EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

DRAINAGE REPORT

for

CITY LINK TRUCKING
225 N. CURTIS ROAD
COLORADO SPRINGS, CO 80930

Prepared for:

T-Bone Construction, Inc.
1310 Ford Street
Colorado Springs, CO 80915

August 24, 2023

Prepared by:

JPS ENGINEERING

19 E. Willamette Ave.
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

PPR2339

JPS Project No. 052301
PCD Filing No. PPR___

CITY LINK TRUCKING
DRAINAGE REPORT
TABLE OF CONTENTS

PAGE

APPENDICES

DRAINAGE STATEMENT

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

____

John P. Schwab, P.E. #29891

Developer's Statement:

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

By:

____

Date

T-Bone Construction, Inc.
1310 Ford Street, Colorado Springs, CO 80915

El Paso County's Statement

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

____

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

Conditions:

Please see comments on the site plan as driveway width is limited to max 40'. If a private roadway is proposed as currently shown then please label it as such in the narrative. Coordinate with the planning consultant & owner and revise as necessary.

I. INTRODUCTION

A. Property Location and Description

City Link Trucking is planning to develop a new trucking facility on a 5-acre portion of a property in eastern El Paso County, Colorado. The project site is an undeveloped, unplatted 5-acre portion of the 100-acre property at 225 N. Curtis Road. The property is located along the east side of Curtis Road, south of State Highway 94 (El Paso County Assessor's Parcel Number 44150-00-021).

The project site is located within the northwest 35.1-acre part of the overall 100-acre property, which was re-zoned to Commercial Service (CS) in 2021 (County Project File# CS-20-003), allowing for the proposed trucking and motor freight terminal land use. The 64.9-acre balance of the overall property is zoned Rural Residential (RR-5).

The project consists of a new trucking and motor freight terminal including a 16,800 square-foot, single-story metal building with associated parking and site improvements. Access to the site will be provided by a proposed private driveway connection to Curtis Road at the southwest corner of the development site.

The site is described as a tract in the Northwest Quarter of Section 15, Township 14 South, Range 64 West of the 6th Principal Meridian, El Paso County, Colorado. The property is bounded by State Highway 94 (SH94) to the north, with several rural residential tracts (Zoned RR-5) located along the north side of SH94. Curtis Road adjoins the west boundary of the property, with an existing 612.7-acre unplatted ranch property (Parcel No. 44000-00-516) owned by Washington / Balser located along the west side of Curtis Road. The east boundary of the property adjoins an undeveloped 40-acre unplatted parcel (zoned RR-5) owned by Davis. The west side of the south boundary of the property adjoins the developed, unplatted 19.7-acre Arrowhead Mobile Home Park property (zoned RR-5) owned by JLO Trust / Orsburn, and the east side of the south boundary of the property adjoins an unplatted 39.3-acre ranch residence (zoned RR-5) owned by Alvarado.

The site is located in the Upper East Chico Drainage Basin (CHEC0400), and surface drainage from this site sheet flows southeasterly to an existing drainage swale flowing to the south and southeast, ultimately reaching the downstream drainage channel of Chico Creek.

Parcel is split between two basins
LIVESTOCK COMPANY CHWS0400

B. Scope

This report will provide a summary of site drainage issues impacting the proposed commercial development. The report will analyze upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This report is based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual, and the report is intended to fulfill the requirements for a "Final Drainage Report" for this property.

Address any other drainage reports that may cover this area or state none

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual," revised October 31, 2018.

City of Colorado Springs "Drainage Criteria Manual, Volumes 1 and 2," revised October 31, 2018.

El Paso County "Engineering Criteria Manual," revised December 13, 2016.

July 18th 2023

FEMA, Flood Insurance Rate Map (FIRM) Number 08041C0785G, December 7, 2018.

II. EXISTING / PROPOSED DRAINAGE CONDITIONS

A. Existing Drainage Conditions

According to the Custom Soil Resource Report for this site (see details in Appendix A) provided by the Natural Resources Conservation Service (NRCS), on-site soils are comprised of "Type 2: Ascalon sandy loam" soils. These soils are classified as hydrologic soils group "B" (moderate infiltration rate).

As shown on the enclosed Existing Conditions Drainage Plans (Figures EX1 and EX2, Appendix E), the site has been delineated as a single on-site drainage basin (Basin A, 5.7-acres). An off-site drainage area along the north side of the project site has been delineated as Basin OA1 (4.2-acres), which sheet flows southeasterly into the northeast corner of Basin A. Historic peak flows from Basin OA1 are calculated as $Q_5 = 0.7$ cfs and $Q_{100} = 5.3$ cfs. Drainage from Basin A sheet flows southeasterly across the property, with existing peak flows calculated as $Q_5 = 1.2$ cfs and $Q_{100} = 8.5$ cfs. Drainage from Basin OA1 combines with Basin A at Design Point #1, with historic (pre-development) peak flows calculated as $Q_5 = 1.6$ cfs and $Q_{100} = 11.8$ cfs. Design Point #1 flows to an existing grass-lined drainage swale at the south boundary of the Land View, LLC property, ultimately flowing to Chico Creek.

B. Developed Drainage Plan

Developed flows have been calculated based on the impervious areas associated with the proposed building and parking improvements. Surface drainage swales, ditches, and culverts will convey developed flows to the proposed Detention Pond A at the southeast corner of the site. The proposed building pad will be graded with protective slopes to provide positive drainage away from the building, and the site drainage swales, ditches, and culverts will convey developed flows southeasterly into Detention Pond A.

The majority of the developed site, including the proposed building and parking areas, has been delineated as Basin A1. Basin A1 will drain by sheet flow and site drainage swales, ditches, and culverts to the proposed Detention Pond A. Developed peak flows at Design Point A1 are calculated as $Q_5 = 8.9$ cfs and $Q_{100} = 20.2$ cfs.

Discuss western side area along Curtis Road which appears will be a separate basin with the discuss and analyze the off-site flows that are being re-routed on the north side of the development

Discuss drainage along Curtis road and addition of culvert for new drive entrace

The north side of the southern entry drive has been delineated as Basin A2, which will drain by roadside ditches and culverts into the proposed Detention Pond A. Developed peak flows from Basin A2 are calculated as $Q_5 = 0.8$ cfs and $Q_{100} = 1.7$ cfs.

Developed flows from Basins A1 and A2 combine in the proposed Detention Pond A, with peak flows at Design Point A1.1 calculated as $Q_5 = 9.6$ cfs and $Q_{100} = 21.6$ cfs.

The 18" HDPE discharge pipe from Detention Pond A (along with overflows from the pond spillway) will drain southeasterly to the existing downstream drainage swale. A riprap apron will be provided for erosion control at the pipe outlet.

design point A4 is shown on the drainage plan

The fringe area along the southeast corner of the property has been delineated as Basin A3. Basin A3 drains southeasterly by sheet flow, with peak flows calculated as $Q_5 = 0.4$ cfs and $Q_{100} = 0.9$ cfs. Basin A3 is excluded from permanent water quality requirements based on ECM Appendix I.7.1.C.1, which allows for 20%, not to exceed 1-acre, of the applicable development site area to not be captured.

The south side of the southern entry road has been delineated as Basin A4, which will drain by roadside ditches flowing southeasterly to Design Point #1. Developed peak flows from Basin A4 are calculated as $Q_5 = 0.8$ cfs and $Q_{100} = 1.7$ cfs. Basin A4 is excluded from permanent water quality requirements based on ECM Appendix I.7.1.C.1, which allows for 20%, not to exceed 1-acre, of the applicable development site area to not be captured.

Developed flows from Basins OA1 and A1-A4 combine at Design Point #1, with peak flows calculated as $Q_5 = 6.3$ cfs and $Q_{100} = 17.8$ cfs.

Hydrologic and hydraulic calculations for the site are detailed in the appendices (Appendix B and C), and peak flows are identified on the Drainage Plans in Appendix E.

III. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in ECM Appendix I.7., the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1-acre or greater or that disturb less than 1-acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Directly Connected Impervious Areas (MDCIA): The majority of developed flows from the site will be routed through the proposed on-site detention basin, which will be grass-lined to encourage stormwater infiltration. Grass-lined ditches and swales will also encourage stormwater infiltration within the property.

Step 2: Stabilize Drainageways

- There are no major drainageways adjacent to this project site. Implementation of the proposed on-site drainage improvements and detention basin will minimize downstream drainage impacts from this site.

Step 3: Provide Water Quality Capture Volume (WQCV)

- EDB: The majority of the developed site will drain through the on-site Private Extended Detention Basin (EDB) in the southeast corner of the property. The extended detention basin which will capture and slowly release the WQCV over an extended release period.

Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial uses are proposed for this site.
- The commercial property owner will implement a Stormwater Management Plan including proper housekeeping practices and spill containment procedures.
- On-site drainage will be routed through the Full-Spectrum Extended Detention Basin (EDB) to minimize introduction of contaminants to the downstream drainage system.

IV. FLOODPLAIN IMPACTS

According to the FEMA floodplain map for this area, El Paso County FIRM Panel No. 08041C0785G, dated December 7, 2018, the site is located beyond the limits of any delineated 100-year floodplains.

V. STORMWATER DETENTION AND WATER QUALITY

Proposed drainage improvements will include construction of a new Private Full-Spectrum Extended Detention Basin (EDB) to meet current full-spectrum detention design standards. The proposed detention facility has been designed to provide the required stormwater detention and water quality mitigation for the overall site in accordance with current El Paso County drainage criteria. The required on-site detention volume has been calculated based on the developed impervious area of the site.

The proposed Detention Basin has been designed utilizing the Denver Mile High Flood District's "MH-Detention_v4.05" software package. The required detention volume has been calculated based on the ultimate developed impervious areas planned for the site.

While the proposed site development consists primarily of gravel parking and driveway areas, drainage calculations in this report have assumed the potential for future asphalt / concrete pavement based on the proposed trucking facility land use, so the site drainage and detention pond facilities have been designed to accommodate potential future pavement improvements.

Detailed design calculations for the proposed Detention Basin are enclosed in Appendix D, and design parameters are summarized as follows:

Detention Basin	Tributary Drainage Basins	Tributary Area (ac)	Impervious Percentage	Min. 100-Yr FSD Vol. (af)	Design Volume (af)
A	A1,A2	5.1	50.0	0.5	0.7

> please also indicate the total flows leaving the site (basin A4+basin A3+ pond A flows) and compare with historic flows

The proposed on-site Full-Spectrum Detention Pond A provides a storage volume of 0.7 acre-feet, which exceeds the required minimum 100-year full-spectrum detention and WQCV volume.

The proposed detention pond will include an outlet structure with a water quality orifice plate to maintain discharges below the allowable release rates. The pond outlet structure has been designed for a 40-hour release of the WQCV, and outlet structure sizing to maintain maximum allowable release rates from the pond. The detention pond will have a grass-lined bottom to encourage infiltration of stormwater prior to discharging into the downstream drainage system.

A concrete forebay will be provided for the westerly entry point into the pond (see "UD-BMP" calculation in Appendix D), and concrete trickle channels will be provided to convey low flows along the bottom of the pond.

The new on-site Detention Basin will be privately owned and maintained by the property owner, and maintenance access will be provided from the driveway along the east boundary of the site.

As detailed in the detention basin calculations in Appendix D, detained peak flows from Detention Basin A are calculated as $Q_5 = 0.9$ cfs and $Q_{100} = 6.4$ cfs, well below the calculated flows based on historic conditions.

<u>Areas Excluded from Water Quality Facilities</u>

The fringe areas along the north side, south side, and southeast corner of the site (Basins OA1, A3, and A4; 0.78 acres total) are excluded from water quality requirements based on ECM Appendix I.7.1.C.1 (see previous discussion in Paragraph II.B for details).

> Discuss/analyze the downstream swale that will receive the sites developed flows. Is the swale stable, are any improvements needed, is it adequate to handle these flows?. As indicated in ECM 3.2.4 flows shall be conveyed to a sutiable outfall. Please address.

VI. SUMMARY

The developed drainage patterns for the proposed City Link Trucking site development will remain consistent with historic conditions for this site. Developed flows from the site will drain through a Private Full-Spectrum Detention Pond at the southeast corner of the property prior to discharging to the existing downstream drainage swale. The proposed on-site Detention Pond has been designed to provide both stormwater detention and water quality requirements for the site. Construction and proper maintenance of the on-site drainage facilities and Extended Detention Basin, in conjunction with proper erosion control practices, will ensure that this developed site has no significant adverse drainage impact on downstream or surrounding areas.

