



## Preliminary Drainage Report

# Waterview East Commercial El Paso County, Colorado

Waterview Commercial  
Investors, LLC

Prepared for:  
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Project #: 196195000

PCD Filing No.: **SP-22-009**

Prepared: May 18, 2022

**Kimley»Horn**

## CERTIFICATION

### **DESIGN 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 any liability caused by any negligent acts, errors, or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): \_\_\_\_\_  
Jared Roberts, P.E.  
Colorado P.E. No. 60470  
Date

### **OWNER/DEVELOPER'S STATEMENT**

I, the developer, have read and will comply with all the requirements specified in this Drainage Report and Plan.

\_\_\_\_\_  
Name of Developer

\_\_\_\_\_  
Authorized Signature Date


\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address:

### **EL PASO COUNTY**

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

 Josh Palmer, P.E.  
\_\_\_\_\_  
Jennifer Irvine, P.E. Date  
County Engineer/ ECM Administrator

Conditions:

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Switch Appendix E & F.  
Drainage Exhibits should  
be last item in the report.

## INTRODUCTION

### ***PURPOSE AND SCOPE OF STUDY***

The purpose of this Preliminary Drainage Report (PDR) is to provide the hydrologic and preliminary hydraulic calculations and to document the drainage design methodology in support of the proposed Waterview East Subdivision (“the Project”) for Westerra Development LLC. The finalized hydraulic design and associated calculations will be provided with the Final Drainage Report. The Project is located within the jurisdictional limits of El Paso County (“the County”). Therefore, the hydrologic and hydraulic design is based on the County’s criteria which is described in further detail within the report.

### ***LOCATION***

The Project is located within part of the West ½ of Section 9, Township 15 South, Range 65 West of the 6<sup>th</sup> Principal Meridian, County of El Paso, State of Colorado (“the Site”). The Site is bounded by Powers Boulevard (Highway 21) on the west, The Trails at Aspen Ridge Filing No. 1 to the east and to the south, and Bradley Road to the north. A vicinity map has been provided in the **Appendix A** of this report.

The Site is currently owned by Waterview East Development, LLC. The site is currently unplatted.

### ***DESCRIPTION OF PROPERTY***

The Site is approximately 22.1 acres consisting of undeveloped land with native vegetation and is classified as Vegetation within the site is characterized primarily by prairie grasses along with some area of scrub brush and a limited occurrence of small oaks. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land. There are no existing irrigation ditches on the Site.

The existing topography consists of slopes ranging from 1% to 33%.

According to NRCS soil mapping data, USCS Type A and B soils are the primary soil type within the site. Soils present at the Site consist mainly of “Blakeland loamy sand” which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

The development of this site will include commercial developments, including convenience store, restaurants, storage units and retail stores. Roadway improvements to the site will include mowing, clearing, and grubbing, weed control, paved access road construction, roadway grading, three onsite extended detention basins, drainage swales, native seeding, and water quality features.

Include discussion of swales used onsite and label on drainage maps

A Topographic field survey was completed for the Project by Kiegeme Land Surveying dated March 12<sup>th</sup>, 2021 and is the basis for design for the drainage improvements.



## DRAINAGE BASINS

### MAJOR BASIN DESCRIPTIONS

The western half of the Property lies within the Big Johnson drainage basin, and the eastern half of the Property lies within the West Fork of Jimmy Camp Creek drainage basin. The watershed is generally located in the central portion of El Paso County. Refer to **Appendix A** for the Flood Insurance Rate Map (FIRM) number 08041C0768G effective date, December 7, 2018.

### MASTER DRAINAGE REPORT STUDY

Indicate if there is a DBPS for either of these basins.

The Waterview East commercial development project is part of the “Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group September 2019. As outlined in the Master Drainage Plan, the “East Pond” was sized to include flows from the future “Commercial Lot south of Bradley Road and West of Legacy Drive”. In these watershed calculations a conservative weighted imperviousness value of 95% was used. This value is substantially higher than the calculated impervious value of 57% in proposed conditions.

As noted in the Master Drainage Plan, the eastern portion of the Site which is part of the West Fork Jimmy Camp Creek drainage basin will require on site detention. As noted in the Master Drainage Plan, the western portion of the Site which is part of the Big Johnson Reservoir drainage basin for future development of this lot “...On-site detention will be required and must discharge to the Powers Boulevard ditch.” Based on the pond sizing calculations and required on site detention, the proposed development is in compliance with the above-mentioned Master Drainage Plan. Offsite flows are addressed in the existing sub-basin descriptions below.

Excerpts from “Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group June 2019 have been provided in **Appendix F**.

### EXISTING SUB-BASIN DESCRIPTIONS

Historically, runoff from the Site is split almost directly down the center. With the eastern portion of the Site heading east and the western portion of the site heading west. The site has been divided into 2 existing onsite subbasins, EX-1 and EX-2.

#### Sub-Basin EX-1

The on-site sub-basin EX-1 is undeveloped consisting of native grasses and shrubs with an area of 10.55 acres comprising the eastern half of the property. Drainage flows overland from west to the east at slopes ranging from 5-9%. Flows are collected in the existing curb and gutter along Legacy Drive and are conveyed to an existing 10' Type-R inlet at the intersection of Legacy Drive and Frontside Drive. Flows are then carried through existing storm infrastructure into East Pond as outlined in the “Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge” Prepared by: Matrix Design Group September 2019. Runoff during the 5-year and 100-year events are 3.31 cfs and 22.20 cfs respectively.

Provide a list of all previous reports used from the area.

Include discussion of offsite flows entering the site (Existing & Proposed conditions)

### **Sub-Basin EX-2**

The on-site sub-basin EX-2 is undeveloped consisting of native grasses and shrubs with an area of 11.57 acres comprising the western half of the property. Drainage flows overland from northeast to southwest at slopes ranging from 5-8%. Flows are collected in the existing roadside ditch along Powers Blvd and travel south where they are conveyed west through an existing 60" CMP under Powers Blvd and into Big Johnson Reservoir. Runoff during the 5-year and 100-year events are 3.25 cfs and 21.81 cfs respectively.

Refer to **Appendix E** for the Existing Drainage Conditions Map.

### ***PROPOSED SUB-BASIN DESCRIPTIONS***

For the proposed condition, stormwater will generally maintain historic flow patterns for the east and west portions of the site. Proposed roadways internal to the site will alter some of the existing flow paths. Proposed curb and gutter, and proposed storm inlets will convey flows to one of three proposed Private Full Spectrum Extended Detention Basins. From there flows will outfall to existing historic drainage paths, which will ultimately outfall to existing natural drainage channels, sub regional pond, or water quality features. The proposed project has been divided into 30 on-site sub-basins.

Indicate if inlets are sump and whether storm system is public or private (add to all descriptions)

### **Sub-Basin A1**

The on-site sub-basin A1 consists of proposed parking, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.67 acres and a weighted imperviousness of 73%. Runoff in this basin will travel overland into a proposed area inlet at DP 1. Flows will then be conveyed to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 2.20 cfs and 4.36 cfs respectively.

### **Sub-Basin A2**

The on-site sub-basin A2 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.33 acres and a weighted imperviousness of 66%. Runoff in this basin will travel overland into a proposed area inlet at DP 2. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.00 cfs and 2.06 cfs respectively.

### **Sub-Basin A3**

The on-site sub-basin A3 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.41 acres and a weighted imperviousness of 81%. Runoff in this basin will travel overland into a proposed area inlet at DP 3. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.50 cfs and 2.87 cfs respectively.

### **Sub-Basin A4**

The on-site sub-basin A4 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.31 acres and a weighted imperviousness of 95%. Runoff in this basin will travel overland into a proposed area inlet at DP 4. Flows will then be conveyed via

proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.22 cfs and 2.23 cfs respectively.

Add Inlet type



#### **Sub-Basin A5**

The on-site sub-basin A5 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.32 acres and a weighted imperviousness of 92%. Runoff in this basin will travel overland into a proposed curb inlet at DP 5. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.31 cfs and 2.41 cfs respectively.

#### **Sub-Basin A6**

The on-site sub-basin A6 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.30 acres and a weighted imperviousness of 89%. Runoff in this basin will travel overland into a proposed area inlet at DP 6. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.14 cfs and 2.12 cfs respectively.

#### **Sub-Basin A7**

The on-site sub-basin A7 consists of proposed drive aisle, landscaping, and sidewalk. The sub-basin has an area of 0.39 acres and a weighted imperviousness of 92%. Runoff in this basin will travel overland into a proposed area inlet at DP 7. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.68 cfs and 3.09 cfs respectively.

#### **Sub-Basin A8**

The on-site sub-basin A8 consists of proposed drive aisle, landscaping, and sidewalk. The sub-basin has an area of 0.42 acres and a weighted imperviousness of 93%. Runoff in this basin will travel overland into a proposed area inlet at DP 8. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.81 cfs and 3.31 cfs respectively.

#### **Sub-Basin A9**

The on-site sub-basin A9 consists of proposed drive aisle, landscaping, and sidewalk. The sub-basin has an area of 0.41 acres and a weighted imperviousness of 93%. Runoff in this basin will travel overland into a proposed area inlet at DP 9. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.80 cfs and 3.29 cfs respectively.

#### **Sub-Basin A10**

The on-site sub-basin A10 consists of proposed drive aisle, landscaping, and sidewalk. The sub-basin has an area of 0.40 acres and a weighted imperviousness of 94%. Runoff in this basin will travel overland into a proposed curb inlet at DP 10. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention

Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.73 cfs and 3.16 cfs respectively.

### Sub-Basin A11

The on-site sub-basin A11 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.35 acres and a weighted imperviousness of 86%. Runoff in this basin will travel overland into a proposed curb inlet at DP 11. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.80 cfs and 3.29 cfs respectively.

Flows shown do not match hydrology spreadsheet in appendix

### Sub-Basin A12

The on-site sub-basin A12 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.26 acres and a weighted imperviousness of 75%. Runoff in this basin will travel overland into a proposed area inlet at DP 12. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 0.74 cfs and 1.45 cfs respectively.

### Sub-Basin A13

Change to A13

The on-site sub-basin A12 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 1.05 acres and a weighted imperviousness of 79%. Runoff in this basin will travel overland into a proposed curb inlet at DP 13. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 3.06 cfs and 5.87 cfs respectively.

### Sub-Basin A14

The on-site sub-basin A14 consists of proposed drive aisle, landscaping, and sidewalk. The sub-basin has an area of 0.11 acres and a weighted imperviousness of 86%. Runoff in this basin will travel overland into a proposed area inlet at DP 14. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 0.43 cfs and 0.81 cfs respectively.

### Sub-Basin A15

The on-site sub-basin A15 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.16 acres and a weighted imperviousness of 75%. Runoff in this basin will travel overland into a proposed area inlet at DP 15. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 0.42 cfs and 0.82 cfs respectively.

### **Sub-Basin A16**

The on-site sub-basin A16 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.39 acres and a weighted imperviousness of 89%. Runoff in this basin will travel overland into a proposed area inlet at DP 16. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 1.47 cfs and 2.75 cfs respectively.

### **Sub-Basin A17**

The on-site sub-basin A17 consists of proposed drive aisle, landscaping, roofing, and sidewalk. The sub-basin has an area of 0.75 acres and a weighted imperviousness of 94%. Runoff in this basin will travel overland into a proposed area inlet at DP 17. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 2). Runoff during the 5-year and 100-year events are 3.14 cfs and 5.72 cfs respectively.

### **Sub-Basin A18**

The on-site sub-basin A18 consists of proposed drive aisle, landscaping, and roofing. The sub-basin has an area of 0.83 acres and a weighted imperviousness of 65%. Runoff in this basin will travel overland into a proposed area inlet at DP 18. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 3). Runoff during the 5-year and 100-year events are 1.82 cfs and 3.77 cfs respectively.

### **Sub-Basin A19**

The on-site sub-basin A19 consists of proposed drive aisle, and roofing. The sub-basin has an area of 1.34 acres and a weighted imperviousness of 95%. Runoff in this basin will travel overland into a proposed area inlet at DP 19. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 3). Runoff during the 5-year and 100-year events are 5.39 cfs and 9.83 cfs respectively.

### **Sub-Basin A20**

The on-site sub-basin A20 consists of proposed drive aisle, and roofing. The sub-basin has an area of 0.60 acres and a weighted imperviousness of 95%. Runoff in this basin will travel overland into a proposed area inlet at DP 20. Flows will then be conveyed via proposed stormwater infrastructure to proposed Private Full Spectrum Extended Detention Basin (Pond 3). Runoff during the 5-year and 100-year events are 2.53 cfs and 4.60 cfs respectively.

### **Sub-Basin A21**

The on-site sub-basin A21 consists of proposed drive aisle, and roofing. The sub-basin has an area of 0.49 acres and a weighted imperviousness of 92%. Runoff in this basin will travel overland through a proposed curb cut at DP 21. Flows will then be conveyed down a proposed riprap channel directly into the proposed Private Full Spectrum Extended Detention Basin (Pond 3). Runoff during the 5-year and 100-year events are 1.57 cfs and 2.89 cfs respectively.

### **Sub-Basin A22**

The on-site sub-basin A22 consists of proposed drive aisle, and roofing. The sub-basin has an

area of 0.63 acres and a weighted imperviousness of 93%. Runoff in this basin will travel overland through a proposed curb cut at DP 22. Flows will then be conveyed down a proposed riprap channel directly into the proposed Private Full Spectrum Extended Detention Basin (Pond 3). Runoff during the 5-year and 100-year events are 2.35 cfs and 4.31 cfs respectively.

### Sub-Basin A23

The on-site sub-basin A23 consists of proposed drive aisle, sidewalk, landscaping, and roofing. The sub-basin has an area of 2.10 acres and a weighted imperviousness of 61%. Runoff in this basin will travel overland via curb and gutter into a proposed curb inlet at DP 23. Flows will then be conveyed through proposed stormwater infrastructure into the proposed Private Full Spectrum Extended Detention Basin (Pond 1). Runoff during the 5-year and 100-year events are 4.83 cfs and 10.15 cfs respectively.

### Sub-Basin PD-1

The on-site sub-basin PD-1 consists of landscaping and proposed Private Full Spectrum Extended Detention Basin (Pond 1). The sub-basin has an area of 0.65 acres and a weighted imperviousness of 2%. Runoff in this basin will travel overland directly into Pond 1. Flows from Pond 1 will outfall at DP 24 into proposed storm infrastructure and flow into existing stormwater infrastructure located in Frontside Drive. Runoff during the 5-year and 100-year events are 0.23 cfs and 1.52 cfs respectively

### Sub-Basin PD-2

The on-site sub-basin PD-2 consists of landscaping, roofing, and proposed Private Full Spectrum Extended Detention Basin (Pond 2). The sub-basin has an area of 0.74 acres and a weighted imperviousness of 26%. Runoff in this basin will flow directly into Pond 2. Flows from Pond 2 will outfall at DP 25 into proposed storm infrastructure and flow into existing stormwater infrastructure located in Frontside Drive. Runoff during the 5-year and 100-year events are 0.79 cfs and 2.39 cfs respectively.

### Sub-Basin PD-3

The on-site sub-basin PD-3 consists of landscaping and proposed Private Full Spectrum Extended Detention Basin (Pond 3). The sub-basin has an area of 0.21 acres and a weighted imperviousness of 2%. Runoff in this basin will flow directly into Pond 3. Flows from Pond 2 will outfall at DP 26 into the existing roadside ditch along Powers Blvd. Runoff during the 5-year and 100-year events are 0.09 cfs and 0.61 cfs respectively.

### Sub-Basin OS-1

The on-site sub-basin OS-1 consists of landscaping along the western property line. The sub-basin has an area of 2.05 acres and a weighted imperviousness of 4%. Runoff in this basin will flow offsite at DP 27 directly into the roadside ditch along Powers Blvd. Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 0.72 cfs and 4.13 cfs respectively.

The majority of this basin is landscaping and a short section of sidewalk. According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This area classifies as "Land Disturbance to Undeveloped Land that will Remain Undeveloped." This area will follow native drainage patterns and remain undisturbed with no buildings or pavement and therefore

Change to undeveloped

Include a summary of total flows (OS-1 & PD-3) entering Powers ditch. Compare flows to existing flows entering ditch and provide an analysis of existing ditch with proposed flows to ensure it continues to function adequately.



classifies as an exclusion.

### Sub-Basin OS-2

The on-site sub-basin OS-2 consists of landscaping along the northern property line. The sub-basin has an area of 0.79 acres and a weighted imperviousness of 2%. Runoff in this basin will flow offsite at DP 28 directly into Legacy Hill Dr where it will be carried by curb and gutter south into the existing storm water infrastructure. Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 0.11 cfs and 0.21 cfs respectively.

The entirety of this basin is landscaping. According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This area classifies as "Land Disturbance to Undeveloped Land that will Remain Undeveloped." This area will follow native drainage patterns and remain undisturbed with no buildings or pavement and therefore classify as an exclusion.

### Sub-Basin OS-3

The on-site sub-basin OS-3 consists of landscaping along the southern property line. The sub-basin has an area of 3.99 acres and a weighted imperviousness of 54%. Runoff in this basin will flow offsite at DP 29 directly into Legacy Hill Dr where it will be carried by curb and gutter into the existing storm water infrastructure. Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 5.59 cfs and 14.91 cfs respectively.

A large portion of this basin is landscaping. According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This landscape area classifies as "Land Disturbance to Undeveloped Land that will Remain Undeveloped." This area will follow native drainage patterns and remain undisturbed with no buildings or pavement and therefore classify as an exclusion.

The portions of the drive aisle from this basin that flow offsite will sheetflow into the proposed offsite Type R Inlets within Frontside Drive. These areas exceed the County's maximum requirement of 20%, not to exceed 1 acre, of total onsite imperviousness being untreated. However, after referencing the Master Development Drainage Report for the basin, it was determined that the East Pond (Design Point M) has adequate capacity and can treat this additional flow. Please reference Appendix F for the UD-Detention spreadsheet for this pond with relevant acreages highlighted, as well as the Proposed Drainage Map showing tributary basins.

### Sub-Basin OS-4

The on-site sub-basin OS-4 consists of landscaping, and drive aisle along the southern property line. The sub-basin has an area of 0.67 acres and a weighted imperviousness of 54%. Runoff in this basin will flow offsite at DP 30 directly into Legacy Hill Dr where it will be carried by curb and gutter into the existing storm water infrastructure. Flows from this sub-basin will follow historic flow patterns. Runoff during the 5-year and 100-year events are 1.71 cfs and 3.74 cfs respectively.

A portion of this basin is landscaping. According to the El Paso County Engineering Criteria Manual, Section I.7.1.B.7, This landscape area classifies as "Land Disturbance to Undeveloped Land that will Remain Undeveloped." This area will follow native drainage patterns and remain undisturbed with no buildings or pavement and therefore classify as an exclusion.

existing

Per MDDP information provided in appendix, existing inlets in Frontside Dr have stubs in the back of the inlets for the commercial site to connect to. Why are flows being released into the road instead of utilizing these stubs? Proposed storm will need to connect to the existing stubs. Frontside Dr and existing inlets will need to be analyzed (street & Inlet capacity) to see if they can handle the additional flow since it appears they were not originally designed to carry and capture flows from OS-2, OS-3 & OS-4

existing

existing

The portions of the drive aisle from this basin that flow offsite will sheetflow into the proposed offsite Type R Inlets within Frontside Drive. These areas exceed the County's maximum requirement of 20%, not to exceed 1 acre, of total onsite imperviousness being untreated. However, after referencing the Master Development Drainage Report for the basin, it was determined that the East Pond (Design Point M) has adequate capacity and can treat this additional flow. Please reference Appendix F for the UD-Detention spreadsheet for this pond with relevant acreages highlighted, as well as the Proposed Drainage Map showing tributary basins.

