

Drainage Letter Report

1830 MAIN STREET
COLORADO SPRINGS, COLORADO
80911

PREPARED FOR: CHARLES HOLLIDAY
WESTERN STATES MANAGEMENT GROUP
13990 BARBWIRE LANE
COLORADO SPRINGS, CO 80930

August 7, 2019

Prepared by
Richard Lyon, P.E.
Rocky Mountain Group
2910 Austin Bluffs Parkway | Colorado Springs, CO 80918

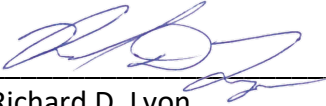


PCD File No.: TBD

Drainage Report Statements

1. Engineer's 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 the City/County for drainage reports and said report is in conformity with the master plan for the drainage basin. I accept responsibility for liability caused by negligent acts, errors or omissions on my part in preparing this report:


Richard D. Lyon Colorado P.E. No. 53921



2. Developer's Statement:

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

Business Name

By: _____

Title: _____

Address: _____

3. EL PASO COUNTY:

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.

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Date

Conditions:

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Plan by Terra Nova Engineering, 10/27/2010

Appendix D – Rational Method Drainage Calculations

Appendix E – Sub-basin Delineation Exhibits

Call out a reference section and identify the references used to author this report.
Drainage basin Planning study.
Previous reports MDDP's, FDR's, etc.

1.0 Existing Conditions

Identify the Drainage basin this site is in.

1.1 Existing Site

Lot 4A of the Bradley Crossroads subdivision is located at the address of 1830 Main Street in Colorado Springs in El Paso County within the northern limits of the census-designated area of Security-Widefield. The 1.50 acre lot is located west of Main Street or the Hancock Expressway, south of Bradley Road, east of Service Road, and north of Gladiator Drive. The parcel number is 6502407105 and is platted as Plat No. 14143 and zoned as CC CAD-O. The parcel is surrounded by commercial development to the south and east and there is residential and school property further south of Gladiator Road. A vicinity map, survey maps with the legal description of the parcel and topography is provided in Appendix A. As part of the development plan, setbacks and adjacent easements are shown.

The property is currently empty for development containing native grasses with surrounding developed right of way such as asphalt paved roads, concrete curb and gutter with curb cuts for designated ingress/egress of the development, and utilities for service line extensions to the development. The site area is generally flat as it flows from its northeast property corner to the southwest at an average grade of 3 percent.

The development plans propose to build a 7,440 square foot commercial building with a concrete foundation and an asphalt and concrete paved parking and driving access area totaling approximately 1.25 acres. As such, a major development plan set and drainage letter are to be submitted to El Paso County. This drainage letter serves as an addendum to the previous Drainage Report developed by Terra Nova Engineering dated September of 2010 which includes information from the Final Drainage Report and Plan for Lincoln Plaza Subdivision Filing No. 2 by Leigh Whitehead & Associates, Inc. dated March 2001; Final Drainage Report for Lincoln Commons Subdivision by WestWorks Engineering, Inc. dated June 12, 2007, revised July 25, 2007 approved May 14, 2008; and Final Drainage Report for Bradley Crossroads by Terra Nova Engineering dated April 2007. As part of this drainage letter, computations and delineations are updated to reflect current EPC and UDFCD standards and present hydrology and hydraulic analysis for Lot 4A, specifically for the purposes of the major development application.

1.2 Existing Drainage Conditions

The drainage concept of Lot 4A consists of collection of runoff from the site through the main public storm water system via a public storm sewer grated inlet (5.5'x3.5') within Service Road to the west of the property. The public storm water system connects to a join-use storm water detention pond located within the Lincoln Commons site dedicated to the Bradley Crossroads development sites, including Lot 4A.

What is the report that studied this site and called out for its detention etc. to be provided on the Lincoln commons site

The site is contained within the Little Johnson/Security Creek Drainage Basin and is part of the Little Johnson/Security Creek Drainage Basin Planning Study dated April 1988 and compiled by Kiowa Engineering Corporation.

According to a subsurface soil investigation report prepared by RMG-Rocky Mountain Group. dated June 27, 2019, "Test Borings performed within the proposed building footprint revealed similar subsurface soil conditions across the site, being primarily silty sand to 17-feet depth (13-foot depth in Test Boring 2). Claystone bedrock was encountered beneath the sand in each Test Boring (sandy clay in Test Boring 4). The soil appears to be native soil in a loose to medium dense state of consolidation. Subsurface soil was classified according the Unified Classification System, and can generally be described as follows:

0 to 17-feet: Brown, moist, loose to medium dense, silty sand. This soil classifies generally as SM, Silty Sand.

17 to 20-feet: Brown with rust staining, moist, firm to hard, sandy claystone."

"Groundwater was not encountered in the Test Borings. While not anticipated to affect foundation design and construction, fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Contractors should, however, always be prepared to control groundwater during construction."

As part of this drainage letter, current criteria will be applied with updated basin and sub-basin delineations for existing conditions. The criteria used to analyze the existing drainage conditions is the rational method for the 5-year and 100-year storm event. The City of Colorado Springs and El Paso County Drainage Criteria Manual, Volumes 1 and 2, were used for hydrologic and hydraulic calculations. FEMA Floodplain maps are provided in Appendix A.

The existing drainage conditions of the lot are presented in the civil exhibit and calculations in the Appendix. The majority of the lot's existing area designated as Sub-basin E-1 has peak flows of $Q_5 = 0.04$ cfs, $Q_{10} = 0.06$ cfs, and $Q_{100} = 1.03$ cfs. The portion of the roadways that flow to the existing curb and gutter is designated as Sub-basin E-2 has peak flows of $Q_5 = 0.20$ cfs, $Q_{10} = 0.25$ cfs, and $Q_{100} = 0.73$ cfs. A small portion of the lot within the existing landscape/public improvement buffer containing existing sidewalk, landscaping, and curb and gutter that flows to Main Street is designated as Sub-basin E-3 and has peak flows of $Q_5 = 0.01$ cfs, $Q_{10} = 0.01$ cfs, and $Q_{100} = 0.04$ cfs. All off-site flows are accounted for in the original drainage report for the subdivision and off-site areas are not to be altered as a part of this development, therefore the historical drainage of off-site basins will not be altered.

2.0 Proposed Conditions

The site development includes a 7,440 square foot commercial building, approximately 1.25 acres of concrete and asphalt pavement and curb and gutter as well as landscaped areas within the parking lot. The regrading of the site to conform to parking lot grading standards and

vehicle and pedestrian access is generally consistent with the historical drainage pattern. The developed site conveys storm water from the east to the west to the public storm grated inlet within Service Street (Design Point 1), consistent with pre-developed conditions.

