**Exhibit B**

**APPLICATION FOR A PERMIT TO
CONDUCT A DESIGNATED ACTIVITY OF STATE INTEREST OR
TO ENGAGE IN DEVELOPMENT IN A DESIGNATED AREA OF STATE INTEREST**

**To:** Permit Authority, El Paso County

**Re:** El Paso County Approval of the Cherokee Metropolitan District PFAS Water Treatment and Distribution Project as a matter of state interest.

**From:** Applicant:

Cherokee Metropolitan District (CMD)
6250 Palmer Park Boulevard
Colorado Springs, CO 80915
Contact: Troy Slocum, District Engineer Phone: 719-330-8042
Email: tslocum@cherokeemetro.org

Consulting Engineer:

Advanced Engineering and Environmental Solutions, LLC (AE2S)
9400 Station Street, Suite 300
Lone Tree, CO 80124
Contact: Kyria Bosma, P.E., Project Manager
Phone: 303-503-8307
Email: Kyria.Bosma@AE2S.com

**Date Submitted:** October 13, 2026

Date Received and Accepted as Complete: _____

1. **Matter of State Interest.**

   The applicant requests that a permit be issued for each of the items checked below: A permit to conduct one or more of the following matters of state interest:

   - ✓ **a. Efficient utilization of municipal and industrial water projects**
   - ✓ **b. Site selection and construction of major new domestic water and sewage treatment systems and/or major extension of existing domestic water and sewage treatment systems**
   - ✓ **c. Site selection and construction of major facilities of a public utility**
   - d. Development in areas containing or having a significant impact upon floodplain natural hazard areas
   - e. Site selection and expansion of airports
   - f. Site selection of arterial highways and interchanges and collector highways
   - g. Site selection of rapid or mass transit facilities

2. **Proposed Activity or Development.**

   Cherokee Metropolitan District (CMD) serves approximately 25,000 residents, Schriever Space Force Base, and several smaller communities through wholesale water deliveries within a 5,000-acre area of unincorporated El Paso County. The

demographics of CMD's service area vary, with median household income (MHI) ranging from $55,822 to $75,853 based on 2025 DOLA Primary Factor Data. The primary mission of CMD is to provide safe, reliable, and affordable water and wastewater service for its residents.

CMD owns and operates an extensive water system comprising 21 wells, three chlorination facilities, storage tanks, transmission pipelines, and distribution pipelines. Raw water is withdrawn from wells and conveyed through a central transmission pipeline to CMD's service areas. Historically, chlorination has been the only treatment process required.

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) testing completed in 2023 detected levels exceeding maximum containment levels (MCL). PFAS sampling results are shown in Attachment 2- PFAS Treatment Report by Hazen of April 30, 2025.

CMD evaluated the implementation of several PFAS mitigation alternatives including: (1) new water source development; (2) blending; and (3) construction of a PFAS Water Treatment Facility (WTF) and raw and finished water transmission pipelines. Alternative 1 was deemed infeasible due to legal and new water source availability limitations. Alternative 2 was deemed infeasible as the impacted wells provide approximately 40% of CMD's raw water and unused water rights may also be contaminated. Even with blending, the PFAS Treatment Report concluded that "due to the higher proportion of water coming from wells 13, 15, 16, and 17 annually, the PFAS contamination within these wells is sufficient to cause the resulting blended influent water to be out of compliance with the MCL."

CMD has selected Alternative 3 – construction of a PFAS WTF and raw and finished water pipelines.

Two raw water connections will be installed including 85 feet of 16-inch pipeline, 85 feet of 24-inch pipeline, and approximately 140 feet of 30-inch pipeline to connect the raw water pipelines to the WTF. Approximately 2 miles of 30-inch finished water piping from the WTF will connect to the existing transmission pipeline and approximately 5 miles of 8-inch finished water pipeline will connect to Ellicott Springs.

**Location of Development:**

CMD's parcel of land on which the proposed PFAS WTF will be constructed is located in unincorporated El Paso County, near the intersection of North Ellicott Highway and Colorado Highway 94 (CO-94). The PFAS WTF site is generally located east of CMDs primary service area and north of the Ellicott Schools service area. The finished water pipelines will begin at the PFAS WTF and proceed south along North Ellicott Highway and west along CO-94 to serve the Ellicott Springs subdivision service area and the main CMD service area, respectively. The pipeline routes will generally follow existing road corridors and will cross private property where necessary.

3. **Legal Descriptions for Portions of the Property located on private land:**

   a. **Cherokee Metropolitan District:** PFAS WTF and Access Road – Portion of 220185375 with a legal description included in Attachment A.

   b. **Cherokee Metropolitan District:** PFAS WTF Access Road – Portion of 220194235 with a legal description included in Attachment A.

4. **Owners and Interests**

   The names of those persons holding recorded legal, equitable, contractual and option interests and any other person known to the applicant having any interest in the property, as well as the nature and extent of those interests for each person, provided that such recorded interests shall be limited to those which are recorded in the El Paso County Clerk and Recorder's Office, the land office of the Bureau of Land Management for the State of Colorado, the Office of the State Board of Land Commissioners of the Department of Natural Resources, or the Secretary of State's Office of Colorado include:

   Property Owners:

   Cherokee Metropolitan District
   6250 Palmer Park Boulevard Colorado Springs, CO 80915
   Parcel #: 220185375
   Parcel #: 220194235

   Easement/Lease/Revocable License Owner:

   Cherokee Metropolitan District
   6250 Palmer Park Boulevard
   Colorado Springs, CO 80915

   Acres included in the project:

   - Approximately 38.91 acres, Portion of parcel number: 220185375
   - Approximately 1.08 acres, Portion of parcel number: 220194235

5. **Submission Requirements**

   Submission requirements described in the Guidelines and Regulations for Areas and Activities of State Interest of El Paso County for each of the activities or areas checked are attached to the application. The attachments are identified, by letter or number, and described by title as follows:

| | |
|---|---|
| Exhibit B | Application/Petition Form |
| Appendix A | Colorado Geological Survey Receipt |
| Appendix B | Elevation Plans |
| Appendix C | Fire Commitment Letter |
| Appendix D | Soils & Geology Report |
| Appendix E | Letter of Intent |
| Appendix F | Map Drawings |
| Appendix G | Mineral Rights Certification |
| Appendix H | Noise Study |

not provided with review 1; is this to be deferred to site development plan. Or is the rational that hydrants are being proposed and area is within a Ellicott fire district, no commitment needed.

Please update per comments

add exhibits pulled out of 1041 document sections.

| | |
|---|---|
| Appendix I | Drainage Report - Preliminary |
| Appendix J | Vicinity/Location Map |
| Appendix K | Visual Impact Analysis |
| Appendix L | Wildland Fire & Hazard Mitigation Plan |
| Appendix M | Wildlife Report |
| Appendix N | Zoning Map |
| Appendix O | District Boundary Map |
| Appendix P | 1041 Documents Related to 2.303 (Items 1-23) |
| Appendix Q | 1041 Documents Related to 3.201 (Items 1-4) |
| Appendix R | 1041 Documents Related to 4.201 (Items 1-6) |
| Appendix S | Operations Plan |
| Appendix T | Haul Route Plan |
| Appendix U | Proposed Laydown Area / Staging Map (all options) |
| Appendix V | 1041 Documents Related to 2.405 Review Criteria for All Applications |
| Appendix W | 1041 Documents Related to 3.202 Review Criteria |
| Appendix X | 1041 Documents Related to 4.202 Review Criteria |

6. **Additional Information Required:**

   Information required by the El Paso County Planning and Community Development Department have been submitted with this application.

7. **Duration of Permit.**

   The Applicant requests a permit for an indefinite term.

8. **Application Fee**

   Fee will be provided upon notice from El Paso County.

APPLICANT:

Cherokee Metropolitan District

sign

_____

Troy Slocum

**Attachment 1 – Legal Descriptions**

# AMENDED AND RESTATED
# PURCHASE AND SALE AGREEMENT

This Amended and Restated Purchase and Sale Agreement (the "**Agreement**" or "**Contract**") is made and entered into effective as of March 20, 2026 (the "**Effective Date**"), by and between the **Cherokee Metropolitan District**, a Colorado special district and political subdivision of the State of Colorado, with a legal address of 6250 Palmer Park Boulevard, Colorado Springs, Colorado 80915 (the "**District**") and **Arete Commons, LLC**, a Colorado limited liability company, with an address of 7661 McLaughlin Rd PMB 514, Peyton, CO 80831 ("**Seller**") (each a "**Party**" and collectively the "**Parties**").

## RECITALS

A. Seller owns the real property described below (the "**Initial Property**").

BEGINNING AT A POINT ON THE EAST-WEST CENTERLINE OF SECTION 7, TOWNSHIP 14 SOUTH, RANGE 62 WEST OF THE 6TH P.M., FROM WHENCE THE WEST 1/4 CORNER THEREOF, BEARS S 89°55'29" W, 1,205.16 FEET; THENCE N 89°55'29" E ALONG THE SAID EAST-WEST CENTERLINE, 1,301.00 FEET; THENCE S 00°04'12" E, 2,577.83 FEET TO INTERSECT THE NORTHERLY RIGHT-OF- WAY OF STATE HIGHWAY 94; THENCE S 89°58'27" W ALONG SAID NORTHERLY RIGHT-OF-WAY, 1,302.40 FEET; THENCE N 00°02'20" W, 2,576.70 FEET TO THE POINT OF BEGINNING, COUNTY OF EL PASO, STATE OF COLORADO.

B. The Initial Property consists of approximately 77 acres, as depicted on Exhibit A. The District seeks to purchase approximately 37.715 acres of the southern half of the Initial Property in fee simple, based on a new legal description prepared by a licensed surveyor and attached hereto as Exhibit B ("**CMD Parcel**" or "**Property**").

C. The District wishes to purchase the CMD Parcel from Seller, and Seller wishes to sell the southern half of the Initial Property to the District, pursuant to the terms set forth in this Agreement.

## AGREEMENT

NOW THEREFORE, for the consideration hereinafter set forth, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Purchase and Sale of Property. Subject to and in accordance with the terms and conditions of this Agreement, Seller agrees to sell and convey to District, and District agrees to purchase from Seller, the CMD Parcel.

2. Purchase Price; Earnest Money. The purchase price and terms of payment, subject to all adjustments and credits hereinafter provided, shall be as follows:

a. Purchase Price: Three Hundred and Eight Thousand Dollars ($308,000).

b. Earnest Money. Fifteen Thousand Four Hundred Dollars ($15,400) which shall be placed in escrow by the District with Land Title (the "**Escrow Agent**" and "**Closing Company**"), to be applied to the Purchase Price at Closing.

3. Inspection. The District shall have sixty (60) days from the Effective Date of this Agreement to complete its due diligence investigation of the Property and investigate the title thereof (the "Inspection Period"). During the Inspection Period, the District and its agents, consultants and representatives shall have the right to enter the Initial Property to conduct inspections and analyses, including but not limited to survey, geophysical testing, and environmental sampling related purposes. District shall conduct such inspections, tests and studies in such a manner as to minimize damage to the Property. In the event District does not purchase the Property, District agrees to close all soil borings and other sampling points, if any, and to repair any damage caused by such inspections, tests or studies. District shall also promptly return all inspection materials to Seller if District does not purchase the Property. Prior to such time as District or any of District's representatives enter the Property, District shall obtain (or cause their representatives to obtain) policies of general liability insurance which insure District (and their representatives as applicable) with liability insurance limits of not less than $1,000,000 per occurrence and $2,000,000 in the aggregate, for personal injury and property damage, and name Seller as an additional insured thereunder, and provide Seller with certificates of insurance evidencing the aforementioned policies of insurance. During the Inspection Period, Seller shall provide to the District copies of all deeds and other documents affecting ownership of and title to the Initial Property. District shall remain solely liable for any and all costs and damages resulting from any acts or omissions of the District and its consultants or contractors in their performance of due diligence activity on the Property. The District is relying on, and does not waive or intend to waive by any provision of this Agreement, the monetary limitations or any other rights, immunities, defenses and protections provided by the Colorado Governmental Immunity Act § 24-10-101 *et seq*., C.R.S. ("**CGIA**"), or otherwise available to District or its officers or employees, but not available to District consultants or contractors.

