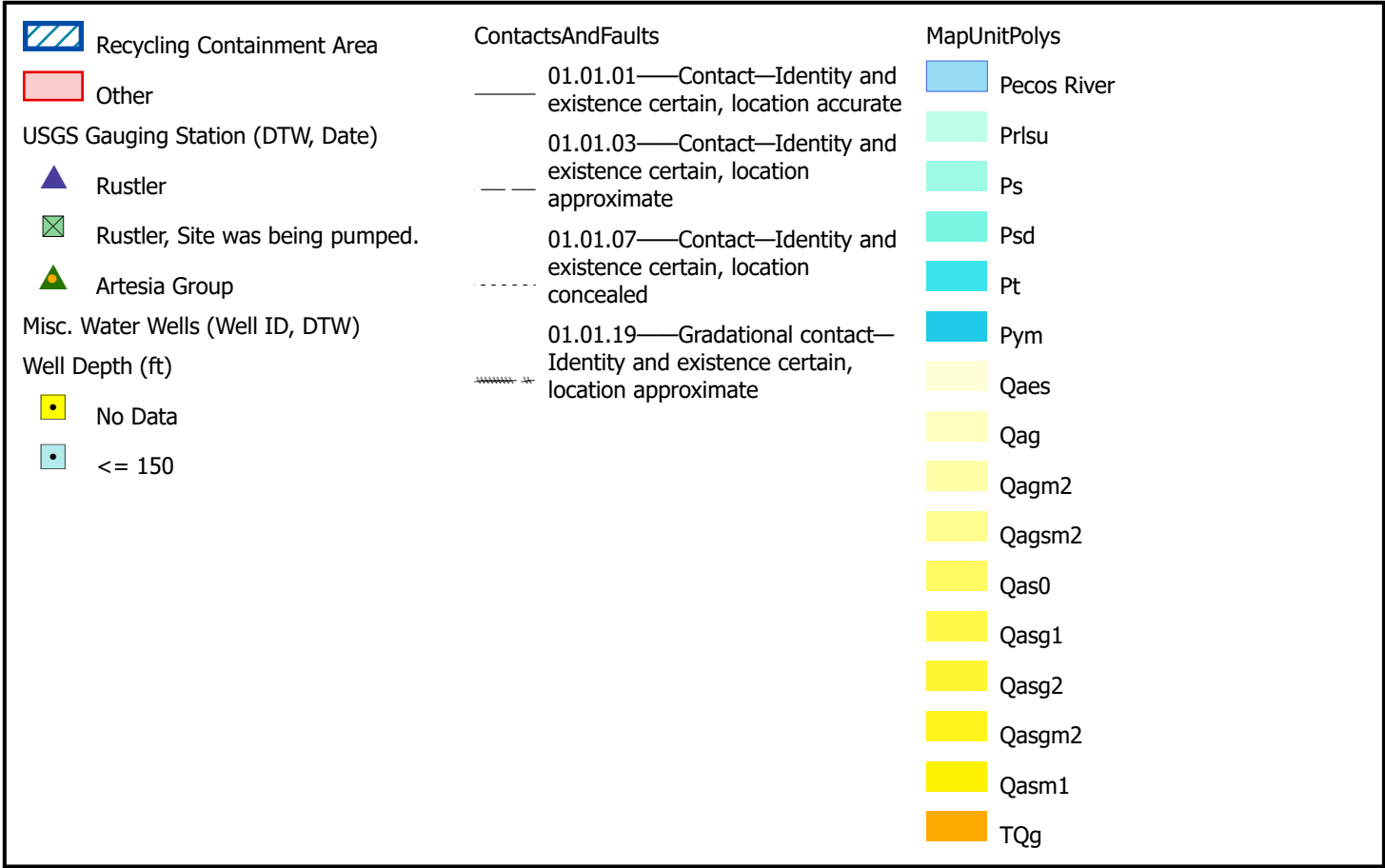


A horizontal scale bar with a black outline. It is divided into two sections: the left section is solid black and represents 2,000 feet, and the right section is white with a black outline and represents another 2,000 feet, totaling 4,000 feet. Above the bar, the numbers 0, 2,000, and 4,000 are printed. To the right of the bar, the text "US Feet" is printed.

Geology From 7.5-Minute Quadrangle & DTW
Tascosa Energy LLC - Catalina Recycling Project

Figure 1b

January 2021

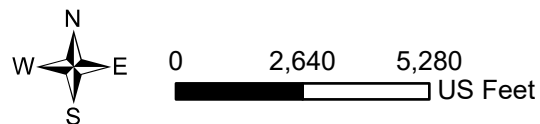
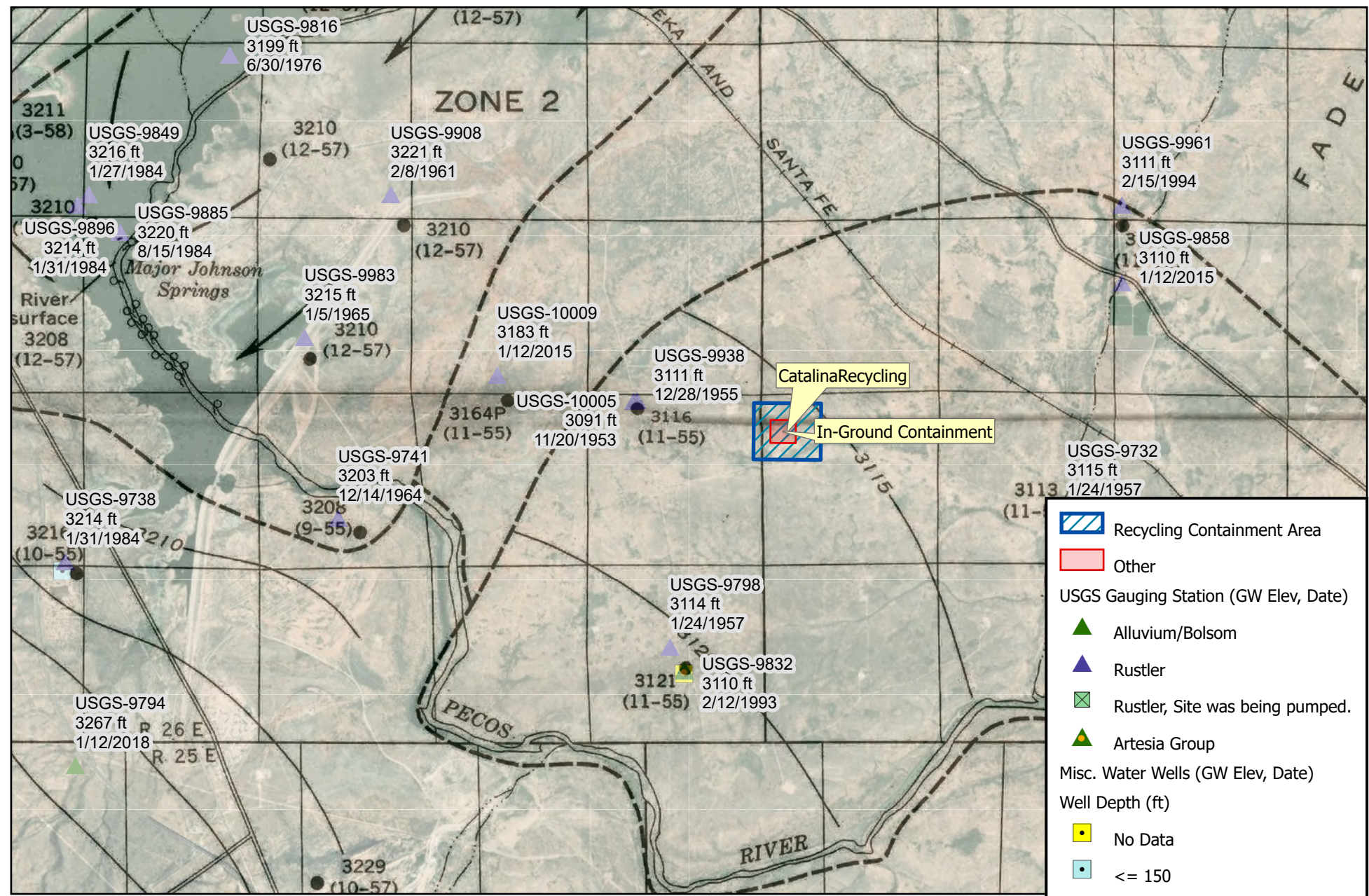