The developed drainage concept will be to provide positive drainage away from proposed structure and generally conform to historic drainage patterns by routing the stormwater via the curb and gutter, concrete drainage pans within the parking lot and sheet flow across landscaped area. The development will have minimal impact to downstream facilities as the storm water will drain to the public storm water system and eventually to the joint-use detention facility dedicated for this subdivision for developments consistent with the proposed site. Developed peak flows at Design Point #1 collect storm water from Sub-basin D-1 and D-2. Sub-basin D-1 has storm water peak flows of $Q_5 = 3.68$ cfs, $Q_{10} = 4.52$ cfs, and $Q_{100} = 8.58$ cfs. Developed peak flows at Sub-basin D-2 are $Q_5 = 0.22$ cfs, $Q_{10} = 0.28$ cfs, and $Q_{100} = 0.71$ cfs. As with the existing conditions, Sub-basin D-3 flows to Main Street and is not to be developed; the peak flows are $Q_5 = 0.01$ cfs, $Q_{10} = 0.01$ cfs, and $Q_{100} = 0.04$ cfs.

The storm water volume increases to DP1 are 3.66 cfs for a 5 year storm, 4.49 cfs for a 10 year storm, and 7.53 cfs for a 100 year storm from the existing drainage conditions. The development is consistent with a typical development for this site/zoning. Commercial developments typically range from 75 percent imperviousness in suburban areas to 95 percent imperviousness in downtown areas for assumed flow conditions in undeveloped parcels such as this. The proposed development at Lot 4A is approximately 78 percent impervious in total, consistent with typical values for downstream drainage design. The drainage volumes and flows are accounted for in the public storm sewer system for conveyance as well as the detention facility downstream. Provide a plan and calculations to show this.

As part of the construction process, proper erosion control measures will be required for development of the site including silt fencing along downstream limits of disturbance to minimize off-site transport of construction sediment and inlet protection of nearby and downstream storm sewer inlets. Other control measures such as rock socks along channelized flow areas, a vehicle tracking pad, a concrete washout area, and erosion blankets are to be installed in appropriate areas. An erosion control plan is provided in the development plan set as a guide to proper control measure placement.

The Developed Drainage Plan includes the following notes for Builders and Property Owners:

1. Proposed site conditions shall not significantly vary from the conditions presented in this report. The degree to which variance from the proposed conditions allowed is at the discretion of the County. The most critical variable is the percent impervious of the site.
2. Individual builders shall provide positive drainage away from structures and account for potential cross-lot drainage impacts within the lot.
3. The builders and property owner shall implement and maintain erosion control best management practices/control measures for protection of downstream properties and facilities.

4. Recognizing the location of this subdivision adjacent to the storm inlets and developed downstream properties, the builders and property owner shall take extra care in providing and maintaining erosion control BMP's/control measures at downstream property boundaries.

3.0 Floodplain Impacts

According to the FEMA floodplain map for this area, El Paso County FIRM Panel No. 08041C0763G, dated December 7, 2018 (see Appendix A), the entire parcel falls into Zone X, an area of minimal flood hazard.

3.1 Four-Step Process

The selection of appropriate BMPs is based on the characteristics of the site and potential pollutants. The Four-Step Process provides a method of going through the selection process. The following applies the four-step process to the preliminary development plan for the development of Lot 4A:

Step 1: Employ Runoff Reduction Practices

The development plan consists of the minimal area of pavement for ease of access, turnarounds for larges, pedestrian access to the structure, and parking. The remainder of the parcel is to be permanently stabilized with grasses and vegetation to improve percolation and overall drainage.

Step 2: Stabilize Drainageways

Stabilized drainageways via concrete curb and gutter and concrete drainage pans are proposed to ensure proper flows.

Step 3: Provide Water Quality Capture Volume

A storm water facility for water quality capture and detention exists downstream of the development and accounts for this lot's development as well as future development of the subdivision. [Discuss WQCV.](#)

Step 4: Consider the Need for Industrial and Commercial BMPs

Since the lot is to be utilized as commercial storefronts, there is no need for industrial BMPs. There will be no storage/handling areas or a need for permanent spill containment and control. The commercial development will have a separate grease sanitary line that goes to a 2,500 gallon two-compartment settling tank to accommodate all of the proposed units within the structure.

4.0 Public Improvements / Drainage Basin Fee

No public drainage improvements are required or proposed for this project. According to El Paso County policies, drainage basin fees are due based on the impervious area projected for the new development but are not applicable with site development plans; therefore, no drainage fees are due.

Fees were previously paid at the time this lot was platted.

5.0 Summary

The proposed drainage patterns for the lot will generally remain consistent with historic conditions and the increase in storm water runoff is accounted for in the public storm water system and downstream detention facility for the subdivision. The development results in an increase of storm water volume that is consistent with the type of development designated for this parcel and zoning. The development will have negligible impact to downstream facilities. Should the proposed site plan for this lot vary significantly from the assumptions made in this Drainage Letter Report, a revised report with updated calculations shall be required. Additionally, should the proposed development vary and cause an increase in storm runoff volumes and result in significant impacts to downstream facilities, the proposed development shall be subject to detention and water quality requirements. Installation and maintenance of proper erosion control practices during and after construction will ensure that this developed site will not adversely affect downstream or surrounding areas.

Calculate the SWQCV and FSD volume for this site and show how these volumes are accounted for in the downstream detention facility. Does the downstream facility meet current criteria for SWQCV? does this facility provide the detention required by previous reports and the DBPS?

Provide a drawing of the storm sewer system that conveys this sites drainage to the detention facility. And describe the detention facility. Show and describe calculations that verify the capacity of these systems.

Who is responsible to maintain the detention facility (Terra nova says on the Lincoln Commons Site?) You indicate the storm sewer system is a Public system?

Appendix A: FEMA Floodplain Map

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, NNGS12
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.

