

# **TIMBER RIDGE WEST**

## **WATER RESOURCES and WATER QUALITY REPORT For Timber Ridge West Subdivision**

**December 3, 2018**

**Prepared By:**



**13511 Northgate Estates Dr., Ste. 250, Colorado Springs, Colorado 80921**

## **Executive Summary:**

### **Water Resources and Water Quality Report – Timber Ridge West Subdivision**

Chris D. Cummins of Monson, Cummins & Shohet, LLC, on behalf of the Applicant, Jacob Decoto, provides the following Water Resources/Water Quality/Wastewater Disposal Report in support of the Timber Ridge West subdivision. The undersigned has been practicing water law, almost exclusively, for over 15 years, and has substantial experience with Denver Basin groundwater resources, augmentation plans, subdivision proceedings, and rural residential water usage, and therefore should be considered a “qualified professional” as concerns water resources, as discussed at Section 8.4.7(B)(1)(c) of the El Paso County Land Development Code. This Report, prepared in conjunction with other professionals, is intended to demonstrate to the El Paso County Planning Commission and the BoCC, the sufficiency in terms of quantity, dependability, and quality, of the water rights and resources to be utilized in the proposed Timber Ridge West subdivision, on the southern edge of the Black Forest in northern El Paso County, Colorado. While Section 8.4.7(B)(2)(d) expressly provides that a full-blown water resources report may not be required for a minor subdivision, as here, Mr. Decoto nonetheless wishes to provide all detail necessary to assist the County in its review.

The Timber Ridge West development proposed by Jacob Decoto, consists of approximately 36.01 acres located west of Vollmer Road and near the intersection with Arroya Lane, in the SE¼ of Section 21, and the NW¼ NE¼ of Section 28 Township 12 South, Range 65 West of the 6<sup>th</sup> P.M. The land is to be provided water and sewer/septic services through on-site individual wells and Individual Septic Disposal Systems (“ISDS”). The development includes two residential lots of approximately 3.8 and 3.2 acres, along with one residential tract of 29.01 acres.

It is expected that each residential home on the residential lots (Lots 1 & 2) in the Timber Ridge West subdivision will require an average of 0.32 annual acre-feet of water supply, and the residential home on Tract A will require an average of 0.58 annual acre-feet of water, to be provided through individual wells on each lot/tract to the non-tributary Dawson aquifer, consistent with the plan for augmentation decreed in Division 2 Case No. 18CW3005. Such water supply demands are consistent with, or in some instances more conservative than, other rural residential homes historical demand in other nearby developments in the Black Forest. The augmentation plan decreed in Case No. 18CW3005 provides for a 300-year water supply for each of the anticipated 2 lots and 1 Tract (3 Dawson aquifer wells, total) within Timber Ridge West, with each lot/tract utilizing ISDS of a non-evaporative nature.

The water resources to be utilized in the Timber Ridge West subdivision are typical to 2.5 to 5-acre rural residential development in Black Forest and other parts of rural northeastern El Paso County, Colorado. The plan for augmentation decreed in Case No. 18CW3005 demonstrates a sufficient quantity and reliability of water to support compliance with El Paso County’s 300-year water supply rules for subdivisions

of this nature, and the well-established water quality in the Dawson aquifers in this part of the County, demonstrates a sufficient water quality consistent with Section 8.4.7(3)(d) of the El Paso County Land Development Code, particularly as concerns the presumption of sufficient quality discussed at El Paso County Land Development Code Section 8.4.7(B)(10)(g) as concerns minor subdivisions, as here.

## **I. INTRODUCTION**

The purpose of this report is to provide a preliminary outline of the water resources, associated wastewater requirements, and water quality, necessary for approval of the Timber Ridge West subdivision, as proposed.

1.1 New Development Description: Timber Ridge West subdivision consists of approximately 36.01 acres located to the west of Vollmer Road and near the intersection with Arroya Lane, in the SE¼ of Section 21, and the NW¼ NE¼ of Section 28 Township 12 South, Range 65 West of the 6th P.M. The Timber Ridge West subdivision anticipates a maximum of 3 rural residential units. **Exhibit A**, attached hereto, is a preliminary plan for the Timber Ridge West subdivision as proposed, prepared by Applicant's planning consultants at Compass Surveying and Mapping, LLC, including an area map.

## **II. PROJECTION OF WATER NEEDS**

2.1 Analysis of Water Demands: It is expected that each of the three (3) rural residential lots/tract in the Timber Ridge West subdivision, utilizing 3 individual wells to the Dawson aquifer will be developed with a single family home, anticipating limited gardens and landscaping, potentially watering of horses or similar stock, and accessory uses such as hot tubs. Consistent with the Plan for Augmentation decreed in Division 2 Case No. 18CW3005, it is anticipated that each single family residence on Lots 1 and 2 will utilize a maximum of 0.32 annual acre feet of water through individual wells, and that the single family residence on Tract A will utilize a maximum of 0.58 annual acre feet of water through an individual well, with total demand for all 3 lots/tract estimated at a maximum of 1.22 annual acre feet. Of this pumping, it is anticipated that 0.20 annual acre feet will be utilized for in-house residential purposes, consistent with and more conservative than Section 8.4.7(B)(7)(d), with the remainder of pumping varying between lots/tract for other uses authorized under the 18CW3005 augmentation plan. The individual wells are each anticipated to produce water from the Dawson aquifer at flow rates of 10 to 15 gallons per minute, based upon production from wells typical to the area. There are no wells currently constructed on the property. Based on past experience with the numerous Dawson wells serving rural residential properties throughout northern El Paso County, this rate of production from each individual well should be sufficient not only to meet each residence's average demand for in-house uses, but maximum demands for accessory uses as well. It is anticipated that all three lots/tract, and associated wells, will be immediately developed.

## **III. PROPOSED WATER RIGHTS AND FACILITIES**

3.1 Water Rights: A plan for augmentation utilizing the underlying Denver

Basin aquifers was decreed by the Water Division 2 District Court in Case No. 18CW3005, which utilizes a portion of the groundwater quantified and decreed in prior Case No. 17CW3002. A copy of the recorded Decree entered in Case No. 18CW3005 is attached hereto as **Exhibit B**, and a copy of the recorded Decree entered in Case No. 17CW3002 is attached as **Exhibit C**, including the following specific quantities of water anticipated to be available for and utilized in the Timber Ridge West subdivision:

<b>AQUIFER</b>	<b>Saturated Thickness (ft)</b>	<b>Total Water Adjudicated (Acre Feet)</b>	<b>Annual Average Withdrawal – 100 Years (Acre Feet)</b>
Dawson (NNT)	270	1,944.4	16.44 <sup>1</sup>
Denver 4% (NNT)	310	1,897.7	18.98
Arapahoe (NT)	255	1,561	15.61
Laramie Fox Hills (NT)	190	1,026.2	10.26

As particularly described in the attached Decrees in Case Nos. 17CW3002 and 18CW3005, a 300-year water supply is demonstrated in the Dawson aquifer, with all depletions augmented in time, place and amount through septic return flows during pumping, and through dedication of nontributary groundwater in the Laramie-Fox Hills aquifer for replacement of post-pumping depletions. The available supplies will meet both legal and physical needs on a 300-year basis. The uses of water available to each of the wells to be utilized in the three residential dwellings/lots include, per the 17CW3002 and 18CW3005 decrees, specifically include fire protection purposes. In addition, the Timber Ridge West Subdivision is adjacent to a higher-density development pending approval, the Timber Ridge development, to the south/southwest, which will include municipal water supplies with associated fire hydrants and flows.

3.2 Source of Supply: Rural residential water supply demand will be met using not-nontributary Dawson aquifer formation wells, consistent with the plan for augmentation decreed in Case No. 18CW3005. Of the total three individual private wells that will be utilized at the Timber Ridge West, none have been constructed to date. Consistent with El Paso County Land Development Code Section 8.4.7(B)(3)(c)(v), a minor subdivision utilizing individual wells need not make a further showing as to source of supply.

3.3 Water Quality and Treatment: The water quality in Dawson aquifer in this area is well established as being suitable for potable use with only in-house filtration for mineral deposits, with an estimated 27,000 households in El Paso County currently utilizing Denver Basin wells, the majority of which are constructed to the shallowest Dawson formation. See June 15, 2015 Gazette article – “Where there is a well, there is a way...”, attached hereto as **Exhibit D**. There is a presumption of suitable and sufficient

<sup>1</sup> The Dawson aquifer annual withdrawal figures represent not the 100-year aquifer life discussed at C.R.S. §37-90-137(4), but rather a 300-year aquifer life consistent with provision of a 300-year water supply in compliance with El Paso County, Colorado land development code as applicable to the subdivision of Applicant’s Property.

water quality for minor subdivisions utilizing Denver Basin groundwater supplies per El Paso County Land Development Code Section 8.4.7(B)(10)(g). All wells will meet all applicable regulatory requirements regarding quality testing before being utilized as a residential water source.

3.4 Pumping Rates for Service: The Dawson aquifer in the location of the Timber Ridge West subdivision are generally known to produce approximately 10-15 gallons per minute, more than sufficient for single family residential and accessory uses.

**IV. WASTEWATER AND WASTEWATER TREATMENT** – While a detailed soils, geology and geotechnical report has been provided by Applicant’s geotechnical consultants at Entech Engineering, Inc. (attached as **Exhibit E**), Applicant provides a summary of ISDS to be utilized herein, as relates to water usage and resulting return flows which support the plan for augmentation pending decree in Case No. 18CW3005.

4.1 Septic/Wastewater Loads: Septic projections are based on similar Denver Basin residential uses on rural residential lots. Average daily wastewater loads are expected to be approximately 180 gallons per day per single family residence. Maximum daily wastewater loads are expected to be roughly 200 gallons per day per single family residence, all assuming residential in-house use at the 0.20 acre foot per year rate described in Case No. 18CW3005.

4.2 On-Site Wastewater Treatment Systems: All three single family homes within the Timber Ridge West subdivision will be served by individual on-site wastewater treatment systems. The site has been evaluated for on-site wastewater treatment systems by Applicants consultants at Entech Engineering, Inc., as described in their report attached as **Exhibit E**. Based on such evaluation, the site is suitable for on-site wastewater treatment systems/ISDS. Each on-site wastewater treatment system will be evaluated and installed according to El Paso County Guidelines and properly maintained to prevent contamination of surface and subsurface water resources.

Respectfully submitted this 4<sup>th</sup> day of December, 2018

MONSON, CUMMINS & SHOHEET, LLC

*/s/ Chris D. Cummins*

Chris D. Cummins

cc: Client

# Timber Ridge West

A SUBDIVISION OF PORTIONS OF THE SOUTHEAST QUARTER OF SECTION 21,  
AND OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 28,  
TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M.,  
EL PASO COUNTY, COLORADO

**KNOW ALL MEN BY THESE PRESENTS:**

That Jacob Decoto, being the owner of the following described tract of land to wit:  
Those portions of the Southeast Quarter of Section 21 and the Northeast Quarter of Section 28 in Township 12 South, Range 65 West of the 6th P.M., El Paso County, Colorado described as follows:

- Beginning at the southwest corner of said Southeast Quarter;
- thence along the west line of said Southeast Quarter North 0 degrees 25 minutes 32 seconds West, 650.00 feet;
  - thence North 89 degrees 40 minutes 31 seconds East, 2076.87 feet to the westerly right-of-way line of Vollmer Road as described in Book 2678 at Page 430;
  - thence along said right of way line South 21 degrees 41 minutes 10 seconds West, 2018.07 feet to the west line of the Northeast Quarter of the Northeast Quarter of said Section 28;
  - thence along said west line North 0 degrees 35 minutes 59 seconds West, 1220.99 feet to the northwest corner of said Northeast Quarter of the Northeast Quarter;
  - thence along the south line of the Southwest Quarter of said Southeast Quarter South 89 degrees 40 minutes 31 seconds West, 1313.52 feet to the point of beginning.

Containing a calculated area of 1,568,545 square feet (36.0088 acres), more or less.

**OWNERS CERTIFICATION:**

The undersigned, being all the owners, mortgages, beneficiaries of deeds of trust and holders of other interests in the land described herein, have laid out, subdivided, and platted said lands into a lot and easements as shown hereon under the name and subdivision of **TIMBER RIDGE WEST**. The utility easements shown hereon are hereby dedicated for public utilities and communication systems and other purposes as shown hereon. The entities responsible for providing the services for which the easements are established are hereby granted the perpetual right of ingress and egress from and to adjacent properties for installation, maintenance, and replacement of utility lines and related facilities.

\_\_\_\_\_  
Jacob Decoto Date

STATE OF COLORADO }  
COUNTY OF EL PASO } SS

Acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 2018 by Jacob Decoto

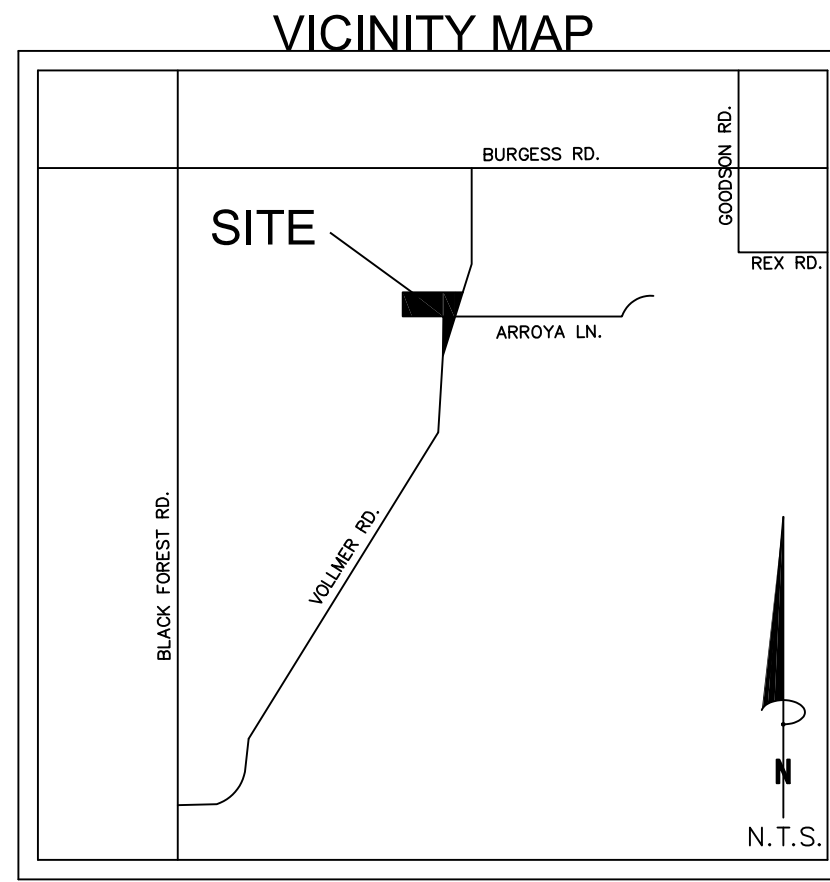
My commission expires \_\_\_\_\_

Witness my hand and official seal \_\_\_\_\_  
Notary Public

**BOARD OF COUNTY COMMISSIONERS CERTIFICATE:**

This plat for **TIMBER RIDGE WEST** was approved for filing by the El Paso County, Colorado Board of County Commissioners on the \_\_\_\_ day of \_\_\_\_\_, 2018, subject to any notes specified hereon and any conditions included in the resolution of approval. The dedications of land to the public (Public Utility Easements) are accepted, but public improvements thereon will not become the maintenance responsibility of El Paso County until preliminary acceptance of the public improvements in accordance with the requirements of the Land Development Code and Engineering Criteria Manual, and the Subdivision Improvements Agreement.

\_\_\_\_\_  
Chair, Board of County Commissioners Date



**SURVEYOR'S CERTIFICATION:**

I Mark S. Johannes, a duly registered Professional Land Surveyor in the State of Colorado, do hereby certify that this plat truly and correctly represents the results of a survey made on the date of survey shown hereon, by me or under my direct supervision and that all monuments exist as shown hereon; that mathematical closure errors are less than 1:10,000; and that said plat has been prepared in full compliance with all applicable laws of the State of Colorado dealing with monuments, subdivision, or surveying of land and all applicable provisions of the El Paso County Land Development Code.

This certification is neither a warranty nor guarantee, either expressed or implied.

Mark S. Johannes  
Colorado Professional Land Surveyor No. 32439  
For and on behalf of Compass Surveying and Mapping, LLC

**NOTES:**

- - Denotes found monument, marked as noted
  - - Denotes set #5 rebar and plastic cap marked "PLS 32439", unless otherwise noted.
  - (1149) - Denotes street address.
- This survey does not constitute a title search by Compass Surveying & Mapping, LLC to determine ownership or easements of record. For all information regarding easements, rights of way and title of record, Compass Surveying & Mapping, LLC relied upon a Commitment for Title Insurance prepared by \_\_\_\_\_, Order No. \_\_\_\_\_ with an effective date of \_\_\_\_\_ at \_\_\_\_\_.
- Basis of bearings is the north line of the property, monumented as shown and assumed to bear North 89 degrees 40 minutes 31 seconds East, 2077.12 feet.
- This property is located within Zone X (areas determined to be outside the 500-year floodplain) as established by FEMA per FIRM panel 08041C0535 F, effective date, March 17, 1997.
- Notice: 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 from the date of the certification shown hereon.
- The linear units used in this drawing are U.S. Survey feet.
- The El Paso County Department of Transportation must be contacted prior to the establishment of any driveway.
- All structural foundations shall be located and designed by a Professional Engineer, currently registered in the State of Colorado.
- The following reports have been submitted and are on file at the County Planning Department: Soils and Geological study; Water Availability study; Drainage Report; Wildfire Hazard Report; Natural Features Report; Erosion Control Report.
- All property owners are responsible for maintaining proper storm water drainage in and through their property.
- No lot, or interest therein, shall be sold, conveyed or transferred, whether by deed or by contract, nor shall building permits be issued, until and unless the required public improvements have been constructed and completed in accordance with the subdivision improvements agreement between the applicant and El Paso County as recorded at Reception No. \_\_\_\_\_, or in the alternative, other collateral is provided which is sufficient in the judgment of the Board of County Commissioners, to make provision for the completion of said improvements.
- The addresses (1149) exhibited on this plat is for informational purposes only. It is not the legal description and is subject to change.
- This plat is regulated by a P.U.D. Development Plan as recorded under Reception No. \_\_\_\_\_.
- Easements are as shown, with the sole responsibility for maintenance vested with the adjacent property owners.

**RECORDING:**

STATE OF COLORADO }  
COUNTY OF EL PASO } SS

I hereby certify that this instrument was filed for record in my office at \_\_\_\_ o'clock \_\_\_\_M., this \_\_\_\_ day of \_\_\_\_\_, 2018, A.D., and is duly recorded under Reception No. \_\_\_\_\_ of the records of El Paso County, Colorado.