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US Feet

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Geology From 7.5-Minute Quadrangle & DTW Legend
Tascosa Energy LLC - Catalina Recycling Project

Figure 1b
January 2021



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Groundwater Elevation from Plate 4 USGS WSP 1828
Tascosa Energy LLC - Catalina Recycling Project

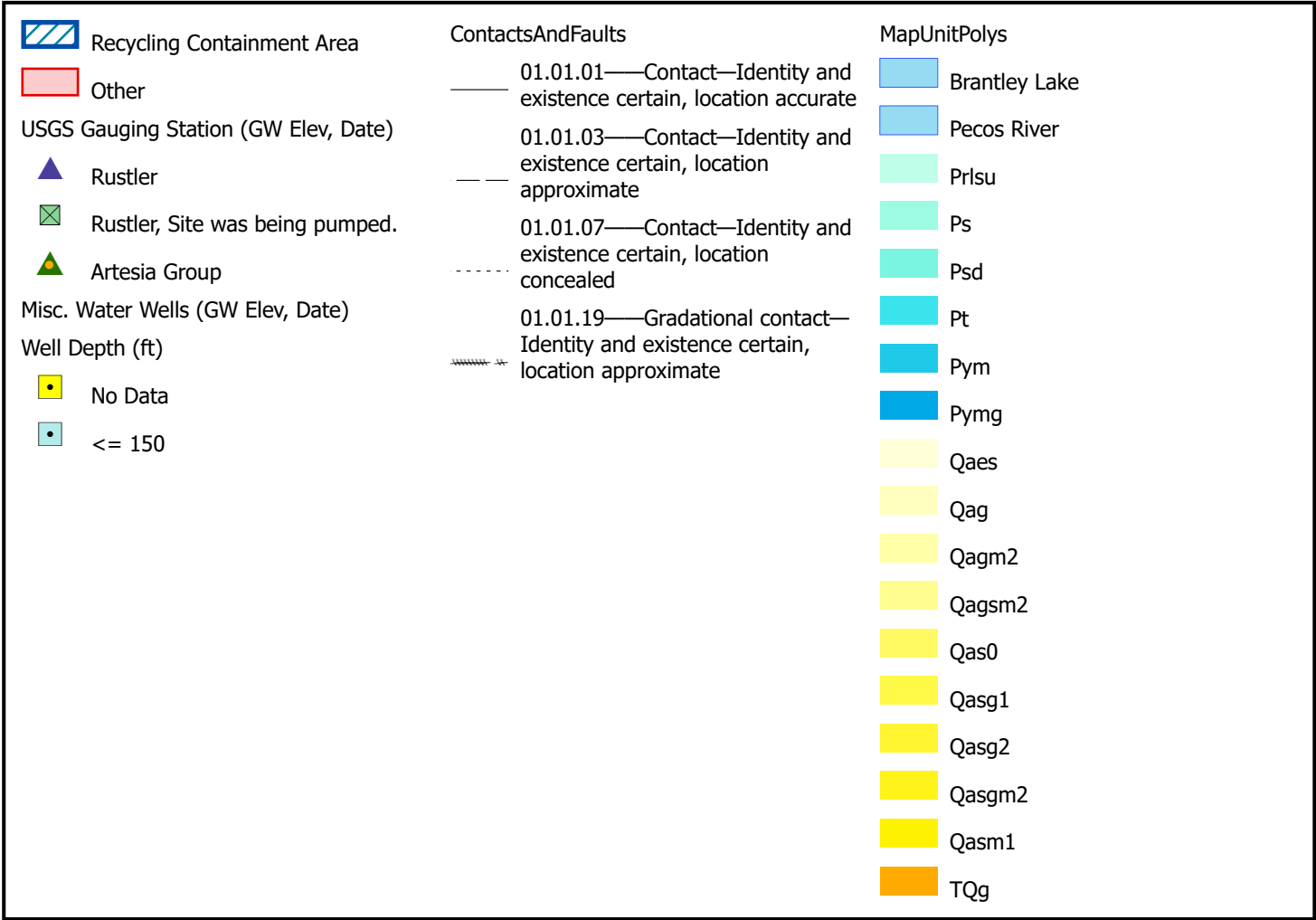
Figure 2a
January 2021



Groundwater Elevations on
Lake McMillan South Geologic Map
Tascosa Energy LLC - Catalina Recycling Project

