Please note Statute will require a review of this report at the preliminary plan stage.

ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

SOIL, GEOLOGY, AND GEOLOGIC HAZARD STUDY
THE RETREAT AT TIMBER RIDGE
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

LLL/rm

Encl.

Entech Job No. 170020
AAprojects/2017/170020 countysoil/geo

Reviewed by:

Joseph Collin Goodee, Jr., P.E.
President

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1.0 SUMMARY

Project Location

The project lies in portions of the SE¼ of Section 21, SW¼ of Section 22, W½ of Section 27, and NE¼ of Section 28, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately three miles northeast of Colorado Springs, Colorado.

Project Description

Total acreage involved in the project is approximately two hundred and thirty-seven acres. The proposed site development consists of four hundred and seventy single-family residential lots. The development will utilize municipal sewer and water.

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, downslope creep, erosion, floodplain, ponded water, shallow groundwater, 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 SE¼ of Section 21, SW¼ of Section 22, W½ of Section 27, and NE¼ of Section 28, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately three 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 south, with moderate to steep slopes along Sand Creek. The drainages on site flow in a southerly direction through the central portion of the site. Two ponds are located on the site, one north of Arroya Lane outside of the proposed residential development, and one located along the eastern side of Parcel C. Water was observed in Sand Creek and the three ponds, other drainages on the site were dry 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, with areas of scattered trees along Sand Creek, and ponderosa pine trees located across the northwest portion of the site. Site photographs, taken February 10, and March 9, 2017, are included in Appendix A.

Total acreage involved in the proposed development is approximately two hundred and thirty-seven acres. Four hundred and seventy single-family residential lots are proposed. The proposed lots will vary from approximately less than one acre to one acre. The area will be serviced municipal sewer and water. Open space is proposed along Sand Creek. Overlot grading is anticipated across a majority of the site to develop the roads and lots. The Preliminary Concept Plan and the Development Plan is presented in Figures 3 and 4.

This is a PUD; we do not have a concept plan.

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.

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 February 10 and March 9, 2017.

Thirteen Test Borings were drilled on the site to determine general soil and bedrock characteristics. The locations of the test borings are indicated on the Development Plan/Test Boring Location Map, Figure 4. The Test Boring 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 and Swell/Consolidation test. Sulfate testing was performed on select samples to evaluate potential for below grade concrete degradation due to sulfate attack. 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 twelve 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 terraces along Sand Creek and the drainages located on the site. Man-made soils exist as fill piles located in the southern portion of the 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 4). In general, the soils classify as coarse sandy loam. The soils are described as follows:

Type	Description
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. Five 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 three man-made dams located across the site.

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

Qay2 **Young alluvium two of Holocene Age:** These materials consist of water deposited alluvium, typically classified as a silty to well-graded sand, brown to dark brown in color and of moderate densisty.

Qam **Middle alluvium of Holocene to Pleistocene Age:** These materials consist of lower stream terrace deposits. The alluvium typically consists of silty to clayey gravelley sands.

Tkd **Dawson Formation of Tertiary to Cretaceous Age:** The Dawson Formation typically consiste 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 1^0 x 2^0 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 four general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 silty to slightly silty sand and very clayey sand (SM-SW, SM, SC), encountered in all of Test Borings at the existing ground surface and extending to depths ranging from1 foot to 17 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 9 to 41 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in the sand being non-plastic. Sulfate testing resulted in less than 0.01 to 0.01 percent sulfate by weight indicating the sand exhibits negligible potential for below grade concrete degradation.

Soil Type 2 sandy clay (CL), encountered in Test Boring Nos. 1, 2 and 7 at depths ranging from 2 to 14 feet bgs, and extending to depths ranging from 4 to 19 feet. These soils were encountered at very soft to stiff consistencies. Samples tested had 78 to 90 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in a liquid limit of 47 and aplastic index of 21. FHA Swell testing on samples of the sandy clay resulted in expansion pressures of 1520 to 1550 psf, indicating a moderate to high expansion potential. Sulfate testing resulted in less than 0.01 to 0.01 percent sulfate by weight indicating the clay exhibits negligible potential for below grade concrete degradation.

Soil Type 3 silty to slightly silty sandstone and clayey-silty sandstone (SM, SM-SW, SC-SM), encountered in all of Test Borings at depths ranging from 1 foot to 19 feet bgs and extending to the termination of the test borings (20 feet). The sandstone was encountered at dense to very dense states and at moist conditions. Samples tested had 9 to 24 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in the sandstone being non-plastic. Sulfate testing resulted in less than 0.01 percent sulfate by weight indicating the sandstone exhibits negligible potential for below grade concrete degradation.

Soil Type 4 sandy to very sandy claystone (CL), encountered in Test Boring Nos. 4 and 5 at depths ranging from 7 to 9 feet bgs and extending to depths ranging from 16 to 19 feet bgs. The claystone was encountered at hard consistencies and at moist conditions. Samples tested had 56 to 64 percent passing the No. 200 Sieve. Swell/Consolidation Testing resulted in expansions

of 1 to 3.3 percent, which indicates the claystone exhibits a low to high expansion potential. Atterberg Limits Testing resulted in a liquid limit of 44 and a plastic index of 20.

The Test Boring 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 encountered in four of the test borings at depths ranging from 5 to 17.5 feet, water was not encountered in the remaining borings which were drilled to 20 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 two dams located across the site. One of the dam is located north of Arroya Lane and is not within the proposed developed area. One dam is located on the eastern side of Parcel C. It is anticipated that this dam will be removed and filled during the site grading process. At the time of the investigation the condition of the dams was observed, and appeared to be in good condition.

Mitigation: The earthen dams lie within defined drainages and should be avoided as building sites. 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 Procter 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 and claystones, if encountered at foundation grade, can cause differential movement in structures. These occurrences should be identified and dealt with on an individual basis.

Mitigation Should expansive soils be encountered beneath foundations, 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.

Areas of Erosion

These are areas that are undergoing erosion by water and sheetwash producing gullies and rill erosion.

Mitigation: Due to the nature of the soils on this site, virtually all the soils are subject to erosion by wind and water. Other minor areas of erosion were observed on site other than those mapped, particularly where some rill erosion has occurred. Areas of erosion can occur across the entire site, particularly if the soils are disturbed during construction. Vegetation reduces the potential for erosion. The areas identified where erosion is actually taking place may require check dams, regrading and revegetation using channel lining mats to anchor vegetation. Further recommendations for erosion control are discussed under Section 9.0 "Erosion Control" of this report. Recommendations pertaining to revegetation may require input from a qualified landscape architect and/or the Natural Resource Conservation Service (previously Soil Conservation Service).

Groundwater and Floodplain Areas

Areas within the drainages on-site have been identified as areas of seasonally wet and/or seasonally high groundwater areas. Water was observed in the three ponds on-site, and flowing in Sand Creek. The majority of the drainages across the site were dry. The site is mapped within floodplain zones according to the FEMA Map No. 08041CO764F, Figure 8 (Reference 7). The floodplain area is to consist of open space/ park for the development. These areas are discussed as follows:

lots less than 2.5 acres are shown in the floodplain which is not allowed per Chapter 8.

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.

Please note these groundwater hazards should be identified on the prelim. plan when submitted and noted on the PUD as areas of concern

Areas of Ponded Water

These are areas of standing water behind earthen dams on site. We would not expect development in these areas. Either the dams can be avoided by construction or the areas may be completely regraded. Should complete regrading of the site be considered, all organic matter and soft, wet soils should be completely removed before filling. Any drainage into these areas should be rerouted in a non-erosive manner off of the site where it does not create areas of ponded water around proposed structures.

Downslope Creep Areas

These areas are acceptable as building sites, however, in areas identified with this hazard classification, we would anticipate accelerated lateral and vertical movement of the near surface soils in the downslope direction. It is anticipated that many of these areas will be mitigated by the overlot grading.

Mitigation: The design of foundations in these areas should account for the additional pressure on the uphill side of the structure due to the creep potential. The lateral pressure distribution for sloping conditions in downslope creep area is presented in Figure 10. Tie-beams, buttresses and counterforts may be necessary in some areas. Where possible, in areas of downslope creep, structures should be designed to be as compact and rigid as possible. This will help them better tolerate the vertical and lateral movements to which the foundation system may be subjected with minimal damage. Long, rambling, irregular structures should be avoided, as they are associated with much greater potential for damaging differential movement. Additionally, structures should be designed to step up the slope. Deep cuts in these areas should be avoided. Any retaining walls proposed in these areas should also be properly designed for by a qualified professional engineer for the global slope stability. Proper control of drainage at both

the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

Potentially Unstable Slope Areas

These slopes are considered stable in their present condition; however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability. These areas are primarily located along the banks of Sand Creek, which are proposed as open space.

Mitigation: Building should be avoided in these areas. Proper control of drainage at both the surface and the subsurface is extremely important. Areas of ponded water at the surface should be avoided. Utility trenches, basement excavations and other subsurface features should not be permitted to become water traps which may promote saturation of the subsurface materials. Drainage should not be permitted over the potentially unstable slope but directed in a non-erosive manner away from the slope. Irrigation above these slopes should be kept to a minimum to prevent saturation of the subsurface soils. The use of xeriscape landscaping utilizing native plantings is recommended to reduce the need for irrigation.

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 major drainages on site that are mitigated by avoidance. The minor drainages are being mitigated by site grading. 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 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. 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.

Areas of seasonal and potentially seasonal high groundwater areas and ponded water were encountered on site. The majority of these areas will likely be mitigated with site grading, or can be avoided by construction. Drains may be necessary for structures adjacent to these areas to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 8. The majority of the site does not lie within any floodplain zones according to the FEMA Map Nos. 08041CO315F and 08041CO325F, dated March 17, 1997 (Figure 9, Reference 8). A floodplain is mapped in the central portion of the site. Along this area is designated as open space and will be avoided by development. Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

Remover lots from floodplain please

Areas of fill were observed on site associated with dams. It is anticipated the dam north of Arroya Lane will be avoided by development, and the dam located on the eastern side of Parcel C will be regraded and filled during site development. Any uncontrolled fill encountered beneath foundations should be removed and recompacted at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. The larger embankment is located on Sand Creek. The existing embankment slopes generally appear to be in good condition. The spillway is an earth/vegetated channel on the west side of the embankment. Periodic observations of the embankment are recommended especially after large storm events.

Areas of erosion and gullying may require the construction of check dams and revegetation if construction encroaches on these areas. General recommendations for erosion control are discussed under Section 9.0 "Erosion Control".

Areas of downslope creep have been identified along on this site. In areas of downslope creep, structures should be designed to be as compact and rigid as possible. Foundations may require tie-beams or additional reinforcement in these areas. Foundations should be designed to step up the slopes to avoid deep cuts. Deep cuts should be avoided on all steeper sloping areas of the site. Any retaining walls proposed should be designed for the global slope stability by a qualified professional engineer. This includes cuts made for terracing in backyards. Proper control of drainage at both the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

Potentially unstable slope areas were observed along portions of Sand Creek. Based on the preliminary development plans these areas will be avoided. These areas should be avoided by construction and considerable care must be exercised in these areas not to create a condition which would tend to activate instability.

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 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 or 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.

9.0 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.

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT ARROYA INVESTMENTS
PROJECT THE RETREAT AT TIMBER RIDGE
JOB NO. 170020

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	5	2-3			10.5						SM-SW	SAND, SLIGHTLY SILTY
1	6	5			41.3			0.01			SC	SAND, VERY CLAYEY
1	11	5			16.5						SM	SAND, SILTY
1	13	2-3			17.8						SM	SAND, SILTY
1	9	2-3			14.6	NV	NP				SM	SAND, SILTY
1	10	5			17.4			<0.01			SM	SAND, SILTY
1	2	10			9.2	NV	NP	<0.01			SM-SW	SAND, SLIGHTLY SILTY
2	1	2-3			77.5				1550		CL	CLAY, SANDY
2	2	4			86.1			0.01	1520		CL	CLAY, SANDY
3	1	10			9.3	NV	NP	<0.01			SM-SW	SANDSTONE, SLIGHTLY SILTY
3	3	5			24.0						SM	SANDSTONE, SILTY
3	7	20			16.6						SM	SANDSTONE, SILTY
3	8	5			14.9						SM	SANDSTONE, SILTY
3	12	10			24.4						SC	SANDSTONE, CLAYEY
3	9	15			9.9	NV	NP				SM-SW	SANDSTONE, SILTY
4	4	15	19.9	109.5	63.9	44	20	<0.01		3.3	CL	CLAYSTONE, SANDY
4	5	10	17.8	111.3	55.7					1.0	CL	CLAYSTONE, VERY SANDY
4	7	15			89.5	47	21	<0.01			CL	CLAYSTONE, SANDY

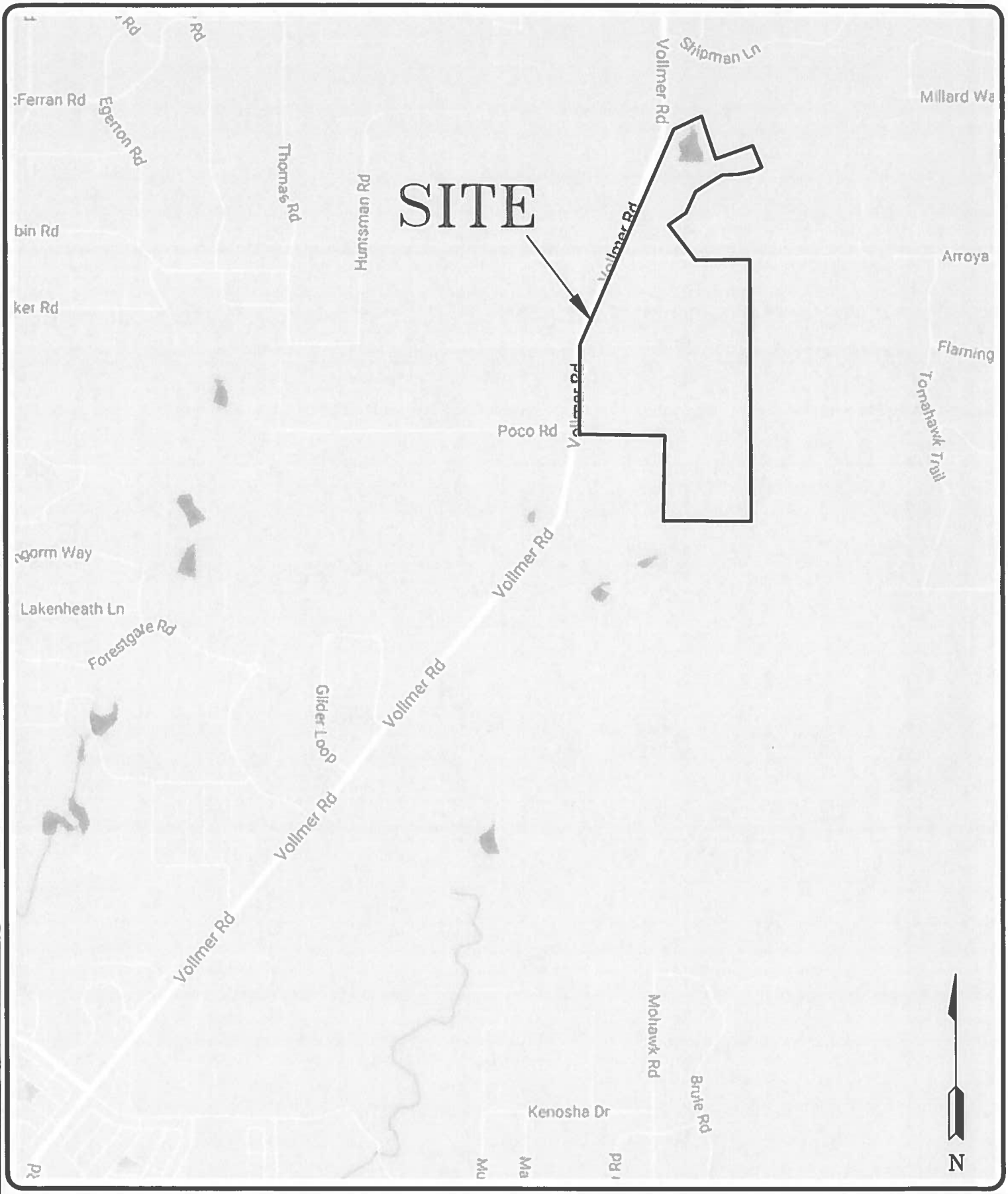
The groundwater may preclude basements on these lots. When the preliminary plan is submitted lease identify lots as confirmed.

TABLE 2

Summary of Depth to Bedrock, Groundwater

Test Boring No.	Depth to Bedrock (ft)	Depth to Groundwater (ft)
1	4	Dry
2	17	5, 11
3	1	Dry
4	1	Dry
5	7	Dry
6	5	17.5
7	19	14.5
8	1	Dry
9	4	Dry
10	3	14.5
11	9	Dry
12	7	Dry
13	4	Dry

FIGURES



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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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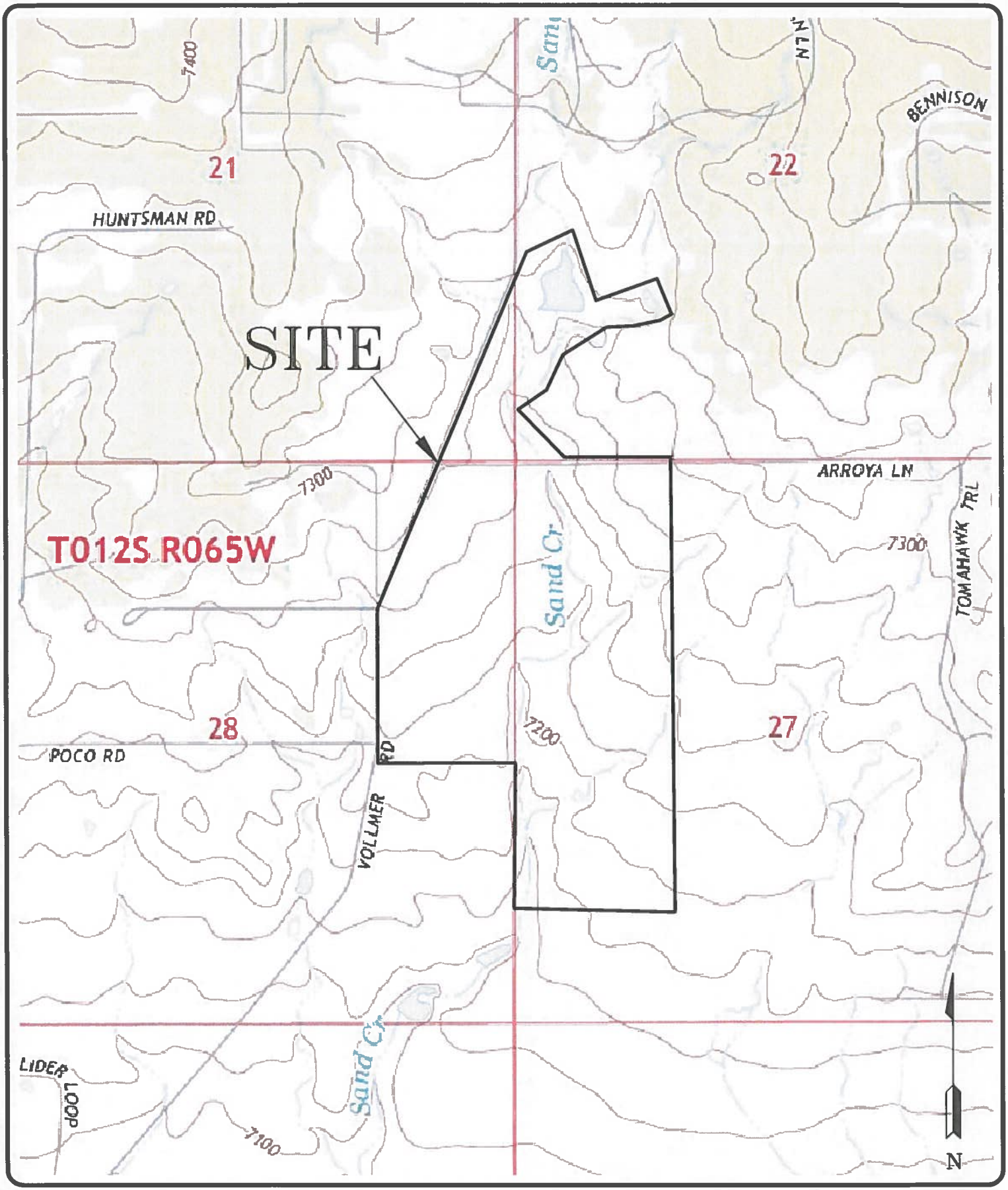
LLL	3/28/17		

JOB NO.: 170020

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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FIG NO.: 2