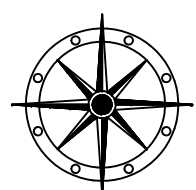
CHUCK BROERMAN, RECORDER

BY: \_\_\_\_\_  
Deputy

SURCHARGE: \_\_\_\_\_

FEE: \_\_\_\_\_

DSD FILE NO: AR FP 18-\_\_\_\_\_



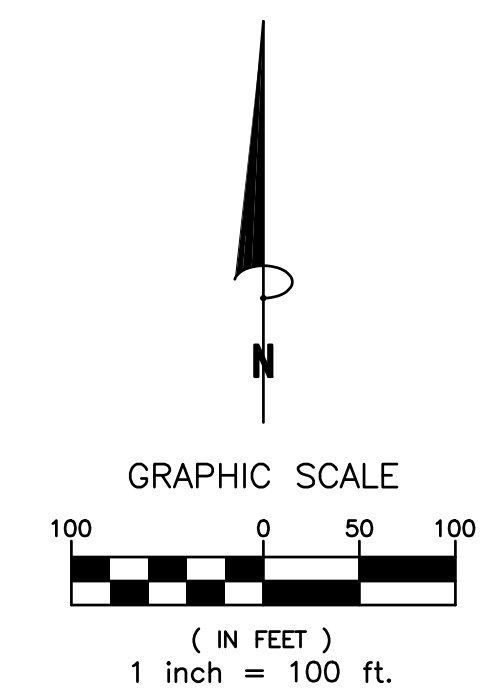
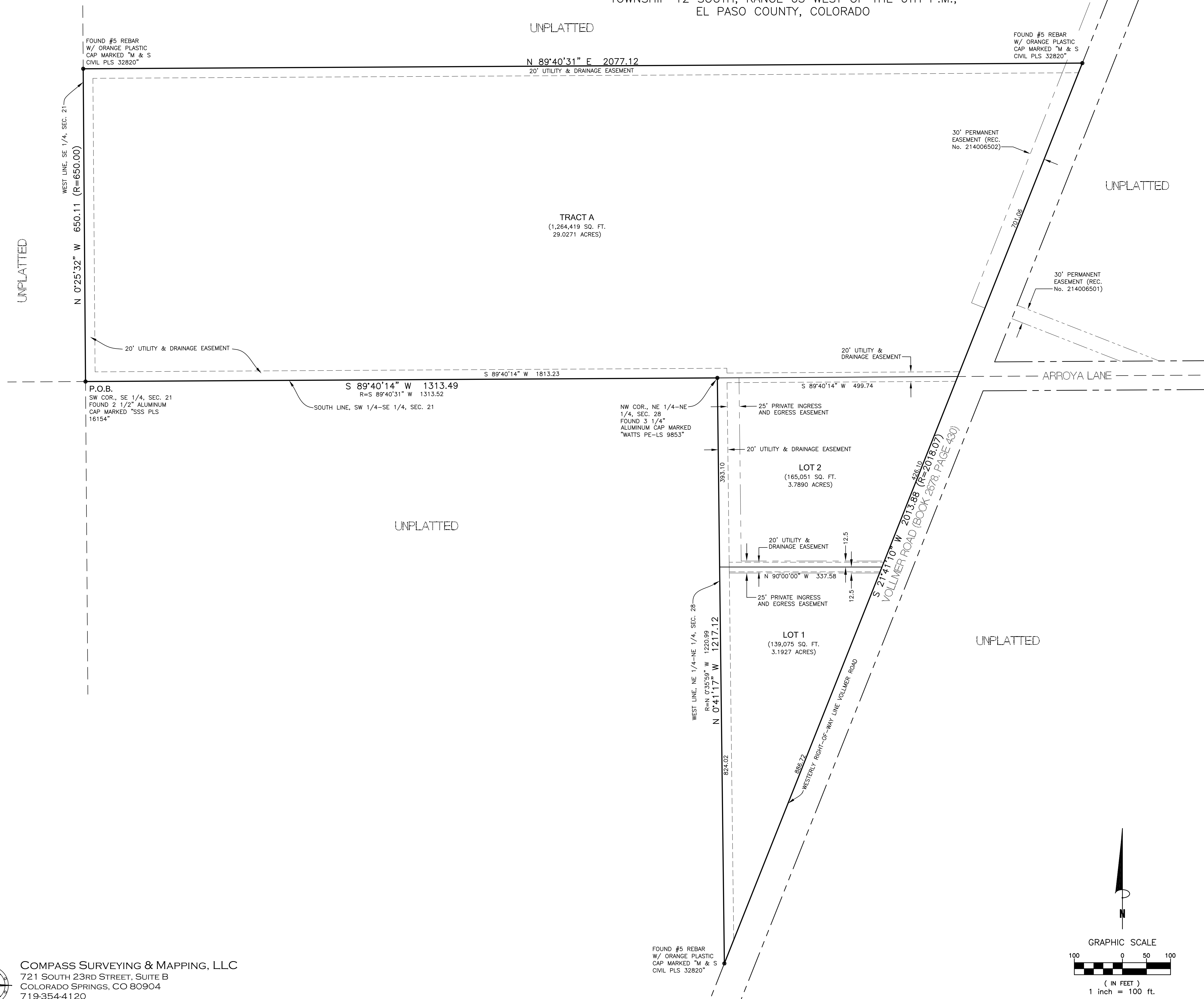
COMPASS SURVEYING & MAPPING, LLC  
721 SOUTH 23RD STREET, SUITE B  
COLORADO SPRINGS, CO 80904  
719-354-4120  
WWW.CSAMLLC.COM

REVISIONS:	

PROJECT No. 18222  
OCTOBER 3, 2018  
SHEET 1 OF 2

# Timber Ridge West

A SUBDIVISION OF PORTIONS OF THE SOUTHEAST QUARTER OF SECTION 21,  
AND OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 28,  
TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M.,  
EL PASO COUNTY, COLORADO



REVISIONS:	

<b>DISTRICT COURT, WATER DIVISION 2, CO</b> Court Address: 501 North Elizabeth Street, Suite 116 Pueblo, CO 81003 Phone Number: (719) 404-8832	DATE FILED: August 9, 2018 3:35 PM CASE NUMBER: 2018CW3005
<b>CONCERNING THE APPLICATION FOR WATER RIGHTS OF:</b>  <b>JAKE DECOTO</b>  <b>IN EL PASO COUNTY</b>	<b>▲ COURT USE ONLY ▲</b>  <b>Case No.: 18CW3005</b> (17CW3002)
<b>FINDINGS OF FACT, CONCLUSIONS OF LAW, RULING OF REFEREE AND DECREE</b>	

THIS MATTER comes before the Water Referee on the Application filed by Jake Decoto, and having reviewed said Application and other pleadings on file, and being fully advised on this matter, the Water Referee makes the following findings and orders:

### GENERAL FINDINGS OF FACT

1. The applicant in this case is Jake Decoto, whose address is 10620 Vollmer Road, Colorado Springs, CO 80908 ("Applicant"). Applicant is the owner of the land totaling approximately 36.01 acres described as "West Parcel 1" in previously adjudicated in Case No. 17CW3002, on which the structures sought to be adjudicated herein are located, and is the owner of the place of use where the water will be put to beneficial use.

2. The Applicant filed this Application with the Water Court for Water Division 2 on January 31, 2018. The Application was referred to the Water Referee in Division 2 on or about January 31, 2018.

3. The time for filing statements of opposition to the Application expired on the last day of March 2018. No Statements of Opposition were timely filed.

4. On January 31, 2018, the Water Court, Division 2 ordered that publication occur in the *Daily Transcript* within El Paso County.

5. The Clerk of this Court has caused publication of the Application filed in this matter as provided by statute and the publication costs have been paid. On February 15, 2018, proof of publication in the *Daily Transcript* was filed with Water Court Division 2. All notices of the Application have been given in the manner required by law.



6. Pursuant to C.R.S. §37-92-302(4), the office of the Division Engineer for Water Division 2 has filed its Consultation Report dated May 2, 2018, with the Court, and a Response to the Consultation Report was filed by the Applicant on June 27, 2018. Both the Consultation Report and Response have been considered by the Water Referee in the entry of this Ruling.

7. The Water Court has jurisdiction over the subject matter of these proceedings and over all who have standing to appear as parties whether they have appeared or not. The land and water rights involved in this case are not within a designated groundwater basin.

8. The Applicant, consistent with the decree entered in Case No. 17CW3002, seeks to utilize ground water rights granted therein for the construction of Decoto Wells Nos. 1 through 3 to the Dawson aquifer, and additional or replacement wells associated therewith, for withdrawal of Applicant's full entitlements of supply under the plan for augmentation sought herein.

9. The land overlying the groundwater subject to the adjudication in this case is owned by the Applicant and was previously quantified in Case No. 17CW3002. The land relevant to this decree consists of an approximately 36.01 acre portion identified as "West Parcel 1" in Case No. 17CW3002, located in a portion of the SE 1/4 of Section 21 and a portion of the NE 1/4 of Section 28, Township 12 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado, as more particularly described on the attached **Exhibit A**, and depicted on the attached **Exhibit B** map ("Subject Property"). Applicant intends to subdivide the property into up to three (3) parcels, two of approximately 3.5 acres in size (Tracts R-11 and R-12) and one of approximately 29 acres (Tract A) as depicted on **Exhibit B**, on Applicant's Property, utilizing individual wells and septic systems on all said lots. All groundwater adjudicated herein shall be withdrawn from the overlying land.

10. Decoto Wells Nos. 1 through 3: Each of the Decoto Wells Nos. 1 through 3 are to be constructed to the not-nontributary Dawson aquifer pursuant to the Plan for Augmentation decreed herein to provide domestic water supplies to a single family residence to be located upon the subdivided Subject Property. Upon entry of this decree and submittal by the Applicant of a complete well permit application and filing fee, the State Engineer shall issue a revised permit for Decoto Wells Nos. 1 through 3 pursuant to C.R.S. §37-90-137(4), consistent with and references the Plan for Augmentation decreed herein.

### **PLAN FOR AUGMENTATION**

11. The structures to be augmented are Decoto Wells Nos. 1 through 3 in the not-nontributary Dawson aquifer underlying the Applicant's Property, along with any additional or replacement wells associated therewith.

12. Pursuant to C.R.S. §37-90-137(9)(c.5), the augmentation obligation for Decoto Wells Nos. 1 through 3, and any additional or replacement wells constructed to the Dawson aquifer requires the replacement of actual stream depletions to the extent necessary to prevent any injurious effect. The water rights to be used for augmentation during pumping are the septic return flows of the not-nontributary Decoto Wells Nos. 1 through 3, to be pumped as set forth in this plan for augmentation. The water rights to be used for augmentation after pumping are a reserved portion of Applicant's nontributary water rights in the Laramie-Fox Hills aquifers. Applicant shall provide for the augmentation of stream depletions caused by pumping the Decoto Wells Nos. 1 through 3 as approved herein. Water use criteria as follows:

A. Use: The Decoto Wells Nos. 2 and 3 may each pump up to 0.32 acre feet of water per year, and Decoto Well No. 1 may pump up to 0.58 acre feet of water per year (unless a maximum depletion percentage of less than 44% during the pumping life of the wells is adequately evidenced), for a maximum total of 1.22 acre feet being withdrawn from the Dawson aquifer annually. Households will utilize up to 0.26 acre feet of water per year per residence, with the additional pumping available for landscape irrigation, the watering of horses or equivalent livestock, and other beneficial uses decreed in 17CW3002 at each residence. The foregoing figures assume the use of 3 septic systems, with resulting return flows from each. Should Applicant subdivide Applicant's property into fewer than 3 lots, both depletions and return flows for the replacement of the same will be correspondingly reduced, though pumping for uses other than household use may be increased provided at all times septic return flows shall replace the maximum depletions resulting from pumping.

B. Depletions: Applicant has determined that maximum stream depletions over the 300-year pumping period will amount to approximately forty-four percent (44%) of pumping. Maximum annual depletions for total residential pumping from all wells is therefore 0.54 acre feet in year 300. Should Applicant's pumping be less than a combined total of 1.22 acre feet described herein, or should fewer lots be developed, resulting depletions and required replacements will be correspondingly reduced.

C. Augmentation of Depletions During Pumping Life of Wells: Depletions during pumping will be effectively replaced by residential return flows from non-evaporative septic systems. The annual consumptive use for non-evaporative septic systems is 10% per year per residence. At a conservatively estimated household use rate of 0.20 acre feet per residence per year (rather than the full 0.26 acre feet annually), a total of 0.54 acre feet is replaced to the stream system per year (0.18 acre feet per lot), utilizing non-evaporative septic systems, assuming all 3 wells are utilized. With maximum depletions from the pumping of 3 wells at 0.18 acre feet, and anticipated replacement of 0.54 acre feet annually, during pumping, stream depletions will be adequately augmented.

D. Augmentation of Post Pumping Depletions: This plan for augmentation shall have a pumping period of a minimum of 300 years. For the

replacement of any injurious post-pumping depletions which may be associated with the use of the Decoto Wells Nos. 1 through 3, Applicant will reserve up to 366 acre feet of water from the nontributary Laramie Fox Hills aquifer, less actual stream depletions replaced during the plan pumping period, as necessary to replace any injurious post pumping depletions. Applicant also reserves the right to substitute other legally available augmentation sources for such post pumping depletions upon further approval of the Court under its retained jurisdiction. Even though this reservation is made, under the Court's retained jurisdiction, Applicant reserves the right in the future to prove that post pumping depletions will be noninjurious. The reserved nontributary Laramie-Fox Hills groundwater will be used to replace any injurious post-pumping depletions. Upon entry of a decree in this case, the Applicant will be entitled to apply for and receive a new well permit for the Decoto Wells Nos. 1 through 3 for the uses in accordance with this Application and otherwise in compliance with C.R.S. §37-90-137.

13. This decree, upon recording, shall constitute a covenant running with Applicant's Property, benefitting and burdening said land, and requiring construction of well(s) to the nontributary Laramie-Fox Hills aquifer and pumping of water to replace any injurious post-pumping depletions under this decree. Subject to the requirements of this decree, in order to determine the amount and timing of post-pumping replacement obligations, if any, under this augmentation plan, Applicant or its successors shall use information commonly used by the Colorado Division of Water Resources for augmentation plans of this type at the time. Pursuant to this covenant, the water from the nontributary Laramie-Fox Hills aquifer reserved herein may not be severed in ownership from the overlying subject property. This covenant shall be for the benefit of, and enforceable by, third parties owning vested water rights who would be materially injured by the failure to provide for the replacement of post-pumping depletions under the decree, and shall be specifically enforceable by such third parties against the owner of the Applicant's Property.

14. Applicant or its successors shall be required to initiate pumping from the Laramie-Fox Hills aquifer for the replacement of post-pumping depletions when either: (i) the absolute total amount of water available from the Dawson aquifer allowed to be withdrawn under the plan for augmentation decreed herein has been pumped; (ii) the Applicant or its successors in interest have acknowledged in writing that all withdrawals for beneficial use through the Decoto Wells Nos. 1 through 3 have permanently ceased, (iii) a period of 10 consecutive years where either no withdrawals of groundwater has occurred, or (iv) accounting shows that return flows from the use of the water being withdrawn is insufficient to replace depletions caused by the withdrawals that already occurred.

15. Accounting and responsibility for post-pumping depletions in the amount set forth herein shall continue for the shortest of the following periods: (i) the period provided by statute; (ii) the period specified by any subsequent change in statute; (iii) the period required by the Court under its retained jurisdiction; (iv) the period determined by the State Engineer; or (v) the period as established by Colorado Supreme Court final decisions. Should Applicant's obligation hereunder to account for

and replace such post-pumping stream depletions be abrogated for any reason, then the Laramie-Fox Hills aquifer groundwater reserved for such a purpose shall be free from the reservation herein and such groundwater may be used or conveyed by its owner without restriction for any post-pumping depletions.

16. The term of this augmentation plan is for a minimum of 300 years, however, the length of the plan for a particular well or wells may be extended beyond such time provided the total plan pumping allocated to such well or wells is not exceeded. Should the actual operation of this augmentation plan depart from the planned diversions described herein such that annual diversions are increased or the duration of the plan is extended, the Applicant must prepare and submit a revised model of stream depletions caused by the actual pumping schedule. This analysis must utilize depletion modeling acceptable to the State Engineer, and to this Court, and must represent the water use under the plan for the entire term of the plan to date. The analysis must show that return flows have equaled or exceeded actual stream depletions throughout the pumping period and that reserved nontributary water remains sufficient to replace post-pumping depletions.

17. Consideration has been given to the depletions from Applicant's use and proposed uses of water, in quantity, time and location, together with the amount and timing of augmentation water which will be provided by the Applicant, and the existence, if any, injury to any owner of or person entitled to use water under a vested water right.

18. It is determined that the timing, quantity and location of replacement water under the protective terms in this decree are sufficient to protect the vested rights of other water users and eliminate material injury thereto. The replacement water shall be of a quantity and quality so as to meet the requirements for which the water of senior appropriators has normally been used, and provided of such quality, such replacement water shall be accepted by the senior appropriators for substitution for water derived by the exercise of the Decoto Wells Nos. 1 through 3. As a result of the operation of this plan for augmentation, the depletions from the Decoto Wells Nos. 1 through 3 and any additional or replacement wells associated therewith will not result in material injury to the vested water rights of others.

### **CONCLUSIONS OF LAW**

19. The Applicant's request for adjudication of the plan for augmentation decreed herein is contemplated and authorized by law, and this Court and the Water Referee have exclusive jurisdiction over these proceedings. C.R.S. §§37-92-302(1)(a), 37-92-203, and 37-92-305.

20. Subject to the terms of the 17CW3002 decree, the Applicant is entitled to the sole right to withdraw all the legally available water in the Denver Basin aquifers underlying the Applicant's Property, and the right to use that water to the exclusion of all others subject to the terms of said 17CW3002 decree.

21. The Applicant's request for approval of a plan for augmentation is contemplated and authorized by law. If administered in accordance with this decree, this plan for augmentation will permit the uninterrupted diversions from the Decoto Wells Nos. 1 through 3 without adversely affecting any other vested water rights in the Arkansas River or its tributaries and when curtailment would otherwise be required to meet a valid senior call for water. C.R.S. §§37-92-305(3),(5), and (8).

**IT IS THEREFORE ORDERED, ADJUDGED AND DECREED AS FOLLOWS:**

22. All of the foregoing Findings of Fact and Conclusions of Law are incorporated herein by reference, and are considered to be a part of this decretal portion as though set forth in full.

23. The Application for Adjudication of Denver Basin Groundwater and for Approval of Plan for Augmentation proposed by the Applicant is approved, subject to the terms of this decree.

24. The Applicant has furnished acceptable proof as to all claims and, therefore, the Application for Adjudication of Groundwater and Plan for Augmentation, as requested by the Applicant, is granted and approved in accordance with the terms and conditions of this decree. Approval of this Application will not result in any material injury to senior vested water rights.

25. The Applicant shall comply with C.R.S. §37-90-137(9)(b), requiring the relinquishment of the right to consume two percent (2%) of the amount of the nontributary groundwater withdrawn. Ninety-eight percent (98%) of the nontributary groundwater withdrawn may therefore be consumed. No plan for augmentation shall be required to provide for such relinquishment.

26. The State Engineer, the Division Engineer, and/or the Water Commissioner shall not curtail the diversion and use of water covered by the Decoto Wells Nos. 1 through 3 so long as the return flows from the annual diversions associated with the Decoto Wells Nos. 1 through 3 accrue to the stream system pursuant to the conditions contained herein. To the extent that Applicant or one of its successors or assigns is ever unable to provide the replacement water required, then the Decoto Wells Nos. 1 through 3 shall not be entitled to operate under the protection of this plan, and shall be subject to administration and curtailment in accordance with the laws, rules, and regulation of the State of Colorado. Pursuant to C.R.S. §37-92-305(8), the State Engineer shall curtail all out-of-priority diversions which are not so replaced as to prevent injury to vested water rights. In order for this plan for augmentation to operate, return flows from the one or both of the septic systems discussed herein, as appropriate, shall at all times during pumping be in an amount sufficient to replace the amount of stream depletions.

27. Pursuant to C.R.S. §37-92-304(6), the Court shall retain continuing jurisdiction over the plan for augmentation decreed herein for reconsideration of the question of whether the provisions of this decree are necessary and/or sufficient to prevent injury to vested water rights of others, as pertains to the use of Denver Basin groundwater supplies adjudicated herein, including for augmentation purposes.

28. Except as otherwise specifically provided in Paragraph 28, above, pursuant to the provisions of C.R.S. §37-92-304(6), this plan for augmentation decreed herein shall be subject to the reconsideration of this Court on the question of material injury to vested water rights of others, for a period of five (5) years, except as otherwise provided herein. Any person, within such period, may petition the Court to invoke its retained jurisdiction. Any person seeking to invoke the Court's retained jurisdiction shall file a verified petition with the Court setting forth with particularity the factual basis for requesting that the Court reconsider material injury to petitioner's vested water rights associated with the operation of this decree, together with proposed decretal language to effect the petition. The party filing the petition shall have the burden of proof of going forward to establish a prima facie case based on the facts alleged in the petition. If the Court finds those facts are established, Applicant shall thereupon have the burden of proof to show: (i) that the petitioner is not materially injured, or (ii) that any modification sought by the petitioner is not required to avoid material injury to the petitioner, or (iii) that any term or condition proposed by Applicant in response to the petition does avoid material injury to the petitioner. The Division of Water Resources as a petitioner shall be entitled to assert material injury to the vested water rights of others. If no such petition is filed within such period and the retained jurisdiction period is not extended by the Court in accordance with the revisions of the statute, this matter shall become final under its own terms.

29. Pursuant to C.R.S. §37-92-502(5)(a), the Applicant shall install and maintain such water measurement devices and recording devices as are deemed essential by the State Engineer or Division Engineers, and the same shall be installed and operated in accordance with instructions from said entities. Applicant is to install and maintain a totalizing flow meters on all Decoto Wells or any additional or replacement wells associated therewith. Applicant is also to maintain records and provide reports to the State Engineer or Division Engineers as instructed by said entities, on at least an annual basis.

30. The vested water rights, water right structures, and plan for augmentation decreed herein shall be subject to all applicable administrative rules and regulations, as currently in place or as may in the future be promulgated, of the offices of Colorado State and Division Engineers for administration of such water rights, to the extent such rules and regulations are uniformly applicable to other similarly situated water rights and water users.

31. This Ruling of Referee, when entered as a decree of the Water Court, shall be recorded in the real property records of El Paso County, Colorado. Copies of this ruling shall be mailed as provided by statute.

DATED THIS 18th day of July, 2018.

BY THE REFEREE:

*Mardell R. DiDomenico*



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Mardell DiDomenico, Water Referee  
Water Division 2

**DECREE**

THE COURT FINDS THAT NO PROTEST WAS MADE IN THIS MATTER, THEREFOR THE FORGOING RULING IS CONFIRMED AND APPROVED, AND IS HEREBY MADE THE JUDGMENT AND DECREE OF THIS COURT.

Dated: August 9<sup>th</sup>, 2018.