Seller shall not make any physical alteration to, or transfer, convey or otherwise encumber any interest in the Initial Property at any time from the Effective Date to Closing.

4. Termination. If on or before the expiration of the Inspection Period, the District gives Seller written notice setting forth the District's dissatisfaction with the Property or any characteristic thereof, in the District's sole discretion, for any reason whatsoever, then this Agreement shall terminate, the Earnest Money shall be returned to the District and both Parties shall be relieved from any further liability hereunder. If the District does not terminate this Agreement on or before the expiration of the Inspection Period, then this Agreement shall remain in full force and effect in accordance with its terms.

5. Seller's Obligations Prior to Closing

a. Seller's Authorized Representative executes and delivers partially executed Contract to Land Title.

b. Seller provides all information on any contracts, liens, or other encumbrances affecting the Initial Property.

c. The existing Deed of Trust shall be paid off against the CMD Parcel and a lien release or partial release of lien shall be recorded at Closing.

d. Seller complies with the terms of the Contract.

e. Seller shall review the metes and bounds legal description for the CMD Parcel for accuracy.

f. Seller agrees to facilitate or comply with all necessary actions required for the sale and timely Closing on the Property.

6. District's Obligations Prior to Closing

a. District's Authorized Representative executes the Contract and delivers a partially executed Contract and Earnest Money Deposit equal to five percent (5%) of CMD Parcel purchase price ($15,400) to Land Title.

b. The District shall engage a licensed surveyor to create a new metes and bounds legal description for the CMD Parcel and the remaining northern parcel ("**Northern Parcel**") of the Initial Property.

c. Facilitate or comply with all necessary actions related to Closing.

d. District agrees to cooperate with Seller during its Inspection Period and with Land Title concerning actions or documentation necessary for the Closing.

e. District shall draft an agreement between the parties addressing the parties' Post Closing Obligations, outlined below. The Post Closing Agreement shall be included in the Closing Documents for execution by the parties.

f. District shall draft the Road Access Easement and Maintenance Agreement described below for inclusion in the Closing Documents for execution by the Parties.

g. District shall draft the Temporary Construction Easement across the northern and western Arete Commons parcels, as shown on Exhibit A for inclusion in the Closing Documents for execution by the Parties.

h. Buyer complies with the terms of the Contract.

i. Buyer agrees to facilitate or comply with all necessary actions required for the sale and timely Closing on the Property.

7. Closing

a. The closing is tentatively set for June 18, 2026, to be conducted by Land Title as the Closing Company, at a time that is mutually acceptable to the Parties, (the "**Closing**").

b. The District shall pay the closing costs for this transaction, title policy fee, and all other items required to be paid at Closing. Seller shall pay real property taxes and any assessments on the Initial Property through the date of Closing. Other costs of Closing shall be borne by the District.

c. At Closing, Seller shall deliver to Land Title a special warranty deed and subject only to statutory exceptions, executed and acknowledged by Seller, conveying good and marketable fee simple title to the CMD Parcel to the District. The special warranty deed shall contain the following provisions:

i. Seller to retain ownership of underlying Denver Basin ground water rights for the Property, as quantified, without authorization for surface disturbance related to such water rights.

ii. Seller shall convey any and all interest it holds in and to underlying mineral rights.

iii. The special warranty deed shall contain a restriction running perpetually with the land that no wastewater treatment facilities or wastewater treatment equipment for treating flows from property outside of the CMD Parcel shall be constructed on the Property. Wastewater flows produced by the proposed Water Treatment Facility shall be explicitly excluded from this restriction.

d. At Closing, the District shall deliver to the Closing Company the Purchase Price plus all closing costs, and such other documents as may be required hereunder or reasonably required by Seller or the Closing Company. The District shall acknowledge acceptance of the Special Warranty Deed.

8. Possession. Possession of the Property shall be delivered to the District at Closing.

9. Seller's Representations and Warranties. Seller hereby represents and warrants that the following statements are now, and will be as of the Closing date, true and correct, to the best of Seller's knowledge.

a. Seller has the full right, power, and authority to transfer and convey the Property, as provided in this Agreement, and to carry out Seller's obligations under the Agreement and Seller, if not a natural person, is a corporation, partnership, limited partnership, limited liability company, or other entity validly existing and in good standing under the laws of the State of Colorado.

b. Seller has not: commenced a voluntary case, or had entered against it a petition, for relief under Title 11 U.S.C., as amended (the "Bankruptcy Code") or any similar petition, order, or decree under any federal or State law or statute relative to bankruptcy, insolvency, or other relief for debtors; caused, suffered, or consented to the appointment of a receiver, trustee, administrator, conservator, liquidator, or similar official in any federal, State, or foreign judicial or non- judicial proceeding, to hold, administer, and liquidate all or substantially all of its property; or made an assignment for the benefit of creditors.

c. There is no action, suit or proceeding pending, or to the best of Seller's knowledge, threatened, against or otherwise affecting Seller or the Initial Property in any court of law or equity, or before any governmental authority, in which an adverse decision might materially impair Seller's ability to perform its obligations under this Agreement.

d. There is no pending or threatened condemnation or similar proceeding affecting the Initial Property.

e. The Property is being conveyed free and clear of all service contracts, agreements, leases, and other occupancy rights.

f. Seller has not received any notice of any violations of any applicable law related to the Property.

g. Seller is not aware of any special assessments to be levied against the Property after acquisition by the District.

The representations and warranties in this Paragraph 9 shall survive Closing for a period of one year from the date of Closing and may be enforced by the District during that period.

10. Condition of Property. The District understands that it is purchasing the Property in its existing condition, "AS IS", “WHERE IS” and “WITH ALL FAULTS”. Except for those warranties expressly set forth in this Agreement, Seller makes no warranties, representations or guarantees, either express or implied, of any kind, nature or type whatsoever. Without limiting the generality of the preceding sentence, Seller acknowledges and agrees that neither Seller, nor anyone acting for or on behalf of Seller, makes or has made any statements, promises, warranties or representations, either express or implied, with respect to the absence or presence of any hazardous substance, material or condition affecting the Property, the soil condition, geologic condition or other physical aspect of the Property or the accuracy or completeness of any reports or information pertaining to such matters.

11. Remedies.

a. Seller's Remedies. If the Closing does not occur by reason of a breach by the District, and the Seller has complied with the terms of this Agreement, Seller

shall have the right to terminate this Agreement by written notice to the District and retain the Earnest Money, if any, which shall be Seller's exclusive remedy.

b. District's Remedies. If the Closing does not occur by reason of a breach by Seller, and the District has complied with the terms of this Agreement, the District may terminate this Agreement by written notice to Seller and the Earnest Money shall be refunded to the District. In addition, the District shall have all remedies available at law or equity for such breach, including specific performance. The District also retains the right to attempt to acquire the Property pursuant to its eminent domain authority.

12. Road Access Easement and Maintenance Agreement

a. Seller, Wishing Star Entertainment (affiliate of Seller) and the District shall grant to each other a forty (40) foot wide permanent cross access and utility easement ("**Road Access Easement and Maintenance Agreement**") and an adjacent twenty (20) foot wide Temporary Construction Easement across the southern edge of the 36 acre parcel defined as the Northwest Quarter of the Southwest Quarter of S7, T14S, R62W, currently owned by Arete Commons and the southern edge of the Northern Parcel for construction and perpetual use of an access road connecting North Ellicott Highway to the Initial Property. Legal descriptions of the Permanent Access Easement and Temporary Construction Easement are attached as Exhibit C. The Road Access Easement shall be for construction of a twenty-four foot (24') wide unpaved road and future utility easement to be utilized by Seller, District and Wishing Star Entertainment, as the Adjacent Property Owner, as shown on Exhibit A.

b. The Road Access Easement and Maintenance Agreement shall be entered into by and between the Seller, District and Wishing Star Entertainment as part of the Closing documents and the Road Access Easement and Maintenance Agreement shall be recorded by the Title Company after recording the special warranty deed conveying the CMD Parcel.

c. Upon commencement of use of the Access Road Easement by the District, the District shall provide:

i. A minimum 5 strand wire livestock fence along the north and south side of the Road Access Easement. If a fence already exists that meets these requirements, the District shall not be required to replace it. This fence shall furthermore have two access points with gates allowing Arete Commons or Wishing Star Entertainment to cross the Easement. One set of gates shall be on the north side of the Road Access Easement and the other shall be on the south side, such that when all gates are open the road will be completely blocked. The final location of access point gates to be determined by Arete Commons, as depicted on Exhibit A.

ii. Access Road construction and ongoing road and new fence maintenance will be the responsibility of District and all costs for such maintenance shall be paid by District.

iii. Should Seller or Wishing Star Entertainment increase the use of, or need access to, more than the first 200 ft. of the western side of the Road Access Easement, Access Road maintenance costs shall be equally split between Seller, District and Wishing Star Entertainment.

iv. The Road Access Easement shall run with the land.

13. District's Post Closing Obligations

a. District shall grant the two adjacent property owners, Arete Commons and Wishing Star Entertainment and their guests a License to use thirty (30) feet along the perimeter of the CMD Parcel for access purposes only to adjacent parcels. The License shall be recorded, and the License shall not authorize Licensees to disturb or make improvements within the License area.

b. Upon substantial completion of the proposed Water Treatment Facility, the District shall provide one metered, potable water line connection to the property line of the adjacent parcel currently owned by Wishing Star Entertainment LLC, Parcel No. 240000265, (the "**Adjacent Parcel**") subject to the following terms:

i. Water line will be metered and usage billed according to District's then current in-district water rates, limited to one acre-foot per year for commercial, domestic, outdoor irrigation, and stock watering purposes.

ii. District shall waive its then current tap fees, water infrastructure fees, and other connection fees for the water line.

iii. District shall commit up to one additional (two total) acre-feet per year of water service to the Seller, subject to District's then current policies.

c. Upon final completion of the proposed Water Treatment Facility, Seller (Arete Commons) and Wishing Star Entertainment, as an adjacent property owner (collectively, the "**Adjacent Property Owners**"), and guests of the Adjacent Property Owners shall be granted the right to use the first two hundred (200) feet of the twenty-four (24) foot wide Access Road for limited access purposes. The gravel road to be constructed by the District on the Arete Commons parcels from Ellicott Highway to the CMD Parcel property line to allow for District access, as

shown on the diagram attached hereto as Exhibit A and as further described in the Road Access Easement and Maintenance Agreement.

d. District agrees to grant Seller, first, then Wishing Star Entertainment, second, so long as Wishing Star Entertainment is fee owner of the adjacent property, a right of first refusal should the District seek to sell or lease any portion of the CMD Parcel, pursuant to the terms being offered by the District. The right of first refusal shall be outlined in the Post Closing Agreement.

