Final Drainage Report

Knecht Minor Final Subdivision
El Paso County, Colorado

PCD File No.: XXXX

Prepared for:
David Knecht
12375 N. Meridian Rd.
El Paso County, Colorado 80106

Prepared by:
Kimley-Horn and Associates, Inc.
2 North Nevada Ave
Suite 900
Colorado Springs, CO 80903
(719) 435-0182
Contact: Kevin Kofford, P.E.

Project #: 196775000

Prepared: August 29, 2024

Kimley»Horn

CERTIFICATION

ENGINEERS STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County, Colorado for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____

Kevin R. Kofford Date
Colorado P.E. No. 57234

DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Jon Knecht
Developer Name

_____
Signature:

Owner
Title:

_____
Address:

EL PASO COUNTY STATEMENT

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code, as amended.

_____ _____
Joshua Palmer, P.E. Date
County Engineer/ECM Administrator

Conditions:

GENERAL LOCATION AND DESCRIPTION

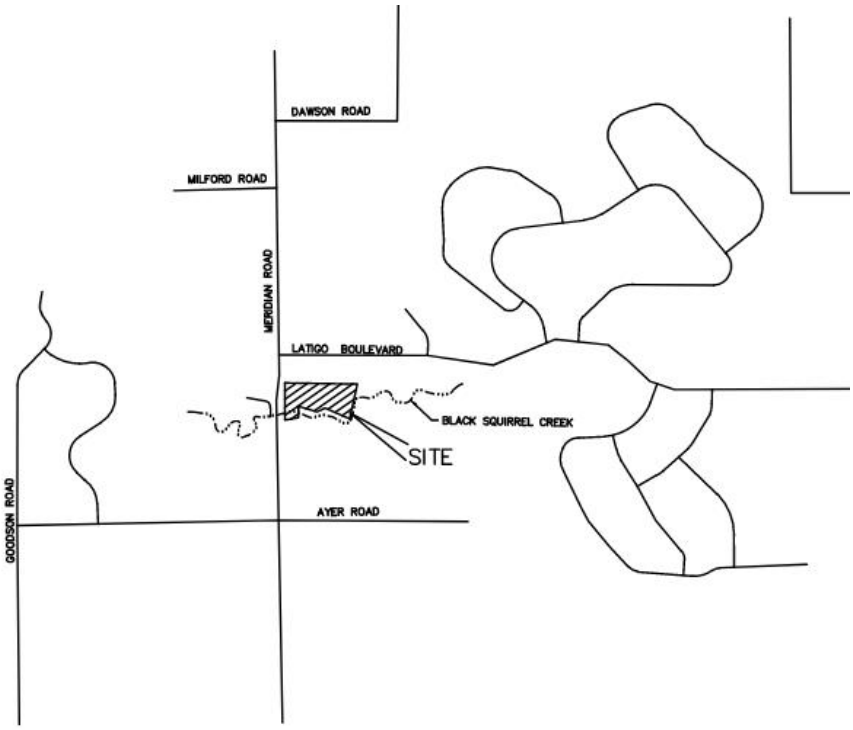
PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations in addition to documenting and finalizing the drainage design methodology in support of the proposed Knecht Minor Final Plat Subdivision development ("the Project") for Jon Knecht ("the Owner"). The Project is located within the jurisdictional limits of El Paso County ("the County"). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria outlined by the County.

LOCATION

The Project is located at 12375 and 12475 N. Meridian Rd. approximately southeast of the intersection of N. Meridian Rd. and Latigo Blvd. in El Paso County, Colorado. More specifically, the Project is within a portion of the northwest quarter of Section 18, Township 12 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. A vicinity map has been provided below.

VICINITY MAP



DESCRIPTION OF PROPERTY

The Project is located on approximately ±21.03 acres (Parcel ID's: 4218000002, 4218000023, 4218000004). In the existing condition, there are three existing residential homes with gravel driveways. Existing vegetation on the Site consists of natural vegetation with scattered patches or native shrubs and trees. Black Squirrel Creek runs through the site and along the southern property line. The proposed Project consists of extending and paving the existing shared driveway from N. Meridian Drive into a private road with a gravel surface. The proposed lots will then tie-in to the private road with gravel driveways. Currently, the site does not provide stormwater quality or detention. The site generally drains from northwest to southeast with

slopes ranging from 1% to 20%, with the steeper slopes along the existing banks of Black Squirrel Creek. Runoff generally flows throughout the Site as sheet flow and is then channelized via Black Squirrel Creek. The Project is ultimately tributary to Black Squirrel Creek which runs along the southern property line. The Project it is located within Flood Zone A along the banks of Black Squirrel Creek where it meanders along the southern property line. A FEMA flood map is provided in the ***Appendix***.

The properties are currently owned by Jon Knecht. The survey was the basis for design of the drainage maps, report, and calculations. The survey was completed by Land Development Consultants, Inc. on November 12, 2018.

SOILS DATA

NRCS soil data for the Site is provided in the ***Appendix*** and most of the onsite soils are generally USCS Hydrologic Soil Group B. Group B soils generally have moderately low runoff potential when thoroughly wet. Generally, water transmission though the soil is unimpeded. Typically, soils in this group have between 10 and 20 percent clay and 50 to 90 percent sand and have loamy sand or sandy loam textures.

PROJECT CHARACTERISTICS

The Project limits of disturbance are approximately ±0.99 acres with a total drainage study area of approximately ±43.67 acres. The proposed project consists of a minor subdivision where the three (3) existing lots are to be subdivided into five (5) separate lots with a gravel private road and separate driveways for each lot. Developed flows within the site will sheetflow across the site over exisitng natural vegetation and channelized through Black Squirrel Creek where flows then generally run to the east and southeast.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

The proposed stormwater facilities follow the El Paso County Drainage Criteria Manual (the “CRITERIA”), El Paso Engineering Criteria Manual (the “ECM”), and the Mile High Flood District Urban Storm Drainage Criteria Manual (the “MANUAL”). Site drainage is not significantly impacted by such constraints as utilities or existing development. Further detail regarding proposed onsite drainage patterns is provided in the Proposed Drainage Conditions Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per chapter 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the CRITERIA by calculating weighted impervious values for each specific site basin.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Results of the hydraulic calculations are summarized in the ***Appendix***.

VARIANCES FROM CRITERIA

A request to waive the requirements of section 8.4.2.B.1.E of the Land Development Code proposed to allow for the use of the desktop BFEs in place of the officially approved FEMA BFEs. This waiver must be accepted by the Floodplain Administrator. See the Floodplain Statement for further information.

