MASTER DEVELOPMENT DRAINAGE PLAN FOR COPPER RIDGE CROSSING AT NORTHGATE

October 2014

Prepared for:

NORTHGATE PROPERTIES, LLC
13540 Meadowgrass Drive. Suite 200
Colorado Springs, CO 80921

Prepared by:

ECE
EXECUTIVE CONSULTING ENGINEERS

Executive Consulting Engineers, Inc.
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JOB NO. 1102

MDDP FOR COPPER RIDGE CROSSING AT NORTHGATE
DRAINAGE REPORT STATEMENT

ECE
EXECUTIVE CONSULTING ENGINEERS

I. 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 mast plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO REGISTERED BOB HYUNG-BAE YOO 36793 PROFESSIONAL ENGINEER

Bob H. Yoo, Colorado P.E. #36793 Date 1/19/15
For and On Behalf of Executive Consulting Engineers, Inc.

II. DEVELOPER'S STATEMENT:

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

Business Name: Northgate Properties, LLC

By: _____
Gary Erickson

Title: Manager
Address: 13540 Meadowgrass Drive, Suite 200
Colorado Springs, CO 80921

III. CITY OF COLORADO SPRINGS ONLY:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

_____ 1/26/15
For City Engineer Date

Conditions:

Certification Statement

"This report and plan for the final drainage design of Copper Ridge Crossing at Northgate was prepared by me in accordance with the provisions of City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, Drainage Design and Technical Criteria for the owners thereof. I understand that City of Colorado Springs (agency) does not and will not assume liability for drainage facilities designed by others."

SIGNATURE: _____

Registered Professional Engineer State of Colorado No. 36793

(Affix Seal)

"Northgate Properties, LLC hereby certifies that the drainage facilities for (Name of Development) shall be constructed according to the design presented in this report. I understand that City of Colorado Springs (agency) does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that City of Colorado Springs (agency) reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28(verify reference to CRS); but cannot, on behalf of Copper Ridge Crossing at Northgate guarantee that final drainage design review will absolve Northgate Properties, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design."

_____.

Name of Developer

_____.

Authorized Signature

MDDP FOR COPPER RIDGE CROSSING AT NORTHGATE

TABLE OF CONTENTS

APPENDIX

PURPOSE

This Master Development Drainage Plan (M.D.D.P.) for Copper Ridge Crossing at Northgate. This M.D.D.P. has been prepared to conform to "The City of Colorado Springs Drainage Criteria Manual, 1994" requirements for new developments. The specific scope of this study includes the following:

1. A description of the property and surrounding platted/unplatted developments.
2. A discussion of the drainage design criteria that govern analysis and design.
3. A discussion on the major basins and sub-basins and the changes to drainage patterns due to development.
4. A preliminary discussion on the drainage facilities required to accommodate the developed runoff.

GENERAL LOCATION AND DESCRIPTION

The proposed Copper Ridge Crossing at Northgate M.D.D.P. development is a 30.09 acre tract of proposed and future commercial use land development. Copper Ridge Crossing at Northgate Filing no. 1 (carwash facility) development, located on the northeast corner of the development was approved on May 2, 2014 prior to this study, and M.D.D.P. will be consistent with the drainage characteristic as described in that report. The development area is located in the northeast and northwest quarter of Section 7, northwest quarter of Section 17 and southeast quarter of Section 8, Township 12 South, Range 66 West of the Sixth Principal Meridian, El Paso County, Colorado.

The site is bordered by Spectrum Loop to the north and west, Voyager Parkway to the east and Powers Boulevard Right-of-Way to the south. On-site soils are classified as Hydrologic Group "B" ('71' Pring coarse sandy loam, 3 to 8 percent slopes and '92' Tomah-Crowfoot loamy sands, 3 to 8 percent slopes) as determined by the Natural Resources Conservation Service (see map in Appendix).

The site is situated within the Monument Branch Drainage Basin area. The site is currently vacant and undeveloped. The site has been graded, and the general drainage is to the southwesterly direction.

CRITERIA

The "City of Colorado Springs/El Paso County Drainage Criteria Manual" dated October 1987, Revised November 1991 and the amendment to the manual dated October 15, 1994 are the primary basis of this study. Forthwith, these documents shall be referred to as the "Manual". The following Drainage Report was also considered in this study:

1. "Monument Branch Drainage Basin Planning Study" by URS Corporation, last revised date August 6, 1987.
2. "Northgate Master Development Drainage Plan" by URS Consultants, Inc., dated June 27, 1988.
3. "Preliminary/Final Drainage Report for Northgate Filing No. 6 (Voyager Parkway Phase 1)" by JR Engineering, last October 1998.
4. "Preliminary/Final Drainage Report for Northgate Filing no. 7 Voyager Parkway, Phase 2 (2,200 feet north of Middle Creek Parkway to Northgate Road" by JR Engineering, last revised date September 1999.

Storm runoff rates for all onsite basins are calculated based on the following criteria found in the manual. The initial storm (5-year event) and the major storm (100-year event) are considered to size drainage facilities and verify conformance with drainage criteria. Additionally, per El Paso County and City's policy for flows upstream of the Air Force Academy, developed peak flows for 2-, 5-, 10-, 25-, 50- and 100- year storm frequencies are released at below the historical "undeveloped" flows. Runoff rates are calculated using the Rational Method Equation Q=CIA. The values for the runoff coefficient "C" acres based on the "Commercial and Business areas (85% impervious)" surface characteristic found in Table 5-5 of the Manual. Rainfall intensities "I" are taken from the Intensity-Duration-Frequency table. Time of concentration is calculated as the sum of overland flow time and travel time. Overland

flow time is calculated over a maximum 300 foot distance using the FAA equation $T_i=1.87(1.1-C_5)L^{0.5}S^{-0.33}$ where:

C_5	=	basin composite runoff coefficient for the five-year storm event
L	=	length of overland flow in feet
S	=	slope of flow path in percent
T_i	=	travel time in minutes

Travel time is calculated as the flow time thru a length of street gutter or channel by multiplying the average flow velocity by the travel length. Flow velocity is obtained thru Manning's equation based on the allowed flow depth for the initial and major storms.

DISCUSSION

The results of this Drainage Study show that the proposed development complies with City criteria and the expected developed drainage patterns as discussed in the Monument Branch Drainage Basin Planning Study, Northgate Master Development Drainage Plan, Preliminary/ Final Drainage Report for Northgate Filing No. 6 (Voyager Parkway Phase 1) and Preliminary/Final Drainage Report for Northgate Filing no. 7 Voyager Parkway, Phase 2.
A private temporary Stormwater Quality/detention pond is currently proposed at Design Point 5. With Sub-basin D development, ultimately a Public Stormwater Quality/Extended Detention Basin Facility will be constructed at the same design point and will be dedicated to City.
No Preble's meadow jumping mouse habitat exists on-site.

EXISTING DRAINAGE CONDITIONS

The site is situated within the Monument Branch Drainage Basin. This area was originally studied in "Monument Branch Drainage Basin Planning Study" by URS Corporation, last revised date August 6, 1987 (will be called D.B.P.S. hereon in the study) and "Northgate Master

Development Drainage Plan" by URS Consultants, Inc., dated June 27, 1988 (hereon referred to as "Northgate M.D.D.P.). The proposed study site area is referred to as Basin "Q2" of the D.B.P.S., and as Basin "Y1" of Northgate M.D.D.P. From this parcel, the runoff is channelized to the future Regional Detention/ Storm water quality Facility at Design Point 11A (M.D.D.P.) or at Design Point 22 (Northgate M.D.D.P.). The said future Regional Detention/ Storm water quality Facility is to provide adequate detention/storm water quality volume to release the runoff at or below allowable rates.

It is our understanding that during the earthwork operation in Powers Boulevard Right-Of-Way, excess fill material was transported to proposed Copper Ridge Crossing site. It is our understanding that cut/fill operation was monitored by Entech Engineering, Inc., a geotechnical firm. Therefore, the entire site was graded at the time of Powers Boulevard Right-of-Way. Presently, the site is currently vacant and undeveloped. The topography of the site shows that general drainage is to the southwesterly direction into Powers Boulevard Right-of-Way, then flows will travel in Powers Boulevard Right-of-Way to the westerly direction toward Interstate-25.

The following is a detailed description of the existing drainage characteristics of the proposed project area.

Basin EX-A (Design Point E1)

Basin EX-A is 3.36 acres of undeveloped land located on the east side of the project area. Historic flows of Q_5=4.1 cfs and Q_{100}=7.3 cfs are traveling overland to the design point E1. Then these flows travels in Powers Boulevard Right-of-Way to the westerly direction to the design point E4.

Basin EX-B (Design Point E2)

Basin EX-B is 7.16 acres of undeveloped land located on the west side of the basin EX-A. Historic flows of Q_5=8.7 cfs and Q_{100}=15.5 cfs are traveling overland to the design point E2.

Then, as did for flows from the Basin EX-A, these flows travels in Powers Boulevard Right-of-Way to the westerly direction to the design point E4.

Basin EX-C (Design Point E4)

Basin EX-C is 17.77 acres of undeveloped land and is the largest tract of land in the project area. Historic flows of Q_5=21.0 cfs and Q_{100}=37.3 cfs are traveling overland in the southwesterly direction to a low point in the basin EX-C, then flows drain into an existing 18" HDPE pipe (constructed by Colorado Department of Transportation as a temporary measure) and released westerly direction overland. Combined flows from Design Point E1 and E2 (Q_5=60.9 cfs and Q_{100}=111.0 cfs) will travel overland in the ditch to the westerly direction toward I-25 as did historically. The design point E4 will serve as a check point to determine the on-site drainage flows are released at or below historical flows.

Basin EX-D (Design Point E3)

Basin EX-D is 1.80 acres of undeveloped land located on the west side of the project area adjacent to future extension of Spectrum Loop. Design point E3 (Q_5=26.7 cfs and Q_{100}=47.4 cfs) is the existing temporary sediment basin where routed flows from the existing Federal Express Development's detention pond are released via an existing 36" RCP pipe. Flows from the upper portion of the Basin EX-D area combined with flows from the existing sediment pond area then travel in the natural drainage ditch in the Powers Boulevard Right-of-Way. With development of project area, the existing 36" RCP from Federal Express Development will be required to re-route thru the development and to an adequate release point.

Basin OS-A

Basin OS-A is 0.34 acre of undeveloped land adjacent to Voyager Parkway next to the Basin EX-A. This area is owned by Colorado Department of Transportation as an on-ramp easement and will not be developed and will remain as a landscape area. Flows (Q_5=0.5 cfs and Q_{100}=1.0 cfs) are travelling overland in an existing ditch running along with Voyager Parkway and into Powers

Boulevard Right-of-Way to the design point E5. Flows are then carried in the existing ditch to the westerly direction to the design point E4.

DEVELOPED DRAINAGE CONDITION

The existing land use for this site is Planned Unit Development (P.U.D.). The project area is proposed to be entirely of commercial level of developments.

The general developed drainage patterns are similar to the existing drainage patterns and according to the Monument Branch D.B.P.S. and Northgate M.D.D.P. Developed runoff is to be collected in the proposed and future storm sewer systems and routed into the future Storm Water Quality/Extended Detention Basin at Design Point 5. This proposed facility does not exists in both Monument Branch D.B.P.S. and Northgate M.D.D.P. studies. This facility is required due to proposed Powers Boulevard grading. Per approved Colorado Department of Transportation's plan, Construction Project Code no. 18221, Powers Boulevard grading is graded approximately 20 feet to 30 feet below the existing grade. With new grading proposed for Powers Boulevard, proposed Storm Water Quality/Extended Detention Basin is required before developed runoffs enter into the Powers Boulevard Right-of-Way.

As required by City of Colorado Springs Drainage Manual and per El Paso County and City's policy for flows upstream of the Air Force Academy, outfall from the Storm Water Quality/Extended Detention Basin is released at below historical. A detailed description of the developed flows is as follows:

Design Point 1 (Q_5=9.9 cfs, Q_{100}=18.7 cfs) is the point at which Basin A's (Q_5=5.4 cfs, Q_{100}=10.1 cfs) 1.21 acres flows and Basin B's (Q_5=4.6 cfs, Q_{100}=8.6 cfs) 1.03 acres flows are released into the temporary proposed 4' wide by 2' deep ditch. Combined flows travel in the ditch and will enter the proposed Public Storm Water Quality/Extended Detention Basin at the design point 5.

Ultimately, 18" diameter pipe will replace this temporary ditch to carry developed flows from Basin A and B.

Basin A is also known as "Lot 1, Copper Ridge Crossing at Northgate Filing no. 1" and an automatic carwash facility. This basin is already studied under "Final Drainage Report for Copper Ridge Crossing at Northgate Filing no. 1" and will not require further study. Basin B will require a separate drainage study at the time of platting.

Design Point 2 (Q_5=6.4 cfs, Q_{100}=12.0 cfs) consists of developed flows from Basin C. It is our understanding that Final Drainage Report for the Basin C has been submitted to City for review at the time of preparation of this report. This basin is also known as future Chick-Fil-A restaurant site. Developed flows from the Basin C, consists of a drive-thru building, parking and landscaping will sheet flow over pavement and carried in the gutter line. These flows will be carried in the 4' wide by 2' deep ditch to proposed Public Storm Water Quality/Extended Detention Basin at the design point 5. Ultimately, flows will be captured by an inlet and carried via underground storm sewer system to the design point 5.

Design Point 3 (Q_5=21.0 cfs, Q_{100}=48.0 cfs) is the existing temporary sediment basin where routed flows from the existing Federal Express Development's detention pond are released via an existing 36" RCP pipe. With construction of project area, this existing 36" RCP will require re-routing through the project area and into proposed Public Storm Water Quality/Extended Detention Basin at the design point 5.

Design Point 4 (Q_5=9.5 cfs, Q_{100}=17.8 cfs) is the point at which 2.20 acres of Basin OS-C's flows are collected by proposed 12' D-10-R at grade inlet. Basin OS-C consists of future extension of Spectrum Loop and existing Spectrum Loop pavement. These flows then carried in the proposed 18" RCP (pipe run 3) to proposed Public Storm Water Quality/Extended Detention Basin at the design point 5.