BY THE COURT:

*Larry C. Schwartz*

LARRY C. SCHWARTZ, WATER JUDGE  
WATER DIVISION 2

## EXHIBIT A

### LEGAL DESCRIPTION:

A PARCEL OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21 AND A PORTION OF THE NORTHEAST ONE-QUARTER (NE1/4) OF SECTION 28, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE WEST LINE OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST IS ASSUMED TO BEAR N00°25'32"W, A DISTANCE OF 2638.53 FEET;

COMMENCING AT THE SOUTHWEST CORNER OF SAID SOUTHEAST ONE-QUARTER (SE1/4) SAID POINT ALSO BEING THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED;

THENCE N00°25'32"W ALONG THE WEST LINE OF SAID SOUTHEAST ONE-QUARTER (SE1/4), A DISTANCE OF 650.11 FEET;

THENCE N89°40'31"E, A DISTANCE OF 2077.12 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF VOLLMER ROAD AS DESCRIBED IN THE DOCUMENT RECORDED IN BOOK 2678 AT PAGE 430 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE S21°41'10"W ALONG SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 2013.98 FEET TO A POINT ON THE EAST LINE OF THE NORTHWEST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (NW1/4 NE1/4) OF SAID SECTION 28;

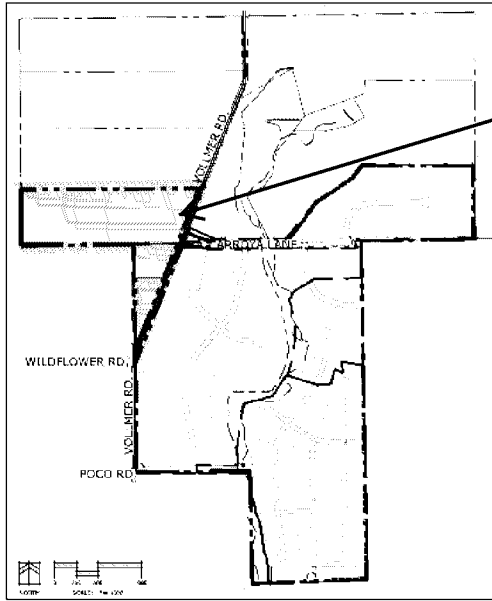
THENCE N00°41'17"W ALONG SAID EAST LINE, A DISTANCE OF 1217.12 FEET TO THE SOUTHEAST CORNER OF THE SOUTHWEST ONE-QUARTER OF THE SOUTHEAST ONE-QUARTER (SW1/4 SE1/4) OF SAID SECTION 21;

THENCE S89°40'14"W ALONG THE SOUTH LINE OF SAID SOUTHWEST ONE-QUARTER OF THE SOUTHEAST ONE-QUARTER (SW1/4 SE1/4), A DISTANCE OF 1313.49 FEET TO THE POINT OF BEGINNING;

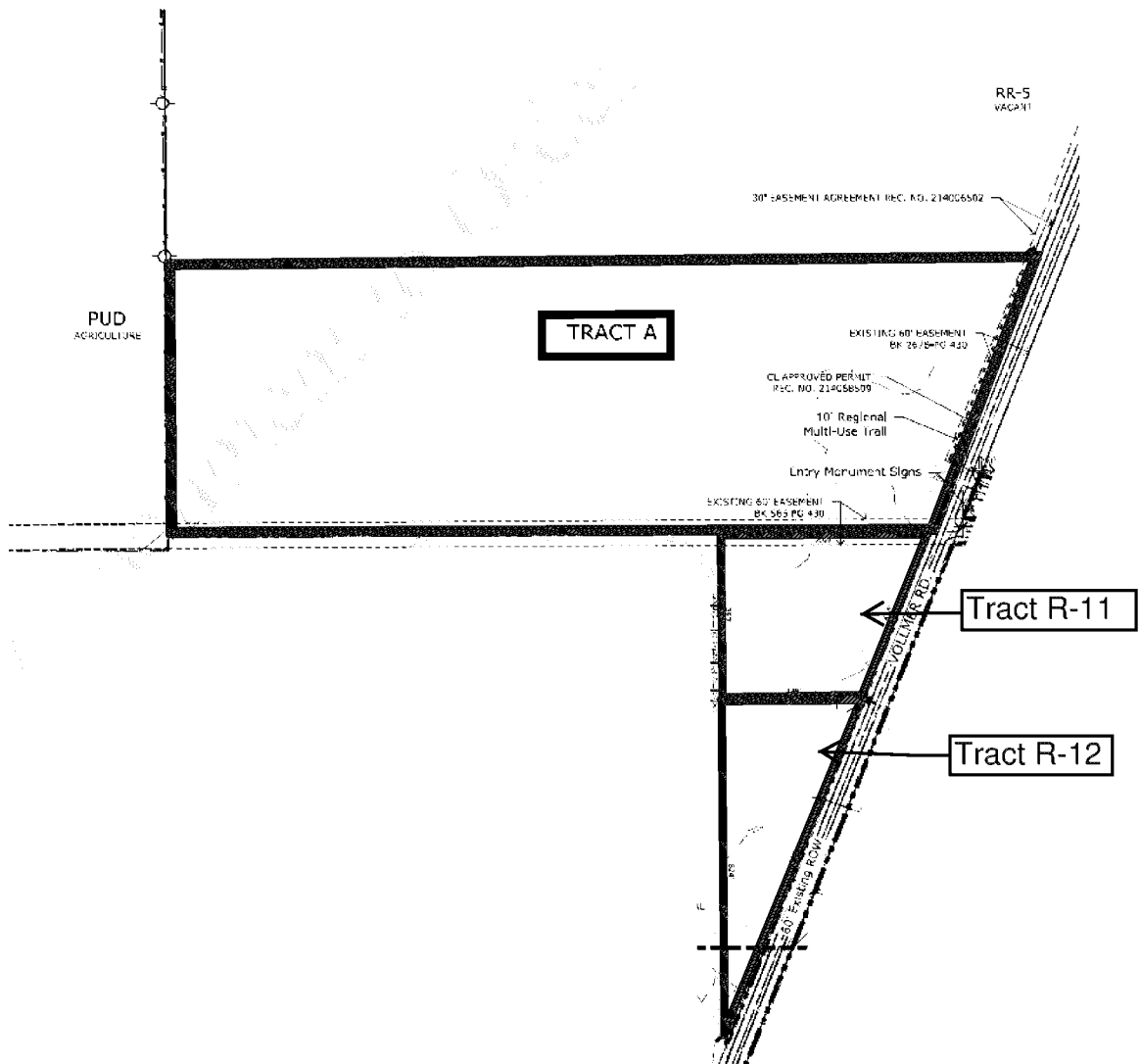
SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 38.01 ACRES OF LAND, MORE OR LESS.



# EXHIBIT B - MAP



Applicant's Property



TRACT A

Tract R-11

Tract R-12

<p><b>DISTRICT COURT, WATER DIVISION 2, COLORADO</b></p> <p>Court Address: 501 North Elizabeth Street,        Suite 116        Pueblo, CO 81003</p>	<p>DATE FILED: May 31, 2017 9:37 AM        CASE NUMBER: 2017CW3002</p>
<p><b>CONCERNING THE APPLICATION FOR WATER RIGHTS OF:</b></p> <p><b>ARROYA INVESTMENTS, LLC, JACOB DECOTO, MARVIN ORNES and TERRI WAHLBERG</b></p> <p><b>IN EL PASO COUNTY</b></p>	<p>▲ COURT USE ONLY ▲</p> <hr/> <p>Case No.: 17CW3002</p>
<p><b>FINDINGS OF FACT, CONCLUSIONS OF LAW, RULING OF REFEREE AND DECREE</b></p>	

THIS MATTER comes before the Water Referee on the Application filed by Arroya Investments, LLC, Jacob Decoto, Marvin Ornes and Terri Wahlberg, and having reviewed said Application and other pleadings on file, and being fully advised on this matter, the Water Referee makes the following findings and orders:

**GENERAL FINDINGS OF FACT**

1. The applicants in this case are Arroya Investments, LLC (“Arroya”), Jacob Decoto (“Decoto”), Marvin Ornes (“Ornes”) and Terri Wahlberg (“Wahlberg”) (collectively, “Applicants”). Applicants are, collectively, the owners of the four separately owned parcels of land totaling approximately 335.59 acres under which the groundwater sought to be adjudicated herein are located, and are likewise the owners of the place of use where the water is anticipated to be put to beneficial use.
2. The Applicants filed this Application with the Water Court for Water Division 2 on January 31, 2017. The Application was referred to the Water Referee by order of the Court dated February 2, 2017.
3. The time for filing statements of opposition to the Application expired on the last day of March, 2017, and a no statements of opposition were timely filed.
4. On February 2, 2017, the Division 2 Water Court ordered that publication occur in the *Daily Transcript* within El Paso County.
5. The Clerk of this Court has caused publication of the Application filed in this matter as provided by statute and the publication costs have been paid. On February 15, 2017, proof of publication in the *Daily Transcript* was filed with the Court. All notices of the Application have been given in the manner required by law.

6. Pursuant to C.R.S. §37-92-302(2), the Office of the State Engineer has filed Determination of Facts for each aquifer with this Court dated March 14, 2017.

7. Pursuant to C.R.S. §37-92-302(4), the office of the Division Engineer for Water Division 2 filed its Consultation Report dated March 29, 2017, with the Court. The Consultation Report has been considered by the Water Referee in the entry of this Ruling.

8. The Water Court has jurisdiction over the subject matter of these proceedings and over all who have standing to appear as parties whether they have appeared or not. The land and water rights involved in this case are not within a designated groundwater basin.

### **GROUNDWATER RIGHTS**

9. The Applicants requested the adjudication and quantification all Denver Basin groundwater in each aquifer underlying the four (4) specifically described parcels of land owned by each of the Applicants, respectively, as described herein. No plan for augmentation for the use of the not-nontributary groundwater was sought or is decreed herein. The Applicants shall construct such wells as necessary for withdrawal of Applicants' full entitlements of water supplies decreed herein. The following findings are made with respect to such underground water rights:

A. Property Description. All wells to all aquifers will be located on the Applicants respective properties. Such Properties are more specifically described as follows:

i. Arroya Parcel. The "Arroya Parcel" is an approximately 226 acre parcel located in the SE1/4 SE1/4 of Section 21, the W1/2 SW1/4 of Section 22, the E1/2 NE1/4 of Section 28, the W1/2 NW1/4 and the NW1/4 SW1/4 of Section 27, all in Township 21 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado, as more particularly described on attached **Exhibit A**, and depicted on attached **Exhibit E**. The Arroya Parcel is owned by Applicant Arroya Investments, LLC.

ii. West Parcel No. 1. The "West Parcel No. 1" is an approximately 36.01 acre parcel located in the SW1/4 SE1/4 and the SE1/4 SE1/4 of Section 21, and the NE1/4 NE1/4 of Section 27, Township 12 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado, as more particularly described on attached **Exhibit B**, and depicted on attached **Exhibit E**. The West Parcel No. 1 is owned by Applicant Jacob Decoto.

iii. West Parcel No. 2. The "West Parcel No. 2" is an approximately 36.03 acre parcel located in the SW1/4 SE1/4 and the SE1/4 SE1/4 of Section 21, Township 12 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado, as more particularly described on attached **Exhibit C**, and depicted on attached **Exhibit E**. The West Parcel No. 2 is owned by Applicant Jacob Decoto.

iv. West Parcel No. 3. The “West Parcel No. 3” is an approximately 37.58 acre parcel located in the NW1/4 SE1/4 and the NE1/4 SE1/4 of Section 21, Township 12 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado, as more particularly described on attached **Exhibit D**, and depicted on attached **Exhibit E**. The West Parcel No. 3 is owned by Applicants Marvin Ornes and Terri Wahlberg.

B. Existing Wells. There is currently one (1) existing well constructed to the Dawson aquifer on West Parcel No. 2 (Decoto): DWR Permit No. 4554, an exempt domestic well. DWR Permit No. 4554 is an exempt structure; water from the Dawson aquifer sufficient to allow for such continued exempt use has been excluded from the quantification herein. Two additional exempt domestic wells have been permitted since the filing of the application in this matter, DWR Permit No. 304551 on West Parcel No. 1 (Decoto), and DWR Permit No. 304498 on West Parcel No. 3 (Ornes/Wahlberg), and are excluded from quantification herein.

C. Additional Wells. Applicants anticipated additional wells will be constructed on each the Applicants’ respective properties. To the extent any additional wells may be constructed to the not-nontributary Dawson and/or Denver aquifer(s), such wells may be constructed only pursuant to a subsequent decree providing an approved plan for augmentation, or as exempt well structures pursuant to C.R.S. §37-92-602.

10. Of the statutorily described Denver Basin aquifers, the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers all exist beneath the Applicants’ respective properties. The Dawson and Denver aquifers contain not-nontributary water, while the water of the Arapahoe and Laramie-Fox Hills aquifers underlying the Applicants’ respective properties is nontributary. The quantity of water in the Denver Basin aquifers exclusive of artificial recharge underlying each of the Applicants’ respective properties as allocated on a pro-rata per acre basis from the amounts described in the State Engineer’s Determination of Facts, is as follows:

A. Arroya Parcel (225.97 acres):

<b>Aquifer</b>	<b>Sand Thickness (Feet)</b>	<b>Total Ground Water Storage (Acre Feet)</b>	<b>Annual Average Withdrawal – 100 Years (Acre Feet)</b>
Dawson (NNT)	270	12,202	122
Denver (NNT)	310	11,909	119.1
Arapahoe (NT)	255	9,796	98
Laramie-Fox Hills (NT)	190	6,440	64.4

B. West Parcel No. 1 (Decoto – 36.01 acres):

<b>Aquifer</b>	<b>Sand Thickness (Feet)</b>	<b>Total Ground Water Storage (Acre Feet)</b>	<b>Annual Average Withdrawal – 100 Years (Acre Feet)</b>
Dawson (NNT)	270	1,944.4	16.44 <sup>1</sup>
Denver (NNT)	310	1,897.7	18.98
Arapahoe (NT)	255	1,561	15.61
Laramie-Fox Hills (NT)	190	1,026.2	10.26

C. West Parcel No. 2 (Decoto – 36.03 acres):

<b>Aquifer</b>	<b>Sand Thickness (Feet)</b>	<b>Total Ground Water Storage (Acre Feet)</b>	<b>Annual Average Withdrawal – 100 Years (Acre Feet)</b>
Dawson (NNT)	270	1,945.4	16.45 <sup>2</sup>
Denver (NNT)	310	1,898.8	18.99
Arapahoe (NT)	255	1,562	15.62
Laramie-Fox Hills (NT)	190	1,026.8	10.27

D. West Parcel No. 3 (Ornes & Wahlberg – 37.58 acres):

<b>Aquifer</b>	<b>Sand Thickness (Feet)</b>	<b>Total Ground Water Storage (Acre Feet)</b>	<b>Annual Average Withdrawal – 100 Years (Acre Feet)</b>
Dawson (NNT)	270	2,029.2	17.29 <sup>3</sup>
Denver (NNT)	310	1,980.5	19.80
Arapahoe (NT)	255	1,629	16.29
Laramie-Fox Hills (NT)	190	1,071	10.7

<sup>1</sup> Three (3) annual acre feet of Dawson groundwater has been reserved from quantification herein for permitting of an exempt domestic well on this parcel pursuant to C.R.S. §37-92-602, *et seq.*, recently permitted as DWR Permit No. 304551.

<sup>2</sup> Three (3) annual acre feet of Dawson groundwater has been reserved from quantification herein for continued use of DWR Permit No. 4554 as an exempt domestic well on this parcel pursuant to C.R.S. §37-92-602, *et seq.*

<sup>3</sup> Three (3) annual acre feet of Dawson groundwater has been reserved from quantification herein for permitting of an exempt domestic well on this parcel pursuant to C.R.S. §37-92-602, *et seq.*, recently permitted as DWR Permit No. 304498.

11. Pursuant to §37-90-137(9)(c.5)(I), C.R.S., the augmentation requirements for wells in the Dawson aquifer require the replacement to the effected stream systems of actual stream depletions on an annual basis, to the extent necessary to prevent injurious effect, based upon actual aquifer conditions. The augmentation requirements for wells to the Denver aquifer are for 4% of pumping. Applicants shall not be entitled to construct a non-exempt well or use water from the not-nontributary Dawson or Denver aquifers except pursuant to an approved augmentation plan in accordance with C.R.S. §37-90-137(9)(c.5).

12. Applicants shall be entitled to withdraw all legally available groundwater in the Denver Basin aquifers underlying Applicants' respective properties. Said amounts can be withdrawn over the 100-year life for the aquifers as set forth in C.R.S. §37-90-137(4), or withdrawn over a longer period of time based upon local governmental regulations or Applicants' water needs. The average annual amounts of ground water available for withdrawal from the underlying Denver Basin aquifers, based upon the 100-year aquifer life is determined and set forth above, based upon the March 14, 2017 Office of the State Engineer Determination of Facts. Such groundwater may be withdrawn from wells located upon the overlying land or contiguous properties with such contiguity to allow such withdrawal, consistent with the Denver Basin Rules as promulgated by the Office of the State Engineer, as may be amended from time to time.

13. Applicants shall be entitled to withdraw an amount of groundwater in excess of the average annual amount decreed herein from the Denver Basin aquifers underlying Applicants' respective properties, so long as the sum of the total withdrawals from wells in the aquifer does not exceed the product of the number of years since the date of issuance of the original well permit or the date of entry of the decree herein, whichever comes first, and the annual volume of water which Applicants are entitled to withdraw from the aquifer underlying Applicants' respective properties.

14. The Applicants shall have the right to use the ground water for beneficial uses on or off the Applicants' respective properties consisting of domestic, commercial, irrigation, stock water, recreation, wildlife, wetlands, fire protection, piscatorial, and for storage and augmentation associated with such uses. The amount of groundwater decreed for such uses upon the Applicants' respective properties is reasonable as such uses are to be made for the long term use and enjoyment of the Applicants' respective properties and are to establish and provide for adequate water reserves. The nontributary groundwater, may be used, reused, and successively used to extinction, both on and off the Applicants' respective properties subject, however, to the relinquishment of the right to consume two percent of such nontributary water withdrawn. Applicants may use such water by immediate application or by storage and subsequent application to the beneficial uses and purposes stated herein. Provided however, as set forth above, Applicants shall only be entitled to construct a non-exempt well or use water from the not-nontributary Dawson and Denver aquifers pursuant to a decreed augmentation plan entered by the Court. Withdrawals of groundwater available from the nontributary aquifers beneath the Applicants' respective properties in the

amounts determined in accordance with the provisions of this decree will not result in material injury to any other vested water rights or to any other owners or users of water.

15. Applicants may construct such wells on their respective properties as necessary for the withdrawal of all entitlements from each aquifer as described above, and such withdrawals may be made through any combination of wells. As to each of Applicants' respective properties, these wells shall be treated as a well field.

### **CONCLUSIONS OF LAW**

16. The application for adjudication of Denver Basin groundwater was filed with the Water Clerk for Water Division 2 pursuant to C.R.S. §§37-92-302(1)(a) and 37-90-137(9)(c).

17. The Applicants' request for adjudication of these water rights is contemplated and authorized by law, and this Court and the Water Referee have exclusive jurisdiction over these proceedings. C.R.S. §§37-92-302(1)(a), 37-92-203, and 37-92-305.

18. Subject to the terms of this decree, the Applicants are entitled to the sole right to withdraw all the legally available water in the Denver Basin aquifers underlying the Applicants' respective properties, and the right to use that water to the exclusion of all others subject to the terms of this decree.

19. The Applicants have complied with C.R.S. §37-90-137(4), and the groundwater is legally available for withdrawal by the requested nontributary well(s), and legally available for withdrawal by the requested not-nontributary well(s) upon the entry of a subsequent decree approving an augmentation plan pursuant to C.R.S. §37-90-137(9)(c.5). Applicants are entitled to a decree from this Court confirming their rights to withdraw groundwater pursuant to C.R.S. §37-90-137(4).

20. The Denver Basin water rights applied for in this case are not conditional water rights, but are vested water rights determined pursuant to C.R.S. §37-90-137(4). No applications for diligence are required. The claims for nontributary and not-nontributary groundwater meet the requirements of Colorado Law.

21. The determination and quantification of the nontributary and not-nontributary groundwater rights in the Denver Basin aquifers as set forth herein is contemplated and authorized by law. C.R.S. §§37-90-137, and 37-92-302 through 37-92-305.

**IT IS THEREFORE ORDERED, ADJUDGED AND DECREED AS FOLLOWS:**

22. All of the foregoing Findings of Fact and Conclusions of Law are incorporated herein by reference, and are considered to be a part of this decretal portion as though set forth in full.

23. The Application for Adjudication of Denver Basin Groundwater proposed by the Applicants is approved, subject to the terms of this decree.

24. The Applicants have furnished acceptable proof as to all claims and, therefore, the Application for Adjudication of Groundwater as requested by the Applicants is granted and approved in accordance with the terms and conditions of this decree. Approval of this Application will not result in any material injury to senior vested water rights.

25. The Applicants shall comply with C.R.S. §37-90-137(9)(b), requiring the relinquishment of the right to consume two percent (2%) of the amount of the nontributary groundwater withdrawn. Ninety-eight percent (98%) of the nontributary groundwater withdrawn may therefore be consumed. No plan for augmentation shall be required to provide for such relinquishment.

26. The Court retains jurisdiction over this matter to make adjustments in the allowed average annual amount of withdrawal from the Denver Basin aquifers, either upwards or downwards, to conform to actual local aquifer characteristic, and that the Applicants need not refile, republish, or otherwise amend this application to request such adjustments.

A. At such time as adequate data may be available, Applicant or the State Engineer may invoke the Court's retained jurisdiction as provided in this Paragraph 26 for purposes of making a final determination of water rights as to the quantities of water available and allowed average annual withdrawals from any of the Denver Basin aquifers quantified and adjudicated herein. Any person seeking to invoke the Court's retained jurisdiction for such purpose shall file a verified petition with the Court setting forth with particularity the factual basis for such final determination of Denver Basin water rights under this decree, together with the proposed decretal language to effect the petition. Within four months of the filing of such verified petition, the State Engineer's Office shall utilize such information as available to make a final determination of water rights finding, and shall provide such information to the Court, Applicant, and the petitioning party.