DRAINAGE BASINS AND SUB-BASINS

MAJOR BASIN DESCRIPTIONS

The Property is located in the Black Squirrel Creek drainage basin and is tributary to Black Squirrel Creek. See Drainage Basin Planning Study in the ***Appendix***. There are no creek improvements proposed with this project. Due to the minimal addition of impervious area and existing natural vegetation and soils readily available for infiltration, the project is not anticipated to adversely affect downstream conditions. There are no identified nearby irrigation facilities or other obstructions which could influence the local drainage.

Currently, there is not an approved drainage report for the Property. All drainage design will comply with the existing Drainage Basin Planning Study for the Black Squirrel Creek drainage basin.

EXISTING DRAINAGE CONDITIONS

The existing Site has been divided into (5) five on-site (E1-E3) and off-site (OE1-OE2) sub-basins. A description of each sub-basin is listed below. In existing conditions, the total studied drainage area of the site is ±43.67 acres. Flows from stormwater runoff generally travel overland to be channelized into Black Squirrel Creek at slopes of 1% to 20%. Runoff flows then travel generally westward to southwestward within Black Squirrel Creek. Calculations of the existing sub-basins on the Project Site have been completed using current stormwater criteria. An Existing Conditions Drainage Map is provided in the ***Appendix*** of this report. The weighted imperviousness of the drainage area under existing conditions 3.0%. Total flows generated in existing conditions are 25.33 cfs for the 5-year event and 129.35 cfs for the 100-year event.

Sub-Basin E1

Sub-basin E1 is approximately 7.50 acres and consists of the northern portion of the Site. This sub-basin consists of existing native grasses and vegetation, an existing gravel driveway, and existing building structures. The runoff developed within this basin generally sheet flows overland from west to east at slopes that range approximately 0.5% to 6%. From design point E1, flows then converge into Black Squirrel Creek. The weighted imperviousness of sub-basin E1 is 2.0%. The developed direct runoff from sub-basin E1 is 3.59 cfs for the 5-year event and 19.00 cfs for the 100-year event.

Sub-Basin E2

Sub-basin E2 is approximately 7.55 acres and consists of the central and southern portion of the Site. This sub-basin consists of existing native grasses and vegetation, and existing residential homes. The runoff developed within this basin sheet flows overland from northwest to southeast at slopes that range approximately 2% to 20%. From design point E2, flows then continue to travel eastward within Black Squirrel Creek. The weighted imperviousness of sub-basin E2 is 2.0%. The developed direct runoff from sub-basin E1 is 4.39 cfs for the 5-year event and 23.26 cfs for the 100-year event.

Sub-Basin E3

Sub-basin E3 is approximately 5.97 acres and generally consists of the central portion of the Site. This sub-basin consists of existing native grasses and vegetation. The runoff developed within this basin sheet flows overland from west to east at slopes that range approximately 1% to 18%. From design point E3, flows then converge into Black Squirrel Creek. The weighted imperviousness of sub-basin E3 is 0.0%. The developed direct runoff from sub-basin E1 is 3.04 cfs for the 5-year event and 17.03 cfs for the 100-year event.

Sub-Basin OE1

Sub-basin OE1 is approximately 14.33 acres and consists of the off-site portion north of the site. This sub-basin consists of existing native grasses and vegetation, gravel road, asphalt road, and various existing building structures. The runoff developed within this basin sheet flows overland from northwest to southeast at slopes that range approximately 2% to 7%. The runoff flows all generally convene at the northern property line. From design point OE1, flows then continue to travel southeastward discharging into Black Squirrel Creek. The weighted imperviousness of sub-basin OE1 is 4.0%. The developed direct runoff from sub-basin OE1 is 9.00 cfs for the 5-year event and 44.24 cfs for the 100-year event.

Sub-Basin OE2

Sub-basin OE2 is approximately 8.33 acres and consists of the off-site portion south of the site. This sub-basin consists of existing native grasses, trees, and vegetation. The runoff developed within this basin sheet flows overland generally from southwest to northeast at slopes that range approximately 3% to 15%. From design point OE2, flows then continue to travel within Black Squirrel Creek generally eastward along the southern property line. The weighted imperviousness of sub-basin OE2 is 4.0%. The developed direct runoff from sub-basin OE2 is 5.30 cfs for the 5-year event and 25.82 cfs for the 100-year event.

PROPOSED DRAINAGE CONDITIONS

The proposed Site has been divided into (3) three on-site sub-basins, P1-P3, and (2) two off-site sub-basins, OP1-OP2. A description of each sub-basin is listed below. Under the proposed conditions, the total studied drainage area is ±43.67 acres in size. The project involves the construction of a proposed asphalt road, internal gravel driveways and cul-de-sac, and proposed buildings. The total disturbed area of the site is approximately ±0.99 acres. Generally, flows from stormwater runoff travel overland to be channelized into Black Squirrel Creek at slopes of 1% to 20%. Some of the stormwater runoff will be conveyed via a proposed ditch along the proposed drive aisle and cul-de-sac. Ultimately, these flows conveyed from the drainage ditch will be channelized into Black Squirrel Creek. Runoff flows then travel generally west to southwest within Black Squirrel Creek. Flows generated from the proposed conditions will generally follow historic patterns. Under proposed conditions the studied drainage area associated with this project is ±43.67 acres with a 6.0% weighted imperviousness and 5 and 100-yr flows of 29.17 cfs and 136.00 cfs respectively.

Reference **Appendix** for the Proposed Drainage Map and delineation of proposed sub-basins. Reference the proposed rational calculations in **Appendix** for each sub-basin area, minor storm runoff, and major storm runoff.

Sub-Basin P1

Sub-basin P1 is 7.50 acres and consists of the northern portion of the Site. This sub-basin consists of proposed asphalt drive, gravel driveways and cul-de-sac, sidewalk, ADA, existing building structures, and native grasses. The runoff developed within this basin is conveyed via a

proposed drainage ditch along the proposed asphalt drive. The rest of the runoff overland flows from west to east at slopes that range approximately 0.5% to 6%. From design point P1, flows then converge into Black Squirrel Creek. The weighted imperviousness of sub-basin P1 is 11.0%. The developed direct runoff from sub-basin P1 is 5.95 cfs for the 5-year event and 24.33 cfs for the 100-year event.

Sub-Basin P2

Sub-basin P2 is 7.55 acres and consists of the southern portion of the Site. This sub-basin consists of proposed gravel driveway, existing buildings, existing creek, and native grasses. The runoff developed within this basin sheet flows overland from northwest to southeast at slopes that range approximately 2% to 20%. From design point P2, flows then continue to travel eastward within Black Squirrel Creek. The weighted imperviousness of sub-basin P2 is 2.0%. The developed direct runoff from sub-basin P1 is 4.53 cfs for the 5-year event and 23.38 cfs for the 100-year event.

