

Add: The
Retreat at
TimberRidge

PRELIMINARY DRAINAGE REPORT
FOR
TIMBERRIDGE ESTATES
PRELIMINARY PLAN
(NORTH OF ARROYA LANE)

April 2018

Prepared For:
TIMBERRIDGE ESTATES, LLC
2760 Brogans Bluff Dr.
Colorado Springs, CO 80919

Prepared By:
TERRA NOVA ENGINEERING, INC.
721 S. 23RD STREET
Colorado Springs, CO 80904
(719) 635-6422

Job No. 1733.00

**PRELIMINARY DRAINAGE REPORT
FOR
TIMBERRIDGE ESTATES
PRELIMINARY PLAN
(NORTH OF ARROYA LANE)**

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REQUIRED MAPS AND DRAWINGS

VICINITY MAP

S.C.S. SOILS MAP

FEMA FIRM MAP

HYDROLOGIC CALCULATIONS

HYDRAULIC CALCULATIONS

DETENTION CALCULATIONS

DRAINAGE PLAN

CERTIFICATION STATEMENT:

Engineers Statement

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

L DUCETT, P.E. 32339

Seal

Developers Statements

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

TIMBERRIDGE ESTATES, LLC.

Business Name

By: _____

Title: _____

Address: _____

El Paso County Approval:

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

Jennifer Irvine,
County Engineer / ECM Administrator

Date

Conditions:

**PRELIMINARY DRAINAGE REPORT
FOR
TIMBERRIDGE ESTATES
PRELIMINARY PLAN
(NORTH OF ARROYA LANE)**

PURPOSE

The purpose of this Preliminary Drainage Report is to identify and analyze the proposed drainage patterns, determine proposed runoff quantities, size drainage structures for conveyance of developed runoff, and present solutions to drainage impacts on-site and off-site resulting from this development.

GENERAL DESCRIPTION

This Preliminary Drainage Report (PDR) is an analysis of approximately 35.30 acres of undeveloped land located in the northern part of El Paso County off of Volmer Road and Arroya Lane. This site is being developed by our client to include 10 single family lots consisting of 2.5 acre lots. The site is located in the south west quarter of Section 22, Township 12 South, Range 65 West of the 6th Principal Meridian currently within El Paso County, Colorado. The site is bounded to the north, and west by open space, to the east by Vantage Point farm and to the south by Arroya Lane. The site is contained within the Sand Creek Basin.

rural
residential?

rural
residential?

Soils for this project are delineated by the map in the appendix as Kettle gravelly loamy sand (40), 3 to 8 percent slopes, Kettle gravelly loamy sand (41), 8 to 40 percent slopes and Pring Coarse sandy loam (71), 3 to 8 percent slopes. Soils in the study area are shown as mapped by S.C.S. in the “Soils Survey of El Paso County Area” and contains soils of Hydrologic Group B.

FLOODPLAIN STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain, as determined by Flood Insurance Rate Map No. 08041C0535 F, dated March 17, 1997 (see appendix).

EXISTING DRAINAGE CONDITIONS

The site is currently undeveloped and is open space. The site consists mostly of natural vegetative grass and weeds, with some areas of trees. The site has been broken down into four existing basins, one onsite basin and three offsite basins tributary to the site. Below is a description of these basins.

see plan redlines

provide existing use

Basin OS-4B's 7.50 acres is an offsite basin located along the eastern boundary. Runoff ($Q_5=1.7$ cfs and $Q_{100}=12.3$ cfs) sheet flows to the southeast corner of the site and then is transported west in an existing ditch section (Design Point OS-3).

Clarify - provide dimensions and extents of existing ditch and label on plan (see plan redlines).

Basin OS-4A's 3.00 acres is an offsite basin located along the eastern boundary consisting of undeveloped open space. Runoff ($Q_5=0.9$ cfs and $Q_{100}=6.5$ cfs) sheet flows onto the southern half of the site (Design Point OS-2) and then is transported west across the site in an existing channel to Design Point EX-3.

Basin OS-4's 13.20 acres is an offsite basin located along the northern boundary consisting of undeveloped open space. Runoff ($Q_5=3.0$ cfs and $Q_{100}=21.7$ cfs) sheet flows onto the northern half of the site (Design Point OS-1) and then is transported southwest across the site in an existing channel to Design Point EX-3.

Basin EX-E1's 35.30 acres consists of undeveloped open space. Runoff ($Q_5=6.5$ cfs and $Q_{100}=46.1$ cfs) sheet flows to existing onsite drainage channels and then is routed southwest across the site in an existing channel to Design Point EX-3. At Design Point EX-3 the combined flow $Q_5=17.8$ cfs and $Q_{100}=78.0$ cfs of all four existing basins is routed south under Arroya Lane via an existing 60" CMP culvert

see plan redlines

PROPOSED DRAINAGE CONDITIONS

Runoff in the developed conditions consists of 5 basins, two onsite basin and three offsite basins. Below is a description of the runoff in the developed conditions and how it will be safely routed, treated and detained. See appendix for calculations.

As in the existing condition Runoff ($Q_5=1.7$ cfs and $Q_{100}=12.3$ cfs) from Basin OS-4B's 7.50 acres sheet flows to the southeast corner of the site and then is transported west in an existing ditch section (Design Point OS-3). It is proposed that a new ditch section will be graded in with the improvements to Arroya Lane.

Runoff ($Q_5=0.9$ cfs and $Q_{100}=6.6$ cfs) from Basin OS-4A's 3.00 acres sheet flows onto the southern half of the site (Design Point OS-2) and onto Basin PR-E1's 16.6 acres. Basin PR-E1 will be comprised of large lot development. Runoff ($Q_5=4.5$ cfs and $Q_{100}=23.5$ cfs) sheet flow to existing channels. The combined flow ($Q_5=5.1$ cfs and $Q_{100}=27.4$ cfs) is routed west across the site via existing channels and proposed ditch sections to a low point (Design Point 1). Dual 24" RCP culverts will route the flow under the new Nature Refuge Way road section and onto Basin PR-E2.

Runoff ($Q_5=0.9$ cfs and $Q_{100}=6.5$ cfs) from Basin OS-4's 13.2 acres sheet flows onto the northern half of the site (Design Point OS-2) and onto Basin PR-E2's 18.7 acres. Basin PR-E2 will also be comprised of large lot development. Runoff ($Q_5=4.9$ cfs and $Q_{100}=26.2$ cfs) sheet flow to existing channels. The combined flow ($Q_5=12.4$ cfs and $Q_{100}=43.5$ cfs) is routed southwest across the site via existing channels and proposed ditch sections to a proposed Full Spectrum Extended Detention Basin (Design Point 2).

At Design Point 3 the combined flow ($Q_5=12.4$ cfs and $Q_{100}=70.9$ cfs) of Basins OS-4, OS-4A, PR-E1 & PR-E2 will be captured in a 2.186 acre-foot EDB. Runoff will be routed in the natural channel into a 130 cu-ft concrete lined forbay with a 1' high concrete cutoff wall. A 6" notch in the wall drains the flow to a 3' concrete trickle channel then the runoff is routed to the 2.5' deep micropool which has a 0.001 ac-ft Initial Surcharge Volume. The 46.10 acres tributary to the EDB are 3.5% impervious. Based upon this we need a WQCV of 0.099 ac-ft, an ERUV volume of 0.040 ac-ft and 100-year volume of 0.939 ac-ft for a total volume needed of 1.078 ac-ft. The Micropool elevation is at 7247.00 while the ISV elevation is at 7247.33. The WQCV orifice starts at 7247 with 3-7/8-inch diameter holes spaced 6" inches apart. A 4'x4' outlet structure is set at 7248.50, which corresponds to the EURV elevation. The 100-year elevation tops out at

7251.70. A 30" RCP outlet will release $Q_5=0.1$ cfs and $Q_{100}=49.4$ cfs the discharge southwest to a riprap pad and then be routed to Design Point 3. The combined runoff at Design Point 3 is $Q_5=1.4$ cfs and $Q_{100}=59.2$. In "The Retreat at Timberridge Master Development Drainage Plan" it is proposed that three 6'x12' concrete box culvers will be installed to replace the existing 60' RCP.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County Storm Drainage Design Criteria Manual - Volumes 1 & 2, latest editions. The Rational Method was used to estimate storm water runoff anticipated from design storms with 5-year and 100-year recurrence intervals. The Urban Drainage Criteria Manual was used to calculate the detention and water quality volume.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County Storm Drainage Design Criteria Manual – Volumes 1 & 2, latest editions. The pertinent data sheets are included in the appendix of this report.

MAINTENANCE

The Extended Detention Basins and the storm drain systems are private and therefore must be maintained by the owner. These should be cleaned and checked after any significant precipitation event and at least once every three months. The proposed erosion control measures will be repaired and maintained by the property owner or owner's representative as required.

CONSTRUCTION COST OPINION

Public Non Reimbursable

NOT APPLICABLE

HOA or district?

Private Non Reimbursable

1. 24" RCP	180 LF	\$ 50	\$ 9,000
2. EDB	1 EA	\$ 20,000	<u>\$ 20,000</u>
			Total \$ 20,900

17,197

DRAINAGE FEES

The existing site is in the Sand Creek Basin. 2018 Drainage fees due prior to final plat recordation are as follows:

DRAINAGE FEES:	1.6 acres	x	\$15,197.00	=	\$27,515.20
BRIDGE FEES:	1.6 acres	x	\$ 5,210.00	=	<u>\$ 8336.00</u>
					TOTAL \$35,851.20

SUMMARY

Development of this site will not adversely affect the surrounding development. Proposed flows, as detailed in this report, will follow the drainage patterns outlined in this report showing how runoff will be safely routed downstream. The Extended Detention Basin will control flow to historic levels and provide water quality for this site. These water features will need to be periodically maintained by the owner in order to maintain their effectiveness in cleaning the discharge form the site.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

L Ducett, P.E.
President
Jobs1733.00/drainage/drng report 1733fdr.doc

Provide full calculation for 2018 fees:
11% imp. x (35.3-Tract) Ac. x 75% x \$17,197/imp. Ac. = \$
11% imp. x (35.3-Tract) Ac. x \$5,210/imp. Ac. = \$
or just state that the area is in the Sand Creek basin and fees will be due. Construction costs of DBPS-listed improvements may be offset against fees. (to be addressed in Final Drainage Report)



REFERENCE

“MDDP for the Retreat at TimberRidge” by Classic Consulting Engineers & Surveyors dated 2/22/18

“El Paso County Drainage Criteria Manual-Volumes 1 & 2, latest edition”

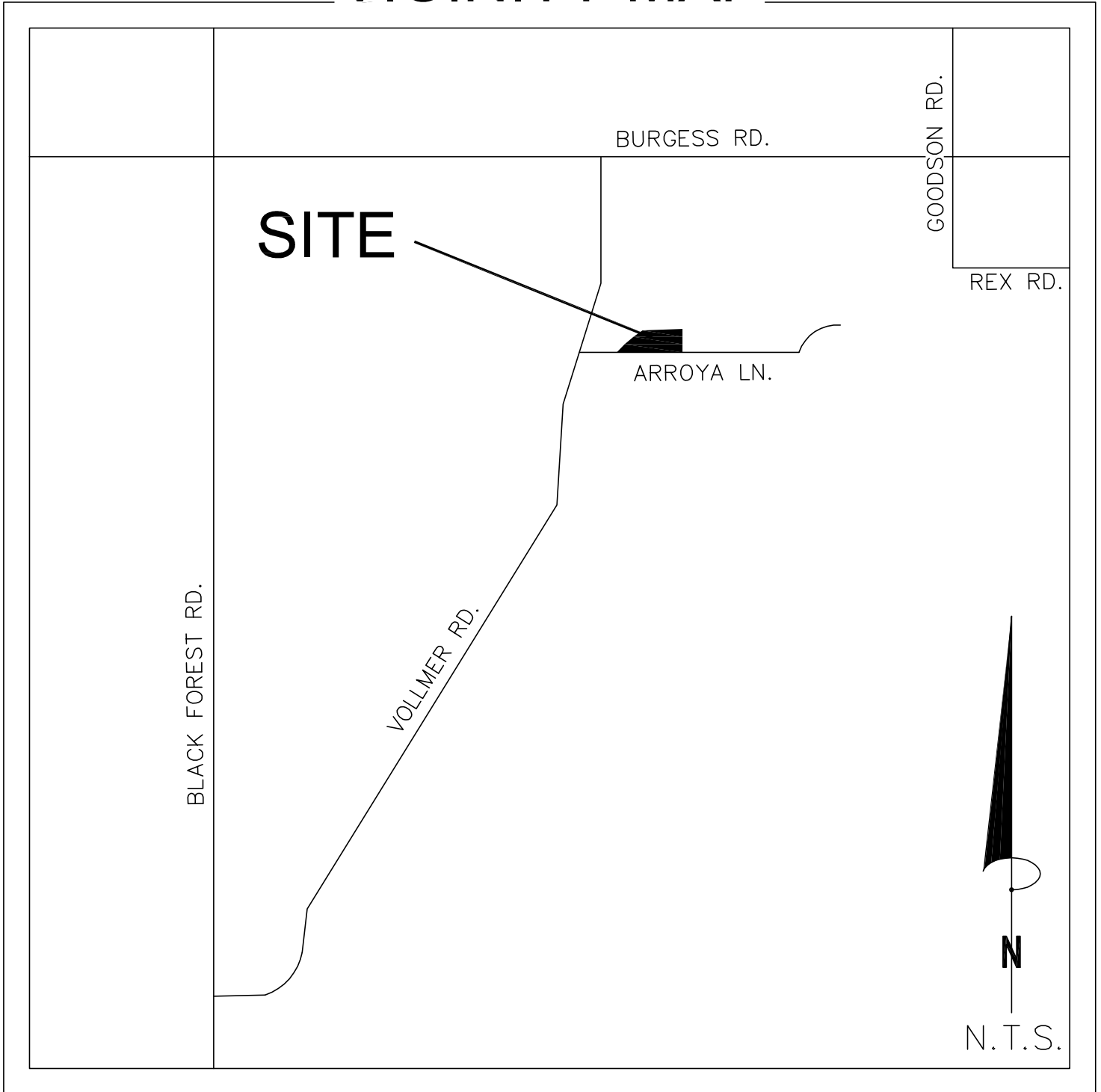
SCS Soils Map for El Paso County

Federal Emergency Management Agency (FEMA) flood maps

Reference EPC Board Resolution No. 15-042
(El Paso County adoption of Chapter 6 and Section
3.2.1 Chapter 13 of the City of Colorado Springs
Drainage Criteria Manual dated May 2014, hydrology
and full-spectrum detention)

VICINITY MAP

VICINITY MAP



S.C.S. SOILS MAP



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Search

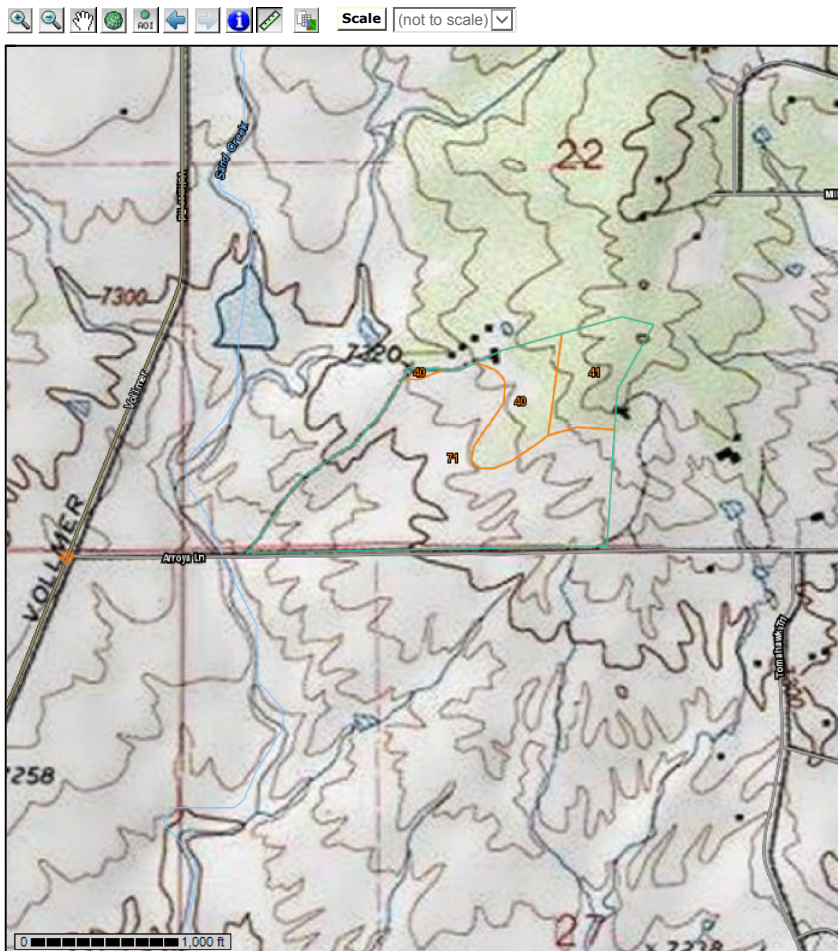
Map Unit Legend

El Paso County Area, Colorado (CO625)

El Paso County Area, Colorado (CO625)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	7.9	13.1%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	8.2	13.6%
71	Pring coarse sandy loam, 3 to 8 percent slopes	44.2	73.3%
Totals for Area of Interest		60.2	100.0%

Soil Map



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

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Maps of this area were mapped at 1:24,000. The design of map units and the level of detail shown in the resulting map are based on this scale. Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of maps of contrasting soils that could have been shown at a more detailed scale.

Measure

Segment	Distance (Feet/Miles)	Distance (Meters/Kilometers)
Segment 1	1.02 miles	1.64 kilometers
Total Distance	1.02 miles	1.64 kilometers

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FEMA FIRM MAP

Missing?

HYDROLOGIC CALCULATIONS

TIMBERRIDGE ESTATES
(Area Runoff Coefficient Summary)
EXISTING CONDITIONS

BASIN	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / UNDEVELOPED			WEIGHTED		
		AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀	
EX-E1	35.30	0.00	0.90	0.96	35.30	0.08	0.35	0.08	0.35	
OS-4	13.20	0.00	0.90	0.96	13.20	0.08	0.35	0.08	0.35	
OS-4A	3.00	0.00	0.90	0.96	3.00	0.08	0.35	0.08	0.35	
OS-4B	7.50	0.00	0.90	0.96	7.50	0.08	0.35	0.08	0.35	

LD

Date: 4/4/2018

Checked by: _____

**TIMBERRIDGE ESTATES
EXISTING
AREA DRAINAGE SUMMARY**

BASIN	AREA TOTAL (Acres)	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				T _t		INTENSITY		TOTAL FLOWS	
		C _s	C ₁₀₀	C _s	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)	
EX-E1	35.30	0.08	0.35	0.08	300	16.0	10.5	2148	5.0%	1.5	23.9	34.3	2.3	3.7	6.5	46.1	
OS-4	13.20	0.08	0.35	0.08	300	20.0	9.7	1460	5.7%	1.8	13.5	23.2	2.8	4.7	3.0	21.7	
OS-4A	3.00	0.08	0.35	0.08	300	25.0	9.0	390	5.0%	1.5	4.3	13.4	3.6	6.2	0.9	6.5	
OS-4B	7.50	0.08	0.35	0.08	300	20.0	9.7	1220	5.0%	1.5	13.6	23.3	2.8	4.7	1.7	12.3	

Calculated by: LJ

Date: 4/4/2018

Checked by: _____

(Not checked on first review)

**TIMBERRIDGE ESTATES
EXISTING SURFACE ROUTING SUMMARY**

Design Point(s)	Contributing Basins	Area A_C	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity		Flow	
						I_5	I_{100}	Q_5	Q_{100}
OS-1	OS-4	13.20	1.06	4.62	23.2	2.8	4.7	3.0	21.7
OS-2	OS-4A	3.00	0.24	1.05	13.4	3.6	6.2	0.9	6.5
OS-3	OS-4B	7.50	0.60	2.63	23.3	2.8	4.7	1.7	12.3
EX-3	EX-E1, OS 4, OS4A, OS4B	59.00	7.72	20.89	34.3	2.3	3.7	17.8	78.0

Date: 4/4/2018
Checked by: LD
Checked by: _____

(Not checked on first review)

TIMBERRIDGE ESTATES
(Area Runoff Coefficient Summary)
PROPOSED CONDITIONS

BASIN	TOTAL AREA (Acres)		STREETS / DEVELOPED			OVERLAND / UNDEVELOPED			WEIGHTED	
	AREA (Acres)		AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
<i>PR-E1</i>	16.60		0.76	0.90	0.96	15.84	0.08	0.35	0.12	0.38
<i>PR-E2</i>	18.70		0.76	0.90	0.96	17.94	0.08	0.35	0.11	0.37
<i>OS-4</i>	13.20		0.00	0.90	0.96	13.20	0.08	0.35	0.08	0.35
<i>OS-4A</i>	3.00		0.00	0.90	0.96	3.00	0.08	0.35	0.08	0.35
<i>OS-4B</i>	7.50		0.00	0.90	0.96	7.50	0.08	0.35	0.08	0.35
	59.00									

LD
Date: 4/4/2018
Checked by: _____

(Not checked on first review)

**TIMBERRIDGE ESTATES
PROPOSED
AREA DRAINAGE SUMMARY**

BASIN	AREA TOTAL (Acres)	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				T _i		INTENSITY		TOTAL FLOWS	
		C ₅	C ₁₀₀	C ₅	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _i (min)	TOTAL (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)	
PR-E1	16.60	0.12	0.38	0.09	300	16.0	10.4	2148	5.0%	1.5	23.9	34.2	2.3	3.7	4.5	23.5	
PR-E2	18.70	0.11	0.37	0.09	300	16.0	10.4	2148	5.0%	1.5	23.9	34.2	2.3	3.7	4.9	26.2	
OS-4	13.20	0.08	0.35	0.09	300	20.0	9.6	1460	5.7%	1.8	13.5	23.1	2.8	4.7	3.0	21.7	
OS-4A	3.00	0.08	0.35	0.09	300	25.0	8.9	390	5.0%	1.5	4.3	13.3	3.7	6.2	0.9	6.6	
OS-4B	7.50	0.08	0.35	0.09	300	20.0	9.6	1220	5.0%	1.5	13.6	23.2	2.8	4.7	1.7	12.3	
59.00																	

Calculated by: LD

Date: 4/4/2018

Checked by: _____

(Not checked on first review)

TIMBERRIDGE ESTATES PROPOSED SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Area A_c	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity		Flow	
						I_5	I_{100}	Q_5	Q_{100}
OS-1	OS-4	13.20	1.55	4.62	23.1	2.8	4.7	4.4	21.7
OS-2	OS-4A	3.00	0.24	1.05	13.3	3.7	6.2	0.9	6.6
OS-3	OS-4B	7.50	0.60	2.63	23.2	2.8	4.7	1.7	12.3
1	PR-E1 & OS4A	19.60	2.19	7.33	34.2	2.3	3.7	5.1	27.4
2	DP 1, OS-4 & PR-E2	51.50	5.37	18.96	34.2	2.3	3.7	12.4	70.9
3	POND RELEASE & DP OS-3	59.00	0.63	15.82	34.2	2.3	3.7	1.4	59.2

Date: 4/4/2018

Checked by: LD

Checked by: _____

(Not checked on first review)

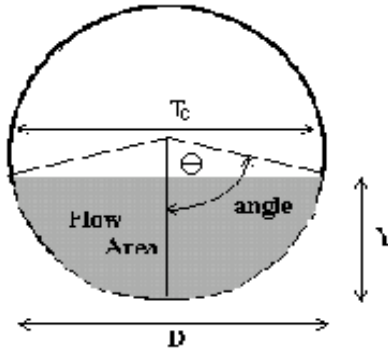
HYDRAULIC CALCULATIONS

Provide channel and
roadside ditch calculations.