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

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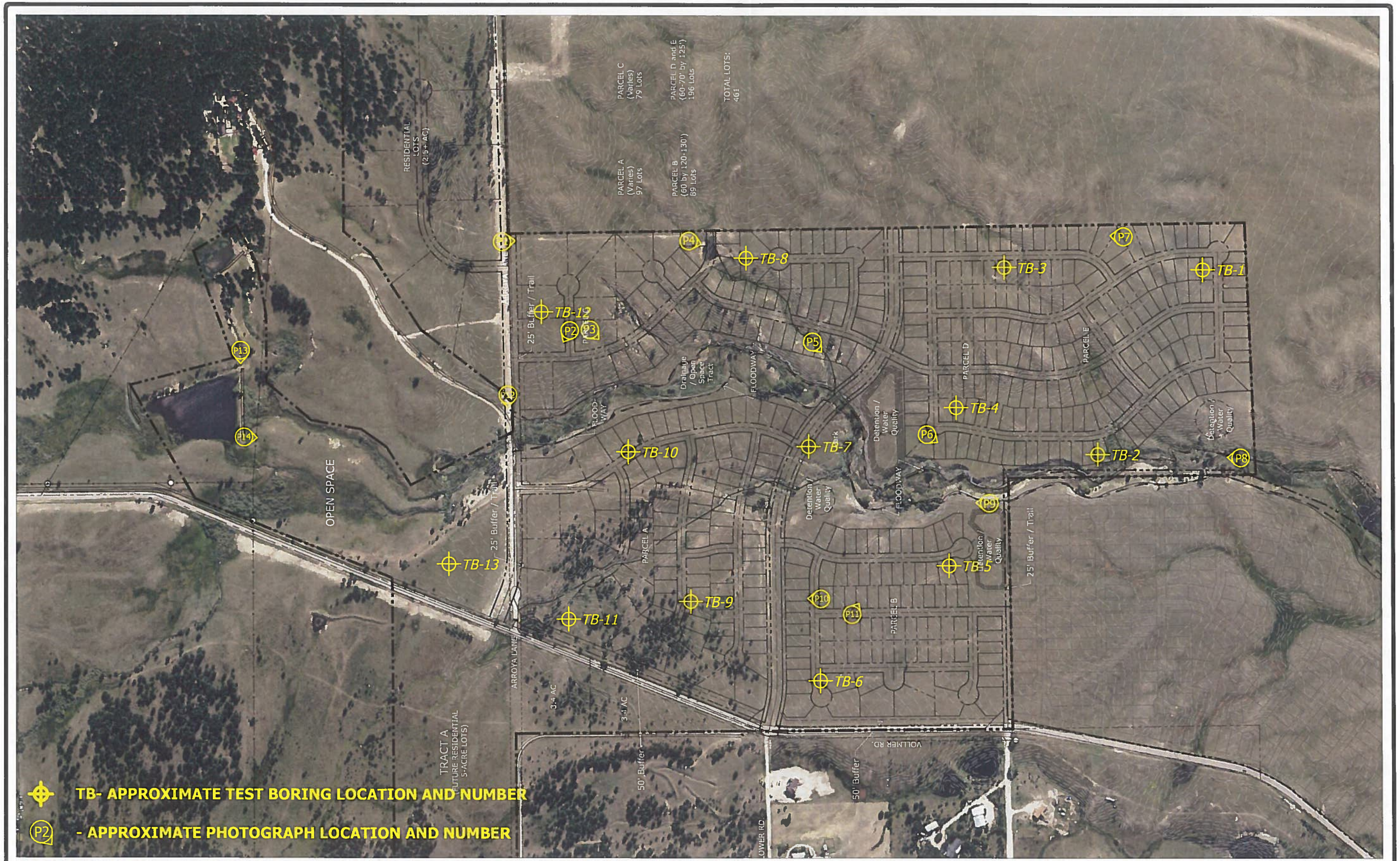
LLL	3/30/17		

JOB NO.: 170020

FIG NO.: 3



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

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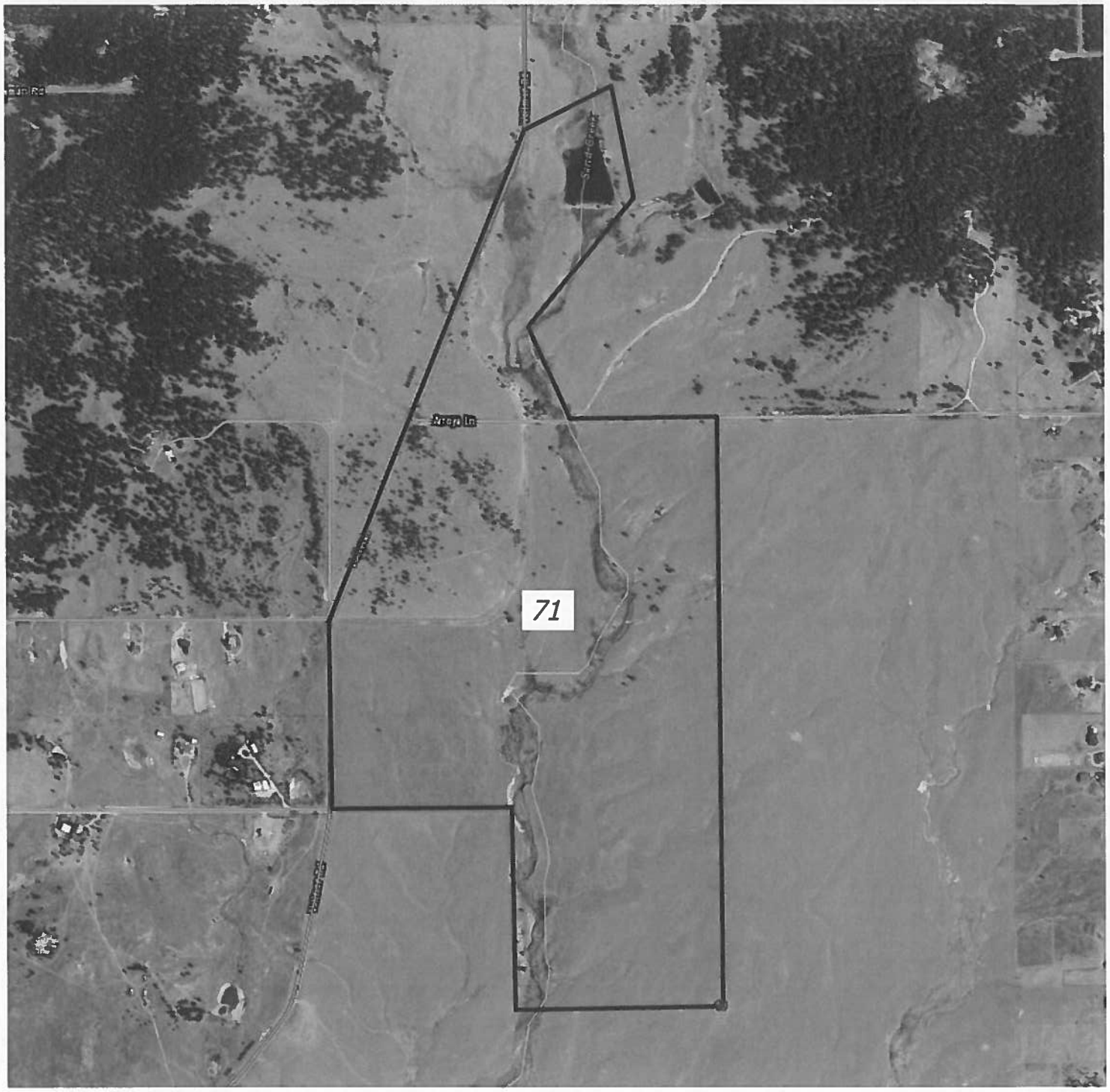
DATE	3/30/17
SCALE	AS SHOWN
JOB NO.	170020
FIGURE No.	4



N

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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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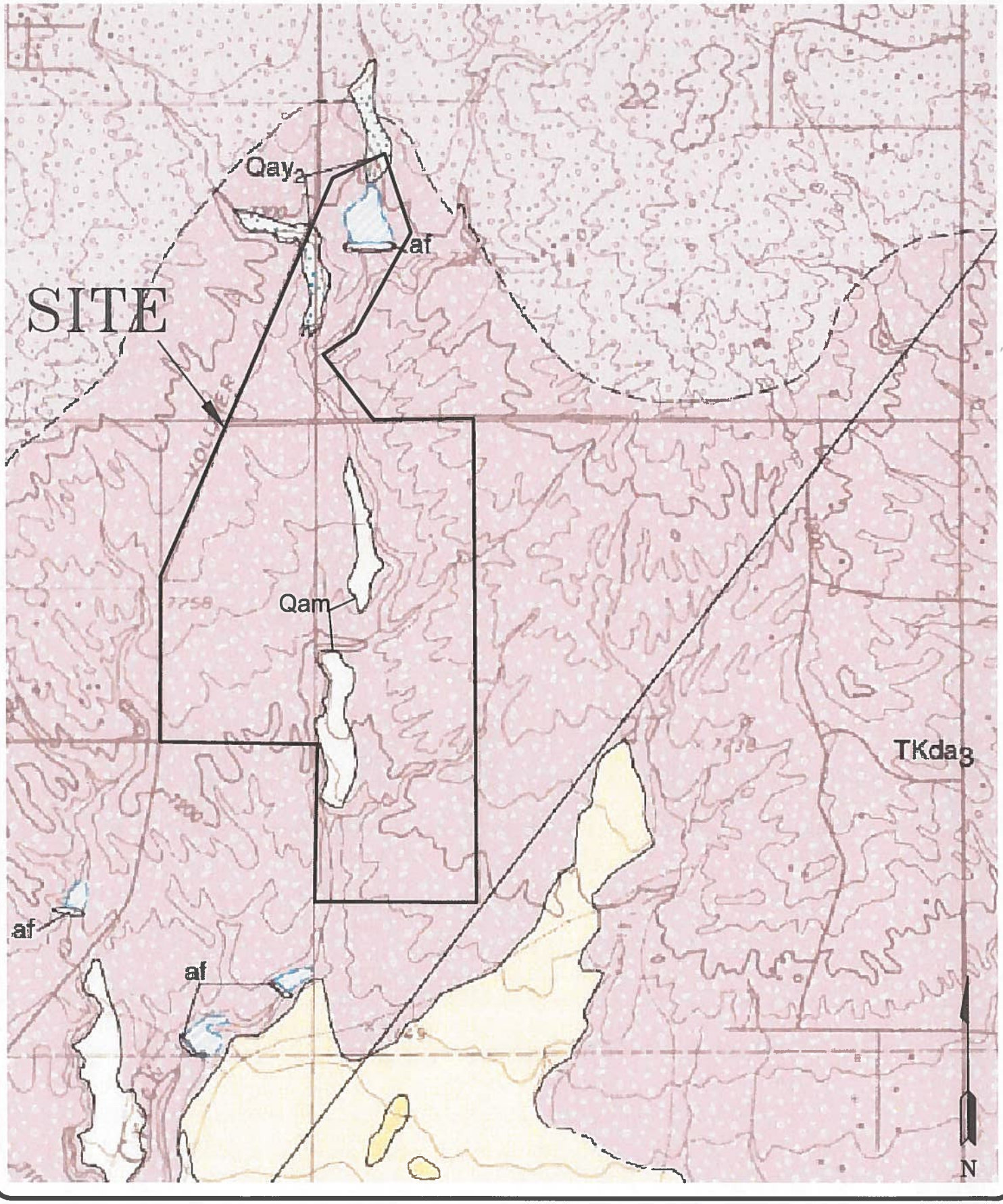
LLL	3/28/17		

JOB NO.: 170020

FIG NO.: 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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LLL	3/28/17		

JOB NO.: 170020

FIG NO.: 6

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, A99, V, and VE. 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 decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 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

ZONE X 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

ZONE X 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.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000 M — 1000-meter Universal Transverse Mercator grid tick values, zone 4
- 600000 FT — 5000-foot grid tick values: Hawaii State Plane coordinate system, zone 3 (FIPSZONE 5103), Transverse Mercator projection
- DX5510 X — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M 2 — Coastal Mile marker

MAP REPOSITORY

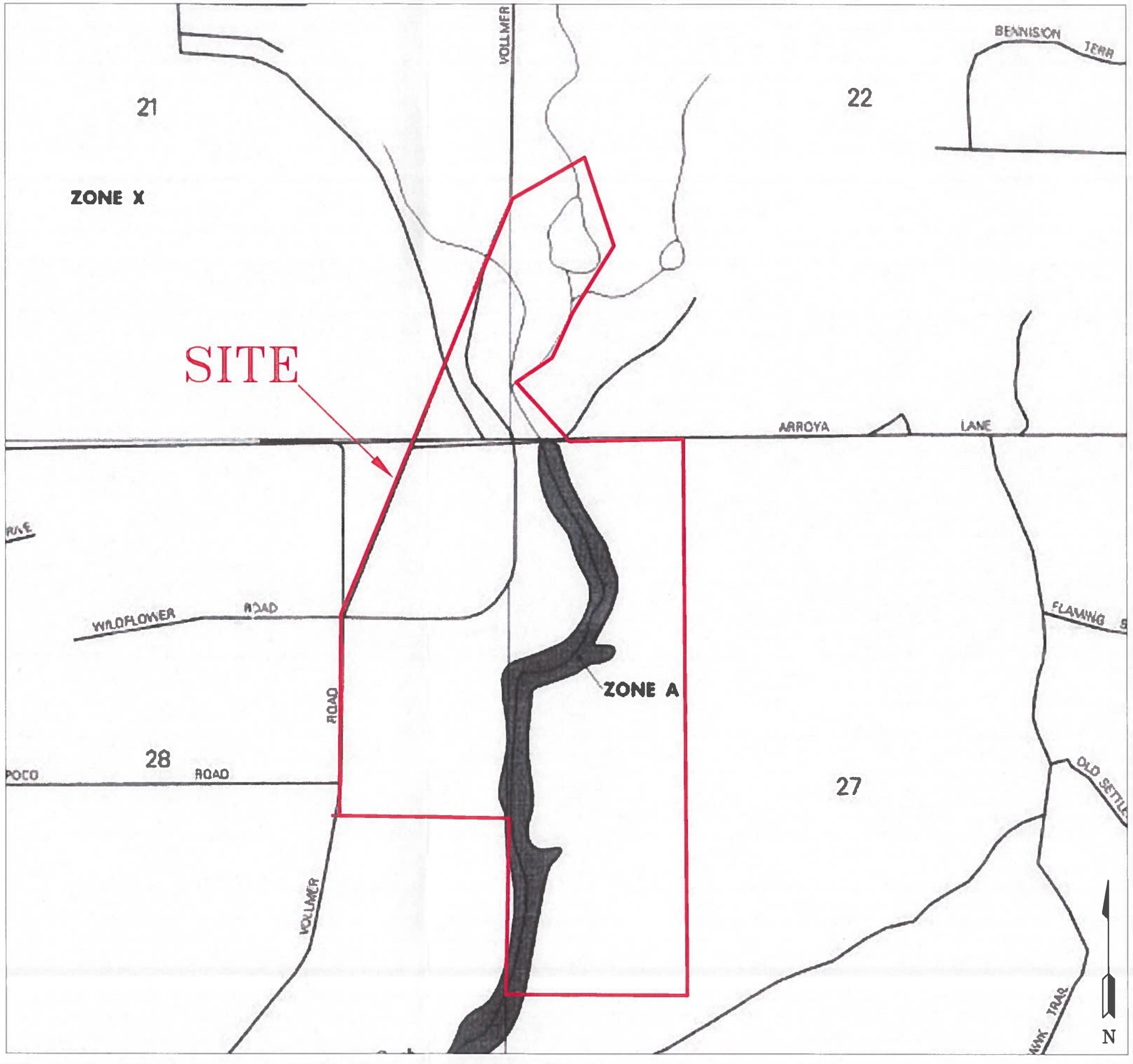
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

November 20, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.



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

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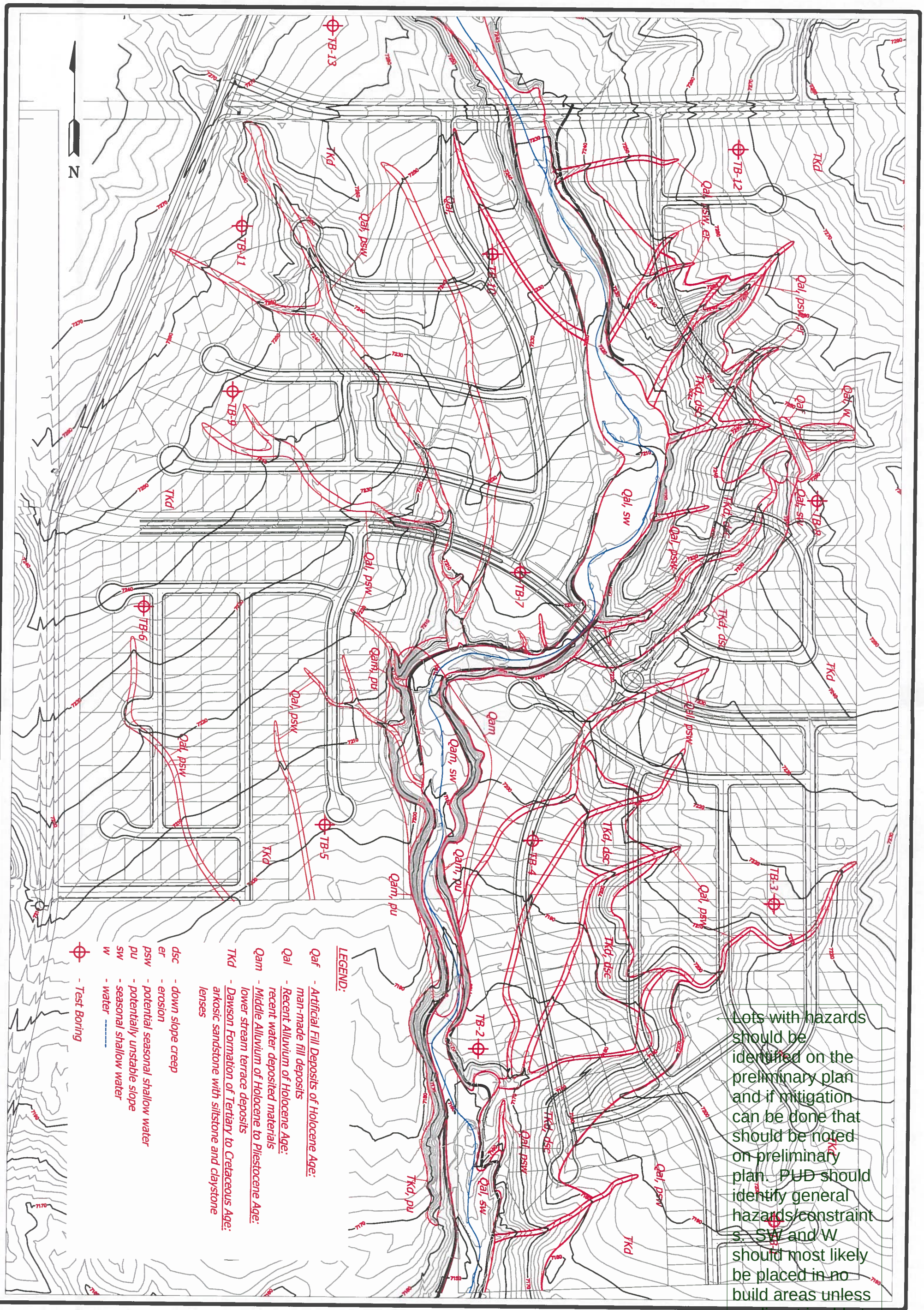
DATE	3/30/17
SCALE	AS SHOWN
JOB NO.	170020
FIGURE No.	8



← Lots with hazards should be identified on the preliminary plan and if mitigation can be done that should be noted on preliminary plan. PUD should identify general hazards/constraints. SW and W should most likely be placed in no build areas unless applicant is able to mitigate near drainage areas and sloped areas (if so note).

DRAWN LLL
CHECKED
DATE 3/30/17
SCALE AS SHOWN
JOB NO. 170020
FIGURE No. 2

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

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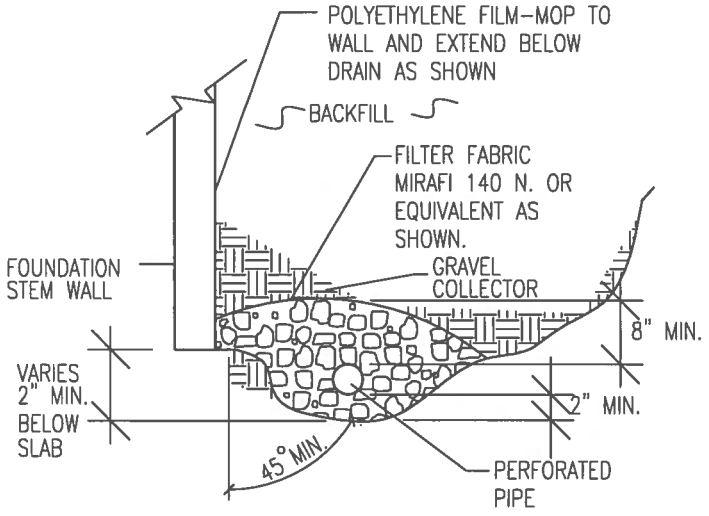

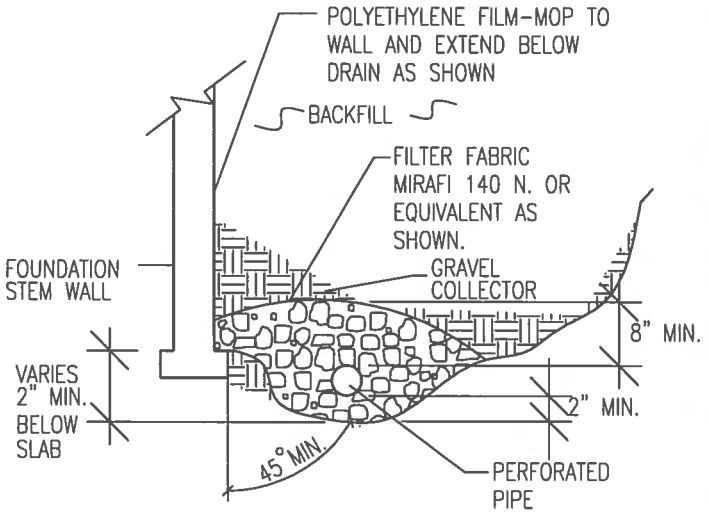

NOTES:

–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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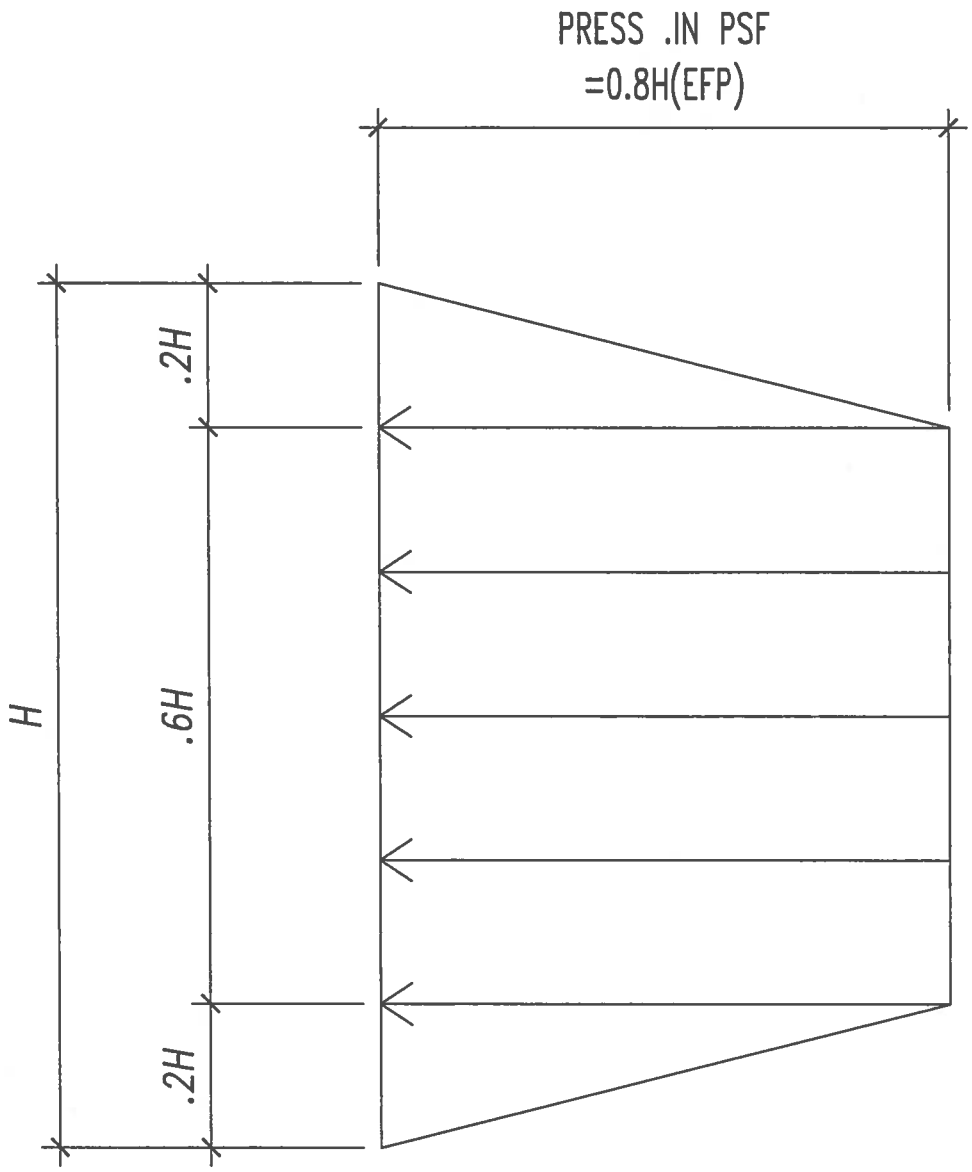
PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
		DS	LLL

JOB NO.: 170020

FIG NO.: 9.