Sub-Basin P3

Sub-basin P3 is 5.97 acres and consists of the eastern portion of the Site. This sub-basin consists of proposed gravel driveways, proposed buildings, and native grasses. The runoff developed within this basin sheet flows overland from west to east at slopes that range approximately 1% to 18%. From design point P3, flows then converge into Black Squirrel Creek. The weighted imperviousness of sub-basin P3 is 10.0%. The developed direct runoff from sub-basin P3 is 4.39 cfs for the 5-year event and 18.24 cfs for the 100-year event.

Sub-Basin OP1

Sub-basin OP1 is 14.33 acres and consists of the offsite portion north of the Site. This sub-basin consists of existing building structures and native grasses. The runoff developed within this basin sheet flows overland from northwest to southeast at slopes that range approximately 2% to 7%. The runoff flows all generally convene at the northern property line. From design point OP1, flows then continue to travel southeastward discharging into Black Squirrel Creek. The weighted imperviousness of sub-basin OP1 is 4.0%. The developed direct runoff from sub-basin OP1 is 9.00 cfs for the 5-year event and 44.24 cfs for the 100-year event.

Sub-Basin OP2

Sub-basin OP2 is 8.33 acres and consists of the off-site portion northwest of the site. This sub-basin consists of existing building structure and native grasses. The runoff developed within this basin sheet flows overland generally from southwest to northeast at slopes that range approximately 3% to 15%. From design point OP2, flows then continue to travel within Black Squirrel Creek generally eastward along the southern property line. The weighted imperviousness of sub-basin OP2 is 4.0%. The developed direct runoff from sub-basin OP2 is 5.30 cfs for the 5-year event and 25.82 cfs for the 100-year event.

FOUR-STEP PROCCESS

The Site was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in Section I.7.2 BMP Selection of the MANUAL. The four-step process per the MANUAL provides guidance and requirements for the selection of siting of structural Best Management Practices (BMPs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices

The purpose of this project is to subdivide the existing two (2) lots north of Black Squirrel Creek in to four (4) proposed residential lots. Per Section I.7.1B of Appendix I of the ECM,

the single-family residences fall under the large lot exemption as the total impervious area is less than 10% of the area. A BESQCP permit will be required by the County to prevent erosion and mitigate any runoff due to those activities.

Step 2: Stabilize Drainageways
Black Squirrel Creek flows throughout the southern portion of the Site. During a Site visit, it was found that the area (basins) tributary to the drainage way is currently well-stabilized and well-vegetated. As the drainageway is currently stable the existing drainageway can be left as-is in its stable condition. As noted in Chapter 1, Section 1.4 of the MANUAL, "Natural channel systems, primarily the designated Major Drainageways and Primary outfalls, serve to store flood waters, enhance water quality, provide for ground water recharge and preserve riparian corridors. The use of historical channels to convey storm water runoff from developed and developing areas is acceptable. However, if historical storm water flows are increased, or if historical channels are unstable in their natural conditions, these channels must be adequately stabilized to prevent excessive erosion." Additionally, Chapter 2, Section 2.2 of the MANUAL states, "A stable natural channel reaches 'equilibrium' over many years. Therefore, channel modifications should be minimal."

Step 3: Provide Water Quality Capture Volume (WQCV)
Per Section I.7.1B of Appendix I of the ECM, detention and water-quality facilities are not required for the Project. No infrastructure improvements are included with the Minor Final Plat.

Full Exclusions per I.7.1.B.5

Large Lot - Single Family Sites
A single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling and having a total lot impervious area of less than 10 percent. A total lot imperviousness greater than 10 percent is allowed when a study specific to the watershed and/or MS4 shows that expected soil and vegetation conditions are suitable for infiltration/filtration of the WQCV for a typical site, and the permittee accepts such study as applicable within its MS4 boundaries. The maximum total lot impervious covered under this exclusion shall be 20 percent.

The 10% imperviousness includes the proposed private road within the calculations for the total impervious area for the lot. The builder will need to comply with assumed proposed roof and driveway areas within the areas listed on the drainage map.

Step 4: Consider need for Industrial and Commercial BMPs
The proposed Project consists of a residential lots with a Minor Final Plat. No industrial and commercial uses or developments are anticipated as part of the proposed development.

WATER QUALITY DESIGN

As discussed in Section I.7.1B of Appendix I of the ECM, detention and water-quality facilities are not required for the Project.

FLOODPLAIN STATEMENT

According to the National Flood Insurance Program, Flood Insurance Rate Map Panel 08041C030G with an effective date of December 7, 2018, the subject property is located in

Zone A 100-year floodplain. Draft model backed BFEs and floodplain extents for this area have been developed as part of Phase 1 for the ongoing El Paso County, CO, Risk MAP Project. The data has been reviewed and approved through FEMA's QA/QC process (May 11, 2022) and is currently in MIP (Case No. 19-08-0037s). The Phase 1/Base Level Engineering outputs and Zone A ready deliverables are, under the following folder: K:/FY2019/19-08-0037S/Discovery - BLE - El Paso and Teller Counties, CO - FY18 - 04/Discovery Data Capture - Discovery Data Capture - El Paso and Teller Counties, CO - 01/El Paso_Discovery_1. Floodplain extents and Base Flood Elevations (BFEs) shown on the plat include the outer limits of both current and effective and CWCB Phase 1 data. The Minor Final Plat shows desktop developed BFEs based on the Phase 1 Risk MAP Project information provided by FEMA, but does not show any FEMA approved BFEs. A request to waive the requirements of section 8.4.2.B.1.E of the Land Development Code proposed to allow for the use of the desktop BFEs in place of the officially approved FEMA BFEs. This waiver must be accepted by the Floodplain Administrator. A drainage easement will be included on the plat to limit any construction within the floodplain.

FEES DEVELOPMENT

Applicable Fees

The project is within the Upper Black Squirrel Creek Drainage Basin per El Paso County Drainage Basin Fees and does not have a Drainage Basin Fee associate with this Drainage Basin. There are no bridge fees for Black Squirrel Drainage Basin.

Construction Cost Opinion

There are no public drainage ponds or permanent control measures proposed as part of the Project.

MAINTENANCE AND OPERATIONS

There are no public drainage ponds or permanent control measures proposed as part of the Project.

GRADING AND EROSION CONTROL

Erosion Control Plans with the Minor Final Plat are not required, as the proposed disturbances is less than one acre. A BESQCP permit will be required by the County to prevent erosion and mitigate any runoff due to those activities for each lot.

OTHER GOVERNMENT AGENCY REQUIREMENTS

Approval from other agencies such as the FEMA, the Army Corps of Engineers, Colorado State Engineer, Colorado Water Conservation Board, and others are not needed with this Project.

SUMMARY

COMPLIANCE WITH STANDARDS

The drainage design presented within this report conforms to the El Paso County Drainage Criteria Manual, El Paso Engineering Criteria Manual, and the Mile High Flood District Urban Storm Drainage Criteria Manual. Additionally, the Minor Final Plat will not adversely affect the

downstream and surrounding developments or waterways.