B. If no protest is filed with the Court to such findings by the State Engineer's Office within sixty (60) days, this Court shall incorporate by entry of an Amended Decree such "final determination of water rights", and the provisions of this Paragraph 26 concerning adjustments to the Denver Basin ground water rights based upon local aquifer conditions shall no longer be applicable. In the event of a protest



being timely filed, or should the State Engineer's Office make no timely determination as provided in Paragraph 26.A., above, the "final determination of water rights" sought in the petition may be made by the Water Court after notice to all parties and following a full and fair hearing, including entry of an Amended Decree, if applicable in the Court's reasonable discretion.

27. Pursuant to C.R.S. §37-92-502(5)(a), the Applicants shall install and maintain such water measurement devices and recording devices as are deemed essential by the State Engineer or Division Engineers, and the same shall be installed and operated in accordance with instructions from said entities. Applicants are to install and maintain a totalizing flow meter on all wells, and any additional or replacement wells. Applicants are also to maintain records and provide reports to the State Engineer or Division Engineers as instructed by said entities, on at least an annual basis.

28. The vested water rights and water right structures decreed herein shall be subject to all applicable administrative rules and regulations, as currently in place or as may in the future be promulgated, of the offices of Colorado State and Division Engineers for administration of such water rights, to the extent such rules and regulations are uniformly applicable to other similarly situated water rights and water users.

29. This Ruling of Referee, when entered as a decree of the Water Court, shall be recorded in the real property records of El Paso County, Colorado. Copies of this ruling shall be mailed as provided by statute.

DATED THIS 5th day of May, 2017.

BY THE REFEREE:



*Mardell R. DiDomenico*

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Mardell R. DiDomenico, Water Referee  
Water Division 2

**DECREE**

THE COURT FINDS THAT NO PROTEST WAS MADE IN THIS MATTER, THEREFOR THE FORGOING RULING IS CONFIRMED AND APPROVED, AND IS HEREBY MADE THE JUDGMENT AND DECREE OF THIS COURT.

Dated: May 31, 2017.



BY THE COURT:

  
LARRY C. SCHWARTZ, WATER JUDGE  
WATER DIVISION 2

# EXHIBIT A

## LEGAL DESCRIPTION – ARROYA PARCEL

A PARCEL OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21 AND A PORTION OF THE SOUTHWEST ONE-QUARTER OF SECTION 22, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: A LINE BETWEEN THE NORTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4) OF SECTION 27 AND THE SOUTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4) OF SAID SECTION 27, TOWNSHIP 12 SOUTH, RANGE 65 WEST, MONUMENTED AT THE NORTHERLY END BY A 3-1/4" ALUMINUM CAP STAMPED "2006 ESI PLS 10376" AND MONUMENTED AT THE SOUTHERLY END BY A 3-1/4" ALUMINUM CAP STAMPED "2006 ESI PLS 10376" AND IS ASSUMED TO BEAR S00°54'30"E, A DISTANCE OF 3925.63 FEET;

COMMENCING AT THE NORTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4) OF SECTION 27;  
THENCE S88°38'56"W ALONG THE NORTH LINE OF SAID NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4), A DISTANCE OF 1047.88 FEET TO THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED;

THENCE S88°38'56"W CONTINUING ALONG SAID NORTH LINE, A DISTANCE OF 283.03 FEET TO THE NORTHWEST CORNER OF SAID SECTION 27 SAID POINT ALSO BEING A POINT ON THE EASTERLY RIGHT-OF-WAY LINE AS DESCRIBED IN THE DEED, AS RECORDED IN BOOK 2678 AT PAGE 431 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE ALONG THE EASTERLY AND NORTHERLY RIGHT-OF-WAY LINES OF SAID DEED THE FOLLOWING TWO (2) COURSES:

1. N00°37'14"W SAID LINE ALSO BEING THE WEST LINE OF THE SOUTHWEST ONE-QUARTER (SW1/4) OF SAID SECTION 22, A DISTANCE OF 30.00 FEET;
2. S89°40'23"W, A DISTANCE OF 736.82 FEET TO THE POINT OF INTERSECTION OF THE EASTERLY RIGHT-OF-WAY LINE AS DESCRIBED IN THE DEED, AS RECORDED IN BOOK 2678 AT PAGE 430 OF SAID COUNTY RECORDS;

THENCE N21°41'10"E ALONG SAID EASTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 1798.07 FEET;

THENCE N59°58'50"E, A DISTANCE OF 694.83 FEET;

THENCE S14°30'58"E, A DISTANCE OF 567.09 FEET;

THENCE N69°36'18"E, A DISTANCE OF 603.87 FEET;

THENCE S30°23'46"E, A DISTANCE OF 264.58 FEET;

THENCE S61°52'38"W, A DISTANCE OF 227.40 FEET;

THENCE S79°15'47"W, A DISTANCE OF 276.17 FEET;

THENCE S89°39'18"W, A DISTANCE OF 356.07 FEET;

THENCE S40°09'47"W, A DISTANCE OF 310.61 FEET;

THENCE S09°56'46"W, A DISTANCE OF 270.03 FEET;

THENCE S35°00'25"W, A DISTANCE OF 167.38 FEET;

THENCE S57°24'01"W, A DISTANCE OF 235.36 FEET;

THENCE S27°23'34"E, A DISTANCE OF 611.29 FEET TO THE POINT OF BEGINNING;

SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 35.08 ACRES OF LAND, MORE OR LESS.

Along With:

A PARCEL OF LAND BEING THE NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4) OF SECTION 27, THE SOUTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (SW1/4 NW1/4) OF SECTION 27, THE NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4) OF SECTION 27, A PORTION OF THE SOUTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER OF SECTION 28 AND A PORTION OF THE NORTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (NE1/4 NE1/4) OF SECTION 28, ALL IN TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: A LINE BETWEEN THE NORTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4) OF SECTION 27 AND THE SOUTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4) OF SAID SECTION 27, TOWNSHIP 12 SOUTH, RANGE 65 WEST, MONUMENTED AT THE NORTHERLY END BY A 3-1/4" ALUMINUM CAP STAMPED "2006 ESI PLS 10376" AND MONUMENTED AT THE SOUTHERLY END BY A 3-1/4" ALUMINUM CAP STAMPED "2006 ESI PLS 10376" AND IS ASSUMED TO BEAR S00°54'30"E, A DISTANCE OF 3925.63 FEET;

COMMENCING AT THE NORTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW1/4 NW1/4) OF SECTION 27, SAID POINT ALSO BEING THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED;

THENCE S00°54'30"E ALONG THE EAST LINE OF THE WEST ONE-HALF (W1/2) OF SAID SECTION 27, A DISTANCE OF 3925.63 FEET TO THE SOUTHEAST CORNER OF THE NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4) OF SAID SECTION 27;

THENCE S87°35'00"W ALONG THE SOUTH LINE OF SAID NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4), A DISTANCE OF 1332.78 FEET TO THE SOUTHWEST CORNER OF SAID NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4);

THENCE N00°53'18"W ALONG THE WEST LINE OF SAID NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4), A DISTANCE OF 1316.78 FEET TO THE NORTHWEST CORNER OF SAID NORTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER (NW1/4 SW1/4);

THENCE S89°08'28"W ALONG THE SOUTH LINE OF THE SOUTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (SE1/4 NE1/4) OF SECTION 28, A DISTANCE OF 1326.68 FEET TO THE SOUTHWEST CORNER OF SAID SOUTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (SE1/4 NE1/4);

THENCE N00°30'49"W ALONG THE WEST LINE OF SAID SOUTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (SE1/4 NE1/4), A DISTANCE OF 1270.77 FEET TO A POINT ON THE EASTERLY RIGHT-OF-WAY LINE AS DESCRIBED IN THE DEED, AS RECORDED IN

BOOK 2678 AT PAGE 430 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE N21°41'10"E ALONG SAID EASTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 1450.84 FEET TO THE POINT OF INTERSECTION OF THE SOUTHERLY RIGHT-OF-WAY LINE AS DESCRIBED IN THE DEED, AS RECORDED IN BOOK 2678 AT PAGE 431 OF SAID COUNTY RECORDS;

THENCE ALONG THE SOUTHERLY AND EASTERLY RIGHT-OF-WAY LINES OF SAID DEED THE FOLLOWING TWO (2) COURSES:

1. N89°40'23"E, A DISTANCE OF 761.52 FEET TO A POINT ON THE EAST LINE OF SAID NORTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (NE1/4 NE1/4);
2. N00°52'58"W ALONG SAID EAST LINE, A DISTANCE OF 30.00 FEET TO THE NORTHWEST CORNER OF SAID SECTION 27;

THENCE N88°38'56"E ALONG THE NORTH LINE OF SAID NORTHWEST ONE-QUARTER OF THE NORTHWEST ONE-QUARTER (NW 1/4 NW1/4), A DISTANCE OF 1330.91 FEET TO THE POINT OF BEGINNING;

SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 190.89 ACRES OF LAND, MORE OR LESS.

Attachment to Order - 2017-0173002

## EXHIBIT B

### LEGAL DESCRIPTION TRAILS AT TIMBERLINE WEST PARCEL 1:

A PARCEL OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21 AND A PORTION OF THE NORTHEAST ONE-QUARTER (NE1/4) OF SECTION 28, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M.L. EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE WEST LINE OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST IS ASSUMED TO BEAR N00°25'32"W, A DISTANCE OF 2638.53 FEET.

COMMENCING AT THE SOUTHWEST CORNER OF SAID SOUTHWEST ONE-QUARTER (SW1/4), SAID POINT ALSO BEING THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED:

THENCE N00°25'32"W ALONG THE WEST LINE OF SAID SOUTHEAST ONE-QUARTER (SE1/4), A DISTANCE OF 650.11 FEET.

THENCE N89°40'51"E, A DISTANCE OF 2077.12 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF VOLLMER ROAD AS DESCRIBED IN THE DOCUMENT RECORDED IN BOOK 2678 AT PAGE 430 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER.

THENCE S21°41'10"W ALONG SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 2013.88 FEET TO A POINT ON THE EAST LINE OF THE NORTHWEST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (NW1/4 NE1/4) OF SAID SECTION 28.

THENCE N00°41'13"W ALONG SAID EAST LINE, A DISTANCE OF 1212.12 FEET TO THE SOUTHWEST CORNER OF THE SOUTHWEST ONE-QUARTER OF THE SOUTHEAST ONE-QUARTER (SW1/4 SE1/4) OF SAID SECTION 21.

THENCE S89°40'14"W ALONG THE SOUTH LINE OF SAID SOUTHWEST ONE-QUARTER OF THE SOUTHEAST ONE-QUARTER (SW1/4 SE1/4), A DISTANCE OF 1343.49 FEET TO THE POINT OF BEGINNING.

SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 38.01 ACRES OF LAND, MORE OR LESS.

Attachment to Order - 2011-0002

## EXHIBIT C

### LEGAL DESCRIPTION TRAILS AT TIMBERLINE WEST PARCEL 2:

A PARCEL OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS, THE WEST LINE OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST IS ASSUMED TO BEAR N00°25'32"W, A DISTANCE OF 3638.53 FEET;

COMMENCING AT THE SOUTHWEST CORNER OF SAID SOUTHEAST ONE-QUARTER (SE1/4);

THENCE N00°25'32"W ALONG THE WEST LINE OF SAID SOUTHEAST ONE-QUARTER (SE1/4), A DISTANCE OF 650.13 FEET TO THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED;

THENCE N00°25'32"W CONTINUING ALONG SAID WEST LINE, A DISTANCE OF 706.70 FEET;

THENCE N89°40'31"E, A DISTANCE OF 2364.04 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF VOLLMER ROAD AS DESCRIBED IN THE DOCUMENT RECORDED IN BOOK 2678 AT PAGE 430 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE S21°41'10"W ALONG SAID WESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 762.36 FEET;

THENCE S89°40'31"W, A DISTANCE OF 2077.32 FEET TO THE POINT OF BEGINNING.

SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 38.03 ACRES OF LAND, MORE OR LESS.

Attachment to Order - 2017-CM-0002

## EXHIBIT D

### LEGAL DESCRIPTION TRAILS AT TIMBERLINE WEST PARCEL 3:

A PARCEL OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE WEST LINE OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 21, TOWNSHIP 12 SOUTH, RANGE 65 WEST IS ASSUMED TO BEAR N00°25'32"W, A DISTANCE OF 2658.53 FEET.

COMMENCING AT THE SOUTHWEST CORNER OF SAID SOUTHEAST ONE-QUARTER (SE1/4);  
THENCE N00°25'32"W ALONG THE WEST LINE OF SAID SOUTHEAST ONE-QUARTER (SE1/4), A DISTANCE OF 1356.81 FEET TO THE POINT OF BEGINNING OF THE PARCEL OF LAND HEREIN DESCRIBED;  
THENCE N00°25'32"W CONTINUING ALONG SAID WEST LINE, A DISTANCE OF 656.30 FEET;  
THENCE N88°40'31"E, A DISTANCE OF 2590.16 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF VOLLMER ROAD AS DESCRIBED IN THE DOCUMENT RECORDED IN BOOK 2678 AT PAGE 430 OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE ALONG SAID WESTERLY RIGHT-OF-WAY LINE THE FOLLOWING TWO (2) COURSES:

1. S00°37'14"E, A DISTANCE OF 95.54 FEET;
2. S21°W10'W, A DISTANCE OF 891.81 FEET;

THENCE S88°40'31"W, A DISTANCE OF 2364.04 FEET TO THE POINT OF BEGINNING.

SAID PARCEL OF LAND CONTAINS A CALCULATED AREA OF 37.58 ACRES OF LAND, MORE OR LESS.

Attachment to Order - 2017CW3002



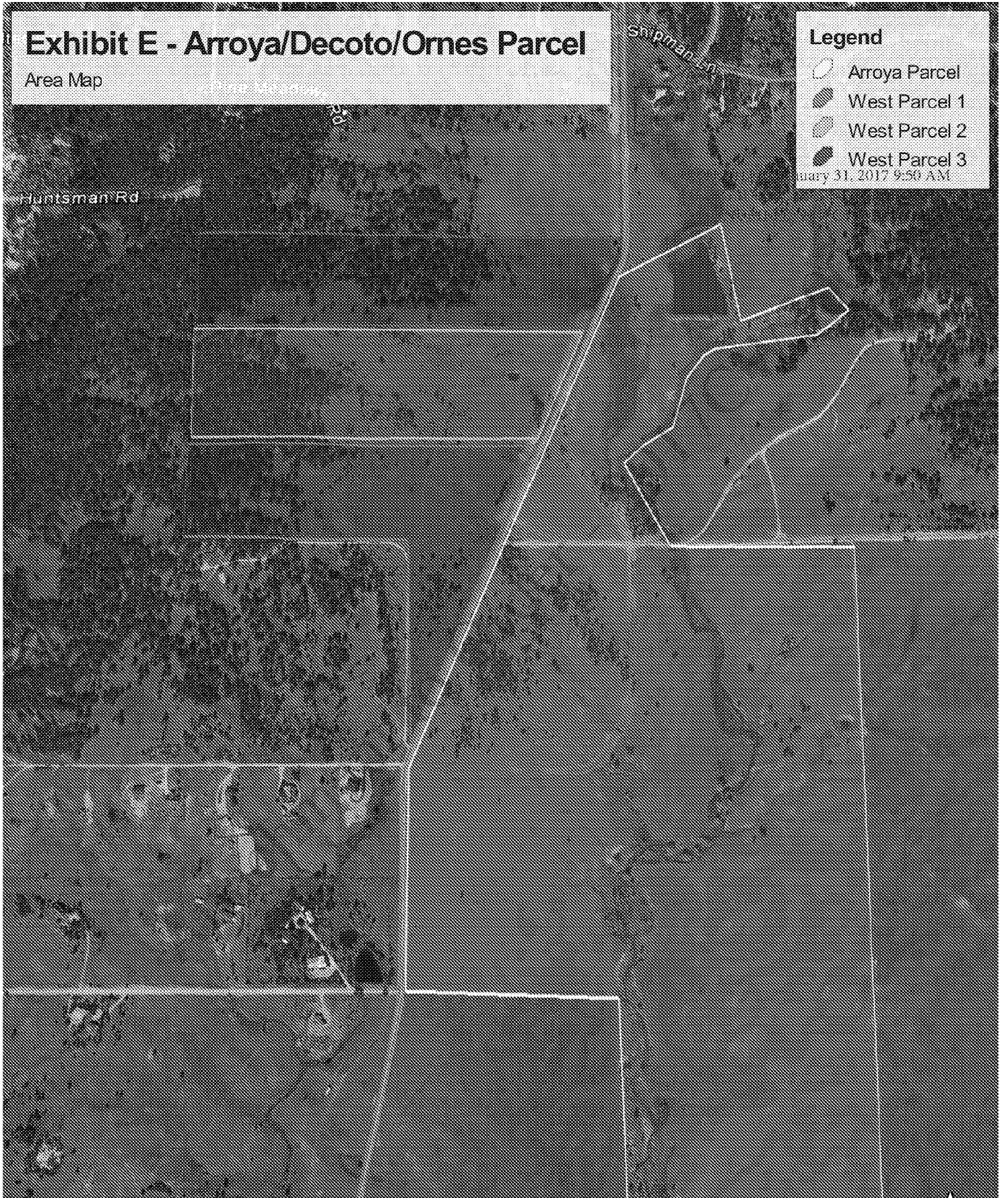
# Exhibit E - Arroya/Decoto/Ornes Parcel

Area Map

**Legend**

- Arroya Parcel
- ▨ West Parcel 1
- ▩ West Parcel 2
- ▧ West Parcel 3

January 31, 2017 9:50 AM



# **The Country Life: Where there's a well, there's a way to get water - hopefully**

By: **Bill Radford** (</author/Bill+Radford>) • June 15, 2015 • *Updated: June 15, 2015 at 4:10 am*

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About 27,000 households are served by individual water wells in El Paso County. BILL RADFORD, THE GAZETTE

[View Gallery !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5\_img.jpg\) \(/gallery/articleid/1553752/pictures?display=flexFullscreen&galleryTheme=lightTheme\)](/gallery/articleid/1553752/pictures?display=flexFullscreen&galleryTheme=lightTheme)

[Log in to comment \(/comments/1/1553752\)](/comments/1/1553752)

When a well was drilled for a neighbor's new home recently, it was another "straw" dipping into the water beneath our feet.

There's a lot of such straws in the area. An estimated 27,000 homes - about 67,500 residents - are served by private water wells in El Paso County. That's about 11 percent of residents; the rest are served by public drinking water systems, from the biggie - Colorado Springs Utilities - to smaller ones such as Donala Water and Sanitation District, Cherokee Metro and the city of Fountain. The public systems draw their water from surface water, groundwater or both.

In eastern El Paso County, where I live, most utilize groundwater - the water that lies beneath the Earth's surface. Our well reaches 870 feet into the Arapahoe Aquifer; it's one of four aquifers that make up the Denver Basin, which stretches from El Paso County to Weld County.

If you're looking for property in the country with plans to dig a well, do your homework first, cautions Mark Birkelo, general manager of Barnhart Pump Co. in Falcon.

"The first phone call you want to make is to a water well contractor," Birkelo said. A company such as Barnhart quickly can check on water quality and quantity in a given area.

"That phone call can save a lot of grief," Birkelo said.

Once a site is chosen, the homeowner must acquire a permit from the state Division of Water Resources. Residential permits include domestic and household use only; the latter means no outside water, so no water for lawns, livestock, etc.

Ready to drill a well? "The cost for drilling and pumping can be considerable," cautions El Paso County's "Code of the West." Expect to pay about \$22 to \$24 a foot for a well 600 feet or deeper, Birkelo said; the cost per foot will be less if under about 600 feet. Barnhart is not a drilling company, but does the oversight for 40 to 50 new wells a year, Birkelo said.

If moving to property with a well, test the water pump's production and the quality of the water, Birkelo advised; for information on water potability testing, visit El Paso County Public Health's website at [elpasocountyhealth.org/service/water-quality](http://elpasocountyhealth.org/service/water-quality).

Quality is one issue; quantity is another. One afternoon I turned on the tap and nothing came out. The immediate paranoid thought: Our well had run dry. But we had simply overtaxed the water pump; after a 10-minute break, water started to flow again. But long-term worry remains. As a water resources report on the county's website notes, "the aquifers found in the Denver Basin are not considered to be a long-range, renewable source of water. The bedrock aquifers are subject to depletion if withdrawals exceed the natural recharge rate, which is very slow, given that the water within these aquifers has accumulated over thousands of years. The negligible rate of natural recharge, the considerable increase in water withdrawal, and the semiarid climate of the region have led to a situation where the amount of withdrawal from the aquifers may be exceeding the amount of recharge."

Birkelo, who has been in the water business in El Paso County for 30 years, believes that rate of replenishment

depends on the area. There are some wells that have a higher water level than they did decades before, he said, even though "there have been more straws put into that glass of water over time." In other areas, he has seen water levels drop.

Bottom line: It's tough to know what's happening deep underground, he says. That's why oil companies "spend millions of dollars trying to see what's down there" and often end up with a hole in the ground and nothing to show for it. "We know more about outer space," Birkelo said, "than we do what's under our own two feet."