PRESSURE DISTRIBUTION

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LATERAL PRESSURE DISTRIBUTION
AREA WITH CREEP

DRAWN BY:	DATE DRAWN:		
R. MCBRIDE	03/13/13		

JOB NO.: 170020

FIG. NO.: 10

APPENDIX A: Site Photographs

1

Looking south from the northeastern portion of the site.

February 10, 2017

2

Looking northwest from the northeastern portion of the site.

February 10, 2017

Job No. 170020

3

Looking west from the northeastern portion of the site.

February 10, 2017

4

Looking southwest from the eastern portion of the site at the existing pond.

February 10, 2017

Job No. 170020

5

Looking west from the central portion of the site.

February 10, 2017

6

Looking south along Sand Creek from the central portion of the site.

February 10, 2017

Job No. 170020

7

Looking north from the southeast portion of the site.

February 10, 2017

8

Looking north from the southern portion of the site along Sand Creek.

February 10, 2017

Job No. 170020

9

Looking north from central portion of the site.

February 10, 2017

10

Looking north from the western portion of the site.

February 10, 2017

Job No. 170020

11

Looking southeast from the western portion of the site

February 10, 2017

12

Looking along Arroya Lane in the northern portion of the site.

February 10, 2017

Job No. 170020

13

Looking west along the crest of the dam in the northern portion of the site.

March 9, 2017

14

Looking south from the dam in the northern portion of site.

March 9, 2017

Job No. 170020

APPENDIX B: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 1/12/2017
Job # 170020

REMARKS

STAKE 3500

DRY TO 18', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					1	SAND, SILTY, BROWN
			15	19.3	2	CLAY, SANDY, BROWN, STIFF, MOIST
5			50/10"	11.5	3	SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
10			50/6"	7.1	3	
15			50/6"	8.2	3	
20			50/4"	17.2	3	SANDSTONE, CLAYEY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 2
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS

STAKE 3501

WATER @ 5', 1/12/17
WATER @ 11', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			10	3.2	1	SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST
			*	19.4	2	CLAY, SANDY, BROWN
5			14	6.9	1	SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO LOOSE, MOIST TO WET
10			15	13.9	1	
15			3	19.4	1	
20			50/8"	11.9	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: B-1

TEST BORING NO. 3
DATE DRILLED 1/12/2017
Job # 170020

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3502 DRY TO 19', 1/23/17						
SAND, SILTY, TAN						1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST				50/11"	6.1	3
	5			50/7"	9.4	3
	10			50/6"	7.4	3
	15			50/4"	8.3	3
	20			50/4"	11.2	3

TEST BORING NO. 4
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3503 DRY TO 19', 1/23/17						
SAND, SILTY, TAN						1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST				43	7.9	3
	5			50	8.5	3
	10			50/8"	9.6	3
CLAYSTONE, SANDY, BROWN, HARD, MOIST	15			50/6"	12.9	4
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST	20			50/4"	10.4	3

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: B-2

TEST BORING NO. 5
DATE DRILLED 1/12/2017
Job # 170020

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3504 DRY TO 19.5', 1/23/17						
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				17	3.9	1
	5			15	7.8	1
CLAYSTONE, SANDY, GREEN BROWN, HARD, MOIST						
	10			50/11"	15.7	4
	15			50/8"	12.0	4
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST	20			50/6"	10.0	3

TEST BORING NO. 6
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3505 WATER @ 17.5', 1/23/17						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				16	5.8	1
	5			15	18.5	1
SAND, VERY CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST SANDSTONE, CLAYEY TO SILTY, FINE TO COARSE GRAINED, BUFF, VERY DENSE, MOIST	10			50/6"	7.7	3
	15			50/6"	11.6	3
	20			50/6"	9.3	3

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: B-3

TEST BORING NO. 7
DATE DRILLED 1/12/2017
Job # 170020

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3506 WATER @ 14.5', 1/23/17						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, MOIST				5	4.5	1
	5			5	6.0	1
	10			9	5.9	1
CLAY, SANDY, DARK BROWN, VERY SOFT, VERY MOIST	15			2	22.9	2
SANDSTONE, SILTY, FINE GRAINED, DARK BROWN, VERY DENSE, MOIST	20			50/9"	11.8	3

TEST BORING NO. 8
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
STAKE 3507 DRY TO 18', 1/23/17						
SAND, SILTY, TAN						1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST				50/10"	6.2	3
	5			50/9"	6.1	3
	10			50/6"	6.5	3
	15			50/7"	11.8	3
	20			50/7"	6.0	3

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: B-4

TEST BORING NO. 9
DATE DRILLED 1/12/2017
Job # 170020

REMARKS

STAKE 3508

DRY TO 20',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			32	8.8	1
5			50 / 11"	4.9	3
10			50	9.6	3
15			50 / 8"	7.6	3
20			50 / 6"	10.5	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 10
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS

STAKE 3509

WATER @ 14.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			44	8.4	1
5			50 / 10"	9.4	3
10			50	10.5	3
15			50 / 11"	11.8	3
20			50 / 9"	12.0	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: B-5

TEST BORING NO. 11
DATE DRILLED 1/12/2017
Job # 170020

REMARKS

STAKE 3510

DRY TO 19.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			11	3.4	1
5			24	11.8	1
10			50 / 8"	11.4	3
15			50 / 6"	8.2	3
20			50 / 6"	8.6	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 12
DATE DRILLED 1/12/2017
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS

STAKE 3511

DRY TO 19',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			21	3.0	1
5			19	7.8	1
10			50 / 10"	14.4	3
15			50 / 6"	8.9	3
20			50 / 6"	9.1	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

SANDSTONE, CLAYEY FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: B-6

TEST BORING NO. 13
DATE DRILLED 1/12/2017
Job # 170020

TEST BORING NO.
DATE DRILLED
CLIENT ARROYA INVESTMENTS
LOCATION THE RETREAT AT TIMBER RIDGE

REMARKS

STAKE 3512

DRY TO 18.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Description
			18	11.9	1	SAND, SILTY WITH SLIGHTLY CLAYEY LENSES, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
5			50/11"	7.8	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
10			50/6"	10.8	3	
15			50/5"	8.4	3	
20			50/6"	9.4	3	

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5					
10					
15					
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
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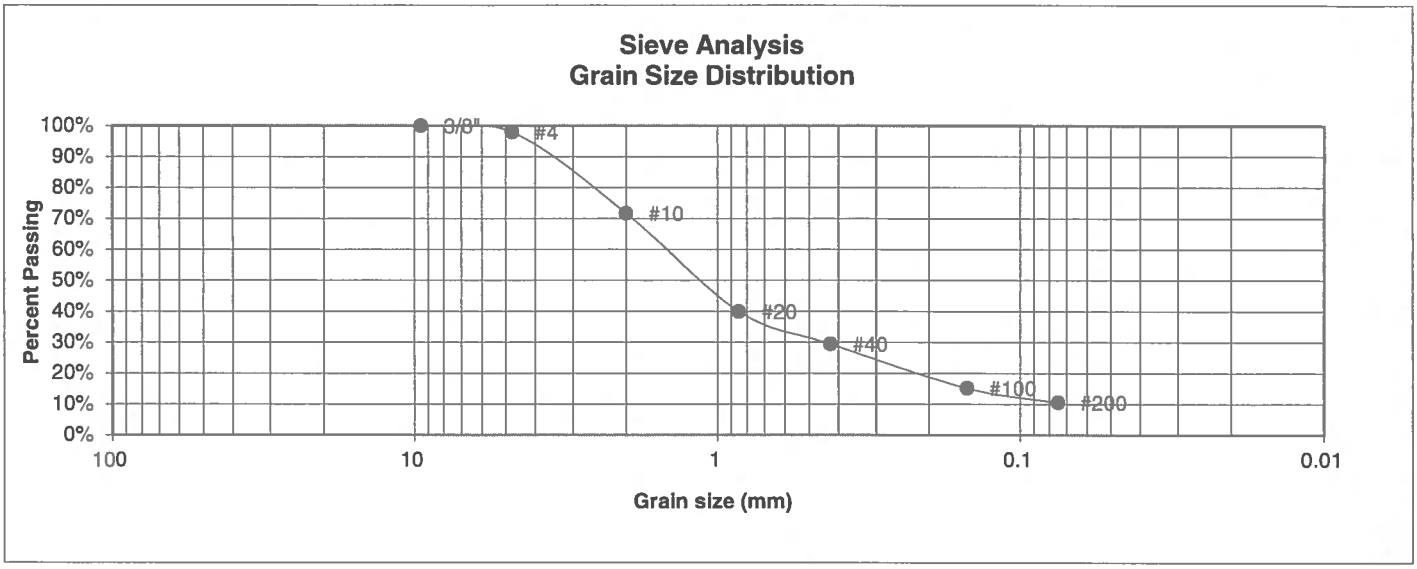
JOB NO.: 170020

FIG NO.: B-7

APPENDIX C: Laboratory Test Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	5	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	71.7%
20	40.0%
40	29.4%
100	15.2%
200	10.5%

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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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

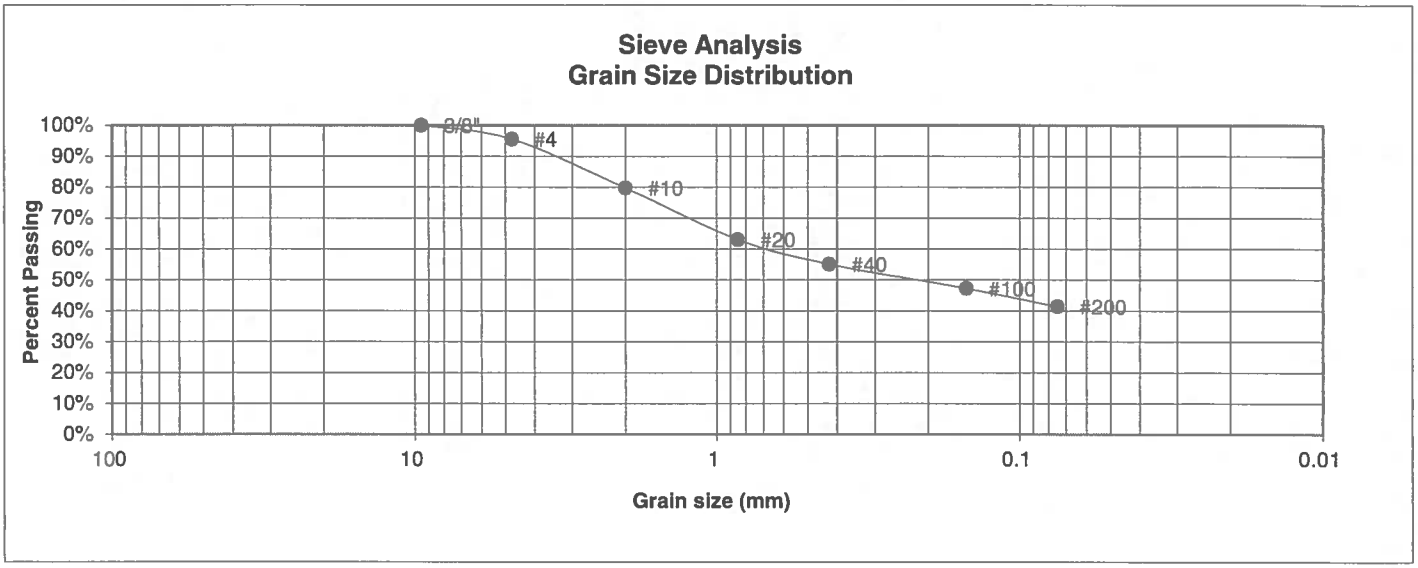
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-1

UNIFIED CLASSIFICATION	SC	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	6	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.6%
10	79.8%
20	63.1%
40	55.1%
100	47.2%
200	41.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

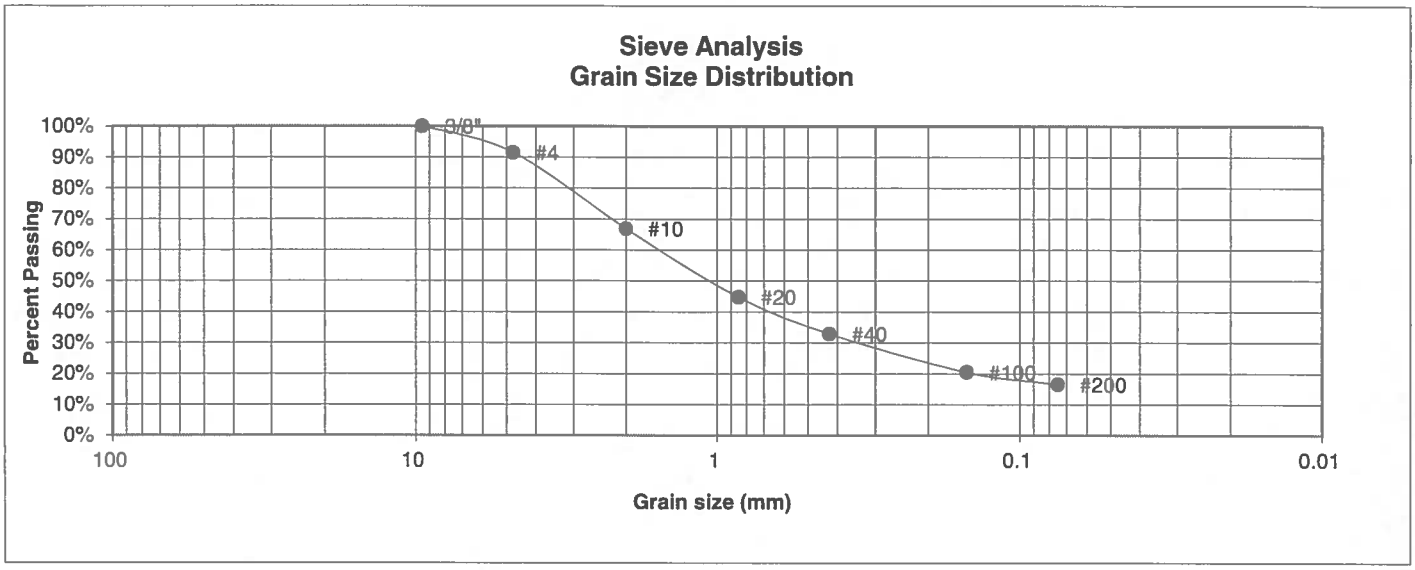
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-2

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	11	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.5%
10	66.9%
20	44.8%
40	32.9%
100	20.5%
200	16.5%

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

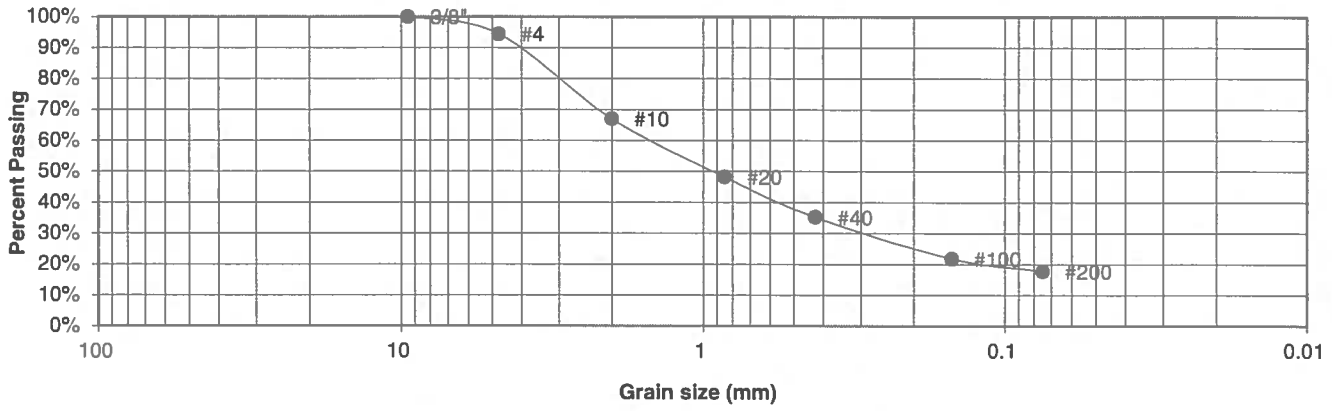
DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 170020

FIG NO.: C-3

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	13	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.4%
10	67.0%
20	48.2%
40	35.2%
100	21.8%
200	17.8%

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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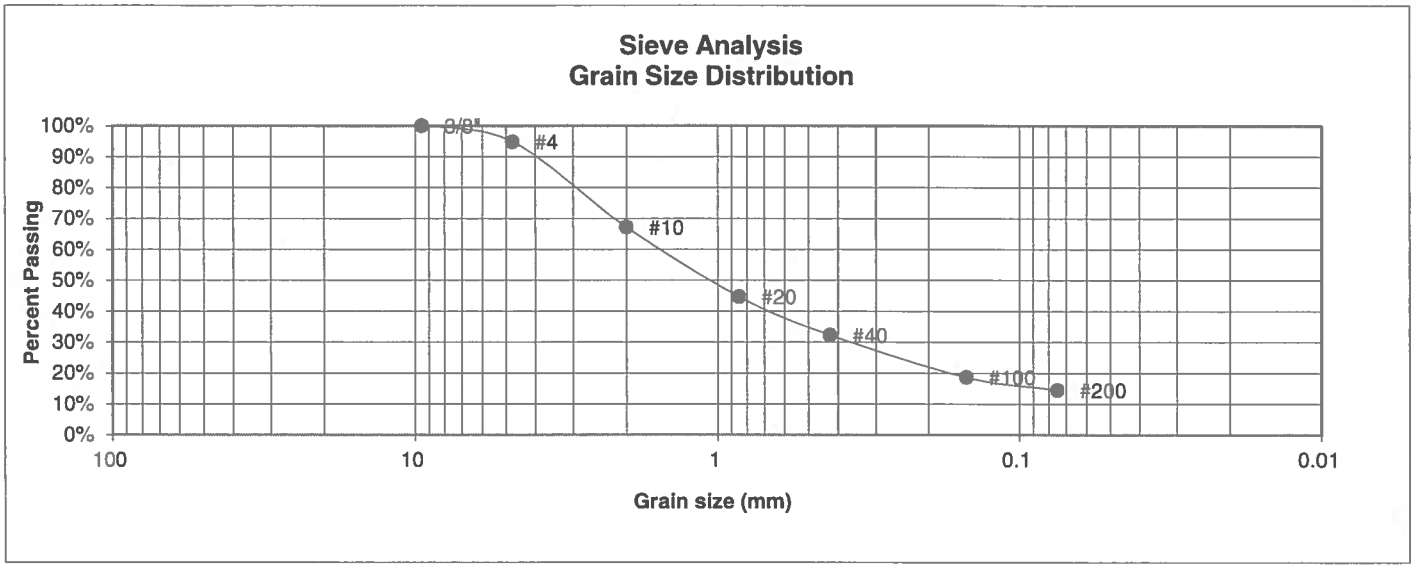
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-4