REFERENCES

1. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994.
2. City of Colorado Springs Drainage Criteria Manual, May 2014, Revised 2021.
3. El Paso County Engineering Criteria Manual, December 2004, Revised 2016
4. Mile High Flood District Drainage Criteria Manual (MHFDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.
5. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0780G Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

SOILS MAP AND FEMA FIRM PANEL

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

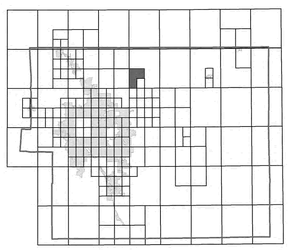
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

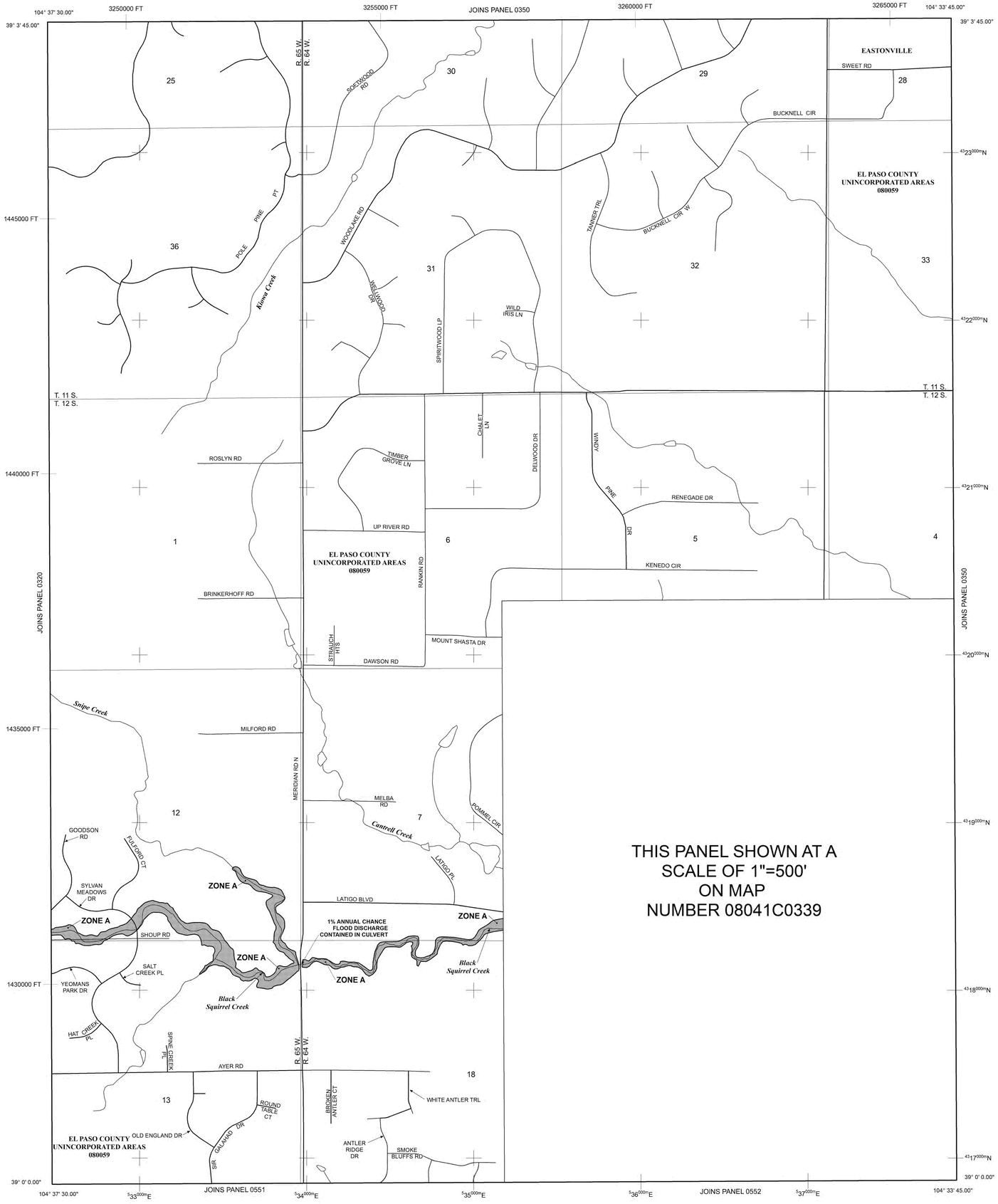
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



THIS PANEL SHOWN AT A SCALE OF 1"=500' ON MAP NUMBER 08041C0339

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) 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.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
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 North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0340G

MAP REVISED TO REFLECT LOMR(S) EFFECTIVE DECEMBER 7, 2018

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 340 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0340	G