Figure 2b

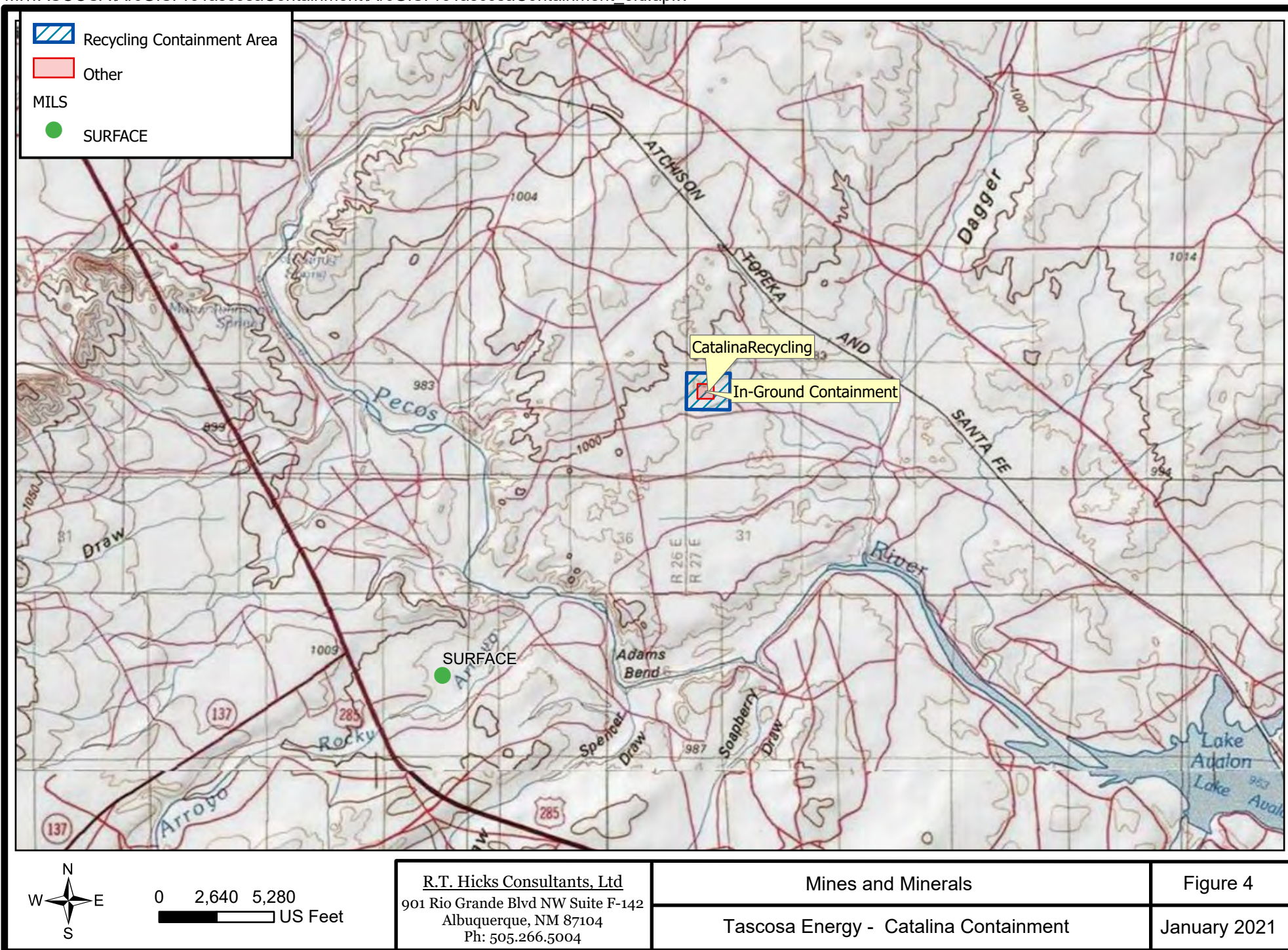
January 2021

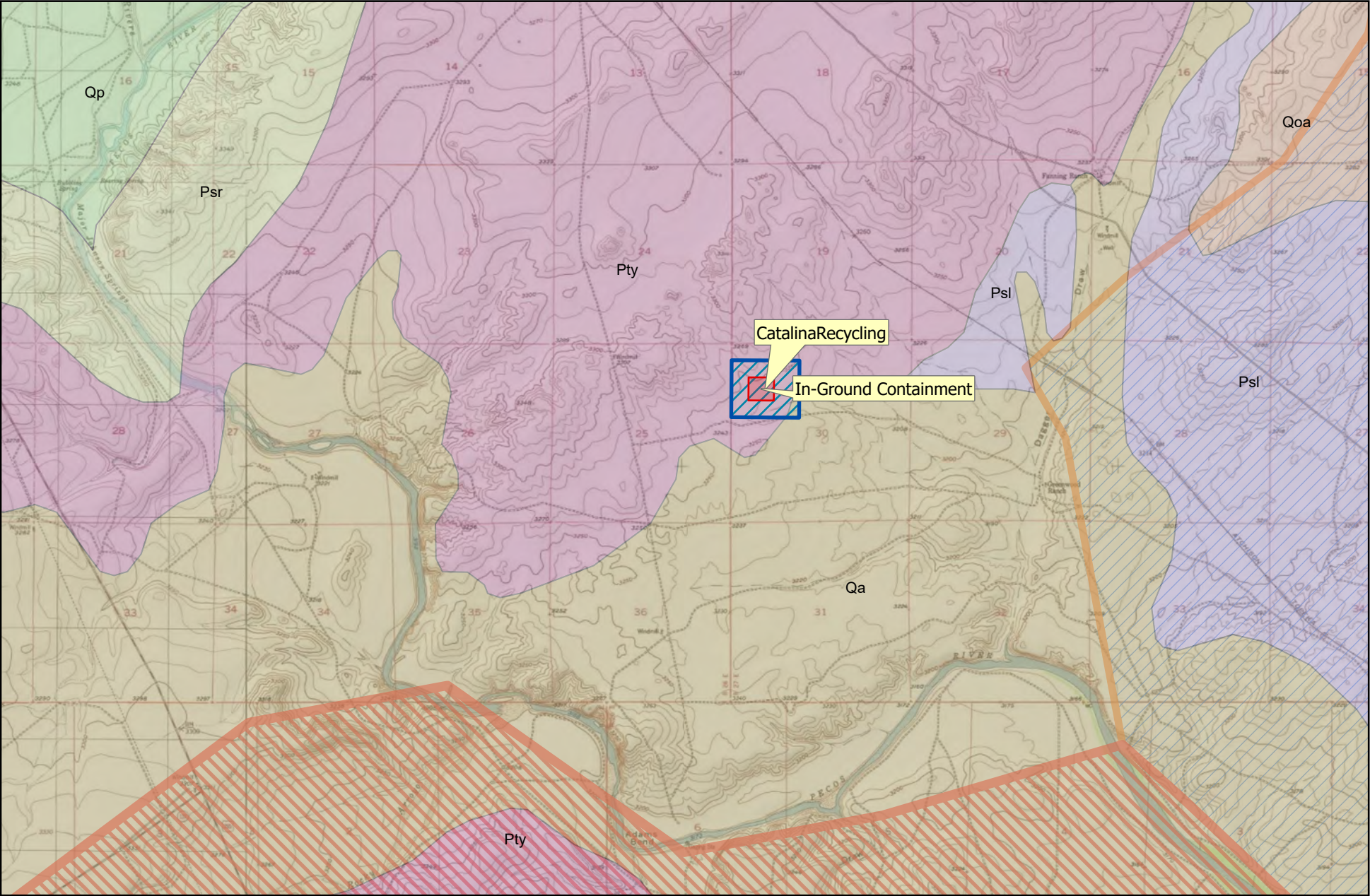


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Groundwater Elevations on
Lake McMillan South Geologic Map Legend
Tascosa Energy LLC - Catalina Recycling Project