Refer to **Appendix E** for the Proposed Drainage Criteria.

Summarize the hydrologic soil group used for the site.

## **DRAINAGE DESIGN CRITERIA**

### ***DEVELOPMENT CRITERIA REFERENCE***

The proposed storm facilities are designed to be in compliance with the El Paso County Drainage Criteria Manual, Volumes 1 and 2 (The "CRITERIA") and the Urban Storm Drainage Criteria Manual (the "MANUAL"). Site drainage is not significantly impacted by such constraints as utilities or existing development.

### ***HYDROLOGIC CRITERIA***

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage analysis per chapter 5 of the CRITERIA. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 5-1 of the CRITERIA by calculating weighted impervious values for each specific site basin. Based upon this approach, the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

### ***HYDRAULIC CRITERIA***

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Hydraulic calculations were computed using Storm CAD using the Standard Method. Results of the hydraulic calculations are summarized in the **Appendix D**.

### ***INLET AND PIPE SIZING***

Detailed sizing for proposed inlets and pipes will be included in subsequent Final Drainage Reports. Inlet sizing will be done using MHFD-Inlet street capacity and inlet sizing software. Pipe sizing will be completed using StormCAD.

### ***DETENTION POND SUMMARY***

Preliminary detention pond and water quality calculations have been completed. A total of three detention basins have been designed for WQCV and summarized below.

Include discussion of all outfall locations, Powers Ditch for Pond 3. Ponds 1 & 2 tie into existing Storm, but where does it go and is it suitable. How do proposed flows into existing systems compare to previously assumed proposed flows.

EURV



add a column for the required WQCV

| Pond | Approximate<br>100-yr<br>Detention<br>Volume<br>Required (ac-ft) | Proposed<br>Volume<br>(ac-ft) | Cumulative<br>100-yr<br>Runoff (cfs) |
|------|--|-------------------------------|--------------------------------------|
| 1    | 0.241  | 0.397                         | 11.7                                 |
| 2    | 1.102  | 1.618                         | 51.3                                 |
| 3    | 0.630  | 0.902                         | 26.0                                 |

Need to show where/how these flows were determined as the pond spreadsheets in appendix did not include the outlet design

UD-detention Pond calculations are provided in **Appendix D**

Discuss maintenance access and who will be maintaining ponds

## DRAINAGE FACILITY DESIGN

### GENERAL CONCEPT

The proposed development includes commercial buildings, landscape, and drive aisles. The proposed development will decrease permeability on the site. This decrease has been accounted for in the Master Drainage Plan. The proposed drainage patterns will match historic patterns as much as possible and not significantly increase developed flows. The runoff within the site will be captured and treated via proposed private Full Spectrum Extended Detention Basins before being released into historic discharge points.

State how many ponds are expected and provide their names if applicable.

Provided in **Appendix C** are the hydrologic calculations used in pond sizing. Provided in **Appendix D** are preliminary pond sizing calculations. Existing and proposed Drainage Maps can be found in **Appendix F**.

### DRAINAGE FEE

The project is within the Big Johnson drainage basin, and the West Fork of Jimmy Camp Creek drainage basin which is a part of the El Paso County Drainage Basin Fee Program. Drainage and bridge fees will be finalized with the Final Drainage Report. Drainage fees shall be paid at the time of final plat recordation.

## THE FOUR STEP PROCESS

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the El Paso County Engineering Manual for BMP selection as noted below:

**Step 1. Employ Runoff Reduction Practices** – The project is proposing commercial development. The Site's proposed paved roadways will increase the Site's impervious area, however, the use of landscaping throughout the Site will slow runoff. The three proposed Full Spectrum Extended Detention Basins will be used to capture stormwater,

provide water quality treatment, and maintain flows discharging off site at or below historic levels.

**Step 2. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release** – Permanent water quality measures and detention facilities will be necessary for the Project. Temporary water quality and erosion control measures will be provided during construction to prevent sediment laden water from discharging from the Site.

**Step 3 Stabilize Drainageways**– Stabilizing proposed roadside ditches, swales, and channels by designing them with slopes that control the flow rates. Placement of riprap upstream and downstream of culverts to help reduce erosion of the roadside ditches. Check dams will be used in areas with steeper grades to slow the runoff. We anticipate this will minimize erosion. Existing drainage ways will be graded to reduce the velocity of the water to minimize erosion.

**Step 4. Implement Site Specific and Other Source Control BMPs** – The erosion control construction BMPs of the Project were designed to reduce contamination. Source control BMPs include the use of vehicle tracking control, culvert protection, stockpile management, and stabilized staging areas.

## SUMMARY

This report has been prepared in accordance with El Paso County stormwater criteria. It outlines the Site design for the 5-year and 100-year storm events drainage system. The drainage design presented within this report conforms to the criteria presented in the CRITERIA and the MANUAL. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

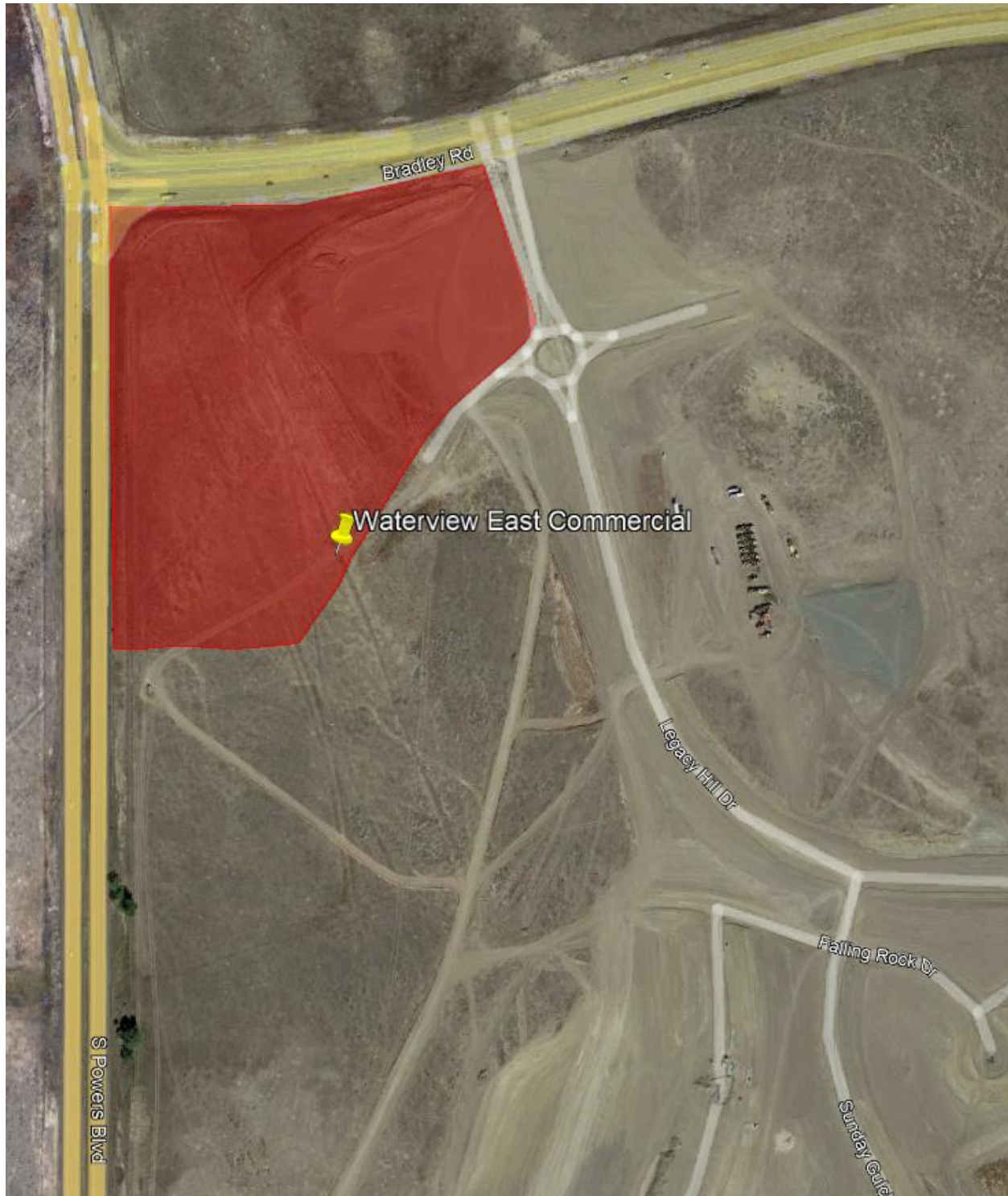
## REFERENCES

1. El Paso County "Engineering Criteria Manual" Volumes 1 & 2, dated October 31, 2018
2. Natural Resources Conservation Service, Web Soil Survey, dated April 29, 2022.
3. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0768G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).
4. Master Development Drainage Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge" Prepared by: Matrix Design Group September 2019

## APPENDIX

## **APPENDIX A – VICINITY MAP**

# Waterview East Commercial Vicinity Map (Not to Scale)



**APPENDIX B – FEMA FIRM PANEL AND SOILS MAP**



# National Flood Hazard Layer FIRMMette



104°41'3"W 38°45'44"N



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

1:6,000

104°40'25"W 38°45'16"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

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

|                             |  |   |
|-----------------------------|--|---|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>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              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                             |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                             |  | Coastal Transect  |
|                             |  | Base Flood Elevation Line (BFE)   |
|                             |  | Limit of Study  |
|                             |  | Jurisdiction Boundary   |
|                             |  | Coastal Transect Baseline   |
| MAP PANELS                  |  | Digital Data Available  |
|                             |  | No Digital Data Available   |
|                             |  | Unmapped  |



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 **4/29/2022 at 2:29 PM** 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.



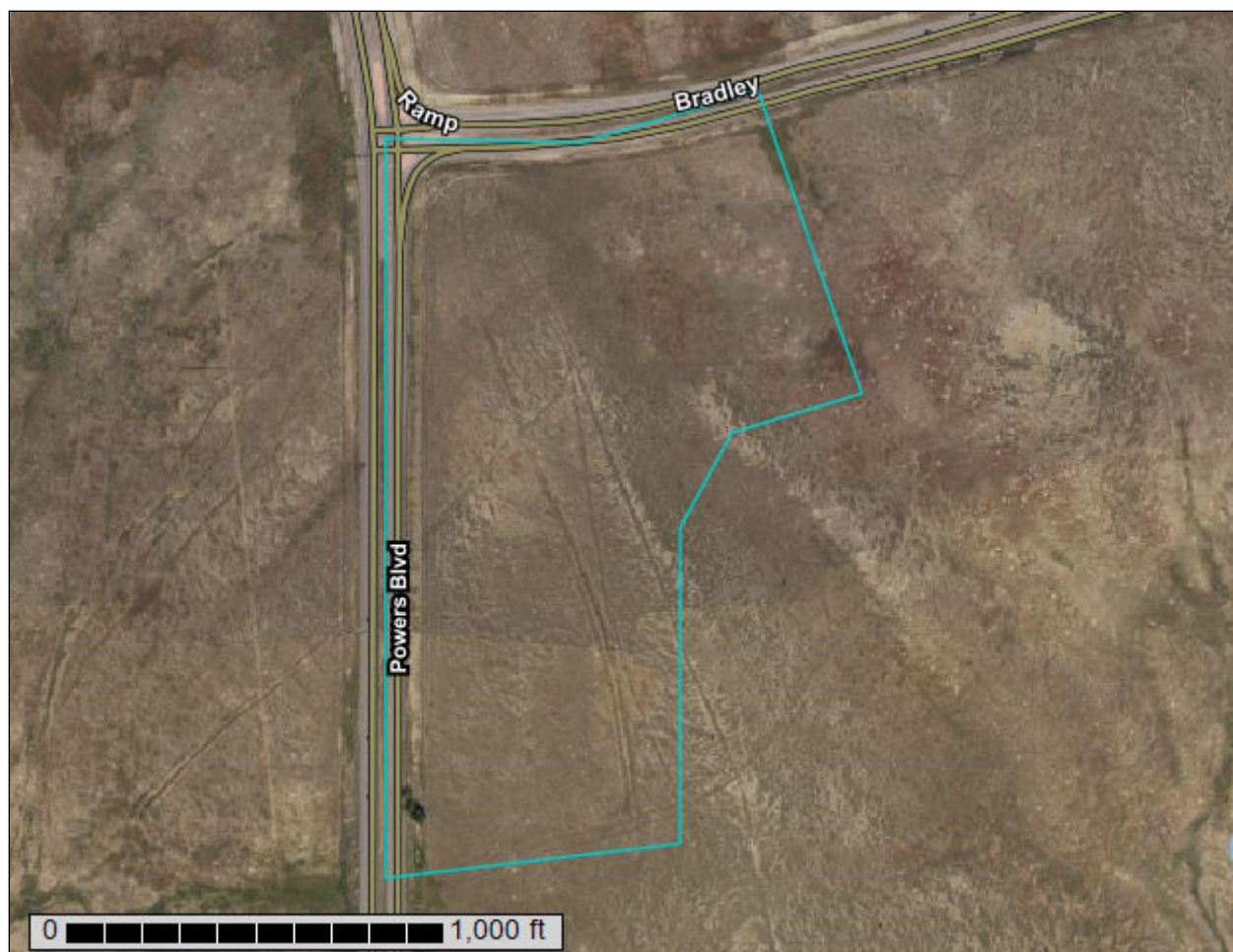
United States  
Department of  
Agriculture

**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**





# Preface

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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](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.

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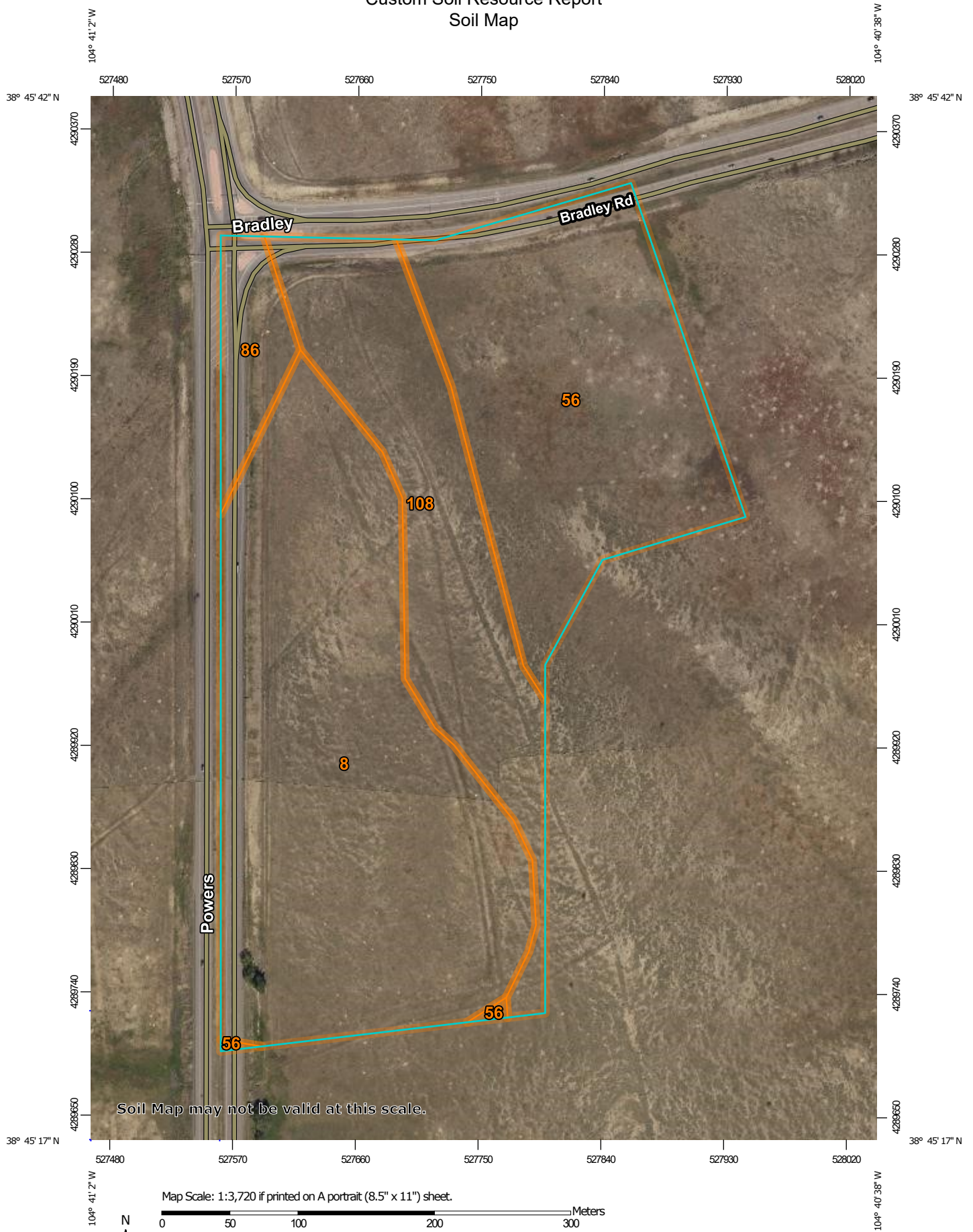
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# Soil Map

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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.