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Timberridge Estates

Pipe ID: Design Point 1 flow (27.4 cfs) split between Dual 24" RCP Culverts



Design Information (Input)

Pipe Invert Slope	So =	0.0100	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	30.00	inches
Design discharge	Q =	13.70	cfs

Full-flow Capacity (Calculated)

Full-flow area	Af =	4.91	sq ft
Full-flow wetted perimeter	Pf =	7.85	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	41.13	cfs

Calculation of Normal Flow Condition

Half Central Angle ($0 < \theta < 3.14$)	Theta =	1.36	radians
Flow area	An =	1.82	sq ft
Top width	Tn =	2.45	ft
Wetted perimeter	Pn =	3.41	ft
Flow depth	Yn =	0.99	ft
Flow velocity	Vn =	7.53	fps
Discharge	Qn =	13.70	cfs
Percent Full Flow	Flow =	33.3%	of full flow
Normal Depth Froude Number	Fr _n =	1.54	supercritical

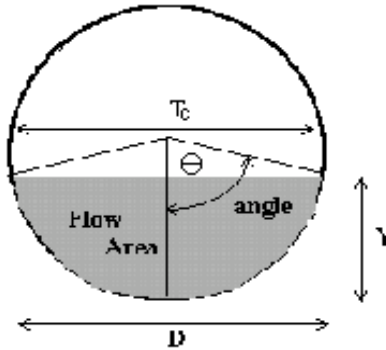
Calculation of Critical Flow Condition

Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c =	1.57	radians
Critical flow area	Ac =	2.44	sq ft
Critical top width	Tc =	2.50	ft
Critical flow depth	Yc =	1.25	ft
Critical flow velocity	Vc =	5.61	fps
Critical Depth Froude Number	Fr _c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Timberidge Estates

Pipe ID: Design Point OS-3



Design Information (Input)	
Pipe Invert Slope	So = 0.0100 ft/ft
Pipe Manning's n-value	n = 0.0130
Pipe Diameter	D = 24.00 inches
Design discharge	Q = 12.30 cfs
Full-flow Capacity (Calculated)	
Full-flow area	Af = 3.14 sq ft
Full-flow wetted perimeter	Pf = 6.28 ft
Half Central Angle	Theta = 3.14 radians
Full-flow capacity	Qf = 22.68 cfs
Calculation of Normal Flow Condition	
Half Central Angle ($0 < \theta < 3.14$)	Theta = 1.62 radians
Flow area	An = 1.67 sq ft
Top width	Tn = 2.00 ft
Wetted perimeter	Pn = 3.24 ft
Flow depth	Yn = 1.05 ft
Flow velocity	Vn = 7.37 fps
Discharge	Qn = 12.30 cfs
Percent Full Flow	Flow = 54.2% of full flow
Normal Depth Froude Number	Fr _n = 1.42 supercritical
Calculation of Critical Flow Condition	
Half Central Angle ($0 < \theta_c < 3.14$)	Theta-c = 1.83 radians
Critical flow area	Ac = 2.09 sq ft
Critical top width	Tc = 1.93 ft
Critical flow depth	Yc = 1.26 ft
Critical flow velocity	Vc = 5.90 fps
Critical Depth Froude Number	Fr _c = 1.00

Provide headwater depth calculations for all culverts.

**HEIRLOOM AT GOLD HILL MESA FILING 8
EAST AND WEST FORBAY WALL NOTCH**

Wall Notch

Correct title?

Notch to releae 2% of the undetained 100-year peak discharge

100-y peak discharge	=	79.0005 cfs
2%	=	1.58 cfs

The general form of the equation for horizontal crested weirs is $Q = CLH^{3/2}$ where:

Q = Weir flow discharge (cfs)	1.58	
C = Weir flow coefficient	3.4	
H = Depth of flow over the weir (ft)	1.00	Opening Height
L = Length of the weir (ft)	0.46	Length
L = Length of the weir (in)	6	

Notch to releae 2% of the undetained 100-year peak discharge is 6" wide by 12" high

(Not checked on first review)

DETENTION CALCULATIONS

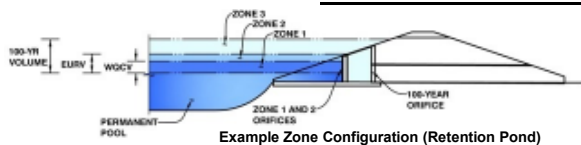
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: _____

Basin ID: _____



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.27	0.099	Orifice Plate
Zone 2 (EURV)	1.50	0.040	Orifice Plate
Zone 3 (100-year)	4.57	0.939	Weir&Pipe (Restrict)
		1.078	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	1.00					
Orifice Area (sq. inches)	0.60	0.60	0.60					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft ²
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="1.50"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	feet
Overflow Grate Open Area % =	<input type="text" value="70%"/>	<input type="text" value="N/A"/>	% grate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	<input type="text" value="1.50"/>	<input type="text" value="N/A"/>	feet
Over Flow Weir Slope Length =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	feet
Grate Open Area / 100-yr Orifice Area =	<input type="text" value="2.28"/>	<input type="text" value="N/A"/>	should be ≥ 4
Overflow Grate Open Area w/o Debris =	<input type="text" value="11.20"/>	<input type="text" value="N/A"/>	ft ²
Overflow Grate Open Area w/ Debris =	<input type="text" value="5.60"/>	<input type="text" value="N/A"/>	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="0.50"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="30.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="30.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	<input type="text" value="4.91"/>	<input type="text" value="N/A"/>	ft ²
Outlet Orifice Centroid =	<input type="text" value="1.25"/>	<input type="text" value="N/A"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="3.14"/>	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

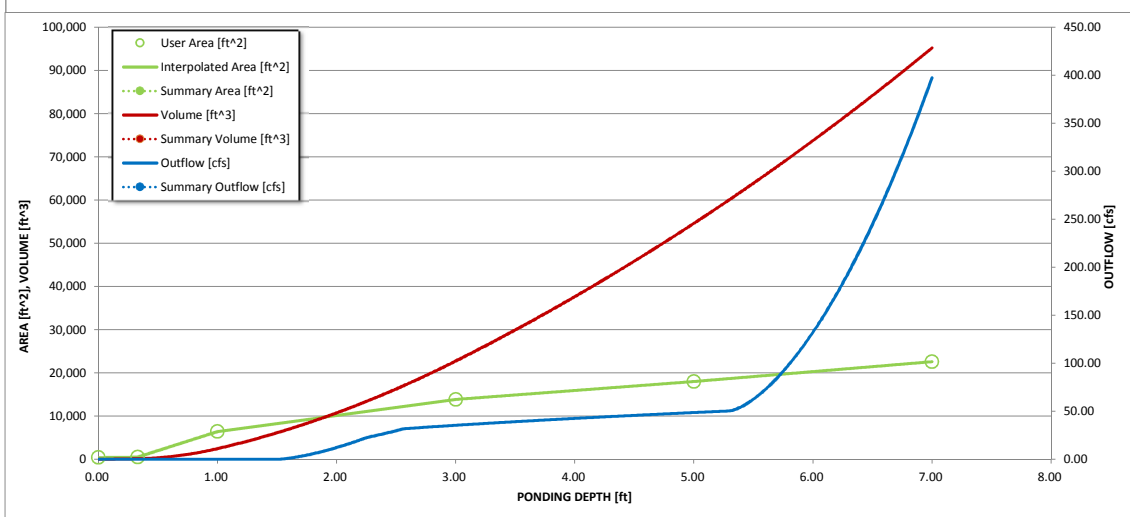
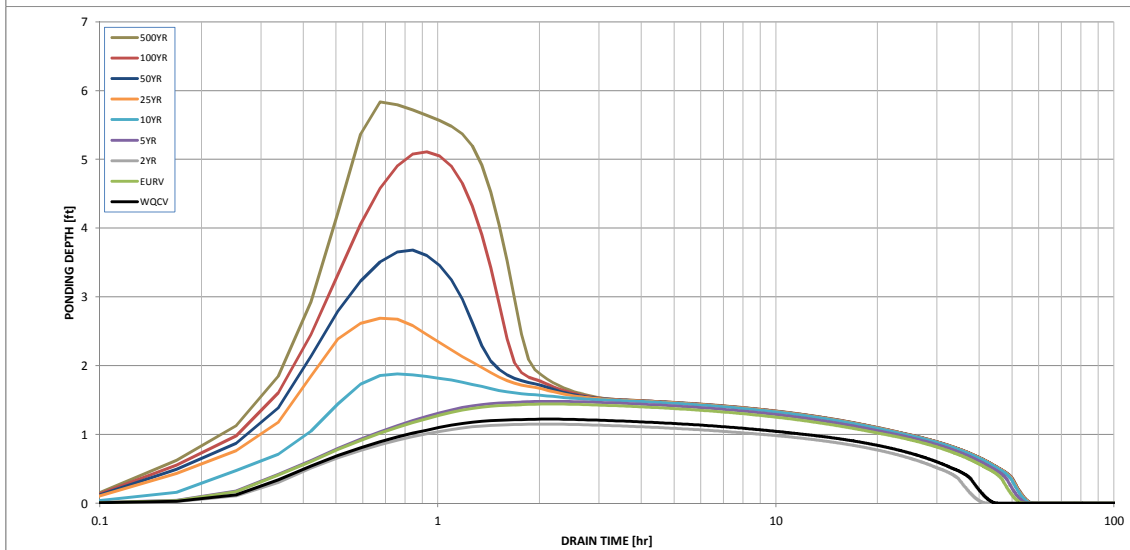
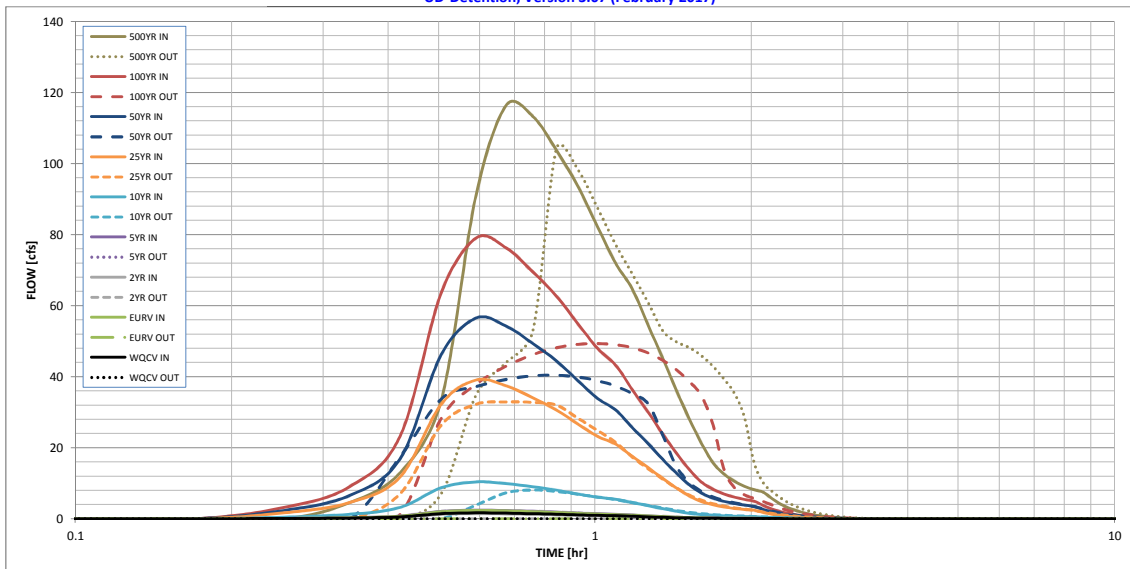
Spillway Design Flow Depth = feet
 Stage at Top of Freeboard = feet
 Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.00
Calculated Runoff Volume (acre-ft) =	0.099	0.139	0.086	0.146	0.632	2.416	3.515	4.950	7.366
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.099	0.139	0.086	0.146	0.632	2.418	3.517	4.952	7.366
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.20	0.66	0.91	1.22	1.72
Predevelopment Peak Q (cfs) =	0.0	0.0	0.6	0.9	9.1	30.2	41.8	56.3	79.5
Peak Inflow Q (cfs) =	1.7	2.3	1.5	2.4	10.4	39.0	56.5	79.0	116.4
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	8.1	32.9	40.4	49.4	104.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.9	1.1	1.0	0.9	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.7	2.9	3.6	4.4	4.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	46	36	48	39	20	11	3	2
Time to Drain 99% of Inflow Volume (hours) =	42	50	39	51	47	37	33	27	20
Maximum Ponding Depth (ft) =	1.22	1.44	1.15	1.48	1.88	2.69	3.68	5.11	5.84
Area at Maximum Ponding Depth (acres) =	0.17	0.18	0.16	0.19	0.22	0.29	0.35	0.42	0.46
Maximum Volume Stored (acre-ft) =	0.091	0.130	0.078	0.137	0.217	0.425	0.746	1.300	1.615

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

DRAINAGE MAPS

TIMBERRIDGE ESTATES EXISTING DRAINAGE PLAN

APRIL 2018

DESIGN POINT SUMMARY







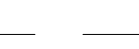
DP	CONTRIBUTING BASINS	AREA AC.	Q5 CFS	Q100 CFS
OS-1	OS-4	13.20	3.0	21.7
OS-2	OS-4A	3.00	0.9	6.5
OS-3	OS-4B	7.50	1.7	12.3
EX-1	EX-1, OS-4, OS4A & OS4B	59.00	17.8	78.0

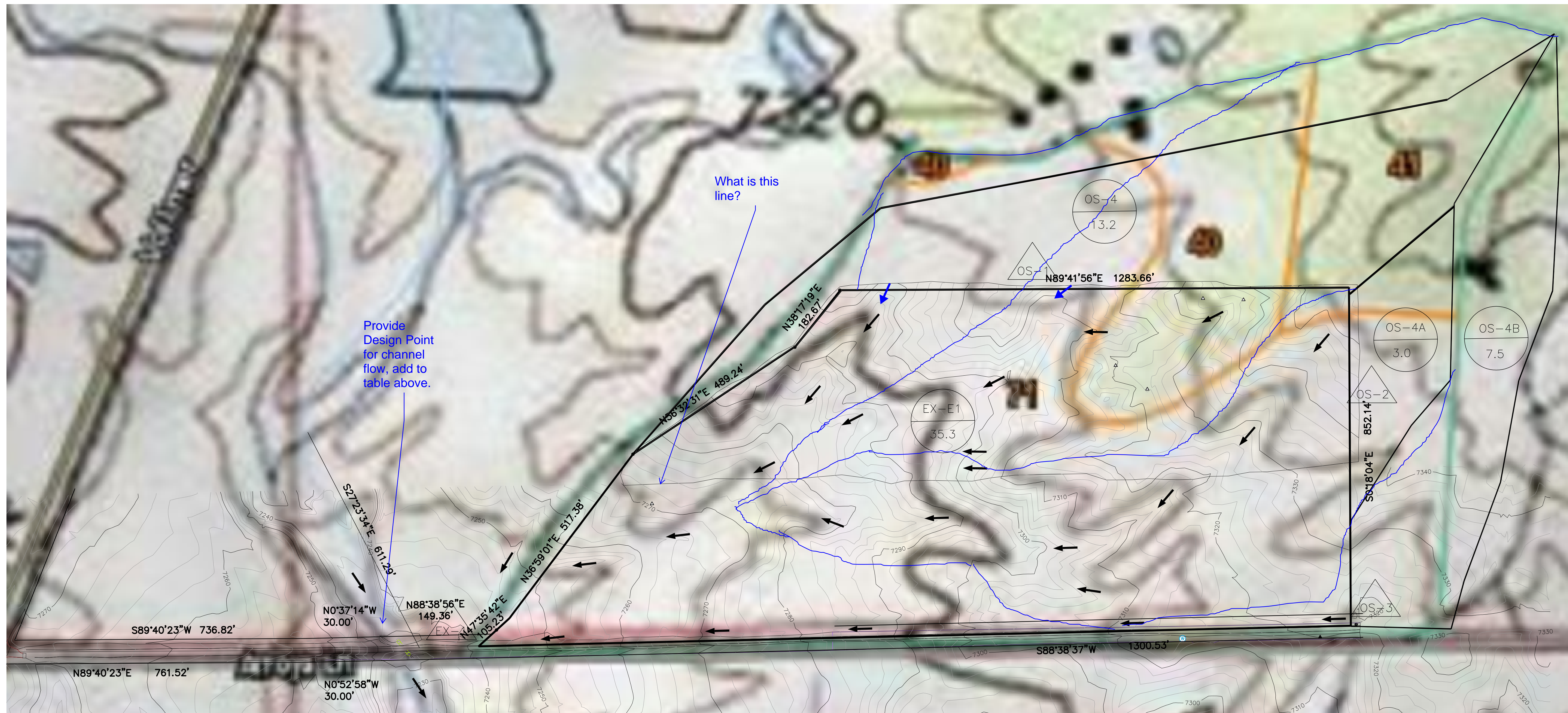
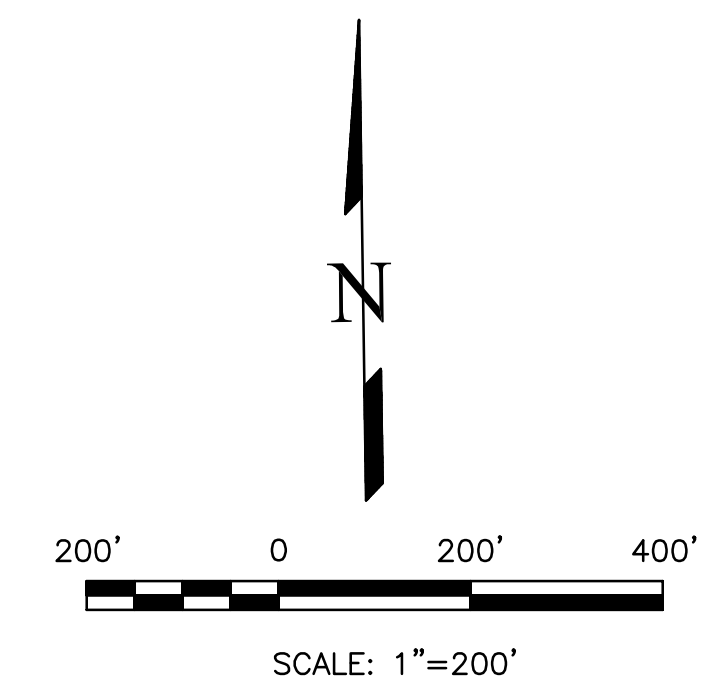
PROPOSED CONDITIONS

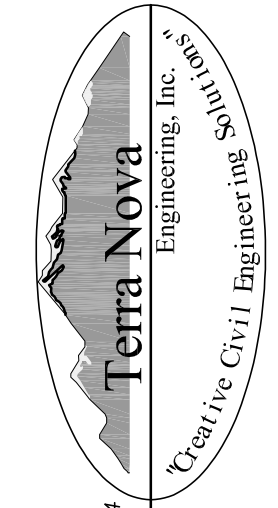
BASIN	ACRES	Q5 CFS	Q100 CFS
EX-E1	35.30	6.5	46.1
OS-4	13.20	3.0	21.7
OS-4A	3.00	0.9	6.5
OS-4B	7.50	1.7	12.3

Existing?

LEGEND

-  BASIN DESIGNATION
-  AREA IN BASIN (AC)
-  DESIGN POINT
-  BASIN BOUNDARY
-  EXISTING 2' CONTOUR
-  EXISTING 10' CONTOUR
-  FLOW DIRECTION



<p>REVISIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NO.</th> <th>DESCRIPTION</th> <th>DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	NO.	DESCRIPTION	DATE													<p>UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE LOCAL JURISDICTION REVIEWING AGENCIES, TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PROJECT AND PURPOSE AUTHORIZED BY WRITTEN AUTHORIZATION.</p> <p>PREPARED FOR: TIMBERRIDGE ESTATES, LLC ATTN: 2760 BROGANS BLUFF COLORADO SPRINGS, CO 80919</p> <div style="text-align: center;">  <p>Terra Nova Engineering, Inc. Civil/City/Engineer/US</p> </div> <p>721 S. 23RD STREET COLORADO SPRINGS, CO 80904 OFFICE: 719-635-6422 FAX: 719-635-6426 www.tnec.com</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">TIMBERRIDGE ESTATES</td> <td style="width: 50%;"></td> </tr> <tr> <td>EXISTING DRAINAGE PLAN</td> <td></td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>DESIGNED BY DLM</td> </tr> <tr> <td>DRAWN BY DLM</td> </tr> <tr> <td>CHECKED BY LD</td> </tr> <tr> <td>H-SCALE 1"=100'</td> </tr> <tr> <td>V-SCALE N/A</td> </tr> <tr> <td>JOB NO. 1733.00</td> </tr> <tr> <td>DATE ISSUED 4/9/18</td> </tr> <tr> <td>SHEET NO. 1 OF 1</td> </tr> </table>	TIMBERRIDGE ESTATES		EXISTING DRAINAGE PLAN		DESIGNED BY DLM	DRAWN BY DLM	CHECKED BY LD	H-SCALE 1"=100'	V-SCALE N/A	JOB NO. 1733.00	DATE ISSUED 4/9/18	SHEET NO. 1 OF 1
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TIMBERRIDGE ESTATES PROPOSED DRAINAGE PLAN

APRIL 2018

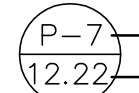
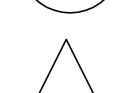


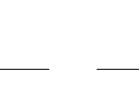
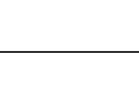
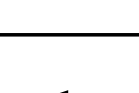


DESIGN POINT SUMMARY

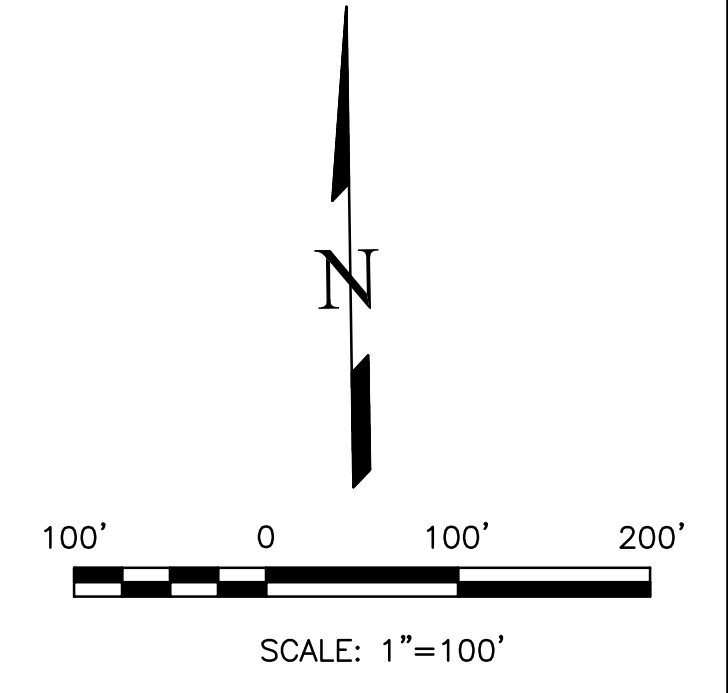
DP	CONTRIBUTING BASINS	AREA AC.	Q5 CFS	Q100 CFS
OS-1	OS-4	13.20	4.4	21.7
OS-2	OS-4A	3.00	0.9	6.6
OS-3	OS-4B	7.50	1.7	12.3
1	PR-E1 & OS4A	19.60	5.1	27.4
2	DP1, OS-4 & PRE-2	51.50	12.4	70.9
3	POND RELEASE & DP OS-3	59.00	1.4	59.2

PROPOSED CONDITIONS

BASIN	ACRES	Q5 CFS	Q100 CFS
PR-E1	16.6	4.5	23.5
PR-E2	18.7	4.9	26.2
OS-4	13.20	3.0	21.7
OS-4A	3.00	0.9	6.5
OS-4B	7.50	1.7	12.3

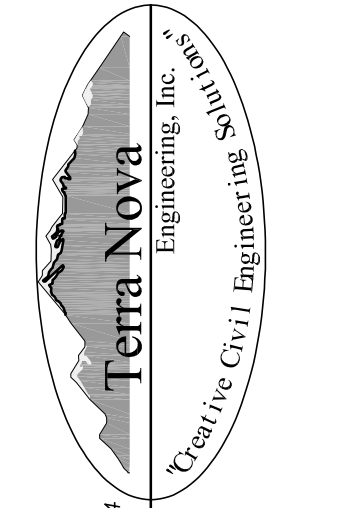
LEGEND

-  BASIN DESIGNATION
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-  DESIGN POINT
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-  PROPOSED 2' CONTOUR
-  PROPOSED 10' CONTOUR
-  FLOW DIRECTION



NO.	DESCRIPTION	DATE
1	REV'D PER 6/2/16 CTY COMMENTS 8/22/16	

PREPARED FOR:
TIMBERRIDGE ESTATES, LLC
ATTN:
2760 BROGANS BLUFF
COLORADO SPRINGS, CO 80919



721 S. 23RD STREET
COLORADO SPRINGS, CO 80904
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TIMBERRIDGE ESTATES
PROPOSED DRAINAGE PLAN

DESIGNED BY DLM
DRAWN BY DLM
CHECKED BY LD
H-SCALE 1"=100'
V-SCALE N/A
JOB NO. 1733.00
DATE ISSUED 4/9/18
SHEET NO. 1 OF 1



Show and label cross-lot drainage easements

Provide Design Point for channel flow, add to table above.