Design Point 5 (Q_2=41.73 cfs, Q_5=57.33 cfs, Q_{10}=67.12 cfs, Q_{25}=85.99 cfs, Q_{50}=97.60 cfs, Q_{100}=101.95 cfs) is the point where the developed runoff from the entire Copper Ridge Crossing at Northgate Master Development Drainage Plan project area. The proposed Public Storm Water Quality/Extended Detention Basin Facility is to be constructed with the Development in Basin D. Currently, a temporary Storm Water Quality/detention pond is proposed to provide adequate volume for Development for Basin A, B and C. The final design of the facility is designed and to be constructed as specified within the "Urban Storm Drainage Criteria Manual Volume 3" utilizing the method of Extended Detention Basin and Outlet Structure utilizing the Full Spectrum Detention methodology. Ultimately, final built-out of the Public Storm Water Quality/Extended Detention Basin Facility will be dedicated to City of Colorado Springs in means of platting/deed. All aesthetic and functional maintenance of the Extended Detention Basin Facility is the responsibility of the Copper Ridge District's Business Owners Association. This includes all storm appurtenances in the forebay ponds, public outlet structure, outlet pipe, trickle channel and micro-pool.

Per Urban Drainage and Flood Control District's UD-BMP Stormwater Best Management Practice Design Workbook, released date of December 2013, 2.941 acre-feet is required for the Excess Urban Runoff Volume (EURV) per City's requirements of Full Spectrum Detention methology. Also meeting the outfalls from the proposed Public Storm Water Quality/ Extended Detention Basin Facility are released at or below historical "undeveloped" flows for 2-, 5-, 10-, 25-, 50- and 100-year storm frequencies City's policy for flows upstream of the Air Force Academy.

According to the Storm Water Quality/Extended Detention Basin Facility calculations (included in the Appendix), detention pond and its appurtenances are required as follows:

- EURV Required: 2.941 acre-feet
- Basin Side Slopes: Maximum slope of 4:1
- Forebay Information:
    - Forebay Volume required: 0.028 acre-feet

- Forebay Depth: 24" provided
- Forebay discharge design: Concrete wall with 8.6 in. Rectangular Notch

- Trickle Channel: Concrete Trickle Channel with slope=0.0040 ft. /ft.
- Micropool and Outlet Structure Information:
  - Depth of Micropool: 3.0 feet
  - Outlet Type: Orifice Plate
  - Depth of Design Volume: H = 4.00 feet
  - EURV volume: EURV= 2.941 acre-feet
  - Drain Time for EURV: T_D= 72 hours
  - Maximum Outlet Area per Row (A_0): A_0=2.51 sq. inches
  - Orifice Dimensions: $D_{orifice}$ = 1-3/4 inches
  - Number of Columns: 1
  - Actual Design Outlet Area per Row (A_0): A_0=2.41 sq. inches
  - Number of Rows: 12
  - Total Outlet Area: 28.9 sq. inches
  - Depth of WQCV: H_{WQCV} = 1.5 feet
  - Actual Drain Time for WQCV: 46.6 hours
- Trash Rack Information:
  - Width of Water Quality Screen Opening: Wopening = 1.3 feet
  - Height of Water Quality Screen: H_{TR} = 6.8 feet
  - Type of Screen: Aluminum Amico-Klemp SR Series or equal
  - Cross-bar Spacing: 2.0 inches
  - Minimum Bearing Bar Size: 1-3/4 inch x 3/16 inch
- Outlet Box Dimension: 4' x 4' inside dimensioned box
- Overflow Embankment: 24" thick rip-rap (minimum type M) with Mirifi fabric beneath rip-rap rocks with 6" top soil on top for vegetation growth.

The outlet box for the facility is a 4' x 4' inside dimensions riser box with a top of box elevation at 6717.50. The inside face of the box contains a 22" wide x 6.8 feet high orifice plate with (1)

column, (12) rows of 1-3/4" circular orifice with 4" center to center vertical spacing with lowest circular orifice elevation of 6713.00. A trash rack screen of 22" wide x 6.8 feet high with 3.0 feet extended into the micro pool water surface is required. A 36" diameter H.D.P.E. pipe is required as an outlet pipe with minimum 1.0% slope. With proposed outlet structure with restricted plat (4' wide x 2' high) at 1.4 feet above invert elevation of 6709.5 in front of 36" diameter H.D.P.E. pipe restricts the release rate of Q_2=36.71 cfs, Q_5=46.74 cfs, Q_{10}=52.25 cfs, Q_{25}=61.53 cfs, Q_{50}=66.39 cfs, Q_{100}=68.07 cfs (Design Point 6).
Per calculation herein included in the appendix, 100-year storage volume of 172,968 (3.97 acre-feet) is provided for the 100-year, and the 100-year water surface elevation is 6718.63. The emergency spillway dimensions of 41 feet wide by 12" depth elevation is set at 6720.0 with minimum size of Type M rip-rap buried with 6" of top soil for vegetation planting.

Design Point 6 is the point where developed restricted release rates are compared to the historical rates. Total combined developed release rates of Q_2=37.59 cfs, Q_5=47.89 cfs, Q_{10}=53.57 cfs, Q_{25}=63.16 cfs, Q_{50}=68.22 cfs, Q_{100}=69.98 cfs which are combined release rates from the proposed Public Storm Water Quality/Extended Detention Basin (Q_2=36.71 cfs, Q_5=46.74 cfs, Q_{10}=52.25 cfs, Q_{25}=61.53 cfs, Q_{50}=66.39 cfs, Q_{100}=68.07 cfs), OS-A (Q_2=0.4 cfs, Q_5=0.6 cfs, Q_{10}=0.8 cfs, Q_{25}=1.0 cfs, Q_{50}=1.2 cfs, Q_{100}=1.4 cfs) and Basin E (Q_2=3.2 cfs, Q_5=4.5 cfs, Q_{10}=5.5 cfs, Q_{25}=7.3 cfs, Q_{50}=8.4 cfs, Q_{100}=9.1 cfs). The combined released rates in all storm events from this development are less than the historical allowable rates as determined at the design point E6 (Historical Design Point E4) of Q_2=39.46 cfs, Q_5=55.38 cfs, Q_{10}=65.32 cfs, Q_{25}=85.11 cfs, Q_{50}=97.24 cfs, Q_{100}=101.75 cfs.

EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual specifies that an Erosion Control Plan and associated cost estimate be submitted with the Final Drainage Report. We respectfully request the Erosion Control Plan and Cost Estimate be submitted in conjunction with the Grading Plan and construction assurances posted prior to obtaining a grading permit.

FLOODPLAIN STATEMENT

No portion of the site is located within a FEMA delineated floodplain as determined by Flood Insurance Rate Map Number 08041C 0290F, effective date, March 17, 1997.

DRAINAGE AND BRIDGE FEES

The proposed platted area is entirely within the Monument Branch Drainage Basin. This drainage basin was closed as approved by the Drainage Board and City Council at the October 12, 2010 Council meeting (reference Resolution #177-10). Therefore, there is no Drainage or Bridge fee due with the proposed development.

CONSTRUCTION COST OPINION

Below is the cost opinion of the proposed public and private storm sewer systems. Because the project area is at the early stage of planning/development, we cannot determine the accurate storm sewer facilities and its costs. As this project progresses in the future and more accurate plan(s) can be generated, the cost of opinion of the public and private drainage facilities is our best educated opinion of costs. More definite construction cost of opinion will be submitted to City with addendum to this drainage study at later time.

Public Drainage Facilities (Non-reimbursable)

Description	Quantity	Unit	Unit Cost	Cost
12' D-10-R Inlet	2	EA	$5,500	$11,000
36" HDPE pipe	145	LF	$35	$5,075
Outlet Structure	1	EA	$15,000	$15,000
HDPE Flared End Section	1	EA	$400	$400
	Sub-Total			$31,475
15% Engineering & Contingency				$4,721
	TOTAL			**$36,196**

Private Drainage Facilities with future development of Basin D (Non-reimbursable)

Description	Quantity	Unit	Unit Cost	Cost
6' D-10-R Inlet	2	EA	$3,000	$6,000
12' D-10-R Inlet	3	EA	$5,500	$16,500
18" HDPE pipe	560	LF	$29	$16,240
24" HDPE pipe	350	LF	$46	$16,100
30" HDPE pipe	200	LF	$60	$12,000
36" HDPE pipe	200	LF	$74	$14,800
42" RCP PIPE	200	LF	$94	$18,800
HDPE Flared End Section	3	EA	$400	$1,200
Storm Sewer MH	1	EA	$3,000	$3,000
	Sub-Total			$104,640
15% Engineering & Contingency				$15,696
	TOTAL			**$120,336**

Executive Consulting Engineers, Inc. cannot and does not guarantee that the construction cost provided above will not vary from these opinions of probable construction costs. These opinions represent our best judgment as a design professional familiar with the construction industry and in this development.

SUMMARY

Development of the proposed Copper Ridge Crossing at Northgate M.D.D.P. project area with proposed Public Storm Water Quality/ Full Spectrum Extended Detention Basin will not adversely affect surrounding developments. With development of Basin A, B and C, temporary Storm Water Quality/Detention pond with adequate outlet structure is provided. Ultimately with any new development in the Sub-basin D, a permanent Public Storm Water Quality/ Full Spectrum Extended Detention Basin with emergency spillway shall be constructed as designed in this M.D.D.P. for Copper Ridge Crossing at Northgate study. This Public Storm Water Quality/ Full Spectrum Extended Detention Basin will be publicly owned by the City of Colorado Springs. All aesthetic and functional maintenance of the Extended Detention Basin Facility is the responsibility of the Copper Ridge District's Business Owners Association. Developed flows will be detained/released at or below historical per El Paso County/City's policy for upstream development of the Air Force Academy. General outfall locations are in accordance with the Monument Branch D.B.P.S. and Northgate M.D.D.P.

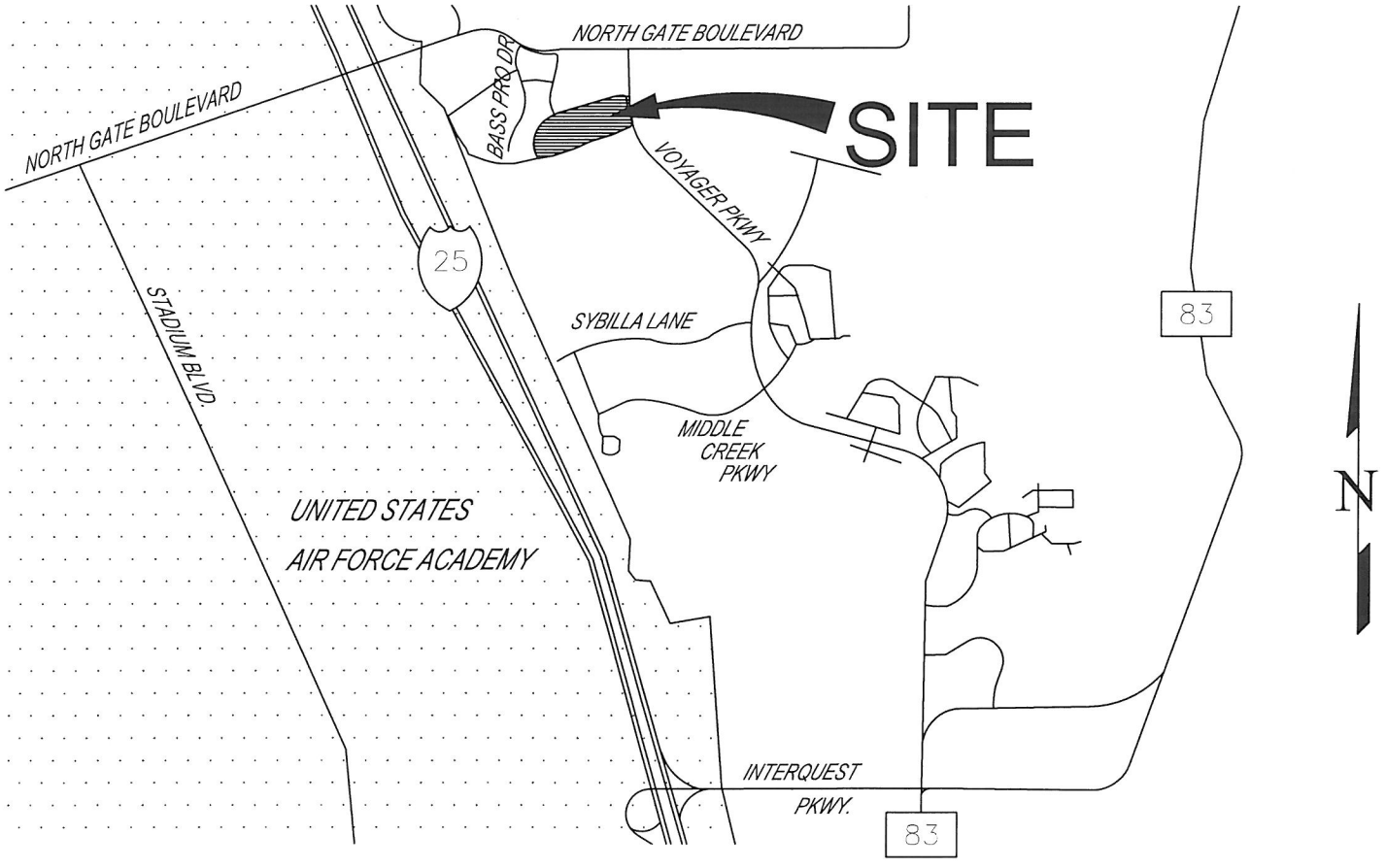
Respectfully submitted,

Executive Consulting Engineers, Inc.