Figure 2b
January 2021



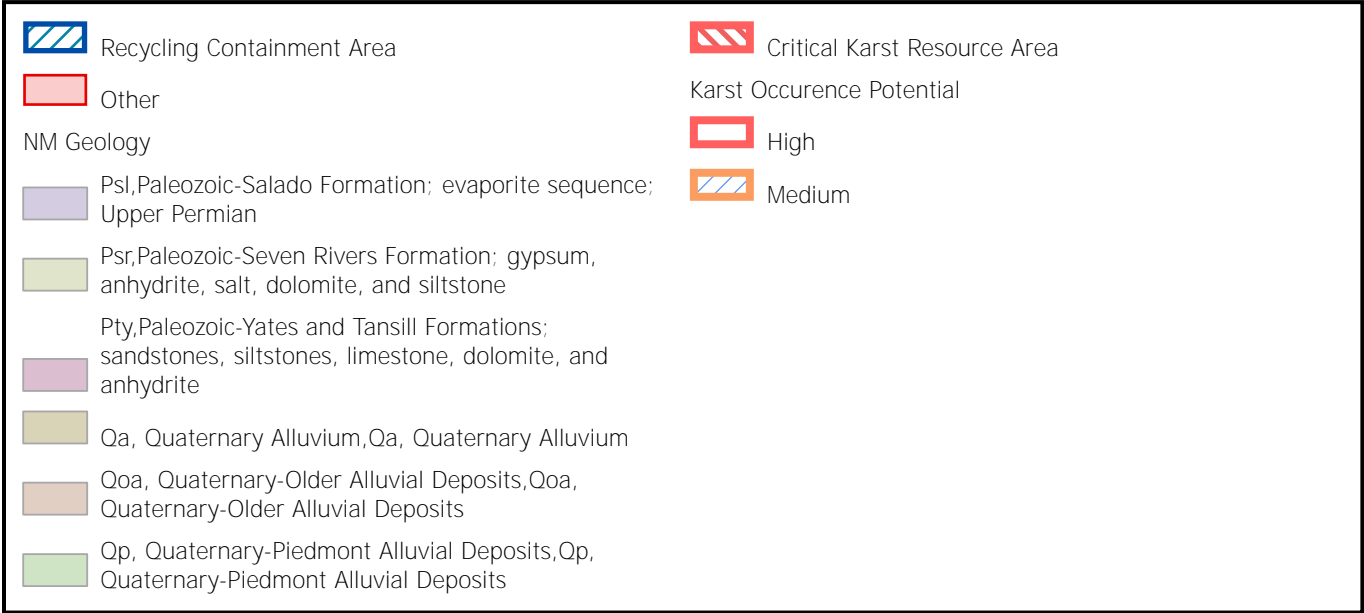


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US Feet

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BLM Karst Potential Map
Tascosa Energy LLC - Catalina Recycling Project

Figure 5a
January 2021

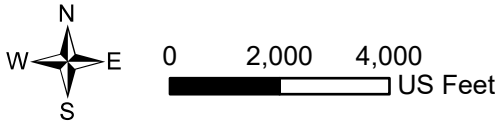
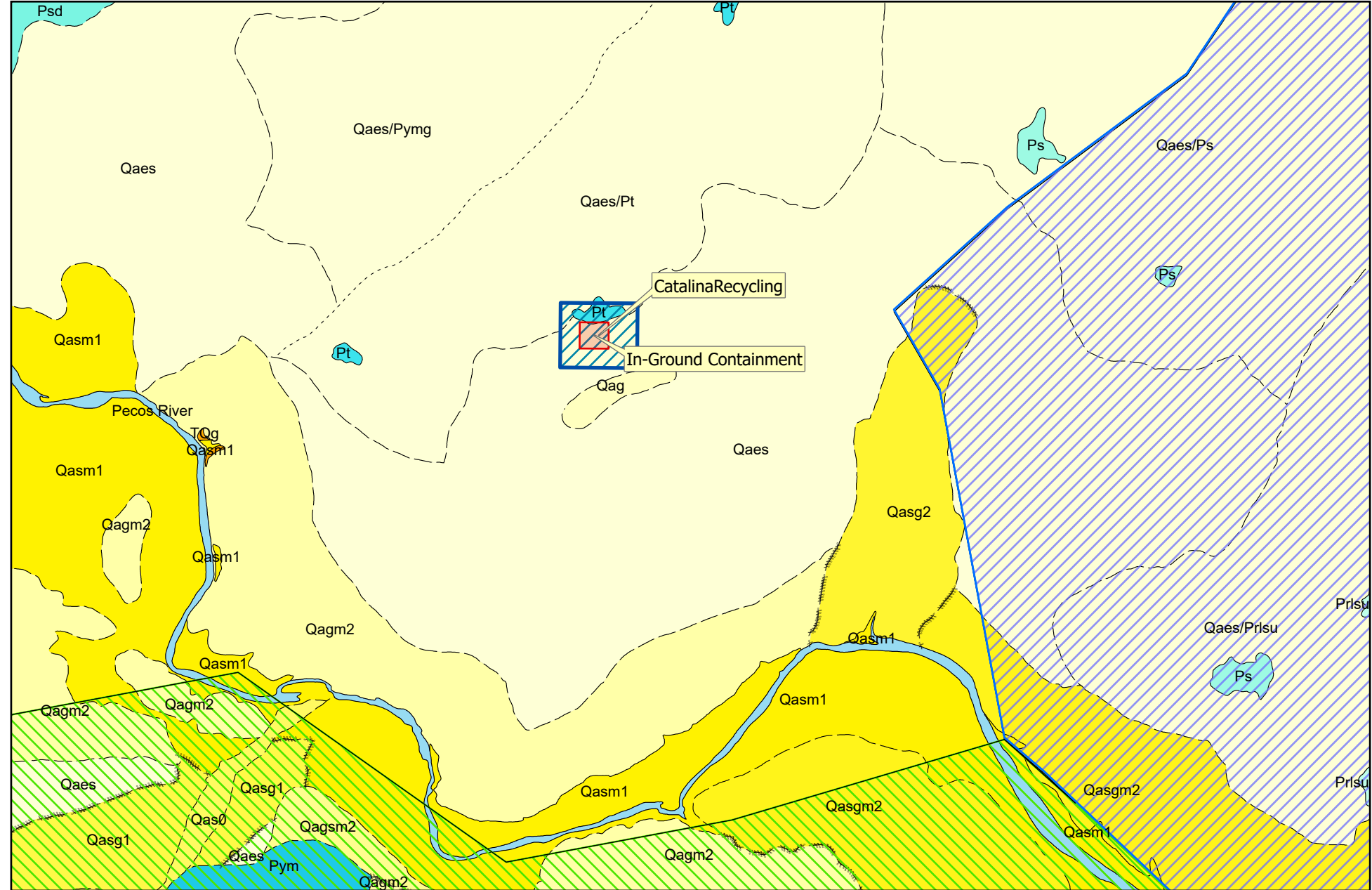