APPENDIX A

SOILS INFORMATION

United States Department of Agriculture

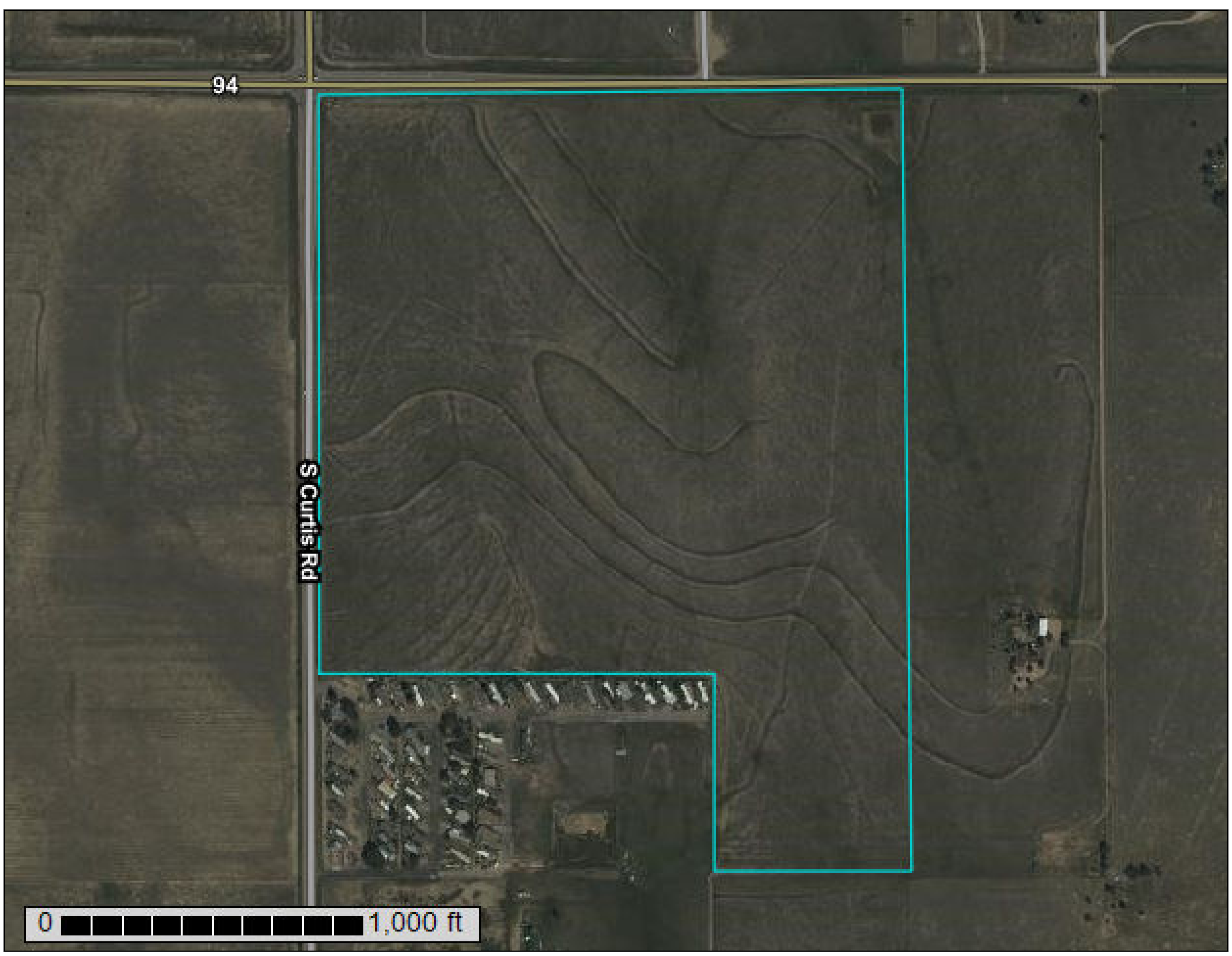
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

El Paso County Area, Colorado



July 12, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

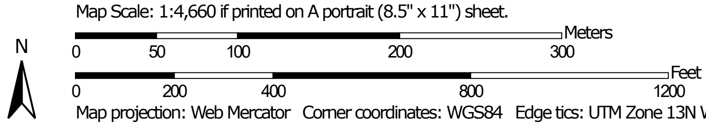
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:4,660 if printed on A portrait (8.5" x 11") sheet.



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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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
2	Ascalon sandy loam, 1 to 3 percent slopes	34.6	35.8%
97	Truckton sandy loam, 3 to 9 percent slopes	14.8	15.3%
105	Vona sandy loam, warm, 3 to 6 percent slopes	47.2	48.8%
Totals for Area of Interest		**96.6**	**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

2—Ascalon sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367q
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 8 inches: sandy loam
Bt - 8 to 21 inches: sandy clay loam
BC - 21 to 27 inches: sandy loam
Ck1 - 27 to 48 inches: sandy loam
Ck2 - 48 to 60 inches: loamy sand

Properties and qualities

Slope: 1 to 3 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): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY026CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069BY026CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

97—Truckton sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2x0j2
Elevation: 5,300 to 6,850 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 85 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Hillslopes, interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 9 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
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Hillslopes, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Landform: Low hills, interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

105—Vona sandy loam, warm, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2t517
Elevation: 3,400 to 6,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Vona, warm, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vona, Warm

Setting

Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands

Typical profile

A - 0 to 5 inches: sandy loam
Bt1 - 5 to 12 inches: sandy loam
Bt2 - 12 to 17 inches: sandy loam
Bk - 17 to 41 inches: sandy loam
BCk - 41 to 79 inches: loamy sand

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very 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
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.9 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Forage suitability group: Loamy, Dry (G067BW019CO)
Other vegetative classification: Sandy Plains #24 (067XY024CO_2), Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Minor Components

Valent, warm

Percent of map unit: 5 percent
Landform: Sand sheets
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R067BY015CO - Deep Sand
Other vegetative classification: Deep Sands #15 (067XY015CO_3), Sandy, Dry (G067BW026CO)
Hydric soil rating: No

Olnest, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Otero, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (067XY024CO_1), Loamy, Dry (G067BW019CO)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

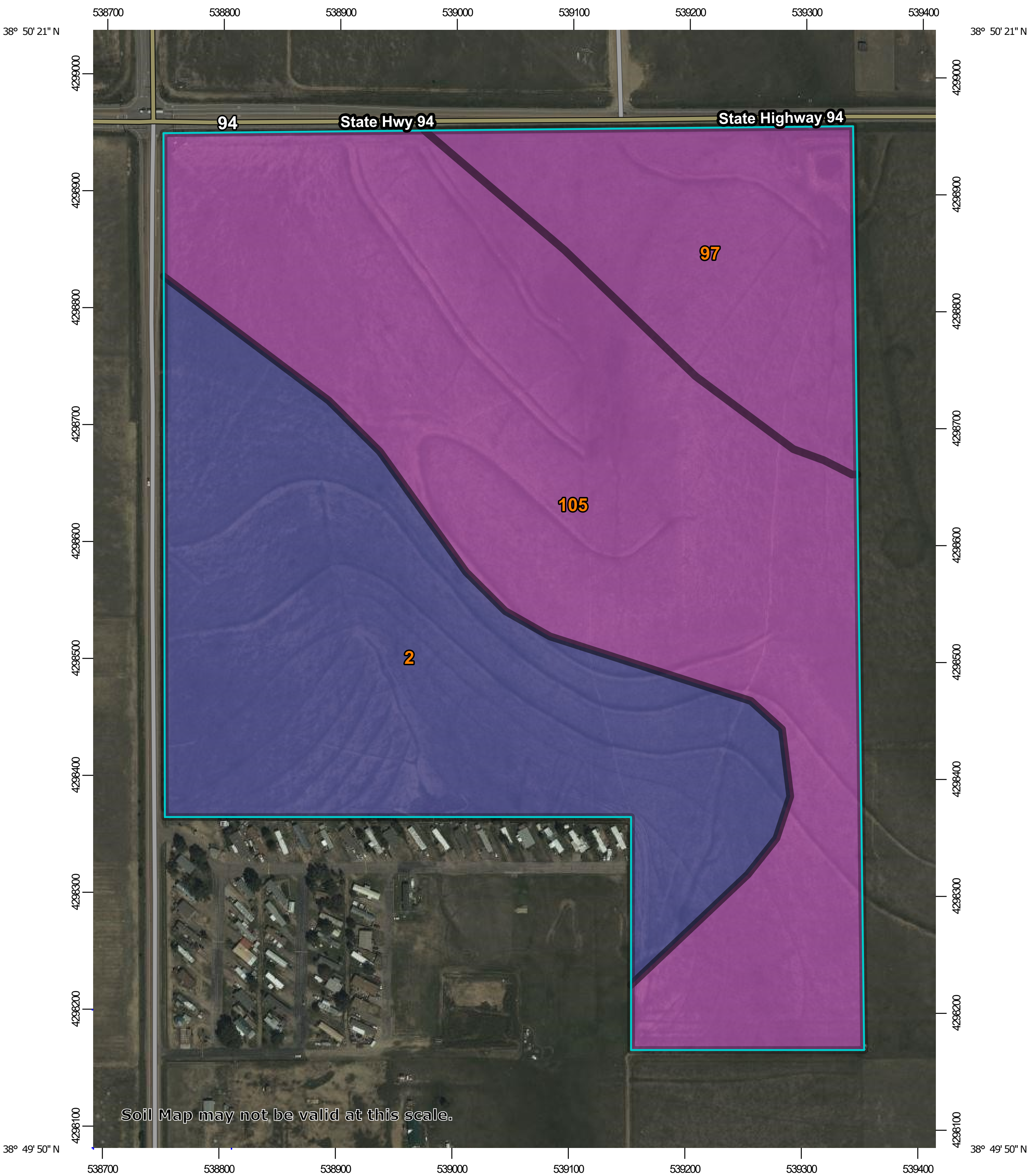
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

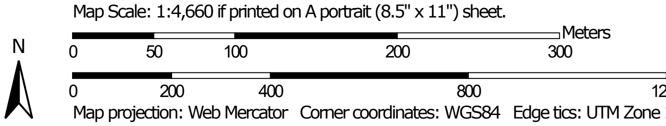
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Hydrologic Soil Group—El Paso County Area, Colorado
(City Link Trucking)



Map Scale: 1:4,660 if printed on A portrait (8.5" x 11") sheet.