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	9	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.8%
10	67.2%
20	44.7%
40	32.3%
100	18.6%
200	14.6%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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:	DATE:
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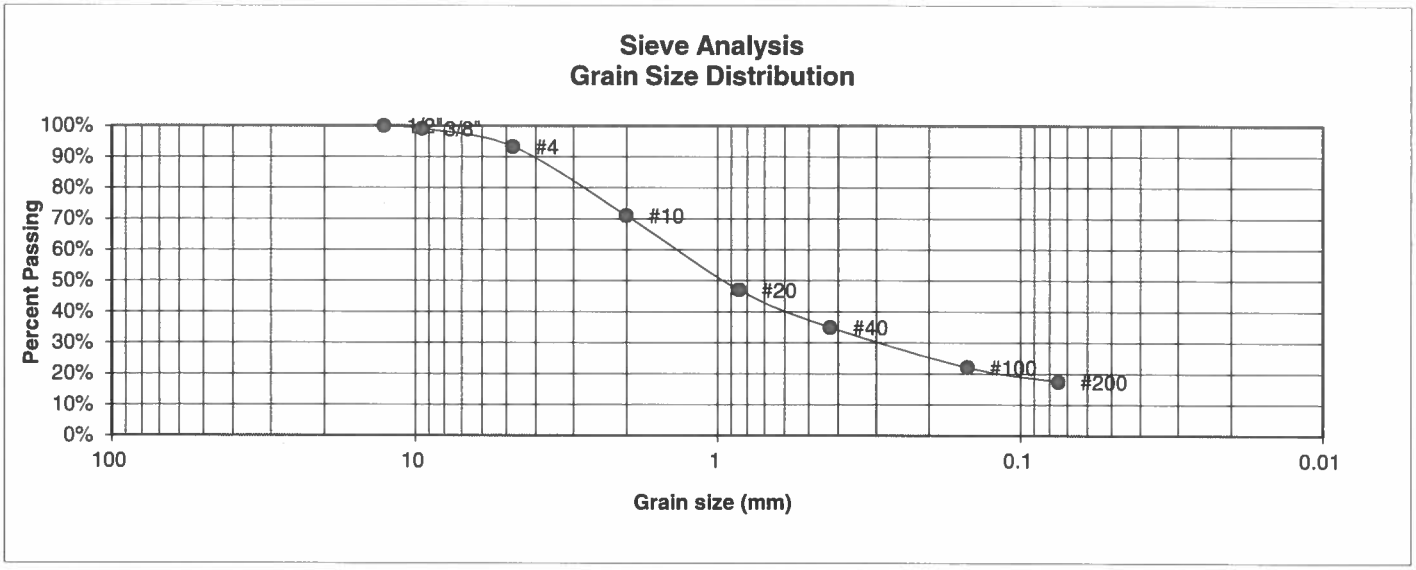
JOB NO.: 170020

FIG NO.: C-5

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	10	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.1%
4	93.3%
10	71.0%
20	47.0%
40	35.0%
100	22.0%
200	17.4%

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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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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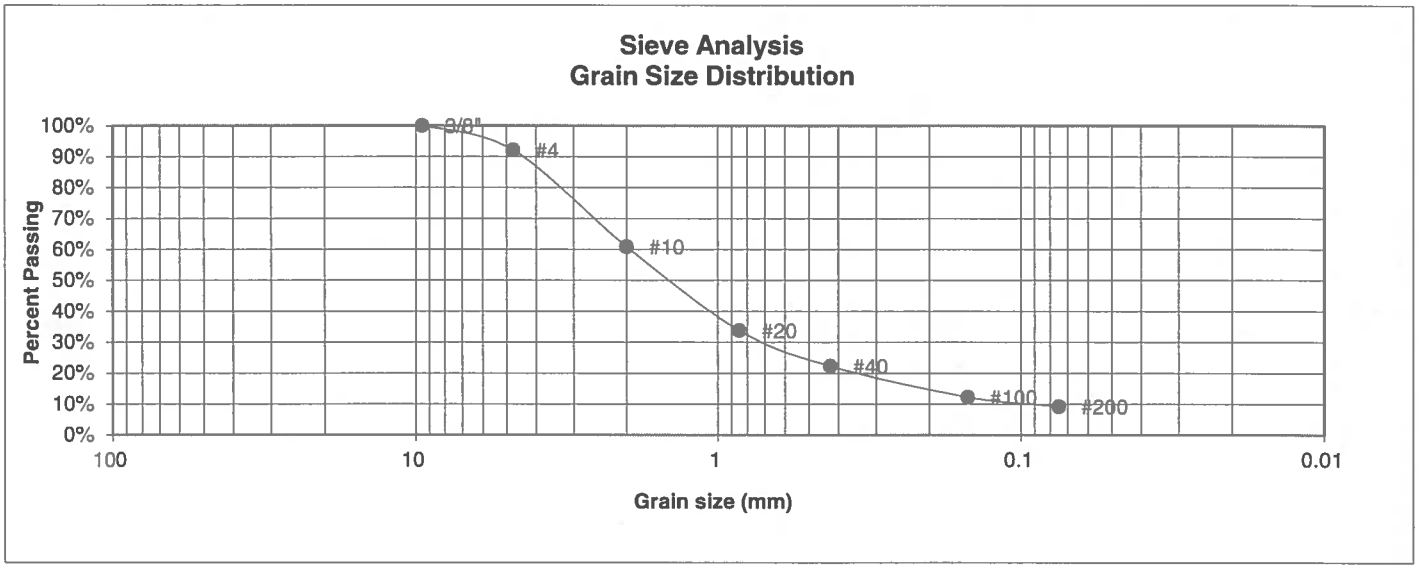
JOB NO.: 170020

FIG NO.: C-6

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	2	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.1%
10	60.9%
20	33.9%
40	22.3%
100	12.3%
200	9.2%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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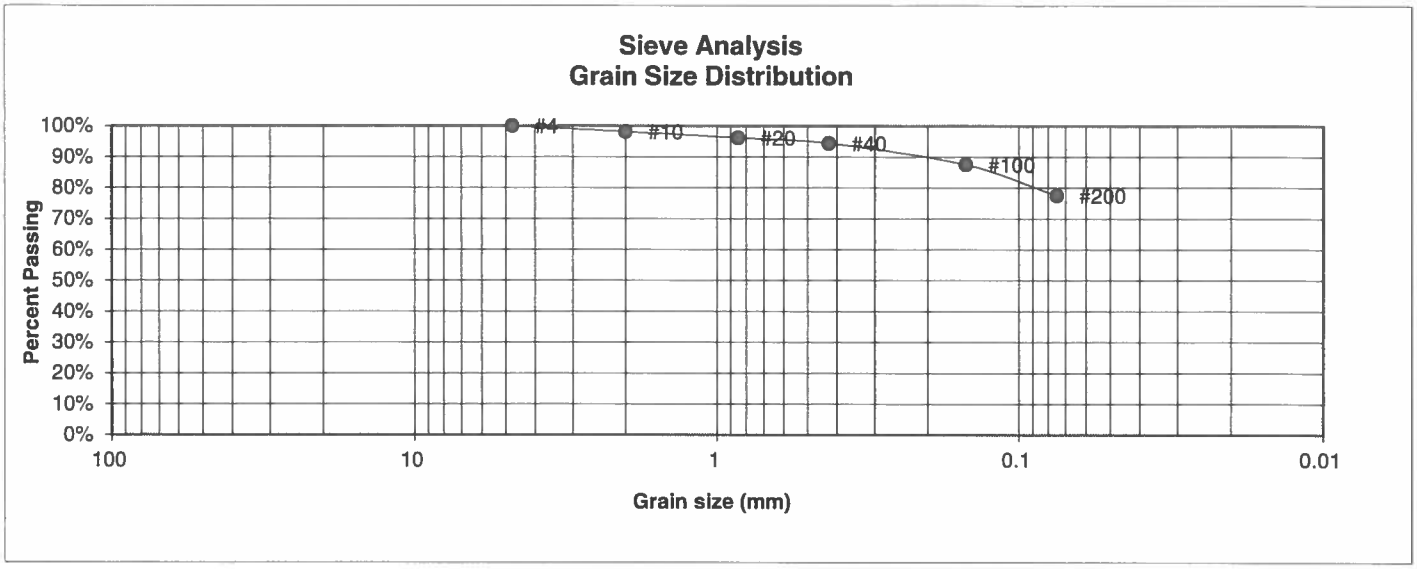
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-7

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	2	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	1	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.2%
20	96.2%
40	94.4%
100	87.5%
200	77.5%

Atterberg Limits

Plastic Limit	
Liquid Limit	
Plastic Index	

Swell

Moisture at start	10.9%
Moisture at finish	20.4%
Moisture increase	9.5%
Initial dry density (pcf)	131
Swell (psf)	1550

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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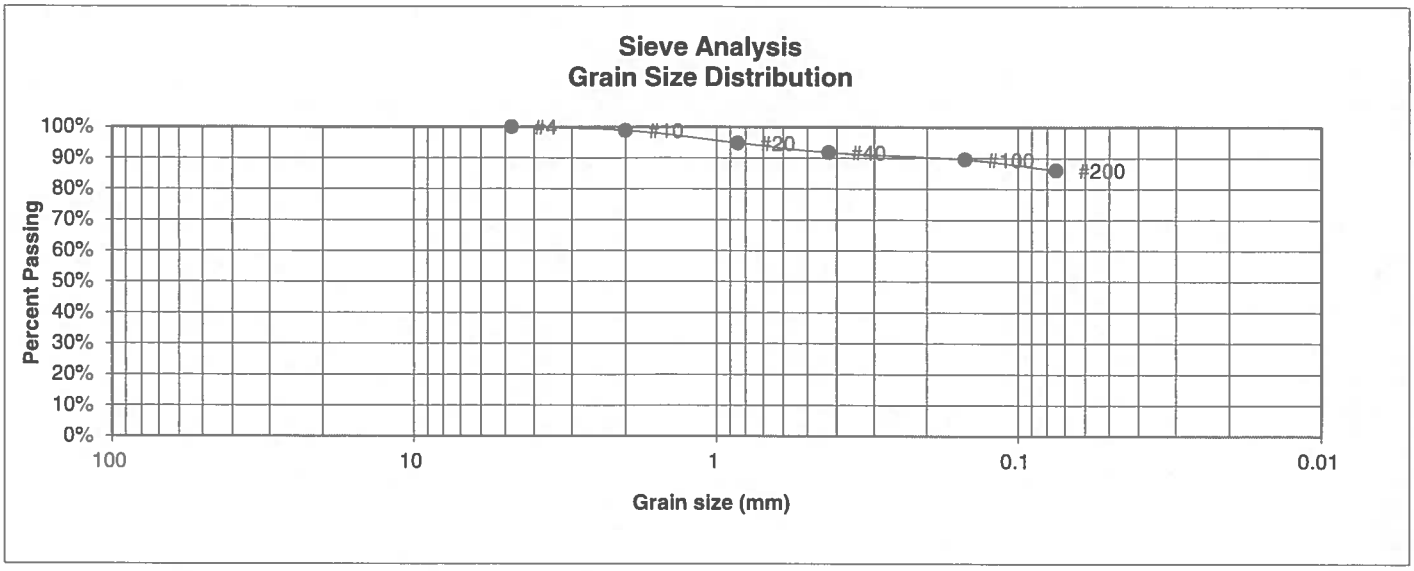
JOB NO.: 170020

FIG NO.: C-8

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	2	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	2	JOB NO.	170020
DEPTH (FT)	4	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.9%
20	94.9%
40	91.8%
100	89.6%
200	86.1%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	15.9%
Moisture at finish	24.9%
Moisture increase	9.0%
Initial dry density (pcf)	99
Swell (psf)	1520

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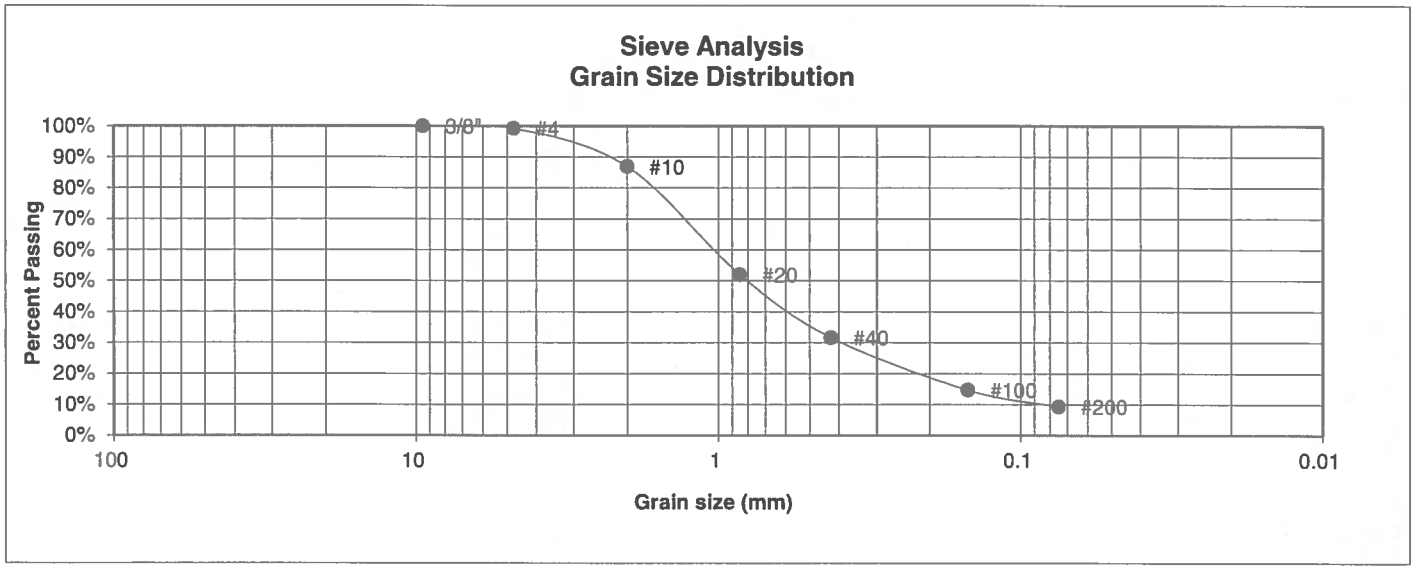
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-9

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	1	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	87.0%
20	52.0%
40	31.6%
100	14.7%
200	9.3%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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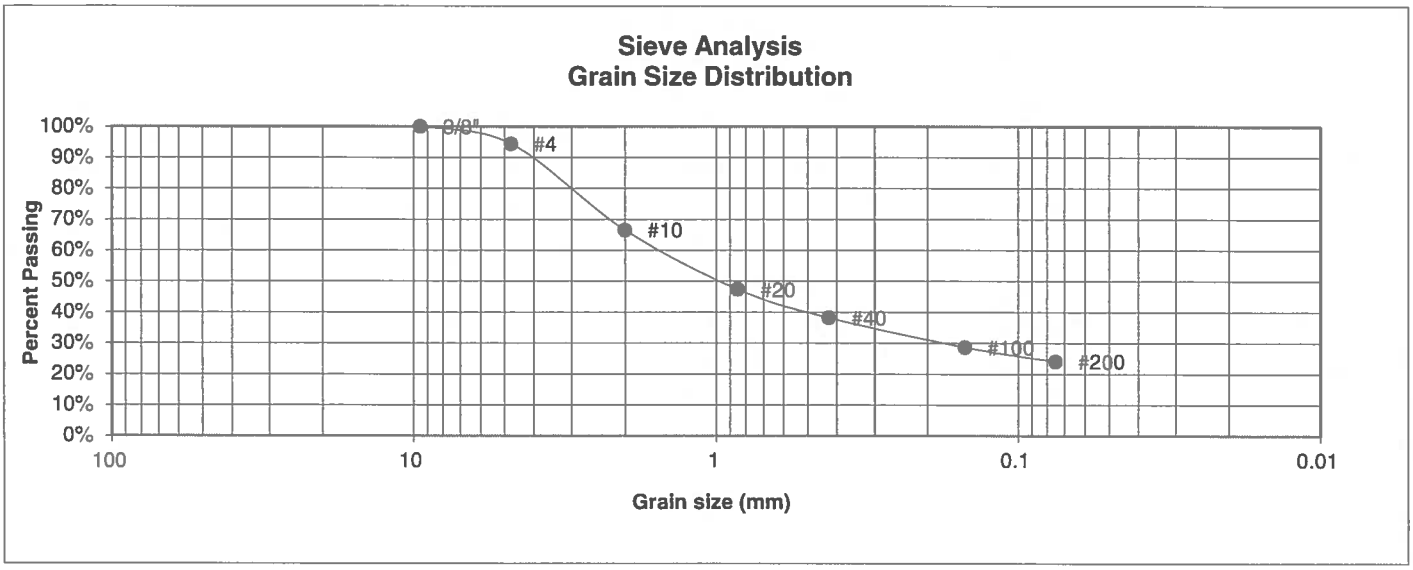
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-10

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	3	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.4%
10	66.5%
20	47.4%
40	38.2%
100	28.7%
200	24.0%

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

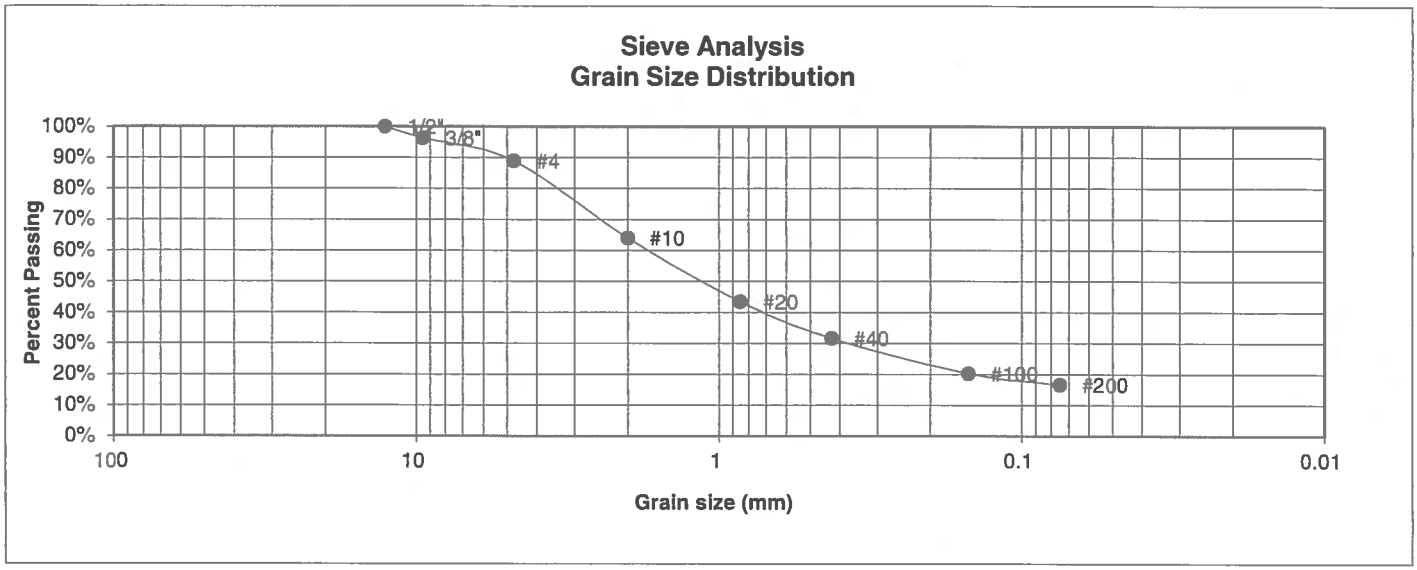
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-11

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	7	JOB NO.	170020
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.3%
4	88.9%
10	64.0%
20	43.5%
40	31.6%
100	20.3%
200	16.6%

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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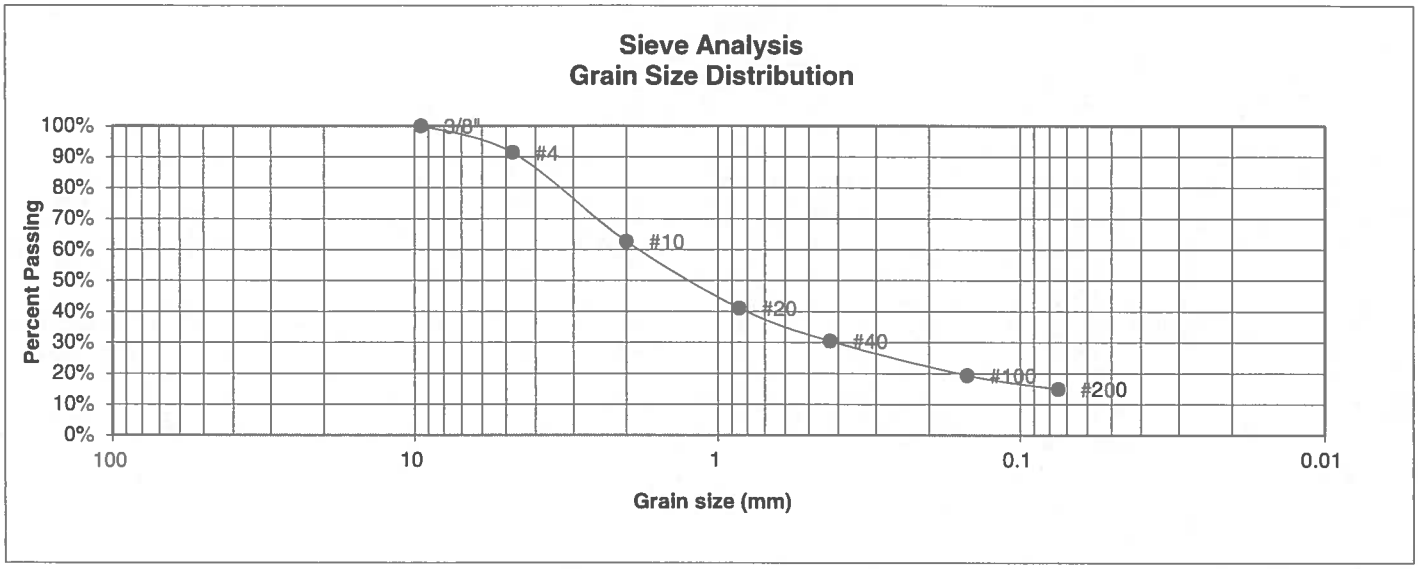
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 170020

FIG NO.: C-12

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	8	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.3%
10	62.6%
20	41.1%
40	30.5%
100	19.4%
200	14.9%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