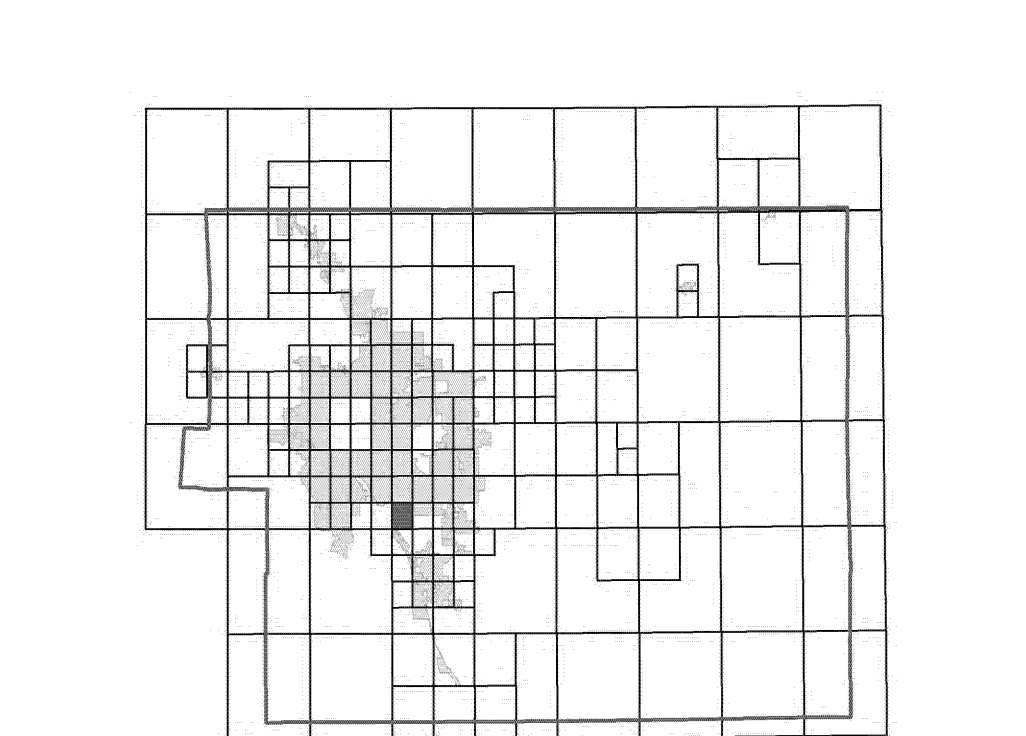
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIMX) 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/nfp>.

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	

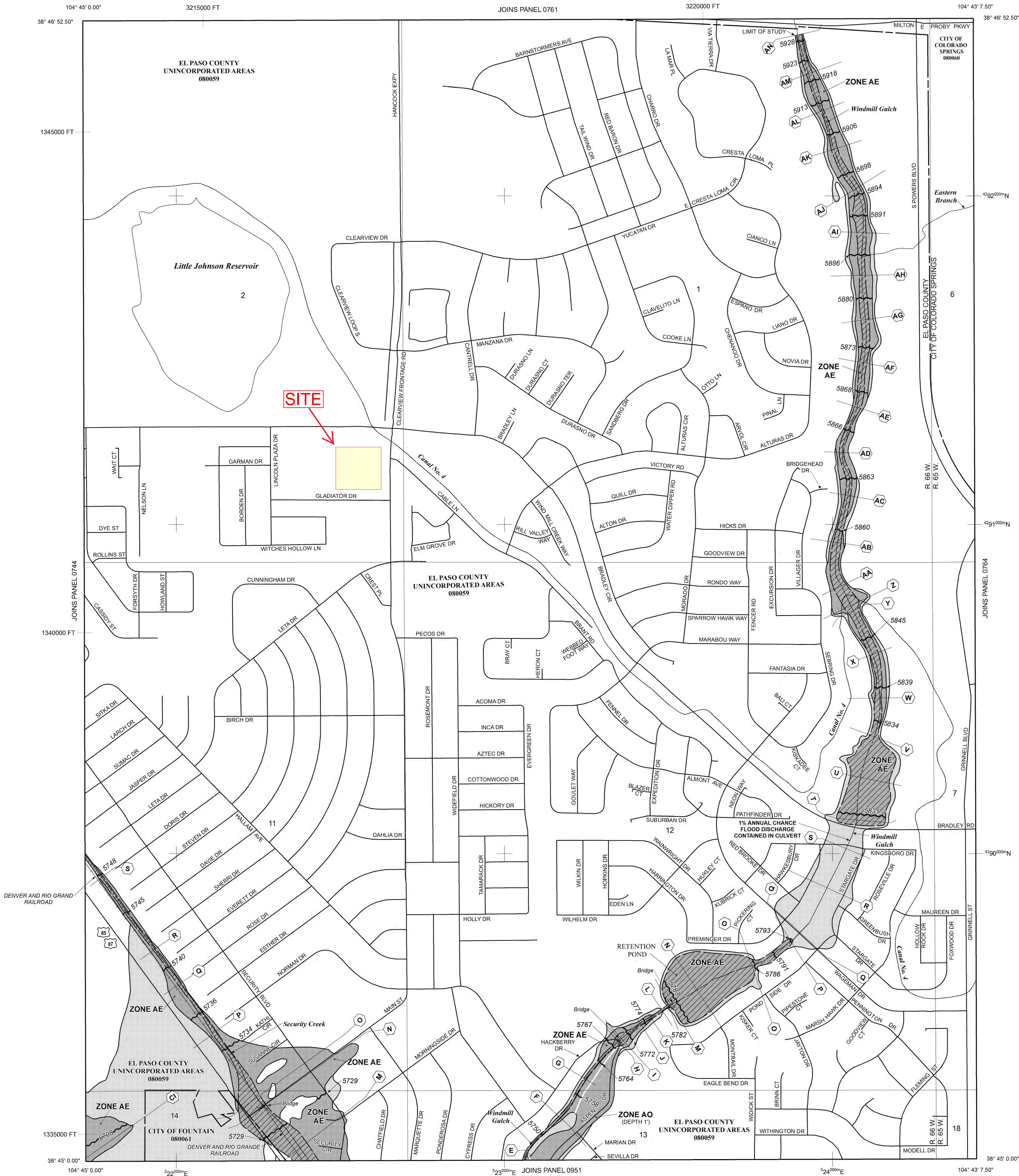
Panel Location Map



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.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 15 SOUTH, RANGE 65 WEST, AND TOWNSHIP 15 SOUTH, RANGE 66 WEST.

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 equalled 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 decrettified. 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.
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)

Cross section line
Transsect line

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

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (TPSZONE 0902), Lambert Conformal Conic Projection

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

River Mile

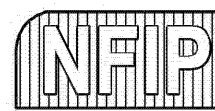
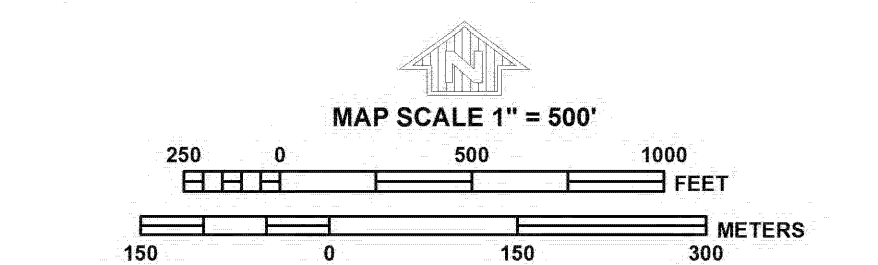
MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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.