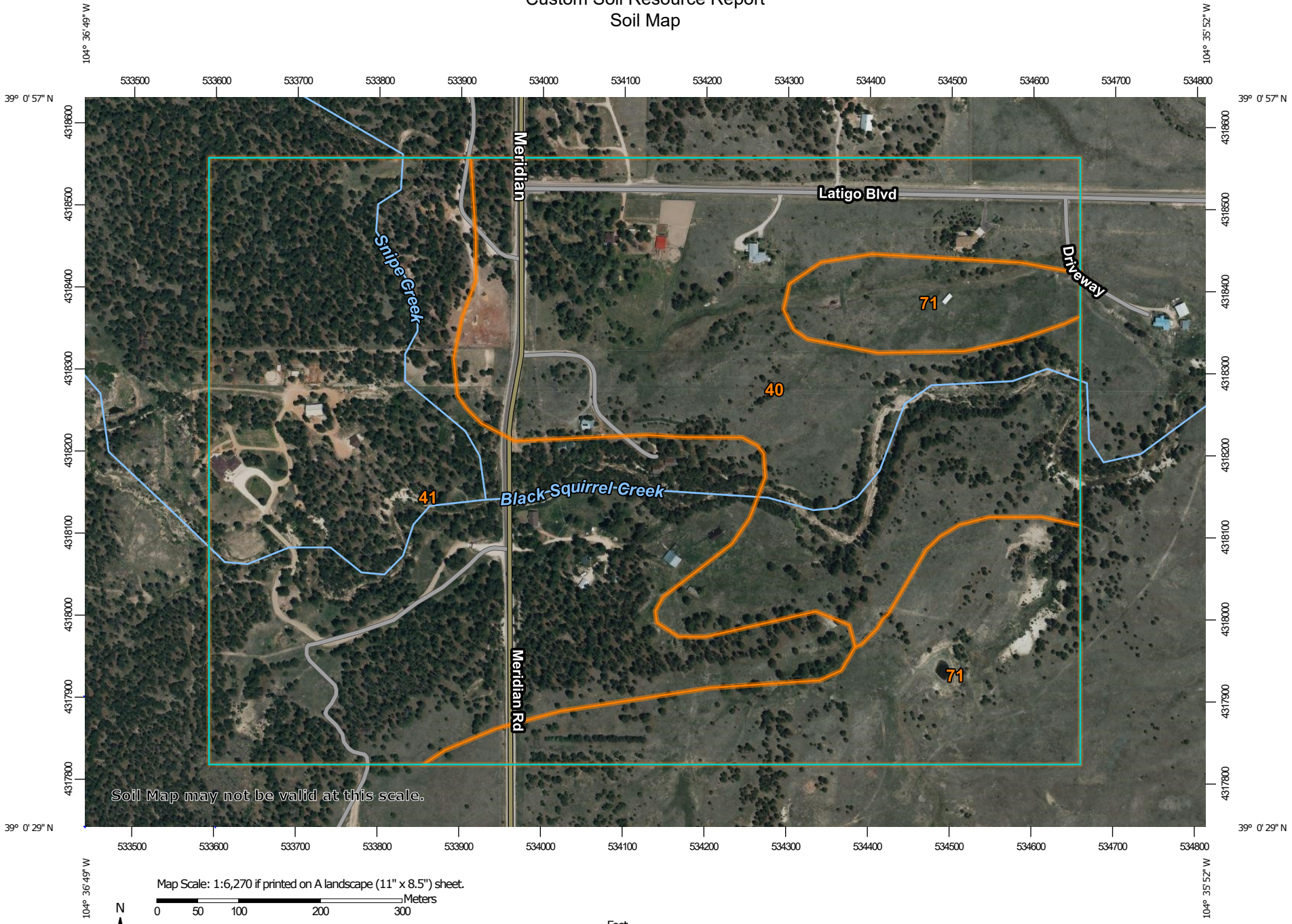
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0340G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

Custom Soil Resource Report
Soil Map



Map Scale: 1:6,270 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	72.9	37.3%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	86.2	44.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	36.5	18.6%
Totals for Area of Interest		**195.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

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
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 supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
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

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
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 supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
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

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
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 supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
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

HYDROLOGIC CALCULATIONS

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION
EXISTING CONDITIONS

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK
DATE: 9/4/2024

SOIL: B

LAND USE:	DRIVES/WALKS AREA	ROOFS AREA	GRAVEL AREA	LANSCAPE AREA
2-YEAR COEFF.	0.89	0.73	0.60	0.04
5-YEAR COEFF.	0.90	0.75	0.63	0.15
10-YEAR COEFF.	0.92	0.77	0.66	0.25
100-YEAR COEFF.	0.96	0.83	0.74	0.50
IMPERVIOUS %	100%	90%	80%	0%

DESIGN BASIN	DESIGN POINT	DRIVES/WALKS AREA (AC)	ROOFS AREA (AC)	GRAVEL AREA (AC)	LANSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(10)	C(100)	Imp %
FDR Basins											
E1	E1	0.00	0.03	0.13	7.34	**7.50**	0.05	0.16	0.26	0.51	2%
E2	E2	0.00	0.13	0.00	7.42	**7.55**	0.05	0.16	0.26	0.51	2%
E3	E3	0.00	0.00	0.00	5.97	**5.97**	0.04	0.15	0.25	0.50	0%
OE1	OE1	0.35	0.07	0.14	13.77	**14.33**	0.07	0.18	0.27	0.52	4%
OE2	OE2	0.20	0.06	0.10	7.97	**8.33**	0.07	0.18	0.27	0.52	4%
TOTAL - OVERALL		**0.55**	**0.29**	**0.37**	**42.47**	**43.67**	**0.06**	**0.17**	**0.27**	**0.51**	**3%**
		1%	**1%**	**1%**	**97%**	**100%**					

Note: Land use coefficients sourced from City of Colorado Springs Drainage Criteria Manual, Volume 1, Table 6-6.

Kimley»Horn

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)					FINAL Tc
DESIGN BASIN (1)	AREA Ac (2)	C5 (3)	LENGTH Ft (4)	SLOPE % (5)	T_i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C_v (9)	VEL fps (11)	T_t Min. (12)	COMP. tc (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	Tc Min. (17)	Min.
FDR Basins																
E1	7.50	0.16	300	3.1%	20.5	1,755	3.0%	2.5	0.4	67.5	88.0	2055	3.0%	2%	21.4	21.4
E2	7.55	0.16	300	15.0%	12.1	410	0.6%	2.5	0.2	35.3	47.4	710	6.7%	2%	13.9	13.9
E3	5.97	0.15	300	1.5%	26.4	825	5.0%	2.5	0.6	24.6	51.0	1125	4.1%		16.3	16.3
OE1	14.33	0.18	300	4.5%	17.8	515	1.4%	2.5	0.3	29.0	46.8	815	2.5%	4%	14.5	14.5
OE2	8.33	0.18	300	3.1%	20.1	500	5.8%	2.5	0.6	13.8	33.9	800	4.8%	4%	14.4	14.4

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_0^{0.33}} \qquad t_c = \frac{L}{180} + 10 \qquad V = C_v S_w^{0.5}$$

Note: Conveyance coefficient from Table 6-7 of DCM

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 2 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		E1	E1	7.50	0.16	21.42	1.20	2.39	2.87													
		E2	E2	7.55	0.16	13.94	1.21	2.90	3.50													
		E3	E3	5.97	0.15	16.25	0.89	2.72	2.43													
		OE1	OE1	14.33	0.18	14.53	2.52	2.85	7.19													
		OE2	OE2	8.33	0.18	14.44	1.48	2.86	4.24													

$$I_2 = -1.19\ln(t_{c,min}) + 6.035$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		E1	E1	7.50	0.16	21.42	1.20	2.99	3.59													
		E2	E2	7.55	0.16	13.94	1.21	3.63	4.39													
		E3	E3	5.97	0.15	16.25	0.89	3.40	3.04													
		OE1	OE1	14.33	0.18	14.53	2.52	3.57	9.00													
		OE2	OE2	8.33	0.18	14.44	1.48	3.58	5.30													

$$I_5 = -1.5\ln(t_{c,min}) + 7.583$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		E1	E1	7.50	0.51	21.42	3.79	5.01	19.00													
		E2	E2	7.55	0.51	13.94	3.82	6.09	23.26													
		E3	E3	5.97	0.50	16.25	2.98	5.71	17.03													
		OE1	OE1	14.33	0.52	14.53	7.38	5.99	44.24													
		OE2	OE2	8.33	0.52	14.44	4.30	6.01	25.82													

$$I_{100} = -2.52\ln(t_{c,min}) + 12.735$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