Bob H. Yoo, P.E.
Project Manager

APPENDIX

VICINITY MAP

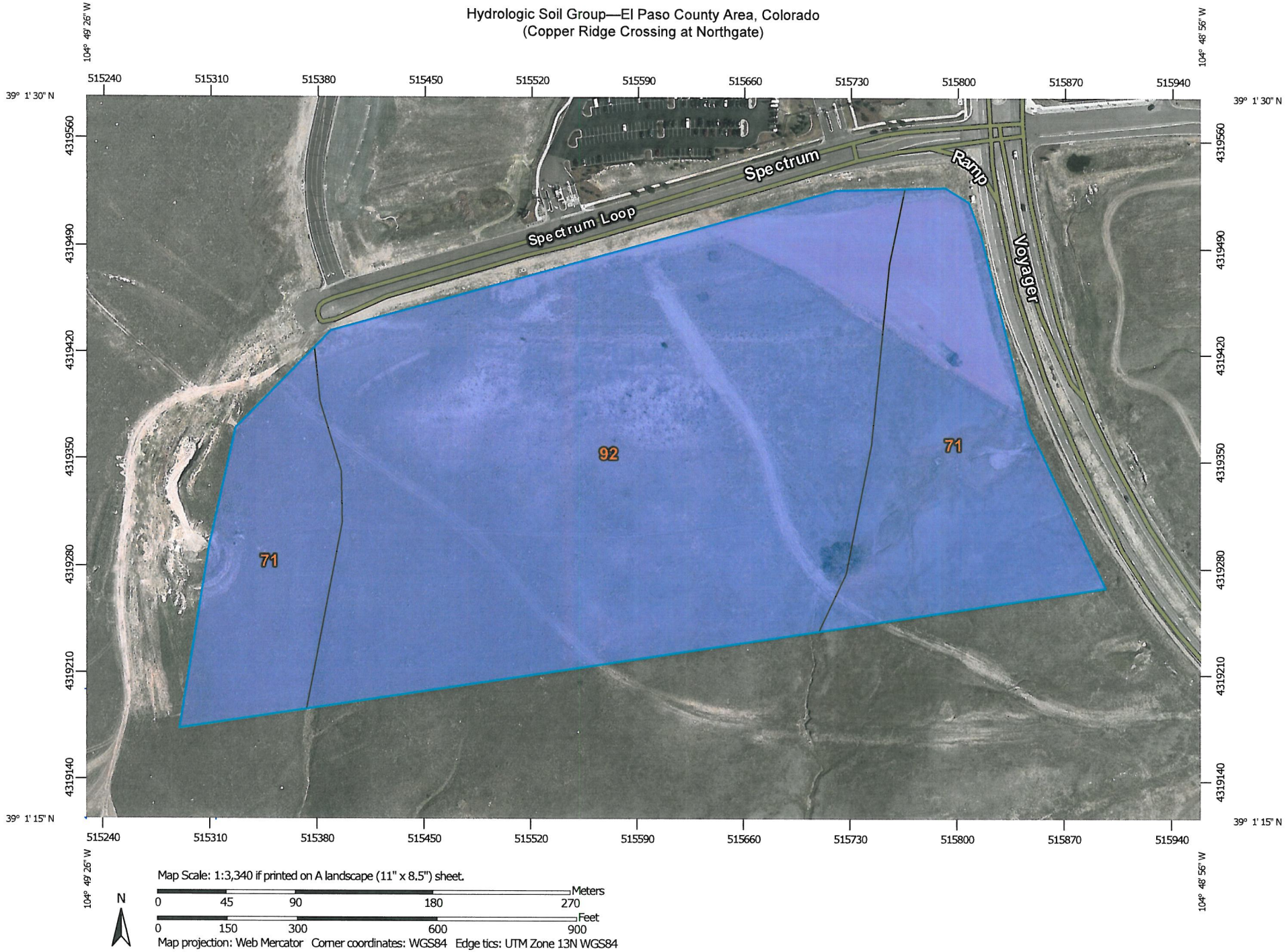


VICINITY MAP

NOT TO SCALE

SCS MAP

Hydrologic Soil Group—El Paso County Area, Colorado
(Copper Ridge Crossing at Northgate)



Map Scale: 1:3,340 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 10, Dec 23, 2013

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

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	11.2	32.0%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	23.8	68.0%
Totals for Area of Interest			**35.0**	**100.0%**

Description

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

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

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

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

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

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

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

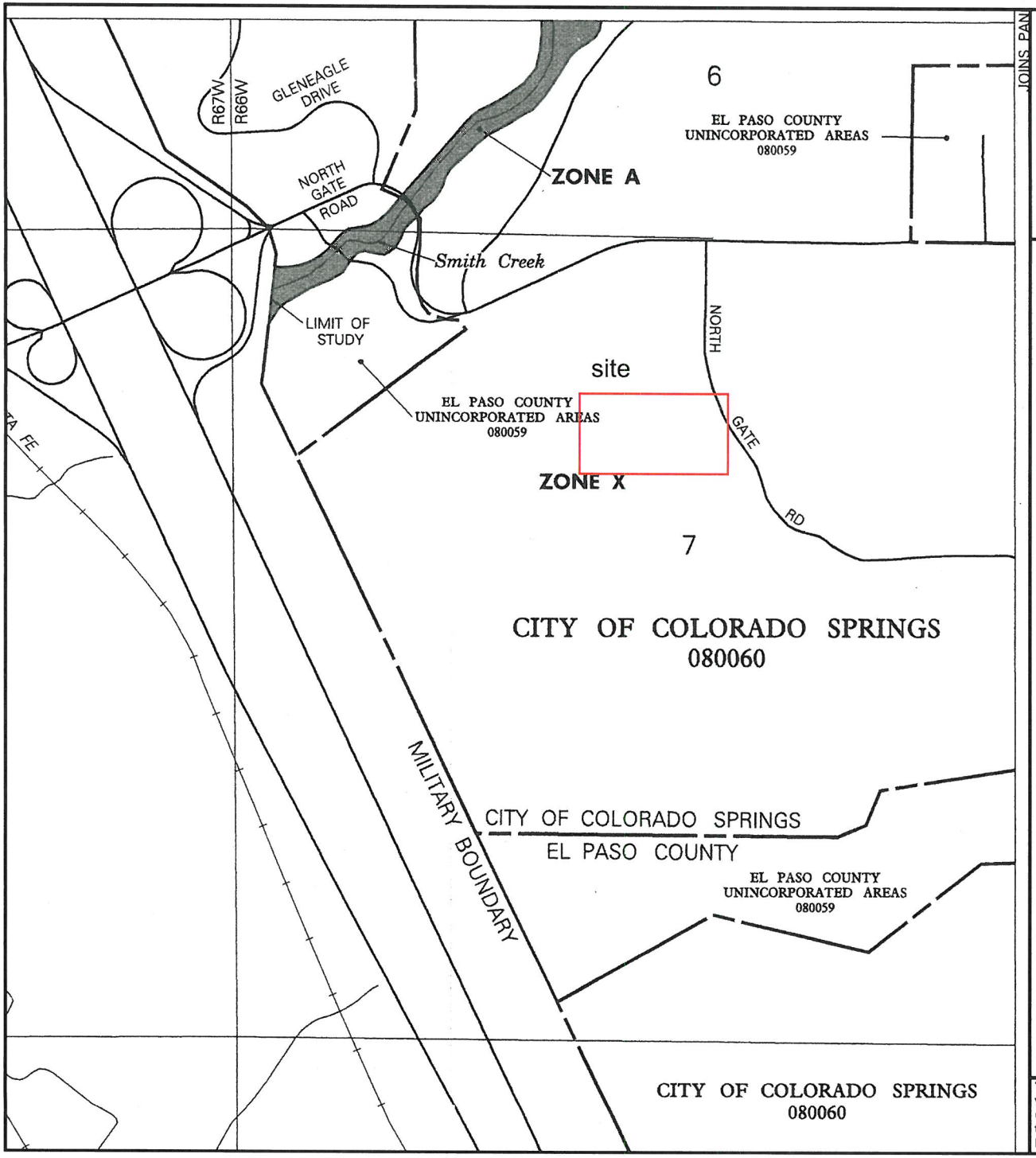
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FEMA MAP



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 290 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

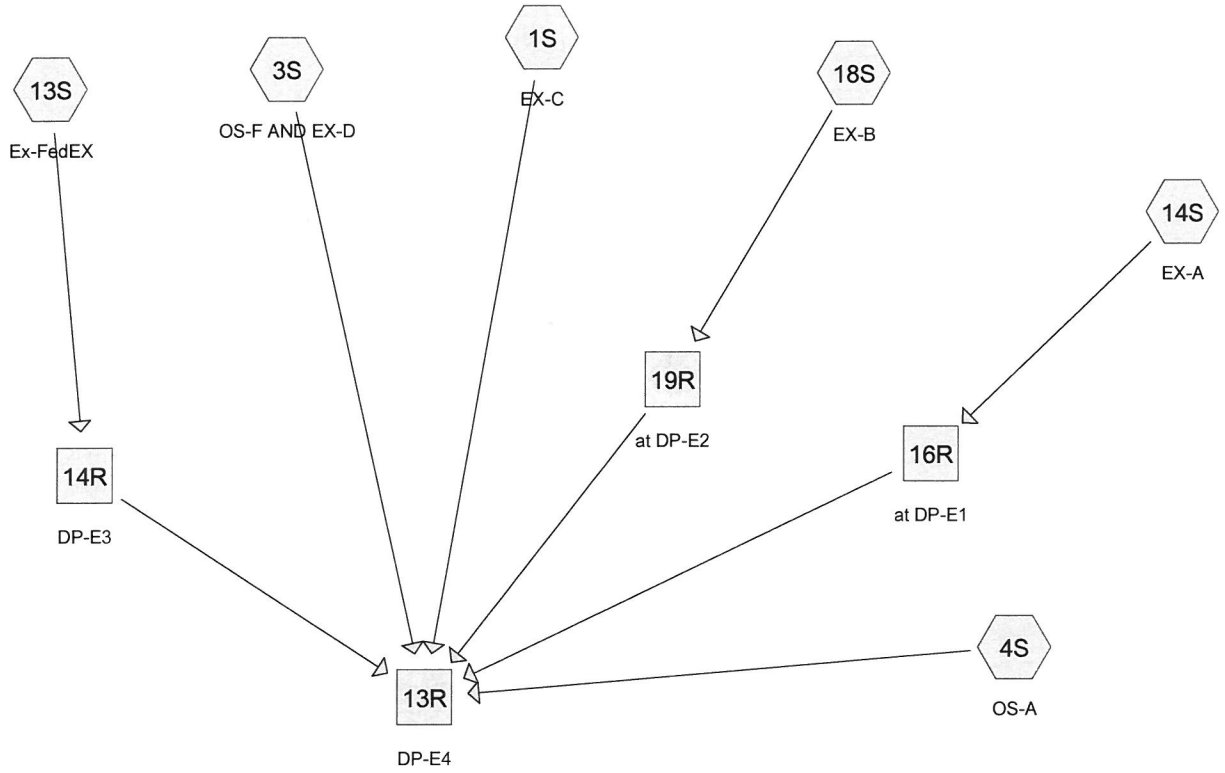
COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0290	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0290	F

MAP NUMBER
08041C0290 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

HYDROLOGIC AND HYDRAULIC CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for 1102-EX-1

Prepared by Executive Consulting Engineers, Inc., Printed 10/31/2014

Summary for Subcatchment 1S: EX-C

Runoff = 14.38 cfs @ 0.14 hrs, Volume= 0.357 af, Depth= 0.24"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 3.78 cfs @ 0.19 hrs, Volume= 0.094 af, Depth= 0.37"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.37 cfs @ 0.10 hrs, Volume= 0.009 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 17.63 cfs @ 0.25 hrs, Volume= 0.437 af, Depth= 0.20"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 2.72 cfs @ 0.14 hrs, Volume= 0.067 af, Depth= 0.24"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 5.79 cfs @ 0.14 hrs, Volume= 0.144 af, Depth= 0.24"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=18 min, Inten=2.29 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

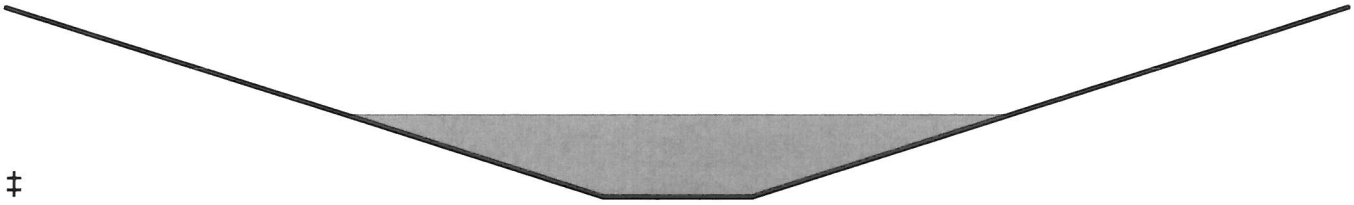
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 39.46 cfs @ 0.30 hrs, Volume= 1.108 af
Outflow = 37.36 cfs @ 0.37 hrs, Volume= 1.108 af, Atten= 5%, Lag= 4.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 13.7 min

Peak Storage= 5,857 cf @ 0.33 hrs
Average Depth at Peak Storage= 1.75'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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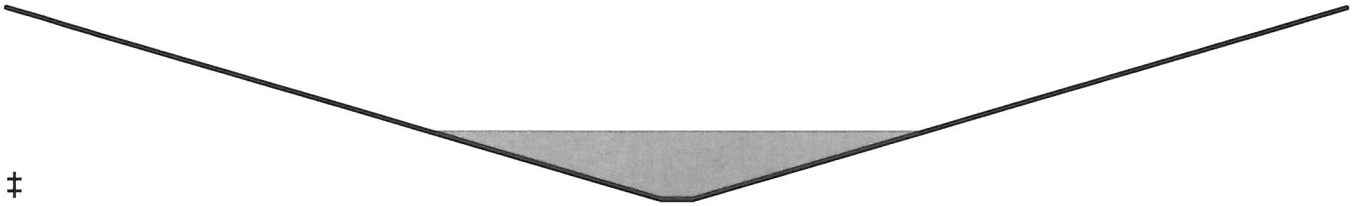
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.20" for 2-Year event
Inflow = 17.63 cfs @ 0.25 hrs, Volume= 0.437 af
Outflow = 17.25 cfs @ 0.35 hrs, Volume= 0.437 af, Atten= 2%, Lag= 5.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 9.4 min