PANEL 0763G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS

PANEL 763 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0763	G
EL PASO COUNTY	080059	0763	G
FOUNTAIN, CITY OF	080061	0763	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.



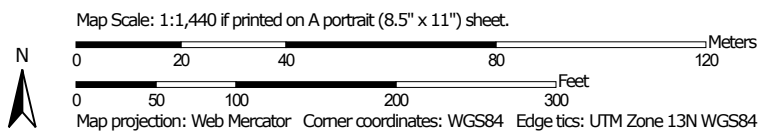
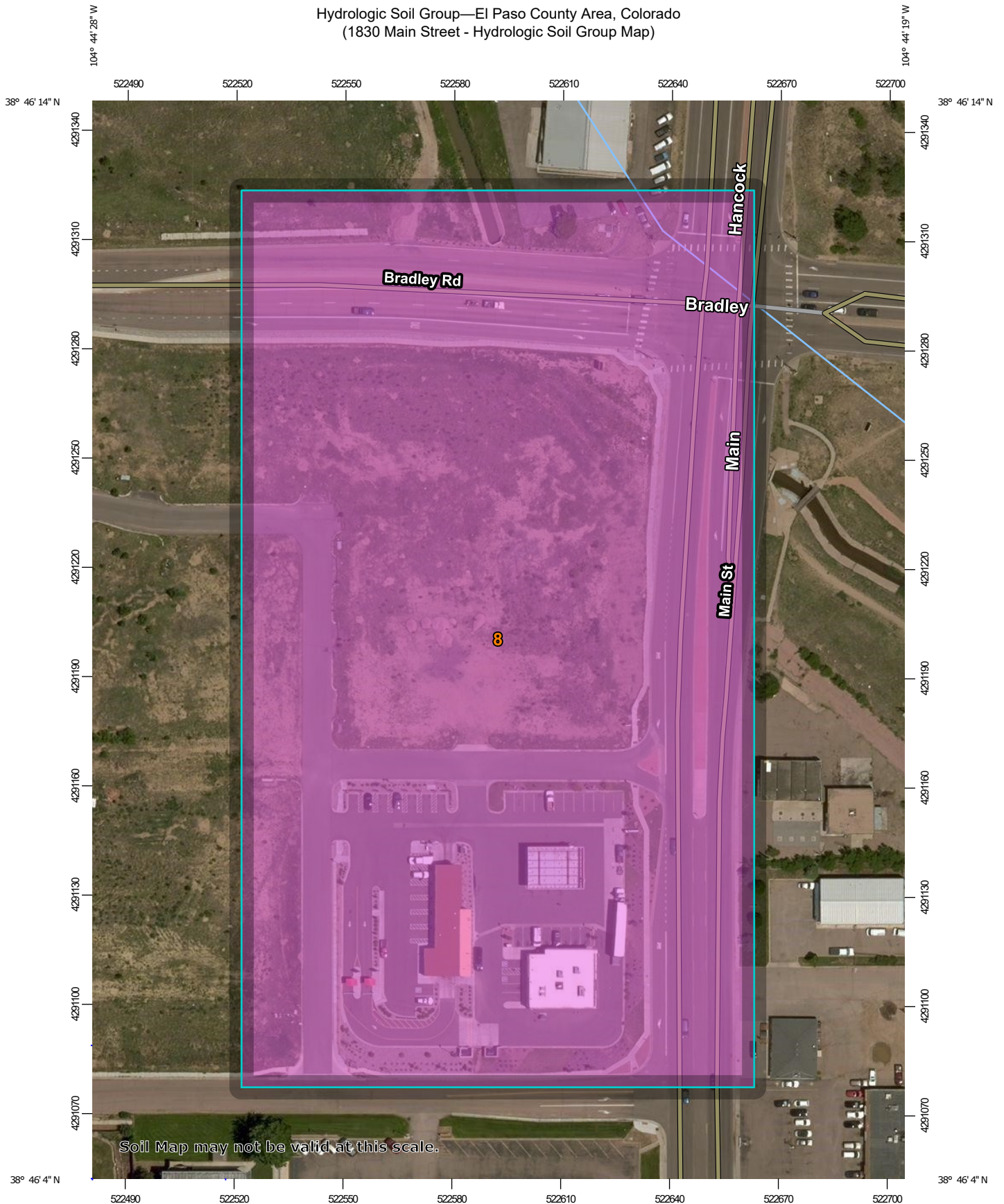
MAP NUMBER
08041C0763G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix B: USGS Soils Map

Hydrologic Soil Group—El Paso County Area, Colorado (1830 Main Street - Hydrologic Soil Group Map)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

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 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 2014

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	8.6	100.0%
Totals for Area of Interest			8.6	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix C: Final Drainage Letter by Terra Nova Engineering

11111111011111



FINAL DRAINAGE LETTER
FOR
BRADLEY CROSSROADS FILING NO. 1
LOT 7 SITE DEVELOPMENT PLAN

September, 2010

Prepared For:
Bradley Crossroads, LLC
150 Wuthering Heights Ct.
Colorado Springs, CO 80921

Prepared By:
TERRA NOVA ENGINEERING, INC.
815 S. 25th Street
Colorado Springs, CO 80904
(719) 635-6422

Job No. 0637.00

nl

RECEIVED

OCT 27 2010

EPC DEVELOPMENT SERVICES

ENGINEER'S 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 the City/County for drainage reports and the 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.

Antin Armijo, P.E. • 37170

A) 2-6/

Developer's Statement:

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

Bra Crossroads, LLC

By: Mr. Brian Schumann

Title: **WartgaGieia**

Address: 150 Wuthering Heights Court
Colorado Springs, Co 80921

REVIEWED FOR GENERAL
COMPLIANCE WITH
EL PASO COUNTY
ENGINEERING CRITERIA

BY.

DATE:

"-HO

May 18, 2010

El Paso County Development Services
c/o Jeffrey D. Rice, P.E.
2880 International Circle, Suite 110
Colorado Springs, CO 80910

Attn: Mr. Jeffrey Rice

RE: Final Drainage Letter for Bradley Crossroads Filing No. 1 — Lot 7

Dear Mr. Rice:

This letter is submitted on behalf of our client, Bradley Crossroads, LLC with regard to the property located as noted above. The overall site is located in Security, Colorado, County of El Paso, State of Colorado. The site is bounded on the east by Main St. (Hancock Expwy.), on the west by Lincoln Commons, on the south by Gladiator Dr., and on the north by Bradley Road. It contains approximately 486,565 square feet or 11.17 acres.