14. Miscellaneous.

a. Entire Agreement. This Agreement contains the entire agreement of the Parties. There are no other agreements, oral or written, and this Agreement can be amended only by written agreement signed by the Parties.

b. Agreement Binding. This Agreement, and the terms, covenants, and conditions herein contained, shall inure to the benefit of and be binding upon the heirs, personal representatives, successors, and assigns of the Parties.

c. Notice. Any notice under this Agreement shall be in writing, and shall be deemed sufficient when hand delivered, sent via overnight national courier service or upon delivery if sent pre-paid, first-class United States Mail to the Party at the address set forth on the first page of this Agreement.

d. Governing Law and Venue. This Agreement shall be governed by the laws of the State of Colorado, and any legal action concerning the provisions hereof shall be brought in El Paso County, Colorado.

e. Severability. If any provision of this Agreement is found by a court of competent jurisdiction to be unlawful or unenforceable for any reason, the remaining provisions hereof shall remain in full force and effect.

f. Subject to Annual Appropriation. Consistent with Article X, § 20 of the Colorado Constitution, any financial obligation of the District not performed during the current fiscal year is subject to annual appropriation, shall extend only to monies currently appropriated, and shall not constitute a mandatory charge, requirement, debt, or liability beyond the current fiscal year.

g. Governmental Immunity. The District and its officers, attorneys and employees, are relying on, and do not waive or intend to waive by any provision of this Agreement, the monetary limitations or any other rights, immunities or protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, et seq., as amended, or otherwise available to the District and its officers, attorneys or employees.

**[Signature Pages Follow]**

IN WITNESS WHEREOF, the Parties have executed this Amended and Restated Agreement as of the Effective Date.

**CHEROKEE METROPOLITAN DISTRICT**

By: _____

Name: DAN WALL

Title: PRESIDENT B.O.D.

Date 5/22/26

STATE OF COLORADO )
) ss.
COUNTY OF EL PASO )

The foregoing instrument was subscribed, sworn to and acknowledged before me this 22 day of May, 2026, by Danial Wall as Board President of Cherokee Metropolitan District.

My commission expires: 02-16-2027

(S E A L)

_____
Notary Public

HEATHER GALBRAITH
Notary Public
State of Colorado
Notary ID # 20234006426
My Commission Expires 02-16-2027

**ARETE COMMONS, LLC**

By: _____

Name: Jason Wood

Title: Owner

STATE OF COLORADO )
) ss.
COUNTY OF El Paso )

The foregoing instrument was subscribed, sworn to and acknowledged before me this 20 day of March, 2026, by Jason Wood as Owner of Arete Commons, LLC.

My commission expires: 2/16/2027

(S E A L)

_____
Notary Public

HEATHER GALBRAITH
Notary Public
State of Colorado
Notary ID # 20234006426
My Commission Expires 02-16-2027

**EXHIBIT A**

**DIAGRAM OF OWNERSHIP AND EASEMENT TERMS AFTER SALE OF PROPERTY**

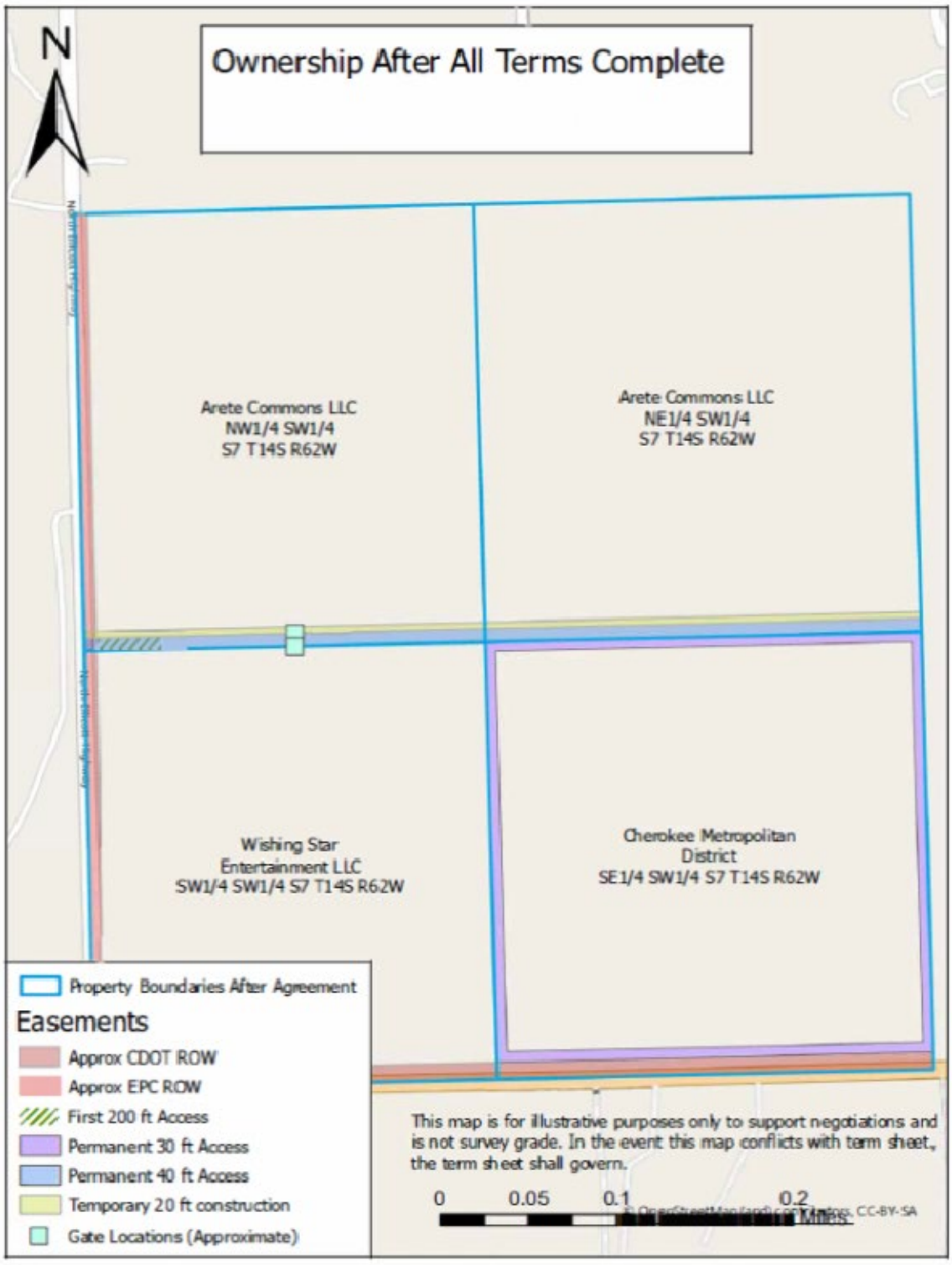
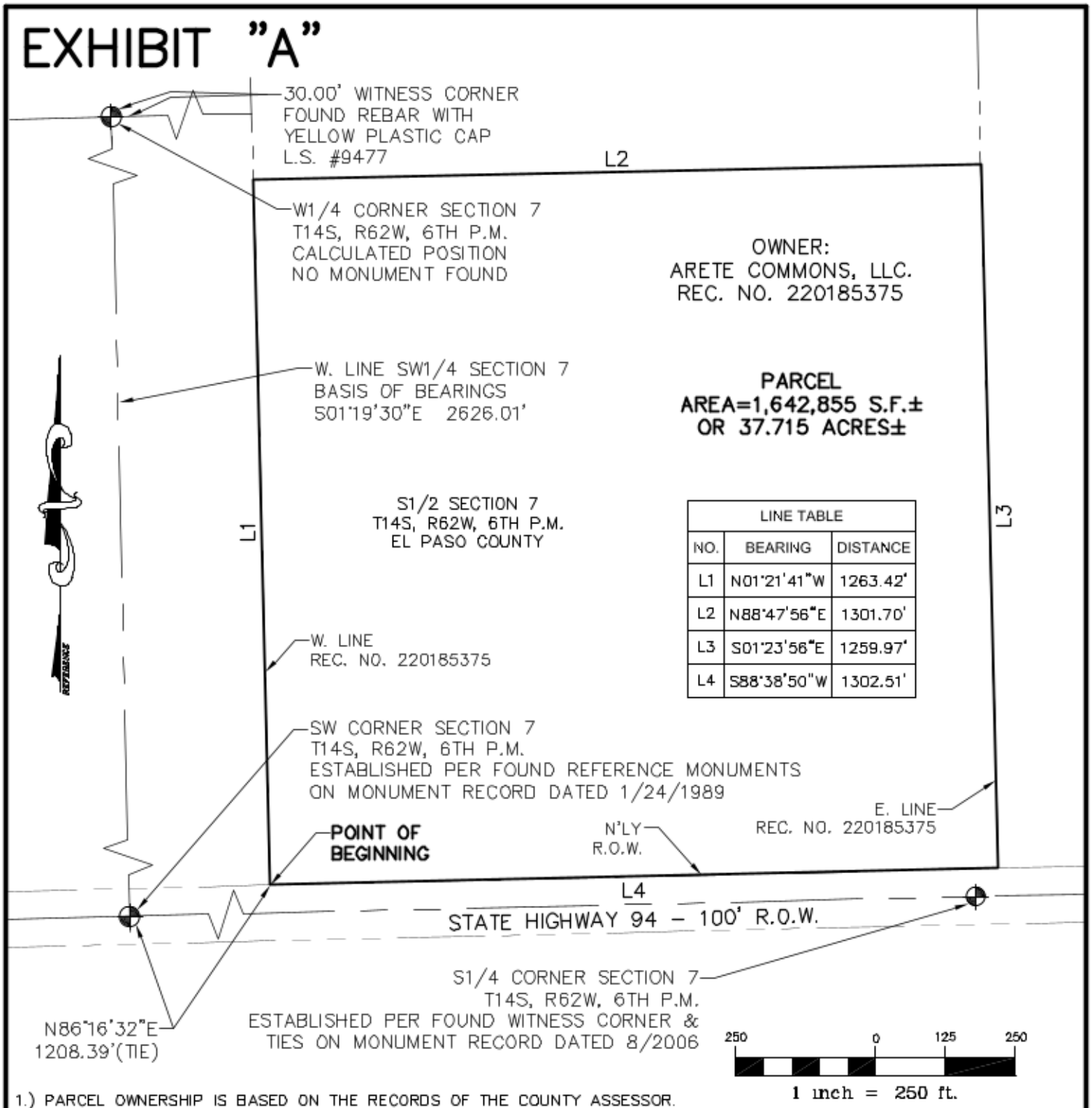


**EXHIBIT B**

**LEGAL DESCRIPTION OF SOUTHERN PARCEL**
**(CMD PARCEL)**
**ATTACHED**

# SOUTHERN CMD PARCEL

# EXHIBIT "A"




| LINE TABLE | | |
|---|---|---|
| NO. | BEARING | DISTANCE |
| L1 | N01°21'41"W | 1263.42' |
| L2 | N88°47'56"E | 1301.70' |
| L3 | S01°23'56"E | 1259.97' |
| L4 | S88°38'50"W | 1302.51' |

1.) PARCEL OWNERSHIP IS BASED ON THE RECORDS OF THE COUNTY ASSESSOR.
2.) ACCORDING TO COLORADO LAW, YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS AFTER THE DATE OF THE CERTIFICATION SHOWN HEREON.
3.) THE ONLY PURPOSE OF THIS EXHIBIT IS TO SHOW THE LOCATION OF THE EASEMENT(S).
4.) THIS DOCUMENT SHALL BE CONSIDERED NULL AND VOID IF IT DOES NOT BEAR THE ORIGINAL SIGNATURE AND SEAL OF THE PROFESSIONAL LAND SURVEYOR OR IF ALTERED IN ANY WAY.