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US Feet

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BLM Karst Potential Legend
Tascosa Energy LLC - Catalina Recycling Project

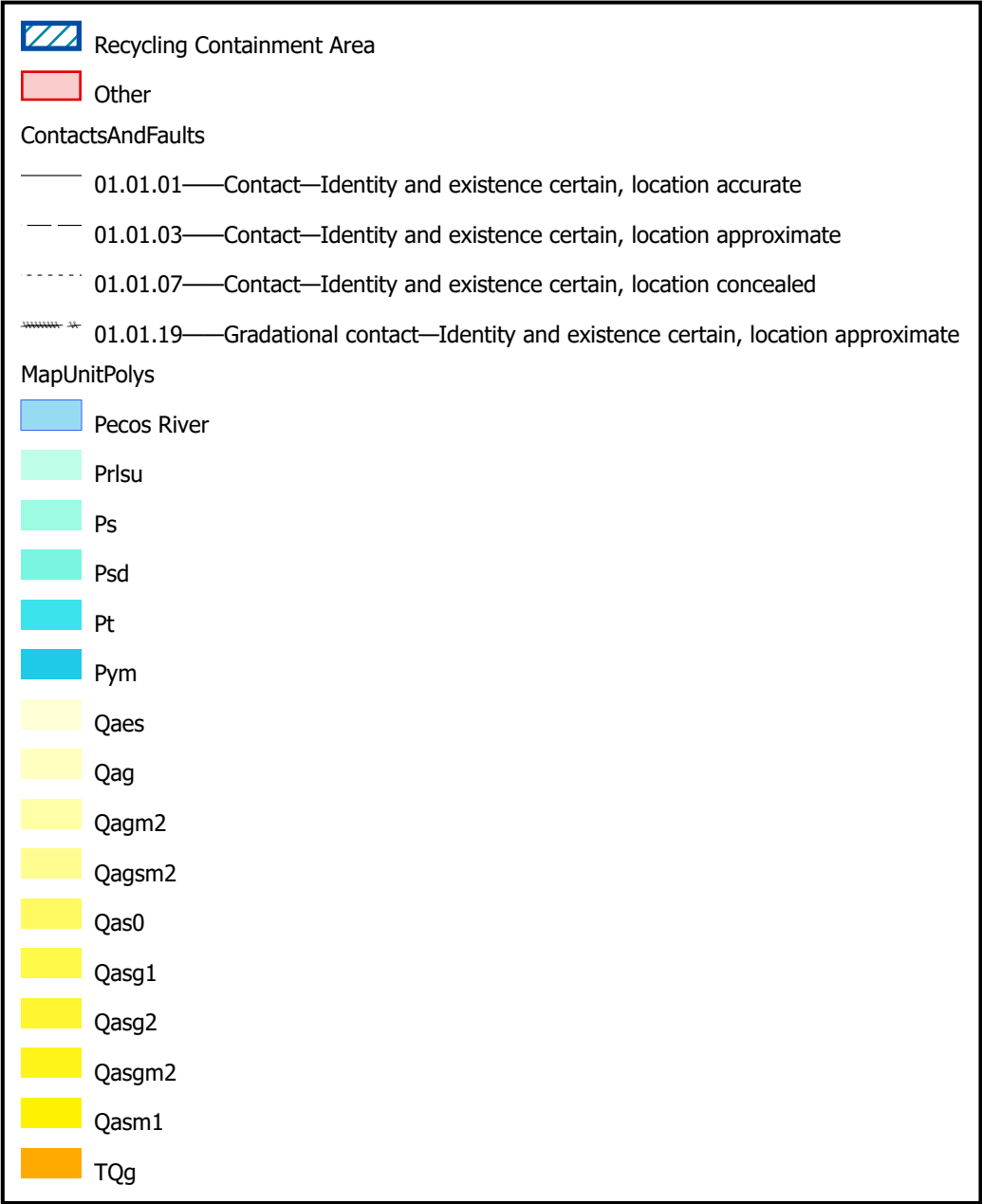
Figure 5a
January 2021



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BLM Karst Potential Map & Geology from
Lake McMillan South Quadrangle
Tascosa Energy LLC - Catalina Recycling Project