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 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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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
2	Ascalon sandy loam, 1 to 3 percent slopes	B	34.6	35.8%
97	Truckton sandy loam, 3 to 9 percent slopes	A	14.8	15.3%
105	Vona sandy loam, warm, 3 to 6 percent slopes	A	47.2	48.8%
Totals for Area of Interest			**96.6**	**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 B

HYDROLOGIC CALCULATIONS

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional “calibration” of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

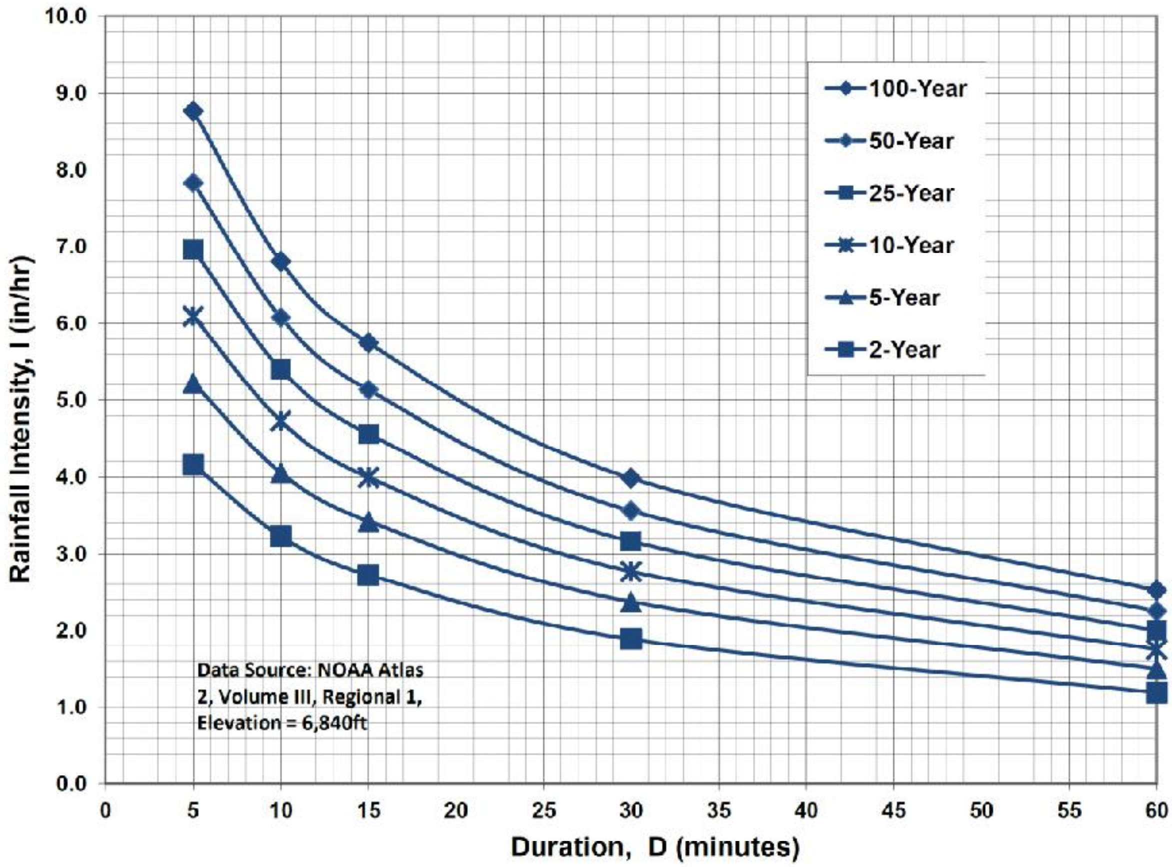
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

I_{100} = -2.52 ln(D) + 12.735

I_{50} = -2.25 ln(D) + 11.375

I_{25} = -2.00 ln(D) + 10.111

I_{10} = -1.75 ln(D) + 8.847

I_{5} = -1.50 ln(D) + 7.583

I_{2} = -1.19 ln(D) + 6.035

Note: Values calculated by equations may not precisely duplicate values read from figure.

CITY LINK TRUCKING
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	4.2	0.00	PAVED/IMPERVIOUS	0.9	4.20	MEADOW	0.08				0.080
OA1.1	0.25	0.00	PAVED/IMPERVIOUS	0.9	0.25	LANDSCAPED	0.08				0.080
OA1,OA1.1	4.45										0.080
A1	4.81	2.34	PAVED/IMPERVIOUS	0.9	2.47	MEADOW	0.08				0.479
A2	0.30	0.19	PAVED/IMPERVIOUS	0.9	0.11	LANDSCAPED	0.08				0.599
A1,A2	5.11										0.486
A3	0.18	0.10	PAVED/IMPERVIOUS	0.9	0.08	LANDSCAPED	0.08				0.536
A4	0.35	0.19	PAVED/IMPERVIOUS	0.9	0.16	LANDSCAPED	0.08				0.525
OA1,OA1.1,A1-A4	10.09										0.309

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OA1	4.2	0.00	PAVED/IMPERVIOUS	0.96	4.20	MEADOW	0.35				0.350
OA1.1	0.25	0.00	PAVED/IMPERVIOUS	0.96	0.25	LANDSCAPED	0.35				0.350
OA1,OA1.1	4.45										0.350
A1	4.81	2.34	PAVED/IMPERVIOUS	0.96	2.47	MEADOW	0.35				0.647
A2	0.30	0.19	PAVED/IMPERVIOUS	0.96	0.11	LANDSCAPED	0.35				0.736
A1,A2	5.11										0.652
A3	0.18	0.10	PAVED/IMPERVIOUS	0.96	0.08	LANDSCAPED	0.35				0.689
A4	0.35	0.19	PAVED/IMPERVIOUS	0.96	0.16	LANDSCAPED	0.35				0.681
OA1,OA1.1,A1-A4	10.09										0.520

CITY LINK TRUCKING
RATIONAL METHOD

EXISTING CONDITIONS

			C		Overland Flow			Channel flow							INTENSITY (5)		PEAK FLOW	
BASIN	**DESIGN POINT**	**AREA (AC)**	**5-YEAR**	**100-YEAR**	**LENGTH (FT)**	**SLOPE (FT/FT)**	**Tco (1) (MIN)**	**CHANNEL LENGTH (FT)**	**CONVEYANCE COEFFICIENT C**	**SLOPE (FT/FT)**	**SCS (2) VELOCITY (FT/S)**	**Tt (3) (MIN)**	**TOTAL Tc (4) (MIN)**	**TOTAL Tc (4) (MIN)**	**5-YR (IN/HR)**	**100-YR (IN/HR)**	**Q5 (6) (CFS)**	**Q100 (6) (CFS)**
OA1	OA1	4.20	0.080	0.350	300	0.010	32.3	510	15	0.014	1.77	4.8	37.1	37.1	2.16	3.63	0.73	5.33
A	A	5.70	0.080	0.350	300	0.020	25.7	410	15	0.020	2.12	3.2	28.9	28.9	2.54	4.26	1.16	8.50
Tt OA1-DP1								455	15	0.02	2.12	3.6						
OA1,A	1	9.90	0.080	0.350									40.7	40.7	2.02	3.39	1.60	11.76

DEVELOPED CONDITIONS

			C		Overland Flow			Channel flow							INTENSITY (5)		PEAK FLOW	
BASIN	**DESIGN POINT**	**AREA (AC)**	**5-YEAR**	**100-YEAR**	**LENGTH (FT)**	**SLOPE (FT/FT)**	**Tco (1) (MIN)**	**CHANNEL LENGTH (FT)**	**CONVEYANCE COEFFICIENT C**	**SLOPE (FT/FT)**	**SCS (2) VELOCITY (FT/S)**	**Tt (3) (MIN)**	**TOTAL Tc (4) (MIN)**	**TOTAL Tc (4) (MIN)**	**5-YR (IN/HR)**	**100-YR (IN/HR)**	**Q5 (6) (CFS)**	**Q100 (6) (CFS)**
OA1	OA1	4.20	0.080	0.350	300	0.010	32.3	510	15	0.014	1.77	4.8	37.1	37.1	2.16	3.63	0.73	5.33
OA1.1		0.25	0.080	0.350	40	0.050	6.9	405	15	0.010	1.50	4.5	11.4	11.4	3.93	6.60	0.08	0.58
Tt OA1-DP1								455	15	0.02	2.12	3.6						
OA1,OA1.1	OA1.1	4.45	0.080	0.350									40.7	40.7	2.02	3.39	0.72	5.29
A1	A1	4.81	0.479	0.647	100	0.020	9.0	550	20	0.024	3.10	3.0	12.0	12.0	3.86	6.48	8.89	20.16
A2	A2	0.30	0.599	0.736	40	0.020	4.6	400	15	0.018	2.01	3.3	7.9	7.9	4.48	7.52	0.80	1.66
A1,A2	**A1.1**	**5.11**	**0.486**	**0.652**									**12.0**	**12.0**	**3.86**	**6.48**	**9.58**	**21.58**
A3	A3	0.18	0.536	0.689	90	0.017	8.2					0.0	8.2	8.2	4.43	7.43	0.43	0.92
A4	A4	0.35	0.525	0.681	20	0.020	3.7	505	15	0.012	1.64	5.1	8.9	8.9	4.31	7.24	0.79	1.73
OA1,OA1.1,A1-A3	**1**	**10.09**	**0.309**	**0.520**									**40.7**	**40.7**	**2.02**	**3.39**	**6.31**	**17.81**

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
$I_5 = -1.5 * \ln(Tc) + 7.583$
$I_{100} = -2.52 * \ln(Tc) + 12.735$
6) Q = CiA

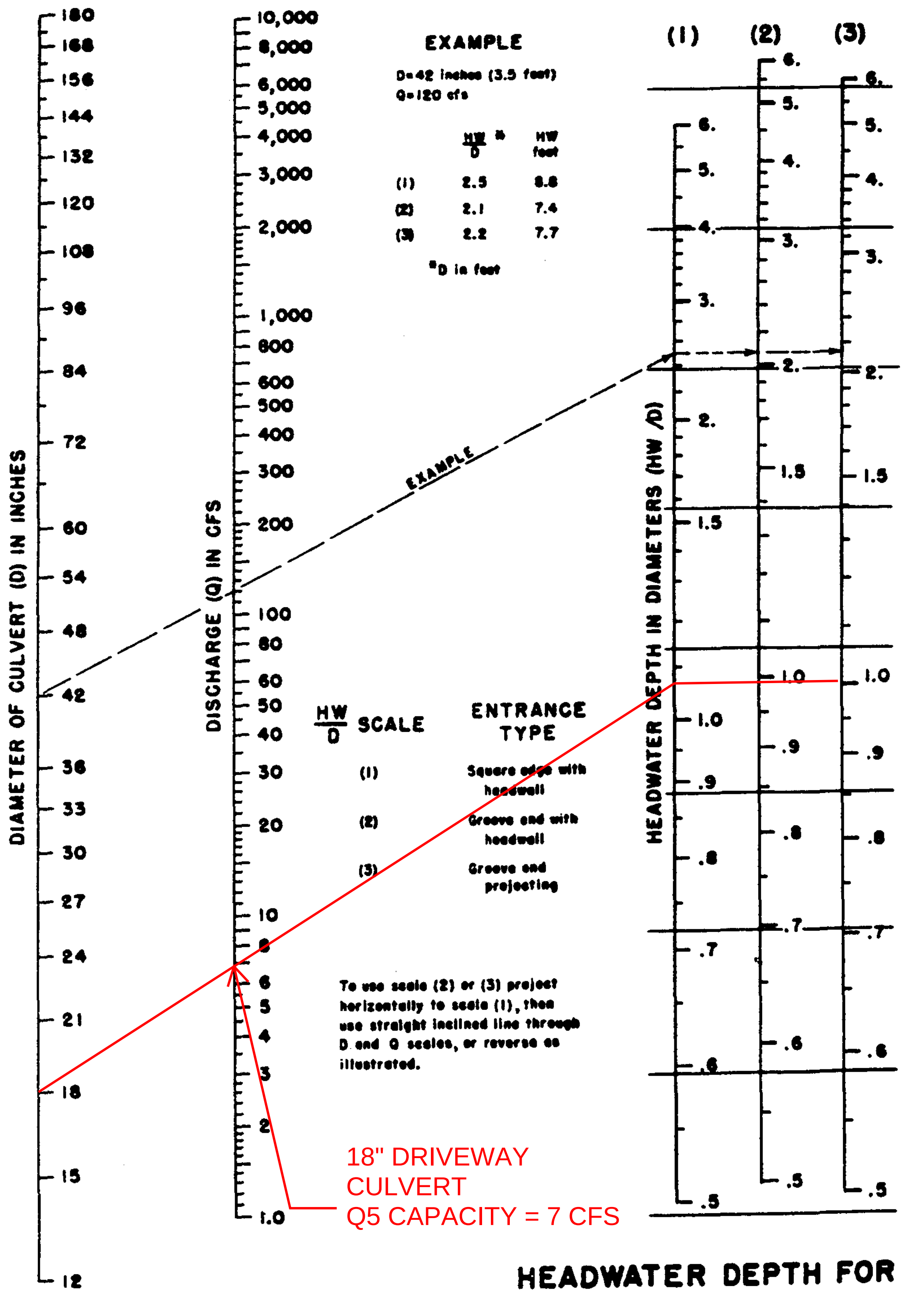
APPENDIX C

HYDRAULIC CALCULATIONS

CITY LINK TRUCKING
DRIVEWAY CULVERT SIZING SUMMARY

PRIVATE CULVERT	DP	Q5 FLOW (CFS)	FLOW % AT DVWY CULVERT	CULVERT FLOW (Q5, CFS)		CULVERT SIZE (IN)
A1.1	A1.1	9.6	24	2.3		18
A1.2	A1.1	9.6	52	5.0		18
A1.3	A1.1	9.6	24	2.3		18