PRECISION SURVEY & MAPPING
PROFESSIONAL LAND SURVEYING CONSULTANTS
9025 E. KENYON AVENUE, SUITE 150
DENVER, COLORADO 80237
TEL: 303-753-9799


DRN. BY: A.S.
CHKD. BY: J.N.
DATE: 05/19/26
SCALE: 1" = 250'

FILE: R14459
SHEET: 1 OF 2
W/O #:

PARCEL

# LEGAL DESCRIPTION

A PARCEL OF LAND LOCATED IN THE SOUTH HALF OF SECTION 7, TOWNSHIP 14 SOUTH, RANGE 62 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, ALSO BEING A PORTION OF LANDS DESCRIBED AT RECEPTION NO. 220185375, FILED IN THE EL PASO COUNTY CLERK AND RECORDER'S OFFICE, SAID PARCEL OF LAND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

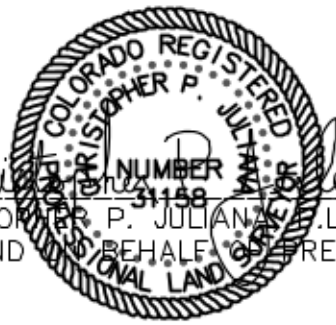
BASIS OF BEARING OF THIS DESCRIPTION IS ALONG THE WEST LINE OF THE SOUTHWEST QUARTER OF SAID SECTION 7, ASSUMED TO BEAR S01°19'30"E A DISTANCE OF 2626.01 FEET FROM THE WEST QUARTER CORNER OF SAID SECTION 7; ESTABLISHED PER FOUND YELLOW PLASTIC CAP STAMPED L.S. #9477 SET AS A 30' WITNESS CORNER EAST OF SAID WEST QUARTER CORNER TO THE SOUTHWEST CORNER OF SAID SECTION 7; ESTABLISHED PER FOUND REFERENCE MONUMENTS ON MONUMENT RECORD DATED 1/24/1989;

BEGINNING AT A POINT ON THE NORTHERLY RIGHT-OF-WAY OF STATE HIGHWAY 94, SAID POINT BEARS N86°16'32"E A DISTANCE OF 1208.39 FEET FROM SAID SOUTHWEST CORNER;

THENCE N01°21'41"W ALONG THE WEST LINE OF SAID LANDS A DISTANCE OF 1263.42 FEET; THENCE N88°47'56"E A DISTANCE OF 1301.70 FEET TO THE EAST LINE OF SAID LANDS; THENCE S01°23'56"E ALONG SAID EAST LINE A DISTANCE OF 1259.97 FEET TO SAID NORTHERLY RIGHT-OF-WAY; THENCE S88°38'50"W ALONG SAID NORTHERLY RIGHT-OF-WAY A DISTANCE OF 1302.51 FEET TO THE POINT OF BEGINNING; WHENCE SAID WEST QUARTER CORNER BEARS N26°26'30"W A DISTANCE OF 2844.37 FEET.

SAID PARCEL CONTAINS 1,642,855 SQUARE FEET OR 37.715 ACRES, MORE OR LESS.

I, CHRISTOPHER P. JULIANA, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PERFORMED BY ME OR UNDER MY RESPONSIBLE CHARGE, IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, IS IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.




Christopher P. Juliana 05/19/26

CHRISTOPHER P. JULIANA, P.L.S. 31158 DATE
FOR AND ON BEHALF OF PRECISION SURVEY & MAPPING, INC.

PRECISION SURVEY & MAPPING
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DRN. BY: A.S.
CHKD. BY: J.N.
DATE: 05/19/26
SCALE: 1" = 250'

FILE: R14459
SHEET: 2 OF 2
W/O #:

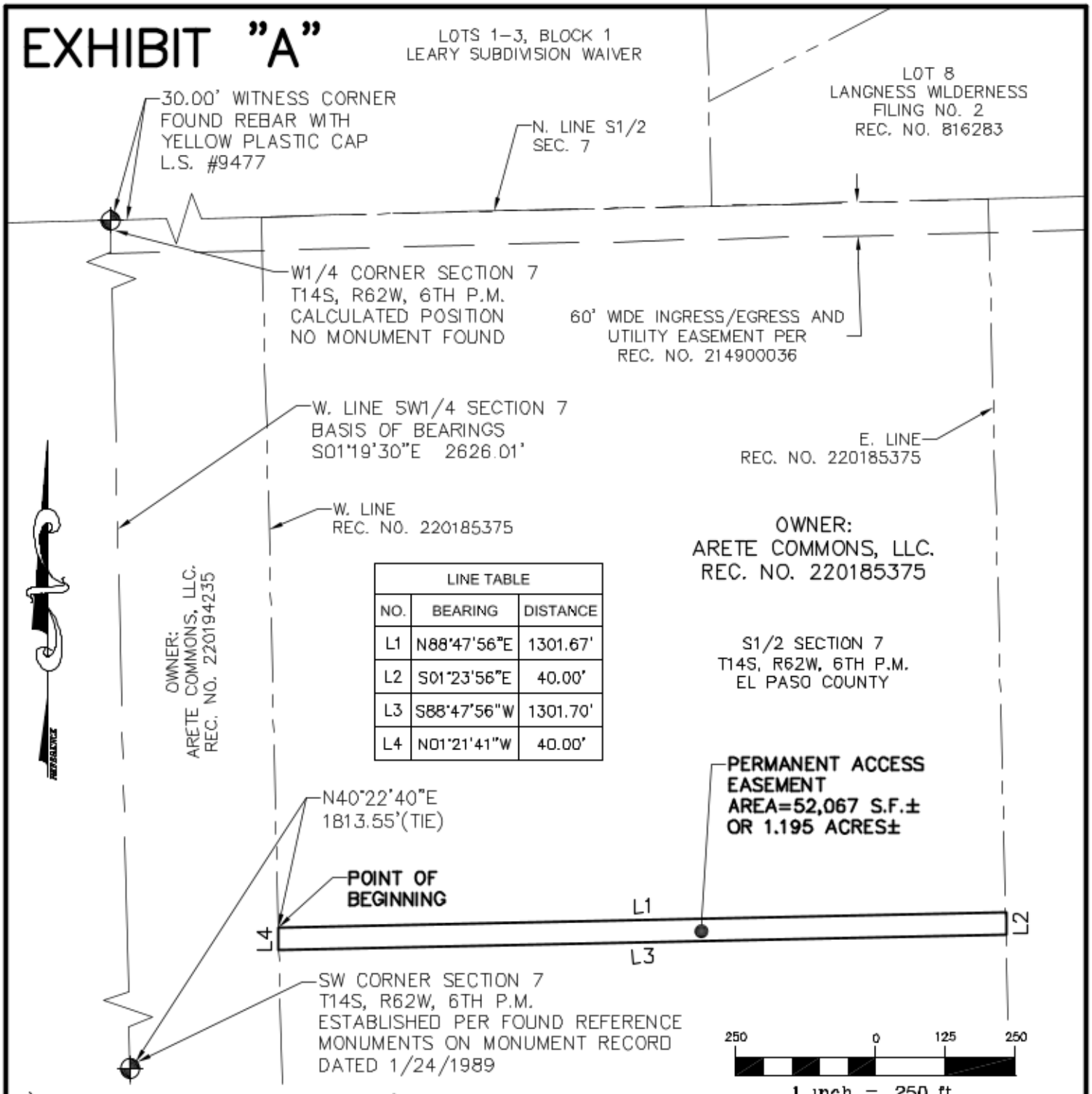
PARCEL

**EXHIBIT C**

**PERMANENT ACCESS AND TEMPORARY CONSTRUCTION EASEMENT**
**LEGAL DESCRIPTIONS**
**ATTACHED**

# NORTHERN ARETE PARCEL - PERMANENT EASEMENT

# EXHIBIT "A"




| LINE TABLE | | |
|---|---|---|
| NO. | BEARING | DISTANCE |
| L1 | N88°47'56"E | 1301.67' |
| L2 | S01°23'56"E | 40.00' |
| L3 | S88°47'56"W | 1301.70' |
| L4 | N01°21'41"W | 40.00' |

1.) PARCEL OWNERSHIP IS BASED ON THE RECORDS OF THE COUNTY ASSESSOR.
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W/O #:

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BEGINNING AT A POINT ON THE WEST LINE OF SAID LANDS, SAID POINT BEARS N40°22'40"E A DISTANCE OF 1813.55 FEET FROM SAID SOUTHWEST CORNER;

THENCE N88°47'56"E A DISTANCE OF 1301.67 FEET TO THE EAST LINE OF SAID LANDS; THENCE S01°23'56"E ALONG SAID EAST LINE A DISTANCE OF 40.00 FEET; THENCE S88°47'56"W A DISTANCE OF 1301.70 FEET TO SAID WEST LINE; THENCE N01°21'41"W ALONG SAID WEST LINE A DISTANCE OF 40.00 FEET TO THE POINT OF BEGINNING; WHENCE SAID WEST QUARTER CORNER BEARS N44°48'40"W A DISTANCE OF 1753.18 FEET.

SAID PARCEL CONTAINS 52,067 SQUARE FEET OR 1.195 ACRES, MORE OR LESS.

I, CHRISTOPHER P. JULIANA, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PERFORMED BY ME OR UNDER MY RESPONSIBLE CHARGE, IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, IS IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.




05/19/26

CHRISTOPHER P. JULIANA, P.L.S. 31158 DATE
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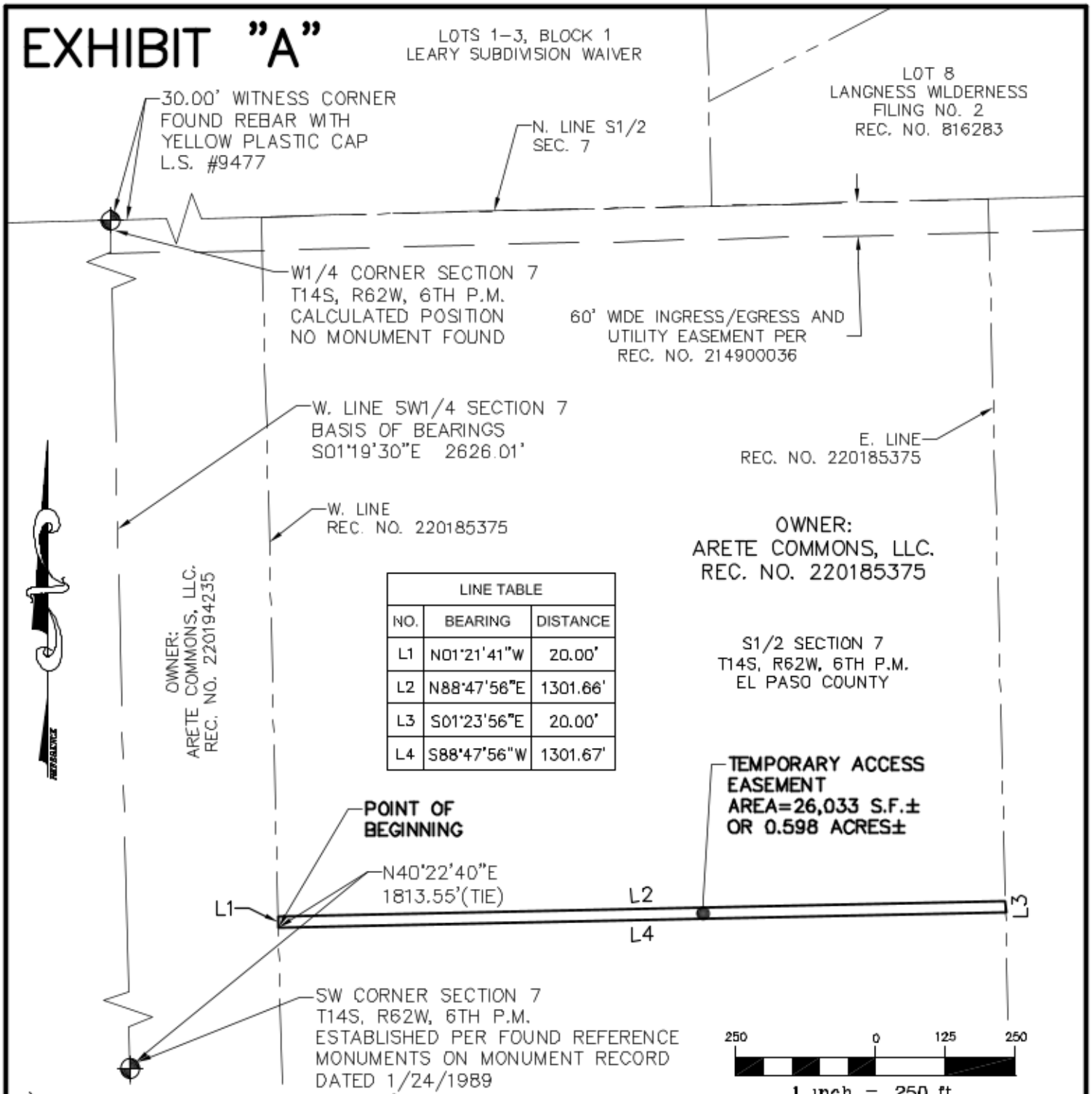
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CHKD. BY: J.N.
DATE: 05/19/26
SCALE: 1" = 250'

FILE: R14459
SHEET: 2 OF 2
W/O #:

# ACCESS EASEMENT

# NORTHERN ARETE PARCEL - TEMPORARY EASEMENT




| LINE TABLE | | |
|---|---|---|
| NO. | BEARING | DISTANCE |
| L1 | N01°21'41"W | 20.00' |
| L2 | N88°47'56"E | 1301.66' |
| L3 | S01°23'56"E | 20.00' |
| L4 | S88°47'56"W | 1301.67' |

1.) PARCEL OWNERSHIP IS BASED ON THE RECORDS OF THE COUNTY ASSESSOR.
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SAID PARCEL CONTAINS 26,033 SQUARE FEET OR 0.598 ACRES, MORE OR LESS.