This letter is prepared to accompany the proposed Site Development Plan submittal. The existing overall site consists of seven (7) lots that vary in size from 0.734 acre to 5.577 acres. Lot 7 is 0.764 acre. The impervious and non-impervious areas on the entire site remain relatively unchanged as do the storm water flows for all lots.

Lot 7 will be a combination of self-serve and automatic car wash bays (building 2). The car wash water will be captured in a system that eventually outfalls to the sanitary sewer system via an oil/grease separator sized for this type of facility. The remaining storm water that falls on and around the footprint of the building will be transported to area inlets which are then connected to the existing storm water collection system within the site.


Runoff from the site collects through the main public storm water system running westerly then southwesterly into a junction box at the southwest corner of the overall property. From here it connects to a joint-use storm water detention pond located within the Lincoln Commons site.

The existing site is located on the FEMA FIRM Map number 08041C0763 F dated March 17, 1997. Bradley Crossroads is located outside of the existing floodplain.

As this site was previously platted, no drainage or bridge fees will be required.

The site is contained within the Little Johnson Drainage Basin and is a part of the Little Johnson/Security Creek Drainage Basin Planning Study dated April 1988 and compiled by Kiowa Engineering Corporation. This site has a previously approved Final Drainage Report written by Terra Nova Engineering, Inc. and dated revised November 2008.

Respectfully submitted,
Terra Nova Engineering

A handwritten signature in black ink, appearing to read 'Quentin Armijo', with a long horizontal stroke extending to the right.

Quentin Armijo, P.E. # 37170.
Project Manager

BIBLIOGRAPHY

"El Paso County and City of Colorado Springs Drainage Criteria Manual".

"El Paso County Engineering Criteria Manual"

SCS Soils Map for El Paso County

"USDA Natural Resources Conservation Service"

USGS Topographic Map

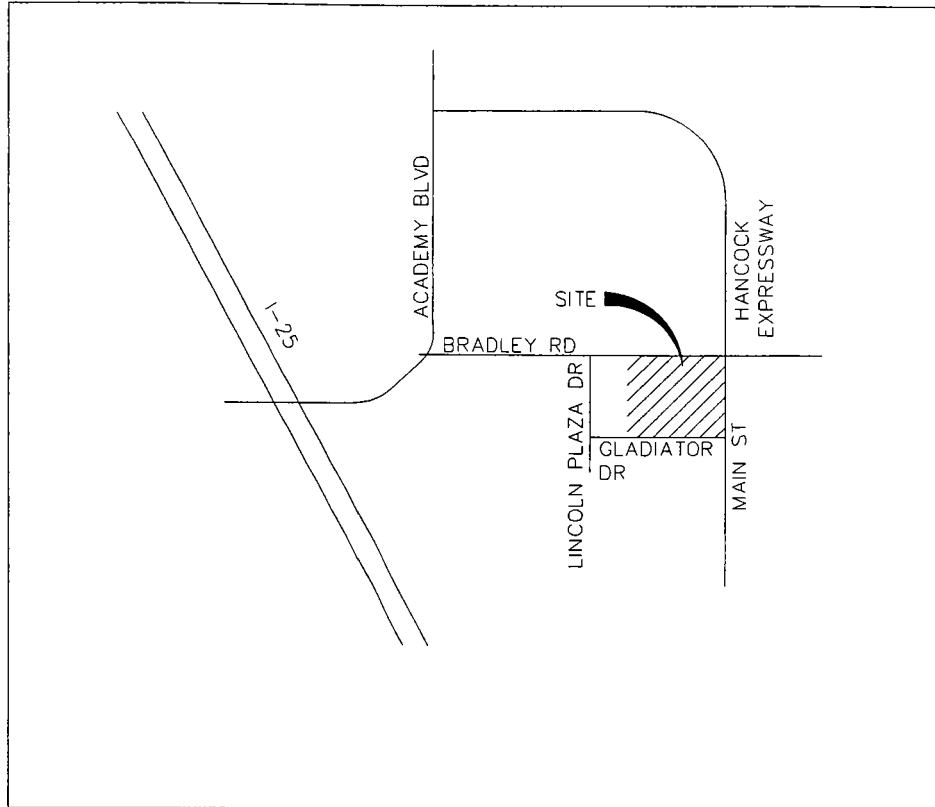
"Little Johnson/Security Creek Drainage Basin Planning Study" by Simons, Li & Associates, Inc. dated April 1988.

"Final Drainage Report and Plan for Lincoln Plaza Subdivision Filing No. 2" by Leigh Whitehead & Associates, Inc dated March, 2001.

"Final Drainage Report for Lincoln Commons Subdivision" by WestWorks Engineering, Inc. dated June 12, 2007, revised July 25, 2007 approved May 14, 2008.

"Final Drainage Report for Bradley Crossroads" by Terra Nova Engineering dated April 2007.