* CULVERT SIZING BASED ON EPC DCM, FIGURE 9-34; ASSUMING MAX. HW/D = 1.0 FOR Q5



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

Figure
9-34

APPENDIX D

DETENTION POND CALCULATIONS

CITY LINK TRUCKING
COMPOSITE IMPERVIOUS AREAS

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
OA1	4.2	0.00	PAVED/IMPERVIOUS	100	4.20	MEADOW	0				0.000
OA1.1	0.25	0.00	PAVED/IMPERVIOUS	100	0.25	LANDSCAPED	0				0.000
OA1,OA1.1	4.45										0.000
A1	4.81	2.34	PAVED/IMPERVIOUS	100	2.47	MEADOW	0				48.649
A2	0.30	0.19	PAVED/IMPERVIOUS	100	0.11	LANDSCAPED	0				63.333
A1,A2	**5.11**										**49.511**
A3	0.18	0.10	PAVED/IMPERVIOUS	100	0.08	LANDSCAPED	0				55.556
A4	0.35	0.19	PAVED/IMPERVIOUS	100	0.16	LANDSCAPED	0				54.286
OA1,OA1.1,A1-A4	10.09										27.948

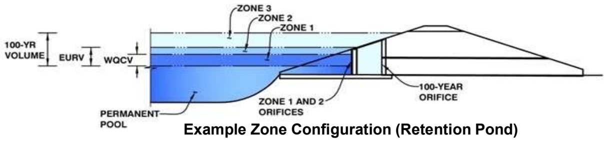
basins OA1 and OA1.1 should not be included in the impervious % calculation of the pond as these areas are not tributary to it since flows are being rerouted around the site. Revise accordingly.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: **City Link Trucking**

Basin ID: **Full-Spectrum Detention Pond A**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	5.11	acres
Watershed Length =	650	ft
Watershed Length to Centroid =	325	ft
Watershed Slope =	0.023	ft/ft
Watershed Imperviousness =	50.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.088	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.273	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.250	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.358	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.452	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.578	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.681	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.811	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.075	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	0.206	acre-feet		
Approximate 5-yr Detention Volume =	0.282	acre-feet		
Approximate 10-yr Detention Volume =	0.374	acre-feet		
Approximate 25-yr Detention Volume =	0.410	acre-feet		
Approximate 50-yr Detention Volume =	0.428	acre-feet		
Approximate 100-yr Detention Volume =	0.478	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.088	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.185	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.205	acre-feet
Total Detention Basin Volume =	0.478	acre-feet

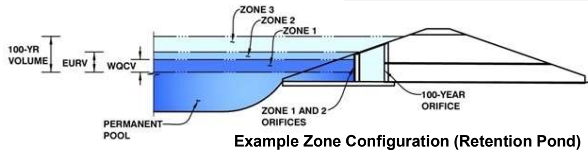
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
Bot EL=6463.0	--	1.00	--	--	--	6,468	0.148	3,239	0.074
	--	2.00	--	--	--	8,030	0.184	10,488	0.241
Spillway=6466.0	--	4.00	--	--	--	11,541	0.265	30,059	0.690
Top EL=6468.0	--	6.00	--	--	--	15,000	0.344	56,600	1.299
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: City Link Trucking
Basin ID: Full-Spectrum Detention Pond A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.09	0.088	Orifice Plate
Zone 2 (EURV)	2.18	0.185	Orifice Plate
Zone 3 (100-year)	3.15	0.205	Weir&Pipe (Restrict)
Total (all zones)		0.478	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)
Underdrain Orifice Diameter =		inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =		ft^2
Underdrain Orifice Centroid =		feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.18	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	8.60	inches
Orifice Plate: Orifice Area per Row =	0.86	sq. inches (diameter = 1-1/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	5.972E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.73	1.45					
Orifice Area (sq. inches)	0.86	0.86	0.86					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.18	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.50	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	2.18	N/A	feet
Overflow Weir Slope Length =	2.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.35	N/A	
Overflow Grate Open Area w/o Debris =	6.96	N/A	ft^2
Overflow Grate Open Area w/ Debris =	3.48	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	8.60		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.83	N/A	ft^2
Outlet Orifice Centroid =	0.41	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.53	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	5.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.73	feet
Stage at Top of Freeboard =	5.73	feet
Basin Area at Top of Freeboard =	0.33	acres
Basin Volume at Top of Freeboard =	1.21	acre-ft

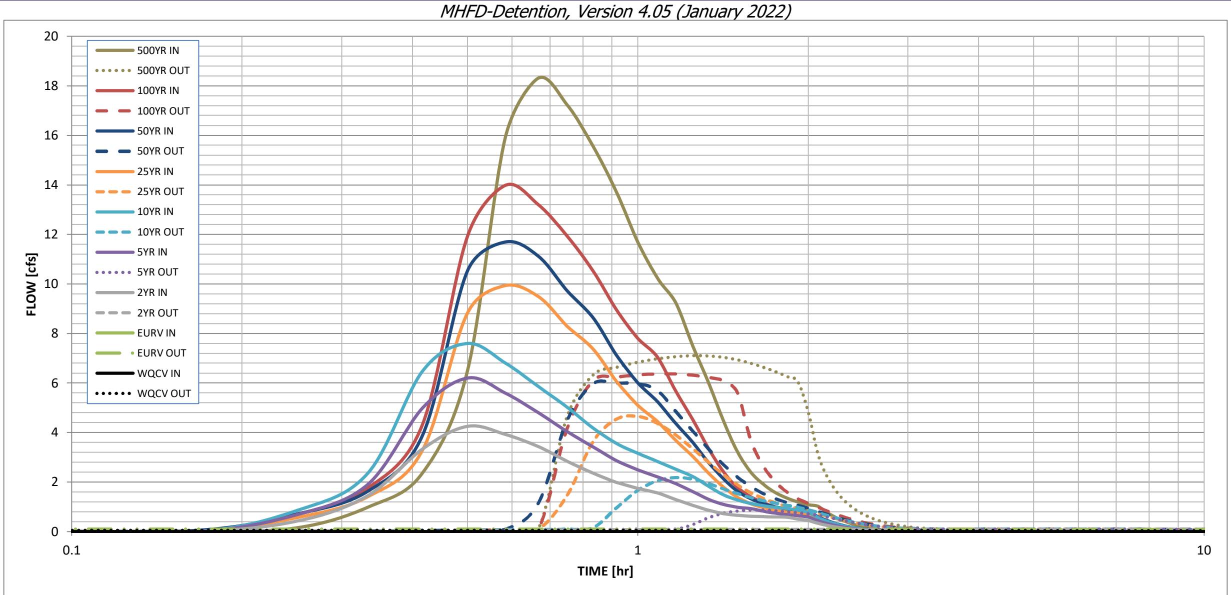
Routed Hydrograph Results

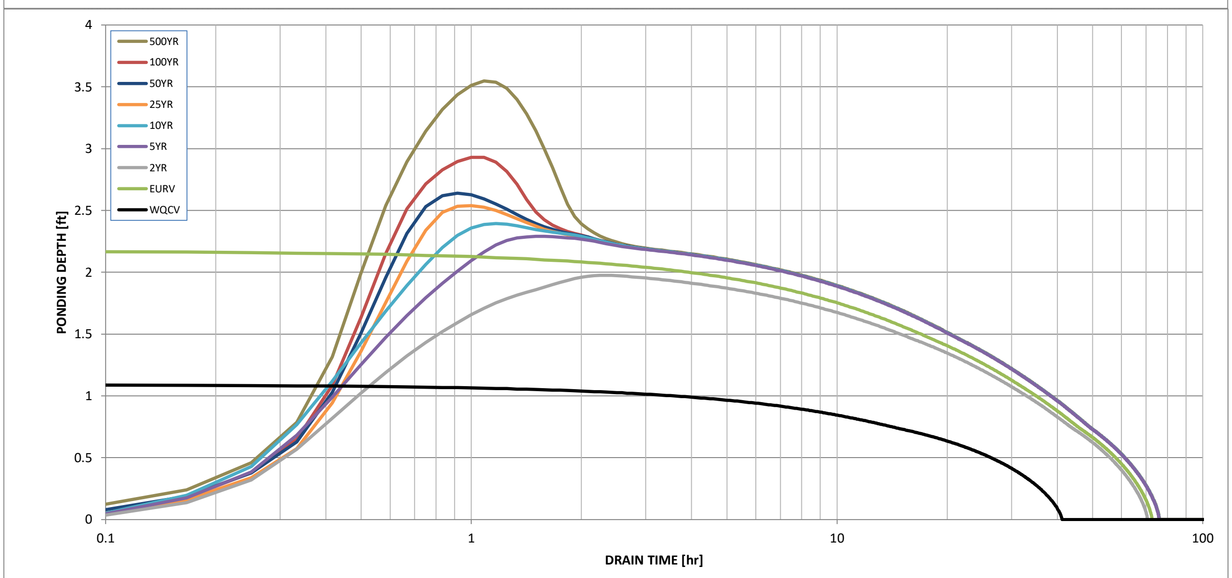
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

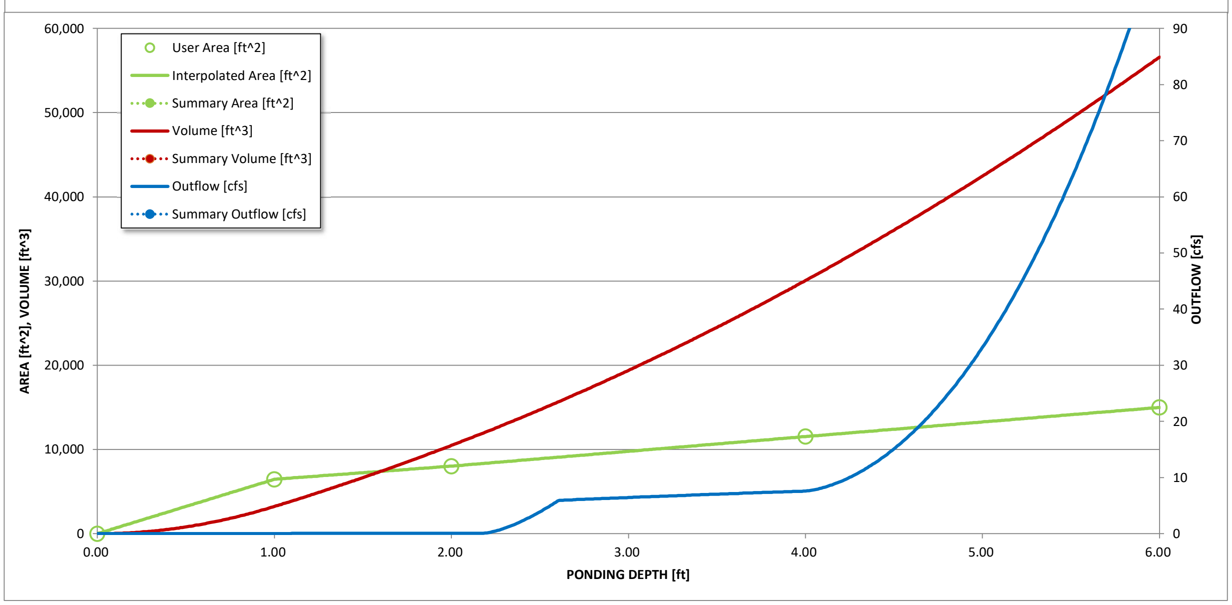
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.088	0.273	0.250	0.358	0.452	0.578	0.681	0.811	1.075
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.250	0.358	0.452	0.578	0.681	0.811	1.075
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.7	2.5	4.5	5.6	7.0	9.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.33	0.49	0.87	1.10	1.37	1.91
Peak Inflow Q (cfs) =	N/A	N/A	4.3	6.2	7.6	9.9	11.7	14.0	18.3
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.9	2.2	4.7	6.0	6.4	7.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.9	1.0	1.1	0.9	0.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.3	0.6	0.8	0.9	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	65	63	66	64	62	60	58	54
Time to Drain 99% of Inflow Volume (hours) =	**40**	69	67	72	71	70	69	68	66
Maximum Ponding Depth (ft) =	1.10	2.18	1.97	2.29	2.39	2.54	2.64	2.93	3.55
Area at Maximum Ponding Depth (acres) =	0.15	0.19	0.18	0.20	0.20	0.21	0.21	0.22	0.25
Maximum Volume Stored (acre-ft) =	0.089	0.275	0.235	0.296	0.316	0.346	0.365	0.427	0.572