I, CHRISTOPHER P. JULIANA, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PERFORMED BY ME OR UNDER MY RESPONSIBLE CHARGE, IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, IS IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.




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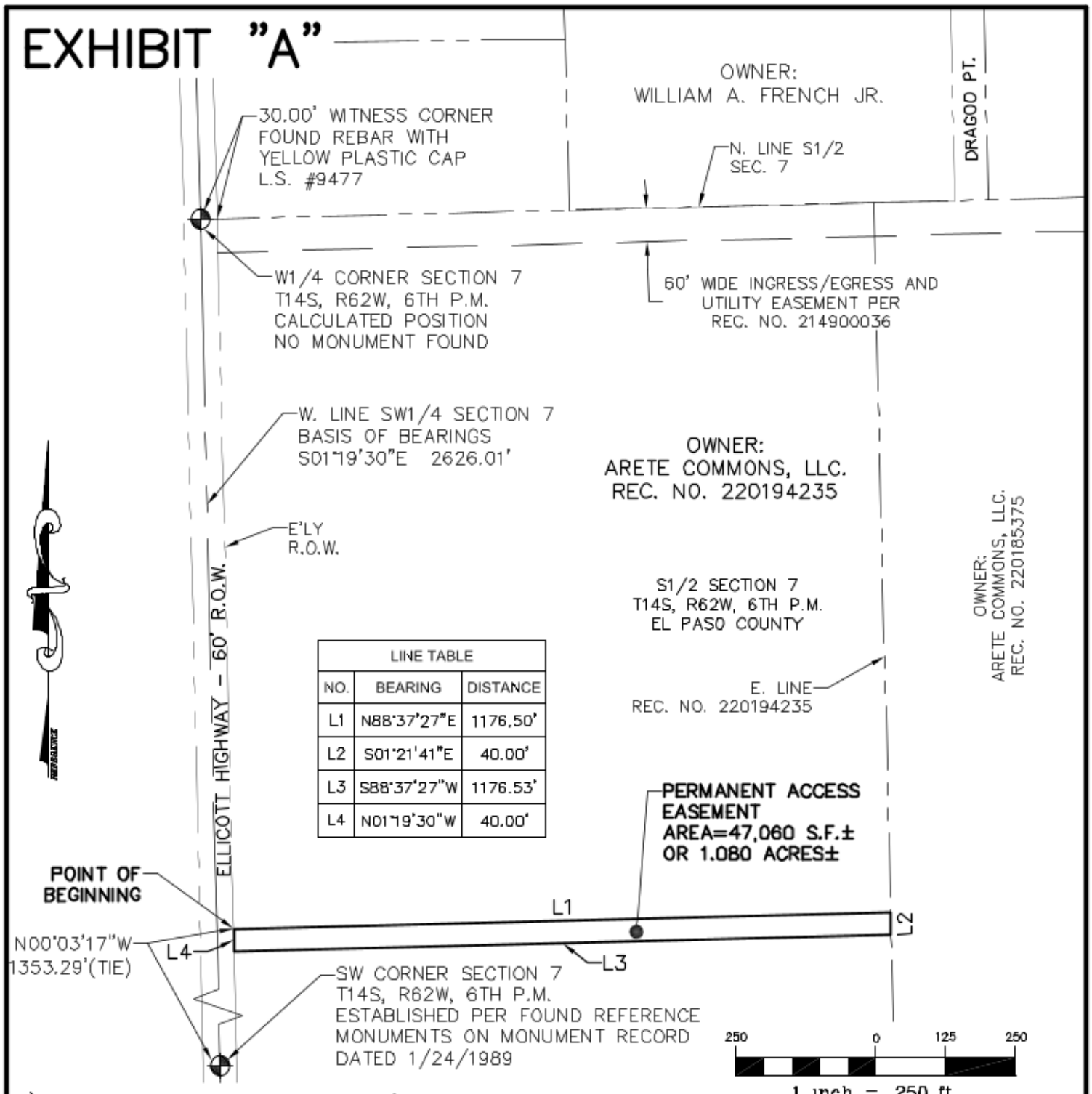
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SCALE: 1" = 250'

FILE: R14459
SHEET: 2 OF 2
W/O #:

# ACCESS EASEMENT

# WESTERN ARETE PARCEL - PERMANENT EASEMENT

# EXHIBIT "A"




| LINE TABLE | | |
|---|---|---|
| NO. | BEARING | DISTANCE |
| L1 | N88°37'27"E | 1176.50' |
| L2 | S01°21'41"E | 40.00' |
| L3 | S88°37'27"W | 1176.53' |
| L4 | N01°19'30"W | 40.00' |

1.) PARCEL OWNERSHIP IS BASED ON THE RECORDS OF THE COUNTY ASSESSOR.
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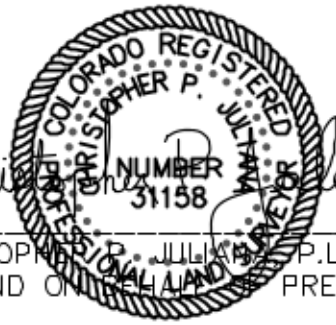
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BEGINNING AT A POINT ON THE EASTERLY RIGHT-OF-WAY OF ELLICOTT HIGHWAY, SAID POINT BEARS N00°03'17"W A DISTANCE OF 1353.29 FEET FROM SAID SOUTHWEST CORNER;

THENCE N88°37'27"E A DISTANCE OF 1176.50 FEET TO THE EAST LINE OF SAID LANDS; THENCE S01°21'41"E ALONG SAID EAST LINE A DISTANCE OF 40.00 FEET; THENCE S88°37'27"W A DISTANCE OF 1176.53 FEET TO SAID EASTERLY RIGHT-OF-WAY; THENCE N01°19'30"W ALONG SAID EASTERLY RIGHT-OF-WAY A DISTANCE OF 40.00 FEET TO THE POINT OF BEGINNING; WHENCE SAID WEST QUARTER CORNER BEARS N02°40'30"W A DISTANCE OF 1273.40 FEET.

SAID PARCEL CONTAINS 47,060 SQUARE FEET OR 1.080 ACRES, MORE OR LESS.

I, CHRISTOPHER P. JULIANA, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PERFORMED BY ME OR UNDER MY RESPONSIBLE CHARGE, IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, IS IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.




05/19/26

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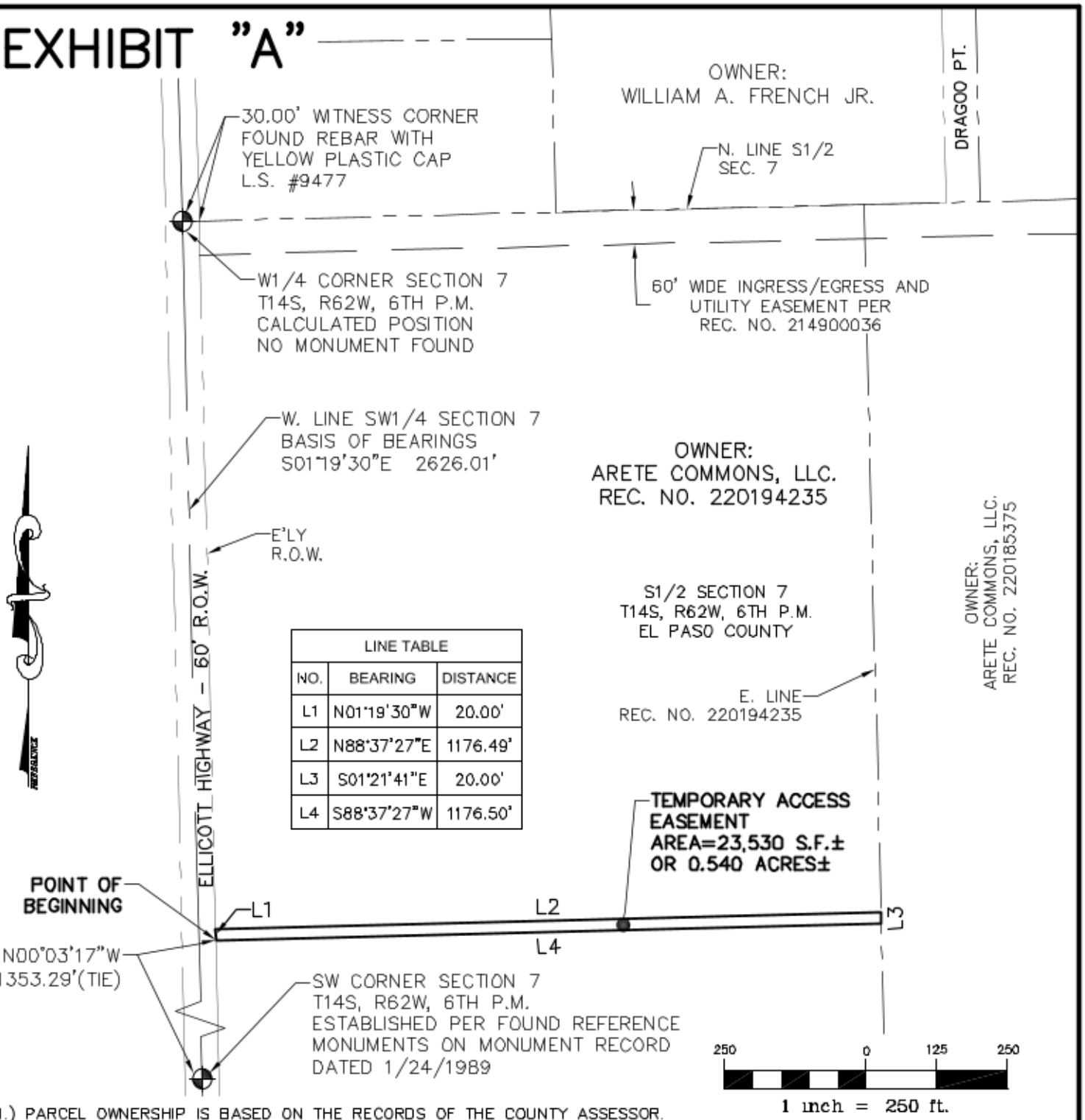
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SHEET: 2 OF 2
W/O #:

ACCESS EASEMENT

# WESTERN ARETE PARCEL - TEMPORARY EASEMENT

# EXHIBIT "A"




| LINE TABLE | | |
|---|---|---|
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| L2 | N88°37'27"E | 1176.49' |
| L3 | S01°21'41"E | 20.00' |
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SAID PARCEL CONTAINS 23,530 SQUARE FEET OR 0.540 ACRES, MORE OR LESS.