Peak Storage= 2,611 cf @ 0.31 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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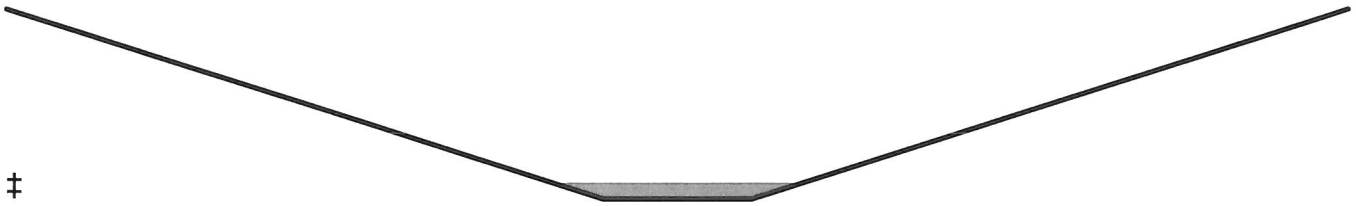
Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.24" for 2-Year event
Inflow = 2.72 cfs @ 0.14 hrs, Volume= 0.067 af
Outflow = 2.03 cfs @ 0.54 hrs, Volume= 0.067 af, Atten= 25%, Lag= 23.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.08 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 36.6 min

Peak Storage= 1,468 cf @ 0.33 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'



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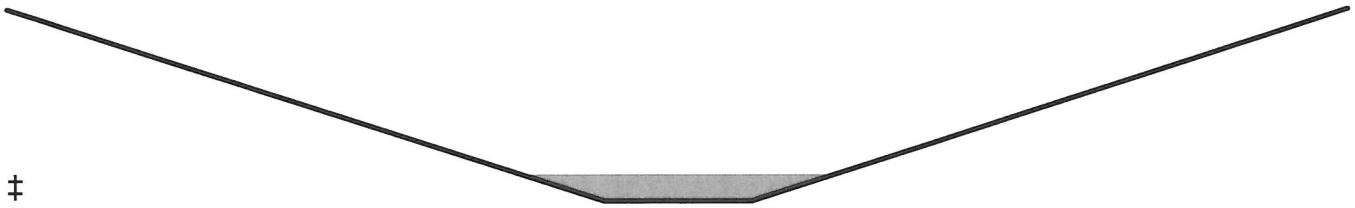
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.24" for 2-Year event
Inflow = 5.79 cfs @ 0.14 hrs, Volume= 0.144 af
Outflow = 5.51 cfs @ 0.40 hrs, Volume= 0.144 af, Atten= 5%, Lag= 15.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.59 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 18.5 min

Peak Storage= 1,801 cf @ 0.31 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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Summary for Subcatchment 1S: EX-C

Runoff = 19.75 cfs @ 0.14 hrs, Volume= 0.490 af, Depth= 0.33"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 5.20 cfs @ 0.19 hrs, Volume= 0.129 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.51 cfs @ 0.10 hrs, Volume= 0.013 af, Depth= 0.44"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 24.22 cfs @ 0.25 hrs, Volume= 0.601 af, Depth= 0.27"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 3.73 cfs @ 0.14 hrs, Volume= 0.093 af, Depth= 0.33"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 7.96 cfs @ 0.14 hrs, Volume= 0.197 af, Depth= 0.33"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=18 min, Inten=3.15 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

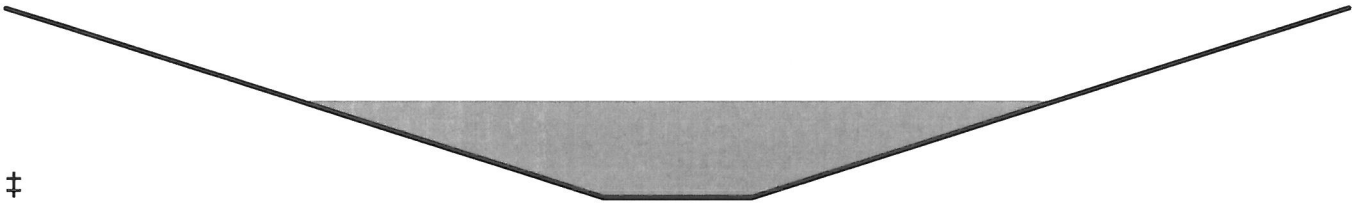
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.32" for 5-Year event
Inflow = 55.38 cfs @ 0.30 hrs, Volume= 1.522 af
Outflow = 52.83 cfs @ 0.36 hrs, Volume= 1.522 af, Atten= 5%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 13.2 min

Peak Storage= 7,573 cf @ 0.32 hrs
Average Depth at Peak Storage= 2.05'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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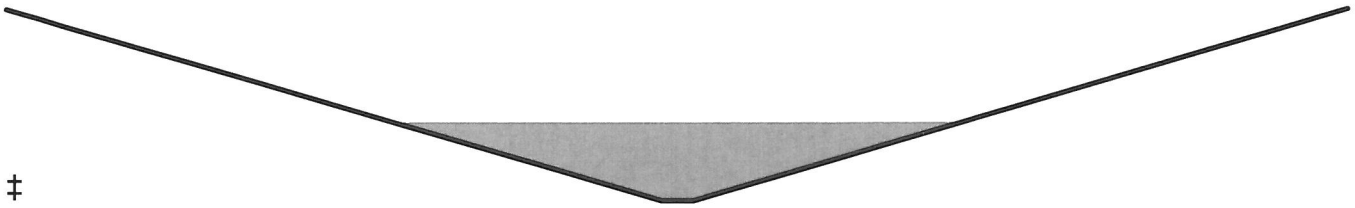
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.27" for 5-Year event
Inflow = 24.22 cfs @ 0.25 hrs, Volume= 0.601 af
Outflow = 23.79 cfs @ 0.34 hrs, Volume= 0.601 af, Atten= 2%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.58 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 9.0 min

Peak Storage= 3,322 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.33" for 5-Year event
Inflow = 3.73 cfs @ 0.14 hrs, Volume= 0.093 af
Outflow = 2.92 cfs @ 0.51 hrs, Volume= 0.093 af, Atten= 22%, Lag= 22.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.21 fps, Min. Travel Time= 10.8 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 35.5 min

Peak Storage= 1,893 cf @ 0.33 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'

‡

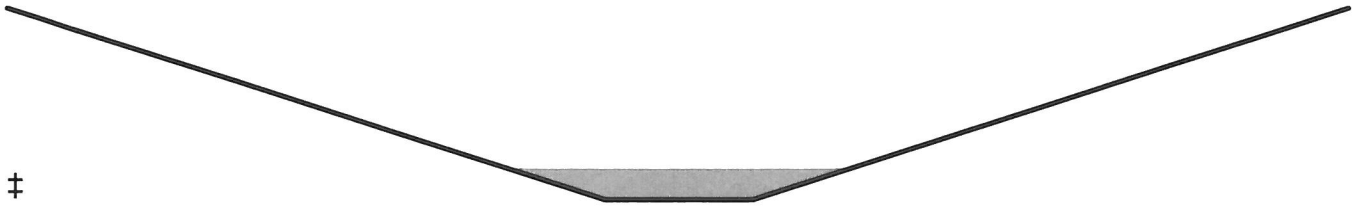
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.33" for 5-Year event
Inflow = 7.96 cfs @ 0.14 hrs, Volume= 0.197 af
Outflow = 7.66 cfs @ 0.39 hrs, Volume= 0.197 af, Atten= 4%, Lag= 14.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 17.8 min

Peak Storage= 2,281 cf @ 0.31 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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Summary for Subcatchment 1S: EX-C

Runoff = 23.07 cfs @ 0.14 hrs, Volume= 0.572 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 6.07 cfs @ 0.19 hrs, Volume= 0.150 af, Depth= 0.60"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.59 cfs @ 0.10 hrs, Volume= 0.015 af, Depth= 0.52"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 28.29 cfs @ 0.25 hrs, Volume= 0.701 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 4.36 cfs @ 0.14 hrs, Volume= 0.108 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 9.30 cfs @ 0.14 hrs, Volume= 0.230 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=18 min, Inten=3.68 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

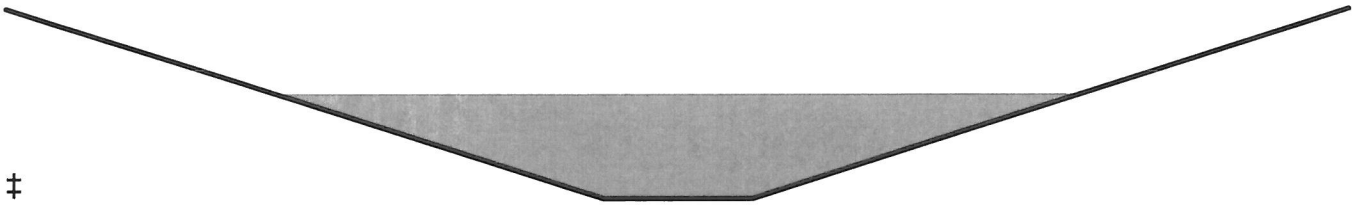
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.37" for 10-Year event
Inflow = 65.32 cfs @ 0.30 hrs, Volume= 1.777 af
Outflow = 62.46 cfs @ 0.36 hrs, Volume= 1.777 af, Atten= 4%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 13.0 min

Peak Storage= 8,581 cf @ 0.32 hrs
Average Depth at Peak Storage= 2.20'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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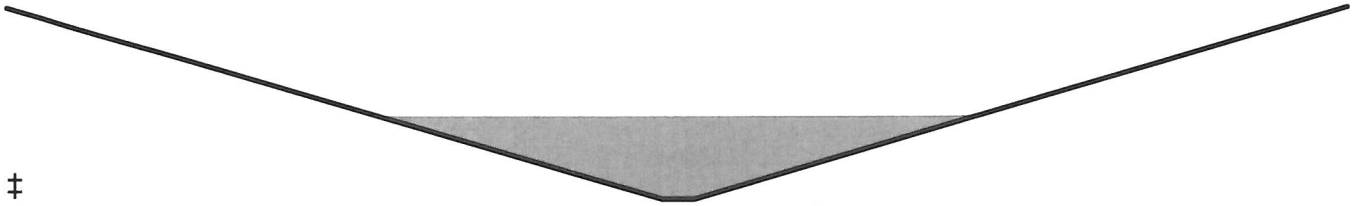
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.32" for 10-Year event
Inflow = 28.29 cfs @ 0.25 hrs, Volume= 0.701 af
Outflow = 27.84 cfs @ 0.34 hrs, Volume= 0.701 af, Atten= 2%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.64 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 8.8 min

Peak Storage= 3,737 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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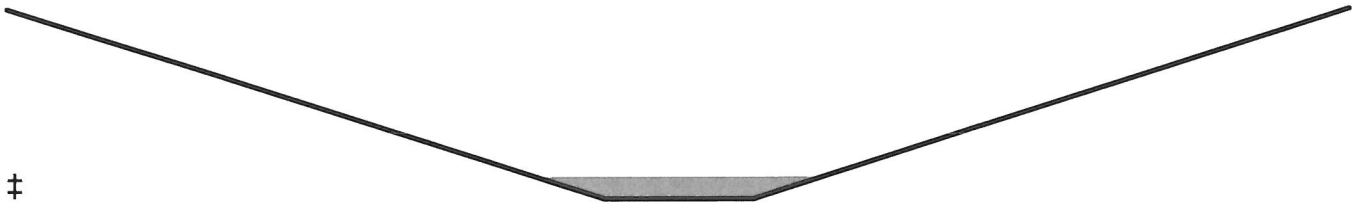
Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.39" for 10-Year event
Inflow = 4.36 cfs @ 0.14 hrs, Volume= 0.108 af
Outflow = 3.49 cfs @ 0.50 hrs, Volume= 0.108 af, Atten= 20%, Lag= 21.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.27 fps, Min. Travel Time= 10.2 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 35.0 min

Peak Storage= 2,142 cf @ 0.33 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'



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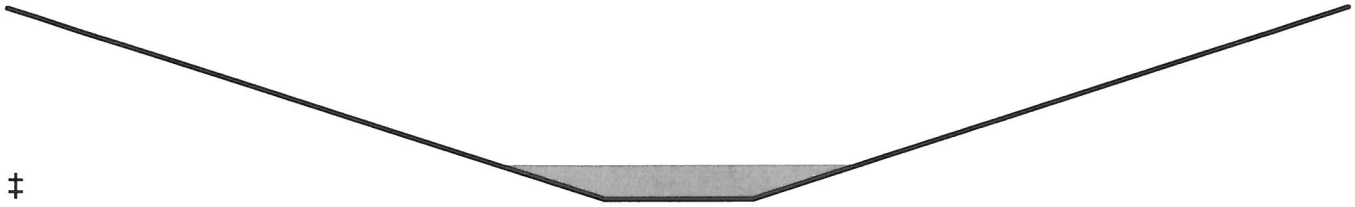
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.39" for 10-Year event
Inflow = 9.30 cfs @ 0.14 hrs, Volume= 0.230 af
Outflow = 8.99 cfs @ 0.38 hrs, Volume= 0.230 af, Atten= 3%, Lag= 14.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 17.5 min

Peak Storage= 2,559 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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Summary for Subcatchment 1S: EX-C

Runoff = 29.63 cfs @ 0.14 hrs, Volume= 0.735 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 7.79 cfs @ 0.19 hrs, Volume= 0.193 af, Depth= 0.77"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.76 cfs @ 0.10 hrs, Volume= 0.019 af, Depth= 0.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 36.33 cfs @ 0.25 hrs, Volume= 0.901 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 5.60 cfs @ 0.14 hrs, Volume= 0.139 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 11.94 cfs @ 0.14 hrs, Volume= 0.296 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=18 min, Inten=4.72 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

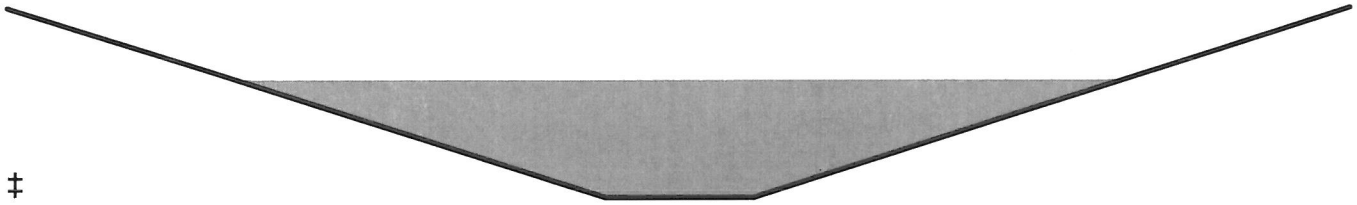
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.47" for 25-Year event
Inflow = 85.11 cfs @ 0.30 hrs, Volume= 2.282 af
Outflow = 81.68 cfs @ 0.36 hrs, Volume= 2.282 af, Atten= 4%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.37 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 12.6 min