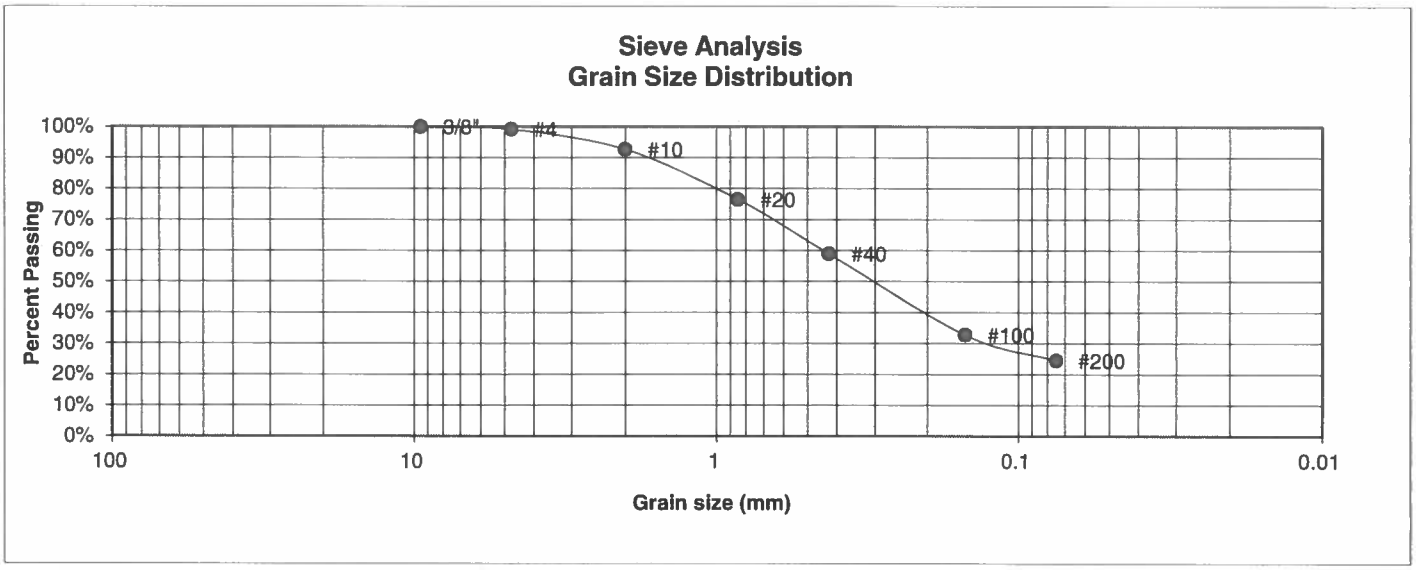
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-13

UNIFIED CLASSIFICATION	SC	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	12	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.1%
10	92.7%
20	76.5%
40	58.9%
100	32.7%
200	24.4%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
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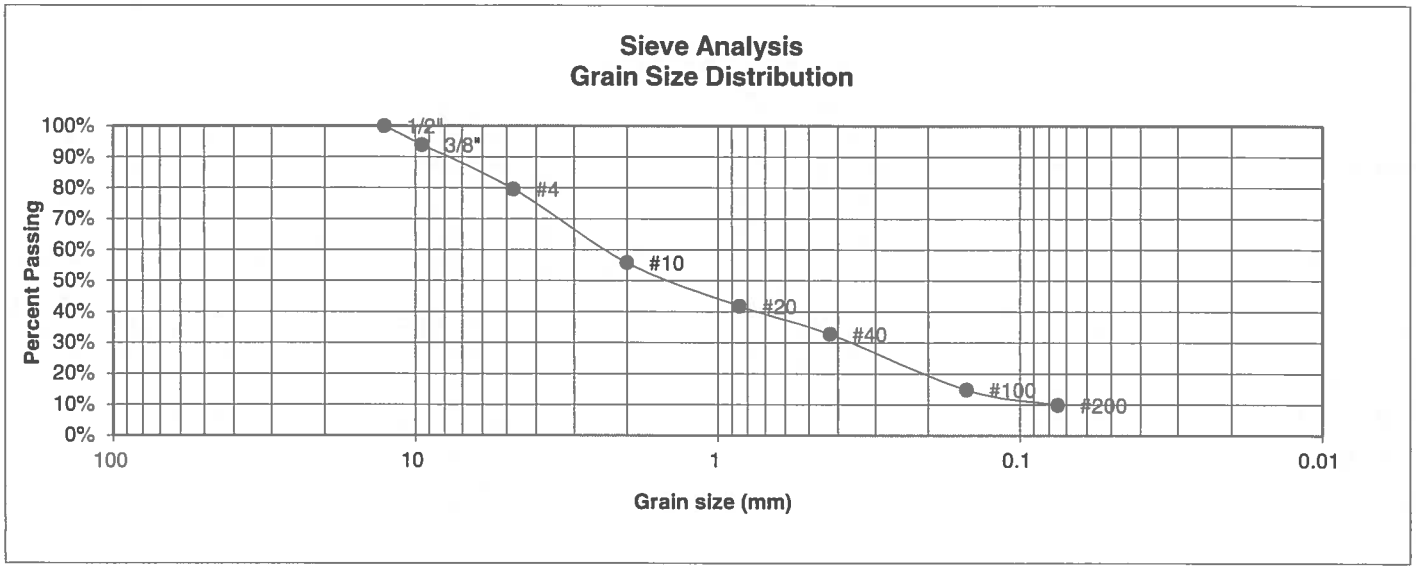
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/29/17

JOB NO.: 170020

FIG NO.: L-14

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	9	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.9%
4	79.6%
10	55.8%
20	41.8%
40	32.8%
100	14.8%
200	9.9%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

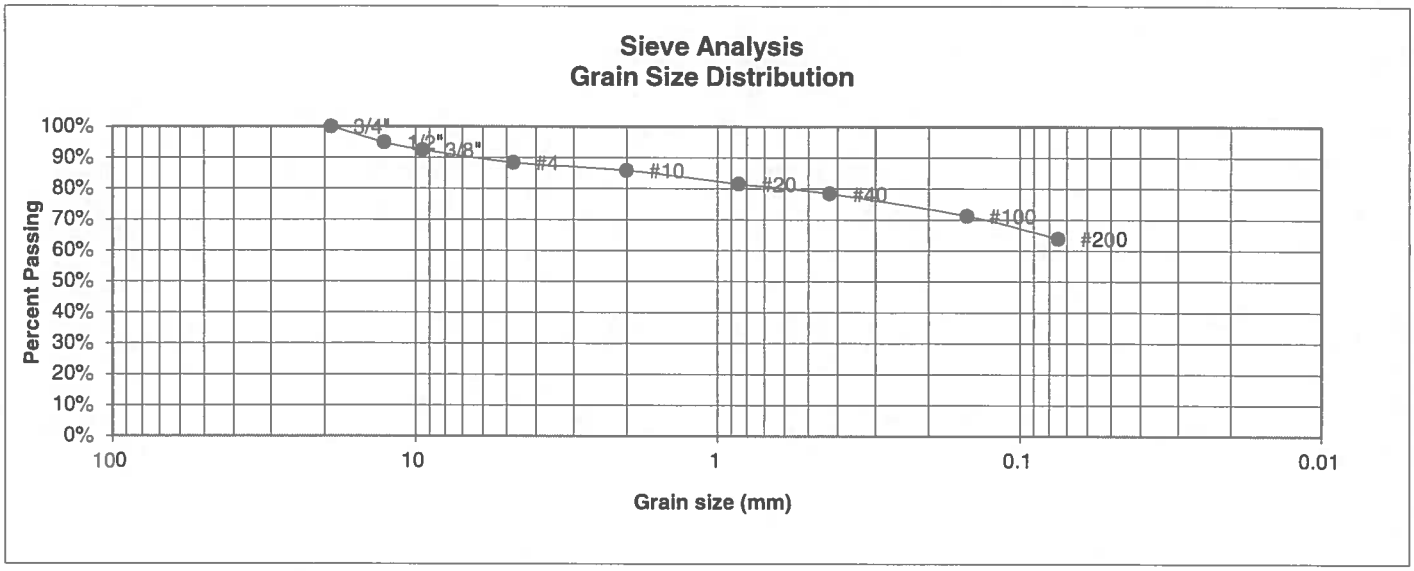
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: 6-15

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	4	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	100.0%
1/2"	94.9%
3/8"	92.5%
4	88.4%
10	85.9%
20	81.5%
40	78.4%
100	71.3%
200	63.9%

Atterberg Limits

Plastic Limit	24
Liquid Limit	44
Plastic Index	20

Swell

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

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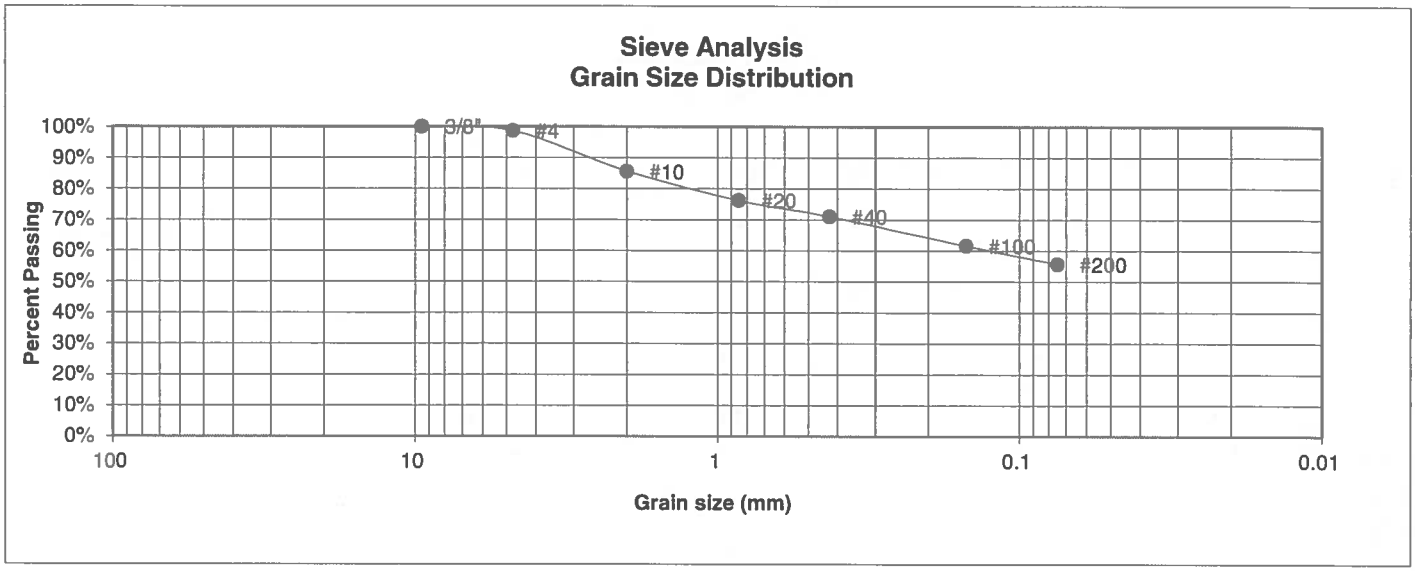
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-16

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	5	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.6%
10	85.6%
20	76.2%
40	71.0%
100	61.6%
200	55.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
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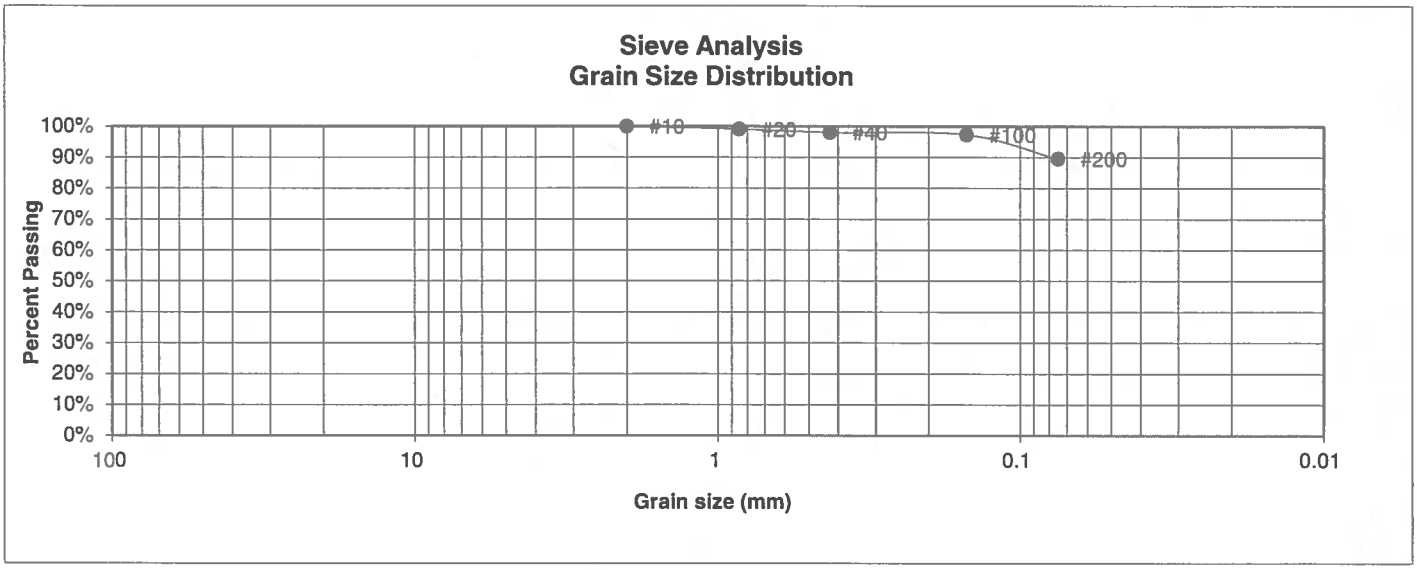
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-17

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	7	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.1%
40	98.1%
100	97.3%
200	89.5%

Atterberg Limits	
Plastic Limit	26
Liquid Limit	47
Plastic Index	21

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:	DATE:
		LLL	3/28/17

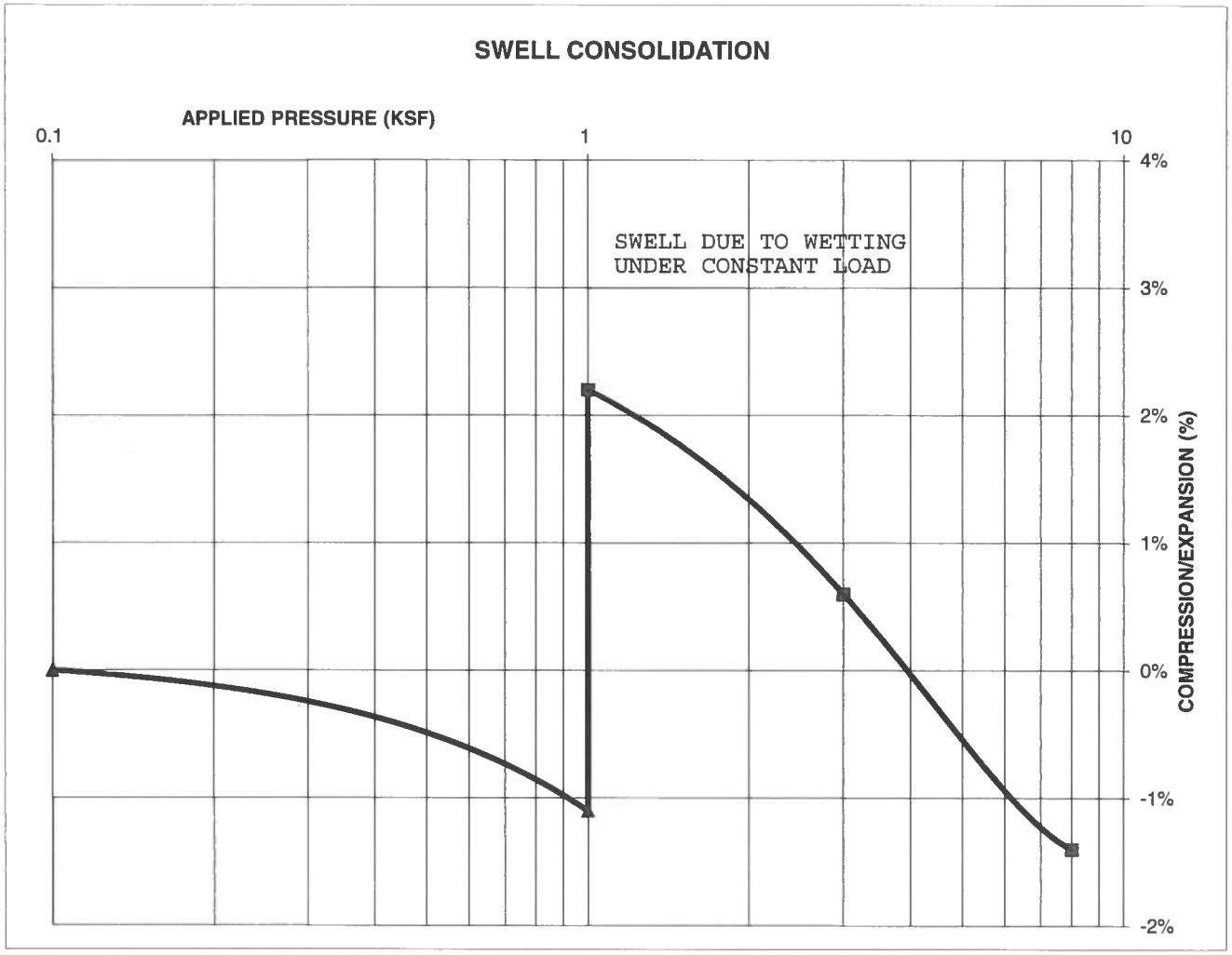
JOB NO.: 170020

FIG NO.: C-18

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			109
NATURAL MOISTURE CONTENT			19.9%
SWELL/CONSOLIDATION (%)			3.3%

JOB NO. 170020
CLIENT ARROYA INVESTMENTS
PROJECT THE RETREAT AT TIMBER RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

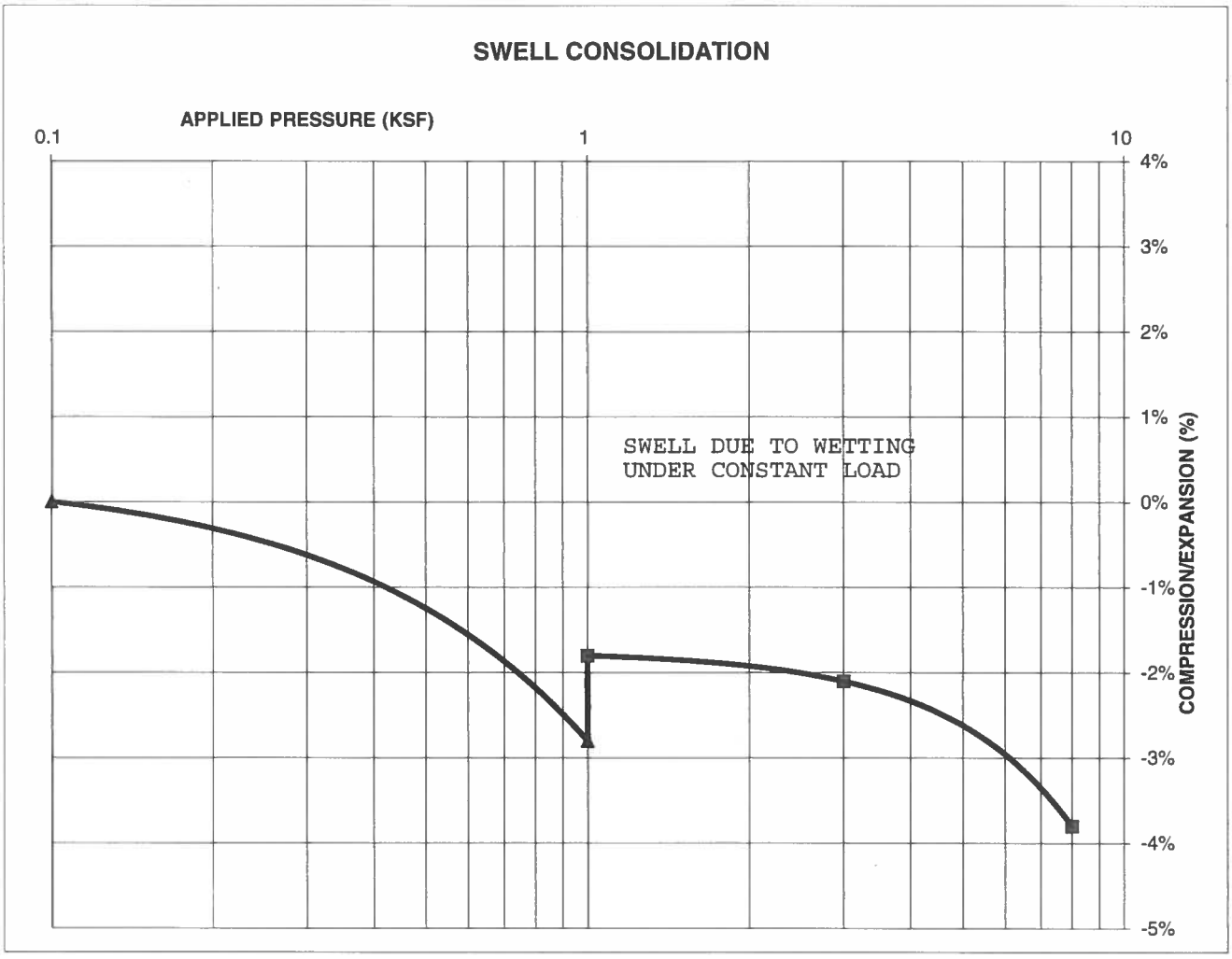
JOB NO.: 170020

FIG NO.: C-19

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			17.8%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 170020
CLIENT ARROYA INVESTMENTS
PROJECT THE RETREAT AT TIMBER RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: C-20

CLIENT	ARROYA INVESTMENTS	JOB NO.	170020
PROJECT	THE RETREAT AT TIMBER RIDGE	DATE	1/20/2017
LOCATION	THE RETREAT AT TIMBER RIDGE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	10	3	SM-SW	<0.01
TB-2	4	2	CL	0.01
TB-2	10	3	SM-SW	<0.01
TB-4	15	4	CL	<0.01
TB-6	5	1	SC	0.01
TB-7	15	4	CL	<0.01
TB-10	5	1	SM	<0.01

QC BLANK PASS

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LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-21

APPENDIX D: Soil Survey Descriptions

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

ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

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

LLL/rm

Encl.