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**SOIL, GEOLOGY, AND GEOLOGIC HAZARD  
THE RETREAT AT TIMBER RIDGE  
2.5+ ACRE LOTS  
VOLLMER ROAD AND ARROYA LANE  
EL PASO COUNTY, COLORADO**

Prepared for

**Arroya Investments**  
P.O. Box 50223  
Colorado Springs, Colorado 80949

Attn: Peter Martz

April 12, 2017

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford  
Geologist

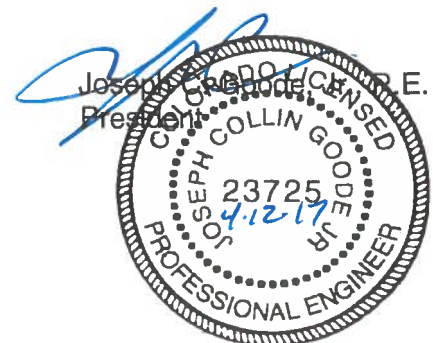
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AAprojects/2017/170209 countysoil/geo/wastewater

Reviewed by:



**TABLE OF CONTENTS**

1.0 SUMMARY ..... 1  
2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION ..... 2  
3.0 SCOPE OF THE REPORT ..... 2  
4.0 FIELD INVESTIGATION ..... 3  
5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY ..... 3  
    5.1 General Geology ..... 3  
    5.2 Soil Conservation Survey ..... 4  
    5.3 Site Stratigraphy ..... 4  
    5.4 Soil Conditions ..... 5  
    5.5 Groundwater ..... 6  
6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS ..... 6  
    6.1 Relevance of Geologic Conditions to Land Use Planning ..... 8  
7.0 ECONOMIC MINERAL RESOURCES ..... 9  
8.0 EROSION CONTROL ..... 12  
9.0 CLOSURE ..... 13  
BIBLIOGRAPHY ..... 14

**TABLES**

- Table 1: Summary of Laboratory Test Results
- Table 2: Summary of Percolation Test Results

**FIGURES**

- Figure 1: Vicinity Map
- Figure 2: USGS Map
- Figure 3: Preliminary Concept Plan
- Figure 4: Development Plan/Test Boring Location Map
- Figure 5: Soil Survey Map
- Figure 6: Falcon Northwest Quadrangle Geology Map
- Figure 7: Geology Map/Engineering Geology
- Figure 8: Floodplain Map
- Figure 9: Typical Perimeter Drain Details
- Figure 10: Septic Suitability Map

- APPENDIX A: Site Photographs
- APPENDIX B: Test Boring Logs and Profile Hole Logs
- APPENDIX C: Laboratory Test Results
- APPENDIX D: Soil Survey Descriptions
- APPENDIX E: Percolation Test Results



## **1.0 SUMMARY**

### ***Project Location***

The project lies in portions of the SW¼ of Section 22 and the NE¼ of Section 28, Township 12 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado. The site is located approximately 3 miles northeast of Colorado Springs, Colorado.

### ***Project Description***

Total acreage involved in the project is approximately forty-two acres. The proposed site development consists of twelve single-family residential lots. Ten lots are located north of Arroya Lane, and two lots are located west of Vollmer Road just south of Arroya Lane. The development will utilize individual water wells and on-site wastewater treatment systems.

### ***Scope of Report***

This report presents the results of our geologic evaluation and treatment of engineering geologic hazard study.

### ***Land Use and Engineering Geology***

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of shallow bedrock, expansive soils, artificial fill, seasonal shallow groundwater and potentially seasonally shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impact on the development. These conditions will be discussed in greater detail in the report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

## **2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION**

The site is located in portions of the SW $\frac{1}{4}$  of Section 22 and the NE $\frac{1}{4}$  of Section 28, Township 15 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado. The site is located approximately 3 miles northeast of Colorado Springs, Colorado, at Vollmer Road and Arroya Lane. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually to moderately sloping to the southeast and southwest towards Sand Creek. The drainages on site flow in southerly and direction through the central portion of the site. Water was not observed in the drainages on-site at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses, weeds, cacti, and yuccas, and ponderosa pine trees. Site photographs, taken March 9 and 28, 2017, are included in Appendix A.

Total acreage involved in the proposed development is approximately forty-two acres. Twelve single-family rural residential lots are proposed. The proposed lots will be approximately 2.5+ acres. The area will be serviced individual water wells and on-site wastewater treatment systems. The proposed Preliminary Concept Plan and the proposed Development Plan is presented in Figures 3 and 4.

## **3.0 SCOPE OF THE REPORT**

The scope of the report will include the following:

- A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.
- The site will be evaluated for on-site wastewater treatment systems in accordance with El Paso Land Development Code.

## **4.0 FIELD INVESTIGATION**

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on March 9 and 28, 2017.

Two Test Borings were performed for the percolation test profile holes, and three test pits were excavated across the site to determine general soil and bedrock characteristics. The locations of the profile holes and test pits are indicated on the Development Plan/Test Boring Location Map, Figure 4. The Test Boring and Test Pit Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis ASTM D-422, Atterberg Limits ASTM D-4318, volume change testing using FHA Swell Testing and Swell/Consolidation test. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

## **5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY**

### ***5.1 General Geology***

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 12 miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be

very gently dipping in a northeasterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Formation. Overlying this formation are unconsolidated deposits of man-made, and alluvial soils of Quaternary Age. The alluvial soils were deposited by water on site and as stream deposits along the drainages on-site. The site's stratigraphy will be discussed in more detail in Section 5.3.

### 5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has mapped three soil types on the site (Figure 5). In general, the soils classify as gravelly loamy sand and coarse sandy loam. The soils are described as follows:

<u>Type</u>	<u>Description</u>
40	Kettle Gravelly Loamy Sand, 3 to 8% slopes
41	Kettle Gravelly Loamy Sand, 8 to 40% slopes
71	Pring Coarse Sandy Loam, 3 to 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have moderate to moderately rapid permeabilities. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have slight to moderate erosion hazards.

### 5.3 Site Stratigraphy

The Falcon NW Quadrangle Geology Map showing the site is presented in Figure 6 (Reference 4). The Geology Map prepared for the site is presented in Figure 7. Three mappable units were identified on this site which are described as follows:

**Qaf Artificial Fill of Holocene Age:** These are recent deposits of man-made fill. They are associated with the erosion berm located on the two lots west of Vollmer Road.

**Qal Recent alluvium of Holocene Age:** These are recent deposits that have been deposited along the drainages on-site.

**Tkd Dawson Formation of Tertiary to Cretaceous Age:** The Dawson Formation typically consist of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands and sandy clays.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Falcon NW Quadrangle* distributed by the Colorado Geological Survey in 2003 (Reference 4), the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Denver 1<sup>o</sup> x 2<sup>o</sup> Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The Test Borings and Profile Holes were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 7.

#### **5.4 Soil Conditions**

The soils encountered in the Test Borings can be grouped into three general soil types. The soils were classified using the Unified Soil Classification System (USCS). The test pit soils were classified using the USDA Textural Soil Classification.

Soil Type 1 clayey to very clayey sand and silty to slightly silty sand (SC, SM, SM-SW), encountered in both of Test Borings and all of the test pits at the existing ground surface and extending to depths ranging from 1 foot to 14 feet bgs. These soils were encountered at loose to dense states and at moist conditions. The majority of the soils were encountered and medium dense states. Samples tested had 11 to 34 percent passing the No. 200 Sieve.

Soil Type 2 silty sandstone and clayey to very clayey sandstone (SM, SC), encountered in both of Test Borings and all of the Test Pits at depths ranging from 1 foot to 14 feet bgs and extending to the termination of the test borings (15 feet). The sandstone was encountered at dense to very dense states and at moist conditions. Samples tested had 48 percent passing the No. 200 Sieve. Swell/Consolidation Testing on a sample of the very clayey sandstone resulted in a swell of 0.2 percent, which is in the low expansion range.

Soil Type 3 sandy claystone and siltstone (CL, MH), encountered in Test Pit Nos. 2 and 3 at depths ranging from 5 to 6.5 feet and extended to the termination test pit (8 feet). The claystone and siltstone were encountered at hard consistencies and at moist conditions. Samples tested had 60 to 77 percent passing the No. 200 Sieve. FHA Swell Testing resulted in an expansion pressure of 1280 psf, which is in the moderate expansion range.

The Test Boring and Test Pit Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

### **5.5 Groundwater**

Groundwater was not encountered in the test borings, which were drilled to 15 feet. Signs of seasonally occurring groundwater were observed in Test Pit Nos. 2 and 3 at depths of 5 to 6 feet. Areas of water, seasonal shallow groundwater water, and potential seasonal shallow groundwater have been mapped along the drainages on-site. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

## **6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS**

As mentioned previously, detailed mapping has been performed on this site to produce an Engineering Geology Map Figure 7. This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction

stages of the project. These hazards and the recommended mitigation techniques are as follows:

Artificial Fill

These are recent man-made fill deposits associated with the erosion berm located across the two lots west of Vollmer Road.

Mitigation: The erosion berms can either be avoided or penetrated by foundations. The fill on this site is considered uncontrolled for construction purposes. Any uncontrolled fill encountered beneath foundations will require removal and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Collapsible Soils

The majority of the soils encountered on-site do not exhibit collapsible characteristics, however, areas of loose soils were encountered in the test borings drilled on site. Should loose or collapsible soils be encountered beneath foundations, recompaction and moisture conditioning of the upper 2 feet of soil at 95% of its maximum Modified Proctor Dry Density ASTM D-1557 will be required. Exterior flatwork and parking areas may also experience movement. Proofrolling and recompaction of soft areas should be performed during site work.

Expansive Soils

Expansive soils were encountered in the test borings drilled on site. These occurrences are typically sporadic; therefore, none have been indicated on the maps. These clays, claystones and siltstones, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis.

Mitigation Should expansive soils be encountered beneath the foundation, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

### Groundwater and Floodplain Areas

Areas within the drainages on-site have been identified as areas of seasonally high groundwater areas. Water was not flowing in the any of the drainages at the time of this investigation. The site is not mapped within floodplain zones according to the FEMA Map No. 08041CO764F, Figure 8 (Reference 7). These areas are discussed as follows:

#### Seasonal Shallow Groundwater Area

In these areas, we would anticipate periodic high subsurface moisture conditions and frost heave potential on a seasonal basis. Additional, highly organic soils could be encountered in these areas. These areas lie within defined drainages and it is anticipated they will be avoided by development. Any structures in or adjacent to these areas should follow the mitigation discussed below.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 9. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. Structures should not block drainages. All organic material should be completely removed prior to any fill placement. Finished floor levels must be located a minimum of one foot above floodplain levels.

#### Potentially Seasonal Shallow Groundwater Area

In these areas, we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. The majority of these areas lie within defined drainages which can likely be avoided by the proposed development. The same mitigation recommendations for the seasonal shallow groundwater areas apply to the potentially seasonal shallow groundwater areas.

## **6.1 Relevance of Geologic Conditions to Land Use Planning**

As mentioned earlier in this report, we understand that the development will be single family residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the drainages on site that can be



properly mitigated. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper materials are typically at loose to dense states. The granular soils encountered in the upper soil profiles of the test borings and test pits should provide good support for foundations. Loose soils if encountered at foundation depth will require mitigation. Foundations anticipated for the site are standard spread footings possibly in conjunction with overexcavation in areas of expansive soils or loose soils. Excavation is anticipated to be moderate with rubber tired equipment for the site sand materials, and will require track mounted equipment for the dense sandstone, and hard claystone and siltstone. Expansive layers may also be encountered in the soil and bedrock on this site. Areas of expansive soils encountered on site are sporadic; therefore, none have been indicated on the maps. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation on each lot is recommended prior to construction.

## **7.0 ECONOMIC MINERAL RESOURCES**

Some of the sandy materials on-site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 8), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 9), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 10), the area of the site has been mapped as "Fair" for industrial minerals. However, considering the silty nature of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 10), the site is mapped within the Denver Basin Coal Region.

However, the area of the site has been mapped as “Poor” for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on-site (Reference 10).

The site has been mapped as “Fair” for oil and gas resources (Reference 10). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

## **8.0 ON-SITE WASTEWATER TREATMENT**

The site was evaluated for on-site wastewater treatment systems for the proposed lots in accordance with El Paso Land Development Code. Two (2) percolation tests and three (3) tactile test pits were performed across the site. Percolation test and tactile test pits were located in anticipated locations of proposed on-site wastewater treatment system (OWTS) for the development. The approximate locations of the profile holes and test pits are indicated on Figure 4 and 7, and on the Septic Suitability Map, Figure 10. The locations were chosen to determine a general understanding of the soil and bedrock conditions across the site. The results of the percolation tests and test pits are presented in Table 2. The specific test results are presented in Appendix E of this report.

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has been mapped with three soil descriptions. The Soil Survey Map (Reference 2) is presented in Figure 5, and the Soil Survey Descriptions are presented in Appendix D. The soils are described as having moderate to moderately rapid percolation rates.

The percolation rates varied from 44 (PH-2) to 133 (PH-1) minutes per inch. The percolation rate for PH-1 is not suitable for conventional OWTS, the rate for PH-2 is suitable for a conventional OWTS. Percolation rates slower than 60 minutes per inch will require designed

systems. Shallow bedrock was also encountered in the profile holes and test pits, and will also require a designed system. Additional drilling may identify areas where faster rates are encountered that are suitable for conventional systems.

Standard penetration testing, ASTM D-1586, was performed in each profile hole to evaluate the density of the soil and the presence of bedrock. Bedrock was encountered in The Profile Holes at 3 to 14 feet. Designed systems are required in areas of shallow bedrock.

Soils encountered in the tactile test pits consisted of sandy loam to gravelly sandy loam, gravelly loamy sand, and gravelly sandy clay loam with underlying clayey to silty sandstone, sandy claystone and sandy siltstone. The limiting layers encountered in the test pits are the sandy clay loam, silty to clayey sandstone, sandy claystone and sandy siltstone, which corresponds to an LTAR values of 0.15 to 0.20 gallons per day per square foot. The bedrock was encountered at 1 to 5 feet in the test pits. The conditions encountered in the test pits will require a designed system. Signs of seasonal shallow groundwater were observed at depths ranging from 5 to 6 feet in Test Pit Nos. 2 and 3.

Absorption fields must be maintained a minimum of 4 feet above groundwater or bedrock. Groundwater was not encountered in the profile holes which was drilled to 15 feet, however; signs of seasonally shallow groundwater were observed in Test Pit Nos. 2 and 3 at depths ranging from 5 to 6 feet. Shallow bedrock was encountered in the profile holes and test pits at depths ranging from 1 to 14 feet.

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems (OWTS) and that contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to El Paso County Guidelines and properly maintained. Based on the testing performed as part of this investigation and the type of project designed systems will likely be required for the majority of the lots. A Septic Suitability Map is presented in Figure 10. Absorption fields must be located a minimum of 100 feet from any well, including those on adjacent properties. Absorption fields must also be located a minimum of 50 feet from any ponded areas and 25 feet from dry gulches. It should be noted that additional testing will be required for the individual lots prior to construction.

## 9.0 EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils become increasingly less susceptible to water erosion. For the typical soils observed on-site, allowable velocities on unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

## **10.0 CLOSURE**

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on development and construction of the site. The majority of these conditions can be mitigated through proper engineering design and construction practices. The proposed development and use is consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for building sites will be required prior to construction. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for Arroya Investments. for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust that this report has provided you with all the information that you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

## BIBLIOGRAPHY

1. Bryant, Bruce; McGrew, Laura W, and Wabus, Reinhard A. 1981. *Geologic Structure Map of the Denver 1° x 2° Quadrangle, North-Central Colorado*. Sheet 2. U.S. Geologic Survey. Map I-1163.
2. Natural Resource Conservation Service, September 22, 2015. *Web Soil Survey*. United States Department Agriculture, <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.
3. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado*.
4. Madole, Richard F., 2003. *Geologic Map of the Falcon NW Quadrangle, El Paso County, Colorado*. Colorado Geological Survey. Open-File Report 03-8.
5. Trimble, Donald E. and Machette, Michael N. 1979. *Geologic Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado*. USGS, Map I-857-F.
6. Bryant, Bruce; McGrew, Laura W. and Wobus, Reinhard A. 1981. *Geologic Map of the Denver 1° x 2° Quadrangle, North-Central Colorado*. U.S. Geologic Survey. Map 1-1163.
7. Federal Emergency Management Agency. March 17, 1997. *Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas*. Map Number 08041CO535F
8. El Paso County Planning Development. December 1995. *El Paso County Aggregate Resource Evaluation Maps*.
9. Schwochow, S.D.; Shroba, R.R. and Wicklein, P.C. 1974. *Atlas of Sand, Gravel, and Quarry Aggregate Resources, Colorado Front Range Counties*. Colorado Geological Survey. Special Publication 5-B.
10. Keller, John W.; TerBest, Harry and Garrison, Rachel E. 2003. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands Administered by the Colorado State Land Board*. Colorado Geological Survey. Open-File Report 03-07.

## TABLES

**TABLE 1**  
**SUMMARY OF LABORATORY TEST RESULTS**

CLIENT: ARROYA INVESTMENTS  
 PROJECT: THE RETREAT AT TIMBER RIDGE  
 JOB NO.: 170209

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			34.3						SC	SAND, CLAYEY
1	2	2-3			11.2						SM-SW	SAND, SLIGHTLY SILTY
1	TP-3	4-5			16.4						SM	SAND, CLAYEY
2	1	5	14.9	108.3	47.6					0.2	SC	SANDSTONE, VERY CLAYEY
3	TP-2	5-6			76.6				1280		CL	CLAYSTONE, SANDY
3	TP-3	6-8			60.6						CL	CLAYSTONE, VERY SANDY



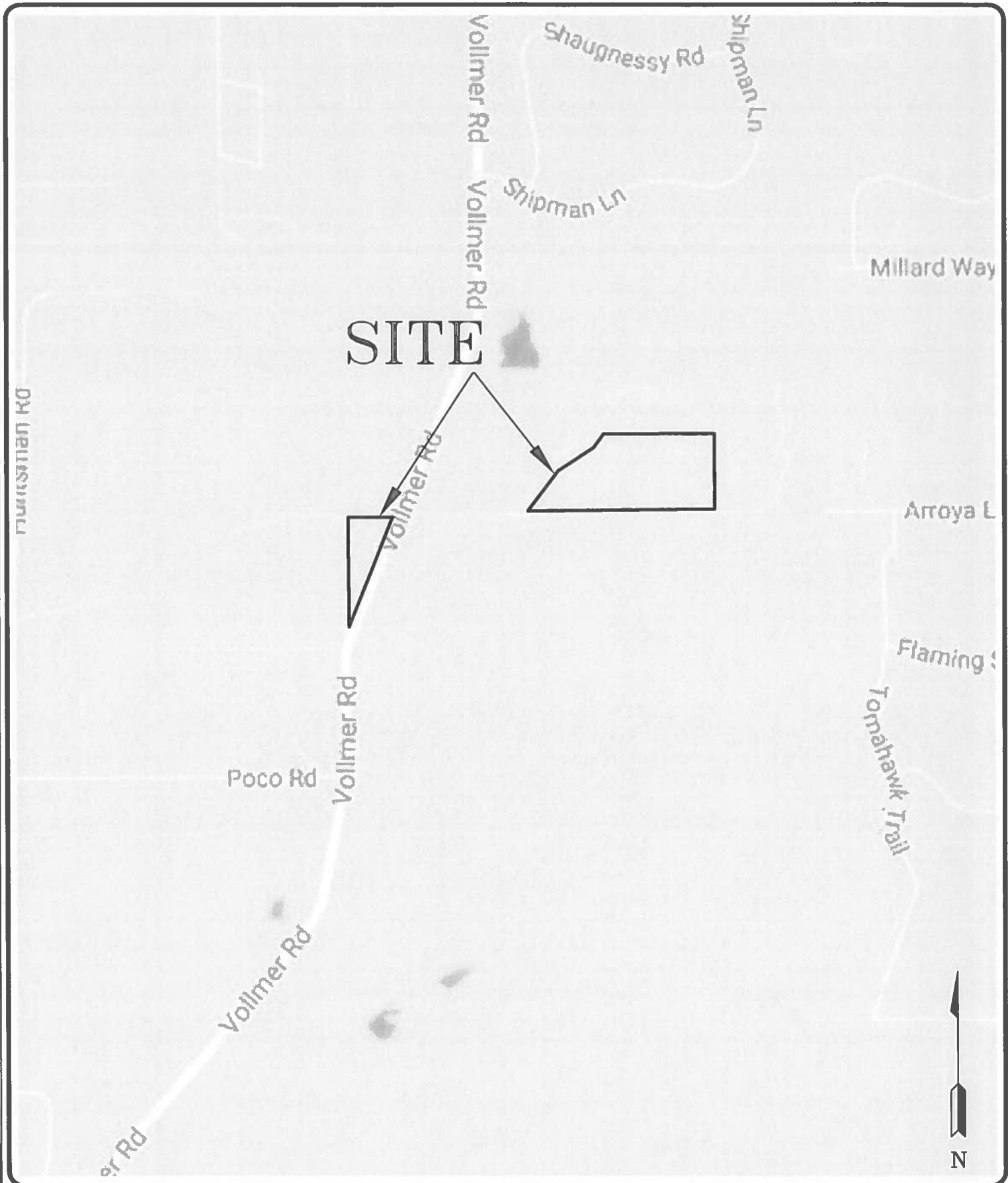
**Table 2: Summary of Percolation Test and Tactile Test Pit Results**