# Custom Soil Resource Report Soil Map



# Custom Soil Resource Report


## 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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 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 |
|------------------------------------|--|--------------|----------------|
| 8                                  | Blakeland loamy sand, 1 to 9 percent slopes            | 19.2         | 45.9%          |
| 56                                 | Nelson-Tassel fine sandy loams, 3 to 18 percent slopes | 12.2         | 29.3%          |
| 86                                 | Stoneham sandy loam, 3 to 8 percent slopes             | 1.8          | 4.3%           |
| 108                                | Wiley silt loam, 3 to 9 percent slopes                 | 8.6          | 20.5%          |
| <b>Totals for Area of Interest</b> |  | <b>41.8</b>  | <b>100.0%</b>  |

## 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.

## Custom Soil Resource Report

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

### 8—Blakeland loamy sand, 1 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369v  
*Elevation:* 4,600 to 5,800 feet  
*Mean annual precipitation:* 14 to 16 inches  
*Mean annual air temperature:* 46 to 48 degrees F  
*Frost-free period:* 125 to 145 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

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

#### Description of Blakeland

##### Setting

*Landform:* Hills, flats  
*Landform position (three-dimensional):* Side slope, talus  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from sedimentary rock and/or eolian deposits  
derived from sedimentary rock

##### Typical profile

*A - 0 to 11 inches:* loamy sand  
*AC - 11 to 27 inches:* loamy sand  
*C - 27 to 60 inches:* sand

##### Properties and qualities

*Slope:* 1 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat excessively drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 5 percent  
*Available water supply, 0 to 60 inches:* Low (about 4.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* A  
*Ecological site:* R049XB210CO - Sandy Foothill  
*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

**56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 3690

*Elevation:* 5,600 to 6,400 feet

*Mean annual precipitation:* 12 to 14 inches

*Mean annual air temperature:* 48 to 52 degrees F

*Frost-free period:* 135 to 155 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Nelson and similar soils:* 55 percent

*Tassel and similar soils:* 40 percent

*Minor components:* 5 percent

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

**Description of Nelson**

**Setting**

*Landform:* Hills

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

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Calcareous residuum weathered from interbedded sedimentary rock

**Typical profile**

*A - 0 to 5 inches:* fine sandy loam

*Ck - 5 to 23 inches:* fine sandy loam

*Cr - 23 to 27 inches:* weathered bedrock

**Properties and qualities**

*Slope:* 3 to 12 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high  
(0.06 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:* Very low (about 2.8 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 4e  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* B  
*Ecological site:* R067BY045CO - Shaly Plains  
*Other vegetative classification:* SHALY PLAINS (069AY046CO)  
*Hydric soil rating:* No

**Description of Tassel**

**Setting**

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Calcareous slope alluvium over residuum weathered from sandstone

**Typical profile**

*A - 0 to 4 inches:* fine sandy loam  
*C - 4 to 10 inches:* fine sandy loam  
*Cr - 10 to 14 inches:* weathered bedrock

**Properties and qualities**

*Slope:* 3 to 18 percent  
*Depth to restrictive feature:* 6 to 20 inches to paralithic bedrock  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 10 percent  
*Available water supply, 0 to 60 inches:* Very low (about 1.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* D  
*Ecological site:* R067BY045CO - Shaly Plains  
*Other vegetative classification:* SHALY PLAINS (069AY046CO)  
*Hydric soil rating:* No

**Minor Components**

**Other soils**

*Percent of map unit:* 4 percent  
*Hydric soil rating:* No

**Pleasant**

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

## **86—Stoneham sandy loam, 3 to 8 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 36b2  
*Elevation:* 5,100 to 6,500 feet  
*Mean annual precipitation:* 13 to 15 inches  
*Mean annual air temperature:* 48 to 52 degrees F  
*Frost-free period:* 135 to 155 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Stoneham and similar soils:* 95 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Stoneham**

#### **Setting**

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Calcareous loamy alluvium

#### **Typical profile**

*A - 0 to 4 inches:* sandy loam  
*Bt - 4 to 8 inches:* sandy clay loam  
*Btk - 8 to 11 inches:* sandy clay loam  
*Ck - 11 to 60 inches:* loam

#### **Properties and qualities**

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*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:* 15 percent  
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* High (about 9.5 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B  
*Ecological site:* R067BY024CO - Sandy Plains

## Custom Soil Resource Report

*Other vegetative classification:* SANDY PLAINS (069AY026CO)

*Hydric soil rating:* No

### Minor Components

#### Other soils

*Percent of map unit:* 4 percent

*Hydric soil rating:* No

#### Pleasant

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## 108—Wiley silt loam, 3 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 367b

*Elevation:* 5,200 to 6,200 feet

*Mean annual precipitation:* 12 to 14 inches

*Mean annual air temperature:* 48 to 52 degrees F

*Frost-free period:* 135 to 155 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Wiley and similar soils:* 95 percent

*Minor components:* 5 percent

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

### Description of Wiley

#### Setting

*Landform:* Hills

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

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Calcareous silty eolian deposits

#### Typical profile

*A - 0 to 4 inches:* silt loam

*Bt - 4 to 16 inches:* silt loam

*Bk - 16 to 60 inches:* silt loam

#### Properties and qualities

*Slope:* 3 to 9 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Medium

*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

## Custom Soil Resource Report

*Frequency of flooding:* None

*Frequency of ponding:* None

*Calcium carbonate, maximum content:* 15 percent

*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water supply, 0 to 60 inches:* High (about 11.5 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* 4e

*Land capability classification (nonirrigated):* 6e

*Hydrologic Soil Group:* B

*Ecological site:* R067BY002CO - Loamy Plains

*Other vegetative classification:* LOAMY PLAINS (069AY006CO)

*Hydric soil rating:* No

### **Minor Components**

#### **Other soils**

*Percent of map unit:* 4 percent

*Hydric soil rating:* No

#### **Pleasant**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

# **Soil Information for All Uses**

---

## **Suitabilities and Limitations for Use**

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

## **Land Management**

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

### **Erosion Hazard (Road, Trail)**

The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.

The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

## Custom Soil Resource Report

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.




Custom Soil Resource Report  
Map—Erosion Hazard (Road, Trail)








## MAP LEGEND

### Area of Interest (AOI)






 Area of Interest (AOI)

### Soils






#### Soil Rating Polygons

 Very severe  
 Severe  
 Moderate  
 Slight  
 Not rated or not available


#### Soil Rating Lines

 Very severe  
 Severe  
 Moderate  
 Slight  
 Not rated or not available

#### Soil Rating Points




 Very severe  
 Severe  
 Moderate  
 Slight  
 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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 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.

**Tables—Erosion Hazard (Road, Trail)**

| Map unit symbol                    | Map unit name  | Rating   | Component name (percent) | Rating reasons (numeric values) | Acres in AOI | Percent of AOI |
|------------------------------------|--|----------|--------------------------|---------------------------------|--------------|----------------|
| 8                                  | Blakeland loamy sand, 1 to 9 percent slopes            | Moderate | Blakeland (98%)          | Slope/erodibility (0.50)        | 19.2         | 45.9%          |
| 56                                 | Nelson-Tassel fine sandy loams, 3 to 18 percent slopes | Moderate | Nelson (55%)             | Slope/erodibility (0.50)        | 12.2         | 29.3%          |
| 86                                 | Stoneham sandy loam, 3 to 8 percent slopes             | Moderate | Stoneham (95%)           | Slope/erodibility (0.50)        | 1.8          | 4.3%           |
| 108                                | Wiley silt loam, 3 to 9 percent slopes                 | Moderate | Wiley (95%)              | Slope/erodibility (0.50)        | 8.6          | 20.5%          |
| <b>Totals for Area of Interest</b> |  |          |                          |                                 | <b>41.8</b>  | <b>100.0%</b>  |

| Rating                             | Acres in AOI | Percent of AOI |
|------------------------------------|--------------|----------------|
| Moderate                           | 41.8         | 100.0%         |
| <b>Totals for Area of Interest</b> | <b>41.8</b>  | <b>100.0%</b>  |

**Rating Options—Erosion Hazard (Road, Trail)***Aggregation Method: Dominant Condition**Component Percent Cutoff: None Specified**Tie-break Rule: Higher*

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## **APPENDIX C – HYDROLOGIC CALCULATIONS**

Weighted Imperviousness Calculations - Existing Conditions

| SUB-BASIN | AREA (SF) | AREA (Acres) | ROOF AREA | ROOF IMPERVIOUSNESS | ROOF |      |      |      | LANDSCAPE AREA | LANDSCAPE IMPERVIOUSNESS | LANDSCAPE |      |      |      | PAVEMENT AREA | PAVEMENT IMPERVIOUSNESS | PAVEMENT |      |      |      | WEIGHTED IMPERVIOUSNESS | WEIGHTED COEFFICIENTS |      |      |      |
|-----------|-----------|--------------|-----------|---------------------|------|------|------|------|----------------|--------------------------|-----------|------|------|------|---------------|-------------------------|----------|------|------|------|-------------------------|-----------------------|------|------|------|
|           |           |              |           |                     | C2   | C5   | C10  | C100 |                |                          | C2        | C5   | C10  | C100 |               |                         | C2       | C5   | C10  | C100 |                         | C2                    | C5   | C10  | C100 |
| EX-1      | 459623    | 10.55        | 0         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 10.55149       | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0             | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |
| EX-2      | 503963    | 11.57        | 0         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 11.5694        | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0             | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |
| TOTAL     | 963,586   | 22.12        | 0.00      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 22.12          | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.00          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |

Waterview East Commercial  
Drainage Report  
El Paso County, CO

5/6/2022  
Calculated by: JAR

| <div> <div> Waterview East Commercial<br/>Existing Runoff Calculations </div> <div> Time of Concentration </div> </div>   |                   |                 |             |      |                            |            |             |                     |            |        |                 |                                  |               |                 |          |                       |
|---|-------------------|-----------------|-------------|------|----------------------------|------------|-------------|---------------------|------------|--------|-----------------|----------------------------------|---------------|-----------------|----------|-----------------------|
| <div> <div> <div>Watercourse Coefficient</div> <div> <div>Forest &amp; Meadow 2.50</div> <div>Short Grass Pasture &amp; Lawns 7.00</div> <div>Grassed Waterway 15.00</div> </div> </div> <div> <div>Fallow or Cultivation 5.00</div> <div>Nearly Bare Ground 10.00</div> <div>Paved Area &amp; Shallow Gutter 20.00</div> </div> </div> |                   |                 |             |      |                            |            |             |                     |            |        |                 |                                  |               |                 |          |                       |
| DESIGN<br>POINT   | SUB-BASIN<br>DATA |                 |             |      | INITIAL / OVERLAND<br>TIME |            |             | TRAVEL TIME<br>T(t) |            |        |                 | T(c) CHECK<br>(URBANIZED BASINS) |               |                 |          | FINAL<br>T(c)<br>min. |
|   | DRAIN<br>BASIN    | AREA<br>sq. ft. | AREA<br>ac. | C(5) | Length<br>ft.              | Slope<br>% | T(i)<br>min | Length<br>ft.       | Slope<br>% | Coeff. | Velocity<br>fps | T(t)<br>min.                     | COMP.<br>T(c) | TOTAL<br>LENGTH | L/180+10 |                       |
| 1   | EX-1              | 459,623         | 10.55       | 0.09 | 100                        | 0.9%       | 19.1        | 742                 | 5.3%       | 7.00   | 1.6             | 7.7                              | 26.8          | 842             | 14.7     | 14.7                  |
| 2   | EX-2              | 503,963         | 11.57       | 0.09 | 100                        | 0.9%       | 19.1        | 1405                | 5.6%       | 7.00   | 1.7             | 14.1                             | 33.2          | 1505            | 18.4     | 18.4                  |



| Waterview East Commercial<br>Existing Runoff Calculations<br>(Rational Method Procedure) |             |          |              |               |       |         |       |                   |       |         |       |       |
|--|-------------|----------|--------------|---------------|-------|---------|-------|-------------------|-------|---------|-------|-------|
| Design Storm 5 Year  |             |          |              |               |       |         |       |                   |       |         |       |       |
| BASIN INFORMATION  |             |          |              | DIRECT RUNOFF |       |         |       | CUMULATIVE RUNOFF |       |         |       | NOTES |
| DESIGN POINT   | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min      | C x A | I in/hr | Q cfs | T(c) min          | C x A | I in/hr | Q cfs |       |
| 1  | EX-1        | 10.55    | 0.09         | 14.7          | 0.95  | 3.48    | 3.31  |                   |       |         | 3.31  |       |
| 2  | EX-2        | 11.57    | 0.09         | 18.4          | 1.04  | 3.12    | 3.25  |                   |       |         | 3.25  |       |

| Waterview East Commercial<br>Existing Runoff Calculations<br>(Rational Method Procedure) |             |          |              |               |       |         |       |                   |       |         |       |       |
|--|-------------|----------|--------------|---------------|-------|---------|-------|-------------------|-------|---------|-------|-------|
| Design Storm 100 Year  |             |          |              |               |       |         |       |                   |       |         |       |       |
| BASIN INFORMATION  |             |          |              | DIRECT RUNOFF |       |         |       | CUMULATIVE RUNOFF |       |         |       | NOTES |
| DESIGN POINT   | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min      | C x A | I in/hr | Q cfs | T(c) min          | C x A | I in/hr | Q cfs |       |
| 1  | EX-1        | 10.55    | 0.36         | 14.7          | 3.80  | 5.84    | 22.20 |                   |       |         | 22.20 |       |
| 2  | EX-2        | 11.57    | 0.36         | 18.4          | 4.16  | 5.24    | 21.81 |                   |       |         | 21.81 |       |

| SUMMARY - EXISTING RUNOFF TABLE |                   |                    |                          |                            |                              |                                |
|---------------------------------|-------------------|--------------------|--------------------------|----------------------------|------------------------------|--------------------------------|
| DESIGN POINT                    | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | CUMULATIVE 5-YR RUNOFF (CFS) | CUMULATIVE 100-YR RUNOFF (CFS) |
| 1                               | EX-1              | 10.55              | 3.31                     | 22.20                      | 3.31                         | 22.20                          |
| 2                               | EX-2              | 11.57              | 3.25                     | 21.81                      | 3.25                         | 21.81                          |

Weighted Imperviousness Calculations

| SUB-BASIN | AREA (SF) | AREA (Acres) | ROOF AREA | ROOF IMPERVIOUSNESS | ROOF |      |      |      | LANDSCAPE AREA | LANDSCAPE IMPERVIOUSNESS | LANDSCAPE |      |      |      | PAVEMENT AREA | PAVEMENT IMPERVIOUSNESS | PAVEMENT |      |      |      | WEIGHTED IMPERVIOUSNESS | WEIGHTED COEFFICIENTS |      |      |      |
|-----------|-----------|--------------|-----------|---------------------|------|------|------|------|----------------|--------------------------|-----------|------|------|------|---------------|-------------------------|----------|------|------|------|-------------------------|-----------------------|------|------|------|
|           |           |              |           |                     | C2   | C5   | C10  | C100 |                |                          | C2        | C5   | C10  | C100 |               |                         | C2       | C5   | C10  | C100 |                         | C2                    | C5   | C10  | C100 |
| A1        | 29196     | 0.67         | 0.25      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.16           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.26          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 73%                     | 0.62                  | 0.64 | 0.68 | 0.76 |
| A2        | 14430     | 0.33         | 0.13      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.10           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.10          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 66%                     | 0.56                  | 0.59 | 0.62 | 0.72 |
| A3        | 17922     | 0.41         | 0.17      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.06           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.18          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 81%                     | 0.69                  | 0.71 | 0.74 | 0.81 |
| A4        | 13342     | 0.31         | 0.16      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | -              | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.15          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 95%                     | 0.80                  | 0.81 | 0.83 | 0.88 |
| A5        | 13734     | 0.32         | 0.10      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.01           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.20          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 92%                     | 0.79                  | 0.81 | 0.83 | 0.88 |
| A6        | 13231     | 0.30         | 0.12      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.02           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.16          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 89%                     | 0.76                  | 0.78 | 0.80 | 0.86 |
| A7        | 17111     | 0.39         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.03           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.36          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 92%                     | 0.82                  | 0.83 | 0.86 | 0.91 |
| A8        | 18143     | 0.42         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.03           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.39          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 93%                     | 0.83                  | 0.85 | 0.87 | 0.92 |
| A9        | 18021     | 0.41         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.03           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.39          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 93%                     | 0.83                  | 0.84 | 0.87 | 0.92 |
| A10       | 17293     | 0.40         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.03           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.37          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 94%                     | 0.83                  | 0.85 | 0.87 | 0.92 |
| A11       | 15161     | 0.35         | 0.10      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.04           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.21          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 86%                     | 0.74                  | 0.76 | 0.78 | 0.85 |
| A12       | 11290     | 0.26         | 0.07      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.06           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.13          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 75%                     | 0.64                  | 0.67 | 0.70 | 0.78 |
| A13       | 45772     | 1.05         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.23           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.82          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 79%                     | 0.70                  | 0.72 | 0.76 | 0.83 |
| A14       | 4637      | 0.11         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.02           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.09          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 86%                     | 0.77                  | 0.79 | 0.81 | 0.88 |
| A15       | 6932      | 0.16         | 0.04      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.04           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.09          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 75%                     | 0.65                  | 0.67 | 0.70 | 0.78 |
| A16       | 16786     | 0.39         | 0.25      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.02           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.11          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 89%                     | 0.73                  | 0.75 | 0.77 | 0.83 |
| A17       | 32766     | 0.75         | 0.04      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.04           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.66          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 94%                     | 0.83                  | 0.84 | 0.87 | 0.92 |
| A18       | 36266     | 0.83         | 0.34      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.26           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.24          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 65%                     | 0.55                  | 0.58 | 0.62 | 0.71 |
| A19       | 58375     | 1.34         | 0.72      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | -              | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.62          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 95%                     | 0.79                  | 0.81 | 0.83 | 0.88 |
| A20       | 26189     | 0.60         | 0.30      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | -              | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.30          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 95%                     | 0.80                  | 0.82 | 0.84 | 0.89 |
| A21       | 21287     | 0.49         | 0.37      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | -              | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.12          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 92%                     | 0.75                  | 0.77 | 0.79 | 0.85 |
| A22       | 27276     | 0.63         | 0.43      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | -              | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.19          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 93%                     | 0.77                  | 0.78 | 0.80 | 0.86 |
| A23       | 91562     | 2.10         | 0.29      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.80           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 1.01          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 61%                     | 0.54                  | 0.57 | 0.61 | 0.71 |
| PD-1      | 28372     | 0.65         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.65           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | -             | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |
| PD-2      | 32272     | 0.74         | 0.15      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.54           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.05          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 26%                     | 0.22                  | 0.27 | 0.33 | 0.49 |
| PD-3      | 9268      | 0.21         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.21           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | -             | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |
| OS-1      | 89106     | 2.05         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 2.00           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.05          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 4%                      | 0.05                  | 0.11 | 0.19 | 0.37 |
| OS-2      | 34503     | 0.79         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.79           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | -             | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 2%                      | 0.03                  | 0.09 | 0.17 | 0.36 |
| OS-3      | 173864    | 3.99         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 2.73           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 1.26          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 33%                     | 0.30                  | 0.35 | 0.41 | 0.55 |
| OS-4      | 29397     | 0.67         | -         | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 0.32           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 0.36          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 54%                     | 0.49                  | 0.52 | 0.57 | 0.68 |
| TOTAL     | 963,504   | 22.12        | 4.05      | 90%                 | 0.71 | 0.73 | 0.75 | 0.81 | 9.23           | 2%                       | 0.03      | 0.09 | 0.17 | 0.36 | 8.85          | 100%                    | 0.89     | 0.90 | 0.92 | 0.96 | 57%                     | 0.50                  | 0.53 | 0.58 | 0.68 |