Entech Job No. 170209
AAprojects/2017/170209 countysoil/geo/wastewater

Reviewed by:

Joseph C. Goode, P.E.
President

COLORADO LICENSED
JOSEPH COLLIN GOODE JR
23725
4.12.17
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

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 6th 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 SW¼ of Section 22 and the NE¼ of Section 28, Township 15 South, Range 65 West of the 6th 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:

Type	Description
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 1^0 x 2^0 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 Procter 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 stie. 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 required 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 or 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.

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7. Federal Emergency Management Agency. March 17, 1997. *Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas.* Map Number 08041CO535F

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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

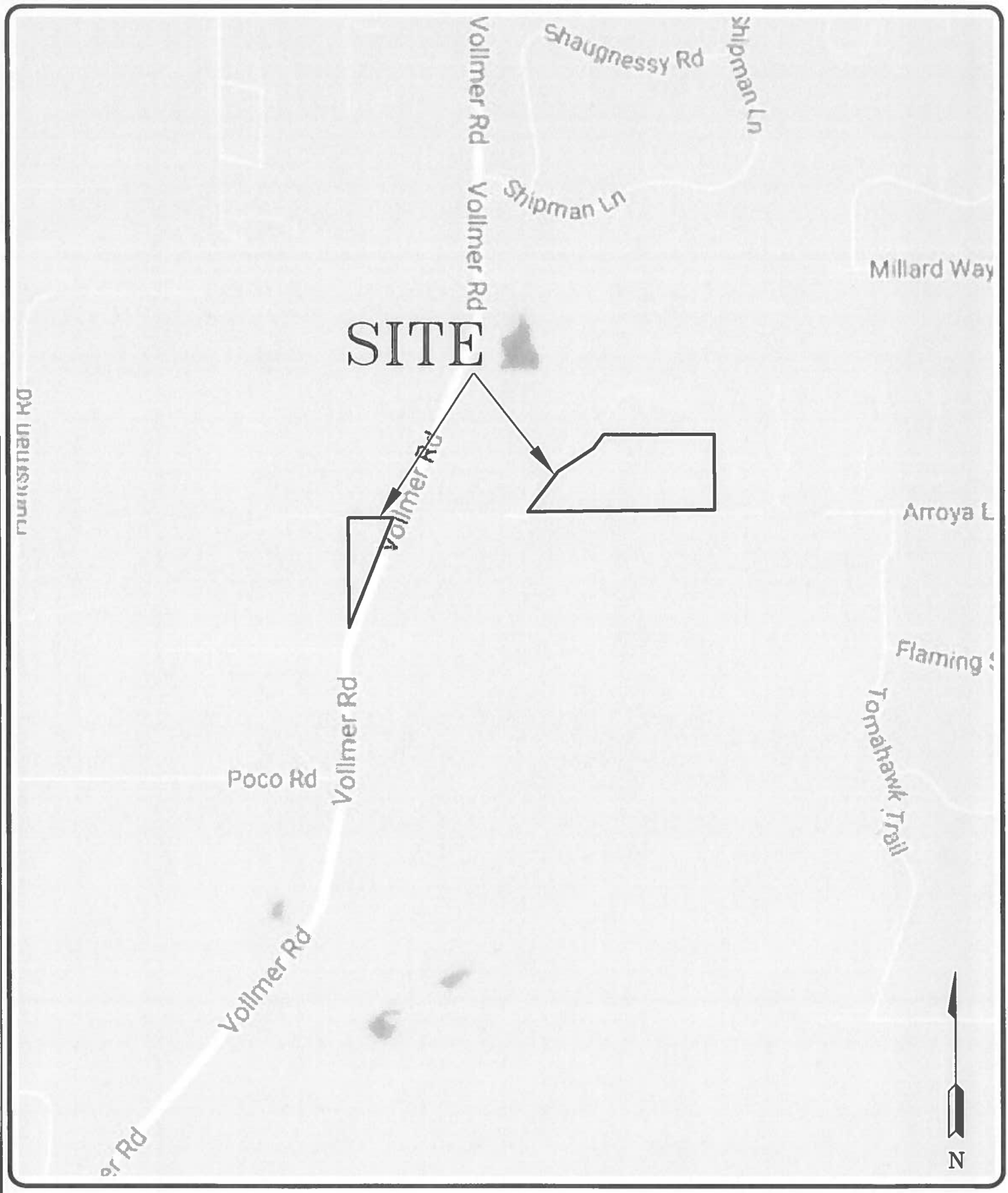
Table 2: Summary of Percolation Test and Tactile Test Pit Results

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

Test Pit No.	USDA Soil Type Limiting Layer	LTAR Value	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
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



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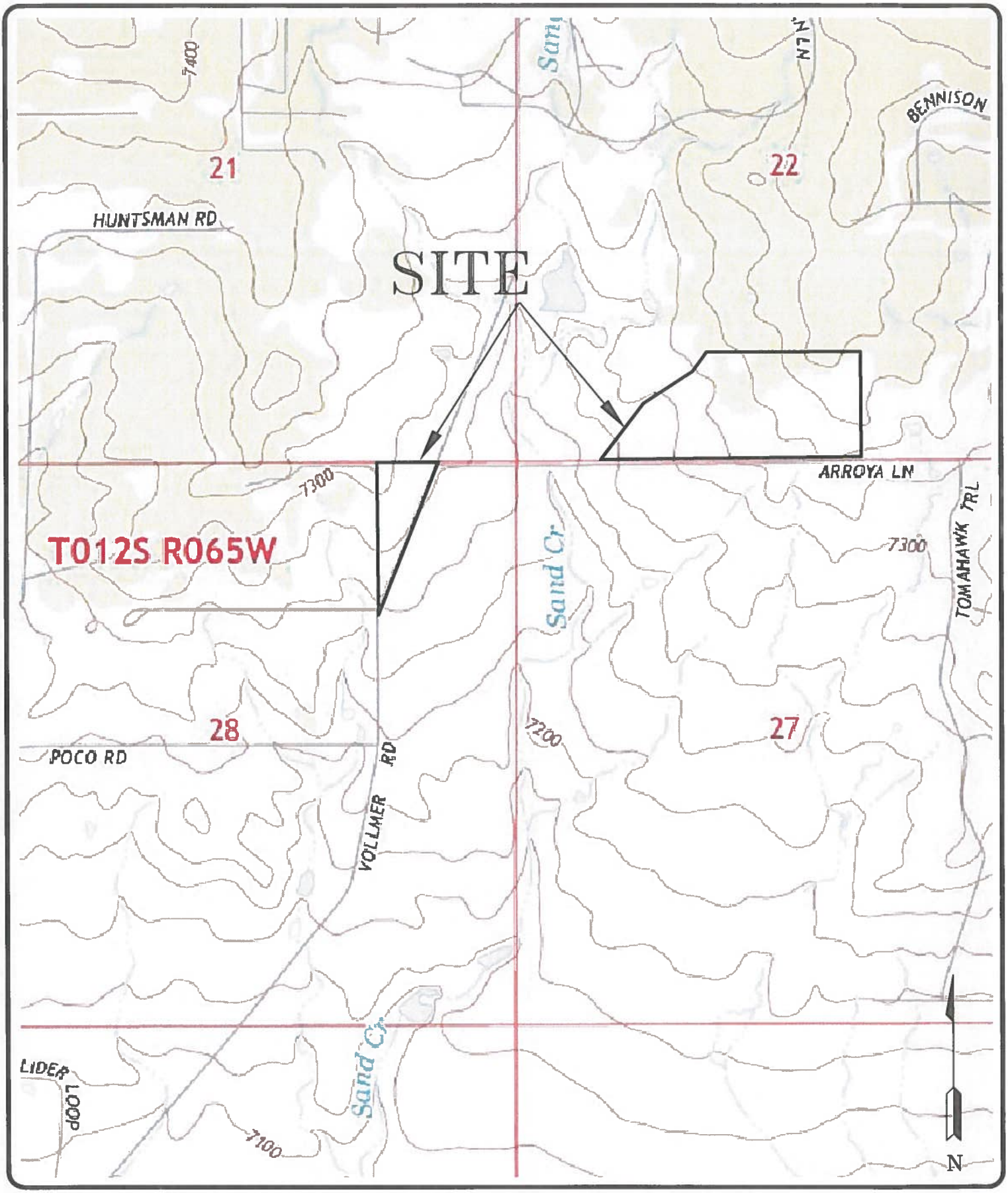
VICINITY MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/31/17		

JOB NO.: 170209

FIG NO.: 1



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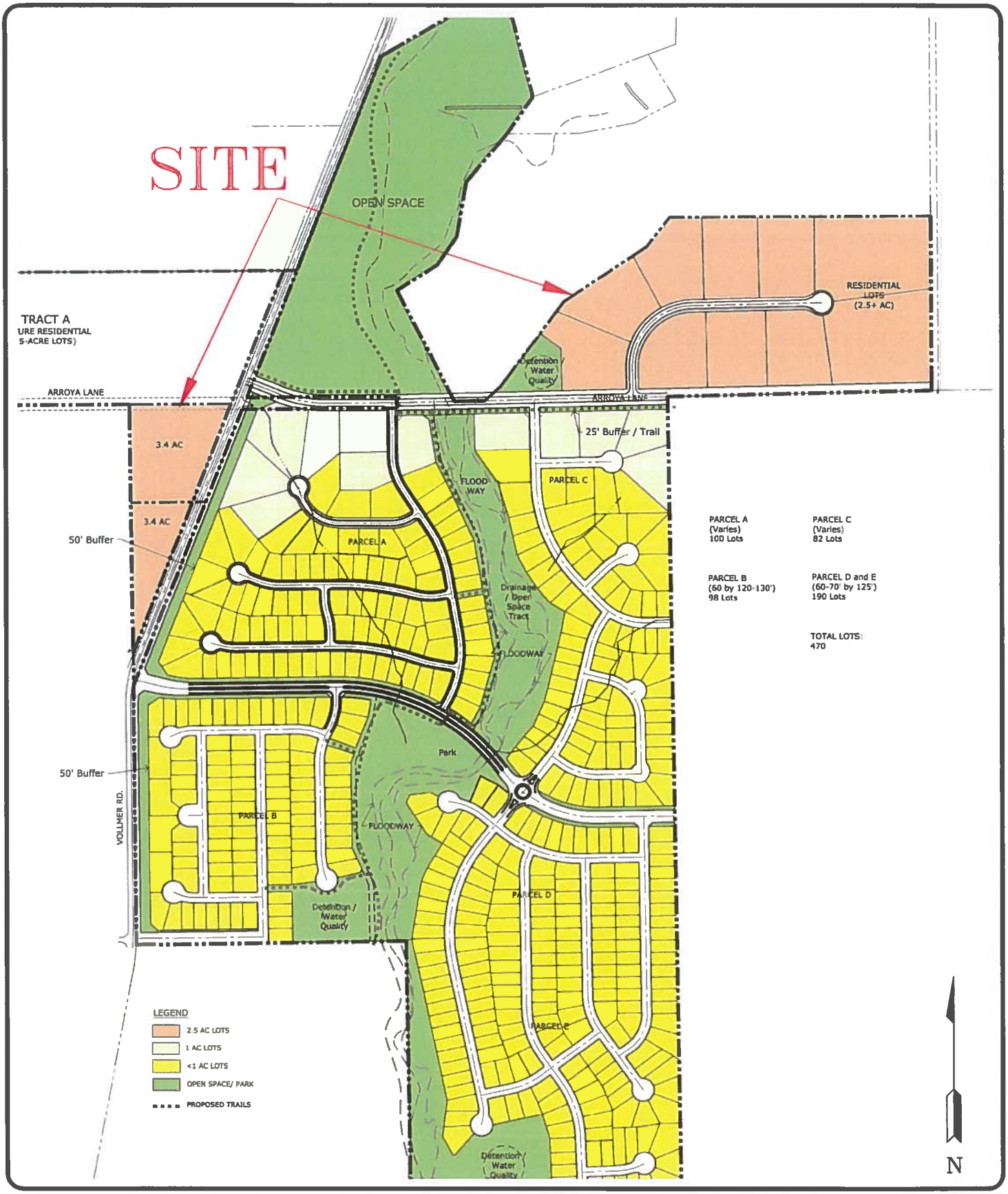
USGS MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/31/17		

JOB NO.: 170209

FIG NO.: 2



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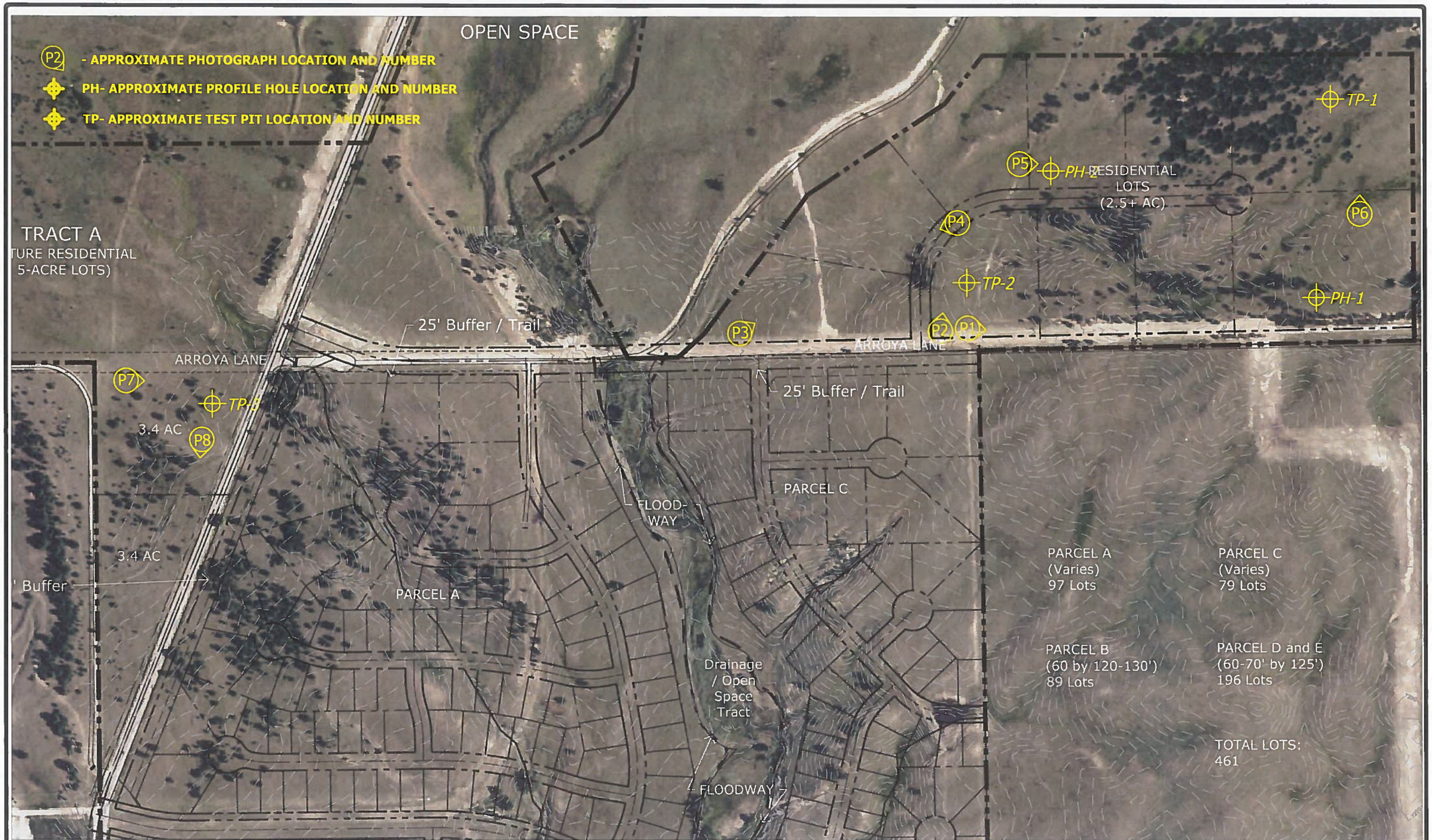
PRELIMINARY CONCEPT PLAN
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/31/17		

JOB NO.: 170209

FIG NO.: 3



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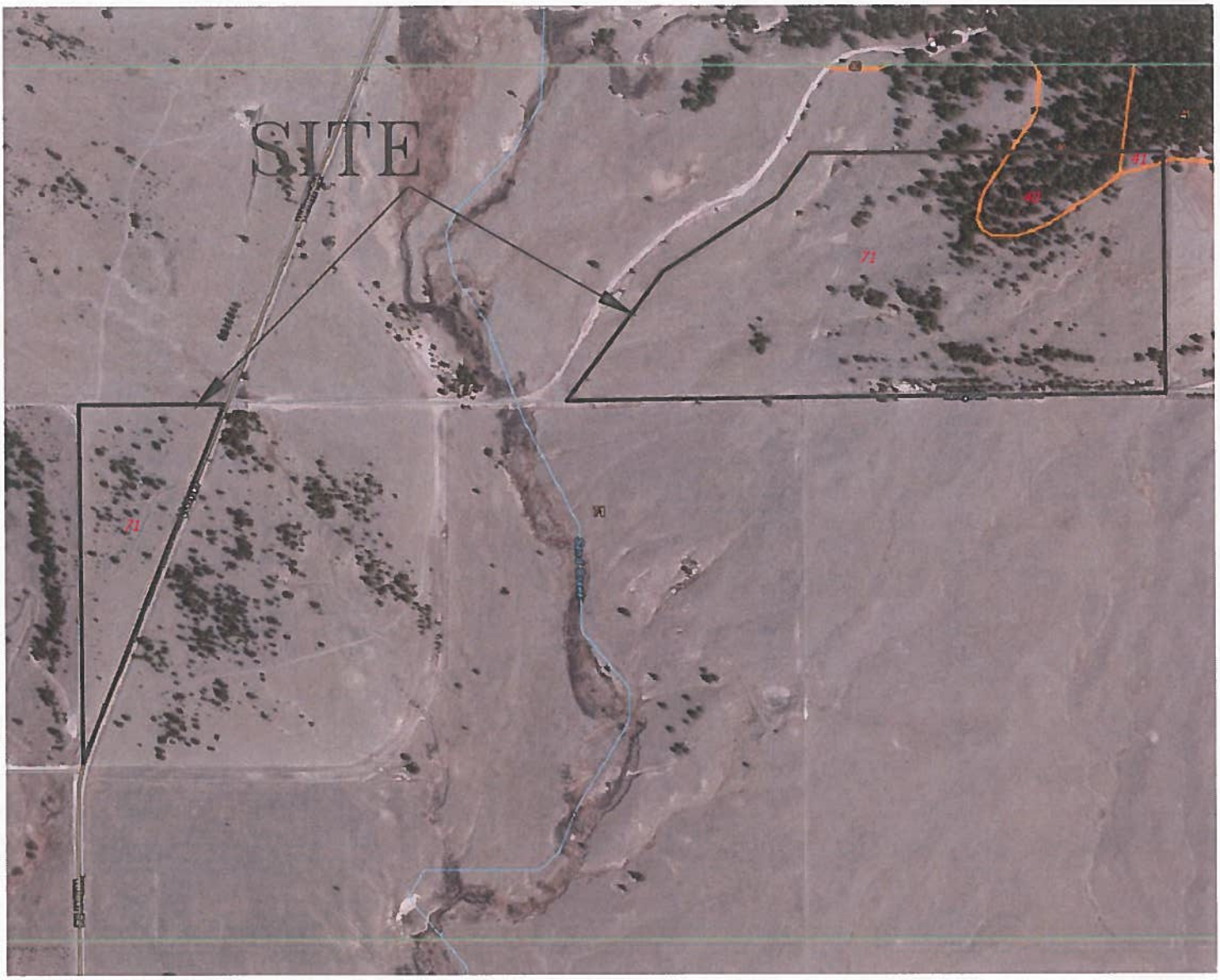
SITE PLAN/TEST BORING AND TEST PIT
LOCATION MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN	LLL
CHECKED	
DATE	4/3/17
SCALE	AS SHOWN
JOB NO.	170209
FIGURE No.	4



N

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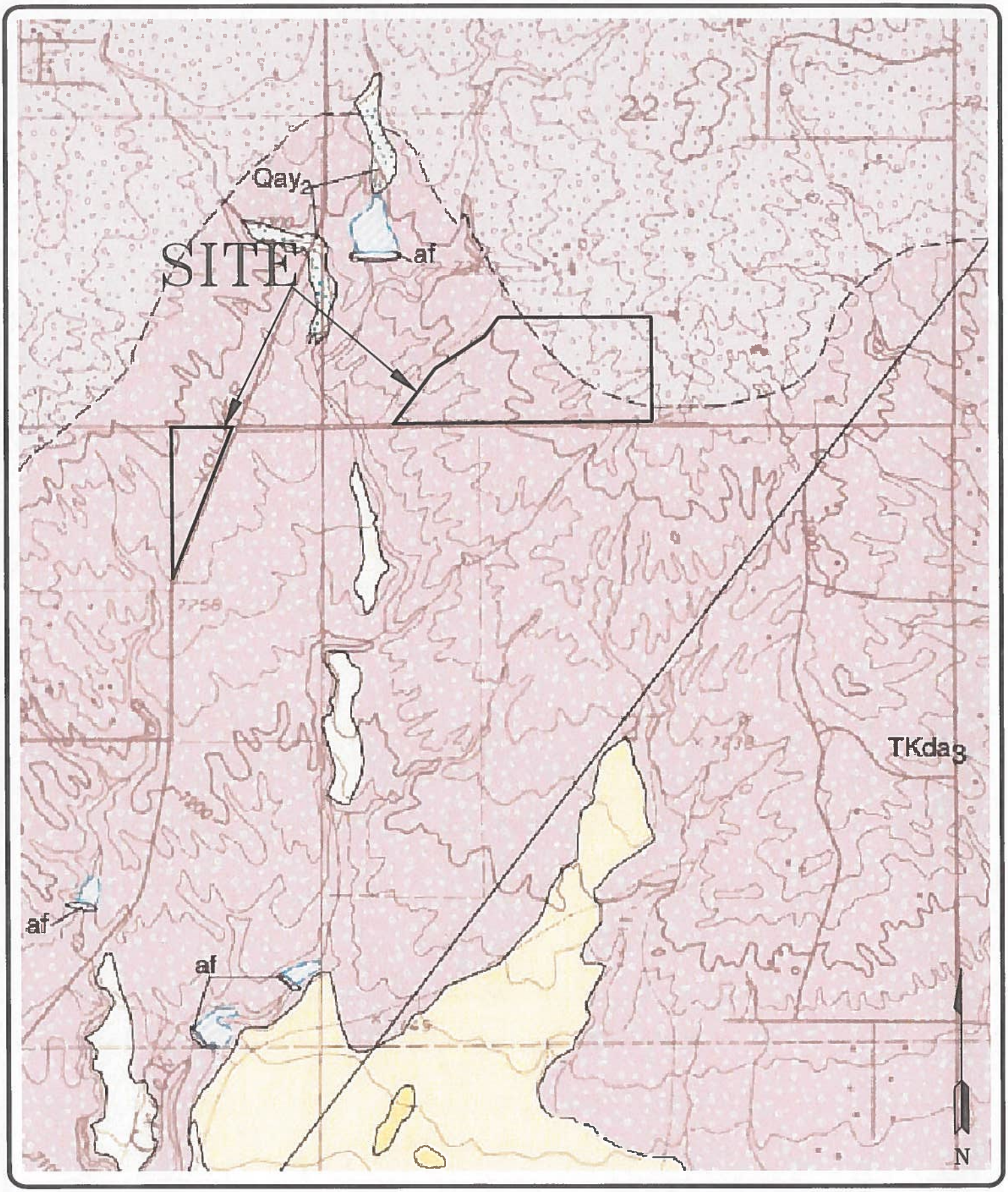
SOIL SURVEY MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/31/17		