<b>Percolation Test No.</b>	<b>Percolation Rate (min/in)</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Groundwater (ft.)</b>
1	133*	N/A	N/A
2	44	N/A	N/A

<b>Test Pit No.</b>	<b>USDA Soil Type Limiting Layer</b>	<b>LTAR Value</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Groundwater (ft.)</b>
1	4*	0.20	1	N/A
2	4A*	0.15	3.5	N/A
3	4A*	0.15	5	N/A

\*- Conditions that will require an engineered OWTS

## FIGURES



**SITE**

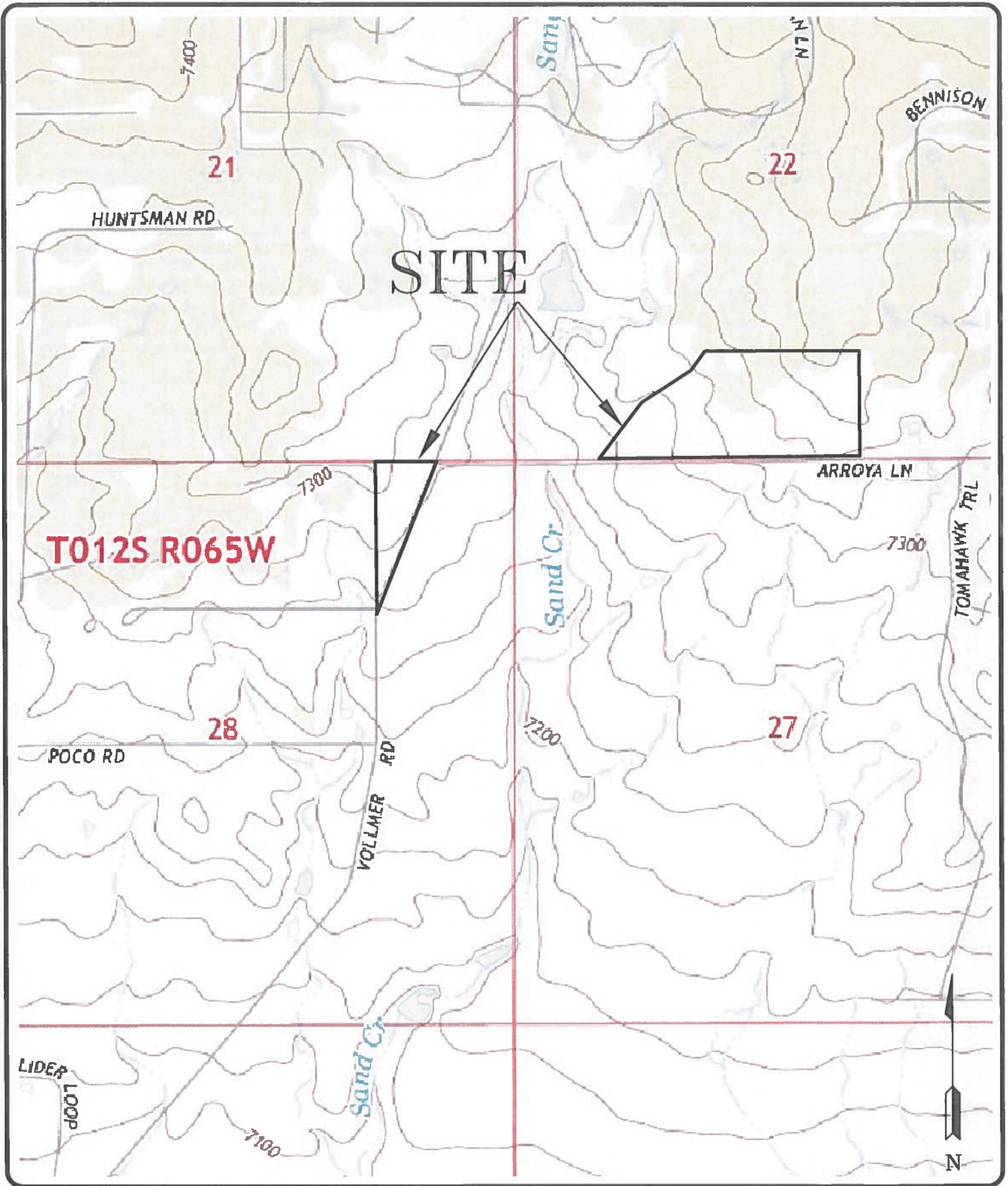


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VICINITY MAP  
 THE RETREAT AT TIMBER RIDGE  
 VOLLMER ROAD AND ARROYA LANE  
 EL PASO COUNTY, CO.  
 FOR: ARROYA INVESTMENTS

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JOB NO.:  
**170209**  
 FIG NO.:  
**1**




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USGS MAP  
THE RETREAT AT TIMBER RIDGE  
VOLLMER ROAD AND ARROYA LANE  
EL PASO COUNTY, CO.  
FOR: ARROYA INVESTMENTS

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JOB NO.:  
170209

FIG NO.:  
2

# SITE

TRACT A  
URE RESIDENTIAL  
(5-ACRE LOTS)

RESIDENTIAL  
LOTS  
(2.5+ AC)

ARROYA LANE

ARROYA LANE

3.4 AC

3.4 AC

50' Buffer

25' Buffer / Trail

PARCELA

PARCEL C

FLOODWAY

Drainage /  
Open  
Space  
Tract

FLOODWAY

Park

FLOODWAY

Detention /  
Water  
Quality

PARCEL D

PARCELE

Detention /  
Water  
Quality

PARCEL A  
(Varies)  
100 Lots

PARCEL C  
(Varies)  
82 Lots

PARCEL B  
(60 by 120-130')  
98 Lots

PARCEL D and E  
(60-70' by 125')  
190 Lots

TOTAL LOTS:  
470

**LEGEND**

- 2.5 AC LOTS
- 1 AC LOTS
- <1 AC LOTS
- OPEN SPACE / PARK
- PROPOSED TRAILS



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PRELIMINARY CONCEPT PLAN  
THE RETREAT AT TIMBER RIDGE  
VOLLMER ROAD AND ARROYA LANE  
EL PASO COUNTY, CO.  
FOR: ARROYA INVESTMENTS

JOB NO.:  
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3

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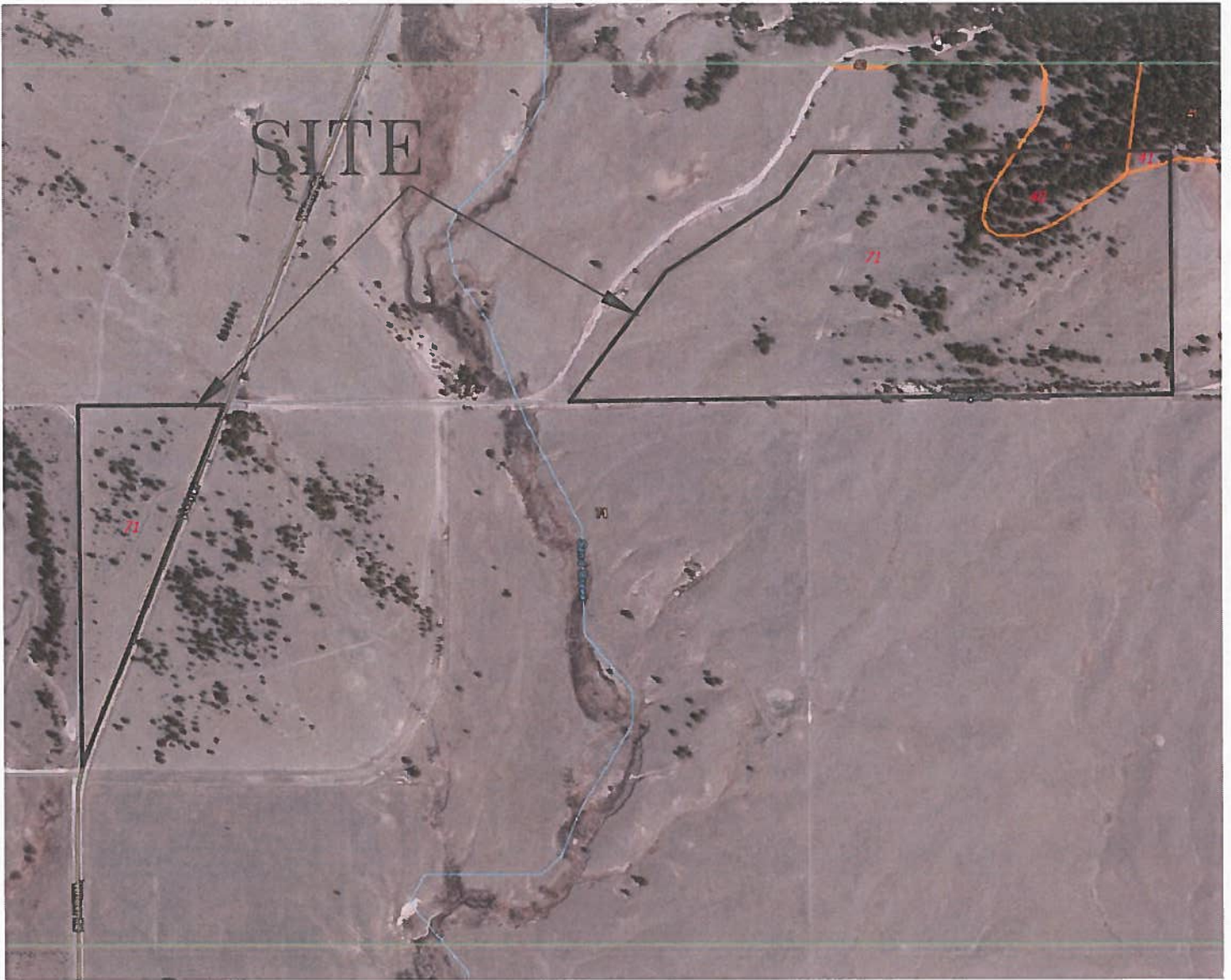
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**SITE PLAN/TEST BORING AND TEST PIT LOCATION MAP**  
**THE RETREAT AT TIMBER RIDGE**  
 VOLLMER ROAD AND ARROYA LANE  
 EL PASO COUNTY, CO.  
 FOR: ARROYA INVESTMENTS

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**SOIL SURVEY MAP**  
**THE RETREAT AT TIMBER RIDGE**  
**VOLLMER ROAD AND ARROYA LANE**  
**EL PASO COUNTY, CO.**  
**FOR: ARROYA INVESTMENTS**

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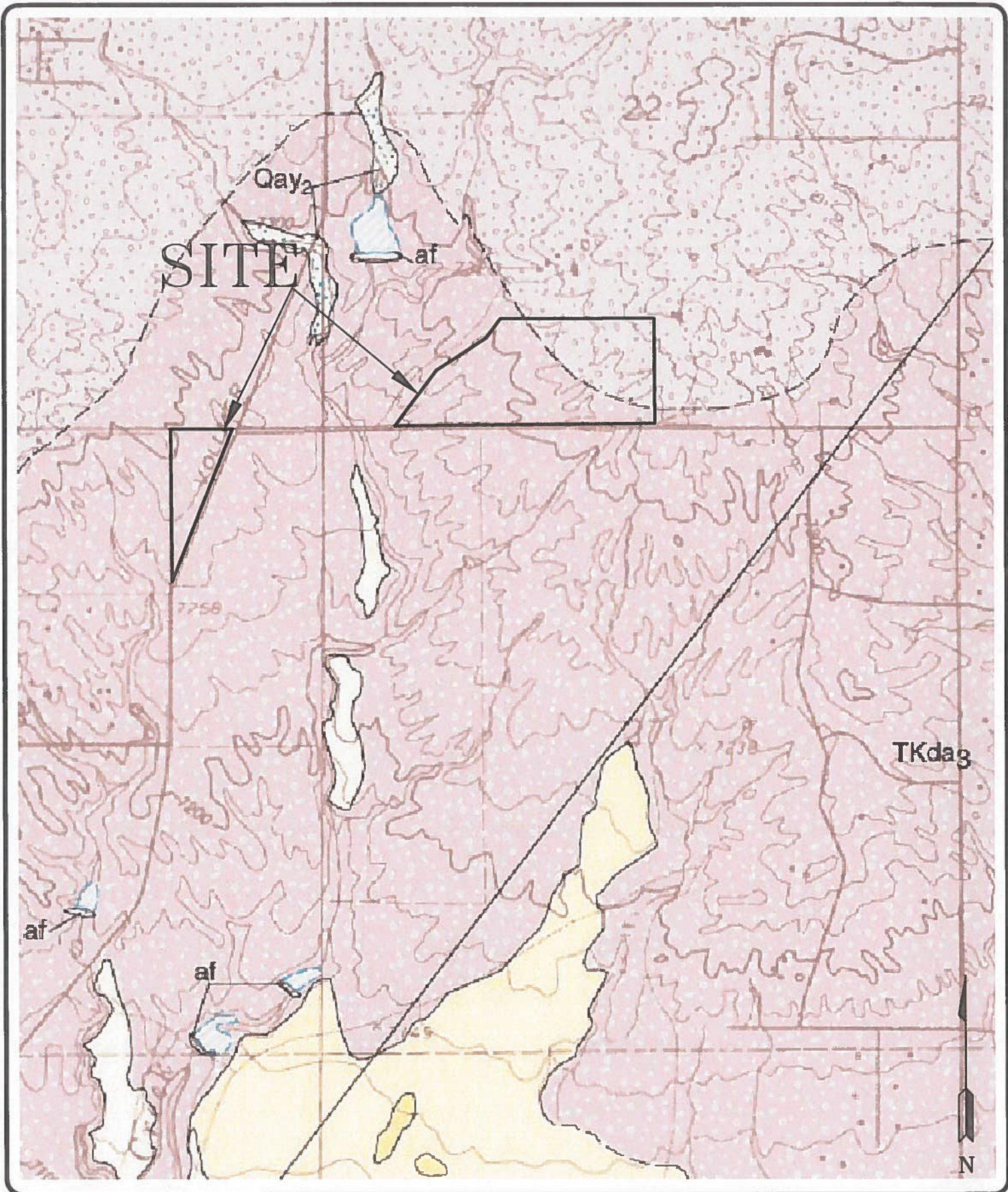
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 5



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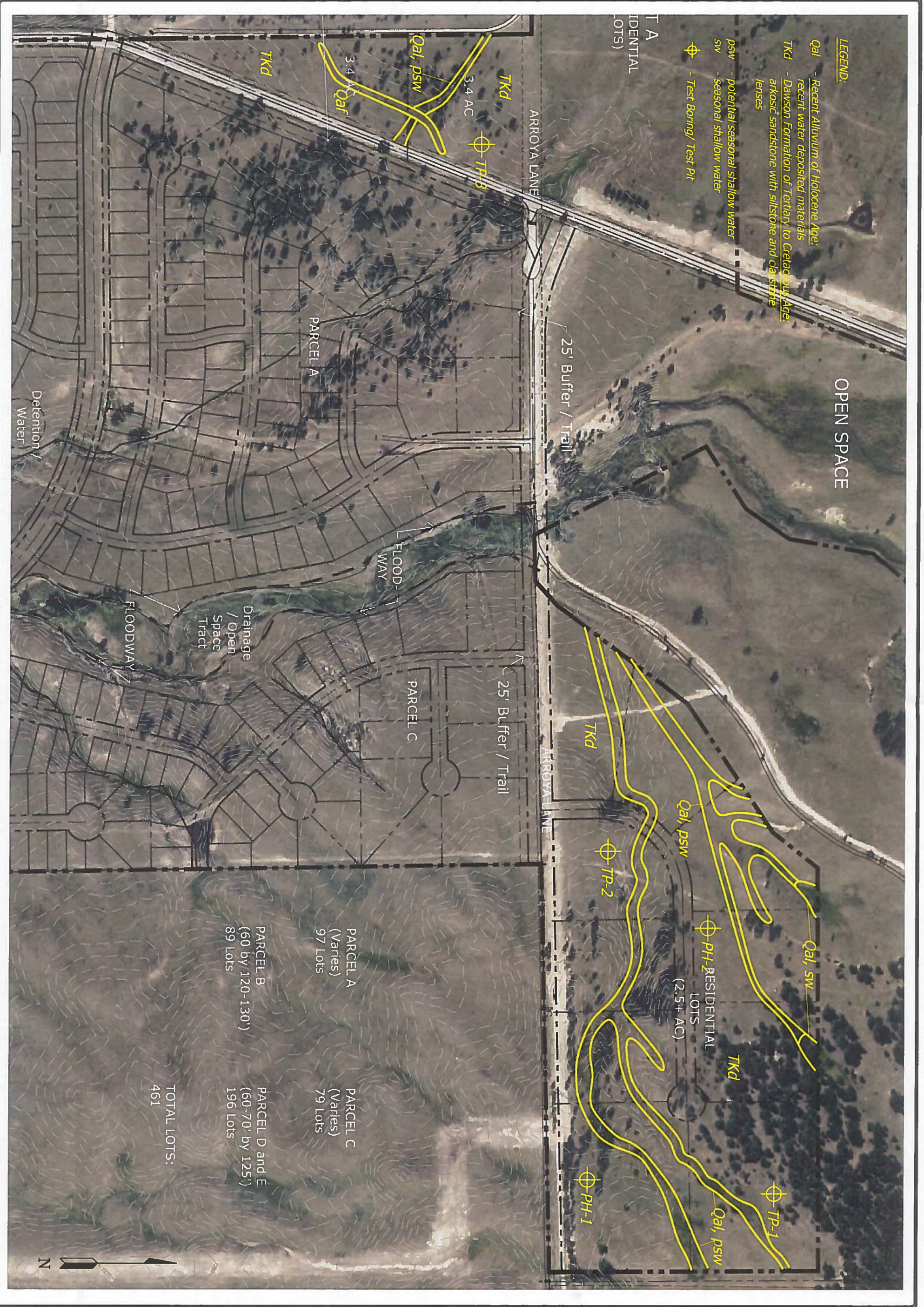
FALCON NW QUADRANGLE GEOLOGY MAP  
THE RETREAT AT TIMBER RIDGE  
VOLLMER ROAD AND ARROYA LANE  
EL PASO COUNTY, CO.  
FOR: ARROYA INVESTMENTS

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JOB NO.:  
170209

FIG NO.:  
6





OPEN SPACE

**LEGEND:**

- Qal - Recent Alluvium of Holocene Age: recent water deposited materials
- TKd - Dawson Formation of Tertiary to Cretaceous Age: arkosic sandstone with siltstone and claystone lenses
- psw - potential seasonal shallow water
- sw - seasonal shallow water
- ⊕ - Test Boring/ Test Pit

T A  
IDENTICAL  
LOTS)

ARROYA LANE

25' Buffer / Trail

25' Buffer / Trail

ARROYA LANE

PARCEL A

PARCEL C

PARCEL A  
(Varies)  
97 Lots

PARCEL C  
(Varies)  
79 Lots

PARCEL B  
(60 by 120-130')  
89 Lots

PARCEL D and E  
(60-70' by 125')  
196 Lots

TOTAL LOTS:  
461

Drainage / Open  
Space  
Tract

FLOOD-  
WAY

FLOODWAY

Detention /  
Water



DRAWN	TLL
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DATE	4/3/17
SCALE	AS SHOWN
JOB NO.	170209
THEME No.	7

**GEOLOGY MAP/ENGINEERING GEOLOGY**  
**THE RETREAT AT TIMBER RIDGE**  
**VOLLMER ROAD AND ARROYA LANE**  
**EL PASO COUNTY, CO.**  
**FOR: ARROYA INVESTMENTS**

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**LEGEND**

**SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, AV, VE, and V. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.