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| Waterview East Commercial - Drainage Report<br>Proposed Runoff Calculations<br>Time of Concentration |                   |                 |             |      |                            |            |             |                                  |            |        |                                   |              |                                  |                 |          |                       |
|--|-------------------|-----------------|-------------|------|----------------------------|------------|-------------|----------------------------------|------------|--------|-----------------------------------|--------------|----------------------------------|-----------------|----------|-----------------------|
|  |                   |                 |             |      | Forest & Meadow 2.50       |            |             | Short Grass Pasture & Lawns 7.00 |            |        | Grassed Waterway 15.00            |              |                                  |                 |          |                       |
|  |                   |                 |             |      | Fallow or Cultivation 5.00 |            |             | Nearly Bare Ground 10.00         |            |        | Paved Area & Shallow Gutter 20.00 |              |                                  |                 |          |                       |
| DESIGN<br>POINT  | SUB-BASIN<br>DATA |                 |             |      | INITIAL / OVERLAND<br>TIME |            |             | TRAVEL TIME<br>T(t)              |            |        |                                   | T(t)<br>min. | T(c) CHECK<br>(URBANIZED BASINS) |                 |          | FINAL<br>T(c)<br>min. |
|  | DRAIN<br>BASIN    | AREA<br>sq. ft. | AREA<br>ac. | C(5) | Length<br>ft.              | Slope<br>% | T(t)<br>min | Length<br>ft.                    | Slope<br>% | Coeff. | Velocity<br>fps                   |              | COMP.<br>T(c)                    | TOTAL<br>LENGTH | L/180+10 |                       |
| 1  | A1                | 29,196          | 0.67        | 0.64 | 100                        | 7.6%       | 4.3         | 110                              | 1.0%       | 20.00  | 2.0                               | 0.9          | 5.2                              | 210             | 11.2     | 5.2                   |
| 2  | A2                | 14,430          | 0.33        | 0.59 | 60                         | 15.6%      | 2.9         | 20                               | 3.1%       | 20.00  | 3.5                               | 0.1          | 5.0                              | 80              | 10.4     | 5.0                   |
| 3  | A3                | 17,922          | 0.41        | 0.71 | 70                         | 7.5%       | 3.1         | 70                               | 1.6%       | 20.00  | 2.5                               | 0.5          | 5.0                              | 140             | 10.8     | 5.0                   |
| 4  | A4                | 13,342          | 0.31        | 0.81 | 100                        | 0.8%       | 5.7         | 23                               | 0.8%       | 20.00  | 1.8                               | 0.2          | 5.9                              | 123             | 10.7     | 5.9                   |
| 5  | A5                | 13,734          | 0.32        | 0.81 | 60                         | 3.0%       | 2.9         | 65                               | 2.8%       | 20.00  | 3.3                               | 0.3          | 5.0                              | 125             | 10.7     | 5.0                   |
| 6  | A6                | 13,231          | 0.30        | 0.78 | 100                        | 1.0%       | 5.9         | 38                               | 1.0%       | 20.00  | 2.0                               | 0.3          | 6.2                              | 138             | 10.8     | 6.2                   |
| 7  | A7                | 17,111          | 0.39        | 0.83 | 50                         | 2.6%       | 2.5         | 216                              | 1.4%       | 20.00  | 2.4                               | 1.5          | 5.0                              | 266             | 11.5     | 5.0                   |
| 8  | A8                | 18,143          | 0.42        | 0.85 | 50                         | 3.2%       | 2.2         | 218                              | 2.1%       | 20.00  | 2.9                               | 1.3          | 5.0                              | 268             | 11.5     | 5.0                   |
| 9  | A9                | 18,021          | 0.41        | 0.84 | 50                         | 3.6%       | 2.2         | 216                              | 2.9%       | 20.00  | 3.4                               | 1.1          | 5.0                              | 266             | 11.5     | 5.0                   |
| 10   | A10               | 17,293          | 0.40        | 0.85 | 80                         | 3.1%       | 2.8         | 220                              | 3.4%       | 20.00  | 3.7                               | 1.0          | 5.0                              | 300             | 11.7     | 5.0                   |
| 11   | A11               | 15,161          | 0.35        | 0.76 | 100                        | 4.0%       | 3.9         | 92                               | 4.0%       | 20.00  | 4.0                               | 0.4          | 5.0                              | 192             | 11.1     | 5.0                   |
| 12   | A12               | 11,290          | 0.26        | 0.67 | 100                        | 0.8%       | 8.6         | 63                               | 1.1%       | 20.00  | 2.1                               | 0.5          | 9.1                              | 163             | 10.9     | 9.1                   |
| 13   | A13               | 45,772          | 1.05        | 0.72 | 100                        | 0.5%       | 8.7         | 388                              | 2.8%       | 20.00  | 3.3                               | 1.9          | 10.6                             | 488             | 12.7     | 10.6                  |
| 14   | A14               | 4,637           | 0.11        | 0.79 | 20                         | 0.2%       | 4.4         | 92                               | 2.0%       | 20.00  | 2.8                               | 0.5          | 5.0                              | 112             | 10.6     | 5.0                   |
| 15   | A15               | 6,932           | 0.16        | 0.67 | 100                        | 0.5%       | 9.9         | 134                              | 0.8%       | 20.00  | 1.8                               | 1.2          | 11.1                             | 234             | 11.3     | 11.1                  |
| 16   | A16               | 16,786          | 0.39        | 0.75 | 60                         | 1.0%       | 5.0         | 30                               | 3.0%       | 20.00  | 3.5                               | 0.1          | 5.1                              | 90              | 10.5     | 5.1                   |
| 17   | A17               | 32,766          | 0.75        | 0.84 | 100                        | 2.0%       | 3.7         | 329                              | 1.7%       | 20.00  | 2.6                               | 2.1          | 5.8                              | 429             | 12.4     | 5.8                   |
| 18   | A18               | 36,266          | 0.83        | 0.58 | 100                        | 0.5%       | 12.0        | 300                              | 0.9%       | 20.00  | 1.9                               | 2.6          | 14.6                             | 400             | 12.2     | 12.2                  |
| 19   | A19               | 58,375          | 1.34        | 0.81 | 100                        | 2.7%       | 3.8         | 269                              | 1.4%       | 20.00  | 2.4                               | 1.9          | 5.7                              | 369             | 12.1     | 5.7                   |
| 20   | A20               | 26,189          | 0.60        | 0.82 | 50                         | 3.1%       | 2.5         | 240                              | 2.3%       | 20.00  | 3.0                               | 1.3          | 5.0                              | 290             | 11.6     | 5.0                   |
| 21   | A21               | 21,287          | 0.49        | 0.77 | 100                        | 0.5%       | 7.6         | 222                              | 0.8%       | 20.00  | 1.8                               | 2.1          | 9.7                              | 322             | 11.8     | 9.7                   |
| 22   | A22               | 27,276          | 0.63        | 0.78 | 100                        | 1.6%       | 5.0         | 156                              | 0.8%       | 20.00  | 1.8                               | 1.5          | 6.5                              | 256             | 11.4     | 6.5                   |
| 23   | A23               | 91,562          | 2.10        | 0.57 | 100                        | 1.4%       | 8.7         | 247                              | 1.5%       | 20.00  | 2.4                               | 1.7          | 10.4                             | 347             | 11.9     | 10.4                  |
| 24   | PD-1              | 28,372          | 0.65        | 0.09 | 100                        | 2.0%       | 14.7        | 201                              | 4.8%       | 7.00   | 1.5                               | 2.2          | 16.9                             | 301             | 11.7     | 11.7                  |
| 25   | PD-2              | 32,272          | 0.74        | 0.27 | 100                        | 1.9%       | 12.3        | 116                              | 7.0%       | 7.00   | 1.9                               | 1.0          | 13.3                             | 216             | 11.2     | 11.2                  |
| 26   | PD-3              | 9,268           | 0.21        | 0.09 | 60                         | 15.0%      | 5.8         | 60                               | 2.0%       | 7.00   | 1.0                               | 1.0          | 6.8                              | 120             | 10.7     | 6.8                   |
| 27   | OS-1              | 89,106          | 2.05        | 0.11 | 100                        | 6.1%       | 9.9         | 1220                             | 3.0%       | 7.00   | 1.2                               | 16.8         | 26.7                             | 1320            | 17.3     | 17.3                  |
| 28   | OS-2              | 34,503          | 0.79        | 0.09 | 100                        | 7.3%       | 9.5         | 509                              | 2.2%       | 7.00   | 1.0                               | 8.2          | 17.7                             | 609             | 13.4     | 13.4                  |
| 29   | OS-3              | 173,864         | 3.99        | 0.35 | 100                        | 11.3%      | 6.2         | 670                              | 1.8%       | 20.00  | 2.7                               | 4.2          | 10.4                             | 770             | 14.3     | 10.4                  |
| 30   | OS-4              | 29,397          | 0.67        | 0.52 | 50                         | 4.9%       | 4.4         | 148                              | 3.9%       | 7.00   | 1.4                               | 1.8          | 6.2                              | 198             | 11.1     | 6.2                   |

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| Waterview East Commercial - Drainage Report |             |          |              |                     |       |         |       |                   |       |         |       |       |
|---|-------------|----------|--------------|---------------------|-------|---------|-------|-------------------|-------|---------|-------|-------|
| Proposed Runoff Calculations                |             |          |              | Design Storm 5 Year |       |         |       |                   |       |         |       |       |
| (Rational Method Procedure)                 |             |          |              |                     |       |         |       |                   |       |         |       |       |
| BASIN INFORMATION                           |             |          |              | DIRECT RUNOFF       |       |         |       | CUMULATIVE RUNOFF |       |         |       | NOTES |
| DESIGN POINT                                | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min            | C x A | I in/hr | Q cfs | T(c) min          | C x A | I in/hr | Q cfs |       |
| 1   | A1          | 0.67     | 0.64         | 5.2                 | 0.43  | 5.10    | 2.20  |                   |       |         | 2.20  |       |
| 2   | A2          | 0.33     | 0.59         | 5.0                 | 0.19  | 5.16    | 1.00  |                   |       |         | 1.00  |       |
| 3   | A3          | 0.41     | 0.71         | 5.0                 | 0.29  | 5.16    | 1.50  |                   |       |         | 1.50  |       |
| 4   | A4          | 0.31     | 0.81         | 5.9                 | 0.25  | 4.92    | 1.22  |                   |       |         | 1.22  |       |
| 5   | A5          | 0.32     | 0.81         | 5.0                 | 0.25  | 5.16    | 1.31  |                   |       |         | 1.31  |       |
| 6   | A6          | 0.30     | 0.78         | 6.2                 | 0.24  | 4.85    | 1.14  |                   |       |         | 1.14  |       |
| 7   | A7          | 0.39     | 0.83         | 5.0                 | 0.33  | 5.16    | 1.68  |                   |       |         | 1.68  |       |
| 8   | A8          | 0.42     | 0.85         | 5.0                 | 0.35  | 5.16    | 1.81  |                   |       |         | 1.81  |       |
| 9   | A9          | 0.41     | 0.84         | 5.0                 | 0.35  | 5.16    | 1.80  |                   |       |         | 1.80  |       |
| 10  | A10         | 0.40     | 0.85         | 5.0                 | 0.34  | 5.16    | 1.73  |                   |       |         | 1.73  |       |
| 11  | A11         | 0.35     | 0.76         | 5.0                 | 0.26  | 5.16    | 1.36  |                   |       |         | 1.36  |       |
| 12  | A12         | 0.26     | 0.67         | 9.1                 | 0.17  | 4.26    | 0.74  |                   |       |         | 0.74  |       |
| 13  | A13         | 1.05     | 0.72         | 10.6                | 0.76  | 4.01    | 3.06  |                   |       |         | 3.06  |       |
| 14  | A14         | 0.11     | 0.79         | 5.0                 | 0.08  | 5.16    | 0.43  |                   |       |         | 0.43  |       |
| 15  | A15         | 0.16     | 0.67         | 11.1                | 0.11  | 3.94    | 0.42  |                   |       |         | 0.42  |       |
| 16  | A16         | 0.39     | 0.75         | 5.1                 | 0.29  | 5.12    | 1.47  |                   |       |         | 1.47  |       |
| 17  | A17         | 0.75     | 0.84         | 5.8                 | 0.63  | 4.95    | 3.14  |                   |       |         | 3.14  |       |
| 18  | A18         | 0.83     | 0.58         | 12.2                | 0.48  | 3.79    | 1.82  |                   |       |         | 1.82  |       |
| 19  | A19         | 1.34     | 0.81         | 5.7                 | 1.08  | 4.98    | 5.39  |                   |       |         | 5.39  |       |
| 20  | A20         | 0.60     | 0.82         | 5.0                 | 0.49  | 5.16    | 2.53  |                   |       |         | 2.53  |       |
| 21  | A21         | 0.49     | 0.77         | 9.7                 | 0.38  | 4.17    | 1.57  |                   |       |         | 1.57  |       |
| 22  | A22         | 0.63     | 0.78         | 6.5                 | 0.49  | 4.79    | 2.35  |                   |       |         | 2.35  |       |
| 23  | A23         | 2.10     | 0.57         | 10.4                | 1.19  | 4.05    | 4.83  |                   |       |         | 4.83  |       |
| 24  | PD-1        | 0.65     | 0.09         | 11.7                | 0.06  | 3.86    | 0.23  |                   |       |         | 0.23  |       |
| 25  | PD-2        | 0.74     | 0.27         | 11.2                | 0.20  | 3.93    | 0.79  |                   |       |         | 0.79  |       |
| 26  | PD-3        | 0.21     | 0.09         | 6.8                 | 0.02  | 4.71    | 0.09  |                   |       |         | 0.09  |       |
| 27  | OS-1        | 2.05     | 0.11         | 17.3                | 0.22  | 3.22    | 0.72  |                   |       |         | 0.72  |       |
| 28  | OS-2        | 0.79     | 0.09         | 13.4                | 0.07  | 3.63    | 0.26  |                   |       |         | 0.26  |       |
| 29  | OS-3        | 3.99     | 0.35         | 10.4                | 1.38  | 4.05    | 5.59  |                   |       |         | 5.59  |       |
| 30  | OS-4        | 0.67     | 0.52         | 6.2                 | 0.35  | 4.86    | 1.71  |                   |       |         | 1.71  |       |

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| Waterview East Commercial - Drainage Report |             |          |              |               |       |         |       |                       |       |         |       |       |
|---|-------------|----------|--------------|---------------|-------|---------|-------|-----------------------|-------|---------|-------|-------|
| Proposed Runoff Calculations                |             |          |              |               |       |         |       | Design Storm 100 Year |       |         |       |       |
| (Rational Method Procedure)                 |             |          |              |               |       |         |       |                       |       |         |       |       |
| BASIN INFORMATION                           |             |          |              | DIRECT RUNOFF |       |         |       | CUMULATIVE RUNOFF     |       |         |       | NOTES |
| DESIGN POINT                                | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min      | C x A | I in/hr | Q cfs | T(c) min              | C x A | I in/hr | Q cfs |       |
| 1   | A1          | 0.67     | 0.76         | 5.2           | 0.51  | 8.55    | 4.36  |                       |       |         | 4.36  |       |
| 2   | A2          | 0.33     | 0.72         | 5.0           | 0.24  | 8.65    | 2.06  |                       |       |         | 2.06  |       |
| 3   | A3          | 0.41     | 0.81         | 5.0           | 0.33  | 8.65    | 2.87  |                       |       |         | 2.87  |       |
| 4   | A4          | 0.31     | 0.88         | 5.9           | 0.27  | 8.26    | 2.23  |                       |       |         | 2.23  |       |
| 5   | A5          | 0.32     | 0.88         | 5.0           | 0.28  | 8.65    | 2.41  |                       |       |         | 2.41  |       |
| 6   | A6          | 0.30     | 0.86         | 6.2           | 0.26  | 8.14    | 2.12  |                       |       |         | 2.12  |       |
| 7   | A7          | 0.39     | 0.91         | 5.0           | 0.36  | 8.65    | 3.09  |                       |       |         | 3.09  |       |
| 8   | A8          | 0.42     | 0.92         | 5.0           | 0.38  | 8.65    | 3.31  |                       |       |         | 3.31  |       |
| 9   | A9          | 0.41     | 0.92         | 5.0           | 0.38  | 8.65    | 3.29  |                       |       |         | 3.29  |       |
| 10  | A10         | 0.40     | 0.92         | 5.0           | 0.37  | 8.65    | 3.16  |                       |       |         | 3.16  |       |
| 11  | A11         | 0.35     | 0.85         | 5.0           | 0.30  | 8.65    | 2.55  |                       |       |         | 2.55  |       |
| 12  | A12         | 0.26     | 0.78         | 9.1           | 0.20  | 7.15    | 1.45  |                       |       |         | 1.45  |       |
| 13  | A13         | 1.05     | 0.83         | 10.6          | 0.87  | 6.73    | 5.87  |                       |       |         | 5.87  |       |
| 14  | A14         | 0.11     | 0.88         | 5.0           | 0.09  | 8.65    | 0.81  |                       |       |         | 0.81  |       |
| 15  | A15         | 0.16     | 0.78         | 11.1          | 0.12  | 6.60    | 0.82  |                       |       |         | 0.82  |       |
| 16  | A16         | 0.39     | 0.83         | 5.1           | 0.32  | 8.58    | 2.75  |                       |       |         | 2.75  |       |
| 17  | A17         | 0.75     | 0.92         | 5.8           | 0.69  | 8.30    | 5.72  |                       |       |         | 5.72  |       |
| 18  | A18         | 0.83     | 0.71         | 12.2          | 0.59  | 6.36    | 3.77  |                       |       |         | 3.77  |       |
| 19  | A19         | 1.34     | 0.88         | 5.7           | 1.18  | 8.35    | 9.83  |                       |       |         | 9.83  |       |
| 20  | A20         | 0.60     | 0.89         | 5.0           | 0.53  | 8.65    | 4.60  |                       |       |         | 4.60  |       |
| 21  | A21         | 0.49     | 0.85         | 9.7           | 0.41  | 6.99    | 2.89  |                       |       |         | 2.89  |       |
| 22  | A22         | 0.63     | 0.86         | 6.5           | 0.54  | 8.04    | 4.31  |                       |       |         | 4.31  |       |
| 23  | A23         | 2.10     | 0.71         | 10.4          | 1.49  | 6.80    | 10.15 |                       |       |         | 10.15 |       |
| 24  | PD-1        | 0.65     | 0.36         | 11.7          | 0.23  | 6.47    | 1.52  |                       |       |         | 1.52  |       |
| 25  | PD-2        | 0.74     | 0.49         | 11.2          | 0.36  | 6.59    | 2.39  |                       |       |         | 2.39  |       |
| 26  | PD-3        | 0.21     | 0.36         | 6.8           | 0.08  | 7.91    | 0.61  |                       |       |         | 0.61  |       |
| 27  | OS-1        | 2.05     | 0.37         | 17.3          | 0.77  | 5.40    | 4.13  |                       |       |         | 4.13  |       |
| 28  | OS-2        | 0.79     | 0.36         | 13.4          | 0.29  | 6.10    | 1.74  |                       |       |         | 1.74  |       |
| 29  | OS-3        | 3.99     | 0.55         | 10.4          | 2.19  | 6.80    | 14.91 |                       |       |         | 14.91 |       |
| 30  | OS-4        | 0.67     | 0.68         | 6.2           | 0.46  | 8.15    | 3.74  |                       |       |         | 3.74  |       |

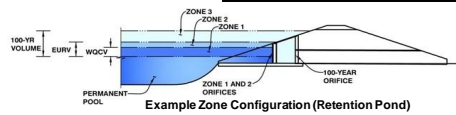
| SUMMARY - PROPOSED RUNOFF TABLE |                   |                    |                          |                            |                              |                                |
|---------------------------------|-------------------|--------------------|--------------------------|----------------------------|------------------------------|--------------------------------|
| DESIGN POINT                    | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | CUMULATIVE 5-YR RUNOFF (CFS) | CUMULATIVE 100-YR RUNOFF (CFS) |
| 1                               | A1                | 0.67               | 2.20                     | 4.36                       | 2.20                         | 4.36                           |
| 2                               | A2                | 0.33               | 1.00                     | 2.06                       | 1.00                         | 2.06                           |
| 3                               | A3                | 0.41               | 1.50                     | 2.87                       | 1.50                         | 2.87                           |
| 4                               | A4                | 0.31               | 1.22                     | 2.23                       | 1.22                         | 2.23                           |
| 5                               | A5                | 0.32               | 1.31                     | 2.41                       | 1.31                         | 2.41                           |
| 6                               | A6                | 0.30               | 1.14                     | 2.12                       | 1.14                         | 2.12                           |
| 7                               | A7                | 0.39               | 1.68                     | 3.09                       | 1.68                         | 3.09                           |
| 8                               | A8                | 0.42               | 1.81                     | 3.31                       | 1.81                         | 3.31                           |
| 9                               | A9                | 0.41               | 1.80                     | 3.29                       | 1.80                         | 3.29                           |
| 10                              | A10               | 0.40               | 1.73                     | 3.16                       | 1.73                         | 3.16                           |
| 11                              | A11               | 0.35               | 1.36                     | 2.55                       | 1.36                         | 2.55                           |
| 12                              | A12               | 0.26               | 0.74                     | 1.45                       | 0.74                         | 1.45                           |
| 13                              | A13               | 1.05               | 3.06                     | 5.87                       | 3.06                         | 5.87                           |
| 14                              | A14               | 0.11               | 0.43                     | 0.81                       | 0.43                         | 0.81                           |
| 15                              | A15               | 0.16               | 0.42                     | 0.82                       | 0.42                         | 0.82                           |
| 16                              | A16               | 0.39               | 1.47                     | 2.75                       | 1.47                         | 2.75                           |
| 17                              | A17               | 0.75               | 3.14                     | 5.72                       | 3.14                         | 5.72                           |
| 18                              | A18               | 0.83               | 1.82                     | 3.77                       | 1.82                         | 3.77                           |
| 19                              | A19               | 1.34               | 5.39                     | 9.83                       | 5.39                         | 9.83                           |
| 20                              | A20               | 0.60               | 2.53                     | 4.60                       | 2.53                         | 4.60                           |
| 21                              | A21               | 0.49               | 1.57                     | 2.89                       | 1.57                         | 2.89                           |
| 22                              | A22               | 0.63               | 2.35                     | 4.31                       | 2.35                         | 4.31                           |
| 23                              | A23               | 2.10               | 4.83                     | 10.15                      | 4.83                         | 10.15                          |
| 24                              | PD-1              | 0.65               | 0.23                     | 1.52                       | 0.23                         | 1.52                           |
| 25                              | PD-2              | 0.74               | 0.79                     | 2.39                       | 0.79                         | 2.39                           |
| 26                              | PD-3              | 0.21               | 0.09                     | 0.61                       | 0.09                         | 0.61                           |
| 27                              | OS-1              | 2.05               | 0.72                     | 4.13                       | 0.72                         | 4.13                           |
| 28                              | OS-2              | 0.79               | 0.26                     | 1.74                       | 0.26                         | 1.74                           |
| 29                              | OS-3              | 3.99               | 5.59                     | 14.91                      | 5.59                         | 14.91                          |
| 30                              | OS-4              | 0.67               | 1.71                     | 3.74                       | 1.71                         | 3.74                           |



## APPENDIX D – HYDRAULIC CALCULATIONS

Include spreadsheet for each pond, list basins which contribute to it, along with impervious area and show total area and overall % impervious per pond.

## MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 1

|   |            |         |
|---|------------|---------|
| Selected BMP Type =                     | EDB        |         |
| Watershed Area =                        | 2.75       | acres   |
| Watershed Length =                      | 380        | ft      |
| Watershed Length to Centroid =          | 190        | ft      |
| Watershed Slope =                       | 0.014      | ft/ft   |
| Watershed Imperviousness =              | 47.00%     | percent |
| Percentage Hydrologic Soil Group A =    | 50.0%      | percent |
| Percentage Hydrologic Soil Group B =    | 50.0%      | 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 |         |

### Optional User Overrides

|   |       |           |
|---|-------|-----------|
| Water Quality Capture Volume (WQC) =      | 0.045 | acre-feet |
| Excess Urban Runoff Volume (EUV) =        | 0.142 | acre-feet |
| 2-yr Runoff Volume ( $P1 = 1.19$ in.) =   | 0.112 | acre-feet |
| 5-yr Runoff Volume ( $P1 = 1.5$ in.) =    | 0.153 | acre-feet |
| 10-yr Runoff Volume ( $P1 = 1.75$ in.) =  | 0.196 | acre-feet |
| 25-yr Runoff Volume ( $P1 = 2$ in.) =     | 0.260 | acre-feet |
| 50-yr Runoff Volume ( $P1 = 2.25$ in.) =  | 0.310 | acre-feet |
| 100-yr Runoff Volume ( $P1 = 2.52$ in.) = | 0.381 | acre-feet |
| 500-yr Runoff Volume ( $P1 = 3.14$ in.) = | 0.515 | acre-feet |
| Approximate 2-yr Detention Volume =       | 0.099 | acre-feet |
| Approximate 5-yr Detention Volume =       | 0.133 | acre-feet |
| Approximate 10-yr Detention Volume =      | 0.171 | acre-feet |
| Approximate 25-yr Detention Volume =      | 0.198 | acre-feet |
| Approximate 50-yr Detention Volume =      | 0.214 | acre-feet |
| Approximate 100-yr Detention Volume =     | 0.241 | acre-feet |

|      |           |
|------|-----------|
|      | acre-feet |
|      | acre-feet |
| 1.19 | inches    |
| 1.50 | inches    |
| 1.75 | inches    |
| 2.00 | inches    |
| 2.25 | inches    |
| 2.52 | inches    |
|      | inches    |

- Need to indicate what volumes are being used for design of ponds

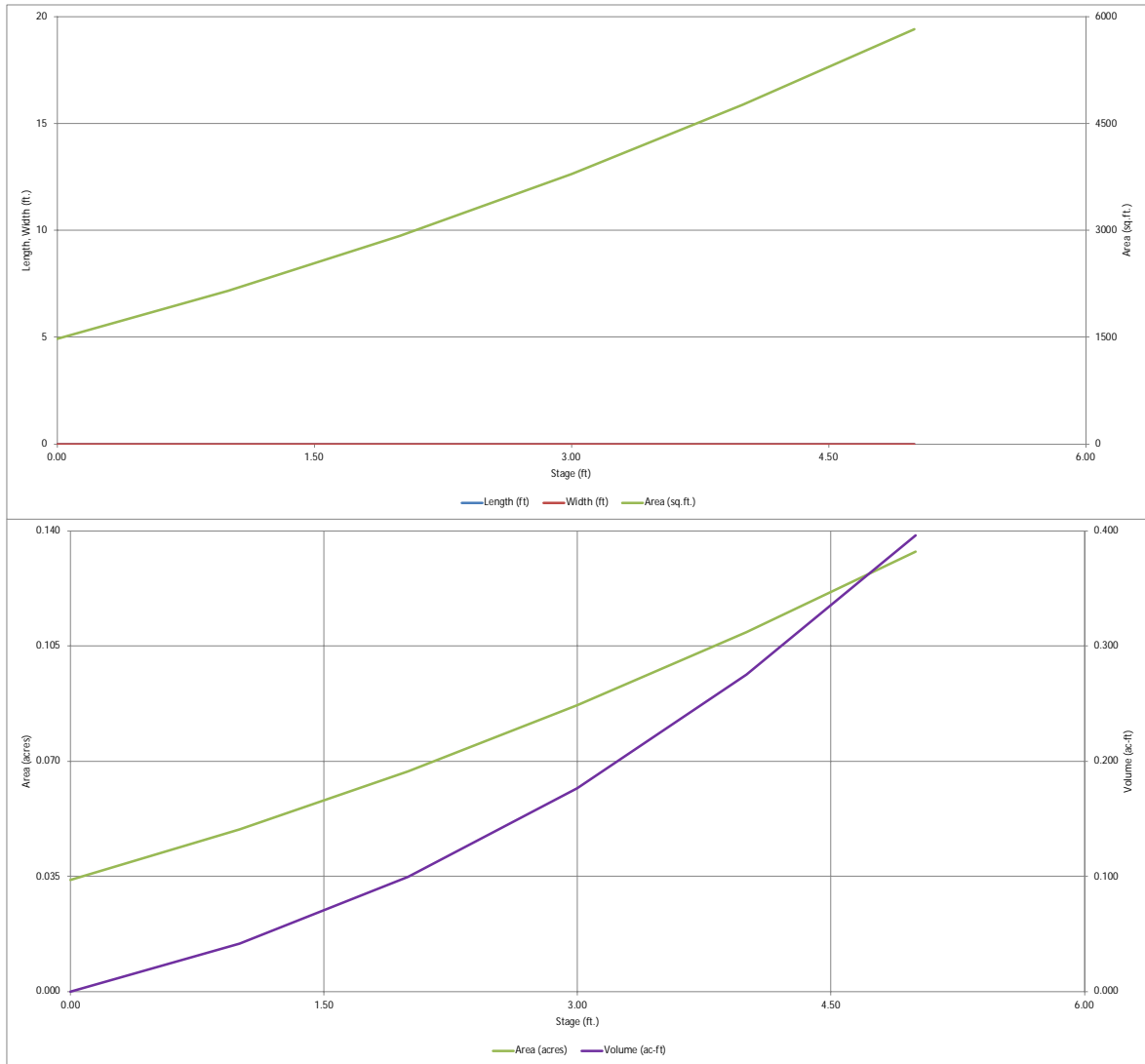
|  |   |      |                 |
|--|---|------|-----------------|
| Select Zone 1 Storage Volume (Required)                | = |      | acre-feet       |
| Select Zone 2 Storage Volume (Optional)                | = |      | acre-feet       |
| Select Zone 3 Storage Volume (Optional)                | = |      | acre-feet       |
| Total Detention Basin Volume                           | = |      | acre-feet       |
| Initial Surge Volume (ISV)                             | = | user | ft <sup>3</sup> |
| Initial Surge Depth (ISD)                              | = | user | ft              |
| Total Available Detention Depth ( $H_{\text{total}}$ ) | = | user | ft              |
| Depth of Trickle Channel ( $H_{\text{TC}}$ )           | = | user | ft              |
| Slope of Trickle Channel ( $S_{\text{TC}}$ )           | = | user | ft/ft           |
| Slopes of Main Basin Sides ( $S_{\text{main}}$ )       | = | user | H:V             |
| Basin Length-to-Width Ratio ( $R_{\text{L/W}}$ )       | = | user |                 |

|   |   |      |                 |
|---|---|------|-----------------|
| Initial Surcharge Area ( $A_{SV}$ )         | = | user | ft <sup>2</sup> |
| Surcharge Volume Length ( $L_{SV}$ )        | = | user | ft              |
| Surcharge Volume Width ( $W_{SV}$ )         | = | user | ft              |
| Depth of Basin Floor ( $H_{1LOOR}$ )        | = | user | ft              |
| Length of Basin Floor ( $L_{1LOOR}$ )       | = | user | ft              |
| Width of Basin Floor ( $W_{1LOOR}$ )        | = | user | ft              |
| Area of Basin Floor ( $A_{1LOOR}$ )         | = | user | ft <sup>2</sup> |
| Volume of Basin Floor ( $V_{1LOOR}$ )       | = | user | ft <sup>3</sup> |
| Depth of Main Basin ( $H_{MAIN}$ )          | = | user | ft              |
| Length of Main Basin ( $L_{MAIN}$ )         | = | user | ft              |
| Width of Main Basin ( $W_{MAIN}$ )          | = | user | ft              |
| Area of Main Basin ( $A_{MAIN}$ )           | = | user | ft <sup>2</sup> |
| Volume of Main Basin ( $V_{MAIN}$ )         | = | user | ft <sup>3</sup> |
| Calculated Total Basin Volume ( $V_{TBL}$ ) | = | user | acre-feet       |

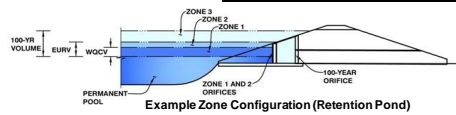
[illegible]

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



## MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 2

|   |            |         |
|---|------------|---------|
| Selected BMP Type =                     | EDB        |         |
| Watershed Area =                        | 7.77       | acres   |
| Watershed Length =                      | 800        | ft      |
| Watershed Length to Centroid =          | 400        | ft      |
| Watershed Slope =                       | 0.020      | ft/ft   |
| Watershed Imperviousness =              | 79.62%     | percent |
| Percentage Hydrologic Soil Group A =    | 50.0%      | percent |
| Percentage Hydrologic Soil Group B =    | 50.0%      | 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 |         |

### Optional User Overrides

|   |       |           |
|---|-------|-----------|
| Water Quality Capture Volume (WQCV) =     | 0.211 | acre-feet |
| Excess Urban Runoff Volume (EURV) =       | 0.751 | acre-feet |
| 2-yr Runoff Volume ( $P1 = 1.19$ in.) =   | 0.572 | acre-feet |
| 5-yr Runoff Volume ( $P1 = 1.5$ in.) =    | 0.746 | acre-feet |
| 10-yr Runoff Volume ( $P1 = 1.75$ in.) =  | 0.897 | acre-feet |
| 25-yr Runoff Volume ( $P1 = 2.1$ in.) =   | 1.071 | acre-feet |
| 50-yr Runoff Volume ( $P1 = 2.25$ in.) =  | 1.229 | acre-feet |
| 100-yr Runoff Volume ( $P1 = 2.52$ in.) = | 1.418 | acre-feet |
| 500-yr Runoff Volume ( $P1 = 3.14$ in.) = | 1.821 | acre-feet |
| Approximate 2-yr Detention Volume =       | 0.538 | acre-feet |
| Approximate 5-yr Detention Volume =       | 0.705 | acre-feet |
| Approximate 10-yr Detention Volume =      | 0.859 | acre-feet |
| Approximate 25-yr Detention Volume =      | 0.969 | acre-feet |
| Approximate 50-yr Detention Volume =      | 1.033 | acre-feet |
| Approximate 100-yr Detention Volume =     | 1.102 | acre-feet |

|      |           |
|------|-----------|
|      | acre-feet |
|      | acre-feet |
| 1.19 | inches    |
| 1.50 | inches    |
| 1.75 | inches    |
| 2.00 | inches    |
| 2.25 | inches    |
| 2.52 | inches    |
|      | inches    |

|  |   |      |                 |
|--|---|------|-----------------|
| Select Zone 1 Storage Volume (Required)                | = |      | acre-feet       |
| Select Zone 2 Storage Volume (Optional)                | = |      | acre-feet       |
| Select Zone 3 Storage Volume (Optional)                | = |      | acre-feet       |
| Total Detention Basin Volume                           | = |      | acre-feet       |
| Initial Surcharge Volume (ISV)                         | = | user | ft <sup>3</sup> |
| Initial Surcharge Depth (ISD)                          | = | user | ft              |
| Total Available Detention Depth ( $H_{\text{total}}$ ) | = | user | ft              |
| Depth of Trickle Channel ( $H_{TC}$ )                  | = | user | ft              |
| Slope of Trickle Channel ( $S_{TC}$ )                  | = | user | ft/ft           |
| Slopes of Main Basin Sides ( $S_{MB}$ )                | = | user | H:V             |
| Basin Length-to-Width Ratio ( $R_{L/W}$ )              | = | user |                 |

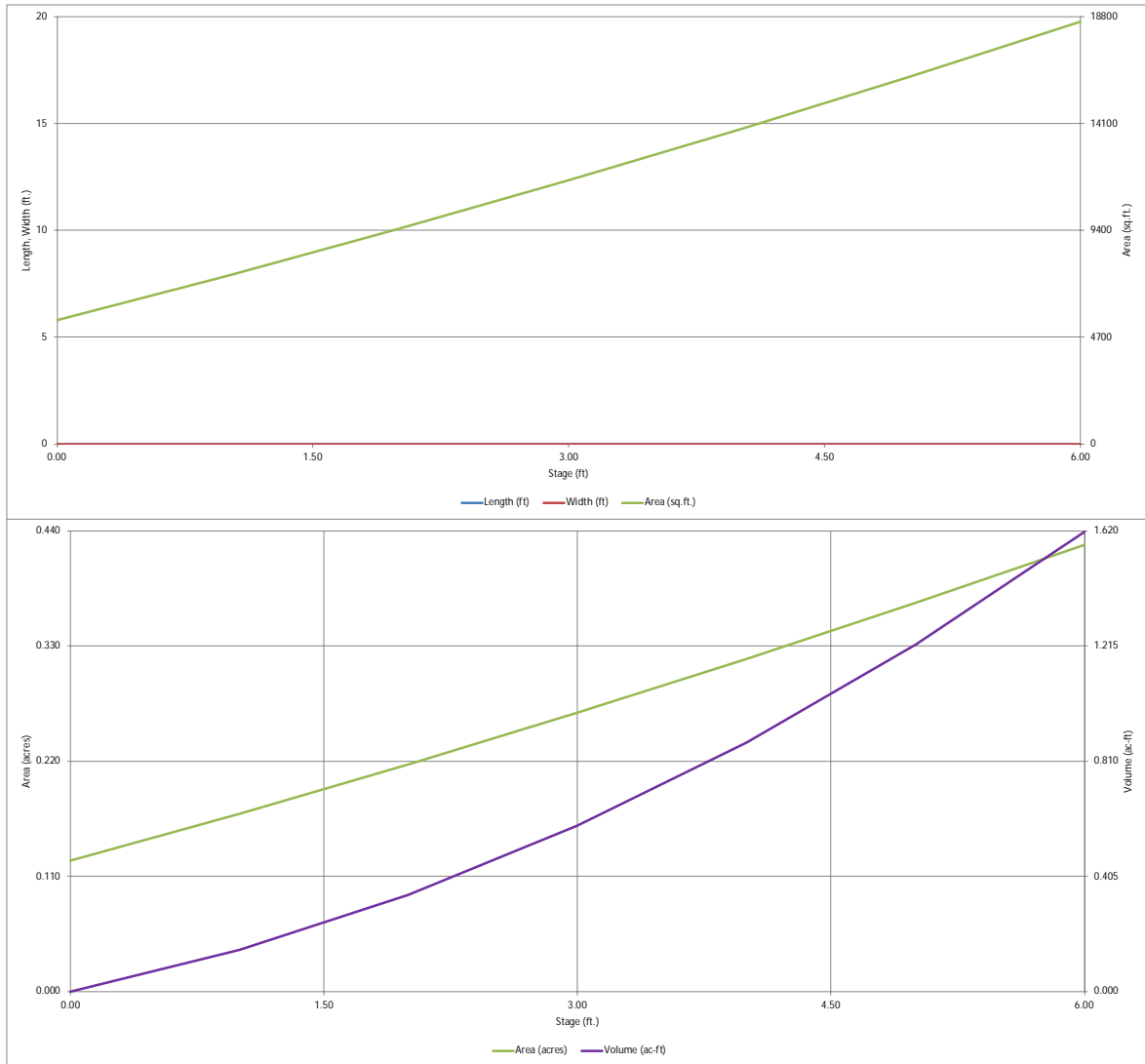
|   |   |      |                 |
|---|---|------|-----------------|
| Initial Surcharge Area ( $A_{SV}$ )         | = | user | ft <sup>2</sup> |
| Surcharge Volume Length ( $L_{SV}$ )        | = | user | ft              |
| Surcharge Volume Width ( $W_{SV}$ )         | = | user | ft              |
| Depth of Basin Floor ( $H_{1LOOR}$ )        | = | user | ft              |
| Length of Basin Floor ( $L_{1LOOR}$ )       | = | user | ft              |
| Width of Basin Floor ( $W_{1LOOR}$ )        | = | user | ft              |
| Area of Basin Floor ( $A_{1LOOR}$ )         | = | user | ft <sup>2</sup> |
| Volume of Basin Floor ( $V_{1LOOR}$ )       | = | user | ft <sup>3</sup> |
| Depth of Main Basin ( $H_{MAIN}$ )          | = | user | ft              |
| Length of Main Basin ( $L_{MAIN}$ )         | = | user | ft              |
| Width of Main Basin ( $W_{MAIN}$ )          | = | user | ft              |
| Area of Main Basin ( $A_{MAIN}$ )           | = | user | ft <sup>2</sup> |
| Volume of Main Basin ( $V_{MAIN}$ )         | = | user | ft <sup>3</sup> |
| Calculated Total Basin Volume ( $V_{TBL}$ ) | = | USER | acre-feet       |

- Need to indicate what volumes are being used for design of ponds

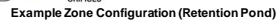
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# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