Peak Storage= 10,485 cf @ 0.32 hrs
Average Depth at Peak Storage= 2.48'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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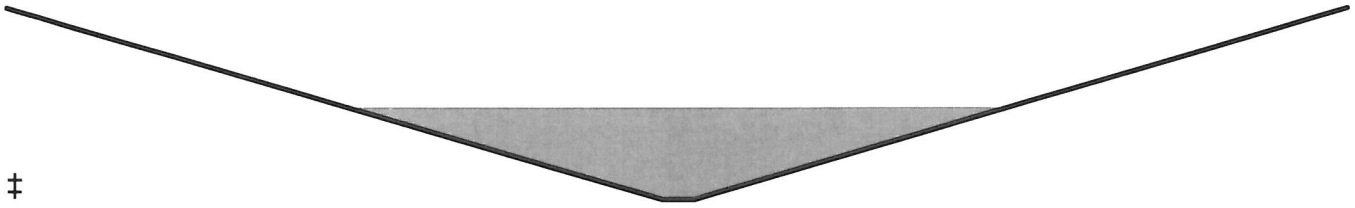
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.41" for 25-Year event
Inflow = 36.33 cfs @ 0.25 hrs, Volume= 0.901 af
Outflow = 35.85 cfs @ 0.34 hrs, Volume= 0.901 af, Atten= 1%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 8.4 min

Peak Storage= 4,517 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.96'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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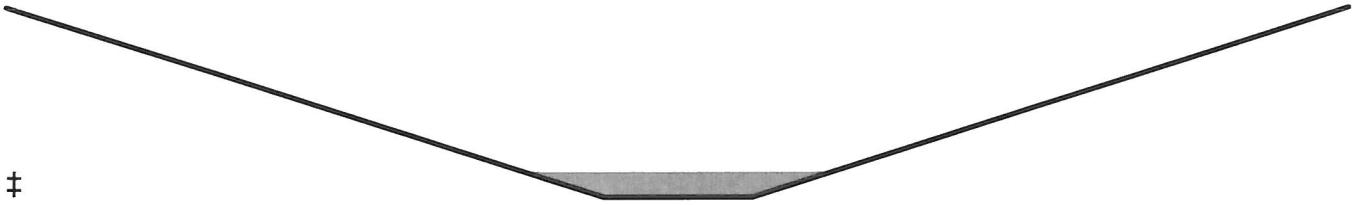
Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.50" for 25-Year event
Inflow = 5.60 cfs @ 0.14 hrs, Volume= 0.139 af
Outflow = 4.61 cfs @ 0.48 hrs, Volume= 0.139 af, Atten= 18%, Lag= 20.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 9.4 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 34.1 min

Peak Storage= 2,612 cf @ 0.32 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'



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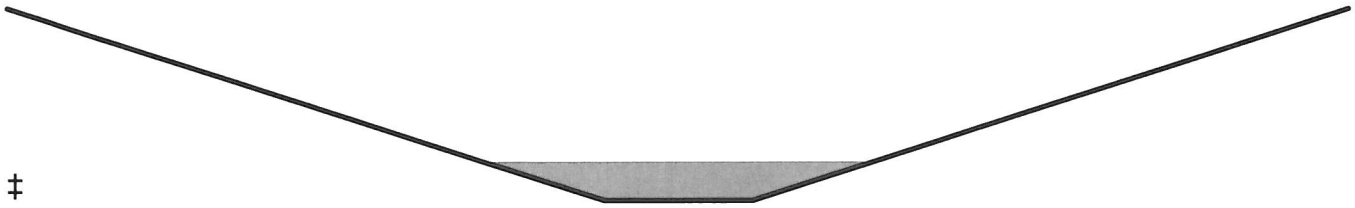
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.50" for 25-Year event
Inflow = 11.94 cfs @ 0.14 hrs, Volume= 0.296 af
Outflow = 11.63 cfs @ 0.38 hrs, Volume= 0.296 af, Atten= 3%, Lag= 14.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.96 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 17.0 min

Peak Storage= 3,083 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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Summary for Subcatchment 1S: EX-C

Runoff = 33.62 cfs @ 0.14 hrs, Volume= 0.834 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 8.85 cfs @ 0.19 hrs, Volume= 0.219 af, Depth= 0.87"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.86 cfs @ 0.10 hrs, Volume= 0.021 af, Depth= 0.76"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 41.23 cfs @ 0.25 hrs, Volume= 1.022 af, Depth= 0.47"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 6.36 cfs @ 0.14 hrs, Volume= 0.158 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 13.55 cfs @ 0.14 hrs, Volume= 0.336 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=18 min, Inten=5.36 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

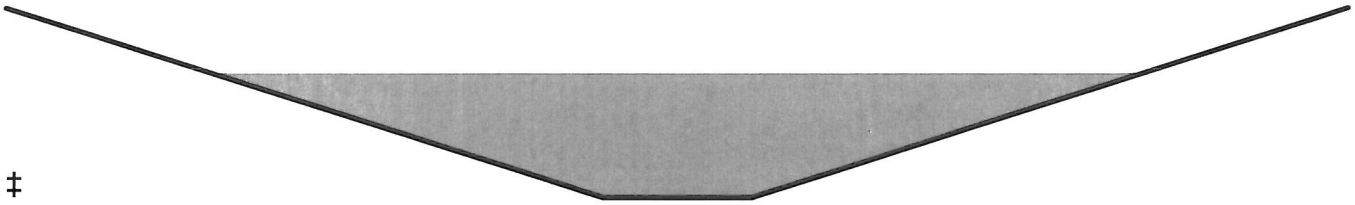
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.54" for 50-Year event
Inflow = 97.24 cfs @ 0.30 hrs, Volume= 2.590 af
Outflow = 93.56 cfs @ 0.35 hrs, Volume= 2.590 af, Atten= 4%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.45 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 12.5 min

Peak Storage= 11,600 cf @ 0.32 hrs
Average Depth at Peak Storage= 2.63'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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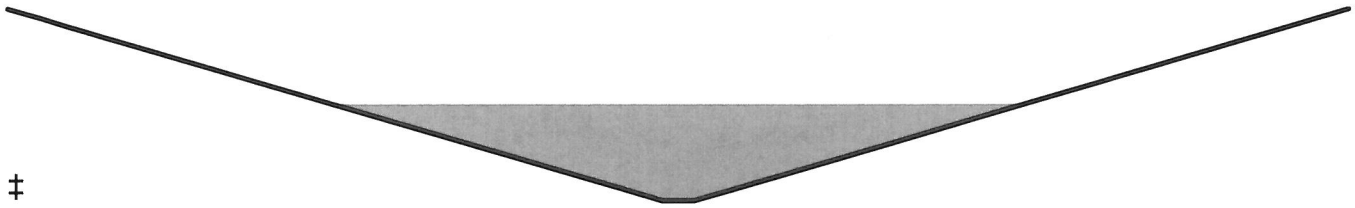
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.47" for 50-Year event
Inflow = 41.23 cfs @ 0.25 hrs, Volume= 1.022 af
Outflow = 40.74 cfs @ 0.34 hrs, Volume= 1.022 af, Atten= 1%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 8.3 min

Peak Storage= 4,971 cf @ 0.30 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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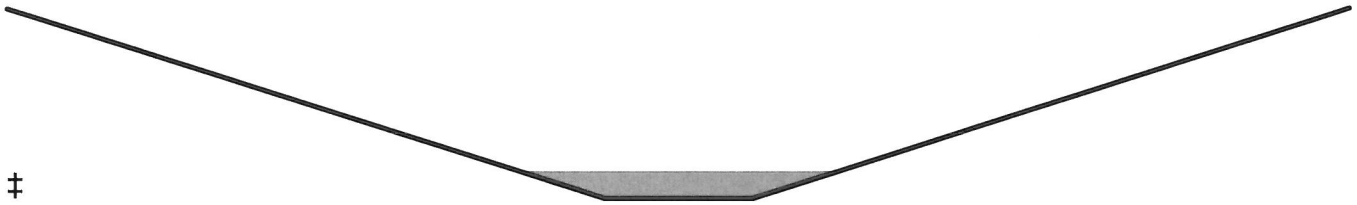
Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.56" for 50-Year event
Inflow = 6.36 cfs @ 0.14 hrs, Volume= 0.158 af
Outflow = 5.31 cfs @ 0.47 hrs, Volume= 0.158 af, Atten= 16%, Lag= 20.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.43 fps, Min. Travel Time= 9.1 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 33.7 min

Peak Storage= 2,887 cf @ 0.32 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'



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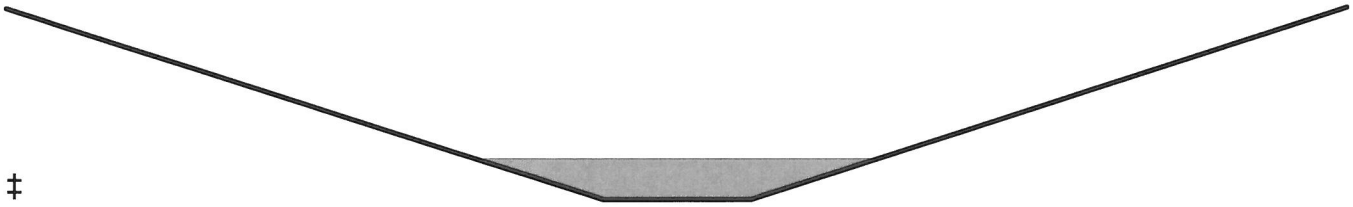
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.56" for 50-Year event
Inflow = 13.55 cfs @ 0.14 hrs, Volume= 0.336 af
Outflow = 13.24 cfs @ 0.37 hrs, Volume= 0.336 af, Atten= 2%, Lag= 13.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 16.7 min

Peak Storage= 3,388 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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Summary for Subcatchment 1S: EX-C

Runoff = 35.10 cfs @ 0.14 hrs, Volume= 0.870 af, Depth= 0.59"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
17.770	0.35	
17.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	1,495	0.0395	2.98		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Summary for Subcatchment 3S: OS-F AND EX-D

Runoff = 9.24 cfs @ 0.19 hrs, Volume= 0.229 af, Depth= 0.91"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
1.230	0.81	
1.800	0.35	
3.030	0.54	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	1,254	0.0231	3.09		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	503	0.0358	1.89		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.2	1,757	Total			

Summary for Subcatchment 4S: OS-A

Runoff = 0.90 cfs @ 0.10 hrs, Volume= 0.022 af, Depth= 0.79"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 43.05 cfs @ 0.25 hrs, Volume= 1.067 af, Depth= 0.49"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: EX-A

Runoff = 6.64 cfs @ 0.14 hrs, Volume= 0.165 af, Depth= 0.59"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
3.360	0.35	
3.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	666	0.0375	1.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Summary for Subcatchment 18S: EX-B

Runoff = 14.14 cfs @ 0.14 hrs, Volume= 0.351 af, Depth= 0.59"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=18 min, Inten=5.60 in/hr

Area (ac)	C	Description
7.160	0.35	
7.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	740	0.0446	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

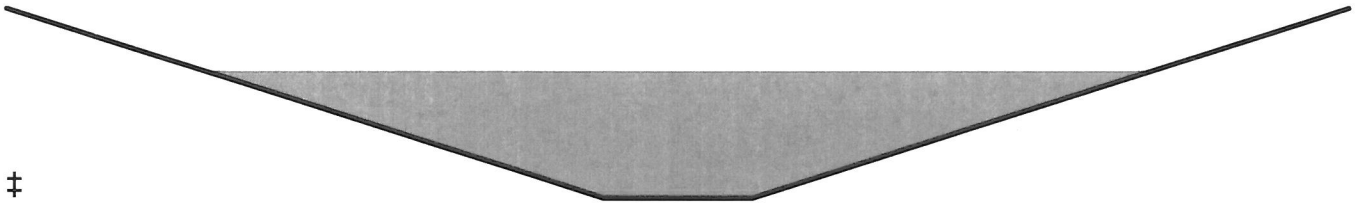
Summary for Reach 13R: DP-E4

Inflow Area = 57.960 ac, 0.00% Impervious, Inflow Depth = 0.56" for 100-Year event
Inflow = 101.75 cfs @ 0.30 hrs, Volume= 2.704 af
Outflow = 97.96 cfs @ 0.35 hrs, Volume= 2.704 af, Atten= 4%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.48 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 12.4 min

Peak Storage= 12,005 cf @ 0.32 hrs
Average Depth at Peak Storage= 2.68'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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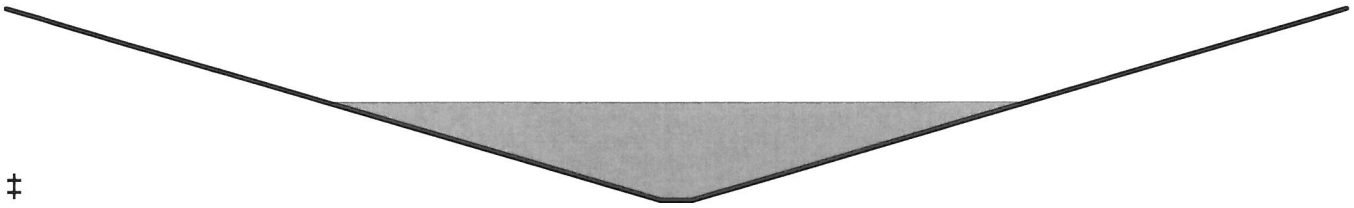
Summary for Reach 14R: DP-E3

Inflow Area = 26.300 ac, 0.00% Impervious, Inflow Depth = 0.49" for 100-Year event
Inflow = 43.05 cfs @ 0.25 hrs, Volume= 1.067 af
Outflow = 42.53 cfs @ 0.33 hrs, Volume= 1.067 af, Atten= 1%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.82 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 8.2 min

Peak Storage= 5,136 cf @ 0.30 hrs
Average Depth at Peak Storage= 1.03'
Bank-Full Depth= 2.00' Flow Area= 84.0 sf, Capacity= 234.88 cfs