Figure 5b
Dec 2020

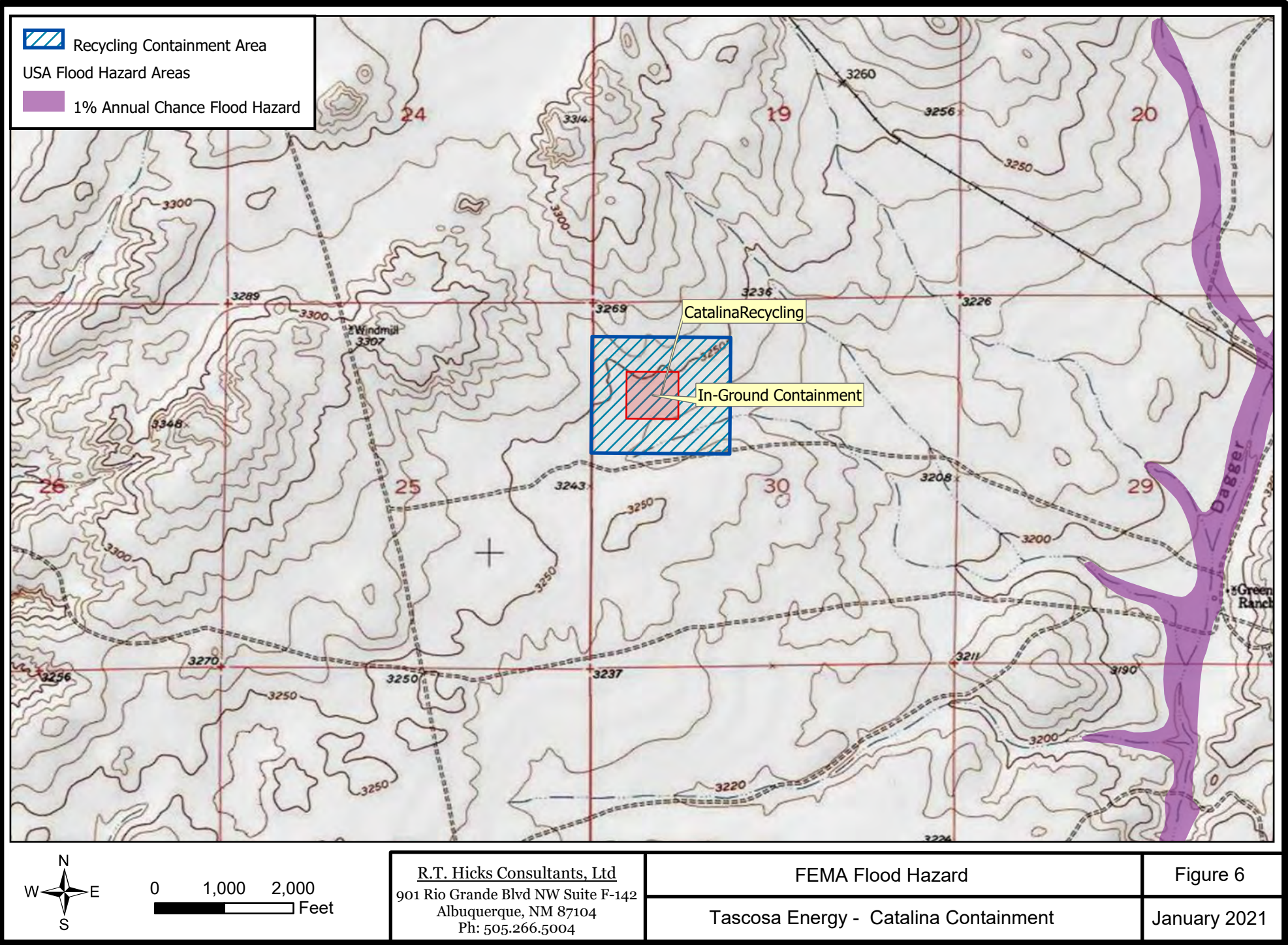


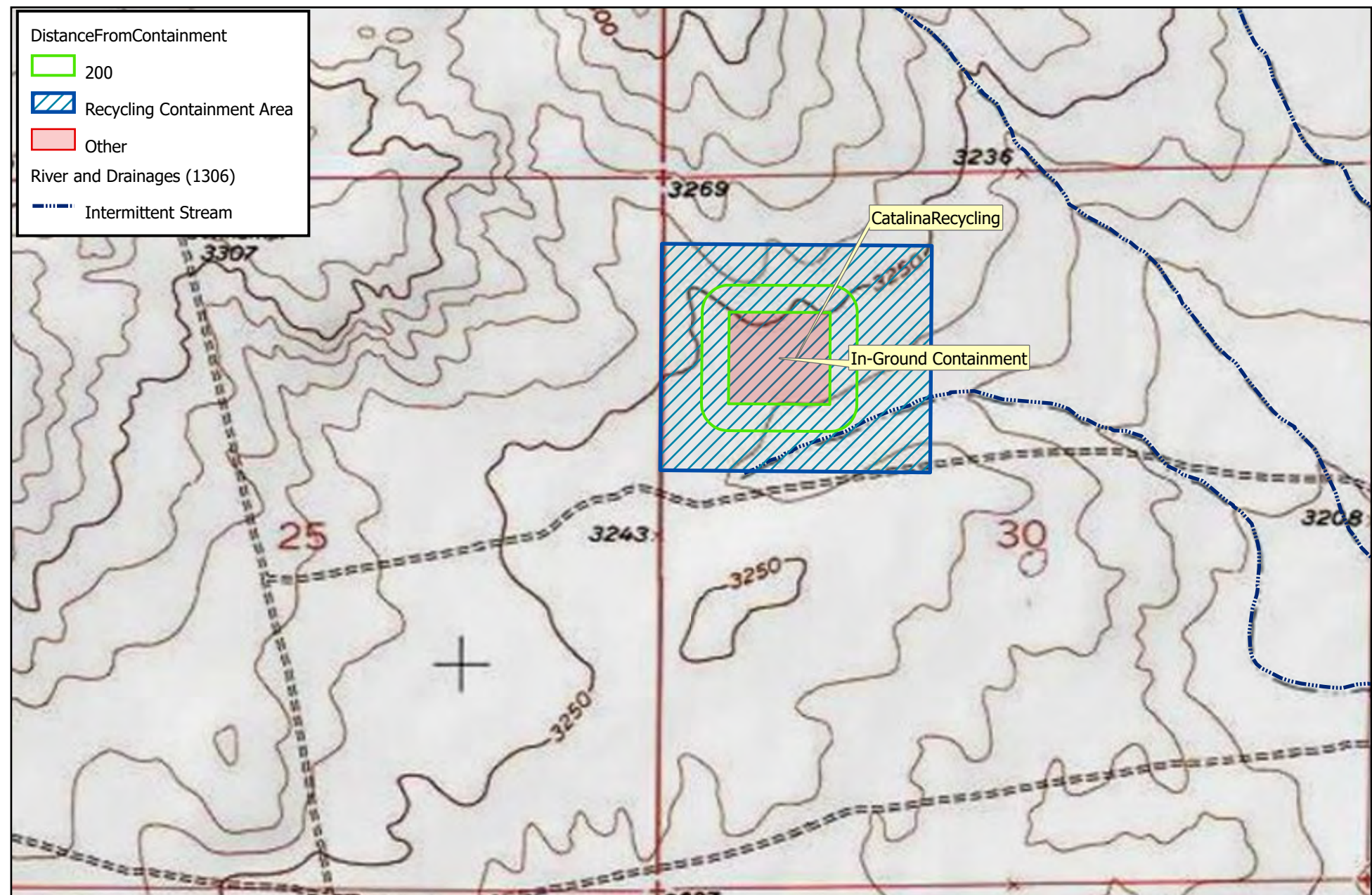
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US Feet

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BLM Karst Potential Map & Geology from
Lake McMillan South Quadrangle Legend
Tascosa Energy LLC - Catalina Recycling Project