What is this line?

Which way is this area supposed to drain?

Label type and dimensions of outfall stabilization

Stabilized spillway outfall needs to be entirely within the property

Show entire access path to pond

Label roads, type and name, and ROW lines with dimensions

From the contours it appears that this flow crosses Arroya Lane. Is there a culvert? If it is being re-routed through a new roadside ditch, provide a note stating that and show the grading.



Innovative Design. Classic Results.

PRELIMINARY DRAINAGE REPORT

FOR

**THE RETREAT AT TIMBERRIDGE
PRELIMINARY PLAN
(SOUTH OF ARROYA LANE)**

Prepared for:

ARROYA INVESTMENTS LLC
1283 KELLY JOHNSON BLVD.
COLORADO SPRINGS CO 80920
(719) 447-8773

Prepared by:

CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job No. 2520.20



**PRELIMINARY DRAINAGE REPORT FOR
THE RETREAT AT TIMBERRIDGE PRELIMINARY PLAN
(SOUTH OF ARROYA LANE)**

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 Drainage Criteria Manual for the City of Colorado Springs and El Paso County. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Marc A. Whorton Colorado P.E. #37155

Date

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: ARROYA INVESTMENTS LLC

By: _____

Title: _____

Address: 1271 Kelly Johnson Blvd., Suite 100

Colorado Springs, CO 80920

use updated signature block:
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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

EL PASO COUNTY:

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

Jennifer Irvine, El Paso County Engineer

Date

Conditions:



**PRELIMINARY DRAINAGE REPORT FOR
THE RETREAT AT TIMBERRIDGE PRELIMINARY PLAN
(SOUTH OF ARROYA LANE)**

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FLOODPLAIN STATEMENT	Page 12
DRAINAGE AND BRIDGE FEES	Page 12
SUMMARY	Page 14
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APPENDICES

VICINITY MAP
SOILS MAP (WEB SOIL SURVEY)
F.E.M.A. MAP / LOMR (08-08-0541P)
RECOMMENDATIONS PER SAND CREEK DBPS
PRELIMINARY WETLANDS MAPPING
HYDROLOGIC CALCULATIONS
STORMWATER QUALITY CALCULATIONS
DETENTION POND CALCULATIONS
DRAINAGE MAPS



PURPOSE

The purpose of this Preliminary Drainage Report, as part of the Retreat at TimberRidge Preliminary Plan, is to identify specific drainage features and facilities and to estimate peak rates of stormwater runoff, from on-site and off-site sources. Also the purpose is to outline the necessary improvements to safely route developed storm water runoff to adequate outfall facilities. The drainage improvements proposed in this report are preliminary in nature and final drainage reports are required upon any development within the site that detail the ‘to be constructed’ drainage systems and detention/SWQ ponds. This report covers the major portion of the Preliminary Plan area south of Arroya Lane. The 10 lots north of Arroya Lane can be found in “Preliminary Drainage Report for TimberRidge Estates Preliminary Plan (North of Arroya Lane)” prepared by Terra Nova Engineering, Inc., dated April 2018.

Provide acreage
addressed in this report.

GENERAL DESCRIPTION

The Retreat at TimberRidge is a 234.1-acre site located in portions sections 21, 22, 27 and 28, township 12 south, range 65 west of the sixth principal meridian. The site is bounded on the north by various unplatted parcels (zoned for 5 ac. residential), to the south and east by Sterling Ranch property (zoned for future urban development) and to the west by Vollmer Road and unplatted parcels (zoned for 5 ac. residential). The site is in the upper portion of the Sand Creek Drainage Basin. Both large lot rural single family residential and urban single family residential are proposed in the Preliminary Plan for this site.

The average soil condition reflects Hydrologic Group “B” (Pring coarse sandy loam and Kettle gravelly loamy sand) as determined by the “Web Soil Survey of El Paso County Area,” prepared by the Natural Resources Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

The Retreat at TimberRidge property is located in the upper portion of the Sand Creek drainage basin on the south edge of Black Forest. The overall property was recently acquired in numerous parcels. The parcels west of Vollmer Road are on the fringe of Black Forest and contains some sparsely scattered pine trees with the majority of the parcel being native grasses. The northeast parcel, north of Arroya Lane again is on the fringe of Black Forest and contains some sparsely scattered pine trees with the majority of the parcel being native grasses. The parcel at the southeast corner of Vollmer Road and Arroya Lane also contains some sparsely scattered pine trees with native grasses and natural ravines tributary to the Sand Creek channel. The remaining larger parcels south of Arroya Lane and east of Vollmer Road are mainly covered with native grasses with few or

realigned

no pine trees. The Sand Creek channel bisects this part of the property from north-south with various natural ravine tributary fingers. A wetlands delineation has been prepared for the property (See Appendix) and reflects some wetlands throughout the Sand Creek channel. Upon determination of exact channel improvements as a part of development and final platting of the site, the appropriate permitting will be prepared for and reviewed/approved by US Fish and Wildlife. Arroya Lane exists along the northern portion of the site. The westerly portion of this road is public ROW with the remainder of the road heading further east being private. A portion of this existing ROW may need to be vacated with the final plat in this area given the planned re-alignment of the Arroya Lane and Vollmer intersection. An existing 60" CMP culvert currently conveys the low flows from Sand Creek under Arroya Lane.

Portions of this site have been previously studied in the "Sand Creek Drainage Basin Planning Study" (DBPS) prepared by Kiowa Engineering Corporation, March 1996. The portion of Sand Creek that traverses the site is defined as Reach SC-9 in the DBPS. Approximately 1000+ acres north of this property is tributary to this reach of the channel. (See Off-site Drainage Map in Appendix) According to the DBPS, this reach of Sand Creek all contained within the channel has the following flow characteristics: $Q_{10} = 630$ cfs $Q_{100} = 2170$ cfs. The majority of these off-site flows enter the property at the north end of the site via various culverts under Vollmer Road conveying flows from the northwest (Black Forest area) and the off-site stock ponds to the north (both tributary to hundreds of acres of property in Black Forest). See the Pre-development Drainage Map in the Appendix.

The following descriptions represent the pre-development flows for the property:

EX DP-1 ($Q_2 = 5.5$ cfs $Q_5 = 34.9$ cfs, $Q_{100} = 273.4$ cfs) This does not include the major off-site channel flows but reflects only the on-site and off-site flows that travel across the property and have a direct effect on the development. This total represents the allowed developed release off-site at this location. This total pre-development flow includes the flowing basins: EX-1, EX-4, OS-1, OS-3, OS-4 and OS-5. Basin EX-1 ($Q_2 = 2.6$ cfs $Q_5 = 17.7$ cfs, $Q_{100} = 140.3$ cfs) consists of the majority of the site proposed for development. This basin contains areas of sheet flow that eventually travel within various natural ravines created within the site. These ravines then route the predevelopment flows



See plan redlines

directly into Sand Creek in the form of concentrated flows at multiple locations along the Creek. Basin EX-4 ($Q_2 = 1.3$ cfs $Q_5 = 6.9$ cfs, $Q_{100} = 41.8$ cfs) consists of the northeasterly portion of the property north of Arroya Lane that drains in a southwesterly direction into Sand Creek. Basin EX-5 is not used in this report. Basin OS-5 ($Q_2 = 0.5$ cfs $Q_5 = 3.6$ cfs, $Q_{100} = 28.1$ cfs) consists off-site property northwest of Vollmer Road that drains under Vollmer through an existing 48" CMP culvert directly on-site. Basin OS-1 ($Q_2 = 0.9$ cfs $Q_5 = 7.0$ cfs, $Q_{100} = 53.9$ cfs) consists of an off-site basin to the east within the Sterling Ranch property that sheet flows directly on-site. Basin OS-3 ($Q_2 = 1.3$ cfs $Q_5 = 2.0$ cfs, $Q_{100} = 4.8$ cfs) consists of the public ROW portion of Arroya Lane that sheet flows directly on-site. Basin OS-4 ($Q_2 = 0.6$ cfs $Q_5 = 3.4$ cfs, $Q_{100} = 20.7$ cfs) consists of the off-site basin directly tributary to the site through Basin EX-4 containing several existing large lot home sites located on 35+ acre property.

Provide combined flows.

EX DP-2 ($Q_2 = 0.2$ cfs $Q_5 = 2.0$ cfs, $Q_{100} = 14.7$ cfs) consists of combined flows from on-site Basin EX-2 ($Q_2 = 0.2$ cfs $Q_5 = 1.7$ cfs, $Q_{100} = 12.2$ cfs) and Basin OS-2 ($Q_2 = 0.04$ cfs $Q_5 = 0.3$ cfs, $Q_{100} = 2.5$ cfs). These combined pre-development flows travel off-site directly onto Sterling Ranch property prior to eventually entering the Sand Creek channel.

EX DP-3 ($Q_2 = 0.4$ cfs $Q_5 = 3.0$ cfs, $Q_{100} = 23.7$ cfs) consists of flows from on-site Basin EX-3 that travel off-site directly onto Sterling Ranch property prior to eventually entering the Sand Creek channel.

EX DP-4 ($Q_2 = 0.1$ cfs $Q_5 = 0.9$ cfs, $Q_{100} = 7.1$ cfs) consists of on-site flows from Basin EX-6 that travel in a southeasterly direction towards the existing roadside ditch along the north side of Vollmer Road. These flows will travel in a southerly direction within the roadside ditch to a release point at the corner of the property. This to flow represents the allowed developed release at this location.



PROPOSED DRAINAGE CONDITIONS

Proposed development within the Retreat at TimberRidge will consist of a variety of different residential lot sizes ranging from 1.0 – 2.5 acre large rural lots to 12,000 SF min. urban lots. The rural lots will have paved streets and roadside ditches while the urban lots paved streets with County standard curb, gutter and sidewalk. Development of the urban lots proposed will consist of overlot grading for the planned roadways and lots. Development of rural lots proposed within the site will be limited to roadways and building pads, conserving the natural feature areas. Individual home sites on these lots are to be left generally in their natural condition with minimal disturbance to existing conditions per individual lot construction. Per the El Paso County ECM, Section I.7.1.B, rural lots of 2.5 ac. and larger are not required to provide Water Quality Capture Volume (WQCV). However, based on the current County/Urban Drainage stormwater quality standards, a WQCV component is automatically built into the UD Detention spreadsheet utilized in the detention basin design. Thus, the proposed facilities within both the rural and urban portions of this development will provide WQCV along with an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2 year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge hydrograph for storms between the 2 year and the 100 year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of development. Prior to development within the Retreat at TimberRidge property, final drainage reports and construction plans will be required detailing the requirements and specifics of proposed facilities. To the greatest extent possible, WQCV will be provided for all new roads and urban lots.

The following describes how this development proposes to handle both the off-site and on-site drainage conditions:

Note: flow values not cross-checked against calculations.



As mentioned previously, the majority of the off-site flows are already within the Sand Creek channel prior to entering the property. However the few off-site basins that must travel through the proposed site development areas prior to entering Sand Creek have been accounted for.

The following represent the basins west of Sand Creek:

Basin OS-5 ($Q_2 = 1$ cfs $Q_5 = 64$ cfs, $Q_{100} = 42$ cfs) represents off-site semi-forested, undeveloped property zoned for 5 ac. residential that is currently tributary to this site via an existing 48" CMP culvert under Vollmer. If future development occurs on this property, any developed flows must be detained beyond this pre-development quantity. An extension of this culvert is planned with the improvements of Arroya Lane to route these off-site flows directly to Sand Creek and by-pass the proposed development.

← Address the size and type of pipe, outfall, and impact to Sand Creek

Basin OS-3 ($Q_2 = 3$ cfs $Q_5 = 4$ cfs, $Q_{100} = 8$ cfs) represents the existing Arroya Lane platted ROW. These flows will continue to travel in side road ditches in an easterly direction towards Sand Creek. Proposed improvements to Arroya Lane will formalize these conveyance efforts.

← Address WQCV

Basins A1 ($Q_2 = 1.7$ cfs $Q_5 = 5$ cfs, $Q_{100} = 23$ cfs), A2 ($Q_2 = 1.0$ cfs $Q_5 = 3$ cfs, $Q_{100} = 14$ cfs), A3 ($Q_2 = 0.7$ cfs $Q_5 = 2$ cfs, $Q_{100} = 10$ cfs) and A4 ($Q_2 = 0.7$ cfs $Q_5 = 1$ cfs, $Q_{100} = 5$ cfs) are all tributary to the proposed Pond B. These basins collect flows from a portion of the rural 2.5 ac. lot development on the property with various culvert crossings designed to convey the proposed ditch flows towards Pond B. Based on the UD Detention Spreadsheet for this basin, the total developed flows entering **Pond B equal ($Q_2 = 3.1$ cfs $Q_5 = 4.7$ cfs, $Q_{100} = 48.1$ cfs)**. A proposed full-spectrum EDB is proposed at this location to release less than the pre-development flows currently seen. (See UD Detention Spreadsheet – Pond B for anticipated outlet structure and release levels) At this point, we have also shown a possible alternate location for this facility. (See Drainage Map) With the Final Plat and Drainage Report it will be determined which location works best from a lotting and development standpoint.



Basins B1 ($Q_2 = 2.7$ cfs $Q_5 = 8$ cfs, $Q_{100} = 38$ cfs) and B2 ($Q_2 = 1.2$ cfs $Q_5 = 3$ cfs, $Q_{100} = 16$ cfs) are tributary to the proposed Pond C. These basins collect flows the rest of the portion of the rural 2.5 ac. lot development west of Sand Creek with various culvert crossings designed to convey the proposed ditch flows towards Pond C. Based on the UD Detention Spreadsheet for this basin, the total developed flows entering **Pond C equal ($Q_2 = 3.1$ cfs $Q_5 = 4.8$ cfs, $Q_{100} = 48.1$ cfs)**. A proposed full-spectrum EDB is proposed at this location to release less than the pre-development flows currently seen. (See UD Detention Spreadsheet – Pond C for anticipated outlet structure and release levels)

urban/paved, isn't it?

Basin B3 ($Q_2 = 1.7$ cfs $Q_5 = 2$ cfs, $Q_{100} = 4$ cfs) represents the south half of the proposed Poco Road extension into the site. The north half of the road has been accounted for in the basins mentioned above. At this time it is undetermined if this roadway will be rural or urban. This report assumes it will be rural and thus the south half of the roadway will continue to sheet flow off-site.

Basins A5 ($Q_2 = 0.9$ cfs $Q_5 = 3$ cfs, $Q_{100} = 12$ cfs) and B4 ($Q_2 = 1.9$ cfs $Q_5 = 6$ cfs, $Q_{100} = 27$ cfs) represent portions of the rural 2.5 ac. lots west of Sand Creek that cannot reasonably be collected into the two facilities just described. With the minimal impervious areas anticipated on these large lots, these basins will continue to sheet flow towards Sand Creek. Per the ECM Section I.7.1.B, WQCV is not required for these lots given their size (2.5 Ac.). Also, the City owned regional facility downstream of this property (Sand Creek #3) is an in-line facility that provides stormwater quality. Basin H ($Q_2 = 0.8$ cfs $Q_5 = 2$ cfs, $Q_{100} = 11$ cfs) is proposed for two large lots averaging 3.5 ac. each west of Vollmer. Again, per the ECM Section I.7.1.B, WQCV is not required for these lots given their size (2.5 Ac. +). However, sediment control will be provided on each individual lot. After this sediment control, the minimal developed flow from these lots will be allowed to continue to sheet flow directly into the side road ditch along Vollmer Road.

The following represent the basins east of Sand Creek:

see plan
redlines

no; provide
WQCV

Basins OS-4 and EX-4 calculations are included in this report but details for these basins and Pond A are part of the Preliminary Drainage Report for north of Arroya Lane, prepared by Terra Nova Engineering.



Address capture of existing flows. Is offsite grading and easement required?

Basins C1 ($Q_2 = 2.5$ cfs $Q_5 = 6$ cfs, $Q_{100} = 25$ cfs) and OS-1A ($Q_2 = 0.4$ cfs $Q_5 = 1$ cfs, $Q_{100} = 9$ cfs) are tributary to the Design Point 7. These basins represent on-site 2.5 ac. – 1.0 ac. lots and off-site future Sterling Ranch development which is planned to continue to sheet flow on-site through the proposed lots. A 30" RCP culvert will collect the flows at this location and route them further downstream within the on-site storm system. Basins C2 ($Q_2 = 1.4$ cfs $Q_5 = 3$ cfs, $Q_{100} = 11$ cfs) and OS-1B ($Q_2 = 1.6$ cfs $Q_5 = 6$ cfs, $Q_{100} = 41$ cfs) are tributary to the Design Point 8 and the on-site storm system. These basins represent on-site 1.0 ac. lots and off-site future Sterling Ranch development. A 30" RCP storm stub is proposed to collect the future off-site flows at this location. In the interim, prior to on-site development in this phase, the existing on-site stock pond will remain in place and continue to act as a sediment facility for the off-site flows. Upon development in this phase, the stock pond will be removed and storm system provided to handle these off-site flows. Future off-site Sterling Ranch development in this basin will need to meet these pre-development flows at this location. At Design Point 8, assuming an even split of flows at this time, 5' Type R sump inlets will collect the developed flows and route them further downstream in a 36" RCP storm system. The Final Drainage Report will further detail the exact inlet design.

Basins D2 ($Q_2 = 6.4$ cfs $Q_5 = 11$ cfs, $Q_{100} = 35$ cfs) and OS-2A ($Q_2 = 0.1$ cfs $Q_5 = 0.6$ cfs, $Q_{100} = 4$ cfs) are tributary to the Design Point 9. These basins represent on-site 1.0 ac. – 1/3 ac. lots and off-site future Sterling Ranch development which is planned to continue to sheet flow on-site through the proposed lots. At this location, assuming an even split of flows at this time, 10' Type R sump inlets will collect the developed flows and route them further downstream in a 42" RCP storm system. The Final Drainage Report will further detail the exact inlet design.

Basins D1 ($Q_2 = 2.4$ cfs $Q_5 = 4$ cfs, $Q_{100} = 14$ cfs) and OS-2B ($Q_2 = 0.2$ cfs $Q_5 = 0.6$ cfs, $Q_{100} = 4$ cfs) are tributary to the Design Point 10. These basins represent on-site 1/3 ac. lots and off-site future Sterling Ranch development which is planned to continue to sheet flow on-site through the proposed lots. At this location, assuming an even split of flows at this time, 5' Type R sump inlets will collect the developed flows and route them further downstream in a 24" RCP storm system. The Final Drainage Report will further detail the exact inlet design.



Basins D3 ($Q_2 = 1.8$ cfs $Q_5 = 3$ cfs, $Q_{100} = 10$ cfs), OS-2C ($Q_2 = 1$ cfs $Q_5 = 4$ cfs, $Q_{100} = 25$ cfs) and OS-2D ($Q_2 = 0.07$ cfs $Q_5 = 0.3$ cfs, $Q_{100} = 2$ cfs) are tributary to the Design Point 11 and the on-site storm system. These basins represent on-site 1/3 ac. lots and off-site future Sterling Ranch development. A 30" RCP storm stub is proposed to collect the future off-site flows at this location. Future off-site Sterling Ranch development in this basin will need to meet these pre-development flows at this location. At Design Point 11, assuming an even split of flows at this time, 5' Type R sump inlets will collect the developed flows and route them further downstream in a 36" RCP storm system. The Final Drainage Report will further detail the exact inlet design.

Basins D5 ($Q_2 = 5.6$ cfs $Q_5 = 10$ cfs, $Q_{100} = 31$ cfs) and OS-2E ($Q_2 = 0.2$ cfs $Q_5 = 0.9$ cfs, $Q_{100} = 6$ cfs) are tributary to the Design Point 12. These basins represent on-site 1/3 ac. – 1/4 ac. lots and off-site future Sterling Ranch development which is planned to continue to sheet flow on-site through the proposed lots. At this location, assuming an even split of flows at this time, 10' Type R sump inlets will collect the developed flows and route them along with the upstream flows directly into Pond D. The Final Drainage Report will further detail the exact inlet design.

Basin D4 ($Q_2 = 3.6$ cfs $Q_5 = 6$ cfs, $Q_{100} = 18$ cfs) is tributary to Design Point 13. This basin represents on-site 1/4 ac. lots. At this location, assuming an even split of flows at this time, 5' Type R sump inlets will collect the developed flows and route them further downstream in a 24" RCP storm system. The Final Drainage Report will further detail the exact inlet design.