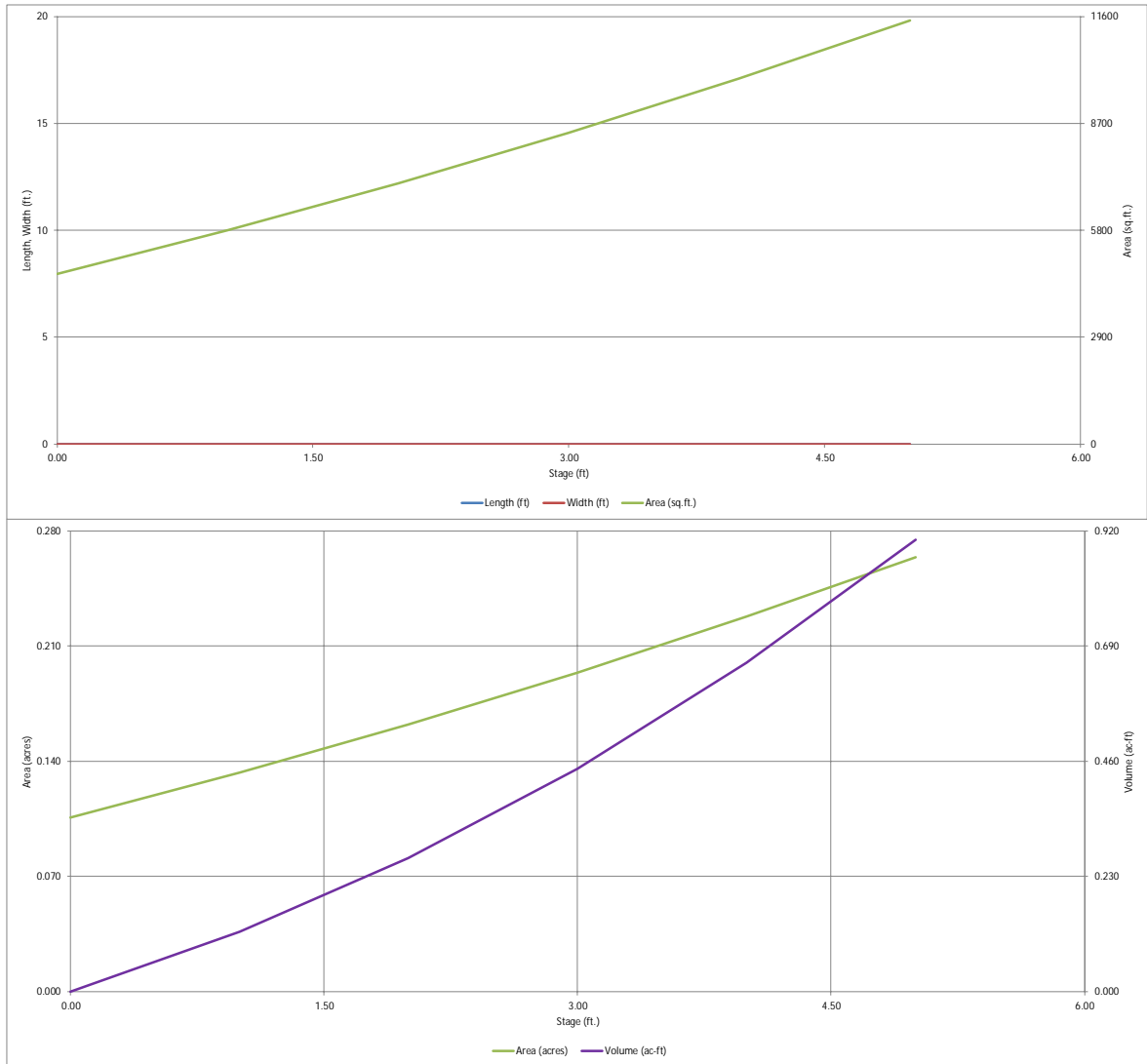


## MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 3

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

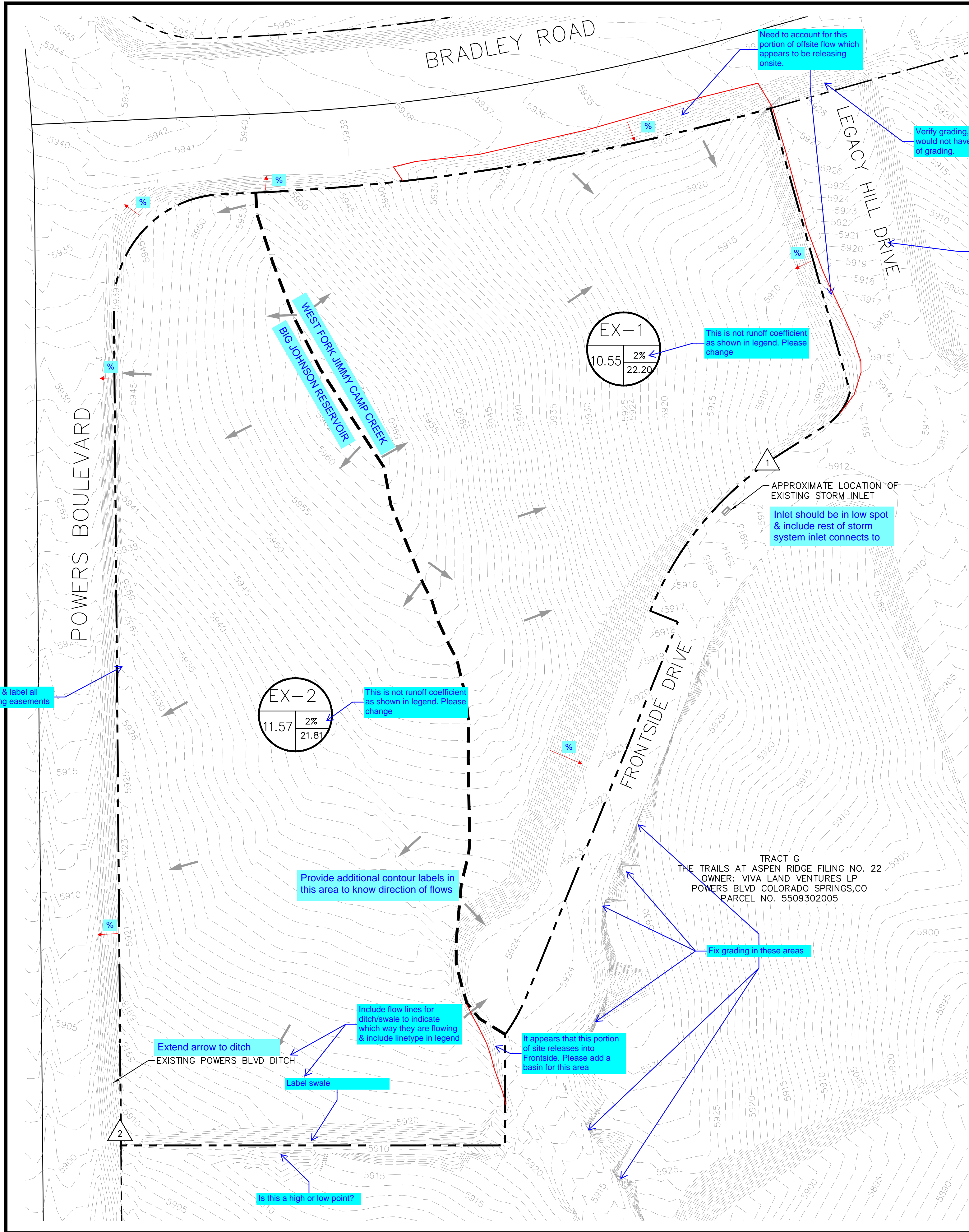
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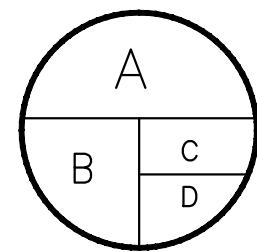
## **APPENDIX E - DRAINAGE EXHIBITS**



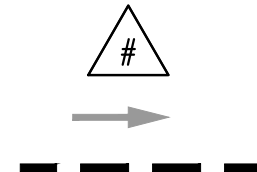
K:\COS\_LA\196195000 - Waterview East Commercial\CADD\PlanSheets\CD\_DR\_EX.dwg Lundberg, Andrew 5/2022 2:10 PM



## LEGEND



A = BASIN DESIGNATION  
B = AREA (ACRES)  
C = 100-YR COMPOSITE RUNOFF COEFFICIENT  
D = 100-YR DESIGN STORM RUNOFF (CFS)



DESIGN POINT  
EXISTING FLOW DIRECTION  
DRAINAGE BASIN BOUNDARY  
PROPERTY LINE  
PROPOSED MAJOR CONTOUR  
PROPOSED MINOR CONTOUR  
EXISTING MAJOR CONTOUR  
EXISTING MAJOR CONTOUR

## NOTES

- THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR COMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.
- PLAN REVIEW BY EL PASO COUNTY IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH DESIGN CRITERIA. EL PASO COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. EL PASO COUNTY, THROUGH APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

| SUMMARY - EXISTING RUNOFF TABLE |                   |                    |                          |                            |                              |                                |
|---------------------------------|-------------------|--------------------|--------------------------|----------------------------|------------------------------|--------------------------------|
| DESIGN POINT                    | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | CUMULATIVE 5-YR RUNOFF (CFS) | CUMULATIVE 100-YR RUNOFF (CFS) |
| 1                               | EX-1              | 10.55              | 3.31                     | 22.20                      | 3.31                         | 22.20                          |
| 2                               | EX-2              | 11.57              | 3.25                     | 21.81                      | 3.25                         | 21.81                          |

**COLORADO SPRINGS REVIEW**

STREET DESIGN FOR CITY ENGINEERING:

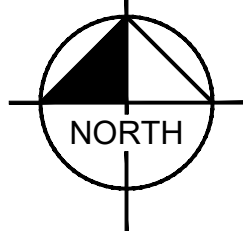
UTILITY GRADE REVIEW: \_\_\_\_\_ DATE: \_\_\_\_\_

CURB & GUTTER REVIEW: \_\_\_\_\_ DATE: \_\_\_\_\_

FINAL REVIEW: \_\_\_\_\_ DATE: \_\_\_\_\_

DRAINAGE DESIGN: \_\_\_\_\_ DATE: \_\_\_\_\_

THIS IS FILED IN ACCORDANCE WITH SECTION 7.7.906 (DRAINAGE ORDINANCE) OF THE CODE OF THE CITY OF COLORADO SPRINGS, 2001 AS AMENDED.



GRAPHIC SCALE IN FEET  
0 40 80 160



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2 North Nevada Avenue, Suite 300  
Colorado Springs, Colorado 80903 (719) 453-0180

WATERVIEW EAST COMMERCIAL  
CONSTRUCTION DOCUMENTS  
EXISTING DRAINAGE MAP

PRELIMINARY  
FOR REVIEW ONLY  
NOT FOR CONSTRUCTION  
**Kimley»Horn**  
Kimley-Horn and Associates, Inc.

PROJECT NO.  
196195000

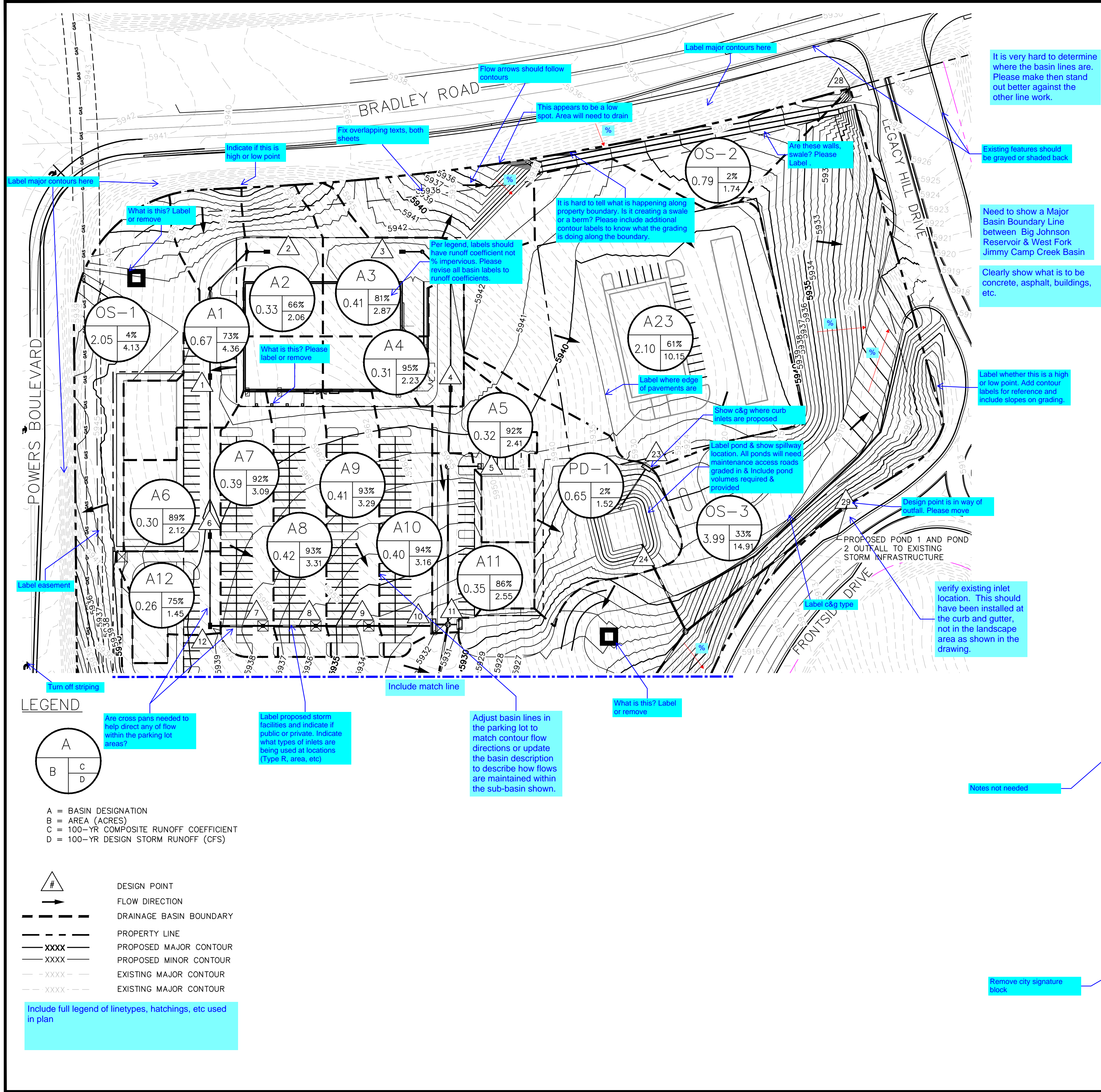
SHEET

DR-EX

NO. BY DATE APPR



K:\COS\_LA\196195000 - Waterview East Commercial\CADD\PlanSheets\CD\_DR.dwg Roberts, Jared 6/27/2022 10:59 AM



| SUMMARY - PROPOSED RUNOFF TABLE |                   |                    |                          |                            |                              |                                |
|---------------------------------|-------------------|--------------------|--------------------------|----------------------------|------------------------------|--------------------------------|
| DESIGN POINT                    | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | CUMULATIVE 5-YR RUNOFF (CFS) | CUMULATIVE 100-YR RUNOFF (CFS) |
| 1                               | A1                | 0.67               | 2.20                     | 4.36                       | 2.20                         | 4.36                           |
| 2                               | A2                | 0.33               | 1.00                     | 2.06                       | 1.00                         | 2.06                           |
| 3                               | A3                | 0.41               | 1.50                     | 2.87                       | 1.50                         | 2.87                           |
| 4                               | A4                | 0.31               | 1.22                     | 2.23                       | 1.22                         | 2.23                           |
| 5                               | A5                | 0.32               | 1.31                     | 2.41                       | 1.31                         | 2.41                           |
| 6                               | A6                | 0.30               | 1.14                     | 2.12                       | 1.14                         | 2.12                           |
| 7                               | A7                | 0.39               | 1.68                     | 3.09                       | 1.68                         | 3.09                           |
| 8                               | A8                | 0.42               | 1.81                     | 3.31                       | 1.81                         | 3.31                           |
| 9                               | A9                | 0.41               | 1.80                     | 3.29                       | 1.80                         | 3.29                           |
| 10                              | A10               | 0.40               | 1.73                     | 3.16                       | 1.73                         | 3.16                           |
| 11                              | A11               | 0.35               | 1.36                     | 2.55                       | 1.36                         | 2.55                           |
| 12                              | A12               | 0.26               | 0.74                     | 1.45                       | 0.74                         | 1.45                           |
| 13                              | A13               | 1.05               | 3.06                     | 5.87                       | 3.06                         | 5.87                           |
| 14                              | A14               | 0.11               | 0.43                     | 0.81                       | 0.43                         | 0.81                           |
| 15                              | A15               | 0.16               | 0.42                     | 0.82                       | 0.42                         | 0.82                           |
| 16                              | A16               | 0.39               | 1.47                     | 2.75                       | 1.47                         | 2.75                           |
| 17                              | A17               | 0.75               | 3.14                     | 5.72                       | 3.14                         | 5.72                           |
| 18                              | A18               | 0.83               | 1.82                     | 3.77                       | 1.82                         | 3.77                           |
| 19                              | A19               | 1.34               | 5.39                     | 9.83                       | 5.39                         | 9.83                           |
| 20                              | A20               | 0.60               | 2.53                     | 4.60                       | 2.53                         | 4.60                           |
| 21                              | A21               | 0.49               | 1.57                     | 2.89                       | 1.57                         | 2.89                           |
| 22                              | A22               | 0.63               | 2.35                     | 4.31                       | 2.35                         | 4.31                           |
| 23                              | A23               | 2.10               | 4.83                     | 10.15                      | 4.83                         | 10.15                          |
| 24                              | PD-1              | 0.65               | 0.23                     | 1.52                       | 0.23                         | 1.52                           |
| 25                              | PD-2              | 0.74               | 0.79                     | 2.39                       | 0.79                         | 2.39                           |
| 26                              | PD-3              | 0.21               | 0.09                     | 0.61                       | 0.09                         | 0.61                           |
| 27                              | OS-1              | 2.05               | 0.72                     | 4.13                       | 0.72                         | 4.13                           |
| 28                              | OS-2              | 0.79               | 0.26                     | 1.74                       | 0.26                         | 1.74                           |
| 29                              | OS-3              | 3.99               | 5.59                     | 14.91                      | 5.59                         | 14.91                          |
| 30                              | OS-4              | 0.67               | 1.71                     | 3.74                       | 1.71                         | 3.74                           |

NOTES

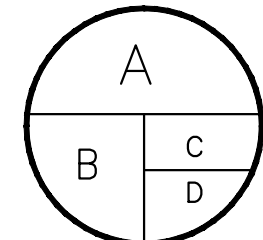
- THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR COMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.
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Provide the combined/routed flows for DP 29. This must be less than or equal to the MDDP

Notes not needed

Remove city signature block

LEGEND

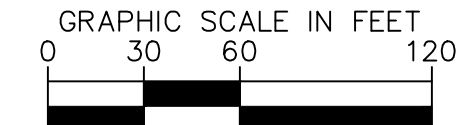
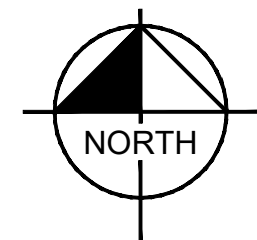


A = BASIN DESIGNATION  
B = AREA (ACRES)  
C = 100-YR COMPOSITE RUNOFF COEFFICIENT  
D = 100-YR DESIGN STORM RUNOFF (CFS)



DESIGN POINT  
FLOW DIRECTION  
DRAINAGE BASIN BOUNDARY  
PROPERTY LINE  
PROPOSED MAJOR CONTOUR  
PROPOSED MINOR CONTOUR  
EXISTING MAJOR CONTOUR  
EXISTING MAJOR CONTOUR

Include full legend of linetypes, hatchings, etc used in plan



| COLORADO SPRINGS REVIEW   |             |
|---|-------------|
| STREET DESIGN FOR CITY ENGINEERING:   |             |
| UTILITY GRADE REVIEW:   | DATE: _____ |
| CURB & GUTTER REVIEW:   | DATE: _____ |
| FINAL REVIEW:   | DATE: _____ |
| DRAINAGE DESIGN:  | DATE: _____ |
| THIS IS FILED IN ACCORDANCE WITH SECTION 7.7.906 (DRAINAGE ORDINANCE) OF THE CODE OF THE CITY OF COLORADO SPRINGS, 2001 AS AMENDED. |             |

**Kimley»Horn**

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DRAWN BY: JAR  
CHECKED BY: EUG  
DATE: 05/06/2022

WATERVIEW EAST COMMERCIAL  
CONSTRUCTION DOCUMENTS  
PROPOSED DRAINAGE MAP

PRELIMINARY  
FOR REVIEW ONLY  
NOT FOR CONSTRUCTION  
**Kimley»Horn**  
Kimley-Horn and Associates, Inc.