GENERAL LOCATION & SOILS MAP



VICINITY MAP NTS

315 S. 25TH STREET

20 LORADO SPRINGS, CO 80904

terra Nova

OFFICE: 719-635-6422

Engineering, Inc. s

cAX: 719-635-6426

www.tnesinc.com

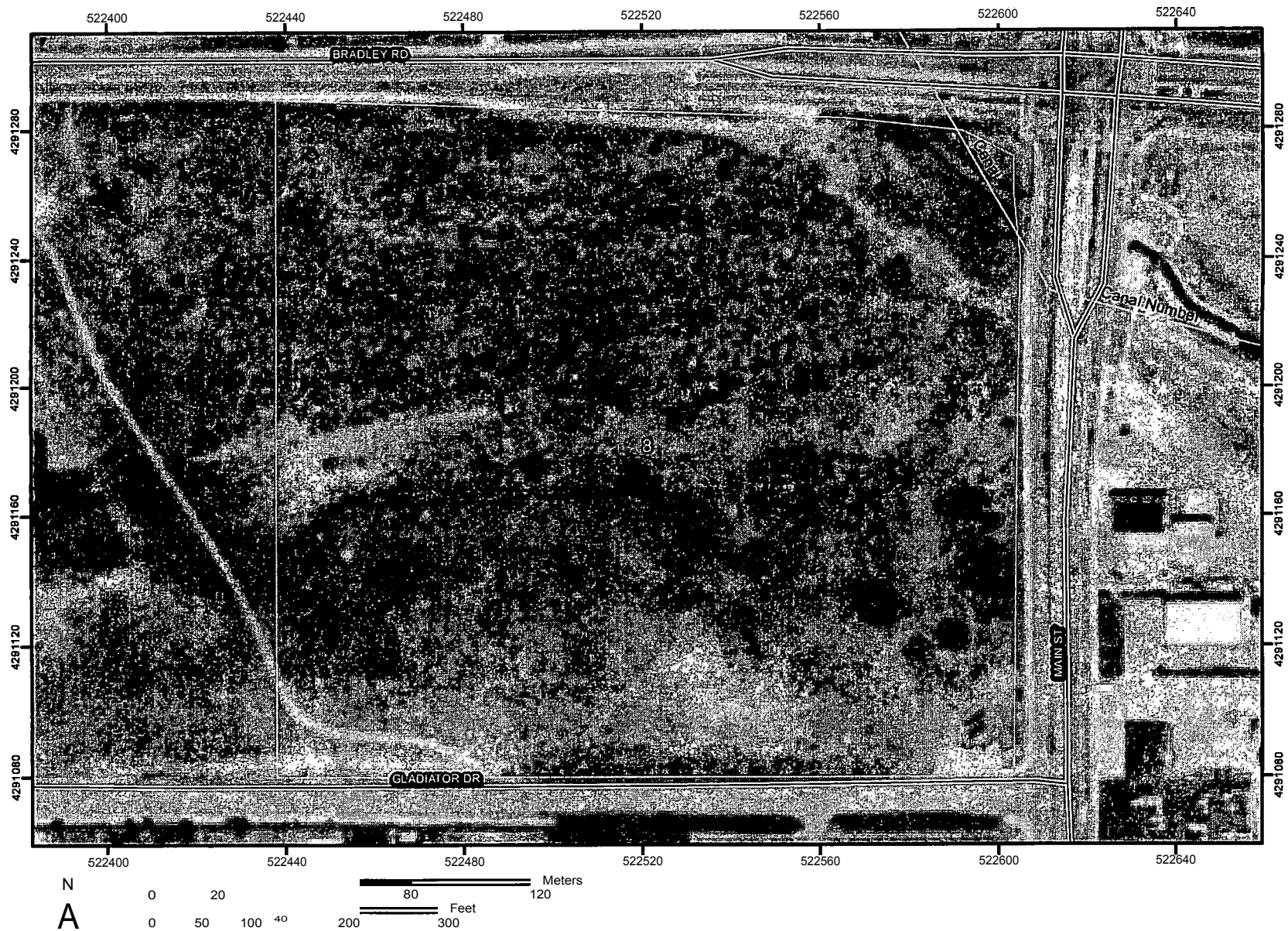
Civil Engineer it Sdk

BRADLEY CROSSROADS
VICINITY MAP

MAY 2010

PROJECT NO. 0637.00

Soil Map—El Paso County Area, Colorado



MAP LEGEND**Area of Interest (A01)**

C 1 Area of Interest (A01)

Soils

Soil Map Units

Special Point Features

kt,i Blowout

• Borrow Pit

• Clay Spot

• Closed Depression

X Gravel Pit

• Gravelly Spot

O Landfill

A Lava Flow

,g Marsh

5t Mine or Quarry

O Miscellaneous Water

Cl Perennial Water

v Rock Outcrop

-l- Saline Spot

Sandy Spot

Severely Eroded Spot

* Sinkhole

3) Slide or Slip

Sodic Spot

= Spoil Area

a Stony Spot

03 Very Stony Spot

t Wet Spot

Other

Special Line Features

LA7 Gully

e!g! Short Steep Slope

Other

Political Features**Municipalities**

Cities

El Urban Areas

Water Features

Oceans

Streams and Canals

Transportation

Rails

Roads

Interstate Highways

US Routes

State Highways

WV' Local Roads

Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 13N

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 6, Aug 21, 2008

Date(s) aerial images were photographed: 1999

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

! E1 Paso.:County.Area;•Colorado (C0625)			
Map Unit Symbol	Map Unit Name	Acres In A01	Percent of A01
8	Blakeland loamy sand, 1 to 9 percent slopes	11.6	100.0%
Totals for Area of Interest (A01)		11.6	100.0%

FEMA FIRM MAP

RESERVOIR

WNCN C.1

[illegible]

The diagram consists of a large rectangle divided into three horizontal sections. The top section is labeled 'CUNNINGHAM' and 'DR'. The middle section is labeled 'VS'. The bottom section is labeled 'v.17, u.1, c.1, t.3'. The labels are positioned at the top of each section, with 'CUNNINGHAM' and 'DR' on the left, 'VS' on the right, and 'v.17, u.1, c.1, t.3' on the right.