Basin D6 ($Q_2 = 6.4$ cfs $Q_5 = 11$ cfs, $Q_{100} = 35$ cfs) is tributary to Design Point 14. This basin represents on-site 1/4 ac. lots. At this location, assuming an even split of flows at this time, 10' Type R sump inlets will collect the developed flows and route them along with the upstream flows directly into Pond D. The Final Drainage Report will further detail the exact inlet design. Based on the UD Detention Spreadsheet for this basin, the total developed flows entering **Pond D equal ($Q_2 = 33$ cfs $Q_5 = 48$ cfs, $Q_{100} = 236$ cfs)**. A proposed full-spectrum EDB is proposed at this location to release less than the pre-development flows currently seen. (See UD Detention Spreadsheet – Pond D for anticipated outlet structure and release levels)



Basin D10 ($Q_2 = 1.1$ cfs $Q_5 = 2$ cfs, $Q_{100} = 6$ cfs) represents the rear yards of proposed lots that cannot reasonably be collected by the proposed Pond D and will then continue to sheet flow off-site. Basins C3 ($Q_2 = 2.1$ cfs $Q_5 = 5$ cfs, $Q_{100} = 21$ cfs), D8 ($Q_2 = 1.3$ cfs $Q_5 = 2$ cfs, $Q_{100} = 7$ cfs) and D9 ($Q_2 = 1.0$ cfs $Q_5 = 2$ cfs, $Q_{100} = 5$ cfs) represent portions of the rear yards that are adjacent to Sand Creek that cannot reasonably be collected into the proposed Pond D just described. With the minimal impervious areas anticipated on the rear of these lots, these basins will continue to sheet flow towards Sand Creek. However, as mentioned earlier, the City owned regional facility downstream of this property (Sand Creek #3) is an in-line facility that provides stormwater quality for this minimal area. Basins F1 ($Q_2 = 1.0$ cfs $Q_5 = 4$ cfs, $Q_{100} = 24$ cfs) and F2 ($Q_2 = 0.3$ cfs $Q_5 = 1$ cfs, $Q_{100} = 8$ cfs) represent the Sand Creek Channel corridor. This area will not have any development take place in it other than the required channel improvements per the DBPS and the proposed roadway crossings.

Both the Poco Road extension and Arroya Lane are proposed to cross Sand Creek. At both these locations a triple cell 6'x12' CBC is proposed to handle the 100 yr. off-site flows. (See culvert calculations in Appendix)

**Address offsite easement(s)
required for Poco bridge.**

DETENTION FACILITIES / STORMWATER QUALITY

Final design of these recommended facilities that include planning for water quality management of storm water runoff features will be designed during final platting of this development. As required, storm water quality measures will be utilized in order to reduce the amount of sediment, debris and pollutants that are allowed to enter Sand Creek. These features include but are not limited to the multiple Full Spectrum Extended Detention Basins. Site Planning and design techniques for the large lot, rural areas should limit impervious area, minimize directly impervious area, lengthen time of travel and increase infiltration in order to decrease the rate and volume of stormwater runoff. Urban areas that require detention will provide a Water Quality Capture Volume (WQCV) and Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume that will release the more frequent storms at a slower rate to help minimize the effects of development of the property. These measures will be taken into consideration upon final design of the individual detention facilities as well as the development of the individual land uses within the site.



Address if this velocity is adequate (slow enough) and FEMA FIS velocities (see comment letter).

MAINTENANCE

The proposed detention/SWQ facilities are to be private facilities with ownership and maintenance by the local Metropolitan District or Homeowners Association. After completion of construction and upon the Board of County Commissioners acceptance, the Sand Creek channel will be owned and maintained by the El Paso County along with all drainage facilities within the public Right of Way.

SAND CREEK CHANNEL IMPROVEMENTS

Clarify -- isn't the proposed development more urban than the DBPS assumptions?

As stated in the Sand Creek DBPS, this Reach SC-9 is recommended as a floodplain preservation design concept. Given the fact of the current requirements for detention/SWQ with these facilities planned for the property and less urbanization anticipated in this reach, the existing drainageway is expected to remain stable. However, localized improvements may be necessary in any steeply incised channel locations and to limit erosion caused by flow concentrations at culverts and storm sewers outfalls. Determination of the specific channel improvements will be made upon further channel analysis/investigation along with the future Final Drainage Report(s). However, specifically located grade control and/or drop structures were specified in the DBPS through this reach in order to slow the canal velocity to the recommended 7 feet per second and to prevent localized and long-term stream degradation from affecting channel linings and overbanks. These facilities will help protect the native wetland vegetation from detrimental effects of stream invert head cutting. A maximum drop height of three feet is recommended with final design following the Urban Drainage Criteria Manual Vol. 2. Concept locations for these facilities are shown on the developed drainage map as recommended in the DBPS. Revegetation would occur wherever the native vegetation is disturbed by channel construction. Selectively located rip-rap bank protection such as outside bends and culvert outlets are also recommended. Also, based on the wetland delineations prepared by CORE Consultants, Inc., likely impacts to jurisdictional waters would trigger permitting under Section 404 of the Clean Water Act. This coordination and permitting would be completed along with the approval process of the final construction plans for the associated channel improvements.

proposed?

Per the approved DBPS, the anticipated developed flows just upstream of this project are $Q_{10} = 630$ cfs and $Q_{100} = 2170$ cfs as depicted within segment no. 171. The anticipated developed flows exiting this property are $Q_{10} = 670$ cfs and $Q_{100} = 2260$ cfs as depicted within segment no. 170. The northern

Preliminary analysis and recommendations need to be provided in this report.

Address FEMA flows and ultimate developed flows.



portion of Sterling Ranch is immediately downstream of this property. This portion of their development appears to be in the later phases and as such has not yet been analyzed for specific channel improvements. However, per the approved DBPS, similar grade control and check structures are shown in Sterling Ranch within Reach SC-8 as are recommended in Reach SC-9 through the TimberRidge property. Based on these anticipated flows, two proposed roadway crossings of Sand Creek are planned for this site. (Arroya Lane and the proposed east-west connector road) The current crossing of Arroya Lane is with a 60" CMP culvert. Upon development, the proposed crossing will consist of a triple cell 6'x12' CBC to facilitate the conveyance of the 100 yr. flow. This same structure is proposed at the crossing with the collector roadway as well. These facilities, along with all proposed channel improvements would be designed to continue to contain the 100 yr. flows within the current floodplain as defined by the LOMR 08-080541P. Upon final design of these culvert crossings and anticipated channel improvements, further floodplain analysis will be required to either suggest a no-rise certification or prepare an updated CLOMR/LOMR for associated improvements affecting the current 100 yr. floodplain. The Arroya Lane proposed culvert crossing is described in the DBPS as a single 6'x12' concrete box culvert (10 yr.) design. However, we would propose a triple cell 6'x12' box culvert at this location, designed to convey the 100 yr. developed flows. Based on this design we would request this facility be eligible towards this developments drainage fee obligation. (Reference the Drainage and Bridge Fees)

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Detention storage and storm sewer conveyance to Sand Creek Drainage Basin was established with the Sand Creek DBPS, previously referenced. The NRCS Unit Hydrograph (Curve Number) was used to estimate stormwater runoff anticipated from design storms for the 2 year, 5 year and 100 year recurrence interval with a 24 hour NRCS Type II distribution.

Also provide Rational calculation criteria.



Rainfall Depths for Colorado Springs

Return Period	24-Hour Depth
2 Year	2.10
5 Year	2.70
10 Year	3.20
25 Year	3.60
50 Year	4.20
100 Year	4.60

FLOODPLAIN STATEMENT

Portions of this site are located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0535F and the previously mentioned LOMR 08-08-0541P both with effective date of July 23, 2009. (See Appendix).

DRAINAGE AND BRIDGE FEES

Any applicable fees shall be provided in the Final Drainage Report(s) prior to final plat recordation of any development within this site. The following represents the anticipated overall fees for this site:

Sand Creek Drainage Basin

This site lies entirely within the Sand Creek Drainage Basin boundaries.

The fees are calculated using the following impervious acreage method approved by El Paso County.

The Retreat at TimberRidge site has a total area of 234.1 acres (including the 10 lots north of Arroya Lane which are not a part of this report) with the following different land uses proposed:

22.4 Ac.	Sand Creek Drainage corridor – Basins F1 and F2)
94.8 Ac.	2.5 Ac. lots
13.4 Ac.	1.0 Ac. lots
42.8 Ac.	1/3 Ac. lots
24.4 Ac.	1/4 Ac. lots



The percent imperviousness for this subdivision is calculated as follows:

Fees for Sand Creek Drainage Corridor

(Per El Paso County Percent Impervious Chart: 2%)

$$22.4 \text{ Ac.} \times 2\% = \mathbf{0.45 \text{ Impervious Ac.}}$$

Fees for 2.5 Ac. lots

(Per El Paso County Percent Impervious Chart: 11% with
25% fee reduction for 2.5 ac. lots planned)

$$94.8 \text{ Ac.} \times 11\% \times 75\% = \mathbf{7.82 \text{ Impervious Ac.}}$$

Fees for 1.0 Ac. lots

(Per El Paso County Percent Impervious Chart: 20%)

$$13.4 \text{ Ac.} \times 20\% = \mathbf{2.68 \text{ Impervious Ac.}}$$

Fees for 1/3 Ac. lots

(Per El Paso County Percent Impervious Chart: 30%)

$$42.8 \text{ Ac.} \times 30\% = \mathbf{12.84 \text{ Impervious Ac.}}$$

Fees for 1/4 Ac. lots

(Per El Paso County Percent Impervious Chart: 40%)

$$24.4 \text{ Ac.} \times 40\% = \mathbf{9.76 \text{ Impervious Ac.}}$$

Total Impervious Acreage: 33.55 Imp. Ac.

The following calculations are based on the 2018 drainage/bridge fees:

ESTIMATED FEE TOTALS (prior to reduction):

Bridge Fees

$$\$ 5,210.00 \times 33.55 \text{ Impervious Ac.} \quad = \quad \underline{\underline{\$ 174,795.50}}$$

Drainage Fees

$$\$ 17,197.00 \times 33.55 \text{ Impervious Ac.} \quad = \quad \underline{\underline{\$ 576,959.35}}$$



The effect of the project's increased impervious acreage needs to be taken into account as to whether the detention facilities will be reimbursable. Compare to the situation if development were all rural lots. In either case, the drainage and bridge fees will need to be updated to account for additional costs.

Per the ECM 3.10.4a and 3.10.5.a, this development requests a reduction of drainage fees based on the on-site full spectrum detention/SWQ facilities and regional channel improvements for this stretch of Sand Creek as shown in the DBPS. The following facilities within the Sand Creek Drainage Basin seem to meet the criteria for this reduction:

Detention Pond B	5.3 ac-ft. full spectrum	\$ 50,000 x 50% =	\$ 25,000.00
Detention Pond C	5.3 ac-ft. full spectrum	\$ 50,000 x 50% =	\$ 25,000.00
Detention Pond D	5.3 ac-ft. full spectrum	\$ 90,000 x 50% =	\$ 45,000.00
Triple Cell 6'x12' CBC Crossing Arroya Lane		\$ 250,000 =	\$ 250,000.00
Sand Creek Channel Improvements per DBPS		\$ 175,000 =	\$ 175,000.00

(Exact facility costs provided with final drainage report(s))

ESTIMATED FEE TOTALS (with reduction):

Bridge Fees

\$ 5,210.00 x 33.55 Impervious Ac. = \$ 174,795.50

Drainage Fees

\$ 576,959.35 - 520,000.00 = \$ 56,959.35

SUMMARY

The proposed Retreat at TimberRidge Preliminary Plan is within the Sand Creek Drainage Basin. Recommendations are made within this report concerning necessary improvements that may be required as a result of development of this property. The points of storm water release from the proposed site are required to be at or below the calculated historic flow quantities. The development of the proposed site does not hinder any downstream facility or property to an extent greater than that which currently exists in the 'historic' conditions. All drainage facilities within this report were sized according to the Drainage Criteria Manuals and the full-spectrum storm water quality requirements. Upon development of the individual parcels within the site, separate Final Drainage Reports will be required to be submitted and approved by El Paso County that details all storm systems, pond design and fee calculation.

impact?



PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC



Marc A. Whorton, P.E.
Project Manager

maw/252000/MDDP.doc



REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.
2. “Urban Storm Drainage Criteria Manual Volume 1, 2 & 3” Urban Drainage and Flood Control District, dated January 2016.
3. “Final Drainage Report for Forest Gate Subdivision” Law & Mariotti Consultants, Inc. dated October 2004.
4. “Sand Creek Drainage Basin Planning Study,” Kiowa Engineering Corporation, dated March 1996.
5. “Master Development Drainage Plan for The Retreat at TimberRidge”, Classic Consulting, approved March 2018.



APPENDIX

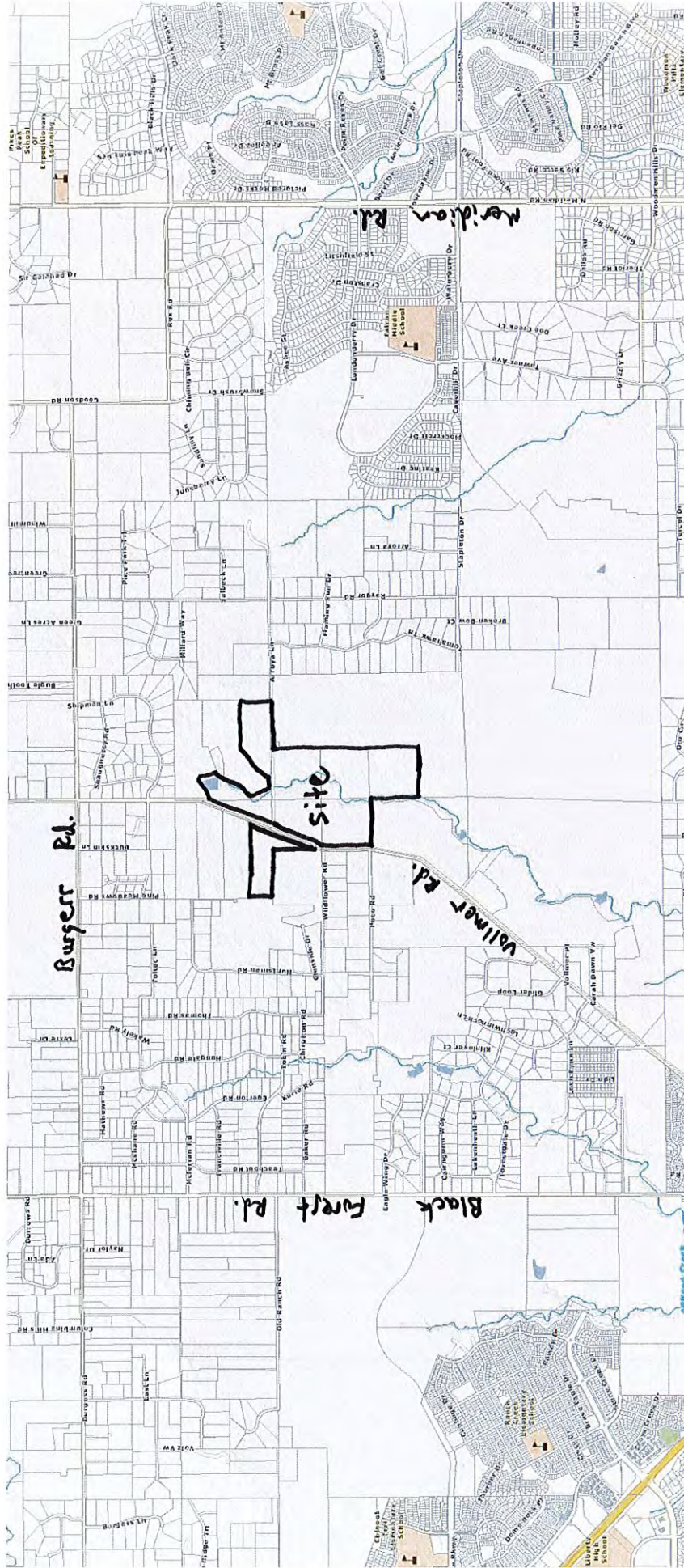
VICINITY MAP

El Paso County Assessor's Office

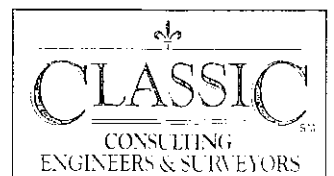
Vicinity Map



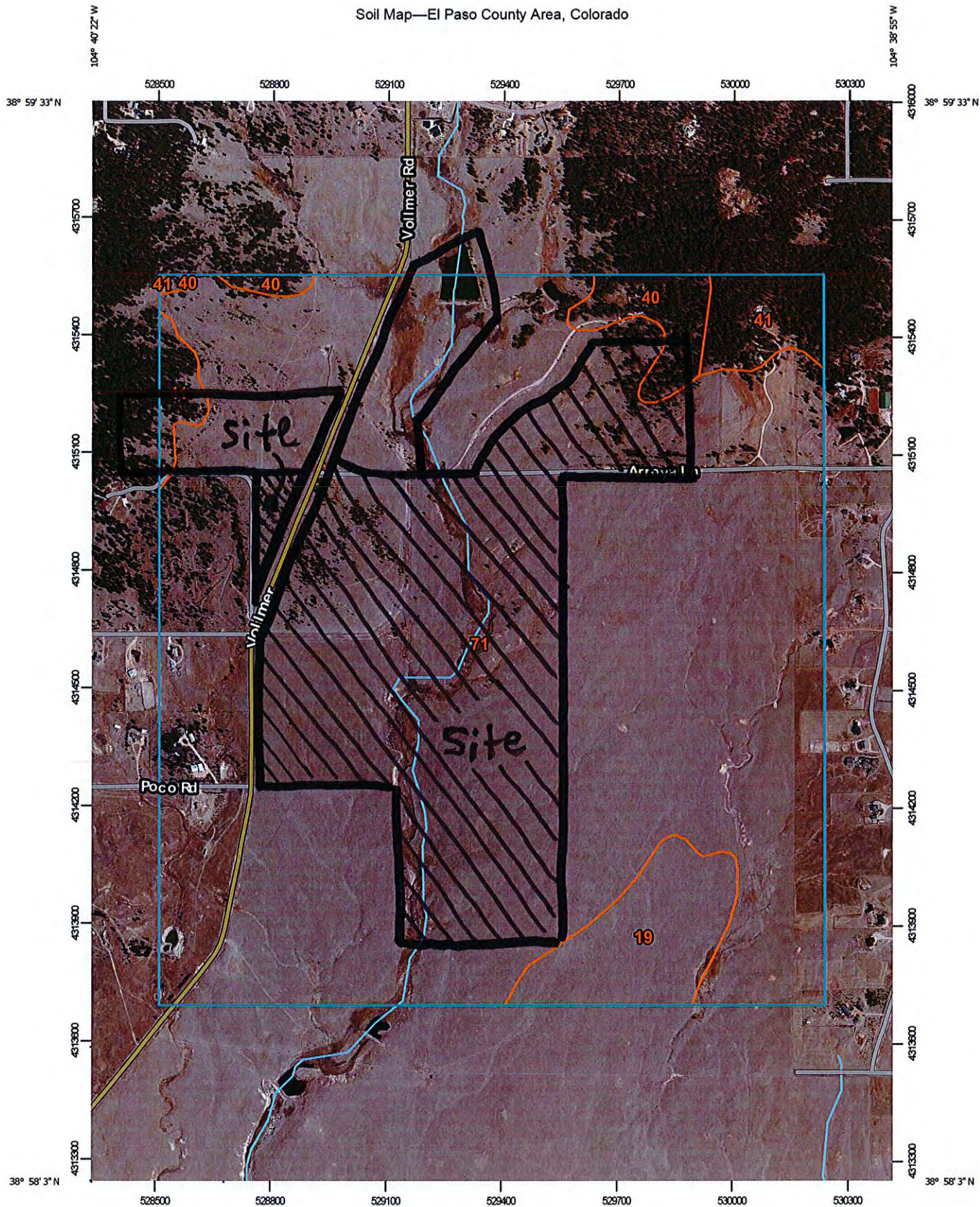
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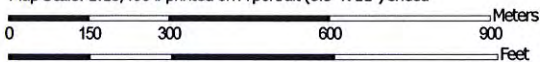
SOILS MAP (S.C.S SURVEY)



Soil Map—El Paso County Area, Colorado



Map Scale: 1:13,400 if printed on A portrait (8.5" x 11") sheet.



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



MAP LEGEND

- Area of Interest (AOI)
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points
- Special Point Features**
 - Blowout
 - Borrow Pit
 - Clay Spot
 - Closed Depression
 - Gravel Pit
 - Gravelly Spot
 - Landfill
 - Lava Flow
 - Marsh or swamp
 - Mine or Quarry
 - Miscellaneous Water
 - Perennial Water
 - Rock Outcrop
 - Saline Spot
 - Sandy Spot
 - Severely Eroded Spot
 - Sinkhole
 - Slide or Slip
 - Sodic Spot
- Water Features**
 - Streams and Canals
- Transportation**
 - Ralls
 - Interstate Highways
 - US Routes
 - Major Roads
 - Local Roads
- Background**
 - Aerial Photography
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

MAP INFORMATION

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

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://www.nrcs.usda.gov/wss>

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 14, Sep 23, 2016

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.

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	36.5	4.6%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	19.0	2.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	24.8	3.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	719.1	90.0%
Totals for Area of Interest		799.4	100.0%

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:

Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

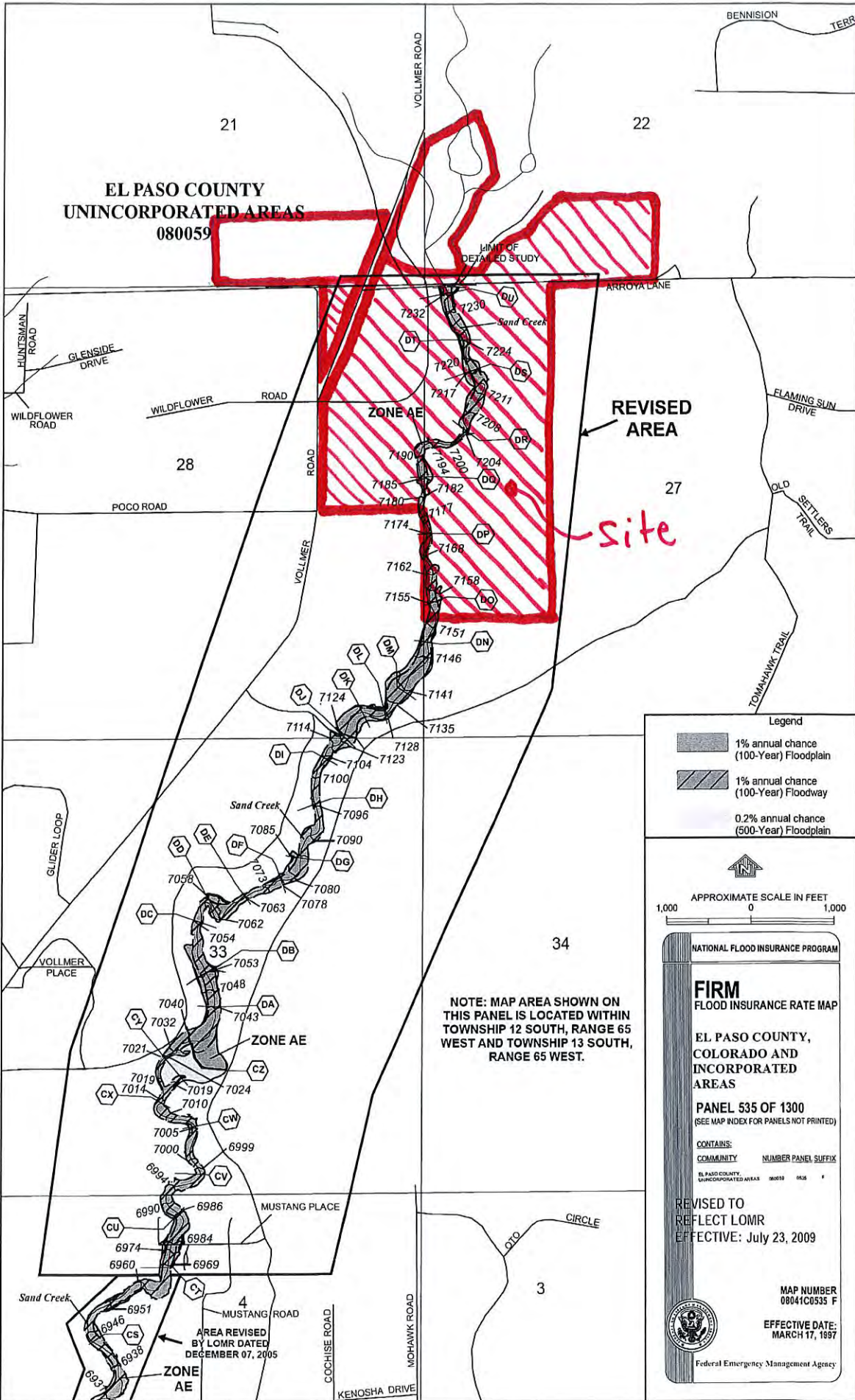
Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

F.E.M.A. MAP / LOMR (08-08-0541P)







Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	El Paso County Colorado (Unincorporated Areas)	NO PROJECT	HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 080059		
IDENTIFIER	Sand Creek Letter of Map Revision, Mustang Place to Arroya Lane	APPROXIMATE LATITUDE & LONGITUDE: 38.971, -104.668 SOURCE: USGS QUADRANGLE DATUM: NAD 27	
ANNOTATED MAPPING ENCLOSURES		ANNOTATED STUDY ENCLOSURES	
TYPE: FIRM* NO.: 08041C0535 F DATE: March 17, 1997		DATE OF EFFECTIVE FLOOD INSURANCE STUDY: August 23, 1999 PROFILE(S): 204P(a), 204P(b), 204P(c) AND 204P(d) FLOODWAY DATA TABLE: 5	

Enclosures reflect changes to flooding sources affected by this revision.

* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Sand Creek - from approximately 360 feet downstream of Mustang Place to just downstream of Arroya Lane

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Sand Creek	Zone A	Zone AE	YES	YES
	No BFEs*	BFEs	YES	NONE
	No Floodway	Floodway	YES	NONE

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

David N. Bascom, Program Specialist
Engineering Management Branch
Mitigation Directorate



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in cursive script that reads "David N. Bascom".

David N. Bascom, Program Specialist
Engineering Management Branch
Mitigation Directorate



Federal Emergency Management Agency
Washington, D.C. 20472

**LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)**

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine D. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

A handwritten signature in cursive script that reads "David N. Bascom".

David N. Bascom, Program Specialist
Engineering Management Branch
Mitigation Directorate



Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NGVD 29)		MAP PANEL NUMBER(S)
		EFFECTIVE	REVISED	
Sand Creek	Just upstream of Mustang Place	None	6,984	08041C0535 F
	Just downstream of Arroya Lane	None	7,238	08041C0535 F

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. A short notice also will be published in your local newspaper on or about the dates listed below. Please refer to FEMA's website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp for a more detailed description of proposed BFE changes, which will be posted within a week of the date of this letter.

LOCAL NEWSPAPER Name: *El Paso County News*
 Dates: 03/18/09 03/25/09

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at <http://www.fema.gov/nfip>.

David N. Bascom, Program Specialist
 Engineering Management Branch
 Mitigation Directorate

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION				
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY FEET (NGVD)	WITH FLOODWAY FEET (NGVD)	INCREASE	
Sand Creek (cont'd)	CA	164	427	6.1	6,748.7	6,748.7	6,749.4	0.7	
	CB	65,292	223	11.7	6,761.2	6,761.2	6,762.2	1.0	
	CC	66,092	270	9.6	6,773.6	6,773.6	6,773.7	0.1	
	CD	66,247	218	11.9	6,782.6	6,782.6	6,783.3	0.7	
	CE	67,647	284	8.8	6,793.9	6,793.9	6,794.4	0.5	
	CF	68,297	213	11.7	6,804.5	6,804.5	6,804.5	0.0	
	CG	69,147	213	11.7	6,815.1	6,815.1	6,815.3	0.2	
	CH	70,157	347	7.2	6,823.9	6,823.9	6,824.5	0.6	
	CI	70,577	267	9.4	6,826.7	6,826.7	6,827.7	1.0	
	CJ	70,627	180	7.3	6,831.1	6,831.1	6,831.1	0.0	
	CK	70,727	340	7.5	6,832.5	6,832.5	6,832.5	0.0	
	CL	70,807	195	334	9.8	6,838.0	6,838.0	6,839.0	1.0
	CM	71,162	90	255	5.2	6,847.4	6,847.4	6,848.3	0.9
	CN	71,977	226	503	7.9	6,861.1	6,861.1	6,861.2	0.1
	CO	73,052	174	328	7.1	6,870.2	6,870.2	6,870.2	0.0
	CP	73,644	237	364	8.0	6,888.5	6,888.5	6,888.7	0.2
	CQ	75,142	172	324	9.2	6,903.5	6,903.5	6,903.7	0.2
	CR	76,161	109	283	9.6	6,926.1	6,926.1	6,926.7	0.6
	CS	77,846	100	272	9.1	6,944.1	6,944.1	6,944.1	0.0
	CT	79,187	117	287	8.4	6,969.2	6,969.2	6,969.2	0.0
CU	80,808	142	310	7.6	6,986.1	6,986.1	6,986.5	0.4	
CV	81,501	120	342	8.8	6,997.4	6,997.4	6,997.4	0.0	
CW	82,281	124	295	11.0	7,005.3	7,005.3	7,006.1	0.8	
CX	82,897	64	237	9.8	7,013.9	7,013.9	7,013.9	0.0	
CY	83,517	90	266	10.7	7,024.3	7,024.3	7,024.3	0.0	
CZ	84,087	70	244	8.1	7,040.2	7,040.2	7,040.2	0.0	
	84,473	160	322						

REVISED TO REFLECT LOMR EFFECTIVE: July 23, 2009

¹ Feet Above Confluence With Fountain Creek

FLOODWAY DATA

FEDERAL EMERGENCY MANAGEMENT AGENCY
EL PASO COUNTY, CO
AND INCORPORATED AREAS

SAND CREEK

TABLE 5

Revised Data From LOMR Dated Dec. 7, 2005

Revised Data

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY FEET (NGVD)	WITH FLOODWAY FEET (NGVD)	INCREASE
Sand Creek (cont'd)								
DA	85,073	139	456	5.7	7,043.0	7,043.0	7,043.1	0.1
DB	85,483	170	328	7.9	7,053.4	7,053.4	7,053.5	0.1
DC	86,103	100	274	9.5	7,054.4	7,054.4	7,054.4	0.0
DD	86,673	197	434	6.0	7,061.7	7,061.7	7,062.0	0.3
DE	87,073	83	270	9.6	7,068.2	7,068.2	7,068.3	0.1
DF	87,573	98	325	8.0	7,077.7	7,077.7	7,077.9	0.2
DG	88,003	135	304	8.6	7,085.1	7,085.1	7,085.1	0.0
DH	88,738	89	263	9.9	7,096.9	7,096.9	7,096.9	0.0
DI	89,303	74	249	10.4	7,104.1	7,104.1	7,104.3	0.2
DJ	89,663	143	309	8.4	7,123.2	7,123.2	7,123.2	0.0
DK	90,058	140	426	6.1	7,125.1	7,125.1	7,125.2	0.1
DL	90,348	102	276	9.4	7,127.6	7,127.6	7,127.8	0.2
DM	90,698	300	398	6.5	7,141.0	7,141.0	7,141.0	0.0
DN	91,388	120	292	8.9	7,148.5	7,148.5	7,148.6	0.1
DO	91,868	105	313	8.3	7,155.2	7,155.2	7,155.9	0.7
DP	92,748	65	239	10.9	7,173.8	7,173.8	7,173.8	0.0
DQ	93,468	117	288	9.0	7,184.6	7,184.6	7,184.6	0.0
DR	94,448	81	260	10.0	7,204.5	7,204.5	7,204.6	0.1
DS	95,343	100	274	9.5	7,216.8	7,216.8	7,217.2	0.4
DT	95,723	77	252	10.3	7,224.2	7,224.2	7,224.3	0.1
DU	96,333	90	266	9.8	7,232.5	7,232.5	7,233.0	0.5

Q100 (ex) = 2,600 cfs

REVISED TO REFLECT LOMR

EFFECTIVE: July 23, 2009

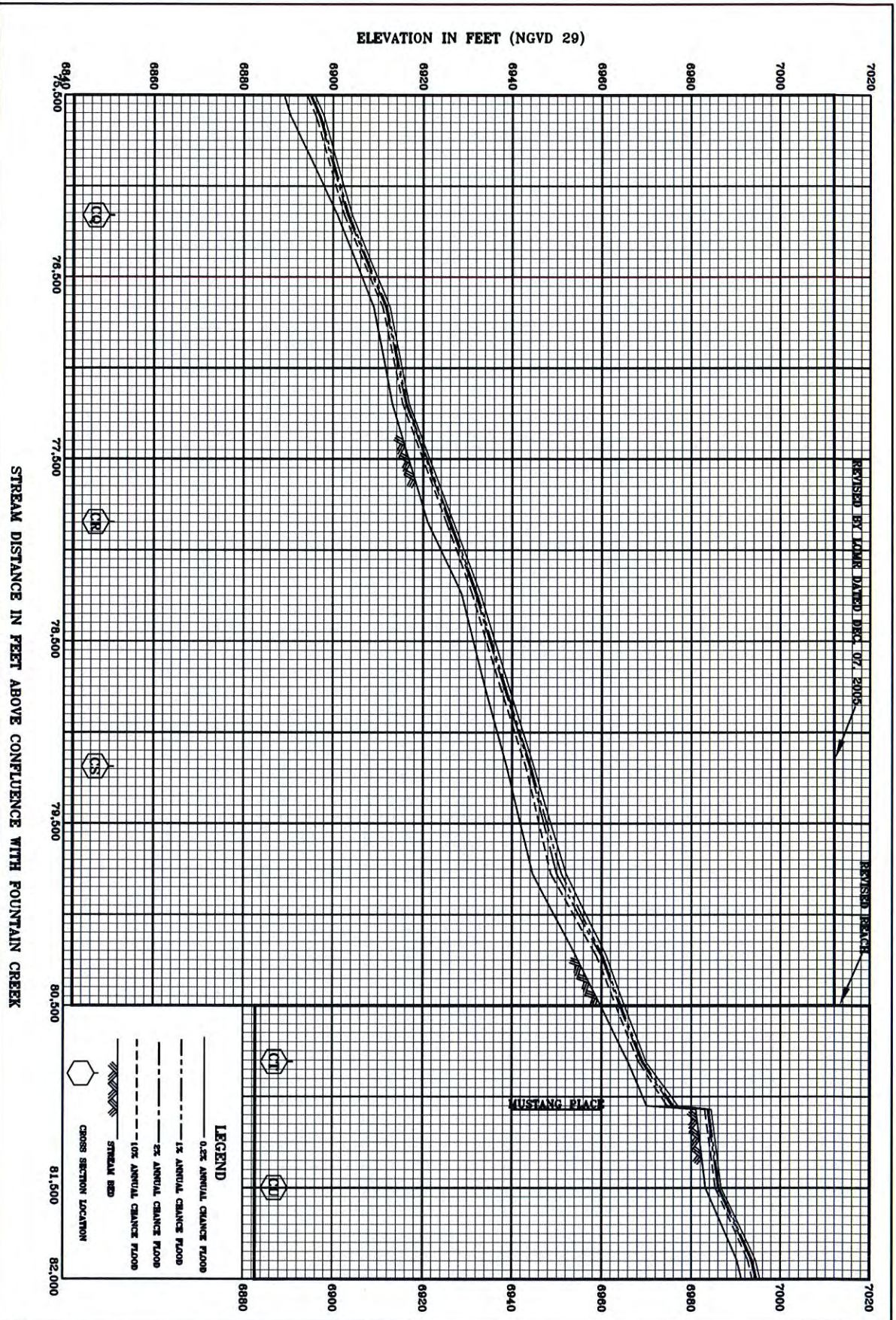
¹ Feet Above Confluence With Fountain Creek

FLOODWAY DATA

FEDERAL EMERGENCY MANAGEMENT AGENCY
EL PASO COUNTY, CO
 AND INCORPORATED AREAS

SAND CREEK

TABLE 5



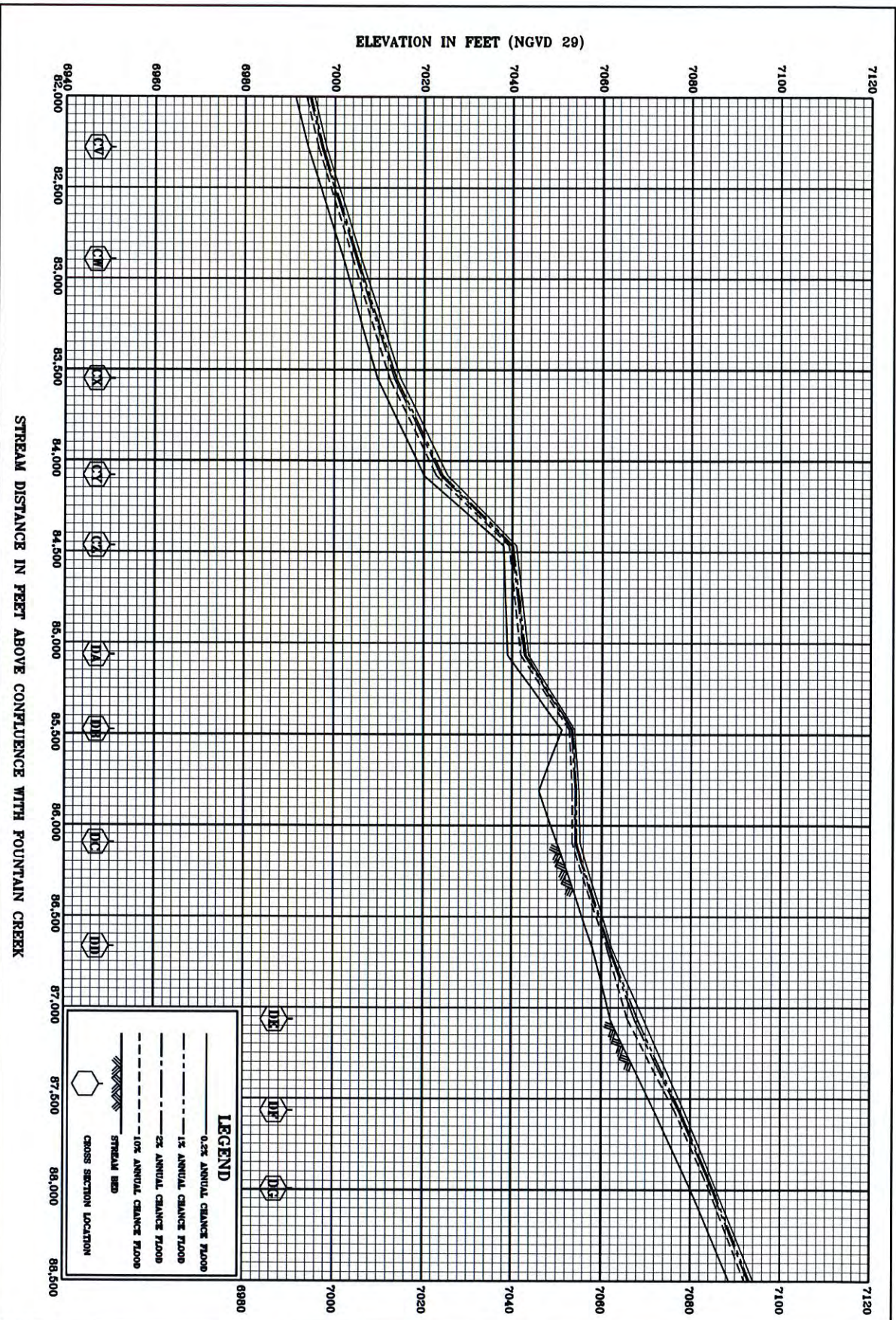
204P(a)

FEDERAL EMERGENCY MANAGEMENT AGENCY
 EL PASO COUNTY, CO
 AND INCORPORATED AREAS

REVISED TO
 REFLECT LOMR
 EFFECTIVE: July 23, 2009

FLOOD PROFILES

SAND CREEK



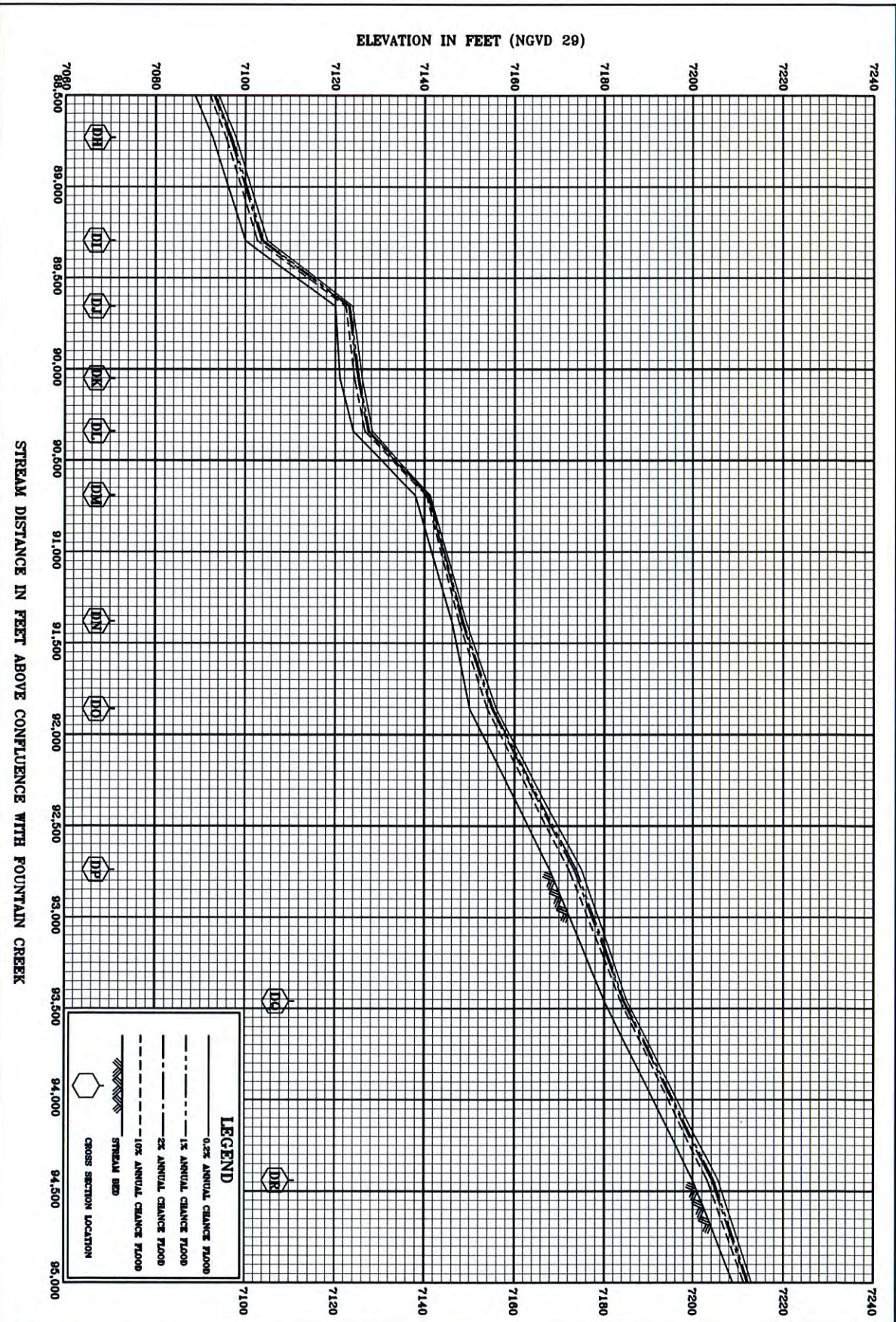
204P(b)

FEDERAL EMERGENCY MANAGEMENT AGENCY
 EL PASO COUNTY, CO
 AND INCORPORATED AREAS

FLOOD PROFILES

REVISED TO
 REFLECT LOMR
 EFFECTIVE: July 23, 2009

SAND CREEK



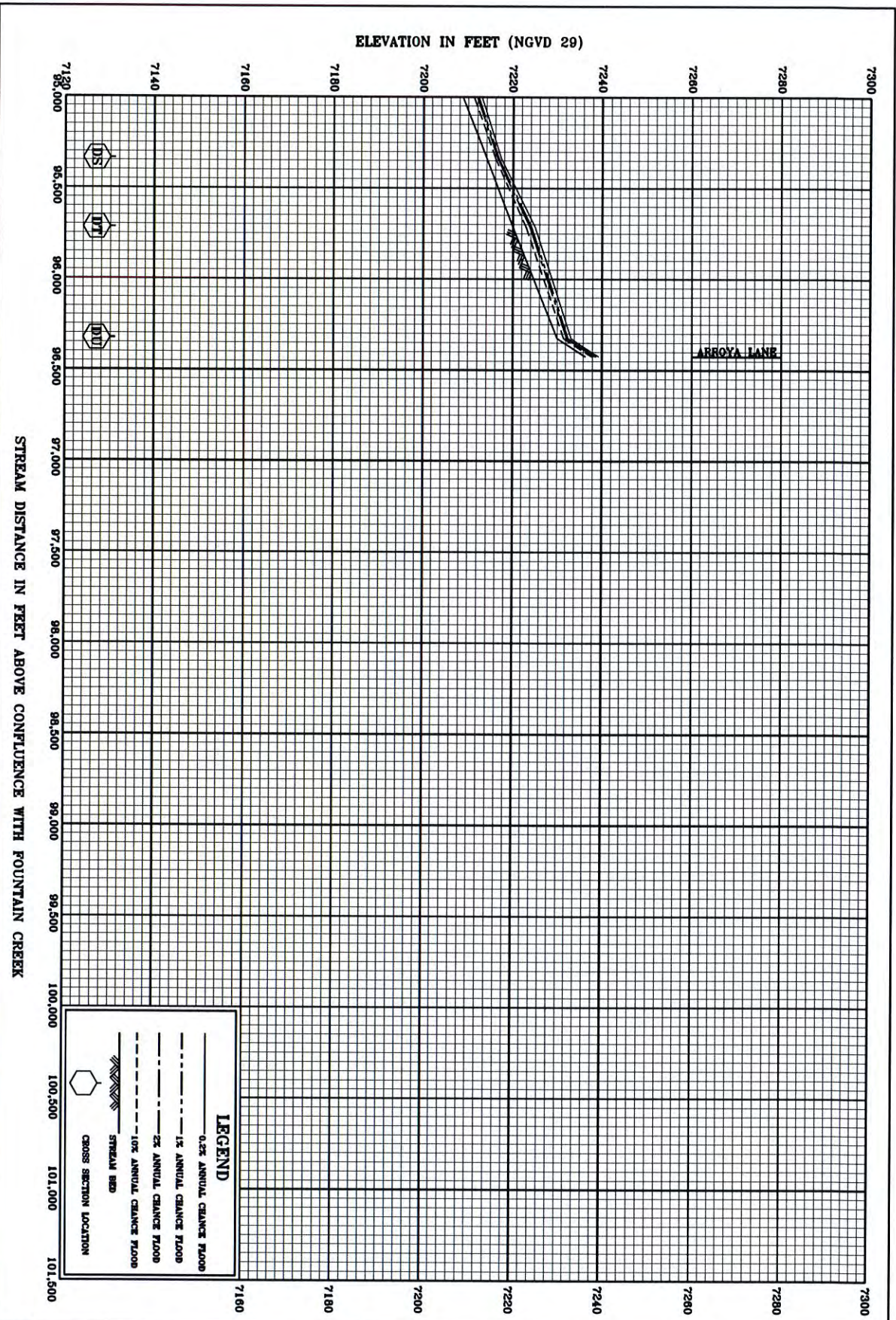
204P(c)