PROJECT NO.  
196195000

SHEET

DR-1

NO. BY DATE APPR







## **APPENDIX F – MASTER DEVELOPMENT DRAINAGE PLANS**

b. The **fully developed conditions** for the site are as follows:

1. **Big Johnson Reservoir:**

Under proposed conditions, developed flows for the westernmost drainage basin (Big Johnson Reservoir) will be directed into a proposed full spectrum detention pond on the west side of the site approximately 2,030 feet south of the intersection of Bradley Road and Powers Boulevard. Sub-basins and Design Points within this major basin are summarized in Tables 3.3, 3.4, and 3.5 below:

| <b>Table 3.3</b><br><b>Trails at Aspen Ridge</b><br><b>Big Johnson Reservoir</b><br><b>Proposed Conditions - Sub-basin Summary</b> |       |      |      |
|--|-------|------|------|
| Basin  | Area  | Q5   | Q100 |
|  | acres | cfs  | cfs  |
| Big Johnson Reservoir  | 14.1  | 21.2 | 46.8 |
| N  |       |      |      |
| O  | 11.7  | 17.4 | 38.4 |
| P  | 8.52  | 22.0 | 43.9 |
| Q  | 2.4   | 4.2  | 8.8  |
| OS-2   | 11.4  | 1.7  | 11.7 |

| <b>Table 3.4</b><br><b>Trails at Aspen Ridge</b><br><b>Big Johnson Reservoir</b><br><b>Proposed Design Point Summary</b>  |            |                         |                  |            |              |
|---|------------|-------------------------|------------------|------------|--------------|
| Design Point  | Sub-Basins | Downstream Design Point | Total Area (ac.) | Q(5) (cfs) | Q(100) (cfs) |
| N   | N          | P                       | 14.1             | 21.2       | 46.8         |
| O   | O          | P                       | 11.7             | 17.4       | 38.4         |
| P (Into West Pond)  | N, O, P    | West Pond Discharge     | 34.7             | 47.6       | 101.5        |
| <b>West Pond Discharge (UD-Detention)</b>   | N, O, P    | Powers Ditch            |                  | 1.0        | 28.3         |
| Q   | Q          | Powers Ditch            | 2.4              | 4.9        | 10.3         |
| OS-2<br>(This sub-basin is just southeast of the Powers and Bradley intersection. Flows which might have flowed across TAR to the Powers ditch will be diverted to the ditch prior to entering the TAR property.) | OS-2       | Powers Ditch            | 11.4             | 1.7        | 11.7         |

| <b>Table 3.8</b><br><b>Trails at Aspen Ridge</b><br><b>West Fork - Jimmy Camp Creek</b><br><b>Proposed Design Point Flow Description</b> |   |
|--|---|
| Design Point   | Description   |
| OS-1   | <ul style="list-style-type: none"> <li>- This design point is at the downstream end of the offsite sub-basin north of Bradley Road. Flows in this sub-basin will sheet flow to the road ditch running along Bradley and Powers Boulevard. Once channelized in the ditch flows will be directed to a proposed 24-inch RCP storm pipe sleeved into one of the existing 42-inch CMP cross road pipes and conveyed on to design point A.</li> <li>- Please note that approximately 7.3 acres of the area tributary to this design point have been diverted from the Big Johnson Reservoir by CDOT construction of Powers Boulevard. Future development of that portion of the tributary sub-basin must redirect these flows to the Big Johnson Reservoir to maintain compliance with the two relevant DBPS reports.</li> <li>- Development of the OS-1 Sub-basin will require onsite detention and an FDR.</li> </ul> |
| A  | <ul style="list-style-type: none"> <li>- This design point is at the manhole (MH-3) receiving flows from DP OS-1 to the north and flows from Sub-basin A captured in the two pairs of inlets on Frontside Drive to the east and west of its intersection with Legacy Drive. These flows will be conveyed on via 30-inch storm pipe to design point B.</li> <li>- Flows from the required onsite detention from the two commercial lots on either side of Legacy Drive will be picked up in the back of the inlets. A 24-inch storm pipe will be stubbed out for the west commercial lot (Inlet 1-A) and an 18-inch will be stubbed out for the east commercial lot (Inlet 3-A).</li> </ul>  |
| B  | <ul style="list-style-type: none"> <li>- This design point is at a manhole (MH-108) just downstream of an on-grade inlet (1-B) capturing gutter flows from the west half of Legacy Drive reflected in Sub-basin B. These flows are carried downstream via 30-inch storm pipe to design point C.</li> </ul>  |
| C  | <ul style="list-style-type: none"> <li>- This design point is a manhole (MH-6) which combines storm sewer flows from design point B with storm sewer flows from Sub-basin C. Flows in Sub-basin C will sheet flow off the residential lots and into the street curb and gutter. The road gutters will convey these flows on to be captured in four pairs of sump inlets (1-C through 8-C) and conveyed to the design point. The combined flows will be conveyed downstream via 42-inch storm pipe to design point D.</li> </ul>   |
| D  | <ul style="list-style-type: none"> <li>- This design point is at a manhole (MH-117) just downstream of an at-grade inlet (1-D) capturing flows from Sub-basin D. Flows in Sub-basin D will sheet flow to the Legacy Road curb and gutter. These gutter flows are captured in the at-grade inlet and combined with storm sewer flows from design point C and carried on via 42-inch storm pipe to design point E.</li> </ul>   |
| E  | <ul style="list-style-type: none"> <li>- This design point is located at a manhole (MH-15) just downstream of a pair of sump inlets capturing flows from Sub-basin E. Flows in Sub-basin E will sheet flow across the park area until being captured in the curb and gutter along Falling Rock Drive. Concentrated gutter flows will then be captured by the sump inlets and conveyed on via storm sewer to the design point. These flows will be combined with flows from design point D and carried on via 48-inch storm pipe to design point G.</li> </ul>   |

Project Name:  
Project Location:  
Designer  
Notes:

Trails at Aspen Ridge (Waterview II)  
El Paso County, CO  
JTS  
Proposed Condition

Average Channel Velocity  
Average Slope for Initial Flow

4 ft/s  
0.04 ft/ft

(If specific channel vel is used, this will be ignored)  
(If Elevations are used, this will be ignored)

| Channel Flow Type Key     |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|--|
| Heavy Meadow 2            |  |  |  |  |  |  |
| Tillage/Field 3           |  |  |  |  |  |  |
| Short Pasture and Lawns 4 |  |  |  |  |  |  |
| Nearly Bare Ground 5      |  |  |  |  |  |  |
| Grassed Waterway 6        |  |  |  |  |  |  |
| Paved Areas 7             |  |  |  |  |  |  |

| Sub-basin                          | Comments   | Area      |       | Rational 'C' Values                                  |      |           |  |      |           |                                  |      |        |   |      |        |           |      | Flow Lengths          |         |                 |         |              |                      | Channel Flow |             |  |                    | Tc                  | Rainfall Intensity & Rational Flow Rate |       |      |       |      | SWMM Values |      |
|------------------------------------|--|-----------|-------|--|------|-----------|--|------|-----------|----------------------------------|------|--------|---|------|--------|-----------|------|-----------------------|---------|-----------------|---------|--------------|----------------------|--------------|-------------|--|--------------------|---------------------|---|-------|------|-------|------|-------------|------|
|                                    |  | sf        | acres | Surface Type 1<br>Residential 1/8 or less (65% Imp.) |      |           | Surface Type 2<br>Pavement (100% Imp.) |      |           | Surface Type 3<br>Park (7% Imp.) |      |        | Surface Type 4<br>Undeveloped (2% Imp.) |      |        | Composite |      | Percent<br>Impervious | Initial | True<br>Initial | Channel | True Channel | Average<br>(decimal) | Initial      | Average (%) | Channel Flow<br>Type<br>(See Key above)<br>Ground Type | Velocity<br>(ft/s) | Channel<br>Tc (min) | Total<br>(min)                          | i5    | Q5   | i100  | Q100 | Q5          | Q100 |
|                                    |  |           |       | C5   | C100 | Area (SF) | C5                                     | C100 | Area (SF) | C5                               | C100 | Area   | C5                                      | C100 | Area   | C5        | C100 |                       | ft      | Length ft       | ft      | Length ft    | Slope                | Tc (min)     | Slope       |  |                    |                     |   | in/hr | cfs  | in/hr | cfs  | cfs         | cfs  |
| West Fork-Jimmy Camp Creek<br>OS-1 | - The most northwestern portion of this basin (7.268 Acres) outside of the proposed Trails at Aspen Ridge development was rerouted out of the Big Johnson Reservoir basin by CDOT construction of Powers Boulevard and Bradley Road. Future development of the rerouted area will require routing the flows back to the Big Johnson Reservoir to return the area to compliance with the relevant DBPS studies. | 853,954   | 19.60 | 0.45   | 0.59 |           | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 | 853954 | 0.09      | 0.36 | 2.00                  | 780.00  | 300.00          | 300.00  | 780.00       | 0.10                 | 23.57        | 1.40        | 5  | 1.2                | 11.0                | 34.6                                    | 2.23  | 4.0  | 3.75  | 26.7 | 1.1         | 16.2 |
| A                                  | -Drainage area is upstream of two pairs of inlets near roundabout at intersection of Frontside Dr. and Legacy Dr.<br>-Development of adjacent commercial lots will require FDR and onsite detention.<br>-Note: The Commercial development will have 95% impervious (per DCM), but since it is required to detain prior to discharging to storm sewer the C values reflect undeveloped commercial areas.        | 804,622   | 18.47 | 0.45   | 0.59 | 22315     | 0.90                                   | 0.96 | 78609     | 0.65                             | 0.80 |        | 0.09                                    | 0.36 | 703698 | 0.18      | 0.42 | 13.32                 | 861.00  | 300.00          | 869.00  | 1430.00      | 0.06                 | 26.77        | 1.10        | 7  | 2.1                | 11.4                | 38.1                                    | 2.10  | 7.0  | 3.54  | 28.0 | 5.0         | 34.6 |
| B                                  | - At grade inlet approximately 400 feet downstream of roundabout.  | 46,101    | 1.06  | 0.45   | 0.59 | 46101     | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.45      | 0.59 | 65.00                 | 185.00  | 185.00          | 400.00  | 400.00       | 0.04                 | 9.86         | 3.40        | 7  | 3.7                | 1.8                 | 11.7                                    | 3.86  | 1.9  | 6.48  | 4.1  | 2.5         | 7.0  |
| C                                  | - Includes the area north of Moose Meadow Street and between Beartrack Point and Sidewinder Drive and four pairs of sump inlets  | 648,154   | 14.88 | 0.45   | 0.59 | 627120    | 0.90                                   | 0.96 | 21034     | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.46      | 0.60 | 66.14                 | 162.00  | 162.00          | 822.00  | 822.00       | 0.05                 | 8.51         | 3.29        | 7  | 3.6                | 3.8                 | 12.3                                    | 3.77  | 26.3 | 6.34  | 57.2 | 19.5        | 58.9 |
| D                                  | -drainage area upstream of at grade inlet approximately 575 feet south of Moose Meadow Street.   | 96,065    | 2.21  | 0.45   | 0.59 |           | 0.90                                   | 0.96 | 14,978    | 0.65                             | 0.80 | 81087  | 0.09                                    | 0.36 |        | 0.69      | 0.82 | 21.50                 | 473.00  | 300.00          | 555.00  | 728.00       | 0.06                 | 8.85         | 4.00        | 7  | 4.0                | 3.0                 | 11.9                                    | 3.83  | 5.9  | 6.44  | 11.8 | 4.1         | 14.2 |
| E                                  | - Located at a pair of sump inlets at the intersection of Sunday Gulch and Falling Rock Drive.   | 373,189   | 8.57  | 0.45   | 0.59 | 49513     | 0.90                                   | 0.96 | 40601     | 0.65                             | 0.80 | 283075 | 0.09                                    | 0.36 |        | 0.65      | 0.79 | 24.81                 | 859.00  | 300.00          | 1450.00 | 2009.00      | 0.07                 | 12.39        | 4.00        | 7  | 4.0                | 8.4                 | 20.8                                    | 2.96  | 16.6 | 4.97  | 33.9 | 12.8        | 39.1 |
| F                                  | -Represents area captured by at grade inlets on Lazy Ridge Drive and Wagon Hammer Drive, as well as sump inlets west of the intersection of Lookout Court and Sunday Gulch.  | 569,234   | 13.07 | 0.45   | 0.59 | 569234    | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.45      | 0.59 | 65.00                 | 332.00  | 300.00          | 868.00  | 900.00       | 0.07                 | 11.14        | 2.00        | 7  | 2.8                | 5.3                 | 16.4                                    | 3.32  | 19.7 | 5.57  | 43.3 | 15.4        | 46.2 |
| G                                  | -At grade inlet on the east side of Sunday Gulch near intersection with Lookout Court.   | 48,227    | 1.11  | 0.45   | 0.59 | 48227     | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.45      | 0.59 | 65.00                 | 80.00   | 80.00           | 667.00  | 667.00       | 0.05                 | 6.12         | 2.45        | 7  | 3.1                | 3.6                 | 9.7                                     | 4.15  | 2.1  | 6.97  | 4.6  | 2.1         | 6.1  |
| H                                  | -This represents the area draining to Buffalo Horn Drive with the exception any flow by from the at grade inlets in Sub-basin F.   | 1,022,296 | 23.47 | 0.45   | 0.59 | 921233    | 0.90                                   | 0.96 | 39,492    | 0.65                             | 0.80 | 61571  | 0.09                                    | 0.36 |        | 0.48      | 0.62 | 62.86                 | 250.00  | 250.00          | 1074.00 | 1074.00      | 0.04                 | 11.13        | 2.00        | 7  | 2.8                | 6.3                 | 17.5                                    | 3.22  | 36.6 | 5.42  | 79.1 | 26.8        | 80.4 |

|   |   | Area      |       | Rational 'C' Values                                  |      |           |  |      |           |                                  |      |        |   |      |        |           |      |                       |               | Flow Lengths                 |               |                           |                               |                     |                      |  |                    | Channel Flow Type (See Key above) |                |             |           |               |             | Tc        | Rainfall Intensity & Rational Flow Rate |  |  |  |  | SWMM Values |  |
|---|---|-----------|-------|--|------|-----------|--|------|-----------|----------------------------------|------|--------|---|------|--------|-----------|------|-----------------------|---------------|------------------------------|---------------|---------------------------|-------------------------------|---------------------|----------------------|--|--------------------|-----------------------------------|----------------|-------------|-----------|---------------|-------------|-----------|---|--|--|--|--|-------------|--|
| Sub-basin                                   | Comments  | sf        | acres | Surface Type 1<br>Residential 1/8 or less (65% Imp.) |      |           | Surface Type 2<br>Pavement (100% Imp.) |      |           | Surface Type 3<br>Park (7% Imp.) |      |        | Surface Type 4<br>Undeveloped (2% Imp.) |      |        | Composite |      | Percent<br>Impervious | Initial<br>ft | True<br>Initial<br>Length ft | Channel<br>ft | True Channel<br>Length ft | Average<br>(decimal)<br>Slope | Initial<br>Tc (min) | Average (%)<br>Slope | Channel Flow<br>Type<br>(See Key above)<br>Ground Type | Velocity<br>(ft/s) | Channel<br>Tc (min)               | Total<br>(min) | i5<br>in/hr | Q5<br>cfs | i100<br>in/hr | Q100<br>cfs | Q5<br>cfs | Q100<br>cfs                             |  |  |  |  |             |  |
|   |   |           |       | C5   | C100 | Area (SF) | C5                                     | C100 | Area (SF) | C5                               | C100 | Area   | C5                                      | C100 | Area   | C5        | C100 |                       |               |                              |               |                           |                               |                     |                      |  |                    |                                   |                |             |           |               |             |           |   |  |  |  |  |             |  |
| I   | -Represents area draining to the proposed sump inlet at the end of the cul-de-sac on Falling Rock Drive.  | 344,236   | 7.90  | 0.45   | 0.59 | 305401    | 0.90                                   | 0.96 | 31104     | 0.65                             | 0.80 | 7731   | 0.09                                    | 0.36 |        | 0.50      | 0.63 | 66.86                 | 153.00        | 153.00                       | 1104.00       | 1104.00                   | 0.05                          | 7.88                | 2.61                 | 7  | 3.2                | 5.7                               | 13.6           | 3.62        | 14.3      | 6.08          | 30.4        | 10.5      | 31.8                                    |  |  |  |  |             |  |
| J   | -Represents drainage area tributary to sump inlets near intersection of Redshirt Point and Big Johnson Drive.   | 229,049   | 5.26  | 0.45   | 0.59 | 70187     | 0.90                                   | 0.96 | 158,862   | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.76      | 0.85 | 89.28                 | 266.00        | 266.00                       | 909.00        | 909.00                    | 0.09                          | 4.77                | 3.20                 | 7  | 3.6                | 4.2                               | 9.0            | 4.27        | 17.2      | 7.17          | 32.2        | 11.1      | 32.7                                    |  |  |  |  |             |  |
| K   | -This sub-basin is tributary to the future sump inlets near the intersection of Big Johnson Drive and Roundhouse Drive.   | 1,414,842 | 32.48 | 0.45   | 0.59 | 1414842   | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.45      | 0.59 | 65.00                 | 400.00        | 300.00                       | 1400.00       | 1500.00                   | 0.06                          | 13.26               | 3.50                 | 7  | 3.7                | 6.7                               | 19.9           | 3.02        | 44.5      | 5.07          | 98.0        | 33.3      | 101.7                                   |  |  |  |  |             |  |
| Marksheffel Tributary to Jimmy Camp Creek L | -Represents entire drainage area to the Northeast Pond.   | 330,836   | 7.59  | 0.45   | 0.59 | 259741    | 0.90                                   | 0.96 |           | 0.65                             | 0.80 | 71095  | 0.09                                    | 0.36 |        | 0.49      | 0.64 | 52.54                 | 290.00        | 290.00                       | 490.00        | 490.00                    | 0.05                          | 10.88               | 5.40                 | 7  | 4.6                | 1.8                               | 12.6           | 3.73        | 14.1      | 6.27          | 30.5        |           |   |  |  |  |  |             |  |
| West Fork-Jimmy Camp Creek M                | Drainage area in and around East Full Spectrum Detention Pond   | 447,971   | 10.29 | 0.45   | 0.59 |           | 0.90                                   | 0.96 |           | 0.65                             | 0.80 | 447971 | 0.09                                    | 0.36 |        | 0.65      | 0.80 | 7.00                  | 437.00        | 300.00                       | 10.00         | 147.00                    | 0.06                          | 9.32                | 1.00                 | 7  | 2.0                | 1.2                               | 10.5           | 4.02        | 27.1      | 6.75          | 56.0        | 14.2      | 61.8                                    |  |  |  |  |             |  |
| Big Johnson Reservoir N                     | -Represents area upstream of sump inlets near intersection of Natural Bridge Trail and Blue Miner Street.   | 614,283   | 14.10 | 0.45   | 0.59 | 614283    | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 |        | 0.45      | 0.59 | 65.00                 | 150.00        | 150.00                       | 1229.00       | 1229.00                   | 0.03                          | 9.94                | 2.50                 | 7  | 3.2                | 6.5                               | 16.4           | 3.32        | 21.2      | 5.58          | 46.8        |           |   |  |  |  |  |             |  |
| O   | -Represents area upstream of sump inlet at intersection of Rainy Creek Trail and Triple Tree Loop   | 510,492   | 11.72 | 0.45   | 0.59 | 510,492   | 0.90                                   | 0.96 | 0         | 0.65                             | 0.80 | 0      | 0.09                                    | 0.36 | 0      | 0.45      | 0.59 | 65.00                 | 104.00        | 104.00                       | 1230.00       | 1230.00                   | 0.02                          | 9.47                | 1.40                 | 7  | 2.4                | 8.7                               | 18.1           | 3.17        | 16.8      | 5.32          | 37.1        |           |   |  |  |  |  |             |  |
| P   | -Drainage area in and around the West Pond.   | 370,936   | 8.52  | 0.45   | 0.59 |           | 0.90                                   | 0.96 | 70,884    | 0.65                             | 0.80 | 300052 | 0.09                                    | 0.36 |        | 0.70      | 0.83 | 24.77                 | 560.00        | 300.00                       | 378.00        | 638.00                    | 0.06                          | 9.43                | 2.00                 | 7  | 2.8                | 3.8                               | 13.2           | 3.67        | 22.0      | 6.16          | 43.9        |           |   |  |  |  |  |             |  |
| Q   | -This area is infeasible to detain and discharges to the Powers Boulevard Ditch<br>-Less than one acre (0.31 Acres) of developed area is within the Big Johnson Reservoir Basin, therefore, compliance with the county's MS4 permit is maintained.                              | 106,017   | 2.43  | 0.45   | 0.59 | 38,063    | 0.90                                   | 0.96 | 0         | 0.65                             | 0.80 | 67,954 | 0.09                                    | 0.36 | 0      | 0.58      | 0.72 | 27.82                 | 143.00        | 143.00                       | 687.00        | 687.00                    | 0.06                          | 6.08                | 3.35                 | 4  | 1.3                | 9.0                               | 15.1           | 3.45        | 4.9       | 5.80          | 10.3        |           |   |  |  |  |  |             |  |
| R   | -This area is infeasible to detain and discharges to the swale at the southeast corner of the property.<br>-Less than one acre (0.67 Acres) of developed area is within the West Fork Jimmy Camp Creek Basin, therefore, compliance with the county's MS4 permit is maintained. | 81,300    | 1.87  | 0.45   | 0.59 |           | 0.90                                   | 0.96 |           | 0.65                             | 0.80 | 81300  | 0.09                                    | 0.36 |        | 0.65      | 0.80 | 7.00                  | 21.00         | 21.00                        | 220.00        | 220.00                    | 0.33                          | 1.16                | 10.00                | 5  | 3.2                | 1.2                               | 5.0            | 5.10        | 6.2       | 8.58          | 12.9        | 1.7       | 7.8                                     |  |  |  |  |             |  |
| OS-2  | - Commercially zoned lot just southeast of the intersection of Bradley and Powers. This area will be required to provide its own detention which must discharge to the Powers Boulevard Ditch.  | 498,467   | 11.44 | 0.45   | 0.59 |           | 0.90                                   | 0.96 |           | 0.65                             | 0.80 |        | 0.09                                    | 0.36 | 498467 | 0.09      | 0.36 | 2.00                  | 971.00        | 300.00                       | 1411.00       | 2082.00                   | 0.04                          | 34.50               | 2.83                 | 5  | 1.7                | 20.7                              | 55.2           | 1.67        | 1.7       | 2.81          | 11.7        |           |   |  |  |  |  |             |  |