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval: 5.00 min

SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.15
0:15:00	0.00	0.00	0.42	0.68	0.85	0.57	0.71	0.69	0.98
0:20:00	0.00	0.00	1.45	1.90	2.34	1.40	1.63	1.75	2.36
0:25:00	0.00	0.00	3.34	4.98	6.48	3.27	3.87	4.31	6.50
0:30:00	0.00	0.00	4.25	6.20	7.60	8.83	10.53	11.93	15.90
0:35:00	0.00	0.00	3.92	5.59	6.81	9.93	11.69	13.98	18.31
0:40:00	0.00	0.00	3.44	4.80	5.86	9.49	11.12	13.21	17.24
0:45:00	0.00	0.00	2.84	4.04	5.02	8.30	9.72	11.94	15.56
0:50:00	0.00	0.00	2.36	3.42	4.18	7.38	8.64	10.53	13.72
0:55:00	0.00	0.00	1.99	2.87	3.56	6.07	7.13	8.96	11.69
1:00:00	0.00	0.00	1.75	2.50	3.16	5.10	6.01	7.81	10.23
1:05:00	0.00	0.00	1.55	2.21	2.83	4.44	5.24	7.03	9.23
1:10:00	0.00	0.00	1.30	1.93	2.52	3.68	4.36	5.67	7.50
1:15:00	0.00	0.00	1.06	1.61	2.23	3.03	3.60	4.52	6.02
1:20:00	0.00	0.00	0.86	1.30	1.83	2.36	2.79	3.36	4.47
1:25:00	0.00	0.00	0.73	1.09	1.48	1.80	2.13	2.41	3.21
1:30:00	0.00	0.00	0.66	0.99	1.27	1.38	1.63	1.78	2.40
1:35:00	0.00	0.00	0.62	0.93	1.14	1.13	1.32	1.41	1.90
1:40:00	0.00	0.00	0.60	0.82	1.04	0.97	1.13	1.17	1.58
1:45:00	0.00	0.00	0.59	0.74	0.98	0.86	1.00	1.00	1.35
1:50:00	0.00	0.00	0.58	0.68	0.93	0.79	0.91	0.88	1.20
1:55:00	0.00	0.00	0.50	0.64	0.86	0.74	0.85	0.80	1.09
2:00:00	0.00	0.00	0.44	0.59	0.77	0.71	0.81	0.75	1.02
2:05:00	0.00	0.00	0.33	0.43	0.57	0.52	0.60	0.55	0.74
2:10:00	0.00	0.00	0.24	0.32	0.41	0.38	0.43	0.40	0.54
2:15:00	0.00	0.00	0.18	0.23	0.29	0.27	0.31	0.29	0.39
2:20:00	0.00	0.00	0.13	0.16	0.21	0.20	0.22	0.21	0.28
2:25:00	0.00	0.00	0.09	0.11	0.15	0.14	0.15	0.15	0.20
2:30:00	0.00	0.00	0.06	0.08	0.10	0.10	0.11	0.10	0.14
2:35:00	0.00	0.00	0.04	0.05	0.07	0.07	0.07	0.07	0.09
2:40:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.04	0.06
2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
2:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Do all three sheets and attach them.

Designer:	**JPS**
Company:	**JPS**
Date:	**August 23, 2023**
Project:	**City Link Trucking - Detention Pond A - Forebay A1.2**
Location:	**225 N. Curtis Road, Colorado Springs, CO 80930 (El Paso County)**

1. Basin Storage Volume			
A) Effective Imperviousness of Tributary Area, I_a	I_a =	50.0	%
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i =	0.500	
C) Contributing Watershed Area	Area =	2.920	ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 =		in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ◯ Water Quality Capture Volume (WQCV); ◉ Excess Urban Runoff Volume (EURV)		
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$	V_{DESIGN}=	0.050	ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$=		ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$=		ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed			
i) Percentage of Watershed consisting of Type A Soils	HSG_A =	0	%
ii) Percentage of Watershed consisting of Type B Soils	HSG_B =	100	%
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ =	0	%
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ =	0.157	ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$=		ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W =	2.0	: 1
3. Basin Side Slopes			
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z =	4.00	ft / ft
4. Inlet			
A) Describe means of providing energy dissipation at concentrated inflow locations:			
5. Forebay			
A) Minimum Forebay Volume (V_{FMIN} = 1% of the WQCV)	V_{FMIN} =	0.001	ac-ft
B) Actual Forebay Volume	V_F =	0.002	ac-ft
C) Forebay Depth (D_F = 12 inch maximum)	D_F =	12.0	in
D) Forebay Discharge			
i) Undetained 100-year Peak Discharge	Q_{100} =	12.30	cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F =	0.25	cfs
E) Forebay Discharge Design	Choose One: ◯ Berm With Pipe; ◉ Wall with Rect. Notch; ◯ Wall with V-Notch Weir	Flow too small for berm w/ pipe	
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P =		in
G) Rectangular Notch Width	Calculated W_N =	3.3	in

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

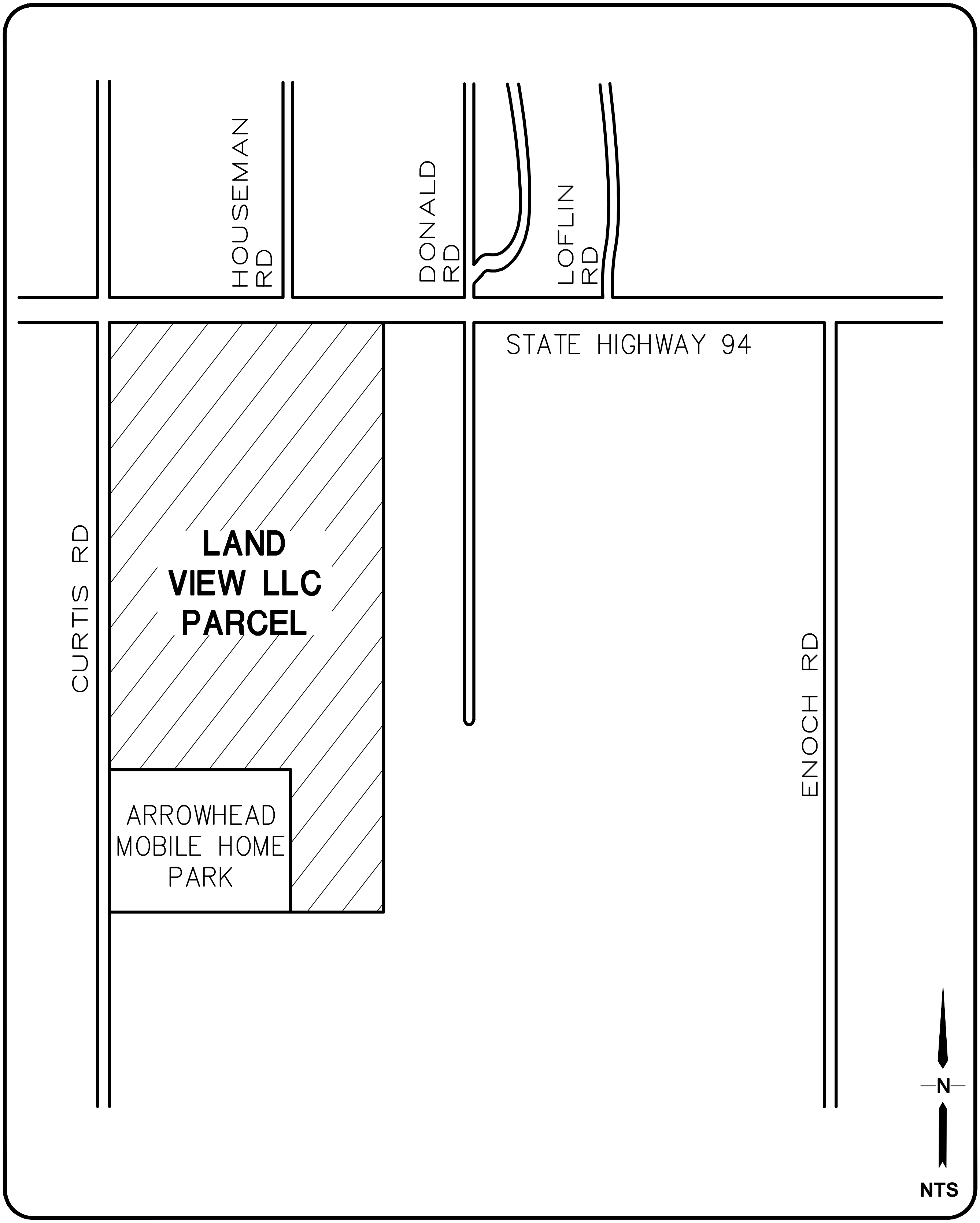
Do all three sheets and attach them.

Designer:	**JPS**
Company:	**JPS**
Date:	**August 23, 2023**
Project:	**City Link Trucking - Detention Pond A - Forebay A1.3**
Location:	**225 N. Curtis Road, Colorado Springs, CO 80930 (El Paso County)**

1. Basin Storage Volume			
A) Effective Imperviousness of Tributary Area, I_a	I_a =	50.0	%
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i =	0.500	
C) Contributing Watershed Area	Area =	1.240	ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 =		in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)		
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}=	0.021	ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$)	$V_{DESIGN\ OTHER}$=		ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$=		ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed			
i) Percentage of Watershed consisting of Type A Soils	HSG_A =	0	%
ii) Percentage of Watershed consisting of Type B Soils	HSG_B =	100	%
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ =	0	%
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ =	0.066	ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$=		ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W =	2.0	: 1
3. Basin Side Slopes			
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z =	4.00	ft / ft
4. Inlet			
A) Describe means of providing energy dissipation at concentrated inflow locations:			
5. Forebay			
A) Minimum Forebay Volume (V_{FMIN} = 0% of the WQCV)	V_{FMIN} =	0.000	ac-ft — **A FOREBAY MAY NOT BE NECESSARY FOR THIS SIZE SITE**
B) Actual Forebay Volume	V_F =		ac-ft
C) Forebay Depth (D_F = 12 inch maximum)	D_F =		in
D) Forebay Discharge			
i) Undetained 100-year Peak Discharge	Q_{100} =		cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F =		cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ○ Wall with Rect. Notch ○ Wall with V-Notch Weir		**Flow too small for berm w/ pipe**
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P =		in
G) Rectangular Notch Width	Calculated W_N =		in