FEDERAL EMERGENCY MANAGEMENT AGENCY
 EL PASO COUNTY, CO
 AND INCORPORATED AREAS

FLOOD PROFILES

REVISED TO
 REFLECT LOMR
 EFFECTIVE: July 23, 2009

SAND CREEK



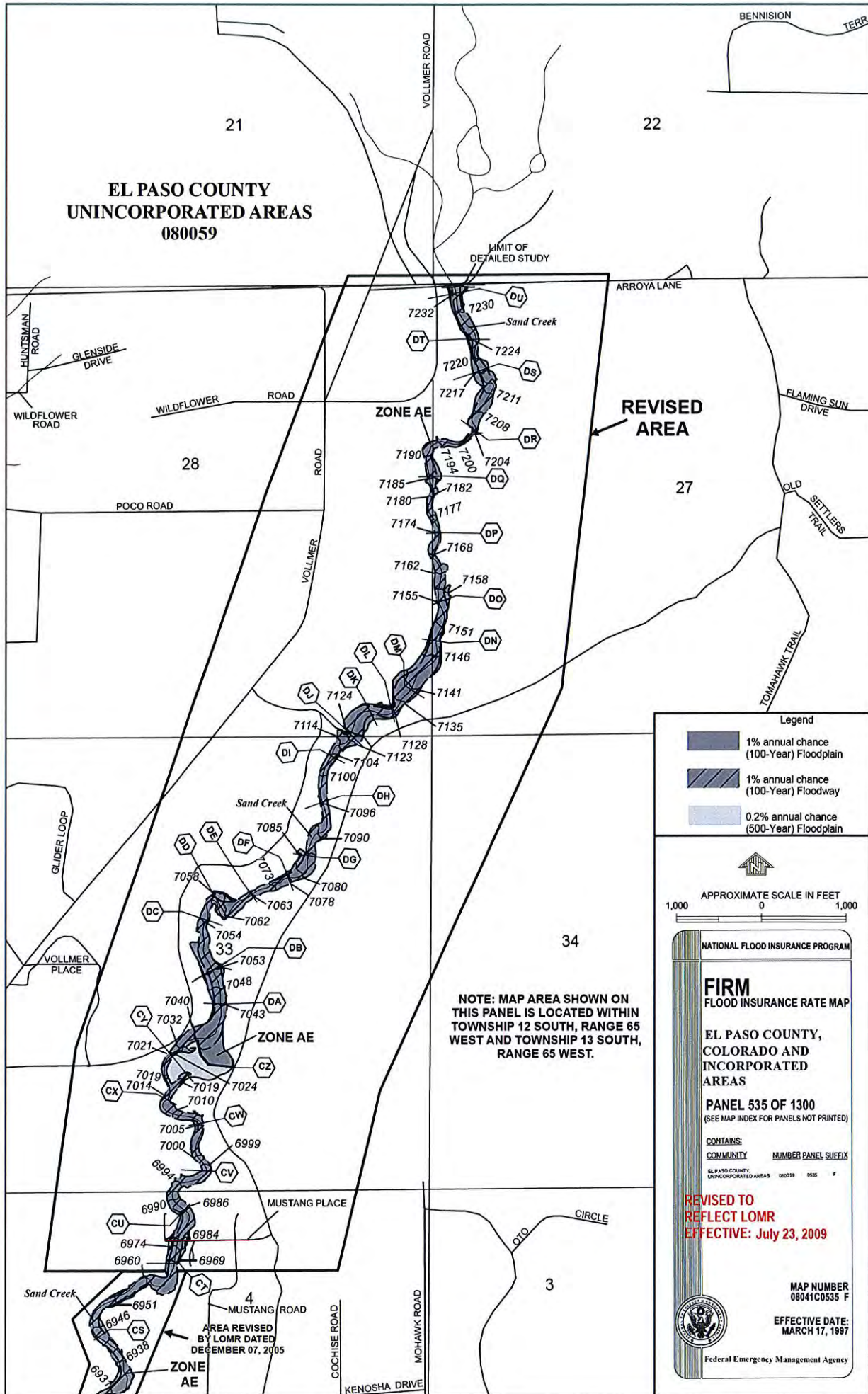
FEDERAL EMERGENCY MANAGEMENT AGENCY
 EL PASO COUNTY, CO
 AND INCORPORATED AREAS

FLOOD PROFILES
 SAND CREEK

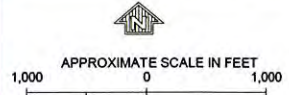
REVISED TO
 REFLECT LOMR
 EFFECTIVE: July 23, 2009

204P(D)

**EL PASO COUNTY
UNINCORPORATED AREAS
080059**



- Legend
- 1% annual chance (100-Year) Floodplain
 - 1% annual chance (100-Year) Floodway
 - 0.2% annual chance (500-Year) Floodplain



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED
AREAS

PANEL 535 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS 080059 0535 F

**REVISED TO
REFLECT LOMR
EFFECTIVE: July 23, 2009**

MAP NUMBER
08041C0535 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

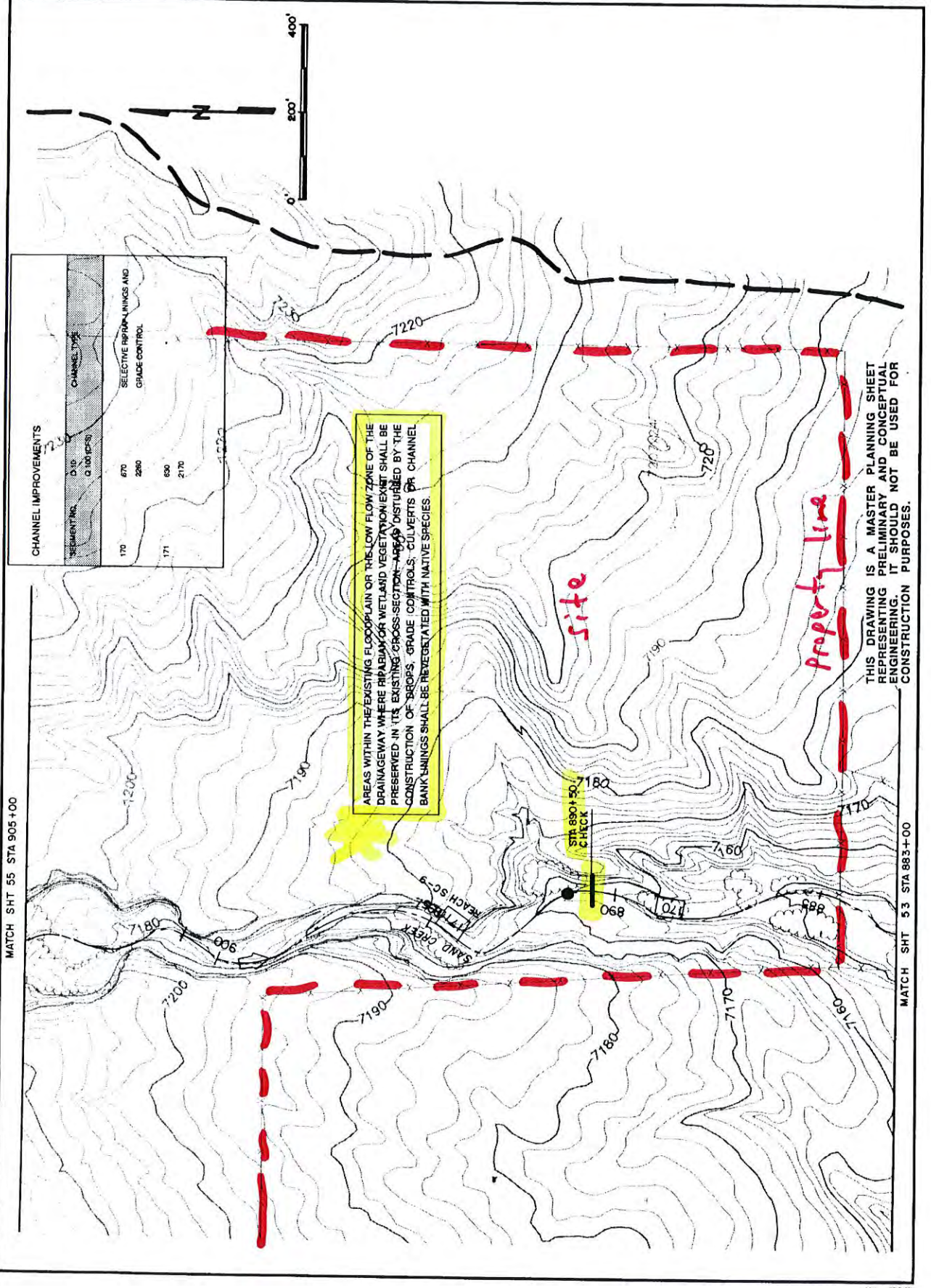
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

AREA REVISED BY LOMR DATED DECEMBER 07, 2005

RECOMMENDATIONS PER SAND CREEK DBPS



Project No.	9034708
Sheet No.	54
Design	RNW
Drawn	EAK
Checked	RNW
Reviewed	



THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

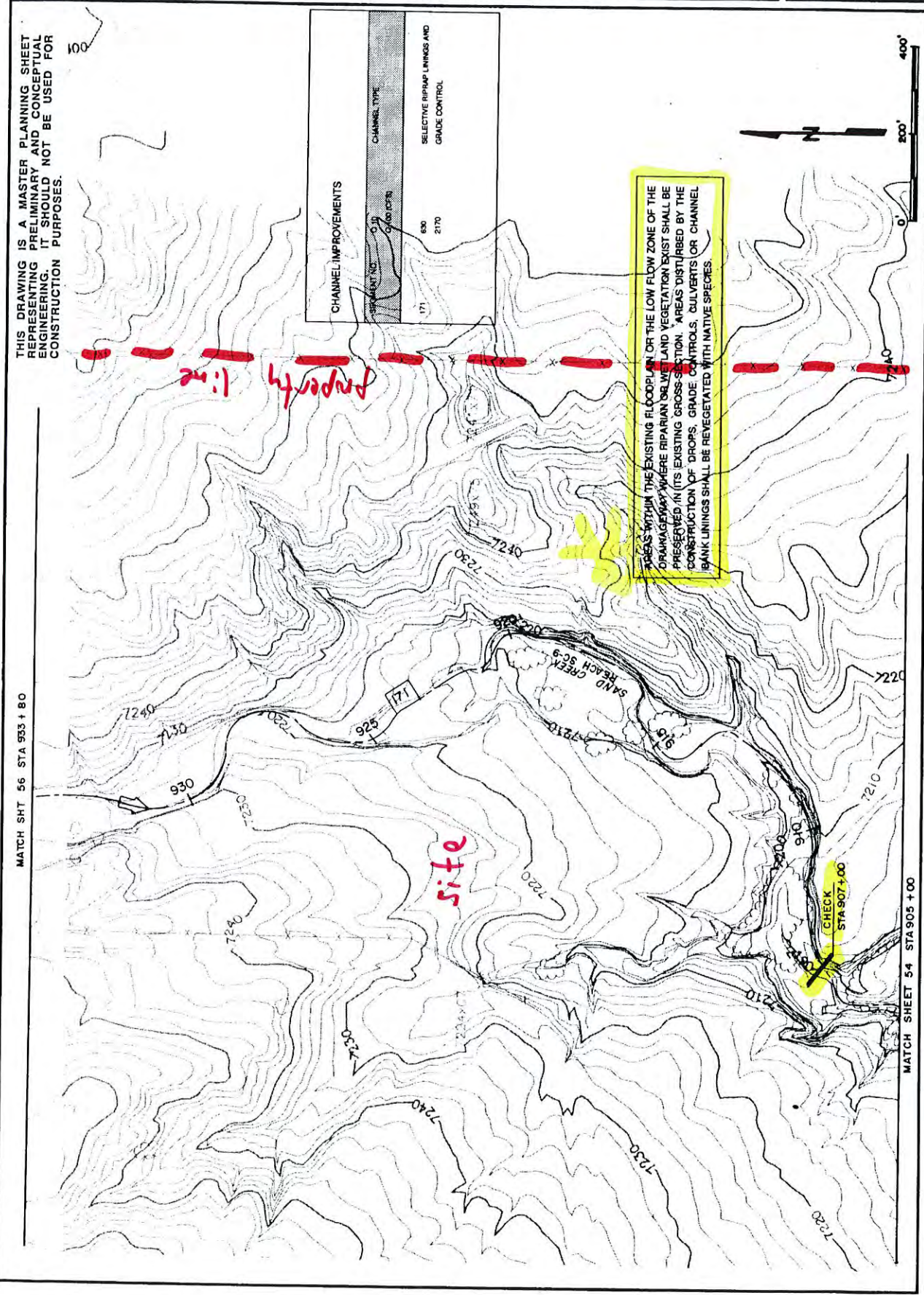
MATCH SHT 56 STA 933 + 80

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80905-1308

CHANNEL IMPROVEMENTS	CHANNEL TYPE	SELECTIVE RIPRAP LININGS AND GRADE CONTROL
171	6x6x6 CFS	6x6
2170		2170

SAND CREEK DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No.	80-04-09
Drawn	RAW
Check	EAK
Review	RAW



AREAS WITHIN THE EXISTING FLOODPLAIN OR THE LOW FLOW ZONE OF THE DRAINAGE WHERE RIPARIAN OR WETLAND VEGETATION EXIST SHALL BE PRESERVED IN ITS EXISTING CROSS-SECTION. AREAS DISTURBED BY THE CONSTRUCTION OF DROPS, GRADE CONTROLS, CULVERTS OR CHANNEL BANK LININGS SHALL BE REVEGETATED WITH NATIVE SPECIES.

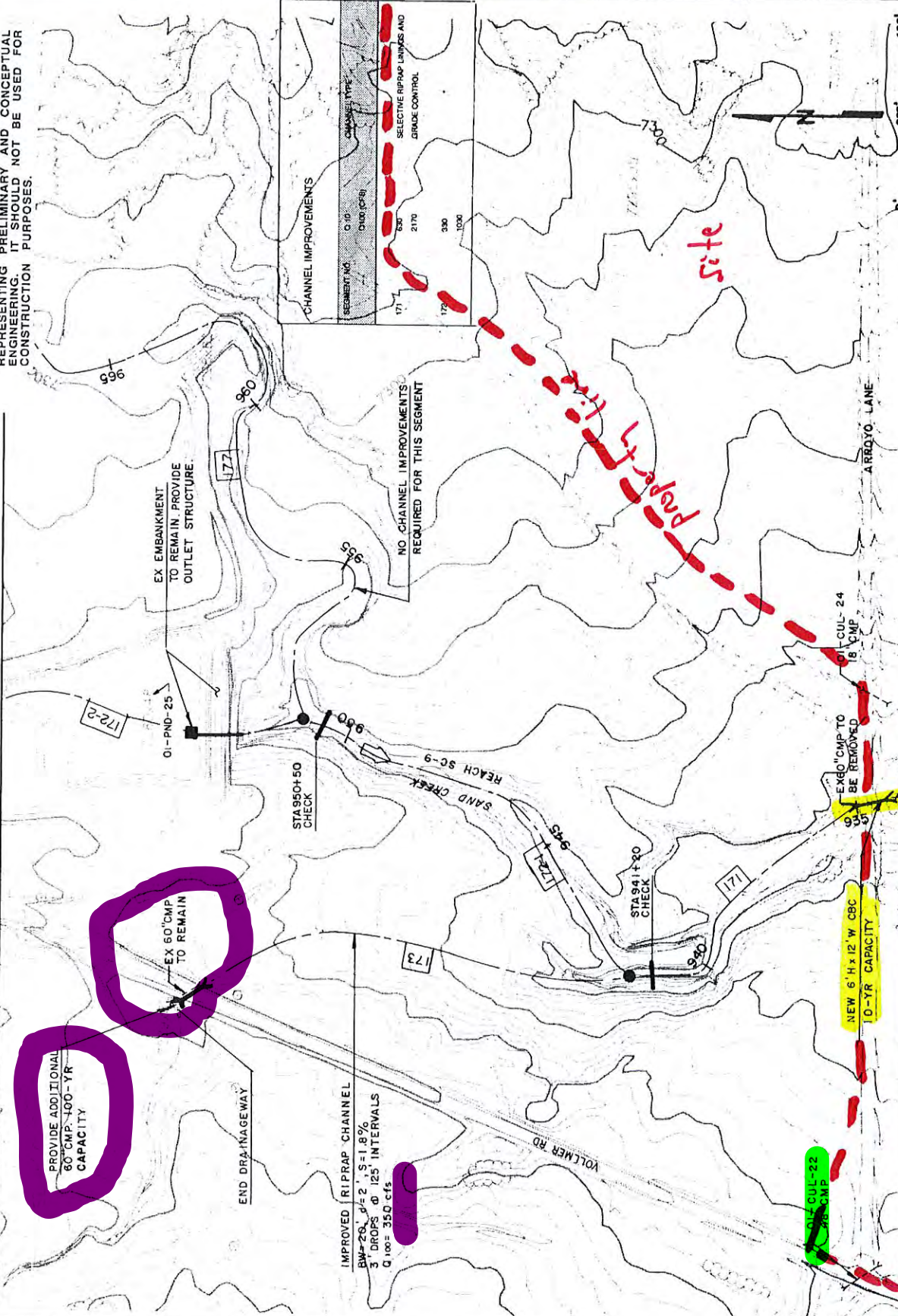
Site

Property line

CHECK STA 907+00

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRIMARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

MATCH SHT 57 STA 968 + 00



MATCH SHT 55 STA 933 + 80

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80905-1308

SAND CREEK DRAINAGE
BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No.	90-04-09
Date	9/82
Drawn	RNW
Checked	EAK
Reviewed	RNW
Approved	

56

VI. DEVELOPMENT OF ALTERNATIVES AND RECOMMENDED PLAN

The concepts which are available for handling stormwater runoff within the Sand Creek basin have been presented and discussed in detail in the Sand Creek Drainage Basin Planning Study Development of Alternatives Report and the draft East Fork Sand Creek Drainage Basin Planning Study. The process of combining the various channel treatment options, detention schemes and roadway crossing structures into a contiguous plan for all of the reaches is presented in this chapter of the report. As a result of the evaluation of the flood control, environmental, open space, operations and maintenance, and implementation concerns within the Sand Creek basin, the following concepts were identified as having sufficient feasibility to warrant further evaluation and review:

Channel Concepts:	Floodplain Preservation Channelization, 10- or 100-year Selective Improvements
Detention:	Regional detention systems

Channel Concepts: The channel concepts listed above have been evaluated with respect to the parameters listed in the previous chapter. A concept's feasibility depends upon its impact, positive or negative, upon the evaluation parameters. *The floodplain preservation* concept has been considered to be the same as the "do-nothing" alternative. The floodplain preservation concept would involve the regulation of the floodplain limits, generally as depicted on the effective City of Colorado Springs and El Paso County Flood Insurance Rate Maps. Regulation of the floodplain so that future encroachments are minimized and the floodproofing of structures which are currently within the 100-year floodplain would presumably be the methods used to address the flood hazard concerns along Sand Creek. In the upper reaches of Sand Creek, the ownership or easements associated with the 100-year floodplain (or greater limits to allow for an erosion buffer zone) would be a primary issue in regards to implementation of such a concept. Detention in the upper reaches of the basin Sand Creek basin and in the East Fork Sand Creek basin will maintain the 100-year floodplain at existing limits within the lower reaches of Sand Creek. The "do-nothing" concept is feasible wherever

the existing drainageway improvements are of adequate capacity to convey flood flows. *Channelization* would involve the lining of the Creek into a more confined flow area, and could be done for either the 100-year or 10-year flood discharges. Several typical channel concepts have been presented. The primary bank lining material would probably be riprap. Grade control and/or drop structures would be required in a channelization concept so that the flood velocities could be controlled to a level requiring medium to heavy riprap. Soil cement offers an alternative to riprap and concrete for the construction of drops or grade control structures. *Revegetation* would occur wherever the native vegetation was disturbed by the channel construction. *Willows* at the toe of the riprap banks would be a minimum replacement. *Selective linings* would involve the construction of grade controls, drop structures, bank linings, storm sewer outlet control structures selectively sited to resist stream erosion or to reduce potential flooding damages. Areas of future concern such as at the outside bends of the creek, or at the outlets of bridges or culverts which will cross the drainageway would be subject to selective improvements.

Detention Concepts: The two general detention concepts evaluated were onsite versus regional detention. During the evaluation process, it was determined that the onsite detention concept has a low feasibility relative to a regional concept. This is because, (1) onsite detention has a unpredictable impact upon lowering peak discharges from urbanized areas to historic conditions (reference, Urbonas and Glidden, "Effect of Detention on Flows in Major Drainageways" ASCE Water Forum '81, 1981), (2) an onsite concept has little impact upon maintaining or enhancing water quality, (3) the number of onsite detention basins, their locations and size cannot be accurately determined in the undeveloped portions of the basin at this time, and (4) onsite detention would present a substantial maintenance responsibility to the jurisdictions involved. For these reasons the onsite detention concept was eliminated and regional detention basin concepts were developed. In the analysis of the channel concepts, regional detention facilities were assumed to be in place.

Channel Alternatives

Presented on Table VI-1 is a matrix of channel alternatives which were evaluated. All reaches of Sand Creek and the East Fork of Sand Creek had at least three alternatives analyzed. Presented on Tables VI-2 through VI-6 are comparative evaluations of the floodplain preservation (do-nothing), channelization and selective lining concepts, for the mainstem Sand Creek basin, by reach. The purpose of the evaluation process was to identify the relative advantages and disadvantages of each concept within each reach.

100-year peak discharge to levels. This will allow for the channel improvements to be constructed within the existing right-of-way.

Reaches SC-5 and SC-6: A selective channel improvement concept has been recommended for these reaches. Detention in Reach SC-8 of the basin will maintain flows to historic peak discharge levels, however the low flows will increase in frequency and volume. For this reason it has been recommended to provide riprap channel linings at selective locations to at least the 10-year water surface and install grade controls. This will prevent the long-term degradation of the invert. A residual 100-year floodplain will remain and will offer opportunities for habitat replacement and open space preservation. Land adjacent to the drainageway is currently undeveloped or unplatted at this time which makes the feasibility of implementing this concept greater in comparison to the urbanized reaches of the creek.