**ZONE AE** Base Flood Elevations determined.

**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelict. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**  
Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot (or with drainage areas less than 1 square mile); and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**  
Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**  
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and values; elevation in feet\*

Base Flood Elevation value where uniform within area; elevation in feet\*

Referenced to the National Geodetic Vertical Datum of 1929

From section line

Traced line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83); Western Hemisphere

1000-foot Universal Transverse Mercator grid tick values, zone 4

5000-foot grid tick values; 11-wall State Plane coordinate system, zone 3 (FIPSZONE 5103), Transverse Mercator projection

Bench mark (see explanation in Notes to Users section of this FEMA panel)

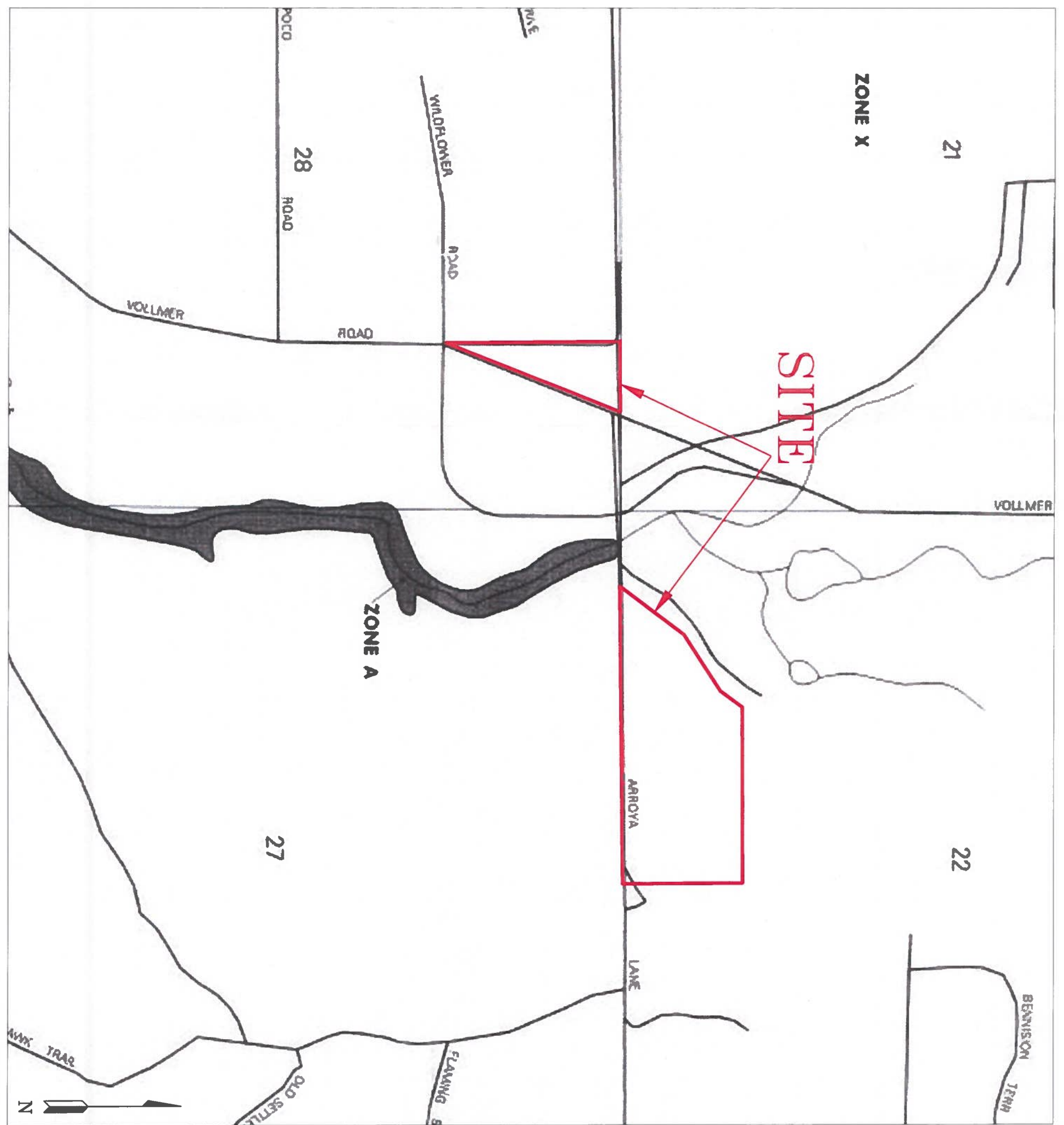
Casualty marker

MAP REPOSITORY

Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

September 30, 2004 - to change Special Flood Hazard Areas, to update map format, to reflect revised shoreline and to incorporate previously issued Letters of Map Revision.

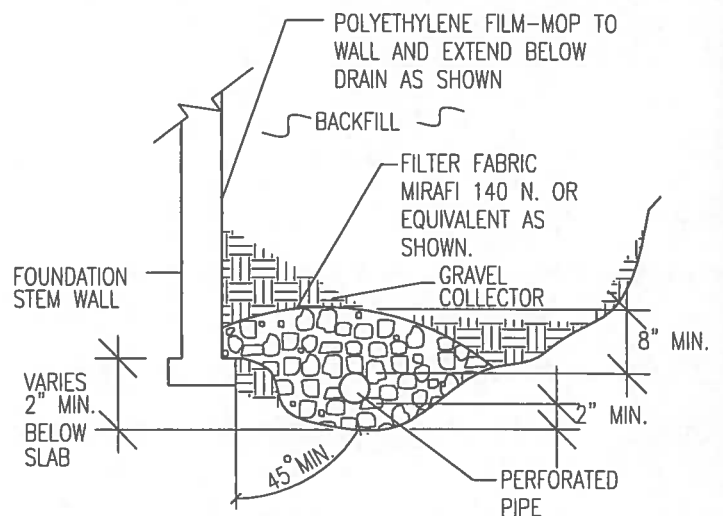
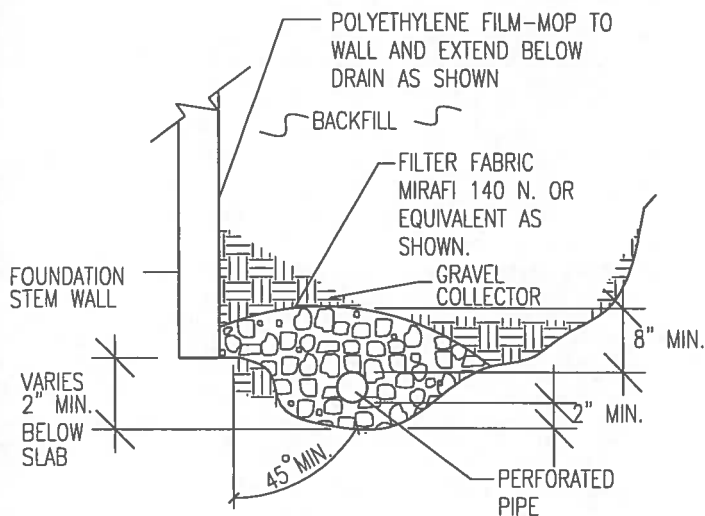


REVISION	BY

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505 ELKTON DRIVE  
COLORADO SPRINGS, CO. 80907 (719) 531-5599

**FLOODPLAIN MAP**  
THE RETREAT AT TIMBER RIDGE  
VOLLMER ROAD AND ARROYA LANE  
EL PASO COUNTY, CO.  
FOR: ARROYA INVESTMENTS

DATE	3/31/17
CHECKED	AS SHOWN
SCALE	AS SHOWN
DATE	170200
DATE	7/20/00
DATE	8



NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.



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*PERIMETER DRAIN DETAIL*

DRAWN:

DATE:

DESIGNED:

DS

CHECKED:

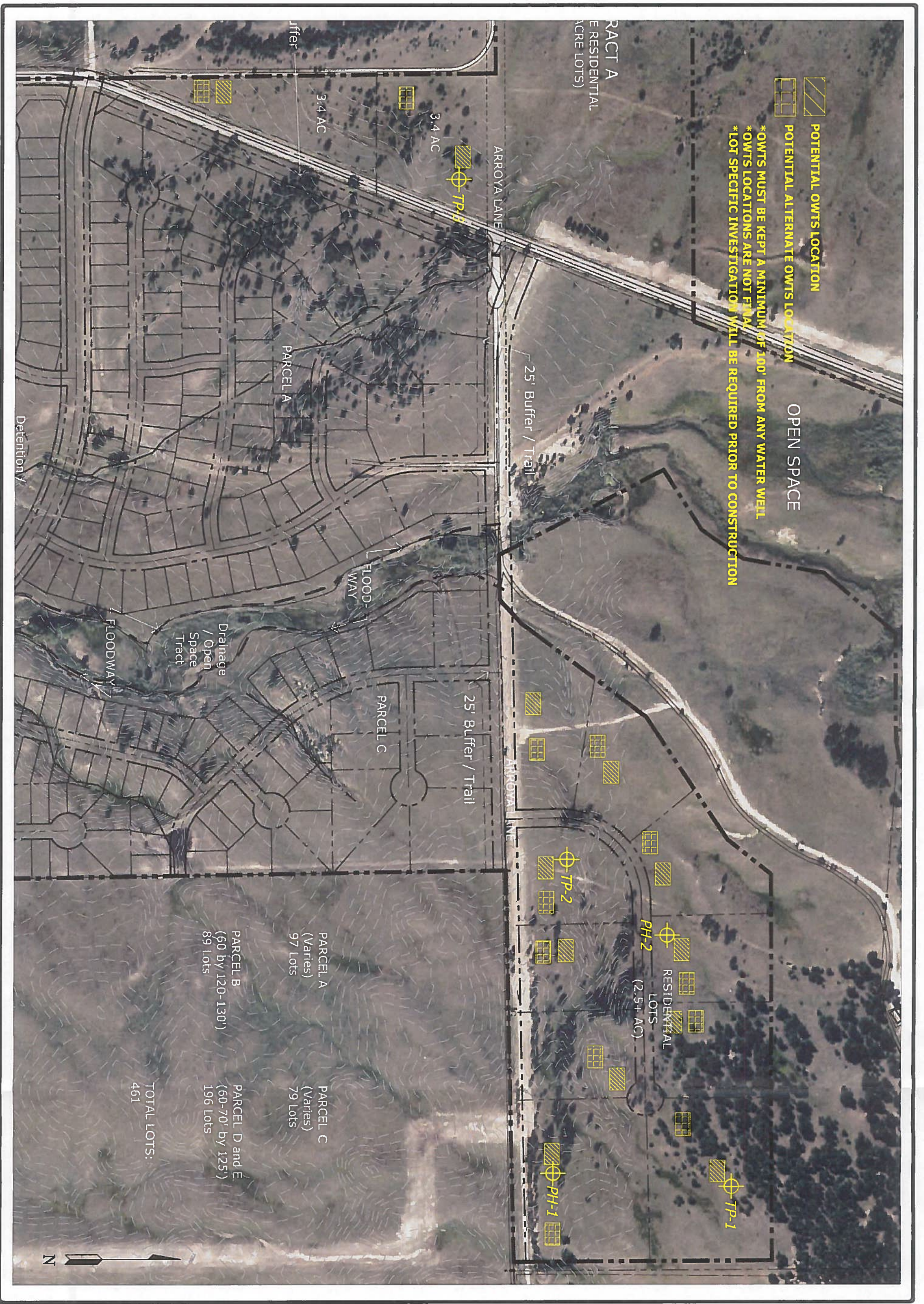
LLR

JOB NO.:

170 209

FIG NO.:

9



 POTENTIAL OWTs LOCATION  
 POTENTIAL ALTERNATE OWTs LOCATION

\*OWT's MUST BE KEPT A MINIMUM OF 100' FROM ANY WATER WELL  
 \*OWT's LOCATIONS ARE NOT FINAL  
 \*LOT SPECIFIC INVESTIGATION WILL BE REQUIRED PRIOR TO CONSTRUCTION

OPEN SPACE

PARCEL A  
 (Varies)  
 97 Lots

PARCEL B  
 (60 by 120-130')  
 89 Lots


PARCEL C  
 (Varies)  
 79 Lots

PARCEL D and E  
 (60-70' by 125')  
 196 Lots

TOTAL LOTS:  
461

DATE	4/23/17
BY	AS SHOWN
SCALE	1" = 200'
PROJECT NO.	170200
ISSUE NO.	10

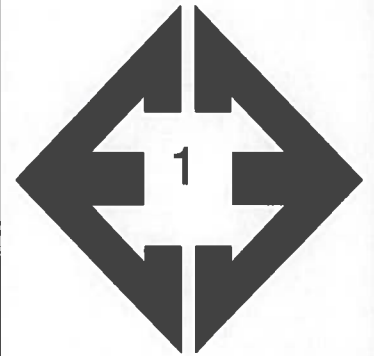
**SEPTIC SUITABILITY MAP**  
**THE RETREAT AT TIMBER RIDGE**  
**VOLLMER ROAD AND ARROYA LANE**  
**EL PASO COUNTY, CO.**  
**FOR: ARROYA INVESTMENTS**



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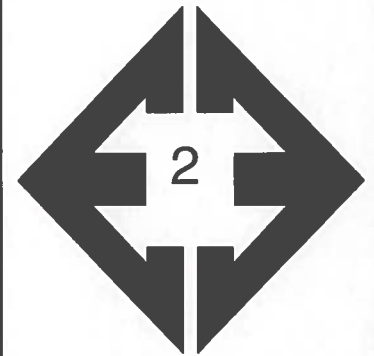
REVISION	BY

## **APPENDIX A: Site Photographs**



**Looking east from the southern portion of the site.**

March 9, 2017



**Looking north from the southern portion of the site.**

March 9, 2017



**Looking northeast  
from the southwestern  
portion of the site on  
the north side of  
Arroya Lane.**

March 9, 2017



**Looking west central  
portion of the site.**

March 9, 2017



Looking east from the  
area of Profile Hole No.  
2.

March 9, 2017



Looking north from the  
southeast portion of  
the site.

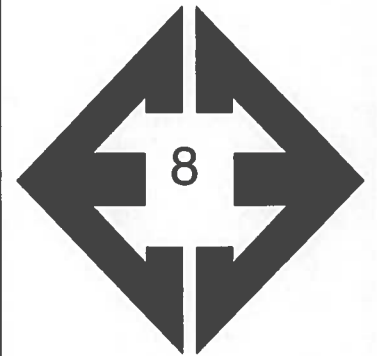
March 28, 2017





**Looking east from the  
northwestern portion  
of the western lots  
towards Arroya Lane.**

March 28, 2017



**Looking south from  
the central portion of  
the western lots along  
Vollmer Road.**

March 28, 2017

**APPENDIX B: Test Boring Logs from the Profile Holes  
and Test Pit Logs**

PROFILE HOLE NO. 1  
 DATE DRILLED 2/16/2017  
 Job # 170209

PROFILE HOLE NO. 2  
 DATE DRILLED 2/16/2017  
 CLIENT ARROYA INVESTMENTS  
 LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 14.5', 2/17/17							DRY TO 14', 2/17/17						
SAND, CLAYEY, FINE GRAINED, GREEN BROWN, DENSE, MOIST				30	13.0		SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST				19	2.3	
SANDSTONE, VERY CLAYEY TO CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST	5			50 11"	13.1			5			7	7.4	
	10			50 7"	13.4			10			6	5.5	
	15			50 7"	9.2		SANDSTONE, CLAYEY, FINE GRAINED, TAN, VERY DENSE, MOIST	15			50	12.5	
	20							20					



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 COLORADO SPRINGS, COLORADO 80907

**PROFILE HOLE LOG**

DRAWN:

DATE:

CHECKED:  
 LLL

DATE:  
 3/31/17

JOB NO.:

170209

FIG NO.:

B-1

TEST PIT NO. 1  
 DATE EXCAVATED 2/15/2017  
 Job # 170209

TEST PIT NO. 2  
 DATE EXCAVATED 2/15/2017  
 CLIENT ARROYA INVESTMENTS  
 LOCATION VOLLMER ROAD & ARROYA LANE

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	w	2A	topsoil, sandy loam, brown	1			gr	w	2a
weathered to formational silty sandstone, fine to coarse grained, reddish-tan	2			ma		4	gravelly loamy sand, fine to coarse grained, tan	2			sg		1
	3							3			ma		4
	4						weathered silty sandstone, fine to coarse grained, reddish-tan	4					
	5						sandy claystone, olive-gray	5			ma		4A
	6			6									
	7			7									
	8			8				8					
	9			9				9					
	10			10				10					

Soil Structure Shape  
 granular - gr  
 platy - pl  
 blocky - bl  
 prismatic - pr  
 single grain - sg  
 massive - ma

Soil Structure Grade  
 weak - w  
 moderate - m  
 strong - s  
 loose - l



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 COLORADO SPRINGS, COLORADO 80907

**TEST PIT LOG**

DRAWN:

DATE:

CHECKED:  
 LLL

DATE:  
 3/31/17

JOB NO.:  
 170209  
 FIG NO.:  
 B-2

TEST PIT NO. 3  
 DATE EXCAVATED 3/28/2016  
 Job # 170209

TEST PIT NO.  
 DATE EXCAVATED  
 CLIENT ARROYA INVESTMENTS  
 LOCATION VOLLMER ROAD & ARROYA LANE

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1	*		gr	w	2A		1					
gravelly loamy sand, fine to coarse grained, tan	2			sg		1		2					
	3							3					
sandy clay loam, very fine to coarse grained, tan-gray	4			ma		3A		4					
weathered clayey sandstone, very fine to coarse grained, tan-gray	5			ma		4A		5					
	6							6					
	7							7					
siltstone, very fine to fine grained, tan to reddish-tan	8			ma		4A		8					
	9							9					
	10							10					

Soil Structure Shape  
 granular - gr  
 platy - pl  
 blocky - bl  
 prismatic - pr  
 single grain - sg  
 massive - ma



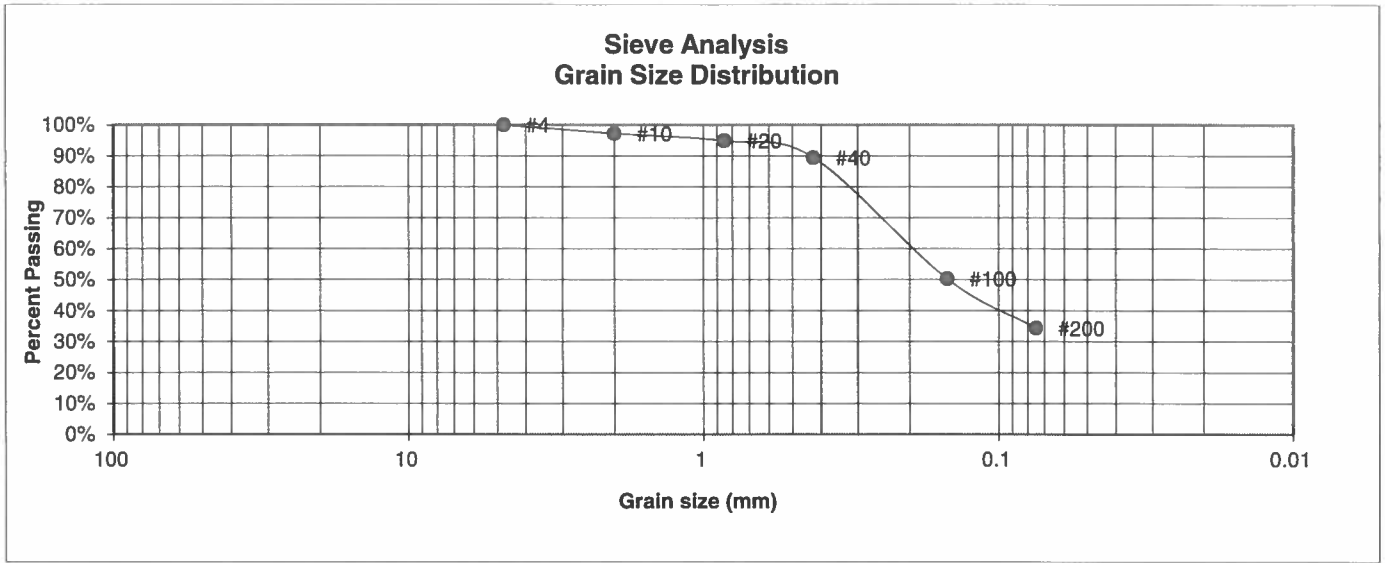
**TEST PIT LOG**

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/31/17
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JOB NO.:  
170209  
 FIG NO.:  
B-3

## **APPENDIX C: Laboratory Test Results**

BORING NO.	1	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.2%
20	94.9%
40	89.5%
100	50.3%
200	34.3%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:

DATE:

CHECKED:  
LLL

DATE:  
3/31/17

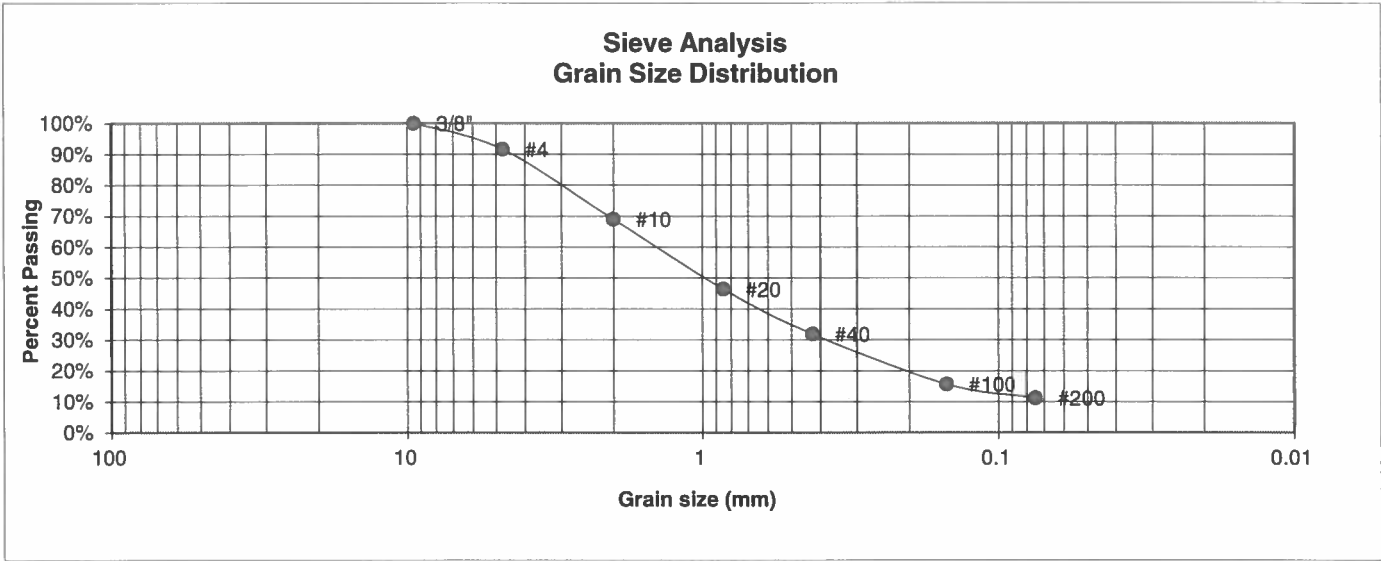
JOB NO.:

170209

FIG NO.:

C-1

BORING NO.	2	<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>TEST BY</u>	BL
DEPTH(ft)	2-3	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.6%
10	69.0%
20	46.4%
40	31.9%
100	15.7%
200	11.2%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:

DATE:

CHECKED:  
LLL

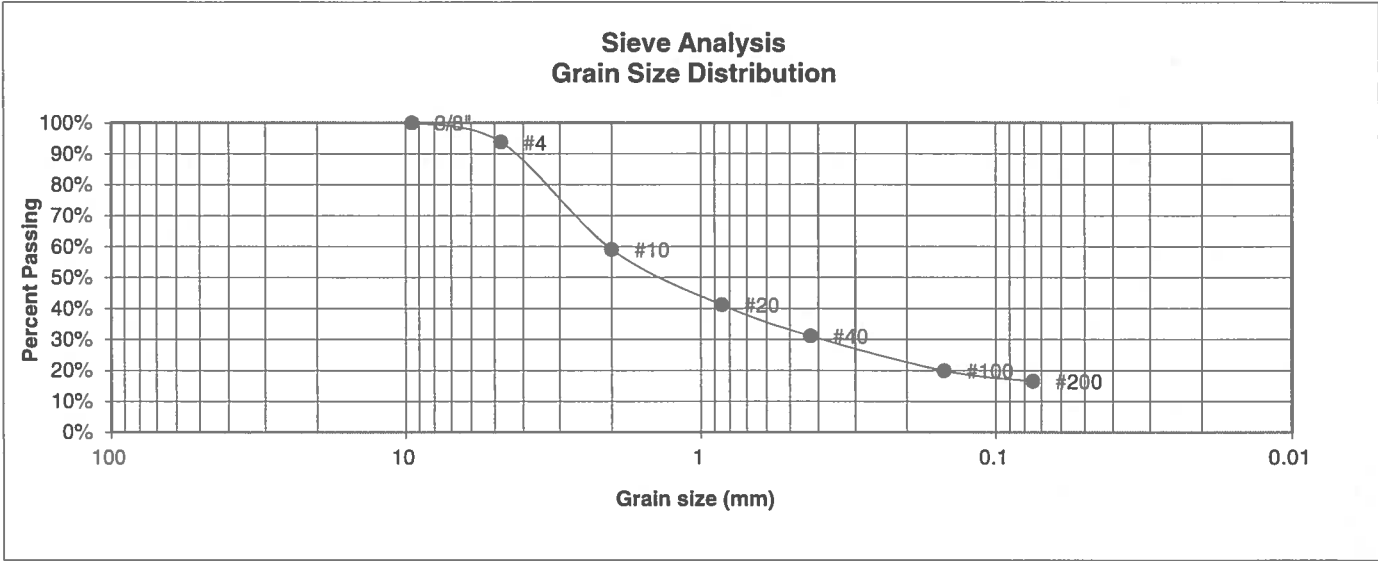
DATE:  
3/31/17

JOB NO.:  
170209

FIG NO.:  
C-2



BORING NO.	TP-3	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	4-5	AASHTO CLASSIFICATION		JOB NO.	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.7%
10	59.1%
20	41.1%
40	31.1%
100	19.9%
200	16.4%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:

DATE:

CHECKED:  
LLL

DATE:  
3/31/17

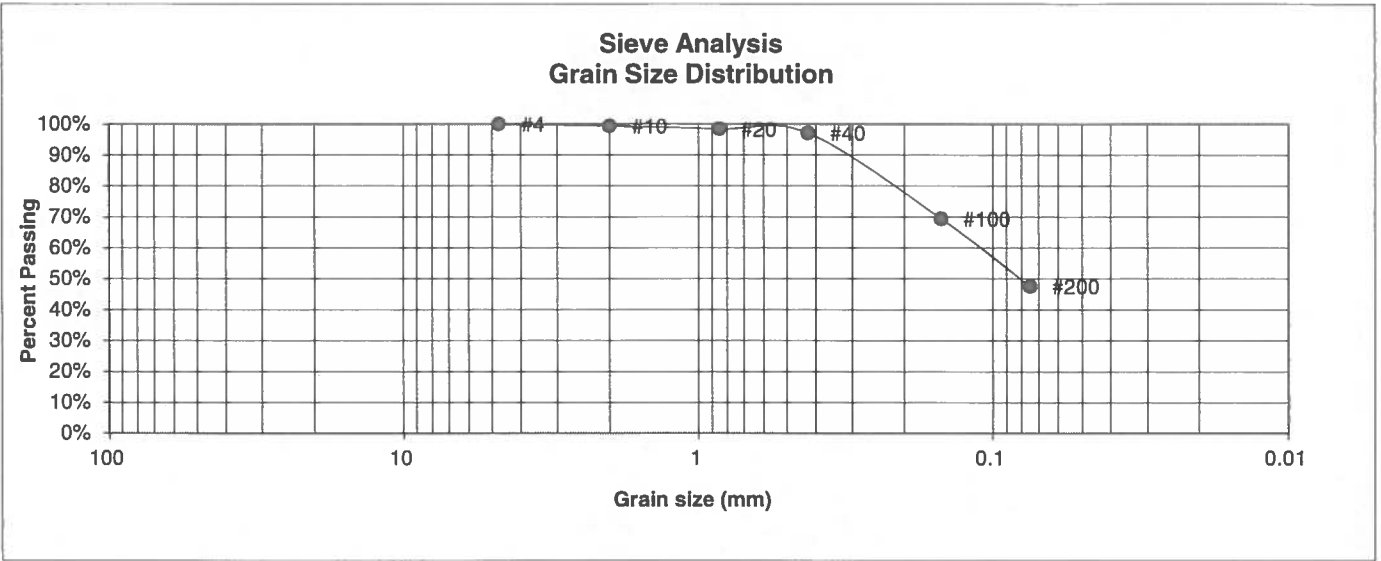
JOB NO.:

170209

FIG NO.:

C-3

BORING NO.	1	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	5	AASHTO CLASSIFICATION		JOB NO.	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.4%
20	98.4%
40	97.1%
100	69.4%
200	47.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:

DATE:

CHECKED:  
LLL

DATE:  
3/31/17

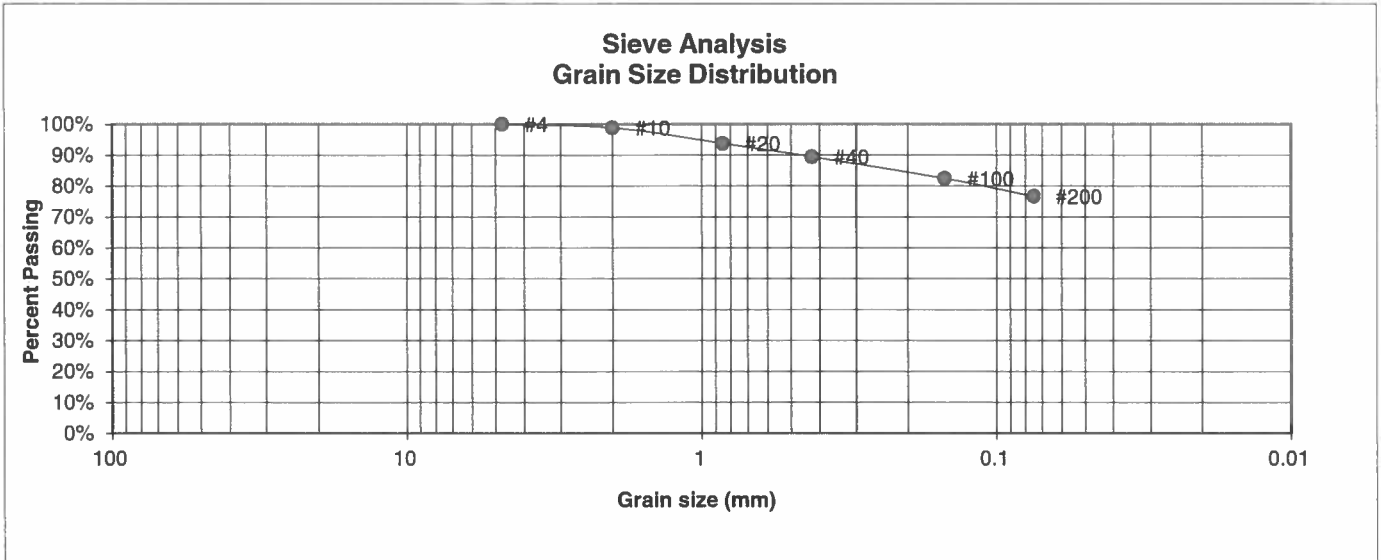
JOB NO.:

170209

FIG NO.:

C-4

BORING NO.	TP-2	<u>UNIFIED CLASSIFICATION</u>	CL	<u>TEST BY</u>	BL
DEPTH(ft)	5-6	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.9%
20	93.8%
40	89.4%
100	82.4%
200	76.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell

Moisture at start	11.5%
Moisture at finish	20.8%
Moisture increase	9.4%
Initial dry density (pcf)	103
Swell (psf)	1280



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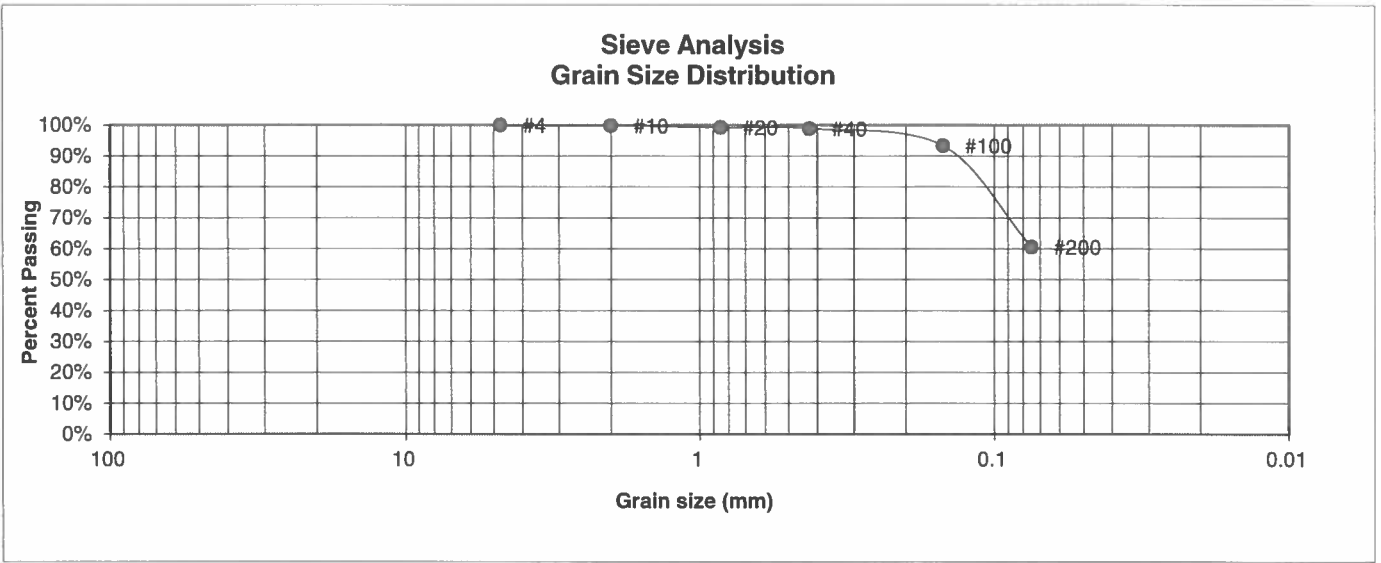
505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/3/17

JOB NO.:  
170209  
FIG NO.:  
C-5

BORING NO.	TP-3	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	6-8	AASHTO CLASSIFICATION		JOB NO.	170209
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	99.3%
40	98.9%
100	93.3%
200	60.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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**LABORATORY TEST  
RESULTS**

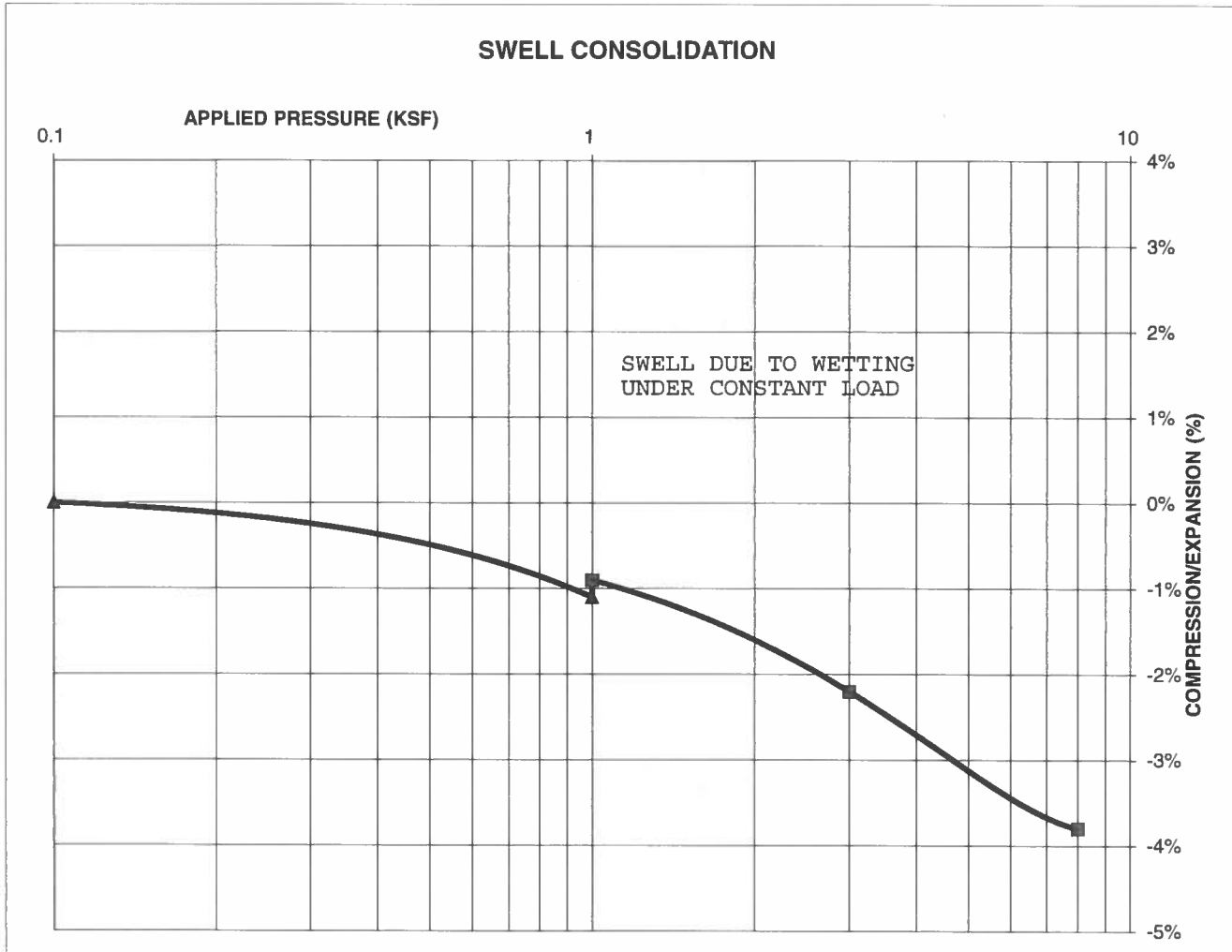
DRAWN:	DATE:	CHECKED: LLL	DATE: 3/31/17
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JOB NO.:  
170209  
FIG NO.:  
C-6

**CONSOLIDATION TEST RESULTS**

SAMPLE FROM:	1	DEPTH(ft)	5
DESCRIPTION	SAND, VERY CLAYEY		
NATURAL UNIT DRY WEIGHT (PCF)	108		
NATURAL MOISTURE CONTENT	14.9%		
SWELL/CONSOLIDATION (%)	0.2%		

JOB NO. 170209  
 CLIENT ARROYA INVESTMENTS  
 PROJECT THE RETREAT AT TIMBER RIDGE



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**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

LLL

3/31/17

JOB NO.:  
 170209

FIG NO.:

C-7

## **APPENDIX D: Soil Survey Descriptions**

## El Paso County Area, Colorado

### 40—Kettle gravelly loamy sand, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 368g

*Elevation:* 7,000 to 7,700 feet

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Kettle and similar soils:* 85 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Kettle

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Sandy alluvium derived from arkose

##### Typical profile

*E - 0 to 16 inches:* gravelly loamy sand

*Bt - 16 to 40 inches:* gravelly sandy loam

*C - 40 to 60 inches:* extremely gravelly loamy sand

##### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Somewhat excessively drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High  
(2.00 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water storage in profile:* Low (about 3.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:*

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016



## El Paso County Area, Colorado

### 41—Kettle gravelly loamy sand, 8 to 40 percent slopes

#### Map Unit Setting

*National map unit symbol:* 368h  
*Elevation:* 7,000 to 7,700 feet  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Kettle and similar soils:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Kettle

##### Setting

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Sandy alluvium derived from arkose

##### Typical profile

*E - 0 to 16 inches:* gravelly loamy sand  
*Bt - 16 to 40 inches:* gravelly sandy loam  
*C - 40 to 60 inches:* extremely gravelly loamy sand

##### Properties and qualities

*Slope:* 8 to 40 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* High  
(2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* Low (about 3.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7e  
*Hydrologic Soil Group:* B  
*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:*  
*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

## El Paso County Area, Colorado

### 71—Pring coarse sandy loam, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369k

*Elevation:* 6,800 to 7,600 feet

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Pring and similar soils:* 85 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Pring

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Arkosic alluvium derived from sedimentary rock

##### Typical profile

*A - 0 to 14 inches:* coarse sandy loam

*C - 14 to 60 inches:* gravelly sandy loam

##### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High  
(2.00 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water storage in profile:* Low (about 6.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* B

*Ecological site:* Loamy Park (R048AY222CO)

*Hydric soil rating:* No

#### Minor Components

##### Pleasant

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

**Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

## **APPENDIX E: Percolation Test Results**

Client: Arroya Investments  
 Test Location: The Retreat at Timber Ridge

Job Number: 170209

**PERCOLATION HOLES - #1**

Date Holes Prepared: 2/16/2017

Date Hole Completed: 2/17/2017

Hole No. 1

Depth: 34"

Hole No. 2

Depth: 36"

Hole No. 3

Depth: 34"

<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>	<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>	<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>
1	10	1/8	1	10	0	1	10	0
2	10	0	2	10	0	2	10	0
3	10	1/8	3	10	1/8	3	10	0

Perc Rate (min./in.): 80

Perc Rate (min./in.): 80

Perc Rate (min./in.): 240

Average Perc Rate (min./in.) 133

**PROFILE HOLE**

Date Profile Hole Completed: 2/16/2017

<u>Depth</u>	<u>Visual Classification</u>	<u>Remarks</u>
0-3'	Sand, clayey, fine grained, green brown	
3-15'	Sandstone, very clayey, fine grained, green brown	Sandstone Bedrock at 3' No Groundwater
	30 Blows / ft. @ 2'	
	50 Blows / 11" @ 4'	
	50 Blows / 7" @ 9'	

LTAR = 0.1 gallons per square foot per day.

Remarks:

\* - Due to slow percolation rate and shallow bedrock, a designed system or additional drilling is recommended

GPS Coordinates: 38° 59' 03.3" N, 104° 39' 17.6" W

Observer: Graham Espenlaub

By:



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**PERCOLATION TEST RESULTS**

DRAWN:

DATE:

CHECKED:  
 LLL

DATE:  
 3/31/17

JOB NO.:

170209

FIG NO.:

E-1

Client: Arroya Investments  
Test Location: The Retreat at Timber Ridge

Job Number: 170209

### PERCOLATION HOLES - #2

Date Holes Prepared: 2/16/2017

Date Hole Completed: 2/17/2017

Hole No. 1  
Depth: 36"

Hole No. 2  
Depth: 36"

Hole No. 3  
Depth: 31"

<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>	<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>	<u>Trial</u>	<u>Time (min.)</u>	<u>Water Level Change (in.)</u>
1	10	1/8	1	10	1/8	1	10	7/8
2	10	0	2	10	3/8	2	10	5/8
3	10	1/8	3	10	3/8	3	10	3/8

Perc Rate (min./in.): 80

Perc Rate (min./in.): 27

Perc Rate (min./in.): 27

Average Perc Rate (min./in.) 44

### PROFILE HOLE

Date Profile Hole Completed: 2/16/2017

<u>Depth</u>	<u>Visual Classification</u>	<u>Remarks</u>
0-14'	Sand, slightly silty, fine to coarse grained, tan	
14-15'	Sandstone, clayey, fine to coarse grained, brown	Sandstone Bedrock at 14' No Groundwater
19 Blows / ft. @ 2'		
7 Blows / ft. @ 4'		
6 Blows / ft. @ 9'		

LTAR = 0.35 gallons per square foot per day.  
Soil Treatment Area (Soil Type 3) = 2.7 square feet per gallon.

Remarks:

GPS Coordinates: 38° 59' 07.0" , 104° 39' 29.2" W

Observer: Graham Espenlaub

By:



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

### PERCOLATION TEST RESULTS

DRAWN:

DATE:

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DATE:  
3/31/17

JOB NO.:

170209

FIG NO.:

E-2