2.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 20.0 '/' Top Width= 82.00'
Length= 220.0' Slope= 0.0773 '/'
Inlet Invert= 6,731.00', Outlet Invert= 6,714.00'



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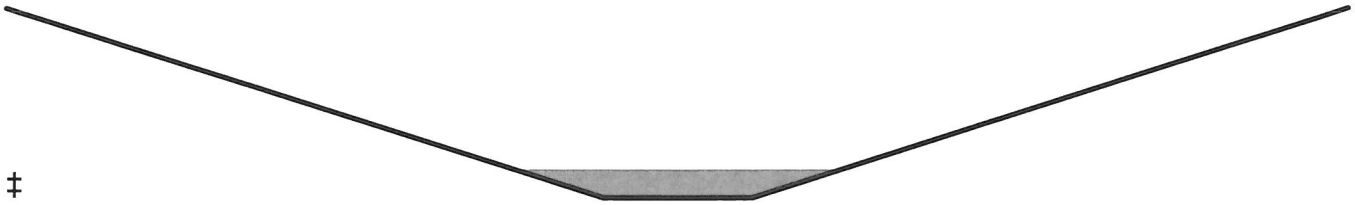
Summary for Reach 16R: at DP-E1

Inflow Area = 3.360 ac, 0.00% Impervious, Inflow Depth = 0.59" for 100-Year event
Inflow = 6.64 cfs @ 0.14 hrs, Volume= 0.165 af
Outflow = 5.57 cfs @ 0.47 hrs, Volume= 0.165 af, Atten= 16%, Lag= 19.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 8.9 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 33.6 min

Peak Storage= 2,988 cf @ 0.32 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 342.25 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 780.0' Slope= 0.0667 '/'
Inlet Invert= 6,750.00', Outlet Invert= 6,698.00'



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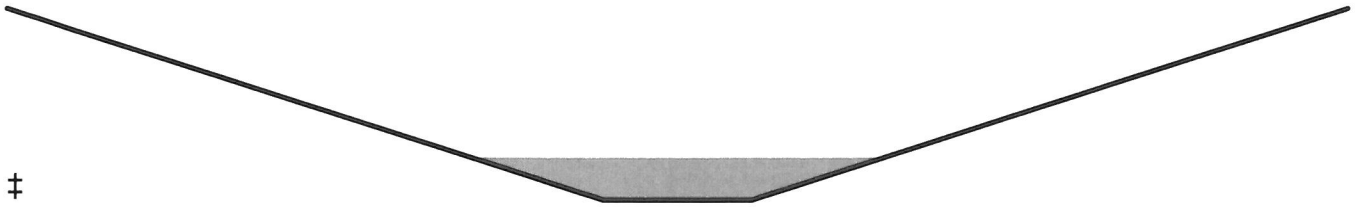
Summary for Reach 19R: at DP-E2

Inflow Area = 7.160 ac, 0.00% Impervious, Inflow Depth = 0.59" for 100-Year event
Inflow = 14.14 cfs @ 0.14 hrs, Volume= 0.351 af
Outflow = 13.85 cfs @ 0.37 hrs, Volume= 0.351 af, Atten= 2%, Lag= 13.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 16.6 min

Peak Storage= 3,498 cf @ 0.30 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 389.94 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 520.0' Slope= 0.0865 '/'
Inlet Invert= 6,743.00', Outlet Invert= 6,698.00'



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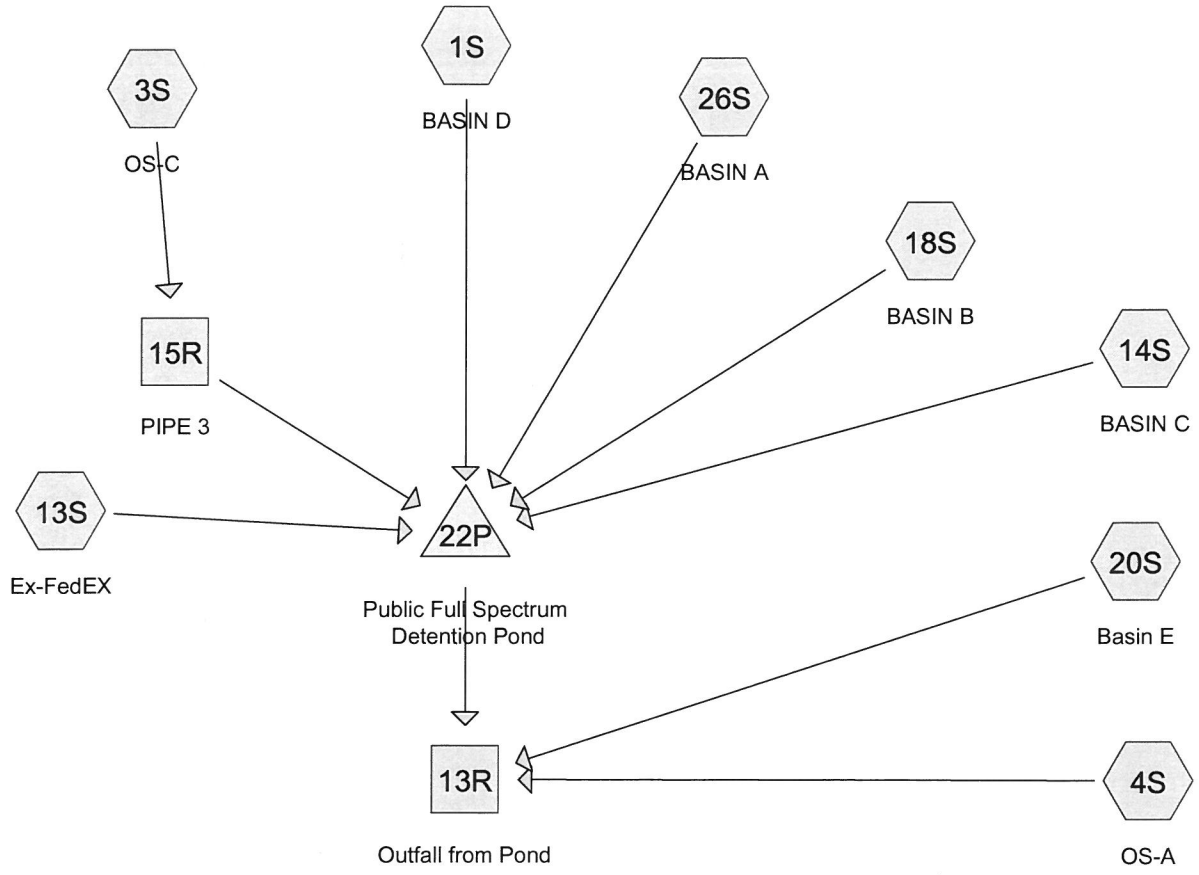


Subcat Reach Pond Link

Routing Diagram for 1102-DEV-2

Prepared by Executive Consulting Engineers, Inc., Printed 12/31/2014

Summary for Subcatchment 1S: BASIN D

Runoff = 40.61 cfs @ 0.17 hrs, Volume= 1.678 af, Depth= 0.81"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 3.71 cfs @ 0.11 hrs, Volume= 0.153 af, Depth= 0.84"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.28 cfs @ 0.10 hrs, Volume= 0.012 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 13.54 cfs @ 0.25 hrs, Volume= 0.559 af, Depth= 0.26"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 2.35 cfs @ 0.13 hrs, Volume= 0.097 af, Depth= 0.81"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 1.68 cfs @ 0.14 hrs, Volume= 0.069 af, Depth= 0.81"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 1.50 cfs @ 0.09 hrs, Volume= 0.062 af, Depth= 0.57"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 1.98 cfs @ 0.19 hrs, Volume= 0.082 af, Depth= 0.81"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 2-Year Duration=30 min, Inten=1.76 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

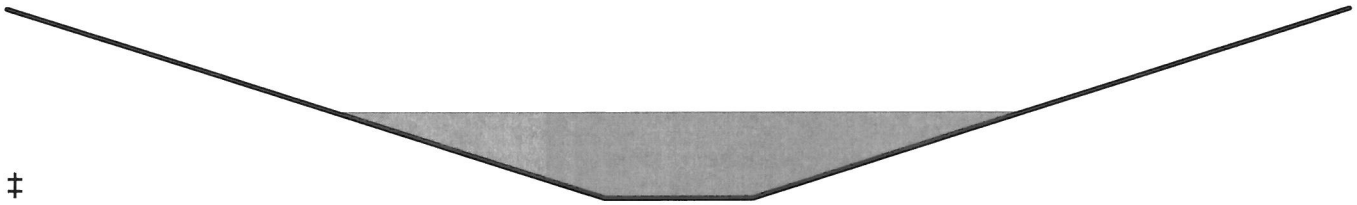
Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 0.55" for 2-Year event
Inflow = 41.47 cfs @ 0.52 hrs, Volume= 2.712 af
Outflow = 41.14 cfs @ 0.60 hrs, Volume= 2.712 af, Atten= 1%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 7.8 min

Peak Storage= 6,289 cf @ 0.56 hrs
Average Depth at Peak Storage= 1.83'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'



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Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 0.84" for 2-Year event
Inflow = 3.71 cfs @ 0.11 hrs, Volume= 0.153 af
Outflow = 3.71 cfs @ 0.30 hrs, Volume= 0.153 af, Atten= 0%, Lag= 11.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 6.21 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.17 fps, Avg. Travel Time= 0.7 min

Peak Storage= 107 cf @ 0.29 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'

Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 0.56" for 2-Year event
Inflow = 63.86 cfs @ 0.29 hrs, Volume= 2.639 af
Outflow = 40.58 cfs @ 0.56 hrs, Volume= 2.639 af, Atten= 36%, Lag= 16.4 min
Primary = 40.58 cfs @ 0.56 hrs, Volume= 2.639 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,713.68' @ 0.56 hrs Surf.Area= 18,771 sf Storage= 57,100 cf

Plug-Flow detention time= 19.6 min calculated for 2.639 af (100% of inflow)
Center-of-Mass det. time= 19.6 min (40.0 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=40.58 cfs @ 0.56 hrs HW=6,713.68' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.10 cfs @ 3.07 fps)
└—**2=Orifice/Grate** (Orifice Controls 40.48 cfs @ 8.25 fps)

Summary for Subcatchment 1S: BASIN D

Runoff = 55.83 cfs @ 0.17 hrs, Volume= 2.307 af, Depth= 1.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 5.10 cfs @ 0.11 hrs, Volume= 0.211 af, Depth= 1.15"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.39 cfs @ 0.10 hrs, Volume= 0.016 af, Depth= 0.57"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 18.61 cfs @ 0.25 hrs, Volume= 0.769 af, Depth= 0.35"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 3.23 cfs @ 0.13 hrs, Volume= 0.134 af, Depth= 1.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 2.31 cfs @ 0.14 hrs, Volume= 0.096 af, Depth= 1.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 2.06 cfs @ 0.09 hrs, Volume= 0.085 af, Depth= 0.79"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 2.72 cfs @ 0.19 hrs, Volume= 0.112 af, Depth= 1.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 5-Year Duration=30 min, Inten=2.42 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 0.76" for 5-Year event
Inflow = 50.78 cfs @ 0.52 hrs, Volume= 3.730 af
Outflow = 50.45 cfs @ 0.60 hrs, Volume= 3.730 af, Atten= 1%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.10 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 7.2 min

Peak Storage= 7,317 cf @ 0.56 hrs
Average Depth at Peak Storage= 2.00'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'

‡

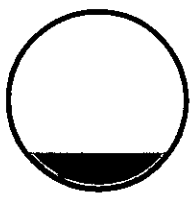
Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 1.15" for 5-Year event
Inflow = 5.10 cfs @ 0.11 hrs, Volume= 0.211 af
Outflow = 5.10 cfs @ 0.28 hrs, Volume= 0.211 af, Atten= 0%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 6.82 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.55 fps, Avg. Travel Time= 0.7 min

Peak Storage= 135 cf @ 0.27 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'



Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 0.76" for 5-Year event
Inflow = 87.80 cfs @ 0.28 hrs, Volume= 3.628 af
Outflow = 49.71 cfs @ 0.57 hrs, Volume= 3.628 af, Atten= 43%, Lag= 17.7 min
Primary = 49.71 cfs @ 0.57 hrs, Volume= 3.628 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,715.09' @ 0.57 hrs Surf.Area= 21,347 sf Storage= 85,246 cf

Plug-Flow detention time= 22.5 min calculated for 3.627 af (100% of inflow)
Center-of-Mass det. time= 22.5 min (42.9 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=49.71 cfs @ 0.57 hrs HW=6,715.09' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.49 cfs @ 4.67 fps)
└**2=Orifice/Grate** (Orifice Controls 49.22 cfs @ 10.03 fps)

Summary for Subcatchment 1S: BASIN D

Runoff = 65.29 cfs @ 0.17 hrs, Volume= 2.698 af, Depth= 1.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 5.96 cfs @ 0.11 hrs, Volume= 0.246 af, Depth= 1.34"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.46 cfs @ 0.10 hrs, Volume= 0.019 af, Depth= 0.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 21.76 cfs @ 0.25 hrs, Volume= 0.899 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 3.78 cfs @ 0.13 hrs, Volume= 0.156 af, Depth= 1.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 2.70 cfs @ 0.14 hrs, Volume= 0.112 af, Depth= 1.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 2.41 cfs @ 0.09 hrs, Volume= 0.100 af, Depth= 0.92"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 3.18 cfs @ 0.19 hrs, Volume= 0.131 af, Depth= 1.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 10-Year Duration=30 min, Inten=2.83 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 0.89" for 10-Year event
Inflow = 55.78 cfs @ 0.52 hrs, Volume= 4.361 af
Outflow = 55.42 cfs @ 0.60 hrs, Volume= 4.361 af, Atten= 1%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.15 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 6.9 min

Peak Storage= 7,848 cf @ 0.56 hrs
Average Depth at Peak Storage= 2.09'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'

‡

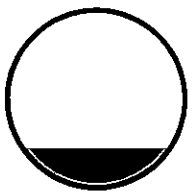
Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 1.34" for 10-Year event
Inflow = 5.96 cfs @ 0.11 hrs, Volume= 0.246 af
Outflow = 5.96 cfs @ 0.27 hrs, Volume= 0.246 af, Atten= 0%, Lag= 9.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 7.14 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.75 fps, Avg. Travel Time= 0.6 min