Figure 5b
January 2021

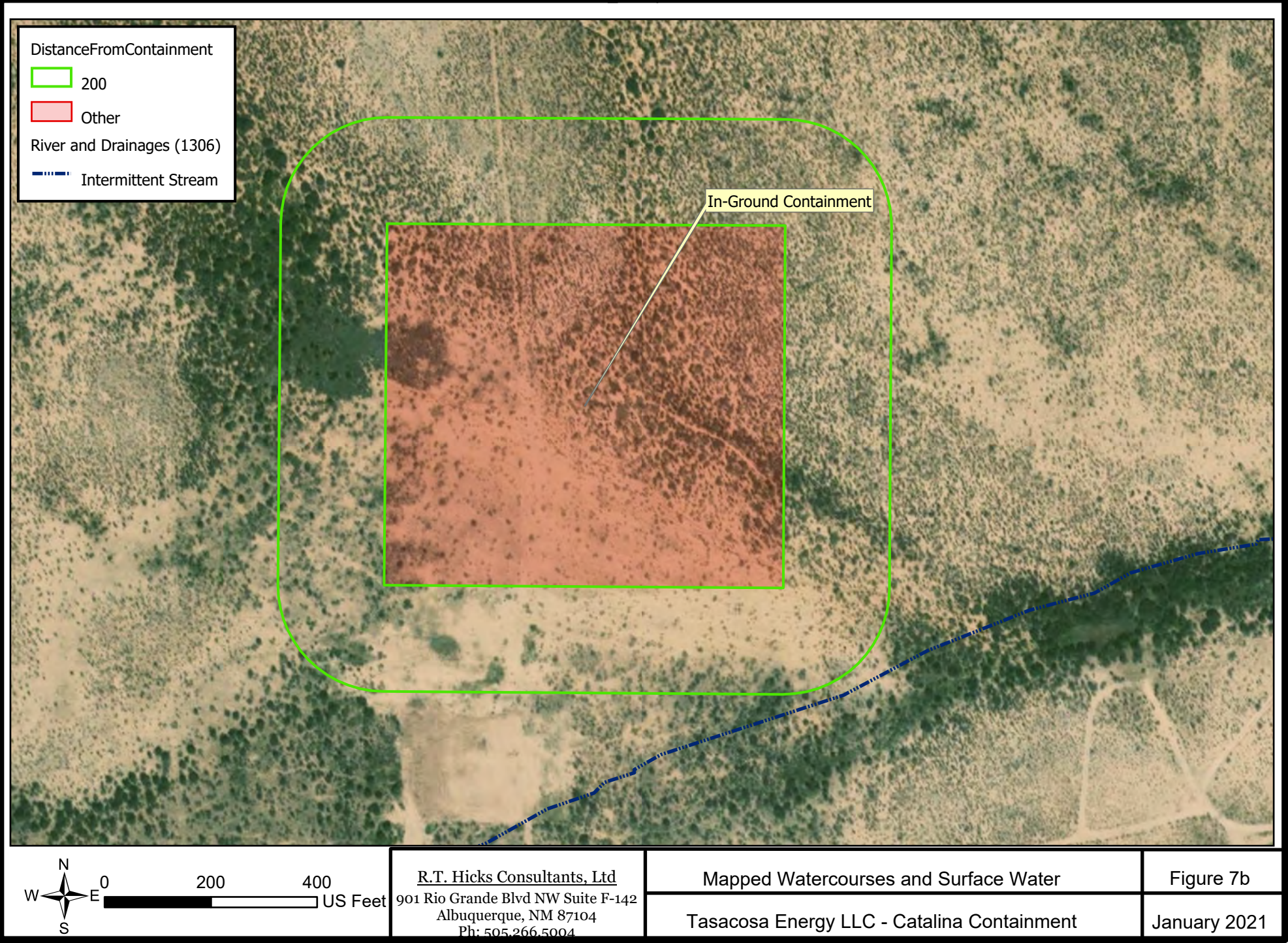




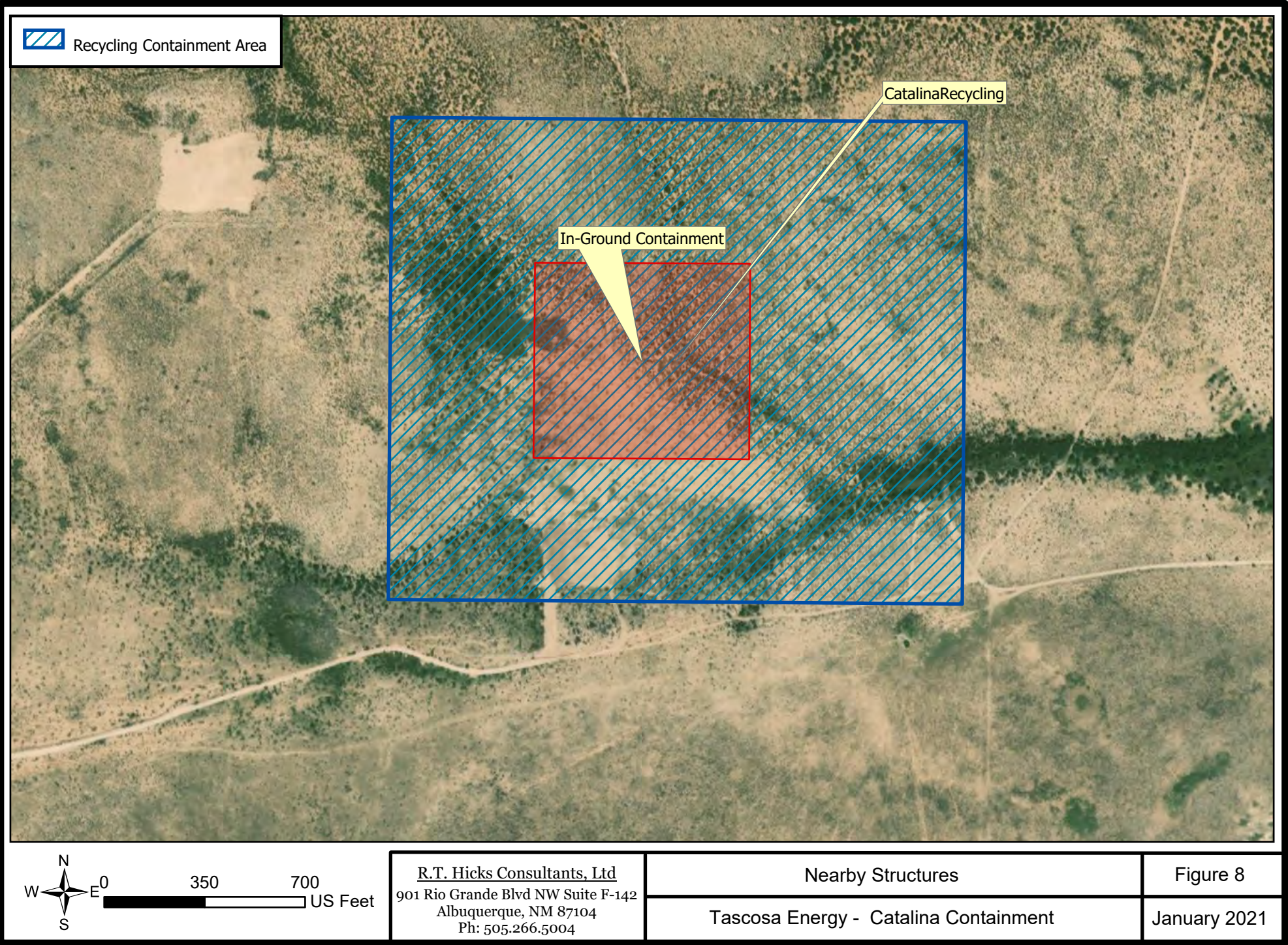
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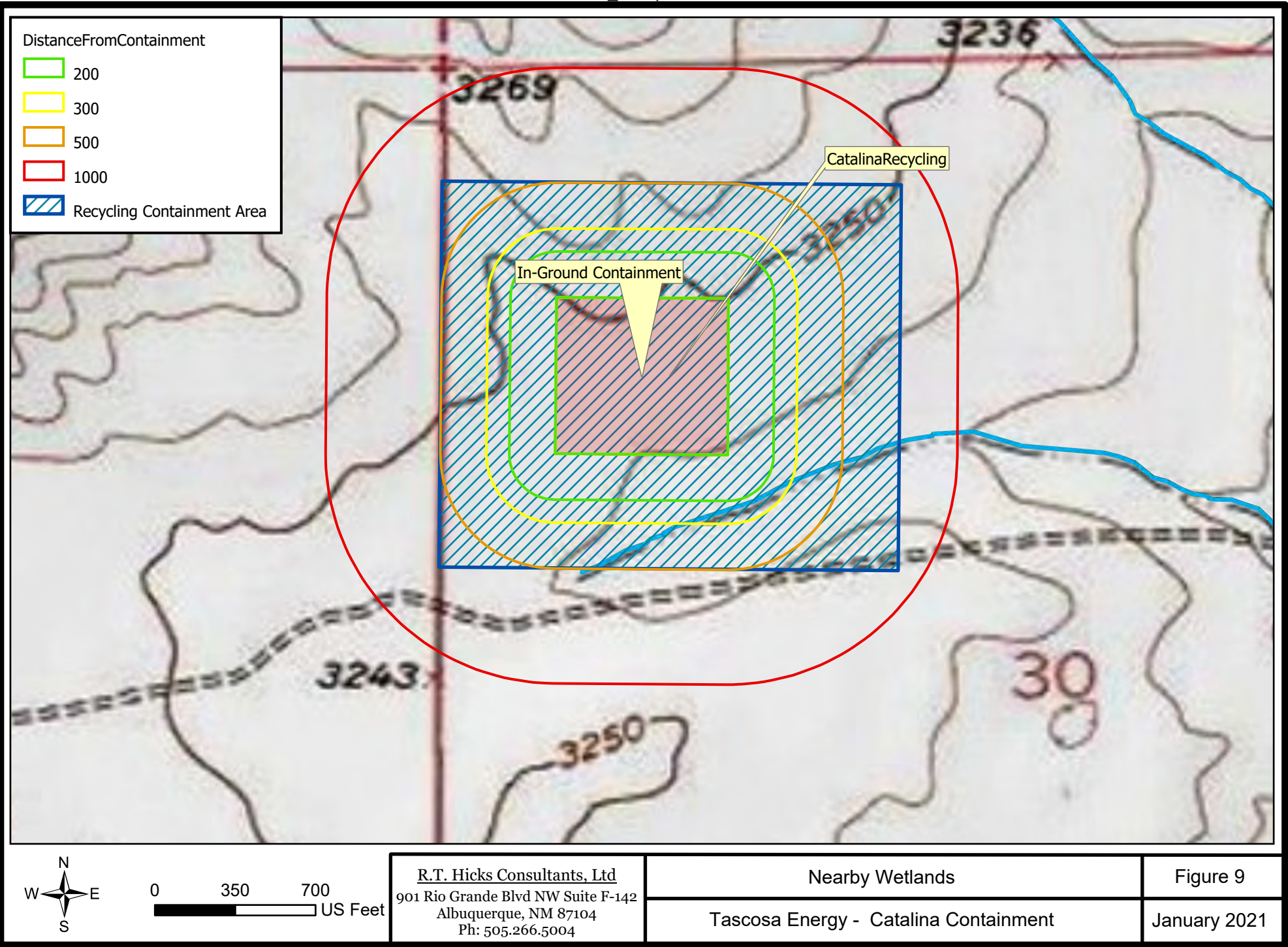
Mapped Watercourses and Surface Water
Tasacosa Energy LLC - Catalina Containment