APPENDIX E

FIGURES



VICINITY MAP

JPS ENGINEERING

CITY LINK TRUCKING
225 N. CURTIS ROAD,
COLORADO SPRINGS, CO 80930

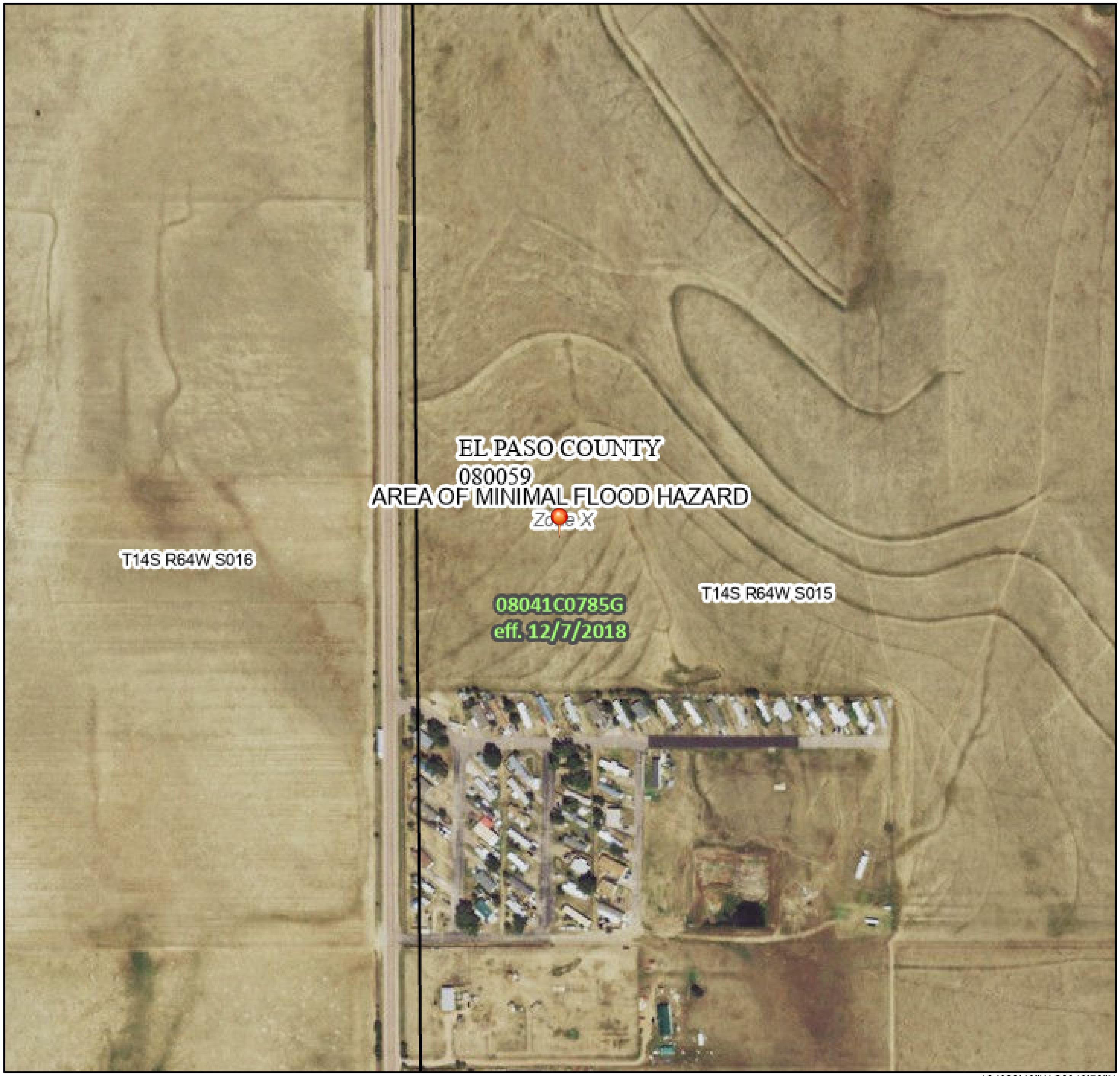
FIGURE A1

JPS PROJ NO. 052301

National Flood Hazard Layer FIRMette

FEMA

104°33'26"W 38°50'18"N



104°32'49"W 38°49'50"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

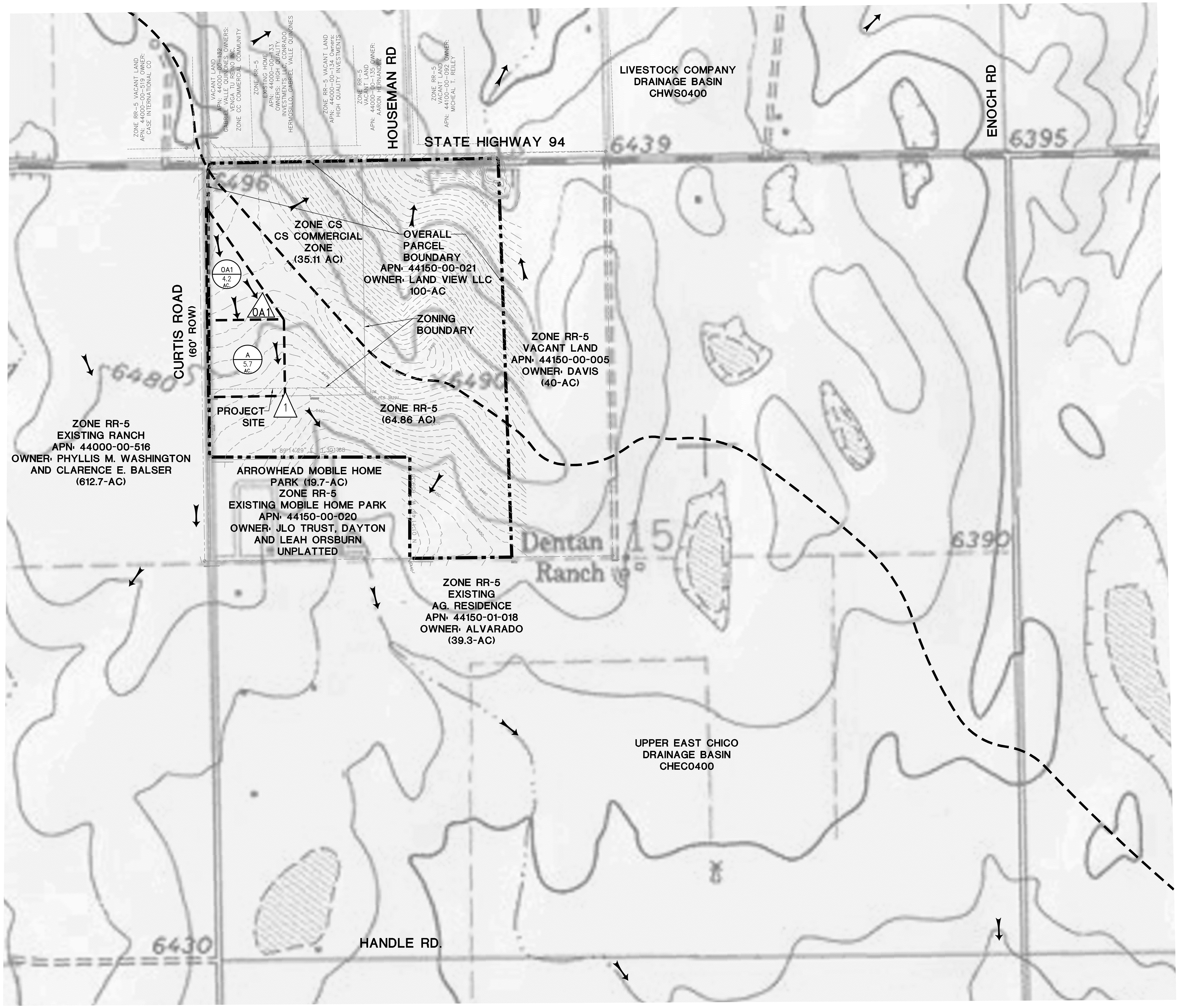
N

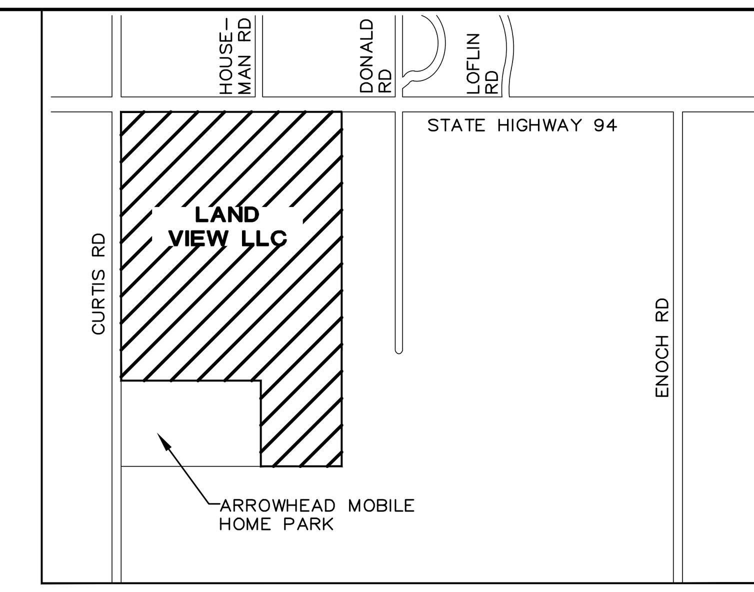
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/22/2023 at 11:34 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.





VICINITY MAP

N

300' 0 300' 600'

ORIGINAL SCALE: 1"=300' (24"x36" SHEET)
CONTOUR INTERVAL: 1'

LEGEND

- LOD — LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- 6470 — PROPOSED CONTOUR
- 6470 — EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- DESIGN POINT (1)
- BASIN DESIGNATION (A)
- BASIN AREA (ACRES) (1.46 AC.)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
0A1	0.7	5.3
1	1.6	11.8

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

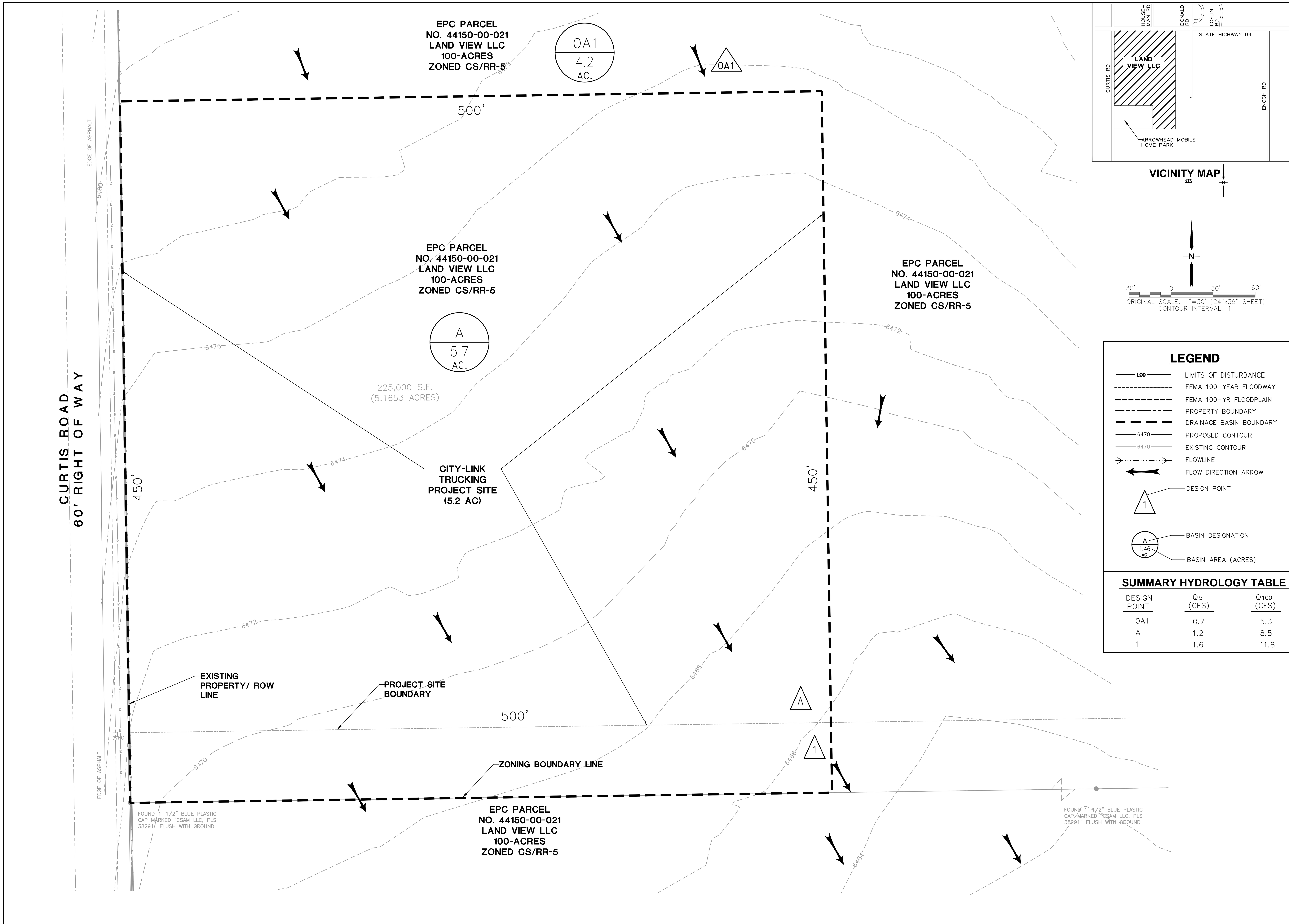
No.	REVISION	BY	DATE

CITY LINK TRUCKING
225 N. CURTIS ROAD, COLORADO SPRINGS, CO 80930

MAJOR BASIN / HISTORIC DRAINAGE PLAN

HORZ. SCALE: 1"=300'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: COMPASS	CHECKED: JPS
CREATED: 08/29/22	LAST MODIFIED: 08/24/23
PROJECT NO: 052301	MODIFIED BY: PV