I, CHRISTOPHER P. JULIANA, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS SURVEY HAS BEEN PERFORMED BY ME OR UNDER MY RESPONSIBLE CHARGE, IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE, IS IN ACCORDANCE WITH APPLICABLE STANDARDS OF PRACTICE AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

COLORADO REGISTERED CHRISTOPHER P. JULIANA NUMBER 31158 PROFESSIONAL LAND SURVEYOR

05/19/26

CHRISTOPHER P. JULIANA, L.S. 31158 DATE
FOR AND ON BEHALF OF PRECISION SURVEY & MAPPING, INC.

PRECISION SURVEY & MAPPING
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CHKD. BY: J.N.
DATE: 05/19/26
SCALE: 1" = 250'

FILE: R14459
SHEET: 2 OF 2
W/O #:

# ACCESS EASEMENT

**Attachment 2 – PFAS Treatment Report**

April 30, 2025

To: Kevin Brown, PE
Brandon Zembles, EIT
Mathew Mevis

From: Rahul Subramanian, PE, PMP
Conner Murray, PhD, PE
Seth Donaldson
Jason Curl, PE

# PFAS Treatment Evaluation for Cherokee Metropolitan District

FINAL

## Executive Summary

Per- and polyfluoroalkyl substance (PFAS) occurrence in Cherokee Metropolitan District's (CMD) groundwater supplies motivated a preliminary investigation of treatment alternatives as well as a pilot-scale study to determine the best treatment approach to achieve compliance with the PFAS maximum contaminant levels (MCLs). This study has included an evaluation of multiple adsorption-based treatment approaches in the establishment of adsorption design parameters, estimation of conceptual capital costs, and the determination of adsorbent changeout intervals. While the pilot-scale study remains ongoing, the objective of this technical memorandum (TM) is to briefly summarize project progress to date while also offering some technical insight into the design parameters dictating capital cost estimates and future considerations for full-scale facility design.

Hazen

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Hazen

# 1. Introduction

The persistence of per- and polyfluoroalkyl substances (PFAS) in drinking water supplies has impacted numerous utilities across Colorado with a newly finalized National Primary Drinking Water Regulation (NPDWR) set for a variety of PFAS species. For Cherokee Metropolitan District (CMD), PFAS concentrations have exceeded the maximum contaminant level for some PFAS species in a few of their groundwater supply wells, which supply a major fraction of their total blended influent water, necessitating treatment to achieve compliance. With a large expansion of CMD's current water treatment infrastructure required to achieve PFAS treatment, CMD has initiated a preliminary treatment study to evaluate treatment alternatives in order to select a treatment process to move forward through design and construction.

## 1.1 Objective

CMD has tasked Hazen and Sawyer (Hazen) to investigate the feasibility of PFAS treatment to achieve compliance with the upcoming PFAS NPDWR. Desktop evaluations and a pilot-scale demonstration were conducted to compare the relative effectiveness and feasibility of multiple PFAS treatment strategies, including adsorption and membrane-based removal technologies.

The objective of this memo is to provide an overview of the pre-design treatment evaluation process used to facilitate treatment selection that will ensure CMD's compliance with the PFAS NPDWR by April 2029. As CMD continues to move forward with treatment design and construction, this TM provides technical details related to the basis of pressure vessel design as well as an opinion of probable construction costs to inform capital budgeting moving forward. This TM reviews PFAS concentrations and background water quality characterized by the anticipated impact on PFAS treatment design and treatment longevity. Although the pilot study and continued hydraulic evaluation associated with the ultimate treatment selection remain ongoing, process design criteria were used to inform treatment sizing and cost estimations which were combined with piloting results to date to make recommendations going forward.

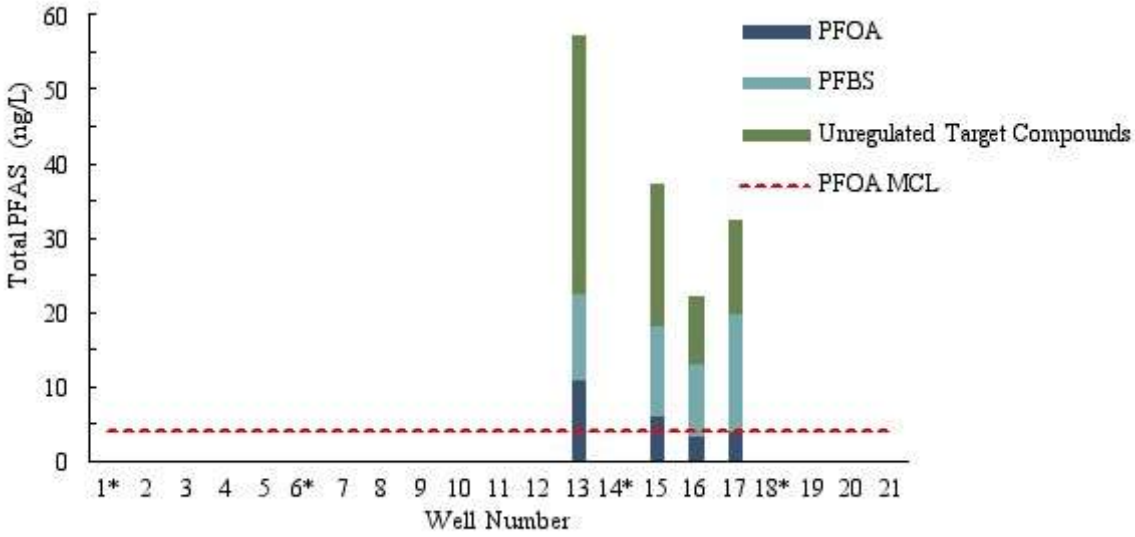
# 2. Data Review

In the investigation of suitable PFAS treatment alternatives, the approach began with a sampling campaign to understand the geospatial variability of PFAS concentrations as well as other water quality constituents impacting adsorption effectiveness. Results from this sampling effort in tandem with blended groundwater quality collected over the course of more than 7 months are summarized in Section 2.1.

## 2.1 Water Quality and PFAS

A sampling campaign was initiated prior to pilot-scale studies to analyze the extent of PFAS contamination as well as the characterization of total organic carbon (TOC) at each individual groundwater well. The analysis of individual wells leads to a better understanding of the implications of well operation and its effect on the blended influent water via a mass balance approach. **Figure 2-1** shows the totalized PFAS concentrations found in the individual wells, approximately 17 out of 21 wells are projected to be operational for future water production and contribute a significant portion of CMD's total influent water.

Wells 1, 6, and 18 have temporary flow restrictions, while well 14 is permanently offline. Therefore, wells 1, 6, 14, and 18 are not projected to contribute a significant portion of flow (<10%) to CMD's blended influent water in the future and were not considered as part of this analysis. **Table 2-1** summarizes the TOC and PFAS concentrations found in the wells with detected PFAS contamination (well 13, 15, 16, and 17). PFOA and PFBS concentrations are shown individually because they have maximum contaminant levels (MCLs) under the EPA NPDWR whereas the PFHxA and PFHpA are grouped together as unregulated compounds under the current EPA NPDWR. The wells with PFAS contamination are historically higher flow wells that contribute a substantial portion (~40%) of the overall flow distributed by CMD during higher water demand seasons. Therefore, due to the higher proportion of water coming from well 13, 15, 16, and 17 annually, the PFAS contamination within these wells is sufficient to cause the resulting blended influent water to be out of compliance with the MCL within the PFAS NPDWR. In particular, the elevated concentrations of PFOA has a high possibility of causing the total blended stream of distributed water to be above the MCL of 4.0 ng/L, if well 13 or 15 contribute a significant flow to the stream.




* Well 1, 6, 14, and 18 will not contribute significant flow to CMD's influent flow in the future and therefore were not considered as part of this analysis

**Figure 2-1: Well Specific PFAS Concentration**

**Table 2-1: Individual Well Analysis**

| Well | TOC (mg/L) | PFHxA (ng/L) | PFOA (ng/L) | PFBS (ng/L) | PFHpA (ng/L) |
|---|---|---|---|---|---|
| 13 | 1.5 | 31 | 11 | 12 | 4 |
| 15 | 1.0 | 17 | 6.2 | 12 | 2.4 |
| 16 | 0.7 | 9.3 | 3.4 | 9.6 | 0.0 |
| 17 | 0.9 | 10 | 3.9 | 16 | 2.3 |

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Sampling of the blended influent water quality and PFAS constituents continued throughout the operation of the pilot adsorption demonstration. The average water quality of the influent water is summarized in **Table 2-2**. Characterization of the background water quality can have a substantial impact on the PFAS removal effectiveness for each adsorbent.

**Table 2-2: Average Influent Analyte Concentration throughout Pilot Operation**

| Parameter | Average Influent | Sample Quantity (n) |
|---|---|---|
| TOC (mg/L) | 1.3 | 12 |
| Alkalinity (mg/L) | 190 | 18 |
| Nitrate (mg/L) | 6.2 | 19 |
| Turbidity (NTU) | 0.52 | 20 |
| Sulfate (mg/L) | 67 | 20 |
| Chloride (mg/L) | 55 | 19 |

Concentrations of TOC were generally low for this groundwater with also low concentrations of competitive anions which, in conjunction with TOC, can inhibit adsorption effectiveness. The impact of these parameters on PFAS breakthrough will be further characterized in a subsequent piloting report.

The influent PFAS slightly varied during the piloting campaign, which began on July 16th, 2024 and is anticipated to end in May, 2025. **Figure 2-2** shows the influent PFAS concentrations throughout the duration of the adsorption pilot. PFOA was the sole compound that was detected with concentrations above compliance and thus will be dictating the adsorbent changeout frequency. The average influent PFOA concentration throughout the pilot was 5.1 ng/L. Hazen recommends a changeout criteria of 3 ng/L for PFOA to ensure compliance with the 4.0 ng/L PFOA MCL. Therefore, the changeout frequency will be dictated by when the PFOA concentration in the effluent from the adsorbents reaches approximately 59% of the influent PFOA concentration.

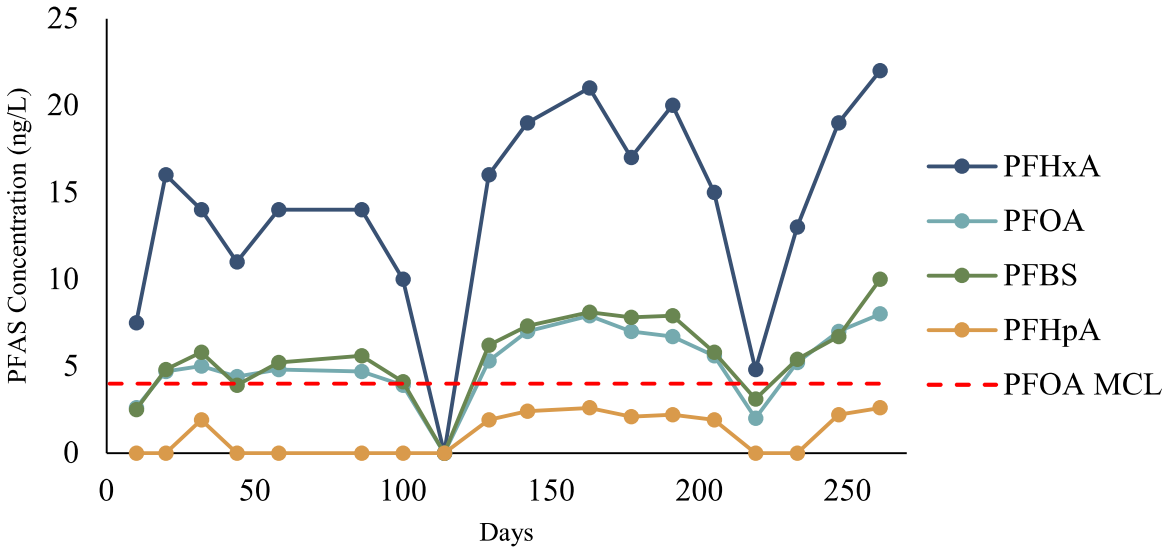



**Figure 2-2: Influent PFAS Concentration throughout Pilot Operation**

# 3. Treatment Alternatives

Best available PFAS treatment alternatives were evaluated for groundwater treatment in this study including granular activated carbon (GAC) adsorption, anion exchange resin (IX) adsorption, and high-pressure membranes as well as novel adsorbent materials such as Fluoro-Sorb (FS). Adsorption-based treatment approaches were piloted for further evaluation of treatment longevity including GAC, IX, and FS as discussed in greater detail in Section 4. While effective for the rejection for a range of trace organic contaminants, evaluation of high-pressure membrane treatment alternatives such as reverse osmosis (RO) and nanofiltration (NF) is not discussed in great detail in this TM (though will be included in the final schematic design evaluation report). Adsorption based PFAS treatment approaches are widely applied for groundwater applications of similar size across Colorado and are estimated to be more favorable with respect to land requirements for concentrate disposal and capital cost at this stage of the evaluation. As a result, preliminary design of adsorption-based treatment approaches is carried out in the following subsections.