Peak Storage= 150 cf @ 0.26 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'



Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 0.89" for 10-Year event
Inflow = 102.68 cfs @ 0.26 hrs, Volume= 4.243 af
Outflow = 54.59 cfs @ 0.58 hrs, Volume= 4.243 af, Atten= 47%, Lag= 19.2 min
Primary = 54.59 cfs @ 0.58 hrs, Volume= 4.243 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,715.93' @ 0.58 hrs Surf.Area= 22,908 sf Storage= 103,867 cf

Plug-Flow detention time= 24.4 min calculated for 4.243 af (100% of inflow)
Center-of-Mass det. time= 24.3 min (44.7 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=54.59 cfs @ 0.58 hrs HW=6,715.93' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.80 cfs @ 5.64 fps)
└—**2=Orifice/Grate** (Orifice Controls 53.79 cfs @ 10.96 fps)

Summary for Subcatchment 1S: BASIN D

Runoff = 83.75 cfs @ 0.17 hrs, Volume= 3.461 af, Depth= 1.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 7.65 cfs @ 0.11 hrs, Volume= 0.316 af, Depth= 1.72"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.58 cfs @ 0.10 hrs, Volume= 0.024 af, Depth= 0.85"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 27.92 cfs @ 0.25 hrs, Volume= 1.154 af, Depth= 0.53"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 4.85 cfs @ 0.13 hrs, Volume= 0.200 af, Depth= 1.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 3.47 cfs @ 0.14 hrs, Volume= 0.143 af, Depth= 1.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 3.09 cfs @ 0.09 hrs, Volume= 0.128 af, Depth= 1.18"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 4.07 cfs @ 0.19 hrs, Volume= 0.168 af, Depth= 1.67"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 25-Year Duration=30 min, Inten=3.63 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 1.14" for 25-Year event
Inflow = 64.29 cfs @ 0.51 hrs, Volume= 5.594 af
Outflow = 63.87 cfs @ 0.59 hrs, Volume= 5.594 af, Atten= 1%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 6.4 min

Peak Storage= 8,722 cf @ 0.55 hrs
Average Depth at Peak Storage= 2.22'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'

‡

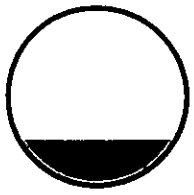
Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 1.72" for 25-Year event
Inflow = 7.65 cfs @ 0.11 hrs, Volume= 0.316 af
Outflow = 7.65 cfs @ 0.26 hrs, Volume= 0.316 af, Atten= 0%, Lag= 9.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 7.68 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.08 fps, Avg. Travel Time= 0.6 min

Peak Storage= 179 cf @ 0.25 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'



Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 1.14" for 25-Year event
Inflow = 131.71 cfs @ 0.25 hrs, Volume= 5.442 af
Outflow = 62.79 cfs @ 0.59 hrs, Volume= 5.442 af, Atten= 52%, Lag= 20.4 min
Primary = 62.79 cfs @ 0.59 hrs, Volume= 5.442 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,717.49' @ 0.59 hrs Surf.Area= 25,984 sf Storage= 142,038 cf

Plug-Flow detention time= 27.8 min calculated for 5.440 af (100% of inflow)
Center-of-Mass det. time= 27.8 min (48.2 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=62.79 cfs @ 0.59 hrs HW=6,717.49' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.42 cfs @ 7.52 fps)
└**2=Orifice/Grate** (Orifice Controls 61.36 cfs @ 12.50 fps)

Summary for Subcatchment 1S: BASIN D

Runoff = 95.05 cfs @ 0.17 hrs, Volume= 3.928 af, Depth= 1.90"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 8.68 cfs @ 0.11 hrs, Volume= 0.359 af, Depth= 1.96"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.66 cfs @ 0.10 hrs, Volume= 0.027 af, Depth= 0.97"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 31.69 cfs @ 0.25 hrs, Volume= 1.309 af, Depth= 0.60"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 5.50 cfs @ 0.13 hrs, Volume= 0.227 af, Depth= 1.90"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 3.94 cfs @ 0.14 hrs, Volume= 0.163 af, Depth= 1.90"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 3.51 cfs @ 0.09 hrs, Volume= 0.145 af, Depth= 1.34"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 4.62 cfs @ 0.19 hrs, Volume= 0.191 af, Depth= 1.90"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 50-Year Duration=30 min, Inten=4.12 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 1.30" for 50-Year event
Inflow = 68.79 cfs @ 0.51 hrs, Volume= 6.350 af
Outflow = 68.32 cfs @ 0.58 hrs, Volume= 6.350 af, Atten= 1%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 6.2 min

Peak Storage= 9,171 cf @ 0.55 hrs
Average Depth at Peak Storage= 2.29'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'

‡

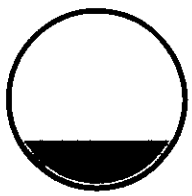
Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 1.96" for 50-Year event
Inflow = 8.68 cfs @ 0.11 hrs, Volume= 0.359 af
Outflow = 8.68 cfs @ 0.26 hrs, Volume= 0.359 af, Atten= 0%, Lag= 9.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 7.96 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.22 fps, Avg. Travel Time= 0.6 min

Peak Storage= 196 cf @ 0.25 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'



Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 1.30" for 50-Year event
Inflow = 149.49 cfs @ 0.25 hrs, Volume= 6.177 af
Outflow = 67.03 cfs @ 0.59 hrs, Volume= 6.177 af, Atten= 55%, Lag= 20.7 min
Primary = 67.03 cfs @ 0.59 hrs, Volume= 6.177 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,718.40' @ 0.59 hrs Surf.Area= 28,085 sf Storage= 166,416 cf

Plug-Flow detention time= 29.9 min calculated for 6.175 af (100% of inflow)
Center-of-Mass det. time= 30.0 min (50.3 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=67.02 cfs @ 0.59 hrs HW=6,718.39' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.68 cfs @ 8.86 fps)
└—**2=Orifice/Grate** (Orifice Controls 65.35 cfs @ 13.31 fps)

Summary for Subcatchment 1S: BASIN D

Runoff = 99.21 cfs @ 0.17 hrs, Volume= 4.099 af, Depth= 1.98"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
24.870	0.92	
24.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	1,690		6.60		**Direct Entry, Street/channel flow**
5.7					**Direct Entry, Overland**
10.0	1,690	Total			

Summary for Subcatchment 3S: OS-C

Runoff = 9.06 cfs @ 0.11 hrs, Volume= 0.374 af, Depth= 2.04"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
2.200	0.95	
2.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	2,200		5.80		**Direct Entry,**

Summary for Subcatchment 4S: OS-A

Runoff = 0.69 cfs @ 0.10 hrs, Volume= 0.029 af, Depth= 1.01"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
0.340	0.47	
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	95		5.10		**Direct Entry, Street/Channel Flow**
5.7	620	0.0677	1.82		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	715	Total			

Summary for Subcatchment 13S: Ex-FedEX

Runoff = 33.07 cfs @ 0.25 hrs, Volume= 1.367 af, Depth= 0.62"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
26.300	0.29	
26.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry,**

Summary for Subcatchment 14S: BASIN C

Runoff = 5.74 cfs @ 0.13 hrs, Volume= 0.237 af, Depth= 1.98"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
1.440	0.92	
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	503		4.90		**Direct Entry, Street/Channel flow**
5.7	1,240	0.0323	3.65		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.4	1,743	Total			

Summary for Subcatchment 18S: BASIN B

Runoff = 4.11 cfs @ 0.14 hrs, Volume= 0.170 af, Depth= 1.98"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
1.030	0.92	
1.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	286	0.0157	2.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.3	1,710	Total			

Summary for Subcatchment 20S: Basin E

Runoff = 3.66 cfs @ 0.09 hrs, Volume= 0.151 af, Depth= 1.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
1.300	0.65	
1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	545	0.0990	2.20		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	545	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 26S: BASIN A

Runoff = 4.83 cfs @ 0.19 hrs, Volume= 0.199 af, Depth= 1.98"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Colorado Springs-Revised 100-Year Duration=30 min, Inten=4.30 in/hr

Area (ac)	C	Description
1.210	0.92	
1.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6					**Direct Entry, Overland**
0.9	248		4.70		**Direct Entry, Street/Channel Flow**
6.4	1,424	0.0337	3.73		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.9	1,672	Total			

Summary for Reach 13R: Outfall from Pond

Inflow Area = 58.690 ac, 3.75% Impervious, Inflow Depth = 1.35" for 100-Year event
Inflow = 70.33 cfs @ 0.51 hrs, Volume= 6.627 af
Outflow = 69.83 cfs @ 0.58 hrs, Volume= 6.627 af, Atten= 1%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.28 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 6.1 min

Peak Storage= 9,322 cf @ 0.55 hrs
Average Depth at Peak Storage= 2.31'
Bank-Full Depth= 4.00' Flow Area= 80.0 sf, Capacity= 252.15 cfs

4.00' x 4.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 4.0 '/' Top Width= 36.00'
Length= 304.0' Slope= 0.0362 '/'
Inlet Invert= 6,698.00', Outlet Invert= 6,687.00'

‡

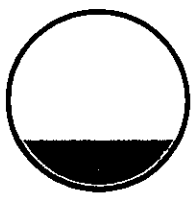
Summary for Reach 15R: PIPE 3

Inflow Area = 2.200 ac,100.00% Impervious, Inflow Depth = 2.04" for 100-Year event
Inflow = 9.06 cfs @ 0.11 hrs, Volume= 0.374 af
Outflow = 9.06 cfs @ 0.25 hrs, Volume= 0.374 af, Atten= 0%, Lag= 8.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 8.06 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.28 fps, Avg. Travel Time= 0.6 min

Peak Storage= 202 cf @ 0.24 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 52.95 cfs

30.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 180.0' Slope= 0.0167 '/'
Inlet Invert= 6,714.00', Outlet Invert= 6,711.00'



Summary for Pond 22P: Public Full Spectrum Detention Pond

Inflow Area = 57.050 ac, 3.86% Impervious, Inflow Depth = 1.36" for 100-Year event
Inflow = 156.02 cfs @ 0.25 hrs, Volume= 6.447 af
Outflow = 68.46 cfs @ 0.60 hrs, Volume= 6.447 af, Atten= 56%, Lag= 20.8 min
Primary = 68.46 cfs @ 0.60 hrs, Volume= 6.447 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 6,718.71' @ 0.60 hrs Surf.Area= 28,970 sf Storage= 175,530 cf

Plug-Flow detention time= 30.7 min calculated for 6.444 af (100% of inflow)
Center-of-Mass det. time= 30.7 min (51.1 - 20.4)

Volume	Invert	Avail.Storage	Storage Description
#1	6,710.00'	284,780 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,710.00	12,200	0	0
6,712.00	15,800	28,000	28,000
6,714.00	19,330	35,130	63,130
6,716.00	23,040	42,370	105,500
6,718.00	26,990	50,030	155,530
6,720.00	32,530	59,520	215,050
6,722.00	37,200	69,730	284,780

Device	Routing	Invert	Outlet Devices
#1	Primary	6,713.00'	**1.7" Vert. Orifice/Grate** X 12 rows with 4.0" cc spacing C= 0.600
#2	Primary	6,709.50'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=68.45 cfs @ 0.60 hrs HW=6,718.71' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.76 cfs @ 9.28 fps)
└**2=Orifice/Grate** (Orifice Controls 66.70 cfs @ 13.59 fps)

MISCELLANEOUS DOCUMENTS

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	Bob H. Yoo
Company:	ECE
Date:	January 19, 2015
Project:	Polaris Crossing at Northgate Filing nol. 1
Location:	Spectrum Loop/Voyager Parkway

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 90.0 %
B) Tributary Area's Imperviousness Ratio (i = I_a / 100)	i = 0.900
C) Contributing Watershed Area	Area = 28.880 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (1.2 WQCV) Based on 40-hour Drain Time (V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area * 1.2)	V_{DESIGN}= 1.160 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER}$ = (d_6*(V_{DESIGN}/0.43))	$V_{DESIGN\ OTHER}$= 1.133 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ○ A ◉ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A$ = (0.1878i - 0.0104)*Area For HSG B: $EURV_B$ = (0.1178i - 0.0042)*Area For HSG C/D: $EURV_{C/D}$ = (0.1043i - 0.0031)*Area	EURV = 2.941 ac-ft
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	with rip-rap
A) Describe means of providing energy dissipation at concentrated inflow locations:	

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	Bob H. Yoo
Company:	ECE
Date:	January 19, 2015
Project:	Polaris Crossing at Northgate Filing nol. 1
Location:	Spectrum Loop/Voyager Parkway

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.028 ac-ft
B) Actual Forebay Volume	V_F = 0.069 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 24.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 149.96 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 3.00 cfs
E) Forebay Discharge Design	Choose One: ○Berm With Pipe ◉Wall with Rect. Notch ○Wall with V-Notch Weir
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 8.6 in
6. Trickle Channel	
A) Type of Trickle Channel	Choose One: ◉Concrete ○Soft Bottom
F) Slope of Trickle Channel	S = 0.0040 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 3.0 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 1000 sq ft
C) Outlet Type	Choose One: ◉Orifice Plate ○Other (Describe):
D) Depth of Design Volume (EURV or 1.2 WQCV) Based on the Design Concept Chosen Under 1.E.	H = 4.00 feet
E) Volume to Drain Over Prescribed Time	EURV = 2.941 ac-ft
F) Drain Time (Min T_D for WQCV= 40 hours; Max T_D for EURV= 72 hours)	T_D = 72 hours
G) Recommended Maximum Outlet Area per Row, (A_o)	A_o = 2.51 square inches
H) Orifice Dimensions: i) Circular Orifice Diameter or ii) Width of 2" High Rectangular Orifice	$D_{orifice}$ = 1 - 3 / 4 inches; $W_{orifice}$ = inches
I) Number of Columns	n_c = 1 number
J) Actual Design Outlet Area per Row (A_o)	A_o = 2.41 square inches
K) Number of Rows (nr)	n_r = 12 number
L) Total Outlet Area (A_{ot})	A_{ot} = 28.9 square inches
M) Depth of WQCV (H_{WQCV}) (Estimate using actual stage-area-volume relationship and V_{WQCV})	H_{WQCV} = 1.5 feet
N) Ensure Minimum 40 Hour Drain Time for WQCV	$T_{D\,WQCV}$ = 46.6 hours