PROJECT NAME: KNECHT MINOR SUBDIVISION 9/4/2024
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

EXISTING CONDITIONS RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	CFS			% IMPERVIOUS
			Q2	Q5	Q100	
FDR Basins						
E1	E1	7.50	2.87	3.59	19.00	2%
E2	E2	7.55	3.50	4.39	23.26	2%
E3	E3	5.97	2.43	3.04	17.03	0%
OE1	OE1	14.33	7.19	9.00	44.24	4%
OE2	OE2	8.33	4.24	5.30	25.82	4%
TOTAL		**43.67**	**20.23**	**25.33**	**129.35**	**3%**

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION
PROPOSED CONDITIONS

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK
DATE: 9/4/2024

SOIL: B

LAND USE:	DRIVES/WALKS AREA	ROOFS AREA	GRAVEL AREA	LANSCAPE AREA
2-YEAR COEFF.	0.89	0.73	0.60	0.04
5-YEAR COEFF.	0.90	0.75	0.63	0.15
10-YEAR COEFF.	0.92	0.77	0.66	0.25
100-YEAR COEFF.	0.96	0.83	0.74	0.50
IMPERVIOUS %	100%	90%	80%	0%

DESIGN BASIN	DESIGN POINT	DRIVES/WALKS AREA (AC)	ROOFS AREA (AC)	GRAVEL AREA (AC)	LANSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(10)	C(100)	Imp %
FDR Basins											
P1	P1	0.05	0.03	0.98	6.44	**7.50**	0.12	0.22	0.31	0.54	11%
P2	P2	0.00	0.13	0.08	7.34	**7.55**	0.06	0.17	0.26	0.51	2%
P3	P3	0.00	0.46	0.25	5.26	**5.97**	0.12	0.22	0.31	0.54	10%
OP1	OP1	0.35	0.07	0.14	13.77	**14.33**	0.07	0.18	0.27	0.52	4%
OP2	OP2	0.20	0.06	0.10	7.97	**8.33**	0.07	0.18	0.27	0.52	4%
TOTAL - OVERALL		**0.60**	**0.74**	**1.55**	**40.78**	**43.67**	**0.08**	**0.19**	**0.28**	**0.52**	**6%**
		1%	**2%**	**4%**	**93%**	**100%**					

Note: Land use coefficients sourced from City of Colorado Springs Drainage Criteria Manual, Volume 1, Table 6-6.

Kimley»Horn

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: **KNECHT MINOR SUBDIVISION**
PROJECT NUMBER: **196775000**
CALCULATED BY: **WDE**
CHECKED BY: **KRK**

PROPOSED CONDITIONS

DATE: 9/4/2024

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)					FINAL Tc
DESIGN BASIN (1)	AREA Ac (2)	C5 (3)	LENGTH Ft (4)	SLOPE % (5)	T_i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C_v (9)	VEL fps (11)	T_t Min. (12)	COMP. tc (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	Tc Min. (17)	Min.
FDR Basins																
P1	7.50	0.22	300	2.5%	20.6	450	0.5%	7.0	0.5	15.2	35.7	750	1.3%	11%	14.2	14.2
P2	7.55	0.17	300	15.0%	12.0	410	0.6%	2.5	0.2	35.3	47.3	710	6.7%	2%	13.9	13.9
P3	5.97	0.22	300	1.5%	24.5	825	5.0%	2.5	0.6	24.6	49.1	1125	4.1%	10%	16.3	16.3
OP1	14.33	0.18	300	4.5%	17.8	515	1.4%	2.5	0.3	29.0	46.8	815	2.5%	4%	14.5	14.5
OP2	8.33	0.18	300	3.1%	20.1	500	5.8%	2.5	0.6	13.8	33.9	800	4.8%	4%	14.4	14.4

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_0^{0.33}} \qquad t_c = \frac{L}{180} + 10 \qquad V = C_v S_w^{0.5}$$

Note: Conveyance coefficient from Table 6-7 of DCM

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 2 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		P1	P1	7.50	0.22	14.17	1.65	2.88	4.75													
		P2	P2	7.55	0.17	13.94	1.25	2.90	3.62													
		P3	P3	5.97	0.22	16.25	1.29	2.72	3.50													
		OP1	OP1	14.33	0.18	14.53	2.52	2.85	7.19													
		OP2	OP2	8.33	0.18	14.44	1.48	2.86	4.24													

$$I_2 = -1.19\ln(t_{c,min}) + 6.035$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		P1	P1	7.50	0.22	14.17	1.65	3.61	5.95													
		P2	P2	7.55	0.17	13.94	1.25	3.63	4.53													
		P3	P3	5.97	0.22	16.25	1.29	3.40	4.39													
		OP1	OP1	14.33	0.18	14.53	2.52	3.57	9.00													
		OP2	OP2	8.33	0.18	14.44	1.48	3.58	5.30													

$$I_5 = -1.5\ln(t_{c,min}) + 7.583$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: KNECHT MINOR SUBDIVISION
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS

DATE: 9/4/2024

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		P1	P1	7.50	0.54	14.17	4.02	6.05	24.33													
		P2	P2	7.55	0.51	13.94	3.84	6.09	23.38													
		P3	P3	5.97	0.54	16.25	3.19	5.71	18.24													
		OP1	OP1	14.33	0.52	14.53	7.38	5.99	44.24													
		OP2	OP2	8.33	0.52	14.44	4.30	6.01	25.82													

$$I_{100} = -2.52 \ln(t_{c,min}) + 12.735$$

Note: Rainfall intensity from Figure 6-5 IDF Equations

Kimley»Horn

PROJECT NAME: KNECHT MINOR SUBDIVISION 9/4/2024
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: KRK

PROPOSED CONDITIONS RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	CFS			% IMPERVIOUS
			Q2	Q5	Q100	
FDR Basins						
P1	P1	7.50	4.75	5.95	24.33	11%
P2	P2	7.55	3.62	4.53	23.38	2%
P3	P3	5.97	3.50	4.39	18.24	10%
OP1	OP1	14.33	7.19	9.00	44.24	4%
OP2	OP2	8.33	4.24	5.30	25.82	4%
TOTAL		**43.67**	**23.30**	**29.17**	**136.00**	**6%**

SITE PHOTOS

EXISTING ACCESS TO 12475 N. MERIDIAN DRIVE

UPPER BLACK SQUIRREL CREEK (WALKING EAST TO WEST ALONG SOUTHERN PROPERTY LINE)