**EL PASO COUNTY
UNINCORPORATED
080059**

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APPROXIMATE SCALE IN FEET

500 0 500

-1 -1 -1

				NATIONAL FLOOD INSURANCE PROGRAM
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FLOOD INSURANCE RATE MAP

PANEL 763 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

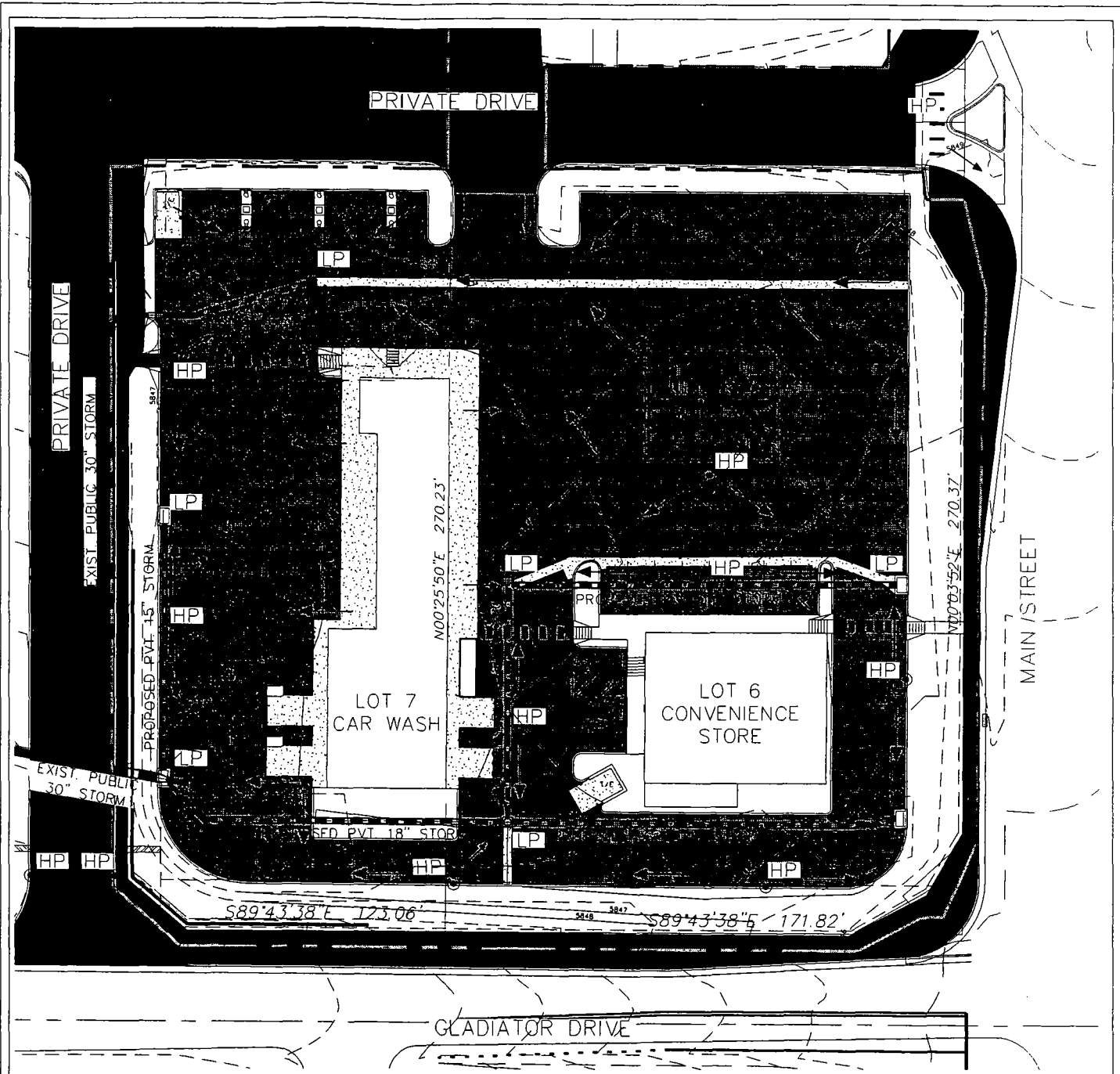
COLORADO SPAN= OW OF	0ED080	one	F
EL PASO COUNTY.			
UNINCOPORATED AREAS	11035069	0703	F
FOUNTAIN, OTT OF	080001	0703	F

AS: - kit...
4rA)V:A
17:

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

DRAINAGE MAP



SITE MAP

SCALE: 1"=50'



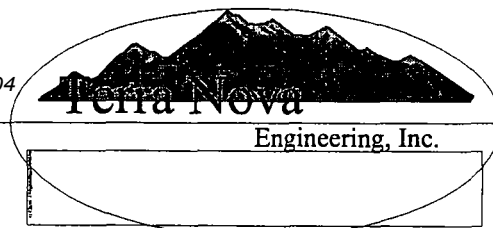
SCALE: 1"=40'

815 S. 25TH STREET
COLORADO SPRINGS, CO. 80904

OFFICE: 779-635-6422

FAX 719-635-6426

www.tnesinc.com



BRADLEY CROSSROADS FILING NO.
LOTS 6 & 7
JUNE 7, 2010
JOB NO. 0637.00

Appendix D: Rational Method Drainage Calculations

Calculation of Peak Runoff using Rational Method	
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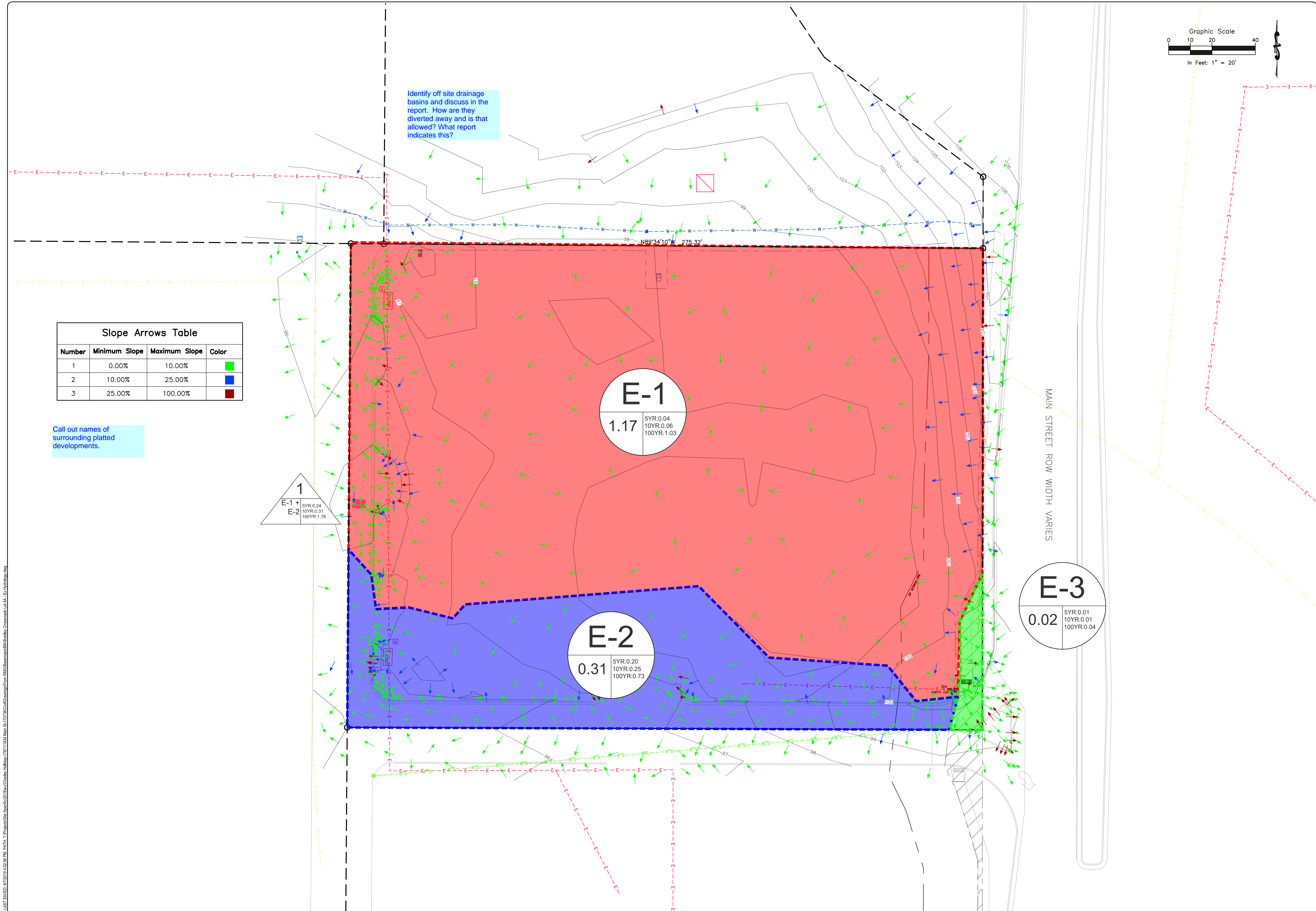
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[illegible]