Figure 7a
January 2021











Appendix Well Logs

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Memorandum

From: Kristin Pope

Date: December 30, 2020

RE: Tascosa Energy – Catalina 30 EH St. #001H, Conductor Hole Evaluation

The subject well site has a surface elevation of 3,244 feet and is located approximately 3 miles east from Brantley Lake. East of the Pecos River, groundwater is present in Permian units, such as the Seven Rivers, Yates, and Tansill formations.

On December 17, 2020 I witnessed the drilling of the conductor hole at the Catalina 30 EH St. #001H, located approximately 10 miles northwest of Carlsbad, New Mexico. Byrd Oilfield Services of Midland, Texas performed the work using a track-mounted auger drilling rig as shown in the adjacent photograph of the auger spinning the cuttings after the final trip out of the hole. A cellar 10-feet deep was previously installed and when I arrived and drilling of the conductor hole began at 11:40 a.m. MST. Beginning at 10 feet below the well pad surface, cuttings were continuously monitored for moisture and lithology with each trip out of the hole. No water or drilling fluids were used to drill this conductor hole.



Over the next 2.75 hours the boring was advanced to a total depth of 120 feet with no issue. I inspected the cuttings from each trip for moisture to indicate a groundwater formation and all samples were dry. If any appreciable moisture would have been indicated, the operation would have been suspended to allow the water to accumulate and then measured.

During the drilling operations, representative samples of each lithologic type were collected for further inspection, if necessary, and photographs were taken of each. Observed lithologies appear consistent with published descriptions of Quaternary alluvium near the surface and Permian Tansill formation throughout the remainder of the boring. The following descriptions of the cuttings were recorded:

10-18 feet	Alluvium: brown, fine sand; caliche
18-63 feet	Tan, loose siltstone with 10-30% interbedded green-gray dolomite. Dolomite beds are massive (1 mm-5 cm vesicles observed at 40 ft, most filled with siltstone)
63-68 feet	Red, massive clay; minor tan silt, loose
68-74 feet	Red, massive clay; clast and veins of white and clear gypsum/selenite

- 74-94 feet Massive purple-red clay interbedded with white and pink gypsum; <5% green "sugar" dolomite clasts
- 94-110 feet Loose, medium red silt interbedded; 30% green/gray/yellow vesicular (1-2 mm) dolomite
- 110-113 feet Red-brown silt with thin layers of red-brown siltstone and gypsum (1-2 mm thick)
- 113-120 feet Dark red silt interbedded with 40% dolomite, green-gray, massive



110-ft sample

50-ft sample



115-ft sample

Based on these observations, I am certain that no groundwater is present below the surface of this well site to 120 feet below ground surface (3,124 feet above sea level).

Kristin Pope



Appendix Site Photographs

APPENDIX SITE PHOTOS
TASCOSA ENERGY LLC, CATALINA CONTAINMENT



Figure SP-1 View west from southwest corner of staked containment showing nature of vegetation and local topography.



Figure SP-2 View east from southwest corner stake shown above.



Figure SP-3 View east from center of mapped watercourse about 220 feet due south of proposed Catalina containment area.



Figure SP-4 View west from same area as SP-3 showing nature of center of channel mapped as a watercourse. Equipment is parked on former production pad located south of the proposed containment area.

APPENDIX SITE PHOTOS
TASCOSA ENERGY LLC, CATALINA CONTAINMENT



Figure SP-5 View north (uphill) of Cattle trail within small swale that, on Google Earth images, could be mistaken as a watercourse.



SP-6 View north from mapped outcrop of Qagp2 sand and gravel. Rig in background is drilling the Catalina 30 EH State 1H oil well, which is the location of the conductor pipe boring.



Figure SP-7 Close up showing nature of alluvial deposit with sub-rounded dolomite cobbles, within a matrix of smaller rounded clasts and some angular clasts.