## 3.1 Adsorption Treatment Sizing

Fixed bed adsorbents can be installed in pressure vessels or gravity contactors. The design flow of the treatment plant influences the choice between pressure vessels and gravity contactors. Pressure vessels are generally the preferred option for treatment systems under 10 MGD, due to the flexibility of pressure vessel operation with seasonal flow variations as well as the ability to easily changeout adsorbents after breakthrough and avoid re-pumping of water as may be required in gravity adsorbers. Gravity contactors are typically selected for higher design flow rates (>20 MGD) to efficiently utilize contactor area but generally incur higher capital costs for systems smaller than 10 MGD where pressurized systems can operate at higher hydraulic loading rates therefore enabling smaller facility footprints. This section will focus on the sizing of pressure vessels based on the design flow rate of CMD.

Pressure vessels can be designed in a lead/lag or a parallel configuration. Operation of pressure vessels in parallel can reduce required footprint but requires more frequent PFAS sampling to ensure the adsorption changeout frequency is sufficient to achieve compliance with PFAS MCLs. Parallel operation also requires diligent breakthrough monitoring and blending of vessel effluents to maintain finished water PFAS concentration targets. A lead/lag configuration has greater operational simplicity due to the lag vessel providing polishing of any PFAS breakthrough from the initial lead vessel. The design of lead/lag pressure vessels was determined to be a more favorable configuration to allow CMD to treat to non-detect PFAS concentrations and ensure consistent compliance with the PFAS MCLs.

## 3.2 Pressure Vessel Sizing

Pressure vessels were initially sized for the design flow of CMD of 6,000 gpm (8.6 mgd). **Table 3-1** shows the proposed design for pressure vessel application for GAC, IX, and FS. At the design flow conditions the GAC pressure vessel application requires 7 lead/lag pairs, while the IX and FS requires 4 lead/lag pressures vessels to maintain appropriate empty bed contact time (EBCT) and hydraulic loading rate (HLR). The EBCT and HLR are consistent with the values used for the pilot testing as well as within the range of recommended operating parameters from the adsorbent manufacturers.

**Table 3-1: Pressure Vessel Design Parameters at Design Flow (6,000 gpm)**

| Design Parameter | Unit | GAC | IX | FS |
|---|---|---|---|---|
| EBCT Lead Vessel | min | 10.4 | 2.3 | 2.3 |
| Hydraulic Loading Rate | gpm/ft$^2$ | 7.6 | 13 | 13 |
| Vessel Diameter | ft | 12 | 12 | 12 |
| Vessel Side Shell Height[a] | ft | 12 | 4 | 4 |
| Total # of Vessels | | 14 | 8 | 8 |
| Total # of Lead/Lag Pairs | | 7 | 4 | 4 |

[a] Vessel dimensions may vary slightly based on selected pressure vessel vendor

Additionally, pressure vessels operational parameters for CMD's average flow of 2,000 gpm have also been calculated to better understand operational conditions representing average flow operation, shown in **Table 3-2**. While flow demands may vary substantially over the course of the year, consideration of average flow conditions were used to estimate operational demands and costs for more typical pressure vessel operation though it should be noted that a range of flows from 1,000 to 3,100 gpm was observed in 2024. Under average flow conditions (2,000 gpm) CMD could consider operation of only a portion (approximately 40% for GAC and 50% for IX/FS) of the total vessel pairs while still maintaining sufficient EBCT and HLR to be within the recommended operational range.

**Table 3-2: Pressure Vessel Operational Parameters at Average Flow (2,000 gpm)**

| Design Parameter | Unit | GAC | IX | FS |
|---|---|---|---|---|
| EBCT Lead Vessel | min | 13.3 | 3.1 | 3.1 |
| Hydraulic Loading Rate | gpm/ft$^2$ | 5.9 | 8.8 | 8.8 |
| Vessel Diameter | ft | 12 | 12 | 12 |
| Vessel Side Shell Height | ft | 12 | 4 | 4 |
| Total # of Operational Vessels | | 6 | 4 | 4 |
| Total # of Operational Lead/Lag Pairs | | 3 | 2 | 2 |

Three-dimensional pressure vessel model renderings have been included for a single pair of both the GAC and IX/FS pressure vessel model sizes in **Figure 3-1**.

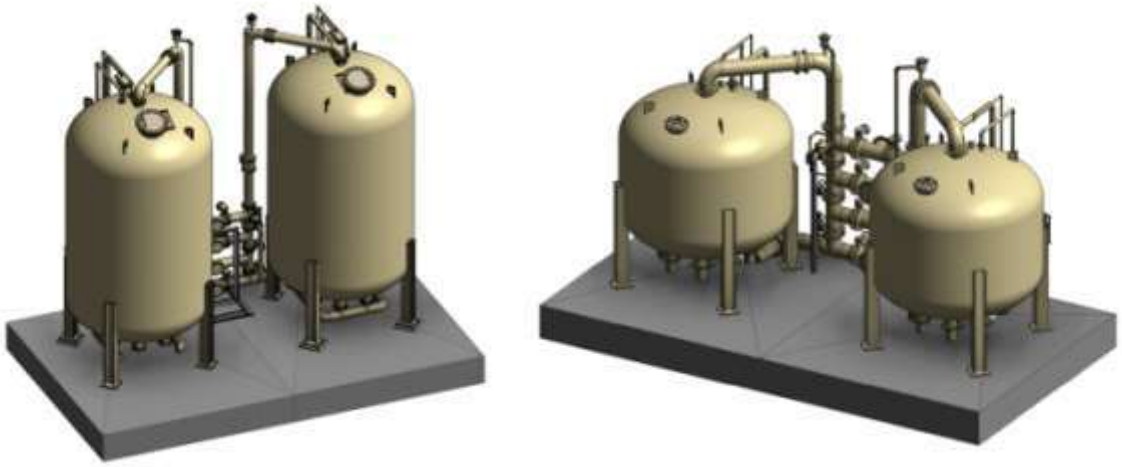


**Figure 3-1: Left GAC Pressure Vessel Pair, Right IX/FS Pressure Vessel Pair**

### 3.2.1 Auxiliary Treatment Components

The use of pressure vessels requires additional auxiliary components, particularly cartridge filters applied upstream to remove particulate matter prior to pressure vessel treatment to mitigate adsorbent head loss accumulation. **Table 3-3** shows the sizing for cartridge filters, based on the design flow of 6,000 gpm. Two UF30 cartridge filter housings can accommodate the design flow, and a third housing is included to allow one housing to be off duty during adsorber changeouts. Cartridge filter design may change slightly in subsequent project phases based on operator preference and facility layout constraints. Additional site development may be required to accommodate adsorbent startup waste generated in forward flushing (IX) or backwashing (GAC) of adsorbents in startup.

**Table 3-3: Preliminary Cartridge Filter Design Criteria**

| Design Parameter | Unit | Cartridge Filter |
|---|---|---|
| Model | | UF 30 |
| Length | in | 60 |
| Max Flow Rate | gpm | 3,000 |
| # of Cartridge Filter Housing | | 3 |
| # of Filters per Housing | | 12 |

# 4. Treatment Operation Demonstration Testing

With a variety of treatment alternatives considered for potential full-scale application, a pilot scale demonstration unit was used to evaluate the relative PFAS removal performance of GAC, IX, and FS. The pilot demonstration was conducted to establish expected changeout frequencies and inform estimated operational costs due to media changeout for each adsorbent investigated.

A demonstration test was not conducted for the membrane application due to well-established PFAS rejection performance of NF membranes considered in this investigation. Furthermore, it is anticipated that the sizing and operation of a full-scale membrane installation will be dictated by other non-PFAS water quality goals such as hardness reduction.

## 4.1 Piloting Setup

The pilot demonstration unit was located inside the 048-pumping and chlorination facility, directly off of highway 94. Flows from all the previously noted wells (Figure 2-1) are blended at this facility. CMD's blended influent water initially flowed into the equalization (EQ) tank. A feed pump was used to feed water from the EQ tank to the distribution manifold with sufficient head to achieve the desired hydraulic loading rates (HLR) in each column. The distribution manifold controlled the flow to each separate column. Effluent from the columns was directed to the nearby floor drain. PFAS samples were collected from the EQ tank (influent), column ½ depth sample port, and column outlets (effluent). Initially the midway ports were analyzed until sufficient breakthrough was observed, at which point the column outlets were analyzed. All samples were retained throughout pilot operation in case 50% breakthrough occurred rapidly and backlogged 100% samples were required to depict breakthrough at the full-scale design EBCT or samples required retesting. The pilot demonstration unit is shown in **Figure 4-1**.



**Figure 4-1: Adsorption Demonstration Unit**

## 4.2 Preliminary Piloting Results

Initial sampling was conducted on mid-column sampling points, to characterize PFAS breakthrough for ½ of the adsorbents designed EBCTs. Midpoint sampling allowed breakthrough to be observed for compounds and adsorbents with prolonged anticipated breakthrough intervals (i.e. PFOA). Once PFAS breakthrough was observed at the 50% column effluent, sampling was switched to the 100% column effluent, to more accurately inform full scale changeout costs. The changeout criteria was defined as breakthrough > 3 ng/L of PFOA for each adsorbent.

The estimated changeout frequencies are shown in **Table 4-1**. The reported changeout frequencies correspond to the operational EBCT observed in the deployed pilot unit. The 100% sampling ports for GAC correspond to a 12 min EBCT, while the 100% sampling ports for IX/FS correspond to a 2 min EBCT. GAC F400 and FS-200 100% sampling ports surpassed the changeout criteria at 129 days and 170 days, respectively. GAC AV 1240 100% sample port surpassed the changeout criteria at 235 days. For both IX's evaluated, the breakthrough of PFOA remains undetected at the 50% sampling port. Assuming adsorption usage rate is linear in respect to EBCT (i.e. longer EBCT achieved via more media depth translates to linear improvements in breakthrough time), the latest sampling event corresponding to 261 days was doubled to result in an inferred changeout frequency of at least 522 days.