JOB NO.: 170209

FIG NO.: 5



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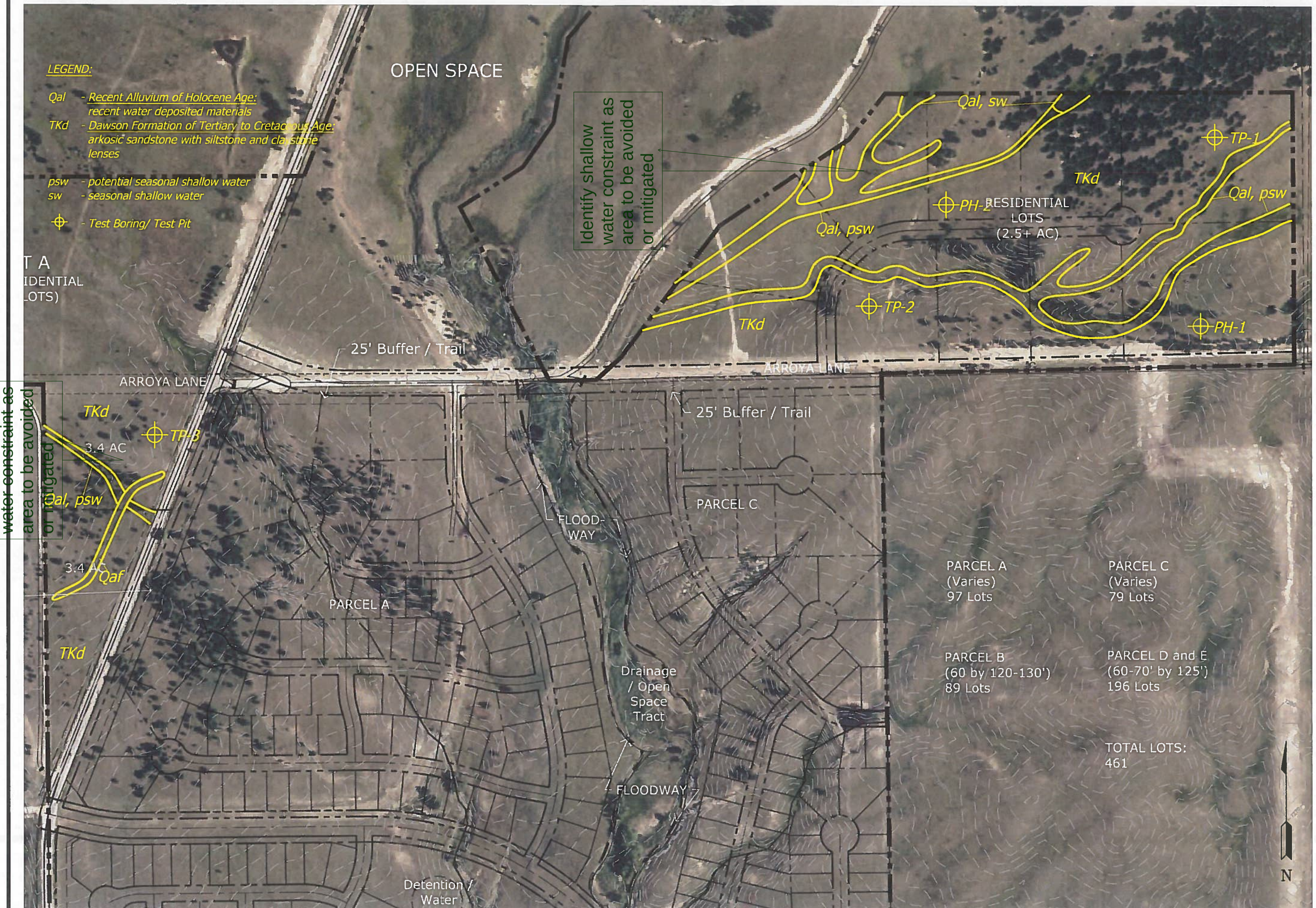
FALCON NW QUADRANGLE GEOLOGY MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/31/17		

JOB NO.: 170209

FIG NO.: 6



Identify shallow water constraint as area to be avoided or mitigated

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

DRAWN	LLL
CHECKED	
DATE	4/3/17
SCALE	AS SHOWN
JOB NO.	170209
FIGURE No.	7

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, A99, V, and VE. 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 decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 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

ZONE X 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

ZONE X 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.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000 M — 1000-meter Universal Transverse Mercator grid tick values, zone 4
- 600000 FT — 5000-foot grid tick values: Hawaii State Plane coordinate system, zone 3 (FIPSZONE 5103), Transverse Mercator projection
- DX5510 X — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M 2 — Coastal Mile marker

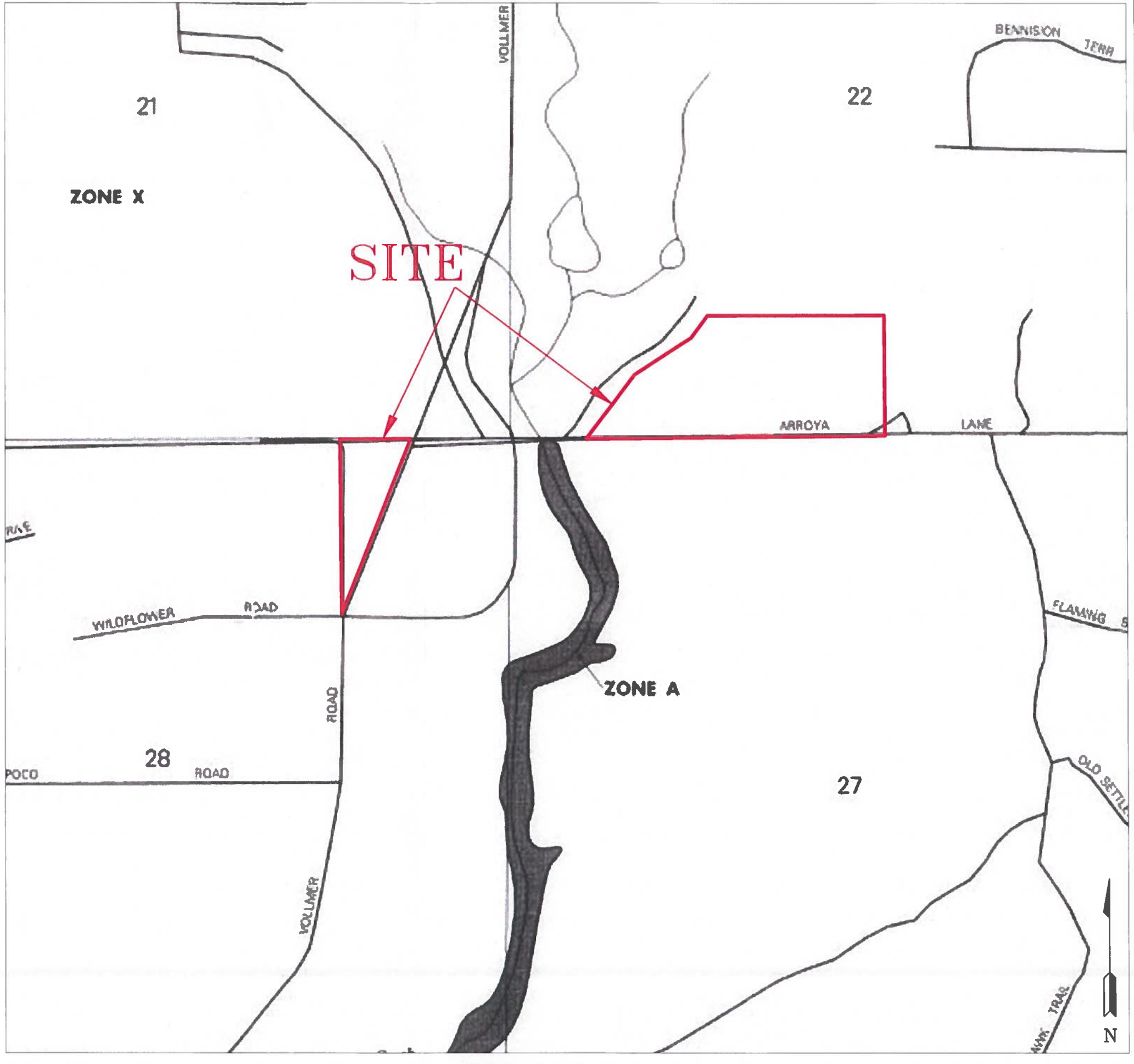
MAP REPOSITORY

Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
November 20, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.



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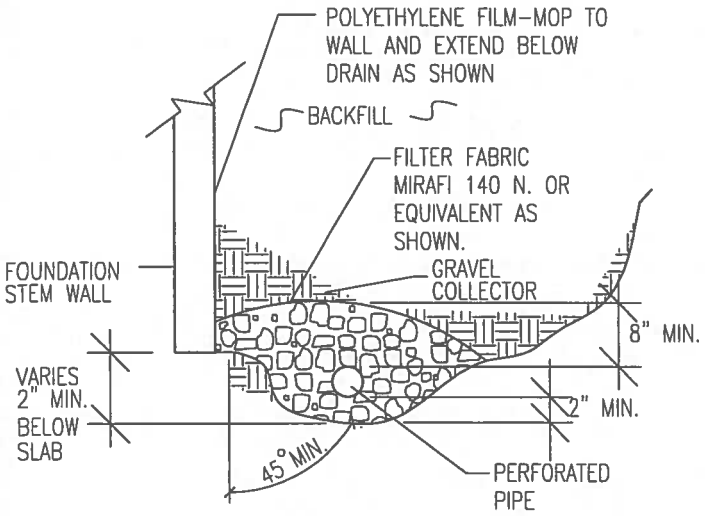
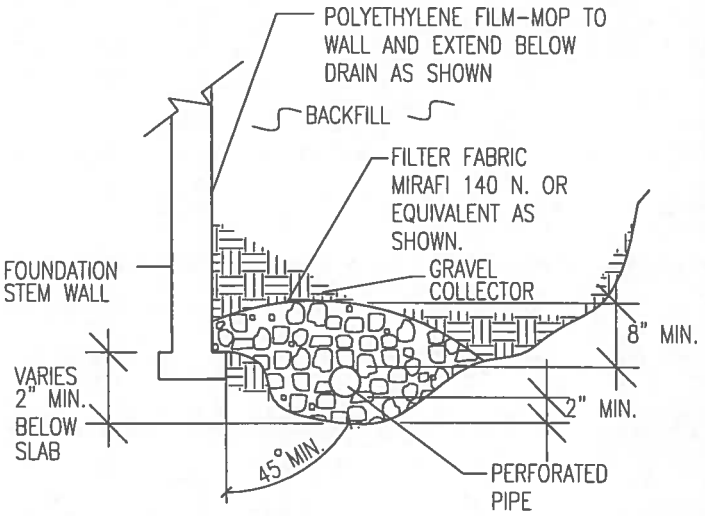
FLOODPLAIN MAP
THE RETREAT AT TIMBER RIDGE
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: ARROYA INVESTMENTS

DRAWN	LLL
CHECKED	
DATE	3/31/17
SCALE	AS SHOWN
JOB NO.	170209
FIGURE No.	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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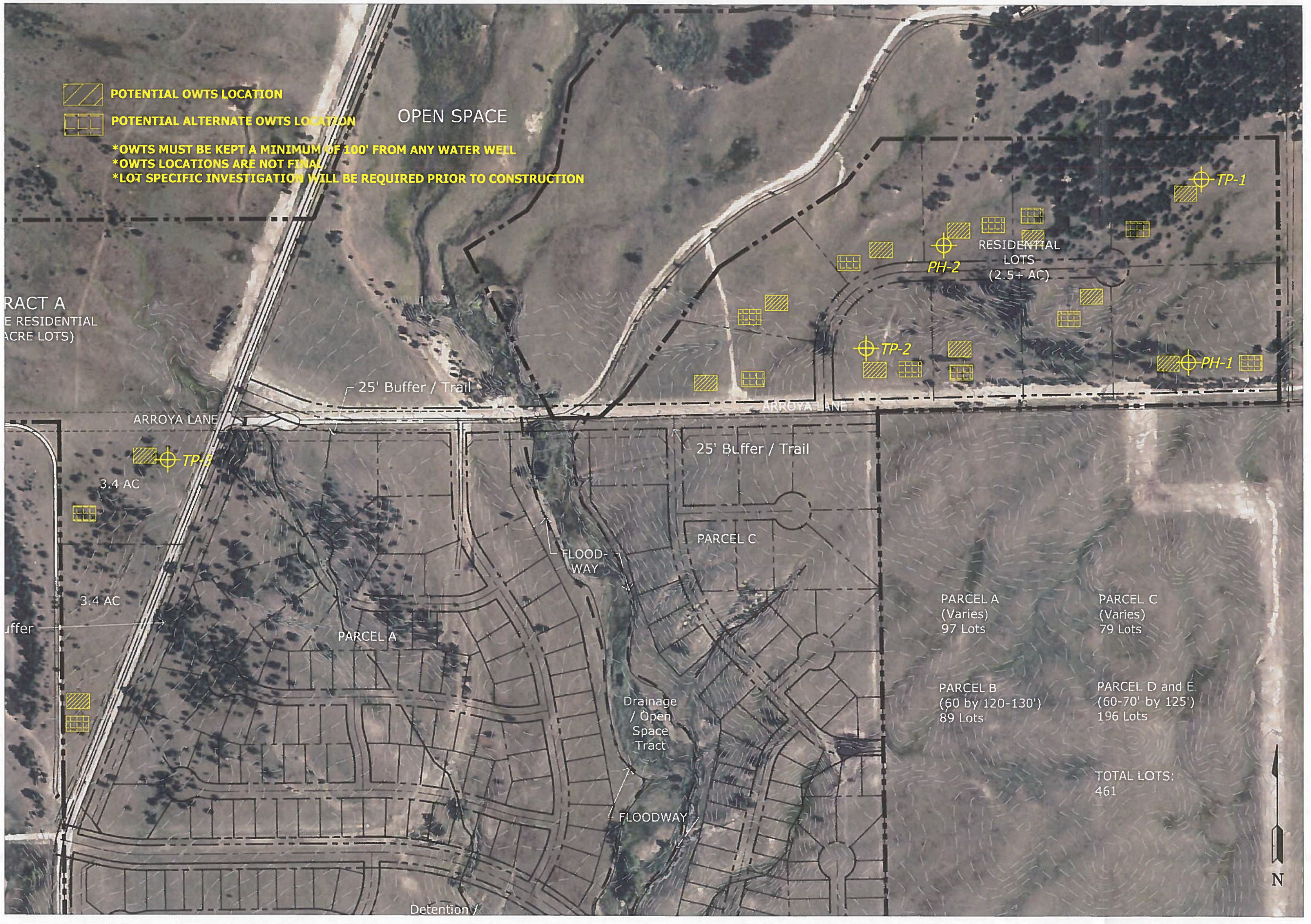
PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
		DS	LLL

JOB NO.: 170209

FIG NO.: 9



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

DRAWN	LLL
CHECKED	
DATE	4/3/17
SCALE	AS SHOWN
JOB NO.	170209
FIGURE No.	10

APPENDIX A: Site Photographs

1

Looking east from the southern portion of the site.

March 9, 2017

2

Looking north from the southern portion of the site.

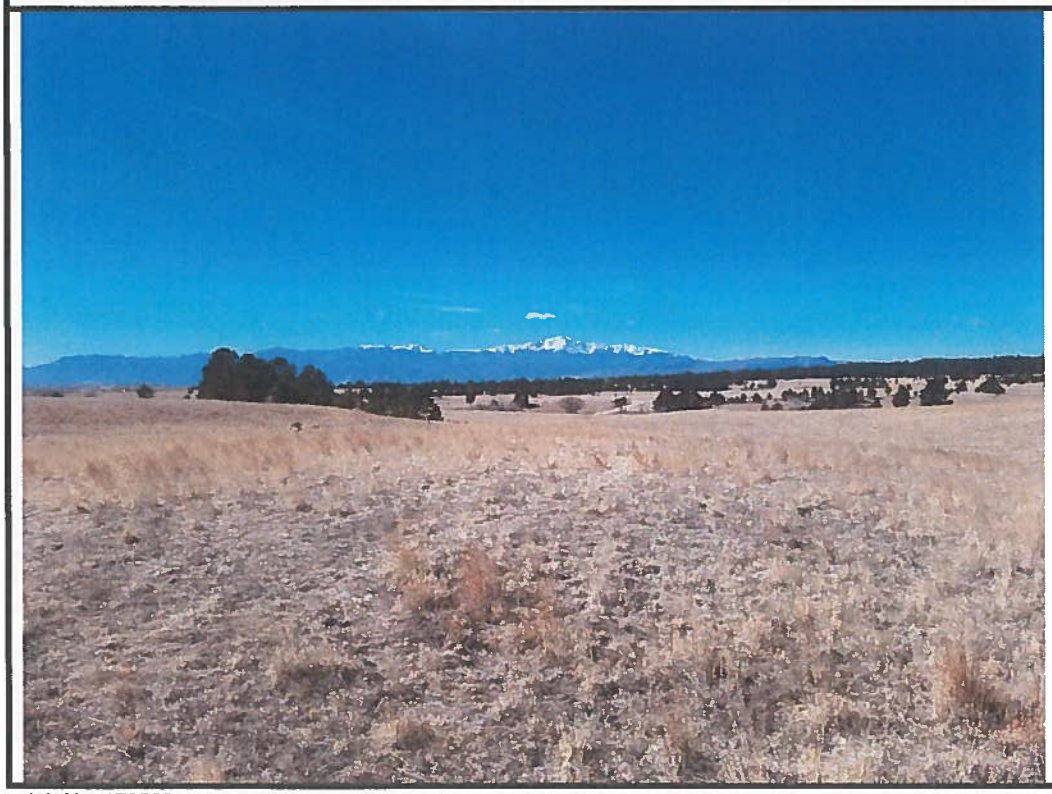
March 9, 2017

Job No. 170209

3

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

March 9, 2017



4

Looking west central portion of the site.

March 9, 2017

Job No. 170209

5

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

March 9, 2017

6

Looking north from the southeast portion of the site.