INTERSECTION OF TWO EXISTING OVERHEAD ELECTRIC LINES

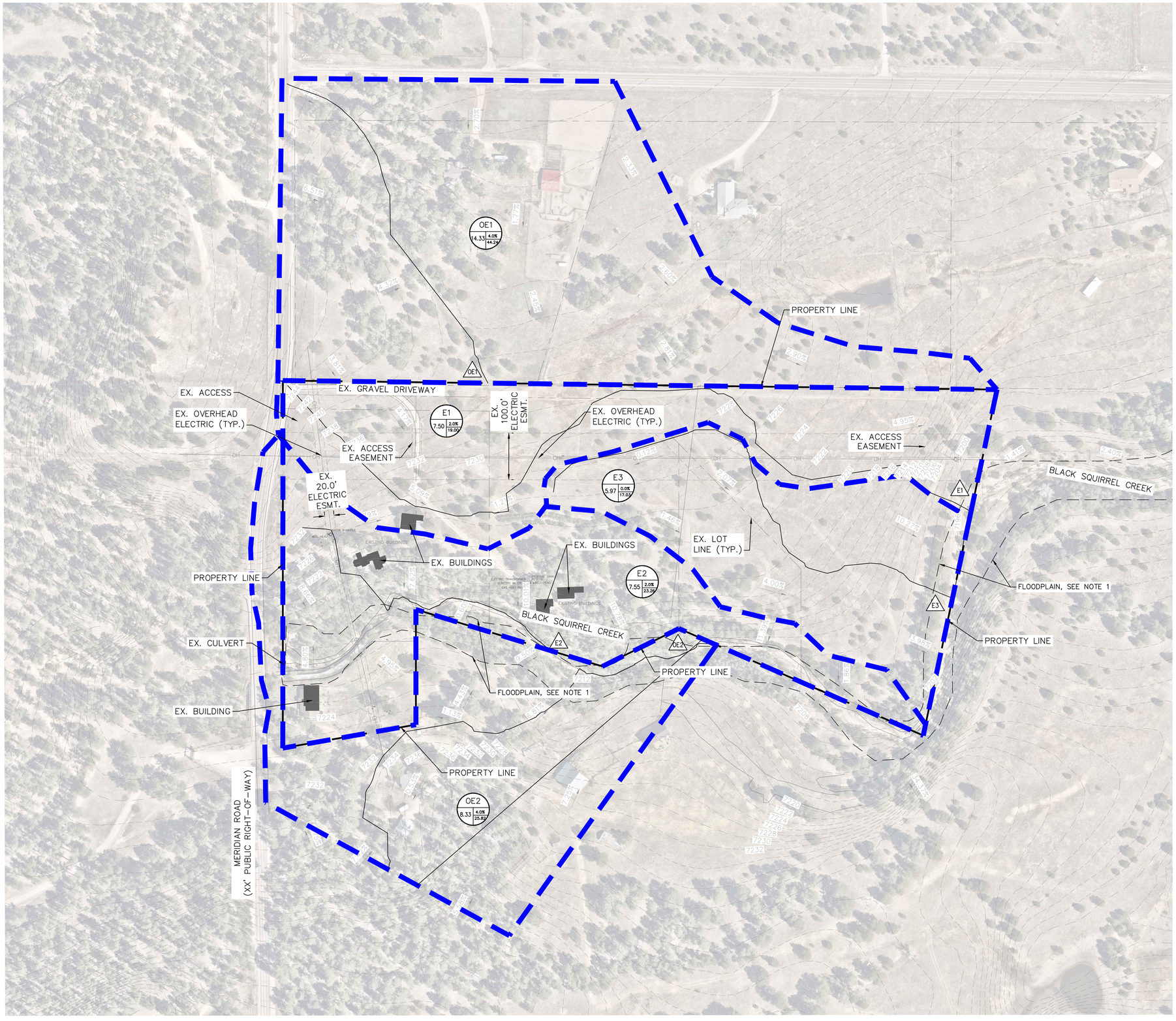
EXISTING STRUCTURE

EXISTING STRUCTURE

EXISTING STRUCTURE

EXISTING DRIVEWAY

EXISTING AND PROPOSED DRAINAGE MAP



LEGEND

- PROPERTY LINE
- XXXX EX. MAJOR CONTOUR
- XXXX EX. MINOR CONTOUR
- EX. DRAINAGE BASIN BOUNDARY

A = BASIN DESIGNATION
B = AREA IN ACRES
C = % IMPERVIOUSNESS
D = 100-YR RUNOFF

\# = DESIGN POINT DESIGNATION

X.XX% EXISTING SLOPE ARROW

Kimley»Horn

PROJECT NAME: KNECHT MINOR SUBDIVISION 8/14/2024
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: G

EXISTING CONDITIONS RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	CFS Q2	CFS Q5	CFS Q100	% IMPERVIOUS
FDR Basins						
E1	E1	7.50	2.87	3.59	19.00	2%
E2	E2	7.55	3.50	4.39	23.26	2%
E3	E3	5.97	2.43	3.04	17.03	0%
OE1	OE1	14.33	7.19	9.00	44.24	4%
OE2	OE2	8.33	4.24	5.30	25.82	4%
TOTAL		**43.67**	**20.23**	**25.33**	**129.35**	**3%**

NOTES

1. DRAFT MODEL BACKED BFES AND FLOODPLAIN EXTENTS FOR THIS AREA HAVE BEEN DEVELOPED AS PART OF PHASE 1 FOR THE ONGOING EL PASO COUNTY, CO, RISK MAP PROJECT*. THE DATA HAS BEEN REVIEWED AND APPROVED THROUGH FEMA'S QA/QC PROCESS (MAY 11, 2022) AND IS CURRENTLY IN THE MIP (CASE NO. 19-08-0037S). THE PHASE 1/BASE LEVEL ENGINEERING OUTPUTS AND ZONE A READY DELIVERABLES ARE, UNDER THE FOLLOWING FOLDER: K:/FY2019/19-08-0037S/DISCOVERY - BLE - EL PASO AND TELLER COUNTIES, CO - FY18 - 04/DISCOVERY DATA CAPTURE - DISCOVERY DATA CAPTURE - EL PASO AND TELLER COUNTIES, CO - 01/EL PASO_DISCOVERY_1. FLOODPLAIN EXTENTS AND BASE FLOOD ELEVATIONS (BFES) SHOWN HEREON INCLUDE BOTH CURRENT EFFECTIVE AND CWCB PHASE 1 DATA.