SHEET: EX1



SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
0A1	0.7	5.3
A	1.2	8.5
1	1.6	11.8

CITY LINK TRUCKING
225 N. CURTIS ROAD, COLORADO SPRINGS, CO 80930

EXISTING CONDITIONS DRAINAGE PLAN

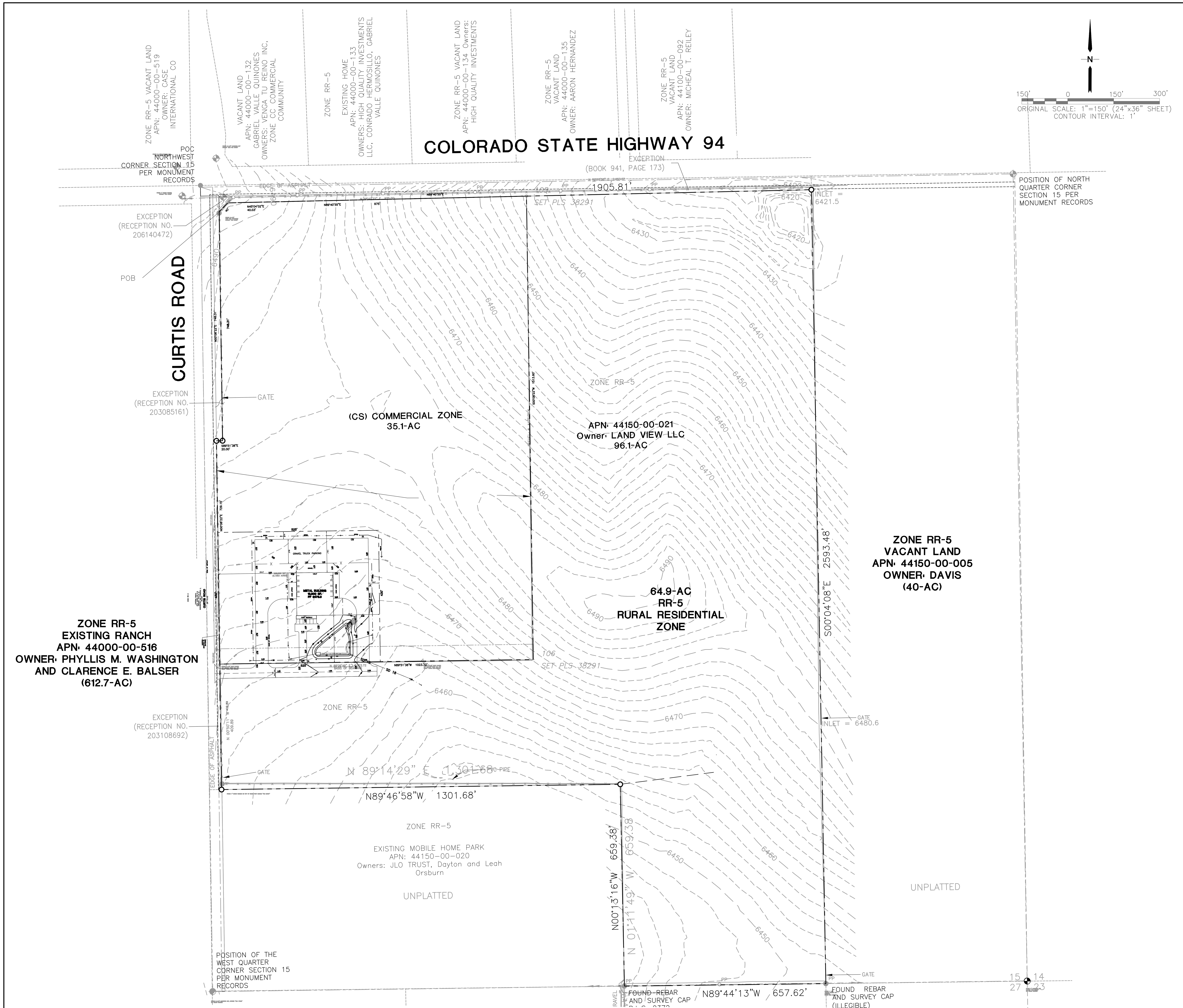
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

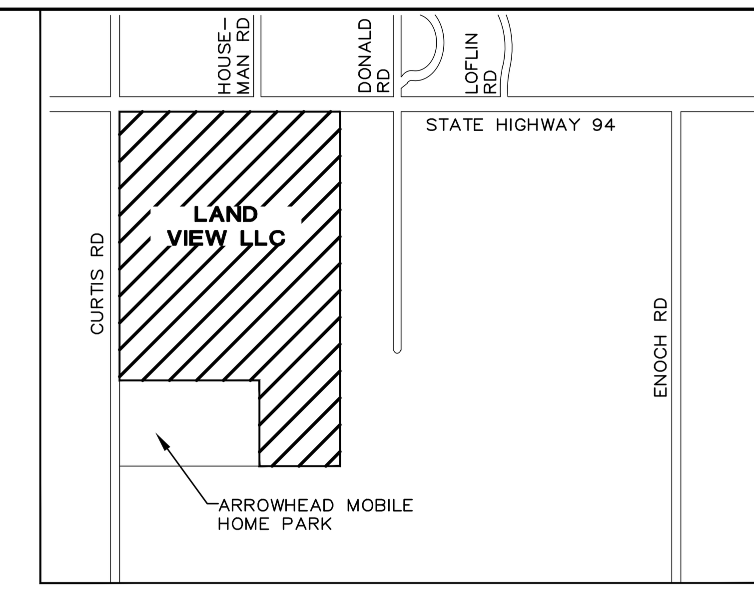
CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

HORZ. SCALE: 1"=30'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: COMPASS	CHECKED: JPS
CREATED: 08/29/22	LAST MODIFIED: 08/24/23
PROJECT NO: 052301	MODIFIED BY: PV

SHEET: EX2





VICINITY MAP
NTS

LEGEND

- LOD — LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- 6450 — PROPOSED CONTOUR
- 6450 — EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- (E) EXISTING
- (P) PROPOSED
- DS — DOWNSPOUT CONNECTION TO STORM SEWER; INSTALL TRANSITION COUPLINGS & EXTEND 6" PVC (SDR35) AT 1.0% MIN. SLOPE TO SD
- 1 — DESIGN POINT
- A — BASIN DESIGNATION
- 1.3 AC. — BASIN AREA (ACRES)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
1	5.8	16.8

CITY LINK TRUCKING
225 N. CURTIS ROAD, COLORADO SPRINGS, CO 80930

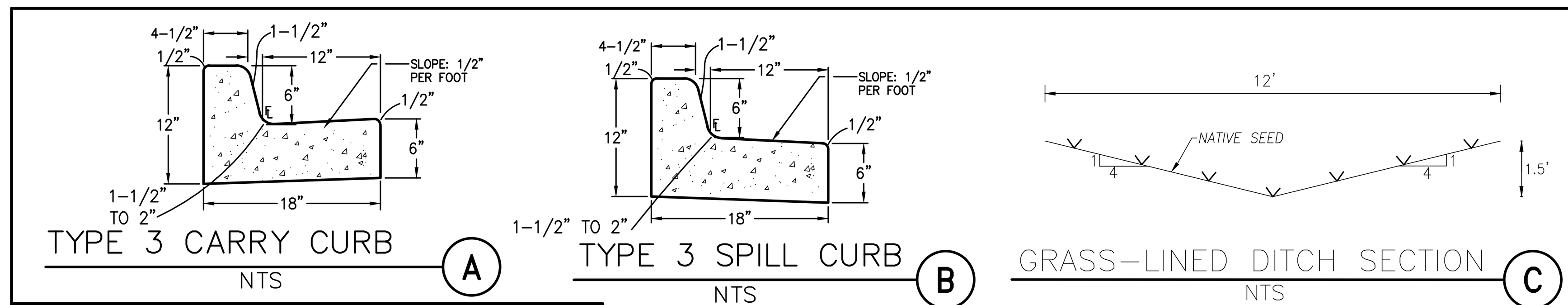
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

DEVELOPED DRAINAGE PLAN

HORZ. SCALE: 1"=150'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: LDC	CHECKED: JPS
CREATED: 08/29/22	LAST MODIFIED: 08/24/23
PROJECT NO: 052301	MODIFIED BY: PV
SHEET:	D1



PBMP SUMMARY TABLE

PBMP TRIBUTARY

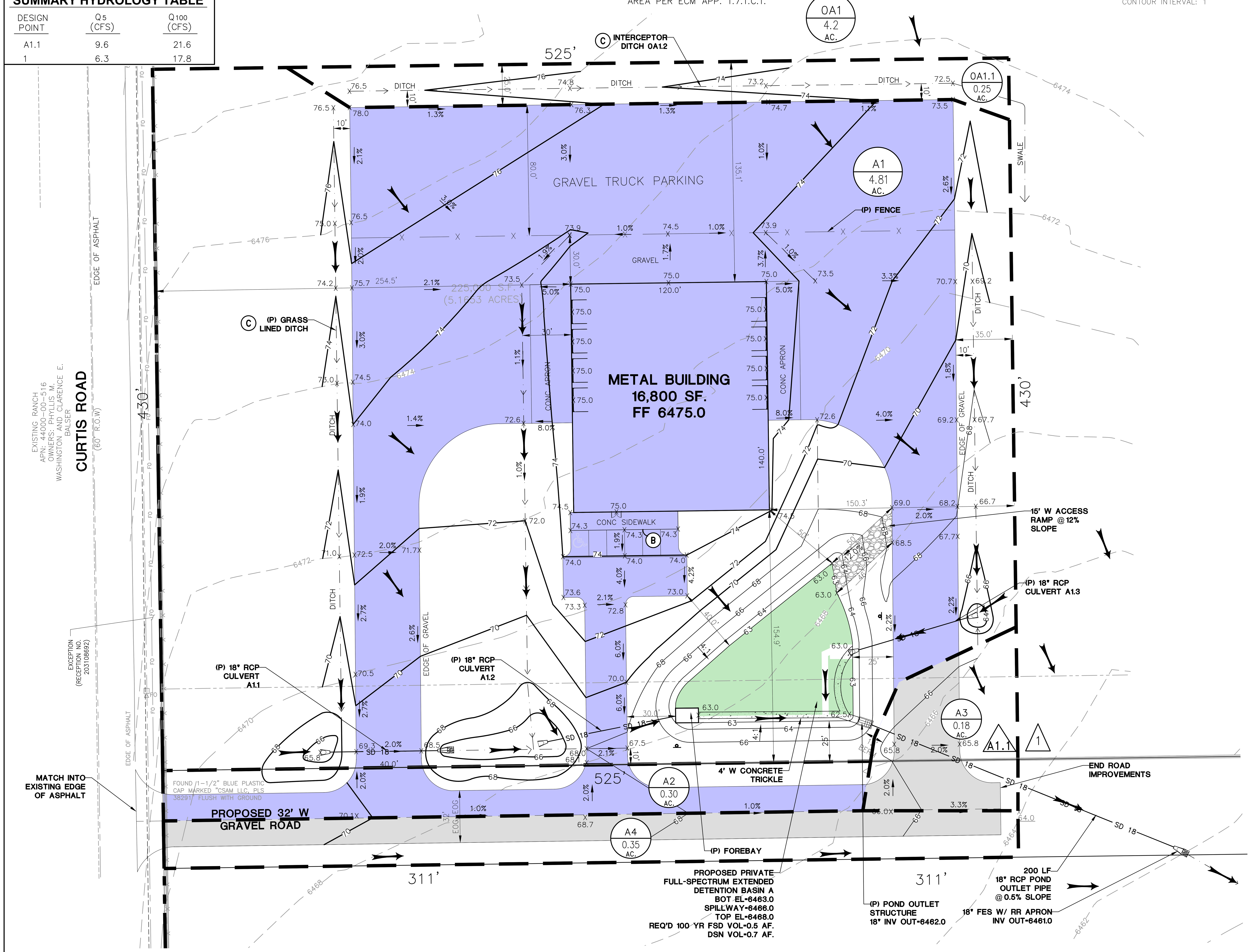
BASINS	AREA (AC)	PBMP
A1–A2	5.13	EDB–A
OA1	0.25	EXCLUDED*
A3	0.18	EXCLUDED*
A4	0.35	EXCLUDED*

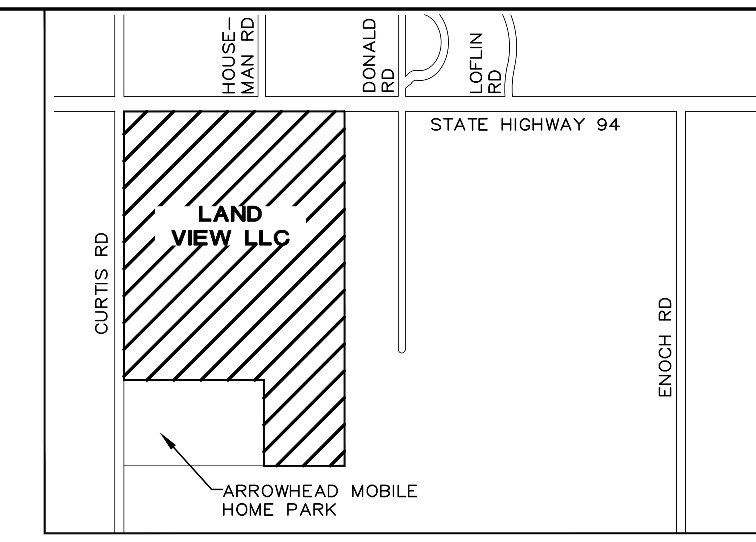
* EXCLUDED BASED ON LESS THAN 1 ACRE OF DEVELOPED AREA PER ECM APP. 1.7.1.C.1.