Reaches SC-7 and SC-8: A selective improvement concept involving the localized lining of channel banks and grade control construction has been recommended for these reaches. The feasibility of this concept stems from the fact that flows will be reduced because of detention. Numerous individual rural ownerships cross the drainageway, however no habitable structures lie within the 100-year floodplain. Because of this, the economic feasibility of channelization concepts is low. Non-structural measures can be used to limit encroachments into flood-prone areas. Additionally, the City of Colorado Springs Comprehensive plan recommends that the floodplains be maintained as open space. Potential habitat disturbances can be avoided with a selective plan, or simply replaced as part of the particular construction activity which caused the disturbance.

Reach SC-9: A floodplain preservation concept has been recommended for this reach. Little increase in urbanization is anticipated in this reach, and for this reason the existing drainageway is expected to remain stable. Localized improvements may be necessary to limit erosion caused by flow concentrations at culverts or storm sewers. Private ownership of the drainageway is anticipated to continue which lower the feasibility of channel concepts which require permanent right-of-ways or easements for construction and maintenance.

Reaches WF-1 through WF-3: A 100-year channel concept has been recommended for these reaches primarily because of the potential for flooding damages. Several roadway crossings are in need of replacement because of the flood hazard the constrictions create. Some open space enhancement potential exists for this concept since these reaches have been degraded visually by debris accumulation, bank sloughing and sedimentation. Little opportunity exists for widening the drainageway because the

Development of the Recommended Plan

Presented on Table VI-7 is a matrix representing the recommended plan for each major drainageway reach. The selection of a recommended channel treatment scheme has been based upon the qualitative and quantitative information presented in the Sand Creek Drainage Basin Planning Study Development of Alternatives report and the draft East Fork Sand Creek Drainage Basin Planning Study. Contained within the Technical Addendum to the Sand Creek Drainage Basin Planning Study Development of Alternatives report, is the alternative hydrologic, hydraulic and conceptual cost data used in the evaluation and comparison of each of the alternatives within the mainstem Sand Creek basin.

Discussion of Recommended Plan

The recommendation of a particular channel treatment or detention scheme has been based upon the qualitative and quantitative data presented. For each reach the flood hazard, environmental, cost, operations and maintenance and open space aspects of the drainageway were weighed for each alternative concept.

Reach SC-1: For this reach a 10-year channel section was recommended for further evaluation. With the implementation of regional detention in the upper basin, the 100-year floodplain will generally be confined within the existing banks, excepting at roadway crossings lacking 100-year capacity. It is recommended that a 10-year low flow channel be constructed within the invert of the existing channel through the construction of benches and sand bars. As urbanization continues towards the full development scenario, the base flow and annual flows will increase in volume and frequency. For this reason, the low flow area must be stabilized to protect the existing channel banks from undermining and subsequent bank sloughing. The benched areas offer an opportunity for habitat replacement and enhancement. At some locations within this reach, a residual 100-year floodplain will remain which will have to be regulated. The residual 100-year floodplain offers some potential for open space preservation and enhancement. This is particularly true in the portion of the reach downstream of Hancock Expressway.

Reaches SC-2 through SC-4: A 100-year channel concept has been recommended primarily because of the potential for flooding damages which exists in these reaches. Habitat disturbed by the construction of channel linings and grade control structures could be replaced along the channel toes and on the overbanks. The replacement of the Waymoka Road crossing will reduce the potential for flood damages in areas adjacent to these roadways. The detention within the upper reaches will limit the

VII. PRELIMINARY DESIGN

The results of the preliminary design analysis are summarized in this section. The alternative improvements have been quantitatively and qualitatively evaluated, and presented to the City of Colorado Springs and other interested agencies and individuals. Field review of specific areas of concern have been conducted in order to refine the channel treatments suggested for use along Sand Creek, East Fork Sand Creek and their major tributaries. The preliminary plan for the recommended alternative is shown on the drawings contained at the rear of this report.

Criteria

The City of Colorado Springs, El Paso County Drainage Criteria Manual was used in the development of the typical sections and plans for the major drainageways within the Basin. The City/County manual was supplemented by various criteria manuals with more specific application. These were:

1. "Design Guidelines and Criteria for Channels and Hydraulic Structures on Sandy Soils," prepared by Simons, Li & Associates, Inc., 1981.
 2. Urban Storm Drainage Criteria Manual, Volumes I, II, and III, prepared by the Urban Drainage and Flood Control District.
- Various design plans for roadway and channel improvement projects, either proposed or already constructed were reviewed in order to prepare the preliminary design plans. Specifically, the project design plans for the Las Vegas Street and Galley Road bridge replacement projects were reviewed and the improvements incorporated in the preliminary design. The proposed Sand Creek Stabilization Project, AT&SF Railroad to Hancock Expressway and the proposed Sand Creek Stabilization Project at Fountain Boulevard design plans have been reviewed and incorporated into the preliminary design plan and profiles.

Hydrology

Presented on Table VII-1 is selected hydrologic data to be used for the sizing of major drainageway improvements within the Basin. **Peak flow rates for the 10- and 100-year frequency incorporating and the selected detention alternatives for the Sand Creek and East Fork Sand Creek Basin are summarized for key points along the major drainageways.**

Contained within the The technical addenda of this report contains a complete listing of peak discharges for all the sub-basins, stream segments and design points shown on Exhibit 1.

The sizing the drainageway improvements for the tributaries will need to be verified during the final design and layout of the proposed drainageway facilities. Land development activities may alter the location of design points along the tributaries, and therefore slight alteration in a sub-basin's length, slope and area may occur. The methods outlined in the City/County Drainage Criteria Manual should be applied during final design analysis. The rational method should be used to check the peak flow rates for all tributary drainageways and storm sewers draining areas less than 100 acres in size.

Channels

The recommended channel sections for each reach of drainageway has been outlined in Section VI of this report. In general, the banks of Sand Creek channel, from the confluence with Fountain Creek to the proposed Sand Creek Detention Basin No. 2 are to be lined, or in some cases relined, with riprap to either a 10-year or 100-year flow depth, as shown on the preliminary design plans. Above the Sand Creek Detention Basin No. 2, selectively located riprap bank protection such as at outside bends, at bridge or culvert outlets, and at confluences with side tributaries have been recommended. In conjunction with the selective improvement measures, and the 10-year low flow concept, the 100-year floodplain should be preserved and regulated. Wherever existing bank linings were judged to be adequate, no improvements have been recommended at this time.

For the West Fork Sand Creek, 100-year riprap bank linings have been recommended in order to address the 100-year flooding hazard which exists at numerous locations along the West Fork. The final design improvements shown in the Palmer Park Bridge Replacement project drawings have been incorporated into the preliminary design plans. In the uppermost reaches of the West Fork, a short segment of rectangular concrete channel has been recommended because of right-of-way constraints.

For the Center Tributary of Sand Creek, 100-year riprap lined channels have been recommended from the confluence with East Fork to Platte Avenue. Above Platte Avenue, the existing concrete channels have adequate capacity except where the drainageway channel has yet to be improved. The final design plans for the US 24 Bypass Project, Phase II have been incorporated into the plans. As part of the bypass construction, it is proposed to line the Center Tributary using riprap. The location of the proposed roadway, new crossings, drops and channel as shown on the Phase II Bypass plans have been reflected on the preliminary design drawings.

For the East Fork Sand Creek drainageway, riprap lined channel banks have been recommended for the majority of the reaches. This is mainly because of the high level of development predicted for the basin in the area known as the Banning-Lewis Ranch development. Open space to accommodate the 100-year floodplains should be allowed for as the East Fork Sand Creek drainageways develop. This is consistent with the Banning-Lewis Ranch master development plan which was approved at the time of annexation of this property. Above Woodmen Road, selective channel lining improvements and grade control structures have been recommended.

For the most part the side tributaries have been recommended to be lined with riprap, however there are some locations in the upper basin which have been proposed to be grasslined. The location of the side drainageways should be considered approximate and may very likely be modified in the future because of land development.

The primary criteria used when sizing the proposed channel sections has been velocity. For all riprap lined channels, the average design velocity should be no greater than 9 feet per second. This criteria allows for the use of Type H riprap within the main flow area of the drainageway. For the case of a 10-year channel with an overall floodplain section, limiting the main channel velocity to 9 feet per second will result in overbank velocities in the five feet per second range. At this level of overbank velocity, native vegetation will be able to withstand the erosive forces which might result in a 100-year flow event. Velocities approaching 10 feet per second could occur at constrictions such as at roadway crossings and at culvert outlets.

Drop Structures and Check Structures

Drop and check structures have been sited along Sand Creek in order to slow the channel velocity to the recommended 7 feet per second, and to prevent localized and long-term stream degradation from affecting channel linings and overbanks. In the reaches to be selectively lined, drops and check structures will protect the native vegetation from the detrimental effects of stream invert headcutting. Several types of structures could be considered for the Sand Creek Basin. For channel bottom widths in excess of fifty feet, soil cement or sheet piling drops/checks are feasible. For channels narrower than this, reinforced concrete structures are probably the best alternative. **A maximum drop height of three feet is recommended. The methodology recommended for use when designing vertical structures is contained with Volume II of the Urban Storm Drainage Criteria Manual.**

Detention

The recommended plan calls for the construction of six regional detention basins within the Sand Creek basin, and six regional basins within the East Fork Sand Creek basin. The

purpose of the Sand Creek detention basins is to limit peak discharges at Powers Boulevard to existing development condition levels. The detention basins in the upper portions of the Sand Creek basin will keep the majority of the existing channel sections and bridges below Powers Boulevard with adequate flow capacity in the future development condition. The detention basins within the East Fork Sand Creek basin have been sized to maintain the flow outfalling from the Banning-Lewis Ranch property at existing levels. This in turn will help to reduce flow to the mainstem of Sand Creek. The detention basins have been designed to accommodate the 100-year future condition volume without overtopping the overflow spillway. Sand Creek Basin Nos. 2 and 6, and East Fork Sand Creek Basin Nos. 1, 2, and 3 will be classified as jurisdictional structures, and their design and operation would be subject to State Engineer's office criteria. Sand Creek basins number 1 and 3 should be designed so as to take advantage of the adjacent roadway embankments, and therefore classifying as incidental storage and not subject State Engineer's regulations.

At Stetson Hills Boulevard, the roadway embankment has created a 2 acre open water wetland which was identified during the environmental review of the basin. It is recommended that this wetland be preserved. Accordingly, an outlet control structure will have to be constructed to pass the 100-year discharge to the downstream channel without overtopping the roadway. No floodwater storage or routing has been accounted for in the hydrology modelling at this roadway for the selected detention plan.

For the East Fork Sand Creek detention basin numbers 2, and 3, the existing embankment and outlet structure act to maintain a permanent pool at this time. It is recommended that the design of these detention basins be directed at maintaining the permanent pool when the flood control storage is to be added. The existence of a permanent pool may enhance the water quality aspects of these basins, and offer the opportunity of open space development conducive with open water.

Water Quality

Improvement of urban stormwater quality has become an important issue in drainage basin planning. Many pollutants are naturally associated with sediments that enter sensitive receiving waters. The pollutants are naturally occurring compounds that are carried to the drainageways in storm runoff. Other pollutants are the result of urbanization such as lawn chemicals, oil and grease, pet feces, lawn clippings and other items. Many pollutants can be limited by programs such as erosion control at construction sites, educational programs to inform the public as to the proper use of lawn chemicals, oil recycling programs and street sweeping programs. Even with these programs in place, erosion along the drainageways can generate large quantities of sediment that can settle out along the downstream channel bottoms.

Table VI-7: Matrix of Channel Alternatives Sand Creek Drainage Basin Planning Study

Reach	Channel Alternative			Selected Improvements	Comments
	Floodplain Preservation	Channelization 100-year	10-year		
Sand Creek					
1		☉	☉		
2		☉			
3		☉			
4		☉			
5					
6					
7					
8					
9	☉			☉	100-year channelization not feasible in this reach
West Fork Sand Creek					
1		☉			
2		☉			
3		☉			
Center Tributary					
1		☉			
2		☉			
East Fork Sand Creek					
1		☉	☉		
2		☉			
3		☉			
4		☉			
5		☉			
6		☉			
7		☉			
8		☉			
East Fork Subtributary					
1		☉			
2		☉			
Ty Raunches Tributary					
1				☉	
2				☉	
3				☉	
East Blinnest Creek					
1		☉			
2		☉			
West Blinnest					
1		☉			
2		☉			

TABLE VIII-2:
 SAND CREEK DRAINAGE BASIN PLANNING STUDY
 DRAINAGEWAY CONVEYANCE COST ESTIMATE
 WITH SELECTED DETENTION ALTERNATIVES

SEGMENT NUMBER	REACH NUMBER	SEGMENT LENGTH (FT)	IMPROVEMENT TYPE	IMP. LENGTH (FT)	UNIT COST (\$/LF)	NUMBER OF GRADE CONTROLS	GRADE CONTROL LENGTH (FT)	TOTAL REIMBURSABL COSTS	TOTAL COST
148-2	"	2600	"	2150	127	5	620	\$384,650	\$384,650
151	SC-8	1700	10-YEAR RIPRAP	500	238	3	250	\$164,000	\$164,000
160	"	5100	SEL LININGS (1 SIDE) 10-YR RIPRAP	4400	127	6	720	\$688,400	\$688,400
	"			600	238	0	0	\$142,800	\$142,800
163	"	6300	SEL LININGS (1 SIDE) 10-YR RIPRAP	2600	127	15	1200	\$546,200	\$546,200
	"			350	238	0	0	\$83,300	\$83,300
187	"	1200	SEL LININGS (1 SIDE)	0	0	2	160	\$28,800	\$28,800
170	SC-9	3200	"	0	0	4	320	\$57,600	\$57,600
171	"	5000	"	0	0	2	170	\$30,600	\$30,600
172	"	3650	"	0	0	2	150	\$27,000	\$27,000
TOTAL SAND CREEK DRAINAGEWAY								\$15,560,220	\$18,279,420

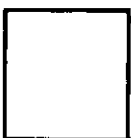
TABLE VIII-3:

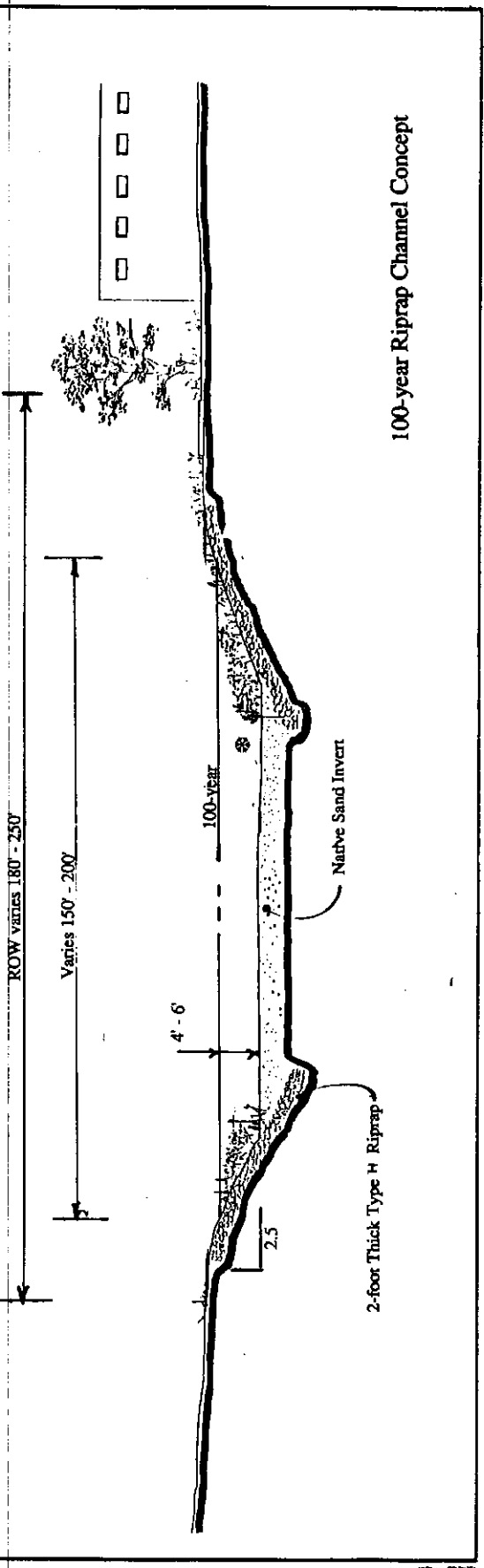
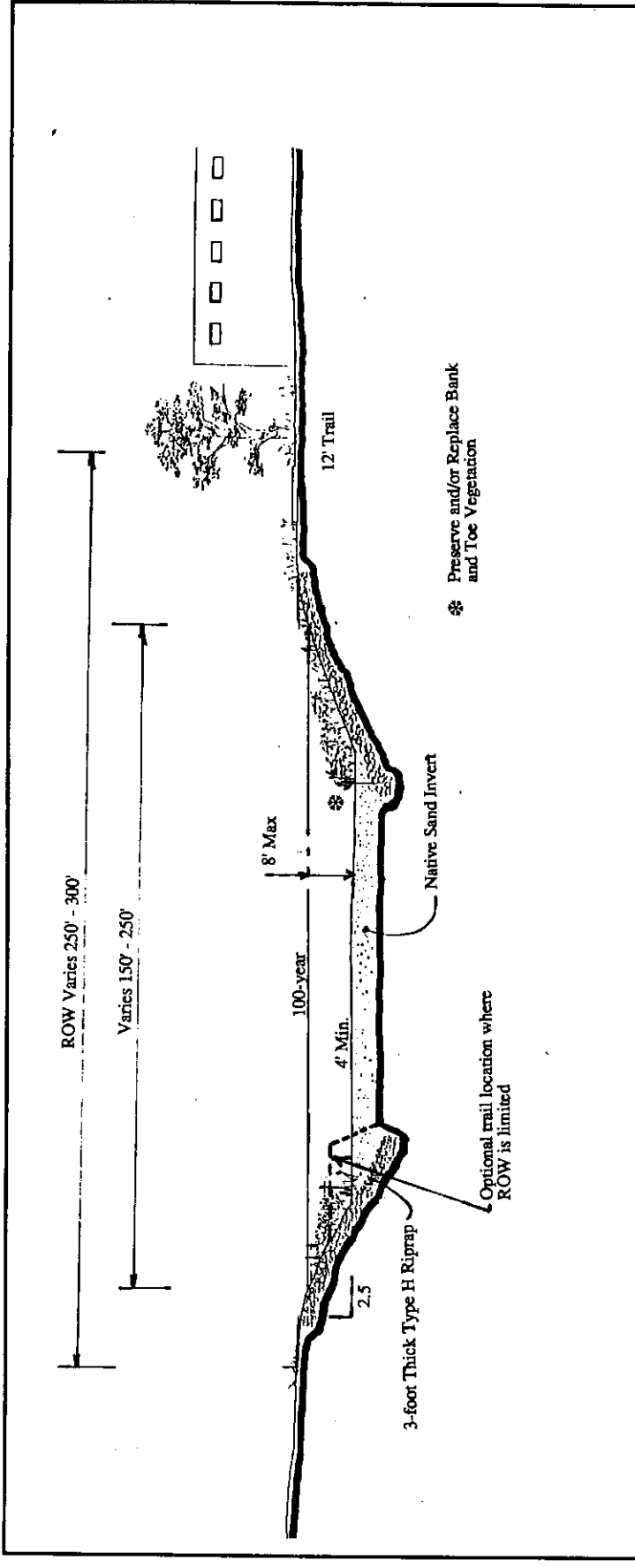
SAND CREEK DRAINAGE BASIN PLANNING STUDY
 TRIBUTARY DRAINAGEWAY CONVEYANCE COST ESTIMATE
 SAND CREEK, CENTER TRIBUTARY AND WEST FORK SAND CREEK

SEGMENT NUMBER	REACH NUMBER	IMPROVEMENT TYPE	IMP. LENGTH (FT)	UNIT COST (\$/LF)	NUMBER OF GRADE CONTROLS	LENGTH OF GRADE CONTROL (FT)	TOTAL REIMBURSABLE COSTS	TOTAL COST
147-2	"	"	1150	200	1	30	\$215,400	\$235,400
153-1	"	"	600	150	0	0	\$90,000	\$90,000
153-2	"	"	450	150	0	0	\$67,500	\$67,500
152-1	SC-7	100-YEAR GRASSLINED	1650	150	0	0	\$247,500	\$247,500
152-2	"	"	800	150	2	100	\$138,000	\$138,000
150-1	"	100-YEAR STORM SEWER 36" RCP	800	58	0	0	\$46,400	\$46,400
150-2	"	100-YEAR RIPRAP	2400	200	0	0	\$480,000	\$480,000
161-1	"	100-YEAR GRASSLINED	550	150	0	0	\$82,500	\$82,500
154	SC-8	"	2100	200	10	600	\$528,000	\$528,000
157	"	"	2400	200	13	520	\$573,600	\$573,600
155-1	"	100-YEAR GRASSLINED	550	175	4	140	\$121,450	\$121,450
159	"	100-YEAR RIPRAP	3450	200	14	840	\$841,200	\$841,200
164	"	"	1350	200	5	200	\$306,000	\$306,000
186	"	"	2250	200	5	200	\$486,000	\$486,000
169	"	"	650	175	1	40	\$120,950	\$120,950
173	SC-9	"	950	175	8	320	\$223,850	\$223,850
WEST FORK SAND CREEK								
154-1	WF-1	100-YEAR RIPRAP	1550	223	2	100	\$0	\$363,650
161	"	"	600	223	2	80	\$0	\$146,200
164-2	"	100-YEAR GRASSLINED	500	150	0	0	\$0	\$75,000
164-4	"	100-YEAR RIPRAP	2500	175	9	280	\$0	\$487,900
165-1	"	"	1350	175	0	0	\$0	\$296,250
TOTAL SAND CREEK TRIBUTARY DRAINAGEWAYS							\$7,420,650	\$12,543,750

TABLE VIII-4:
SAND CREEK DRAINAGE BASIN PLANNING STUDY
ROADWAY CULVERT CROSSING COST ESTIMATE

ROADWAY	REACH NUMBER	DRAINAGEWAY SEGMENT	CROSSING TYPE	LENGTH	UNIT	UNIT COST	TOTAL COST	TOTAL REIMBURSABLE COST
SAND CREEK BASINS								
BANNING-LEWIS PRKW	SC-8	186	6'Hx10'W CBC	120	LF	\$390	\$46,800	\$46,800
ARROYO LANE	SC-9	171	6'Hx12'W CBC	80	LF	\$510	\$40,800	\$0
VOLLMER ROAD	SC-8	169	60-INCH CMP	80	LF	\$120	\$9,600	\$0
"	SC-9	173	"	80	LF	\$120	\$9,600	\$0
BURGESS ROAD	SC-9	176	42-INCH CMP	80	LF	\$75	\$6,000	\$0
"	SC-9	178	2-42-INCH CMP	80	LF	\$150	\$12,000	\$0
CENTER TRIBUTARY								
TERMINAL AVENUE	CT-2	144	4-5'Hx8'W CBC	60	LF	\$1,200	\$72,000	\$0
OMAHA BOULEVARD	CT-2	146-2	3-4'Hx9'W CBC	80	LF	\$900	\$72,000	\$0
WEST FORK SAND CREEK								
WOOTEN ROAD	WF-1	153	2-4'Hx6'W CBC	100	LF	\$480	\$48,000	\$0
EDISON AVENUE	WF-1	153	2-4'Hx6'W CBC	60	LF	\$240	\$14,400	\$0
PALLMER PARK BLVD.	WF-1	154-2	2-4'Hx10'W CBC	80	LF	\$540	\$43,200	\$0
CHICAGO RI RR	WF-1	165-1	4'Hx8'W CBC	220	LF	\$270	\$59,400	\$0
HALF MOON DRIVE	WF-1	165-2	4'Hx6'W CBC	60	LF	\$240	\$14,400	\$0
TOTAL CULVERT CONSTRUCTION COSTS, SAND CREEK							\$1,902,600	\$1,111,000