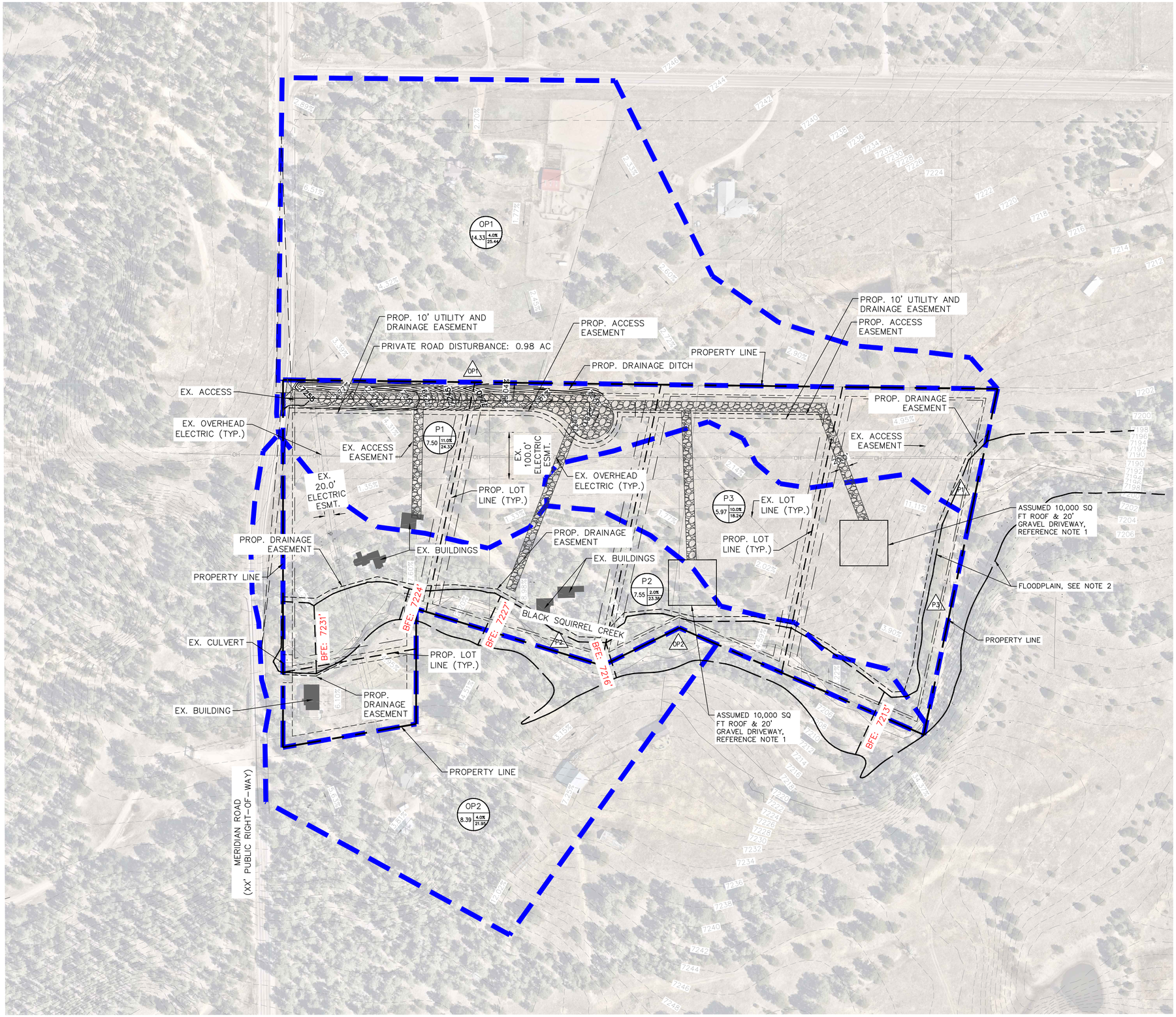
NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

KNECHT MINOR SUBDIVISION
EXISTING DRAINAGE MAP

Kimley»Horn

Date: September 05, 2024 - 8.41am / User: KevinKofford
Path: K:\COS_Dev\196775000_Knecht minor subdivision\CAD\Exhibits\Drainage\Ex.Conditions Drainage Map.dwg



LEGEND

- PROPERTY LINE
- XXXX EX. MAJOR CONTOUR
- XXXX EX. MINOR CONTOUR
- XXXX PROP. MAJOR CONTOUR
- XXXX PROP. MINOR CONTOUR
- DRAINAGE BASIN BOUNDARY

A = BASIN DESIGNATION
B = AREA IN ACRES
C = % IMPERVIOUSNESS
D = 100-YR RUNOFF

\# = DESIGN POINT DESIGNATION

X.XX% EXISTING SLOPE ARROW

X.XX% PROPOSED SLOPE ARROW

Kimley»Horn

PROJECT NAME: KNECHT MINOR SUBDIVISION 8/14/2024
PROJECT NUMBER: 196775000
CALCULATED BY: WDE
CHECKED BY: 0

PROPOSED CONDITIONS RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	CFS Q2	CFS Q5	CFS Q100	% IMPERVIOUS
FDR Basins						
P1	P1	7.50	4.75	5.95	24.33	11%
P2	P2	7.55	3.62	4.53	23.38	2%
P3	P3	5.97	3.50	4.39	18.24	10%
OP1	OP1	14.33	7.19	9.00	44.24	4%
OP2	OP2	8.33	4.24	5.30	25.82	4%
TOTAL		**43.67**	**23.30**	**29.17**	**136.00**	**6%**

NOTES

1. SINGLE FAMILY LOTS GREATER THAN OR EQUAL TO 2.5 ACRES IN SIZE PER DWELLING AND HAVING A TOTAL LOT IMPERVIOUS AREA OF LESS THAN 10 PERCENT.
2. DRAFT MODEL BACKED BFES AND FLOODPLAIN EXTENTS FOR THIS AREA HAVE BEEN DEVELOPED AS PART OF PHASE 1 FOR THE ONGOING EL PASO COUNTY, CO, RISK MAP PROJECT". THE DATA HAS BEEN REVIEWED AND APPROVED THROUGH FEMA'S QA/QC PROCESS (MAY 11, 2022) AND IS CURRENTLY IN THE MIP (CASE NO. 19-08-0037S). THE PHASE 1/BASE LEVEL ENGINEERING OUTPUTS AND ZONE A READY DELIVERABLES ARE, UNDER THE FOLLOWING FOLDER: K:/FY2019/19-08-0037S/DISCOVERY - BLE - EL PASO AND TELLER COUNTIES, CO - FY18 - 04/DISCOVERY DATA CAPTURE - DISCOVERY DATA CAPTURE - EL PASO AND TELLER COUNTIES, CO - 01/EL PASO_DISCOVERY_1. FLOODPLAIN EXTENTS AND BASE FLOOD ELEVATIONS (BFES) SHOWN HEREON INCLUDE BOTH CURRENT EFFECTIVE AND CWCB PHASE 1 DATA.

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

KNECHT MINOR SUBDIVISION
PROPOSED DRAINAGE MAP

Kimley»Horn

Date: September 05, 2024 - 8:41am / User: Kevin.Kofford
Path: K:\COS_DN\196775000_Knecht minor subdivision\CADD\Exhibits\Drainage\Pr. Conditions Drainage Map.dwg