**Table 4-1: Adsorbent Media Changeout Frequency**

| Media | Changeout Frequency (days) |
|---|---|
| GAC F400 | 129[a] |
| GAC AV 1240 | 235[a] |
| IX PSR2+ | 522[b] |
| IX CalRes 2301 | 522[b] |
| FS-200 | 170[a] |

[a] Observed PFOA > 3 ng/L at 100% sampling port

[b] PFOA undetected at 50% sampling ports, assumed full scale IX will last at least double the time of current pilot operation

# 5. Cost of PFAS Treatment Alternatives

Treatment alternatives were evaluated with respect to treatment cost both with capital infrastructure cost estimates and operational and maintenance cost estimates to provide insight into the cost viability of each treatment alternative. This section provides additional details into the provided estimates of capital, operation and maintenance (O&M), and lifecycle costs for each treatment alternative. Greater cost certainty may be provided for each treatment alternative with continued investigation and detailed design.

## 5.1 Capital

In the development of cost estimates for each of the alternatives noted to achieve the water treatment goals, a variety of assumptions were included in this preliminary AACE Class 5 cost estimate. Class 5 has a typical

accuracy range of –50% on the low end and +100% on the high end. Cost assumptions were added to all line items and are described in **Table 5-1**.

**Table 5-1: Capital Cost Assumptions**

| Markups and Indirect Cost | % |
|---|---|
| Special Conditions | 5% |
| Small Tools (Applied on Labor) | 2% |
| Indicental Overtime | 5% |
| General Conditions | 15% |
| Labor Escalation | 11.2% |
| Material/Equipment Escalation | 12.5% |
| Subcontractor Overhead, Profit, & Fee | 25% |
| Prime Contractor Overhead & Profit | 10% |
| Prime Profit on Subcontracted Work | 5% |
| Bond and Insurance | 3% |
| Design Contingency | 30% |

Capital cost estimates for each treatment alternative are summarized in **Table 5-2** with associated costs for treatment equipment as well as other necessary treatment components such as distribution components (e.g. two raw water tanks (1 million gallons each), finished water tank (0.5 million gallons), raw water and finished water pumping , electrical components, yard piping, and site modifications (including site building). Generally, the highest cost treatment alternatives were GAC treatment alternatives which contained a much larger building footprint size and more pressure vessels compared to IX/FS treatment alternatives. The lowest cost alternatives were associated with IX and FS treatment which have identical site footprints housed within the same pressure vessels. The small difference in capital cost is associated with the lower unit price of the initial media load which is more expensive for IX relative to FS. Note exclusions in these noted capital cost estimates are potential residuals management infrastructure required for adsorbent startup waste as well as engineering design fees and services during construction. It is noted that these costs include substantial design contingency as is appropriate at this time as the treatment site layout continues to develop.

Opportunities to reduce capital cost estimates may be realized with continued design efforts to optimize site footprint, options for less expensive construction materials, or staged procurement of treatment equipment. These cost reduction measures will be reviewed in greater detail in preliminary design of this treatment facility.

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**Table 5-2: Anticipated Capital Costs for Pressure Vessel Systems**

| Description | GAC | IX | FS |
|---|---|---|---|
| Process Building | *9,630,000* | *6,250,000* | *6,250,000* |
| Cartridge Filter System | *650,000* | *650,000* | *650,000* |
| Pressure Vessel System | *15,810,000* | *10,980,000* | *10,320,000* |
| Raw Water Pumping and Storage | *8,740,000* | *8,750,000* | *8,750,000* |
| Finished Water Pumping and Storage | *4,090,000* | *4,090,000* | *4,090,000* |
| GAC Backwash Tank | *370,000* | ~ | ~ |
| Disinfection | *750,000* | *750,000* | *750,000* |
| Yard Piping | *700,000* | *700,000* | *700,000* |
| Site Work | *1,610,000* | *1,090,000* | *1,090,000* |
| Electrical + I&C | *9,070,000* | *6,320,000* | *6,320,000* |
| **Capital Cost** | **$51,400,000** | **$39,600,000** | **$38,900,000** |

## 5.2 Operational and Maintenance

Annual O&M costs were developed for each alternative as summarized in **Table 5-3** where the most costly alternatives from an O&M perspective were generally associated with GAC treatment alternatives which included shorter changeout intervals (derived from piloting outcomes to date) and comparatively higher media changeout costs. Estimated annual O&M costs reflect an annual average flow of 2,000gpm and the level of design provided in this document.

O&M cost estimates were predominantly composed of adsorbent changeout costs. Labor costs and analytical components were also estimated for each alternative but may not substantially impact the annual O&M cost. Labor costs were assumed to be a function of required changeout events for a given adsorbent where the labor costs were lowest for IX which only requires changeout less than once per year. It is important to note that O&M costs do not include existing treatment costs associated with pumping and disinfection at the new treatment facility. The unit adsorbent costs noted in **Table 5-3** are inclusive of spent adsorbent disposal. Assumptions for the O&M cost development are noted in the table footnotes specifically related to adsorbent unit pricing and labor assumptions.

**Table 5-3: Annual O&M Costs**

| Parameter | Units | GAC | IX | FS |
|---|---|---|---|---|
| Media / Consumable Replacement[a] | $/yr | *400,000-666,000*[b] | *258,000* | *350,000* |
| Labor[c] | $/yr | *194,400* | *45,100* | *138,500* |
| Analytical | $/yr | *31,600* | *24,400* | *24,400* |
| **Total O&M ($/MG)** | | *595-850* | *312* | *487* |
| **Annual O&M ($/yr)** | | *626,000-892,000*[b] | *328,000* | *512,000* |

[a] Unit Costs for Adsorbents, including anticipated disposal costs ($/ft$^3$): GAC = $66/ft$^3$, IX= $480/ft$^3$, FS = $235/ft$^3$
Assumed 3x UF30 cartridge filters with 3 complete changeouts of cartridge filter elements per year

[b] O&M contingent on GAC media selection

[c] Labor Assumptions: FTE requirements corresponding to changeout events per year where a single FTE is $100,000 annually

### 5.3 Lifecycle Cost Comparison

In the cross comparison of multiple treatment alternatives a net present value cost analysis was performed based on the following assumptions below:

- Inflation rate = 3%
- Discount rate = 6%
- 20-year lifecycle cost

The capital cost estimates summarized in **Table 5-2** were combined with annual O&M costs in **Table 5-3** to calculate a 20-year net present value as summarized in **Table 5-4**.

**Table 5-4: Net Present Value of PFAS Treatment Alternatives**

| Parameter | Units | GAC | IX | FS |
|---|---|---|---|---|
| 20-yr Net Present Value | $ M | *$60.9 M – $64.9 M*[a] | *$44.5 M* | *$46.7 M* |

[a] *Net present value contingent on GAC media selection*

In review of the net present value calculations for each evaluated adsorbent, IX is the most cost-effective PFAS treatment alternative due to the similar capital cost of IX and FS alternatives coupled with a prolonged changeout interval reducing O&M costs.

## 6. Recommendations

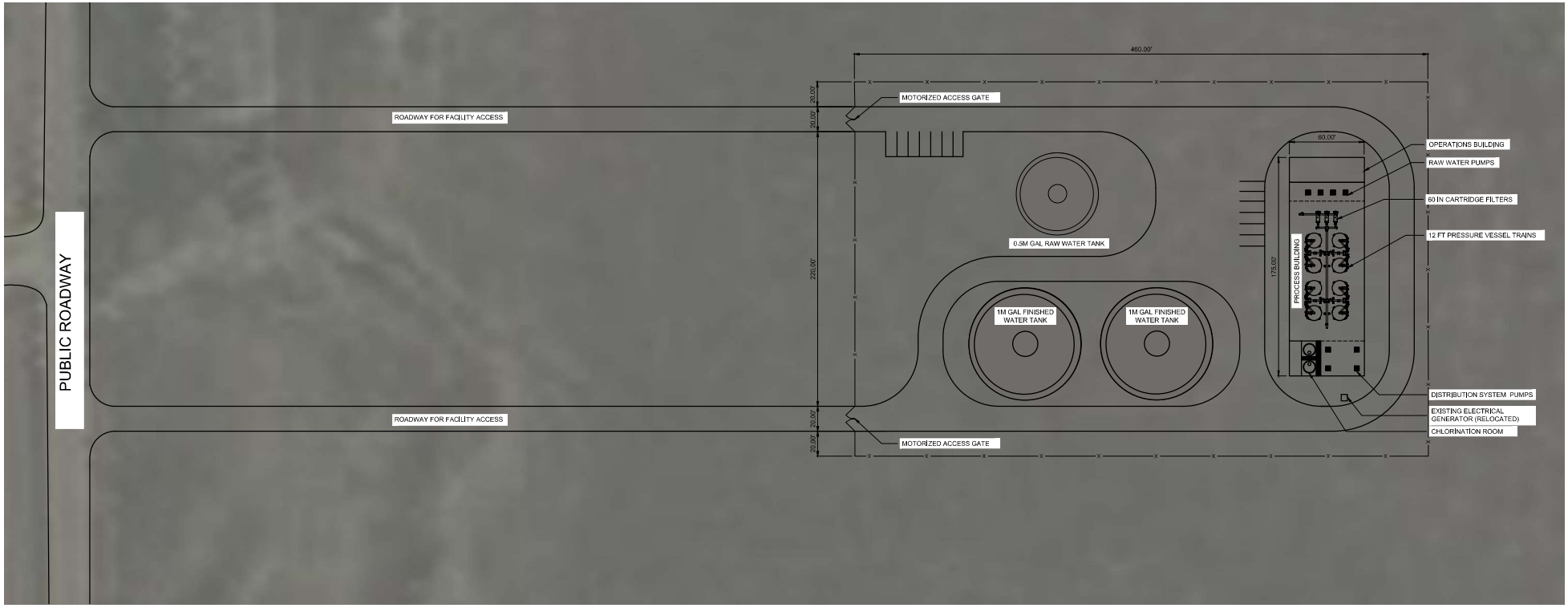
In the investigation of PFAS treatment alternatives to be applied at CMD, preliminary design of an adsorption pressure vessel system was used to inform projected site layouts and class 5 cost estimates for treatment infrastructure. Ongoing adsorption piloting is being conducted to inform adsorption changeout intervals for each adsorbent that can be used to estimate annual O&M costs for each alternative.

Outcomes of this investigation thus far favor the continued detailed design and installation of an IX treatment solution for PFAS compliance. An IX treatment solution offers considerable footprint and cost savings over the sized GAC treatment alternative while also representing the highest treatment effectiveness of piloted adsorbents with respect to treatment longevity. Through more than 7 months of adsorption piloting, the IX columns have far outperformed FS in PFAS treatment.

Continued detailed design of IX treatment is recommended to provide a robust treatment solution for CMD to achieve compliance with the new PFAS MCLs.

NOTES:

1. PROCESS UNITS ALONG WITH OPERATIONS ROOM WILL BE LOCATED INSIDE A BUILDING.
2. EXACT LOCATION OF THE PLANT WITHIN THE PROPOSED SITE WILL BE DETERMINED DURING DETAILED DESIGN AND UPON COMPLETION OF SITE SURVEY AND TOPOGRAPHY




PLAN
SCALE: 1" = 40'

| REV. | ISSUED FOR | DATE | BY |
|---|---|---|---|

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DESIGNED BY: S. DONALDSON
DRAWN BY: J. PAYTON
CHECKED BY: R. SUBRAMANIAN
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

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HAZEN AND SAWYER
1975 RESEARCH PARKWAY
COLORADO SPRINGS, CO 80920

CHEROKEE METROPOLITAN DISTRICT
COLORADO SPRINGS, COLORADO

PFAS TREATMENT FACILITY

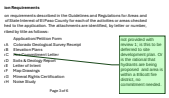
CHEROKEE METROPOLITAN DISTRICT
PFAS TREATMENT FACILITY
PROPOSED SITE PLAN

DATE: JUNE 2025
HAZEN NO.: 70129-000
CONTRACT NO.:
DRAWING NUMBER: C001


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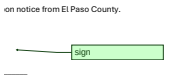
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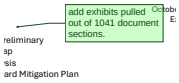
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