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
A1.1	9.6	21.6
1	6.3	17.8

ORIGINAL SCALE: 1"=30' (24"x36" SHEET)
CONTOUR INTERVAL: 1'





VICINITY MAP
NTS

LEGEND

- LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- (E) EXISTING
- (P) PROPOSED
- DS: DOWNSPOUT CONNECTION TO STORM SEWER; INSTALL TRANSITION COUPLINGS & EXTEND 6" PVC (SDR35) AT 1.0% MIN. SLOPE TO SD
- DESIGN POINT
- BASIN DESIGNATION
- BASIN AREA (ACRES)
- UNCONNECTED IMPERVIOUS AREA (UIA)
- RECEIVING PERVIOUS AREA (RPA)
- DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)
- SEPARATE PERVIOUS AREA (SPA)

IMPERVIOUS AREA CALCULATIONS:

BASIN A1 AREA = 4.81 AC.

SURFACE TYPE	AREA	
PROP. BUILDING	16,800 SF	
PROP. SIDEWALK	5,651 SF	
PROP. GRAVEL	79,325 SF	
TOTAL IMPERVIOUS AREA	101,776 SF	= 2.34 AC
		= 48.6%

IMPERVIOUS AREA CALCULATIONS:

BASIN A2 AREA = 0.30 AC.

SURFACE TYPE	AREA	
PROP. BUILDING	00 SF	
PROP. SIDEWALK	00 SF	
PROP. GRAVEL	8,168 SF	
TOTAL IMPERVIOUS AREA	8,168 SF	= 0.19 AC
		= 63.3%

IMPERVIOUS AREA CALCULATIONS:

BASIN A3 AREA = 0.18 AC.

SURFACE TYPE	AREA	
PROP. BUILDING	00 SF	
PROP. SIDEWALK	00 SF	
PROP. GRAVEL	4,353 SF	
TOTAL IMPERVIOUS AREA	4,353 SF	= 0.1 AC
		= 55.6%

IMPERVIOUS AREA CALCULATIONS:

BASIN A4 AREA = 0.35 AC.

SURFACE TYPE	AREA	
PROP. BUILDING	00 SF	
PROP. SIDEWALK	00 SF	
PROP. GRAVEL	8,164 SF	
TOTAL IMPERVIOUS AREA	8,164 SF	= 0.19 AC
		= 54%

CITY LINK TRUCKING

225 N. CURTIS ROAD, COLORADO SPRINGS, CO 80930

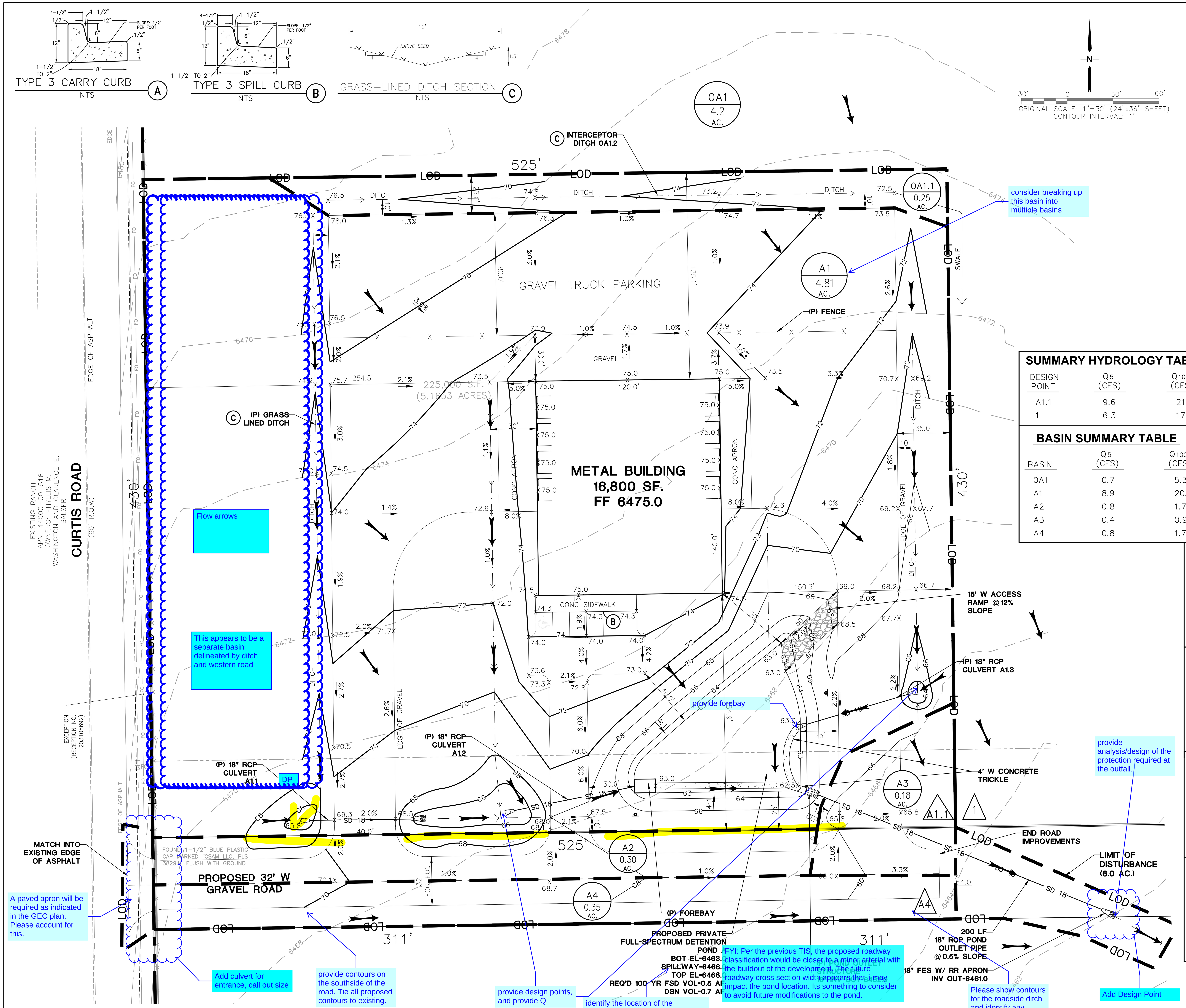
RUNOFF REDUCTION EXHIBIT

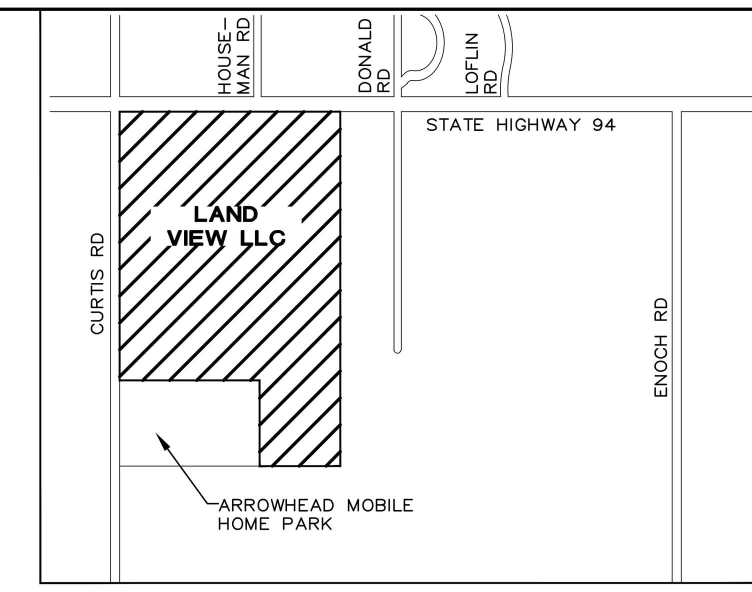
No.	REVISION	BY	DATE

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

HORZ. SCALE: 1"=30'	DRAWN: PV		
VERT. SCALE: N/A	DESIGNED: JPS		
SURVEYED: COMPASS	CHECKED: JPS		
CREATED: 08/29/22	LAST MODIFIED: 08/24/23		
PROJECT NO: 052301	MODIFIED BY: PV		
SHEET: RR-1			





VICINITY MAP NTS

LEGEND

- LOD — LIMITS OF DISTURBANCE
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- 6450 — PROPOSED CONTOUR
- 6450 — EXISTING CONTOUR
- FLOWLINE
- FLOW DIRECTION ARROW
- (E) EXISTING
- (P) PROPOSED
- DS — DOWNSPOUT CONNECTION TO STORM SEWER; INSTALL TRANSITION COUPLINGS & EXTEND 6" PVC (SDR35) AT 1.0% MIN. SLOPE TO SD
- DESIGN POINT
- BASIN DESIGNATION
- BASIN AREA (ACRES)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
A1.1	9.6	21.6
1	6.3	17.8

BASIN SUMMARY TABLE

BASIN	Q5 (CFS)	Q100 (CFS)
OA1	0.7	5.3
A1	8.9	20.2
A2	0.8	1.7
A3	0.4	0.9
A4	0.8	1.7

IMPERVIOUS AREA CALCULATIONS:

BASIN A1 AREA = 4.81 AC.

SURFACE TYPE	AREA
PROP. BUILDING	16,800 SF
PROP. SIDEWALK	5,651 SF
PROP. GRAVEL	79,325 SF
TOTAL IMPERVIOUS AREA	101,776 SF = 2.34 AC

= 48.6%

IMPERVIOUS AREA CALCULATIONS:

BASIN A2 AREA = 0.30 AC.

SURFACE TYPE	AREA
PROP. BUILDING	00 SF
PROP. SIDEWALK	00 SF
PROP. GRAVEL	8,168 SF
TOTAL IMPERVIOUS AREA	8,168 SF = 0.19 AC

= 63.3%

IMPERVIOUS AREA CALCULATIONS:

BASIN A3 AREA = 0.18 AC.

SURFACE TYPE	AREA
PROP. BUILDING	00 SF
PROP. SIDEWALK	00 SF
PROP. GRAVEL	4,353 SF
TOTAL IMPERVIOUS AREA	4,353 SF = 0.1 AC

= 55.6%

IMPERVIOUS AREA CALCULATIONS:

BASIN A4 AREA = 0.35 AC.

SURFACE TYPE	AREA
PROP. BUILDING	00 SF
PROP. SIDEWALK	00 SF
PROP. GRAVEL	8,164 SF
TOTAL IMPERVIOUS AREA	8,164 SF = 0.19 AC

= 54%

CITY LINK TRUCKING
225 N. CURTIS ROAD, COLORADO SPRINGS, CO 80930

BUILDING SITE DEVELOPED DRAINAGE PLAN

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO 1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

HORZ. SCALE: 1"=30'	DRAWN: PV	VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: COMPASS	CHECKED: JPS	CREATED: 08/29/22	LAST MODIFIED: 08/24/23
PROJECT NO: 052301	MODIFIED BY: PV	SHEET: D1.1	