March 28, 2017

Job No. 170209

7

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

March 28, 2017

8

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

March 28, 2017

Job No. 170209

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

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

REMARKS

DRY TO 14.5', 2/17/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			30	13.0	
5			50/11"	13.1	
10			50/7"	13.4	
15			50/7"	9.2	
20					

SAND, CLAYEY, FINE GRAINED, GREEN BROWN, DENSE, MOIST

SANDSTONE, VERY CLAYEY TO CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

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

REMARKS

DRY TO 14', 2/17/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			19	2.3	
5			7	7.4	
10			6	5.5	
15			50	12.5	
20					

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST

SANDSTONE, CLAYEY, FINE GRAINED, TAN, VERY DENSE, MOIST

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

JOB NO.: 170209
FIG NO.: B-1

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

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

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
topsoil, sandy loam, brown	1			gr	w	2a
gravelly loamy sand, fine to coarse grained, tan	2			sg		1
	3					
weathered silty sandstone, fine to coarse grained, reddish-tan	4			ma		4
	5					
sandy claystone, olive-gray	6			ma		4A
	7					
	8					
	9					
	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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TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	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
topsoil, sandy loam, brown	1			gr	w	2A
gravelly loamy sand, fine to coarse grained, tan	2			sg		1
	3					
	4					
sandy clay loam, very fine to coarse grained, tan-gray	5			ma		3A
weathered clayey sandstone, very fine to coarse grained, tan-gray	6			ma		4A
	7					
siltstone, very fine to fine grained, tan to reddish-tan	8			ma		4A
	9					
	10					

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					

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

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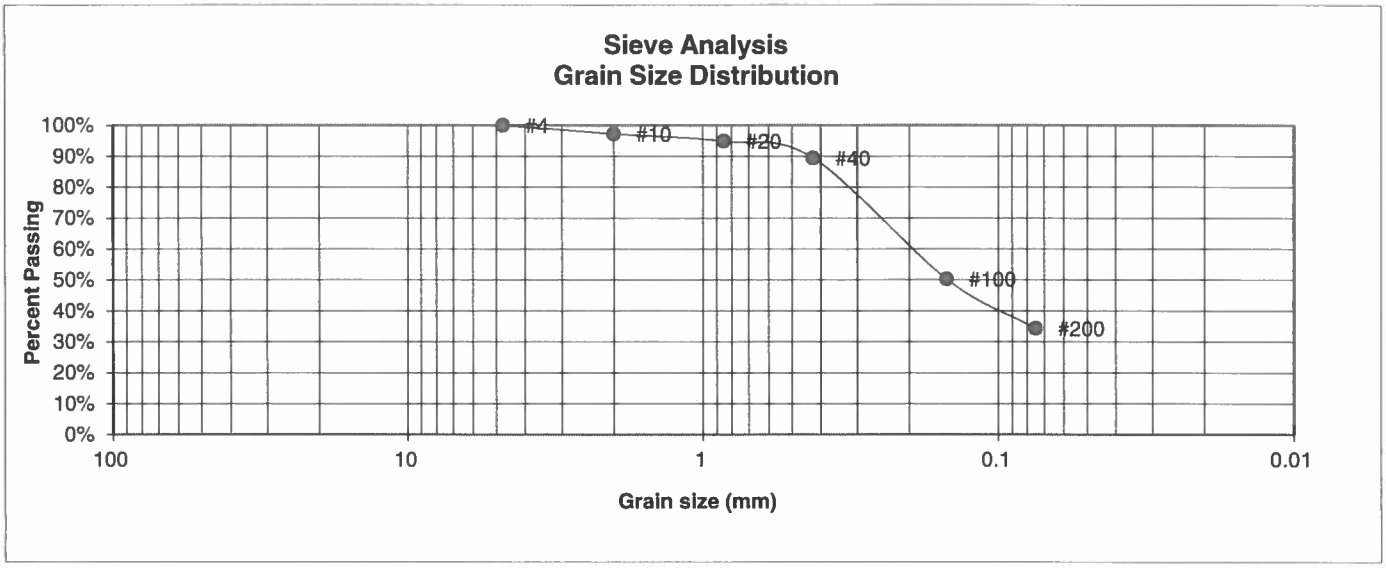
TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

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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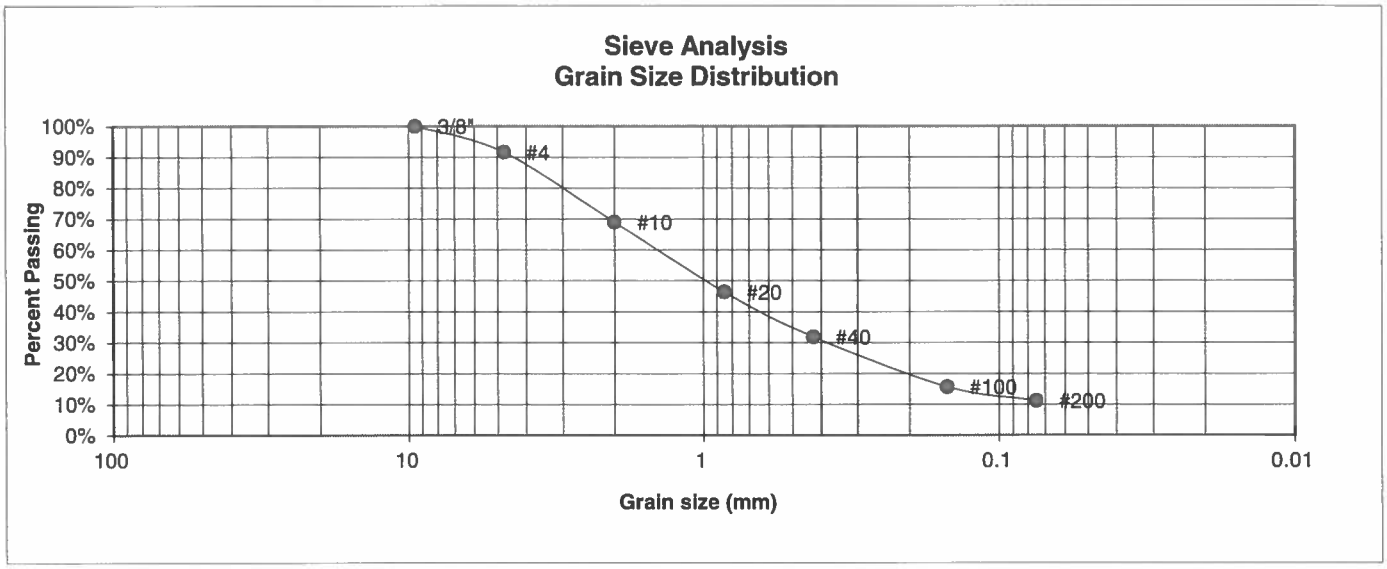
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

JOB NO.: 170209
FIG NO.: C-1

BORING NO.	2	UNIFIED CLASSIFICATION	SM-SW	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"	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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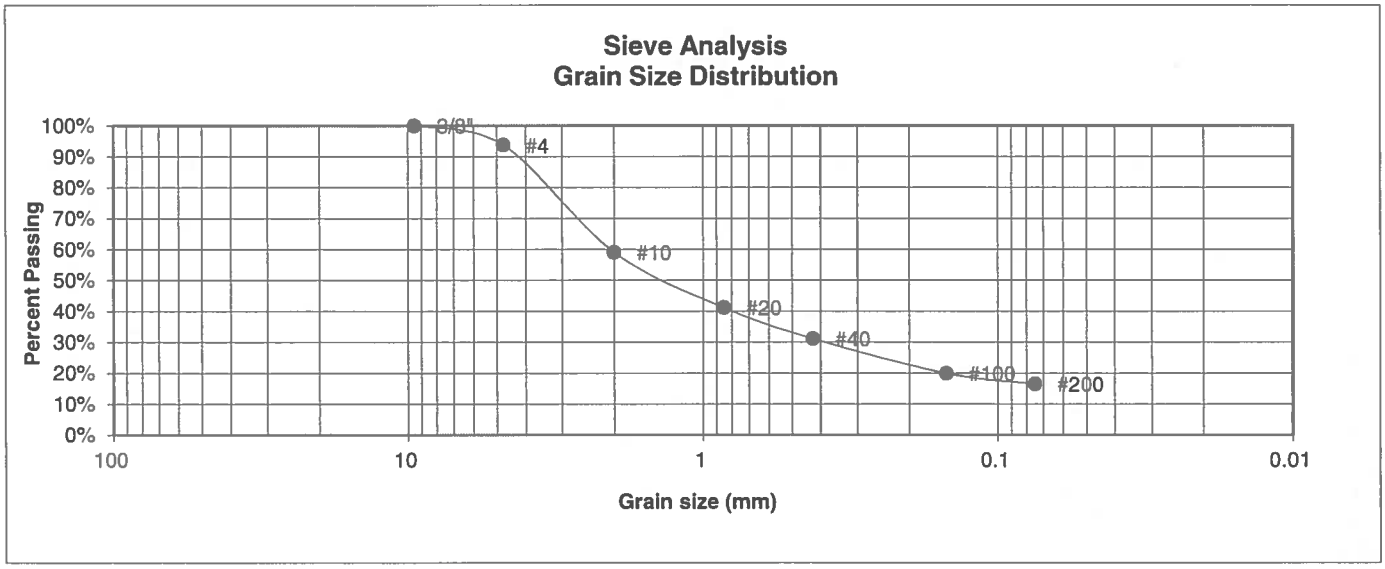
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	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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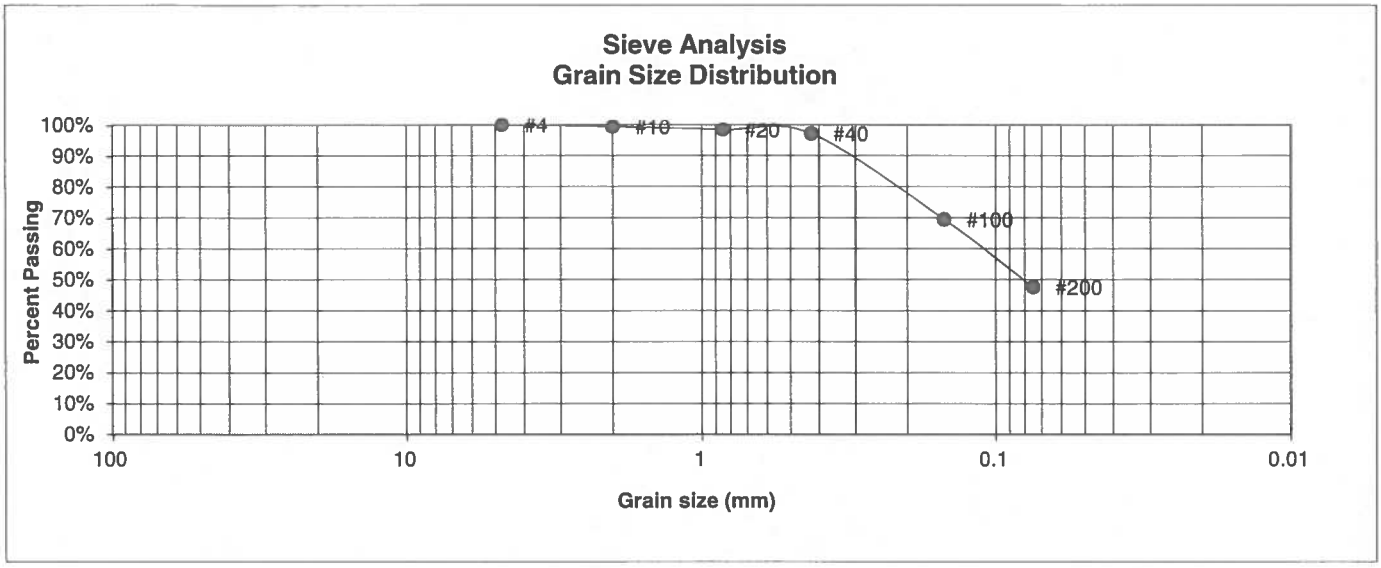
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	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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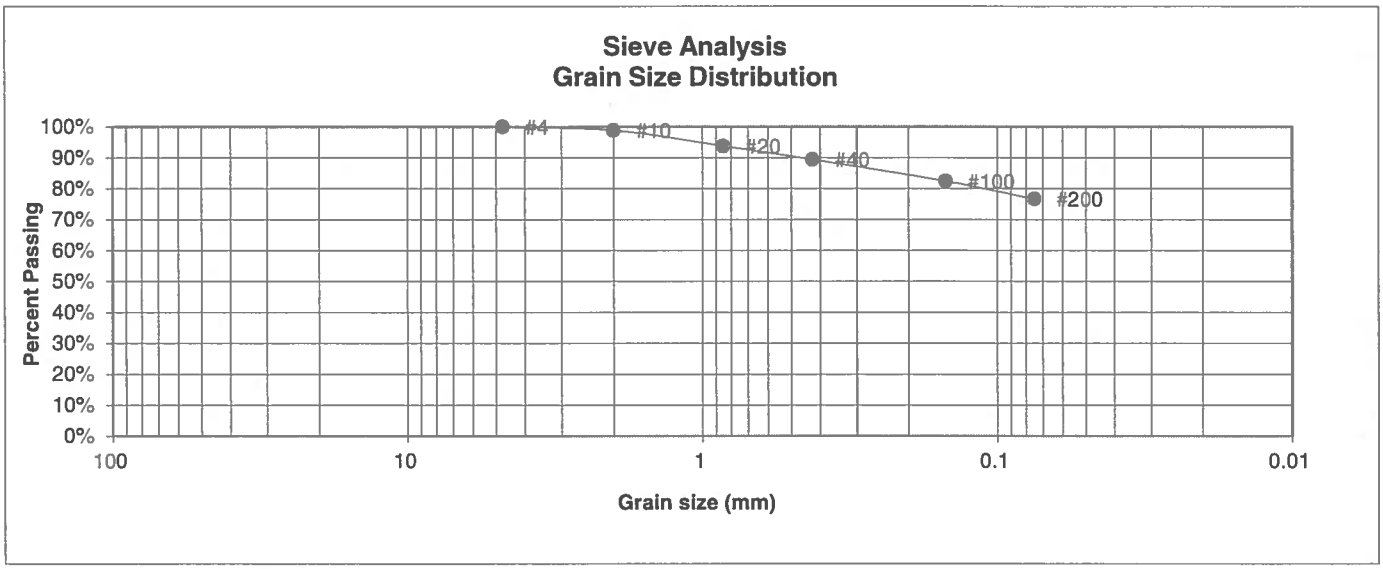
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

JOB NO.: 170209
FIG NO.: C-4

BORING NO.	TP-2	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	5-6	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	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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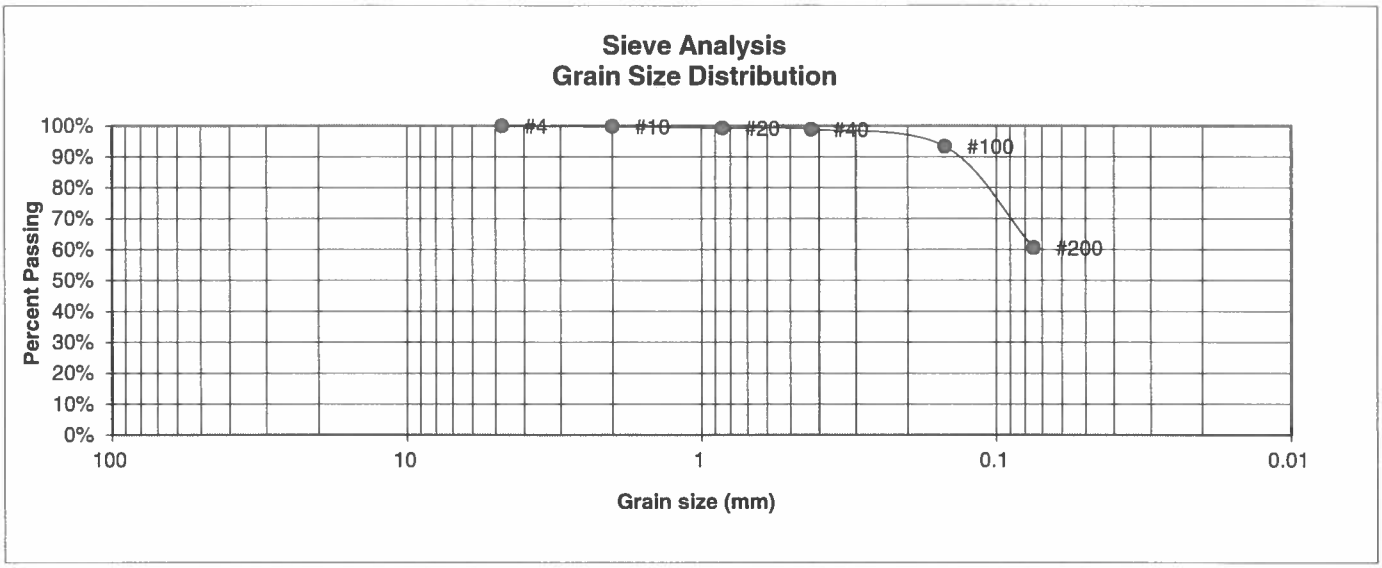
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

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

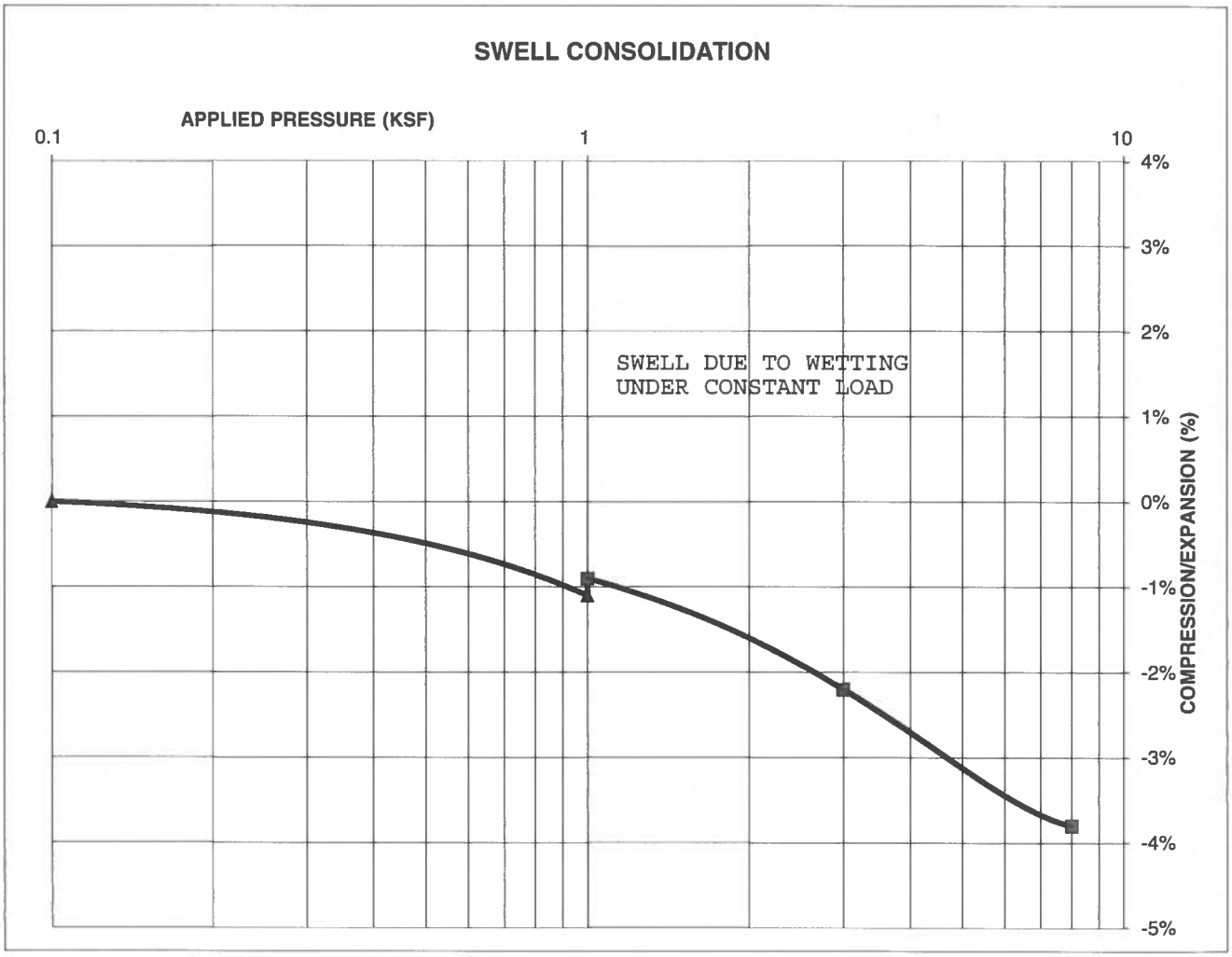
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

JOB NO.: 170209
FIG NO.: L-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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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
Job Number: 170209
Test Location: The Retreat at Timber Ridge

PERCOLATION HOLES - #1

Date Holes Prepared: 2/16/2017
Date Hole Completed: 2/17/2017

Hole No. 1
Depth: 34"

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

Perc Rate (min./in.): 80

Hole No. 2
Depth: 36"

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

Perc Rate (min./in.): 80

Hole No. 3
Depth: 34"

Trial	Time (min.)	Water Level Change (in.)
1	10	0
2	10	0
3	10	0

Perc Rate (min./in.): 240

Average Perc Rate (min./in.) 133

PROFILE HOLE

Date Profile Hole Completed: 2/16/2017

Depth	Visual Classification	Remarks
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:

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PERCOLATION TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

JOB NO.: 170209
FIG NO.: E-1

Client: Arroya Investments
Job Number: 170209
Test Location: The Retreat at Timber Ridge

PERCOLATION HOLES - #2

Date Holes Prepared: 2/16/2017
Date Hole Completed: 2/17/2017

Hole No. 1
Depth: 36"

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

Perc Rate (min./in.): 80

Hole No. 2
Depth: 36"

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

Perc Rate (min./in.): 27

Hole No. 3
Depth: 31"

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

Perc Rate (min./in.): 27

Average Perc Rate (min./in.) 44

PROFILE HOLE

Date Profile Hole Completed: 2/16/2017

Depth	Visual Classification	Remarks
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:

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

PERCOLATION TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/31/17

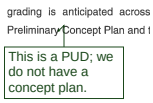
JOB NO.: 170209
FIG NO.: E-2

Markup Summary

Unlocked (9)

Subject: Callout
Page Label: 1
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdparsons
Date: 5/25/2017 9:03:33 AM
Color:

Please note Statute will require a review of this report at the preliminary plan stage.



Subject: Callout
Page Label: 4
Lock: Unlocked
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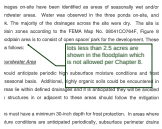
Checkmark: Unchecked
Author: dsdparsons
Date: 5/18/2017 9:11:04 AM
Color:

This is a PUD; we do not have a concept plan.



Subject: Callout
Page Label: 11
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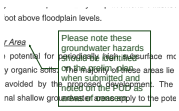
Checkmark: Unchecked
Author: dsdparsons
Date: 5/18/2017 2:45:01 PM
Color:

lots less than 2.5 acres are shown in the floodplain which is not allowed per Chapter 8.



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Page Label: 12
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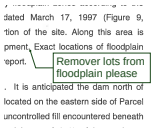
Checkmark: Unchecked
Author: dsdparsons
Date: 5/24/2017 7:52:59 AM
Color:

Please note these groundwater hazards should be identified on the prelim. plan when submitted and noted on the PUD as areas of concern.



Subject: Callout
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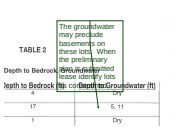
Checkmark: Unchecked
Author: dsdparsons
Date: 5/24/2017 10:07:35 AM
Color:

Remover lots from floodplain please



Subject: Callout
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Checkmark: Unchecked
Author: dsdparsons
Date: 5/25/2017 8:41:54 AM
Color:

The groundwater may preclude basements on these lots. When the preliminary plan is submitted lease identify lots as constrained.

Subject: Callout
Page Label: 30
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Status:
Checkmark: Unchecked
Author: dsdparsons
Date: 5/25/2017 8:46:03 AM
Color:

Lots with hazards should be identified on the preliminary plan and if mitigation can be done that should be noted on preliminary plan. PUD should identify general hazards/constraints. SW and W should most likely be placed in no build areas unless applicant is able to mitigate near drainage areas and sloped areas (if so note).

Subject: Callout
Page Label: 100
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Status:
Checkmark: Unchecked
Author: dsdparsons
Date: 5/25/2017 8:52:39 AM
Color:

Identify shallow water constraint as area to be avoided or mitigated

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Subject: Callout
Page Label: 100
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Status:
Checkmark: Unchecked
Author: dsdparsons
Date: 5/25/2017 8:53:17 AM
Color:

Identify shallow water constraint as area to be avoided or mitigated