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Bob H. Yoo
Company: ECE
Date: January 19, 2015
Project: Polaris Crossing at Northgate Filing nol. 1
Location: Spectrum Loop/Voyager Parkway

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches): D_{IS} = 4.0 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV): V_{IS} = 123.3 cu ft

C) Initial Surcharge Provided Above Micropool: V_S = 333.3 cu ft

9. Trash Rack

A) Type of Water Quality Orifice Used: Choose One
- ○ Circular (up to 1-1/4" diameter)
- ◉ Circular (greater than 1-1/4" diameter) OR Rectangular (2" high)

B) Water Quality Screen Open Area: $A_t = Aot * 38.5*(e^{-0.095D})$: A_t = 941 square inches

C) For 1-1/4"", or Smaller, Circular Opening (See Fact Sheet T-12):

i) Width of Water Quality Screen and Concrete Opening ($W_{opening}$): $W_{opening}$ = inches

ii) Height of Water Quality Screen (H_{TR}): H_{TR} = inches

iii) Type of Screen, Describe if "Other": Choose One
- ○ S.S. Well Screen with 60% Open Area*
- ○ Other (Describe):

D) For Circular Opening (greater than 1-1/4" diameter) OR 2" High Rectangular Opening (See Fact Sheet T-12):

i) Width of Water Quality Screen Opening ($W_{opening}$): $W_{opening}$ = 1.3 ft

ii) Height of Water Quality Screen (H_{TR}): H_{TR} = 6.8 ft

iii) Type of Screen, Describe if "Other": Choose One
- ◉ Aluminum Amico-Klemp SR Series (or equal)
- ○ Other (Describe):

v) Cross-bar Spacing: 2.0 inches

vi) Minimum Bearing Bar Size: 1-3/4 inch x 3/16 inch

Design Procedure Form: Extended Detention Basin (EDB)

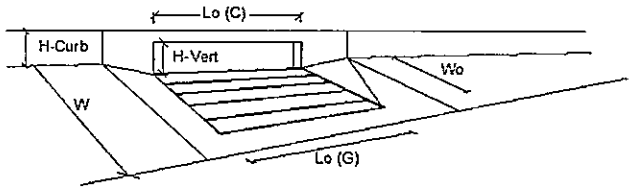
Designer: Bob H. Yoo
Company: ECE
Date: January 19, 2015
Project: Polaris Crossing at Northgate Filing nol. 1
Location: Spectrum Loop/Voyager Parkway

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	24" thick Rip-rap (Type M minimum) with Mirifi fabric beneath rip-rap wih 6" top soil for vegetation growth
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z_E = 4.00 ft / ft
11. Vegetation	Choose One: ○ Irrigated ◉ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	Access road to the forebay and to the outlet structure provided for routine maintenance

Notes:

INLET ON A CONTINUOUS GRADE

Project: M.D.D.P. FOR COPPER RIDGE AT NORTHGATE
Inlet ID: DP-4



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	12.00	12.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	6.9	9.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.4	3.1	cfs
Capture Percentage = Q_a/Q_o =	C% =	95	76	%

Emergency Spillway

Given: 100-year inflow into pond = 150.0 cfs

100-year surface elevation = 6720.8 feet

Calculate:

Using Broad Crested Weir formula,

$Q = C \times L \times H^{1.5}$ Where, Q = 150.0 c.f.s. total runoff into the pond

C = 3.71 coefficient of discharge

L = ? Feet Length of broad crest weir

H = 1 foot head of water

(top of bank=6788.0)

$150 = 3.71 \times L \times 1^{1.5}$

L = 40.5 feet L = 41 feet required

Therefore, the dimensions for the broad crested weir is 41' long by 1' depth.

See Rip Rap calculations for rip rap design

DRAINAGE MAPS

FEDEX
LOT 1, NORTHGATE CAMPUS FILING NO. 1
ZONED FIR-HR

OS-C
26.30

SPECTRUM LOOP
(COLLECTOR, 87' R.O.W.
(PUBLIC, EXISTING)

LOT 1, COPPER RIDGE CROSSING
AT NORTHGATE FIL #1
(ZONED: PUD)

VOYAGER PARKWAY
(PRINCIPAL ARTERIAL, 120' R.O.W.
(PUBLIC, EXISTING)

UNPLATTED (ZONED: A)
CHAPTER TWO
INVESTMENTS, LLC

PROP. COMMERCIAL USE
(ZONED: PUD)

OS-F
1.23

UNPLATTED
(ZONED: PUD)
NORTHGATE PROPERTIES, LLC

EX-A
3.36

EX-B
7.16

PROP. CHICK-FIL-A RESTAURANT
(ZONED: PUD)

UNPLATTED
(ZONED: PUD)

OS-A
0.34

EX-C
17.77

E1

UNPLATTED
(ZONED: PUD)
NORTHGATE PROPERTIES, LLC

EX-D
1.80

E3

LOT 1, SHOPS AT BASS PRO
NORTHGATE (ZONED: PUD)
BOURBON BROTHERS LLC

E2

PROJECT LINE

POWERS BOULEVARD
(COLORADO DEPARTMENT OF TRANSFORTATION)

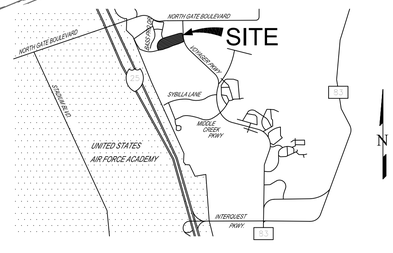
LOT 2, BASS PRO
CROSSING AT NORTHGATE
(ZONED: PUD)
COPPER RIDGE
DEVELOPMENT, INC.

E4

N

80' 0 80' 160'

SCALE: 1" = 80'



VICINITY MAP
NOT TO SCALE

PROPERTY LINE
BASIN BOUNDARY
FLOW DIRECTION X.XX%
BASIN IDENTIFIER B
AREA IN ACRES 0.34
DESIGN POINT 1
PIPE RUN 1

HISTORICAL AREA DRAINAGE SUMMARY

BASIN	AREA TOTAL (Acres)	Q_2 (c.f.s.)	Q_5 (c.f.s.)	Q_{10} (c.f.s.)	Q_{25} (c.f.s.)	Q_{50} (c.f.s.)	Q_{100} (c.f.s.)
OS-A	0.34	0.4	0.5	0.6	0.8	0.9	1.0
OS-F	1.23	3.1	4.3	5.2	6.8	7.8	8.3
OS-G	26.30	19.4	26.7	31.2	40.0	45.4	47.4
EX-A	3.36	3.0	4.1	4.8	6.2	7.0	7.3
EX-B	7.16	6.4	8.7	10.2	13.1	14.9	15.5
EX-C	17.77	15.3	21.0	24.5	31.5	35.7	37.3
EX-D	1.80	1.6	2.3	3.0	4.1	5.0	5.7

HISTORICAL AREA DESIGN POINTS

Design Point(s)	Q_2 (c.f.s.)	Q_5 (c.f.s.)	Q_{10} (c.f.s.)	Q_{25} (c.f.s.)	Q_{50} (c.f.s.)	Q_{100} (c.f.s.)
E1	3.0	4.1	4.8	6.2	7.0	7.3
E2	6.4	8.7	10.2	13.1	14.9	15.5
E3	19.4	26.7	31.2	40.0	45.4	47.4
E4	43.7	60.9	71.7	93.0	106.1	111.0

ECE
EXECUTIVE CONSULTING ENGINEERS
13570 Meadowgrass Drive
Suite 200
Colorado Springs, Colorado
80921
(719) 531-0707

NO.	REVISION DESCRIPTION	BY	DATE
1	1ST CITY COMMENTS	BHY	10/31/14

CLIENT INFORMATION:
NORTHGATE PROPERTIES, LLC.
13570 MEADOWGRASS DRIVE
SUITE 200
COLORADO SPRINGS, CO 80921
(719) 531-0707

PROJECT NAME
COPPER RIDGE CROSSING
AT NORTHGATE
COLORADO SPRINGS, COLORADO

DRAWING TITLE
PRE-DEVELOPED CONDITIONS
DRAINAGE MAP

H-Scale	1"=80'
V-Scale	N/A
Date	04/14/2014
Project No.	1089
Drawn by	BHY
Designed by	BHY
Approved by	_
SHEET:	DM-1

SHEET 1 OF 2

PROPERTY LINE

BASIN BOUNDARY

FLOW DIRECTION X.XX%

BASIN IDENTIFIER B / AREA IN ACRES 0.34

DESIGN POINT 1

PIPE RUN 1

FEDEX
LOT 1, NORTHGATE CAMPUS FILING NO. 1
ZONED: PIF-HR

SPECTRUM LOOP
(60' LEGEND, 87' R.O.W.)
(PUBLIC; EXISTING)

VOYAGER PARKWAY
(PRINCIPAL ARTERIAL, 120' R.O.W.)
(PUBLIC; EXISTING)

COPPER RIDGE CROSSING
(ZONED: PUD)

A 1.21

PROP. COMMERCIAL USE
(ZONED: PUD)

B 1.03

PROP. CHICK-FIL-A RESTAURANT
(ZONED: PUD)

C 1.68

OS-A 0.34

UNPLATTED
(ZONED: A)
CHAPTER TWO
INVESTMENTS, LLC

UNPLATTED
(ZONED: PUD)
NORTHGATE PROPERTIES, LLC

D 24.87

UNPLATTED
(ZONED: PUD)
NORTHGATE PROPERTIES, LLC

UNPLATTED
(ZONED: PUD)

OS-C 2.20

FLOWS FROM EXISTING FEDEX SITE WILL BE RE-ROUTED TO PROPOSED MASTER DETENTION POND WITH ADJACENT DEVELOPMENT

APPROX. 370 LF OF 18" HDPE STORM SEWER PIPE

APPROX. 350LF OF 24" HDPE STORM SEWER PIPE

APPROX. 200 LF OF 30" HDPE STORM SEWER PIPE

APPROX. 200 LF OF 36" HDPE STORM SEWER PIPE

THIS PORTION OF STORM SEWER SYSTEM WILL BE DESIGNED WITH ADJACENT DEVELOPMENT

E 1.30

LOT 1, SHOPS AT BASS PRO
NORTHGATE (ZONED: PUD)
BOURBON BROTHERS LLC

PROPOSED 24" STORM SEWER PER MDDP FOR BASS PRO AT NORTHGATE FILING NO. 1; THIS STORM PIPE WILL BE NOT BE REQUIRED PER MDDP FOR COPPER RIDGE CROSSING AT NORTHGATE.

PROPOSED 20' D-10-R INLET IN MDDP FOR BASS PRO AT NORTHGATE FILING NO. 1; THIS INLET WILL NOT BE REQUIRED WITH MDDP FOR COPPER RIDGE CROSSING

PRIVATE TEMPORARY SEDIMENT/WATER QUALITY POND

APPROX. 200LF OF 42" RCP STORM SEWER PIPE

PROPERTY LINE

POWERS BOULEVARD
(COLORADO DEPARTMENT OF TRANSFORTATION)

LOT 2, BASS PRO
CROSSING AT NORTHGATE
(ZONED: PUD)
COPPER RIDGE
DEVELOPMENT, INC.

N

80' 0 80' 160'

SCALE: 1" = 80'

NOTE:
1. PRIVATE TEMPORARY SEDIMENT/WATER QUALITY POND IS PROPOSED FOR INTERIM CONDITION, AND A PUBLIC PERMANENT STORMWATER QUALITY/ EXTENDED DETENTION BASIN FACILITY WILL BE CONSTRUCTED WITH DEVELOPMENT OF SUB-BASIN D. THEN, ULTIMATE STORM WATER QUALITY/ EXTENDED DETENTION BASIN FACILITY WILL BE DEDICATED TO CITY.

AREA DRAINAGE SUMMARY

BASIN	AREA TOTAL (Acres)	Q_2 (c.f.s.)	Q_5 (c.f.s.)	Q_{10} (c.f.s.)	Q_{25} (c.f.s.)	Q_{50} (c.f.s.)	Q_{100} (c.f.s.)
A	1.21	3.8	5.4	6.4	8.3	9.5	10.1
B	1.03	3.3	4.6	4.9	7.1	8.1	8.6
C	1.44	4.6	6.4	7.6	9.9	11.4	12.0
D	24.87	63.6	88.5	105.7	137.5	157.7	167.1
E	1.54	3.2	4.5	5.5	7.3	8.4	9.1
OS-A	0.34	0.4	0.6	0.8	1.0	1.2	1.4
OS-C	2.20	6.8	9.5	11.3	14.7	16.9	17.8

DESIGN POINTS SUMMARY

Design Point(s)	Q_2 (c.f.s.)	Q_5 (c.f.s.)	Q_{10} (c.f.s.)	Q_{25} (c.f.s.)	Q_{50} (c.f.s.)	Q_{100} (c.f.s.)
1	7.1	9.9	11.8	15.4	17.7	18.7
2	4.6	6.4	7.6	9.9	11.4	12.0
3	15.2	21.0	24.5	40.5	45.9	48.0
4	6.8	9.5	11.3	14.7	16.9	17.8
5	41.73	57.33	67.12	85.99	97.60	101.95
6	37.59	47.89	53.57	63.16	68.22	69.98

PIPE ROUTING SUMMARY

Pipe Run	Flow Q_5	Flow Q_{100}	Pipe Size (Inches)	Pipe length (L.F.)	Pipe material	
1	9.92	18.72	18	370'	HDPE	PRIVATE
2	9.50	17.84	18	180'	HDPE	PRIVATE
3	46.74	68.07	36	160	HDPE	PRIVATE
4	72.39	136.66	varies; see plan for pipe spec			PRIVATE

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CLIENT INFORMATION:
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PROJECT NAME
COPPER RIDGE CROSSING
AT NORTHGATE
COLORADO SPRINGS, COLORADO

DRAWING TITLE
DEVELOPED CONDITIONS
DRAINAGE MAP

H-Scale	1"=80'
V-Scale	N/A
Date	04/14/2014
Project No.	1089
Drawn by	BHY
Designed by	BHY
Approved by	_

SHEET: DM-2

SHEET 2 OF 2