Calculation of Peak Runoff using Rational Method	
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$$\overline{Q(cfs)} = CIA$$
[illegible]

Appendix E: Sub-Basin Delineation Exhibits

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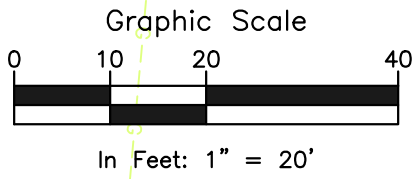


Slope Arrows Table			
Number	Minimum Slope	Maximum Slope	Color
1	0.00%	10.00%	Green
2	10.00%	25.00%	Blue
3	25.00%	100.00%	Red

Call out names of surrounding platted developments.

Identify off site drainage basins and discuss in the report. How are they diverted away and is that allowed? What report indicates this?

MAIN STREET ROW WIDTH VARIES



ROCKY MOUNTAIN GROUP

ARCHITECTS
STRUCTURAL
FORENSICS

Geotechnical
Materials Testing
Civil Planning

RMG
ENGINEERS

SOUTHERN COLORADO
19375 BEACON LITE RD., MONUMENT, CO 80132
(719) 488-2145 - WWW.RMENGINEERS.COM
SOUTHERN COLORADO BRIDGE TRUST, NORTHERN COLORADO

BRADLEY CROSSROADS LOT 4A DEVELOPMENT

1830 MAIN STREET
COLORADO SPRINGS, CO

CHARLES HOLLIDAY

SHEET NAME
EXISTING SUB-BASIN
DELINEATION

PROJECT STATUS
COUNTY REVIEW

ENG: RDL
DRAWN: RDL
CHECKED: RDL

DATE
08/06/19

#	REVISION	DATE
DD		07/18/19
CNTY. REV. 1		08/06/19

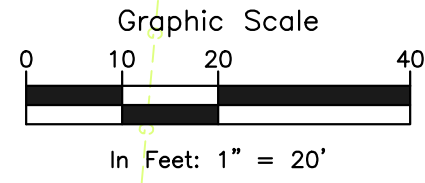
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170736

SHEET NO.
C-EX-01
of N/A

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Slope Arrows Table			
Number	Minimum Slope	Maximum Slope	Color
1	0.00%	5.00%	Green
2	5.00%	10.00%	Blue
3	10.00%	100.00%	Red

Off site basins? Show what is proposed or what areas flow to this site.



ROCKY MOUNTAIN GROUP



Geotechnical
Materials Testing
Civil Planning
Architectural
Structural
Forensics

SOUTHERN COLORADO
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(719) 488-2145 - WWW.RMENGINEERS.COM
SOUTHERN COLORADO BRIDGE & INFRASTRUCTURE

NOT FOR CONSTRUCTION
FOR CIVIL ONLY

BRADLEY CROSSROADS LOT 4A DEVELOPMENT

1830 MAIN STREET

COLORADO SPRINGS, CO

CHARLES HOLLIDAY

SHEET NAME
DEVELOPED SUB-BASIN
DELINEATION

PROJECT STATUS
COUNTY REVIEW

ENG: RDL
DRAWN: RDL
CHECKED: RDL
DATE
08/06/19

#	REVISION	DATE
DD		07/18/19
CNTY. REV. 1		08/06/19

JOB NO.
170736

SHEET NO.
C-EX-02
of N/A

Identify the outfall?

MAIN STREET ROW WIDTH VARIES

D-1
1.25
5YR:3.68
10YR:4.52
100YR:8.58

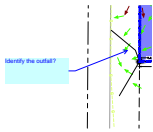
NEW BUILDING
(7,440 S.F.)
1830 MAIN STREET

D-3
0.02
5YR:0.01
10YR:0.01
100YR:0.04

D-2
0.23
5YR:0.22
10YR:0.28
100YR:0.71

Drainage Letter_v1_redlines.pdf Markup Summary

arrow & box (1)



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Author: Steve Kuehster
Date: 10/7/2019 10:45:37 AM
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Layer:
Space:

Identify the outfall?

Highlight (2)



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Page Label: 7
Author: Steve Kuehster
Date: 10/7/2019 10:37:47 AM
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The drainage volumes and flows are accounted for in the public storm sewer system for conveyance as well as the detention facility downstream.

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Author: Steve Kuehster
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Line (1)



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Author: rlyon
Date: 8/7/2019 3:50:48 PM
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Color: ■
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Space:

PE Stamp (1)



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Page Label: 2
Author: rlyon
Date: 8/7/2019 4:09:17 PM
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Rectangle (1)



ADIATOR DR

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Date: 8/7/2019 3:50:37 PM
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text box (12)



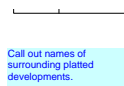
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Who is responsible to maintain the detention facility (Terra nova says on the Lincoln Commons Site?) You indicate the storm sewer system is a Public system?



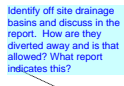
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Provide a drawing of the storm sewer system that conveys this sites drainage to the detention facility. And describe the detention facility. Show and describe calculations that verify the capacity of these systems.



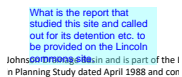
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Call out names of surrounding platted developments.



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Identify off site drainage basins and discuss in the report. How are they diverted away and is that allowed? What report indicates this?



Subject: text box
Page Label: 6
Author: Steve Kuehster
Date: 10/7/2019 10:35:03 AM
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What is the report that studied this site and called out for its detention etc. to be provided on the Lincoln commons site.

Calculate the SWQCV and FSD volume for this site and show how these volumes are accounted for in the downstream detention facility. Does the downstream facility meet current criteria for SWQCV? does this facility provide the detention required by previous reports and the DBPS?

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Date: 10/8/2019 10:28:30 AM
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Color: 
Layer:
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Text Box (1)

SITE

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