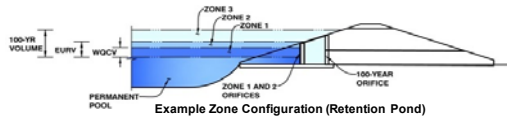


# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: Approximated future detention for Commercial lot South of Bradley Road and West of Legacy Drive



Example Zone Configuration (Retention Pond)

## Required Volume Calculation

|   |            |           |
|---|------------|-----------|
| Selected BMP Type =                     | EDB        |           |
| Watershed Area =                        | 13.43      | acres     |
| Watershed Length =                      | 894        | ft        |
| Watershed Slope =                       | 0.070      | ft/ft     |
| Watershed Imperviousness =              | 95.00%     | 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   |
| Desired WQCV Drain Time =               | 40.0       | hours     |
| Location for 1-hr Rainfall Depths =     | User Input |           |
| Water Quality Capture Volume (WQCV) =   | 0.501      | acre-feet |
| Excess Urban Runoff Volume (EURV) =     | 1.436      | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) =    | 1.234      | acre-feet |
| 5-yr Runoff Volume (P1 = 1.5 in.) =     | 1.600      | acre-feet |
| 10-yr Runoff Volume (P1 = 1.75 in.) =   | 1.926      | acre-feet |
| 25-yr Runoff Volume (P1 = 2 in.) =      | 2.252      | acre-feet |
| 50-yr Runoff Volume (P1 = 2.25 in.) =   | 2.517      | acre-feet |
| 100-yr Runoff Volume (P1 = 2.52 in.) =  | 2.867      | acre-feet |
| 500-yr Runoff Volume (P1 = 3.55 in.) =  | 4.110      | acre-feet |
| Approximate 2-yr Detention Volume =     | 1.158      | acre-feet |
| Approximate 5-yr Detention Volume =     | 1.504      | acre-feet |
| Approximate 10-yr Detention Volume =    | 1.831      | acre-feet |
| Approximate 25-yr Detention Volume =    | 1.964      | acre-feet |
| Approximate 50-yr Detention Volume =    | 2.037      | acre-feet |
| Approximate 100-yr Detention Volume =   | 2.102      | acre-feet |

|                        |                    |
|------------------------|--------------------|
| Optional User Override | 1-hr Precipitation |
| 1.19                   | inches             |
| 1.50                   | inches             |
| 1.75                   | inches             |
| 2.00                   | inches             |
| 2.25                   | inches             |
| 2.52                   | inches             |
| 3.55                   | inches             |

## Stage-Storage Calculation

|   |        |                 |
|---|--------|-----------------|
| Zone 1 Volume (WQCV) =                                  | 0.501  | acre-feet       |
| Zone 2 Volume (EURV - Zone 1) =                         | 0.935  | acre-feet       |
| Zone 3 Volume (100-year - Zones 1 & 2) =                | 0.666  | acre-feet       |
| Total Detention Basin Volume =                          | 2.102  | acre-feet       |
| Initial Surcharge Volume (ISV) =                        | 65     | ft <sup>3</sup> |
| Initial Surcharge Depth (ISD) =                         | 0.33   | ft              |
| Total Available Detention Depth (H <sub>total</sub> ) = | 4.00   | ft              |
| Depth of Trickle Channel (H <sub>TC</sub> ) =           | 0.50   | ft              |
| Slope of Trickle Channel (S <sub>TC</sub> ) =           | 0.005  | ft/ft           |
| Slopes of Main Basin Sides (S <sub>main</sub> ) =       | 4      | H:V             |
| Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =       | 2      |                 |
| Initial Surcharge Area (A <sub>ISV</sub> ) =            | 198    | ft <sup>2</sup> |
| Surcharge Volume Length (L <sub>ISV</sub> ) =           | 14.1   | ft              |
| Surcharge Volume Width (W <sub>ISV</sub> ) =            | 14.1   | ft              |
| Depth of Basin Floor (H <sub>100OR</sub> ) =            | 1.22   | ft              |
| Length of Basin Floor (L <sub>100OR</sub> ) =           | 262.3  | ft              |
| Width of Basin Floor (W <sub>100OR</sub> ) =            | 135.8  | ft              |
| Area of Basin Floor (A <sub>100OR</sub> ) =             | 35,621 | ft <sup>2</sup> |
| Volume of Basin Floor (V <sub>100OR</sub> ) =           | 15,609 | ft <sup>3</sup> |
| Depth of Main Basin (H <sub>MAIN</sub> ) =              | 1.95   | ft              |
| Length of Main Basin (L <sub>MAIN</sub> ) =             | 278.0  | ft              |
| Width of Main Basin (W <sub>MAIN</sub> ) =              | 151.4  | ft              |
| Area of Main Basin (A <sub>MAIN</sub> ) =               | 42,086 | ft <sup>2</sup> |
| Volume of Main Basin (V <sub>MAIN</sub> ) =             | 75,793 | ft <sup>3</sup> |
| Calculated Total Basin Volume (V <sub>total</sub> ) =   | 2.102  | acre-feet       |

|                             |            |                              |             |            |             |                               |             |               |                |
|-----------------------------|------------|------------------------------|-------------|------------|-------------|-------------------------------|-------------|---------------|----------------|
| Depth Increment =           | 0.1        | 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       |                              | 14.1        | 14.1       | 198         |                               | 0.005       |               |                |
| ISV                         | 0.33       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 63            | 0.001          |
|                             | 0.40       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 77            | 0.002          |
|                             | 0.50       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 97            | 0.002          |
|                             | 0.60       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 117           | 0.003          |
|                             | 0.70       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 137           | 0.003          |
|                             | 0.80       |                              | 14.1        | 14.1       | 198         |                               | 0.005       | 157           | 0.004          |
|                             | 0.90       |                              | 26.3        | 20.1       | 528         |                               | 0.012       | 186           | 0.004          |
|                             | 1.00       |                              | 46.7        | 30.1       | 1,405       |                               | 0.032       | 279           | 0.006          |
|                             | 1.10       |                              | 67.1        | 40.1       | 2,690       |                               | 0.062       | 480           | 0.011          |
|                             | 1.20       |                              | 87.5        | 50.1       | 4,383       |                               | 0.101       | 830           | 0.019          |
|                             | 1.30       |                              | 107.9       | 60.1       | 6,484       |                               | 0.149       | 1,370         | 0.031          |
|                             | 1.40       |                              | 128.3       | 70.1       | 8,992       |                               | 0.206       | 2,141         | 0.049          |
|                             | 1.50       |                              | 148.7       | 80.1       | 11,909      |                               | 0.273       | 3,182         | 0.073          |
|                             | 1.60       |                              | 169.1       | 90.1       | 15,234      |                               | 0.350       | 4,536         | 0.104          |
|                             | 1.70       |                              | 189.5       | 100.1      | 18,967      |                               | 0.435       | 6,243         | 0.143          |
|                             | 1.80       |                              | 209.9       | 110.1      | 23,108      |                               | 0.530       | 8,343         | 0.192          |
|                             | 1.90       |                              | 230.3       | 120.1      | 27,656      |                               | 0.635       | 10,878        | 0.250          |
|                             | 2.00       |                              | 250.7       | 130.1      | 32,613      |                               | 0.749       | 13,888        | 0.319          |
| Floor                       | 2.05       |                              | 260.9       | 135.1      | 35,245      |                               | 0.809       | 15,584        | 0.358          |
|                             | 2.10       |                              | 262.8       | 136.2      | 35,790      |                               | 0.822       | 17,724        | 0.407          |
|                             | 2.20       |                              | 263.6       | 137.0      | 36,110      |                               | 0.829       | 21,319        | 0.489          |
| Zone 1 (WQCV)               | 2.22       |                              | 263.7       | 137.2      | 36,174      |                               | 0.830       | 22,042        | 0.506          |
|                             | 2.30       |                              | 264.4       | 137.8      | 36,431      |                               | 0.836       | 24,946        | 0.573          |
|                             | 2.40       |                              | 265.2       | 138.6      | 36,753      |                               | 0.844       | 28,605        | 0.657          |
|                             | 2.50       |                              | 266.0       | 139.4      | 37,077      |                               | 0.851       | 32,297        | 0.741          |
|                             | 2.60       |                              | 266.8       | 140.2      | 37,402      |                               | 0.859       | 36,021        | 0.827          |
|                             | 2.70       |                              | 267.6       | 141.0      | 37,728      |                               | 0.866       | 39,777        | 0.913          |
|                             | 2.80       |                              | 268.4       | 141.8      | 38,056      |                               | 0.874       | 43,566        | 1.000          |
|                             | 2.90       |                              | 269.2       | 142.6      | 38,384      |                               | 0.881       | 47,388        | 1.088          |
|                             | 3.00       |                              | 270.0       | 143.4      | 38,715      |                               | 0.889       | 51,243        | 1.176          |
|                             | 3.10       |                              | 270.8       | 144.2      | 39,046      |                               | 0.896       | 55,131        | 1.266          |
|                             | 3.20       |                              | 271.6       | 145.0      | 39,378      |                               | 0.904       | 59,053        | 1.356          |
| Zone 2 (EURV)               | 3.29       |                              | 272.3       | 145.7      | 39,679      |                               | 0.911       | 62,610        | 1.437          |
|                             | 3.30       |                              | 272.4       | 145.8      | 39,712      |                               | 0.912       | 63,007        | 1.446          |
|                             | 3.40       |                              | 273.2       | 146.6      | 40,048      |                               | 0.919       | 66,995        | 1.538          |
|                             | 3.50       |                              | 274.0       | 147.4      | 40,384      |                               | 0.927       | 71,017        | 1.630          |
|                             | 3.60       |                              | 274.8       | 148.2      | 40,722      |                               | 0.935       | 75,072        | 1.723          |
|                             | 3.70       |                              | 275.6       | 149.0      | 41,061      |                               | 0.943       | 79,161        | 1.817          |
|                             | 3.80       |                              | 276.4       | 149.8      | 41,401      |                               | 0.950       | 83,284        | 1.912          |
|                             | 3.90       |                              | 277.2       | 150.6      | 41,743      |                               | 0.958       | 87,441        | 2.007          |
| Zone 3 (100-year)           | 4.00       |                              | 278.0       | 151.4      | 42,086      |                               | 0.966       | 91,633        | 2.104          |
|                             | 4.10       |                              | 278.8       | 152.2      | 42,430      |                               | 0.974       | 95,858        | 2.201          |
|                             | 4.20       |                              | 279.6       | 153.0      | 42,775      |                               | 0.982       | 100,119       | 2.298          |
|                             | 4.30       |                              | 280.4       | 153.8      | 43,122      |                               | 0.990       | 104,413       | 2.397          |
|                             | 4.40       |                              | 281.2       | 154.6      | 43,470      |                               | 0.998       | 108,743       | 2.496          |
|                             | 4.50       |                              | 282.0       | 155.4      | 43,819      |                               | 1.006       | 113,107       | 2.597          |
|                             | 4.60       |                              | 282.8       | 156.2      | 44,170      |                               | 1.014       | 117,507       | 2.698          |
|                             | 4.70       |                              | 283.6       | 157.0      | 44,521      |                               | 1.022       | 121,941       | 2.799          |
|                             | 4.80       |                              | 284.4       | 157.8      | 44,874      |                               | 1.030       | 126,411       | 2.902          |
|                             | 4.90       |                              | 285.2       | 158.6      | 45,229      |                               | 1.038       | 130,916       | 3.005          |
|                             | 5.00       |                              | 286.0       | 159.4      | 45,585      |                               | 1.046       | 135,457       | 3.110          |
|                             | 5.10       |                              | 286.8       | 160.2      | 45,941      |                               | 1.055       | 140,033       | 3.215          |
|                             | 5.20       |                              | 287.6       | 161.0      | 46,300      |                               | 1.063       | 144,645       | 3.321          |
|                             | 5.30       |                              | 288.4       | 161.8      | 46,659      |                               | 1.071       | 149,293       | 3.427          |
|                             | 5.40       |                              | 289.2       | 162.6      | 47,020      |                               | 1.079       | 153,977       | 3.535          |
|                             | 5.50       |                              | 290.0       | 163.4      | 47,382      |                               | 1.088       | 158,697       | 3.643          |
|                             | 5.60       |                              | 290.8       | 164.2      | 47,745      |                               | 1.096       | 163,454       | 3.752          |
|                             | 5.70       |                              | 291.6       | 165.0      | 48,110      |                               | 1.104       | 168,246       | 3.862          |
|                             | 5.80       |                              | 292.4       | 165.8      | 48,476      |                               | 1.113       | 173,076       | 3.973          |
|                             | 5.90       |                              | 293.2       | 166.6      | 48,843      |                               | 1.121       | 177,942       | 4.085          |







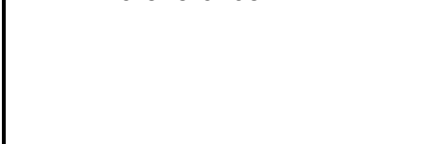
| <b>Traite at Aspen Ridge<br/>Big Johnson Reservoir<br/>Proposed Design Point Summary</b> |                   |                                |                         |                   |                     |
|--|-------------------|--------------------------------|-------------------------|-------------------|---------------------|
| <b>Design Point</b>  | <b>Sub-Basins</b> | <b>Downstream Design Point</b> | <b>Total Area (ac.)</b> | <b>Q(5) (cfs)</b> | <b>Q(100) (cfs)</b> |
| N  | N                 | P                              | 14.1                    | 21.2              | 46.8                |
| O  | O                 | P                              | 11.7                    | 16.8              | 37.1                |
| P (Into West Pond)   | N, O, P           | West Pond Discharge            | 34.3                    | 47.1              | 100.6               |
| <b>West Pond Discharge (UD-Detention)</b>  | N, O, P           | Powers Ditch                   |                         | 1.0               | 28.3                |
| Q  | Q                 | Powers Ditch                   | 2.4                     | 4.9               | 10.3                |
| OS-2   | OS-2              | Powers Ditch                   | 11.4                    | 1.7               | 11.7                |

| <b>Trails at Aspen Ridge<br/>Marksheffel Tributary to Jimmy Camp Creek<br/>Proposed Design Point Summary</b> |                   |                                     |                             |                       |                         |
|--|-------------------|-------------------------------------|-----------------------------|-----------------------|-------------------------|
| <b>Design Point</b>  | <b>Sub-Basins</b> | <b>Downstream<br/>Design Point</b>  | <b>Total Area<br/>(ac.)</b> | <b>Q(5)<br/>(cfs)</b> | <b>Q(100)<br/>(cfs)</b> |
| <b>L</b>   | <b>L</b>          | <b>Northeast Pond<br/>Discharge</b> | <b>7.6</b>                  | <b>14.1</b>           | <b>30.5</b>             |
| <b>Northeast Pond<br/>Discharge</b>  | <b>L</b>          | <b>Bradley Road Ditch</b>           |                             | <b>0.3</b>            | <b>8</b>                |
| <b>BR1</b>   | <b>BR1</b>        | <b>Bradley Road Ditch</b>           | <b>0.3</b>                  | <b>0.8</b>            | <b>1.6</b>              |
| <b>BR2</b>   | <b>BR2</b>        | <b>Bradley Road Ditch</b>           | <b>2.8</b>                  | <b>2.9</b>            | <b>7.4</b>              |

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY  
DIRECT SUPERVISION, FOR  
AND ON BEHALF OF MATRIX  
DESIGN GROUP, INC.



COLA, LLC.

# TRAILS AT ASPEN RIDGE: FILING #1 & PUD MDDP-AMENDMENT & PRELIMINARY DRAINAGE REPORT

|                  |        |                             |
|------------------|--------|-----------------------------|
| DESIGNED BY: JTS | SCALE  | DATE ISSUED: September 2019 |
| DRAWN BY: JTS    | HORIZ: | SHEET NO. 2 OF 2 SHEETS     |
| CHECKED BY:      | VERT:  |                             |

DR-02