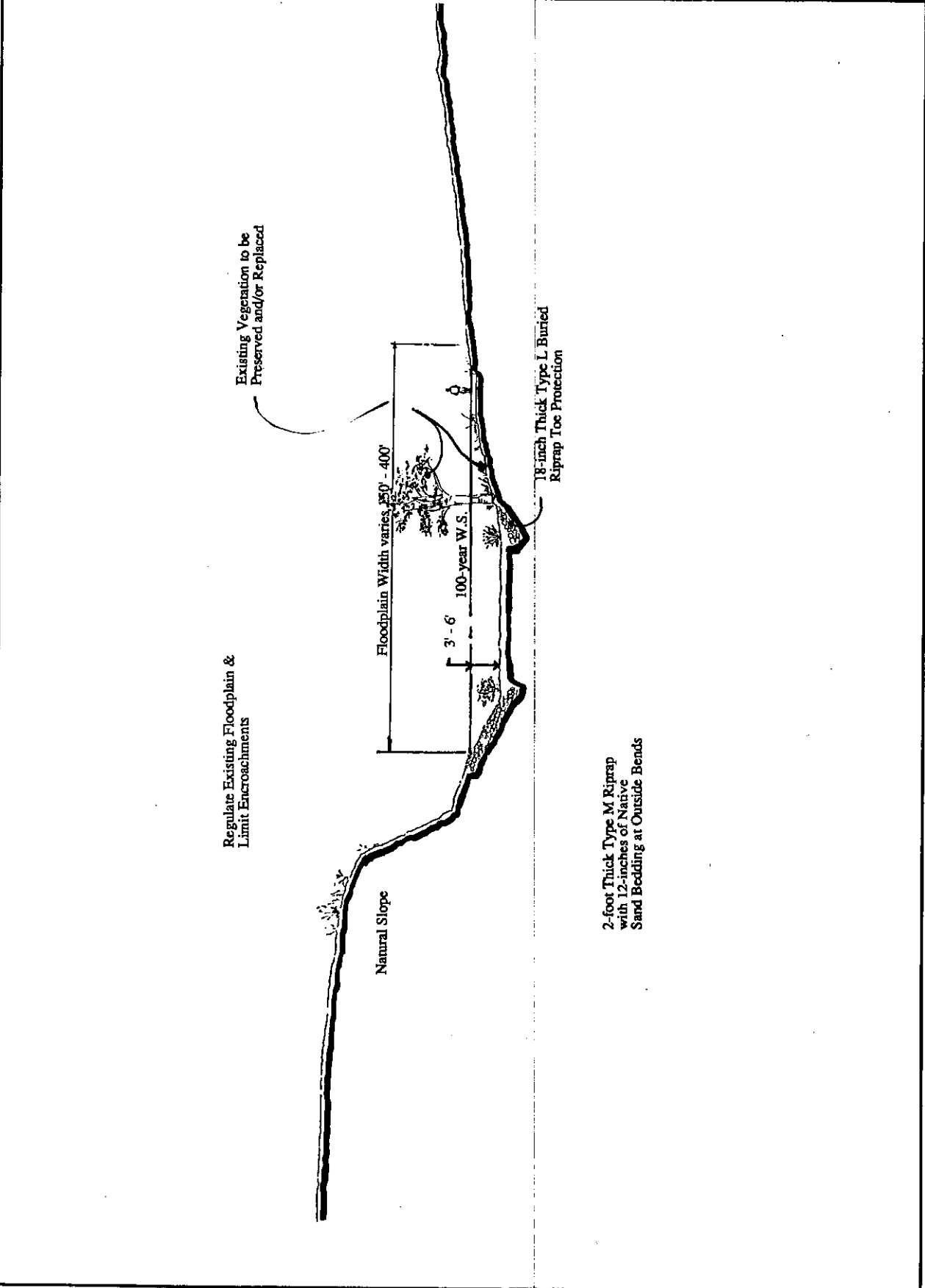


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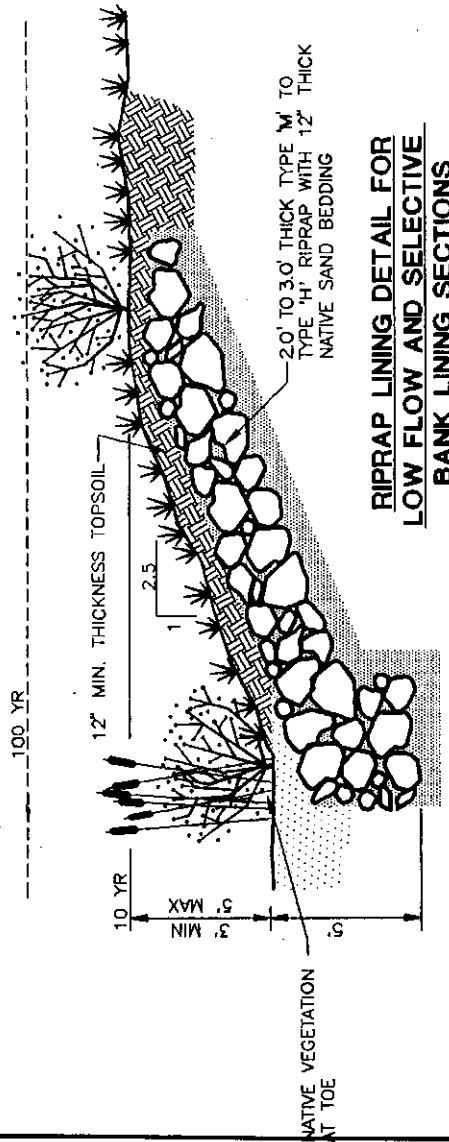
**SAND CREEK DRAINAGE
 BASIN PLANNING STUDY**
 Typical Channel Sections

Project No.	
Date	
Scale	
Sheet	
Drawn	
Checked	
Reviewed	

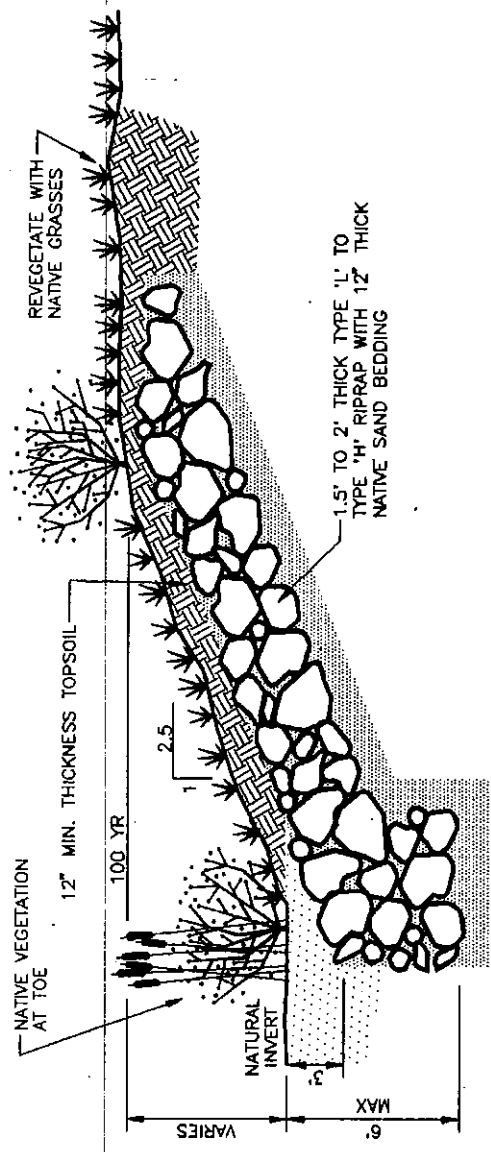
CS-3



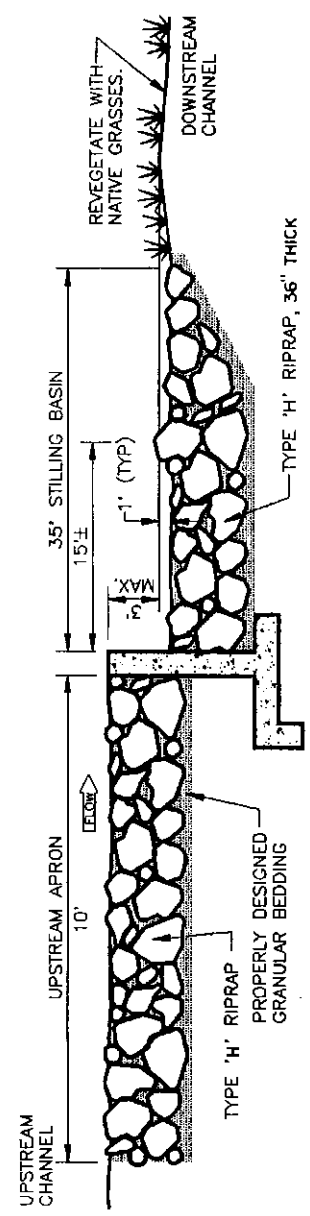
Prepared by	
Checked by	
Designed by	
Drawn by	
Reviewed by	



RIPRAP LINING DETAIL FOR LOW FLOW AND SELECTIVE BANK LINING SECTIONS
 NTS



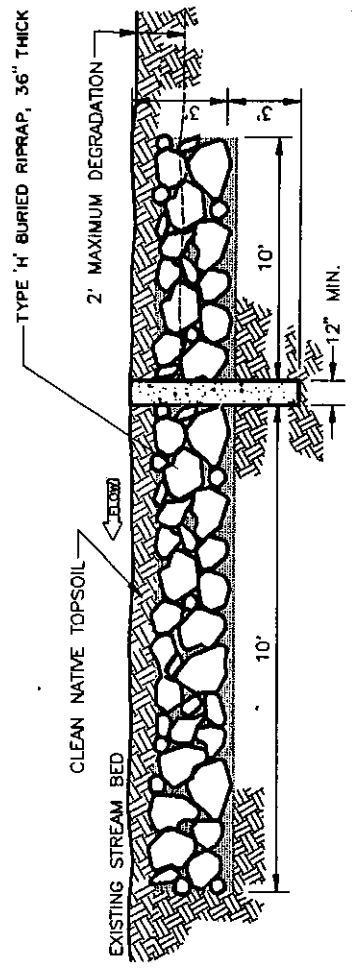
RIPRAP LINING DETAIL FOR 100_YR CHANNEL SECTIONS
 NTS



NOTE: DIMENSIONS OF APRON, STILLING BASIN, RIPRAP, AND CHECK STRUCTURE IS TO BE DETERMINED DURING FINAL DESIGN.

**TYPICAL DROP STRUCTURE
GENERALIZED PROFILE**

NTS

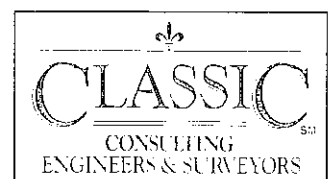


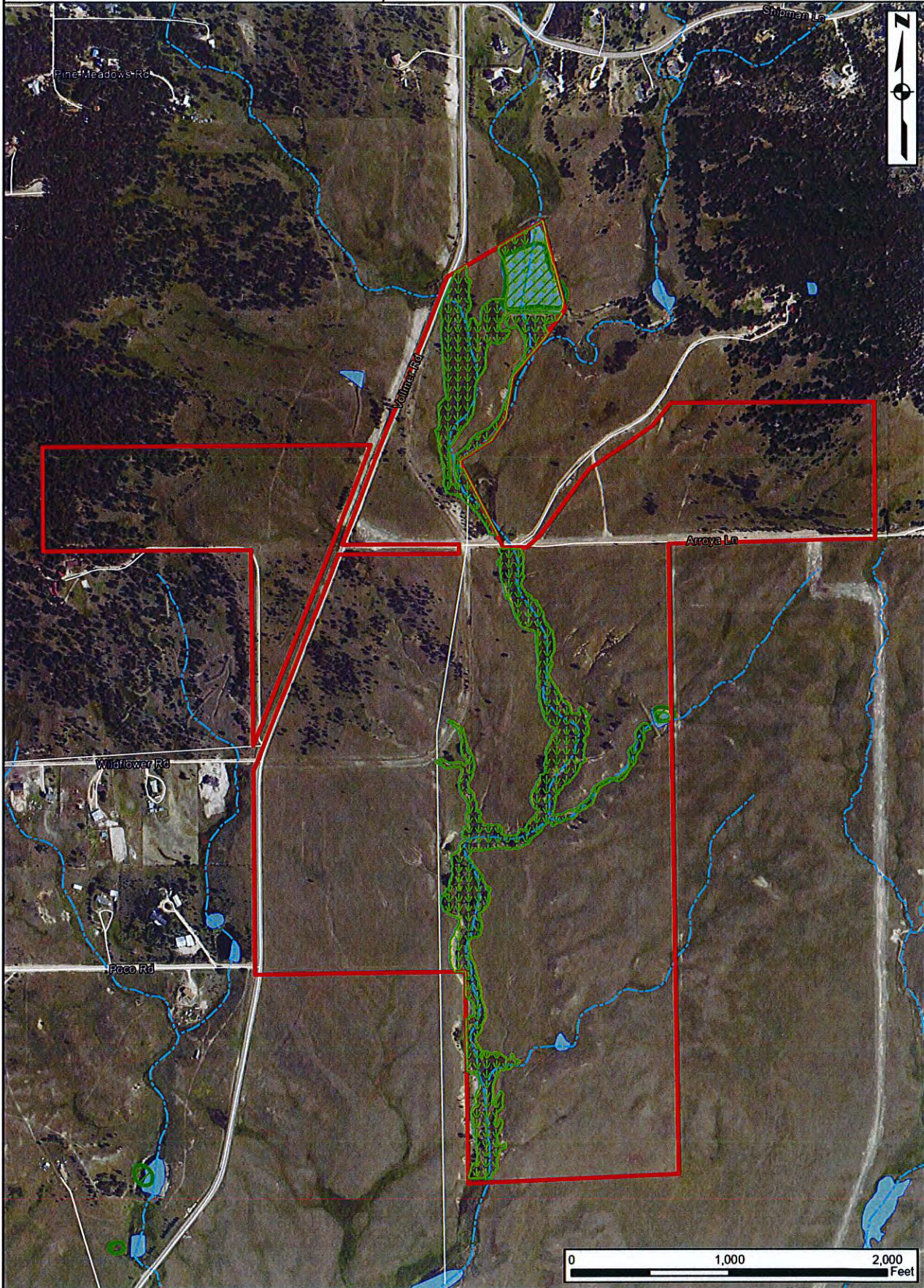
**TYPICAL EROSION CONTROL
CHECK PROFILE**

NTS

Project No.	
Date	
Author	
Checked	
Drawn	
Reviewed	

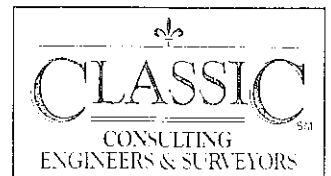
PRELIMINARY WETLANDS MAPPING





- Project Boundary
- NHD Watercourse
- NHD Waterbody
- NWI Wetland
- Preliminary Wetland

HYDROLOGIC CALCULATIONS



UNDEVELOPED LAND ASSUMED TO BE ONE OF THE FOLLOWING: PASTURE, GRASSLAND, RANGE - POOR
 HERBACEOUS MIXTURE OF GRASS WEEDS AND LOW GROWING BRUSH WITH BRUSH MINOR ELEMENT - POOR
 WOODS - GRASS COMBINATION - POOR

C_N VALUES - EXISTING CONDITIONS

BASIN (label)	BASIN AREA (Ac)	SOIL TYPE B		WEIGHTED C _N
		CN	AREA (Ac.)	
EX-1	156.9	61	156.9	61
EX-2	9.2	61	9.2	61
EX-3	24.9	61	24.9	61
EX-4	35.2	63	35.2	63
EX-6	6.7	61	6.7	61
OS-1	49.1	61	49.1	61
OS-2	2.1	61	2.1	61
OS-3	1.0	82	1.0	82
OS-4	16.1	63	16.1	63
OS-5	27.6	61	27.6	61

BASIN SUMMARY - EXISTING CONDITIONS

BASIN (label)	TOTAL BASIN AREA (acres)	WEIGHTED CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
EX-1	156.9	61	0.44	2.6	17.7	140.3
EX-2	9.2	61	0.21	0.2	1.7	12.2
EX-3	24.9	61	0.40	0.4	3.0	23.7
EX-4	35.2	63	0.34	1.3	6.9	41.8
EX-6	6.7	61	0.33	0.1	0.9	7.1
OS-1	49.1	61	0.31	0.9	7.0	53.9
OS-2	2.1	61	0.26	0.04	0.3	2.5
OS-3	1.0	82	0.20	1.3	2.0	4.8
OS-4	16.1	63	0.30	0.6	3.4	20.7
OS-5	27.6	61	0.39	0.5	3.6	28.1

DESIGN POINTS SURFACE ROUTING SUMMARY - EXISTING CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
EX DP-1	BASINS OS-1, OS-3, OS-4, OS-5, EX-1, EX-4, EX-5, EX-6	5.5	34.9	273.4
EX DP-2	BASINS OS-2, EX-2	0.2	2.0	14.7
EX DP-3	BASIN EX-3	0.4	3.0	23.7
EX DP-4	BASIN EX-6	0.12	0.9	7.1

JOB NAME: The Retreat at TimberRidge (Preliminary Plan)
 JOB NUMBER: 2520.00
 DATE: 04/09/18
 CALCULATED BY: MAW

PRELIMINARY DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS				LANDSCAPE / DEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
		AREA (AC)	C(2)	C(50)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)
A1	12.0	0.00	0.89	0.95	0.96	12.00	0.06	0.14	0.40	0.06	0.14	0.40	0.72	1.68	4.80
A2	6.9	0.00	0.89	0.95	0.96	6.90	0.06	0.14	0.40	0.06	0.14	0.40	0.41	0.97	2.76
A3	5.7	0.00	0.89	0.95	0.96	5.70	0.06	0.14	0.40	0.06	0.14	0.40	0.34	0.80	2.28
A4	2.1	0.00	0.89	0.95	0.96	2.10	0.12	0.20	0.44	0.12	0.20	0.44	0.25	0.42	0.92
A5	5.7	0.00	0.89	0.95	0.96	5.70	0.06	0.14	0.40	0.06	0.14	0.40	0.34	0.80	2.28
B1	23.5	0.00	0.89	0.95	0.96	23.50	0.06	0.14	0.40	0.06	0.14	0.40	1.41	3.29	9.40
B2	7.9	0.00	0.89	0.95	0.96	7.90	0.06	0.14	0.40	0.06	0.14	0.40	0.47	1.11	3.16
B3	0.77	0.77	0.89	0.95	0.96	0.00	0.06	0.14	0.40	0.89	0.90	0.96	0.69	0.69	0.74
B4	13.1	0.00	0.89	0.95	0.96	13.10	0.06	0.14	0.40	0.06	0.14	0.40	0.79	1.83	5.24
C1	12.0	0.00	0.89	0.95	0.96	12.00	0.09	0.17	0.42	0.09	0.17	0.42	1.08	2.04	5.04
C2	4.3	0.00	0.89	0.95	0.96	4.30	0.12	0.20	0.44	0.12	0.20	0.44	0.52	0.86	1.89
C3	8.6	0.00	0.89	0.95	0.96	8.60	0.09	0.17	0.42	0.09	0.17	0.42	0.77	1.46	3.61
D1	6.0	0.00	0.89	0.95	0.96	6.00	0.17	0.21	0.45	0.17	0.21	0.45	1.02	1.28	2.72
D2	14.1	0.00	0.89	0.95	0.96	14.10	0.18	0.25	0.47	0.18	0.25	0.47	2.54	3.53	6.63
D3	4.0	0.00	0.89	0.95	0.96	4.00	0.17	0.21	0.45	0.17	0.21	0.45	0.68	0.85	1.81
D4	6.8	0.00	0.89	0.95	0.96	6.80	0.20	0.27	0.49	0.20	0.27	0.49	1.36	1.84	3.30
D5	12.8	0.00	0.89	0.95	0.96	12.80	0.18	0.25	0.47	0.18	0.25	0.47	2.30	3.20	6.02
D6	15.2	0.00	0.89	0.95	0.96	15.20	0.18	0.25	0.47	0.18	0.25	0.47	2.74	3.80	7.14
D7	2.7	0.00	0.89	0.95	0.96	2.70	0.07	0.16	0.41	0.07	0.16	0.41	0.19	0.43	1.11
D8	2.1	0.00	0.89	0.95	0.96	2.10	0.18	0.25	0.47	0.18	0.25	0.47	0.38	0.53	0.99
D9	1.5	0.00	0.89	0.95	0.96	1.50	0.18	0.25	0.47	0.18	0.25	0.47	0.27	0.38	0.71
D10	1.7	0.00	0.89	0.95	0.96	1.70	0.18	0.25	0.47	0.18	0.25	0.47	0.31	0.43	0.80
E	1.8	1.80	0.89	0.95	0.96	0.00	0.18	0.25	0.47	0.89	0.90	0.96	1.60	1.62	1.73
F1	18.1	0.00	0.89	0.95	0.96	18.10	0.03	0.09	0.36	0.03	0.09	0.36	0.54	1.63	6.52
F2	4.6	0.00	0.89	0.95	0.96	4.60	0.03	0.09	0.36	0.03	0.09	0.36	0.14	0.41	1.66
H	6.7	0.00	0.89	0.95	0.96	6.70	0.06	0.14	0.40	0.06	0.14	0.40	0.40	0.94	2.68
OS-1A	4.8	0.00	0.89	0.95	0.96	4.80	0.03	0.09	0.36	0.03	0.09	0.36	0.14	0.43	1.73
OS-1B	23.4	0.00	0.89	0.95	0.96	23.40	0.03	0.09	0.36	0.03	0.09	0.36	0.70	2.11	8.42
OS-2A	2.0	0.00	0.89	0.95	0.96	2.00	0.03	0.09	0.36	0.03	0.09	0.36	0.06	0.18	0.72
OS-2B	2.3	0.00	0.89	0.95	0.96	2.30	0.03	0.09	0.36	0.03	0.09	0.36	0.07	0.21	0.83
OS-2C	14.9	0.00	0.89	0.95	0.96	14.90	0.03	0.09	0.36	0.03	0.09	0.36	0.45	1.34	5.36
OS-2D	0.85	0.00	0.89	0.95	0.96	0.85	0.03	0.09	0.36	0.03	0.09	0.36	0.03	0.08	0.31
OS-2E	3.1	0.00	0.89	0.95	0.96	3.10	0.03	0.09	0.36	0.03	0.09	0.36	0.09	0.28	1.12
OS-3	1.4	1.40	0.89	0.95	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	1.25	1.26	1.34
OS-5	27.6	0.00	0.89	0.95	0.96	27.60	0.02	0.08	0.35	0.02	0.08	0.35	0.55	2.21	9.66

JOB NAME: The Retreat at TimberRidge (Preliminary Plan)
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Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)* $t_c = \frac{L}{180} + 10$	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_i = \frac{0.395(1.1 - C_v)\sqrt{L}}{S^{0.33}} \quad V = C_v S_w^{0.5} \quad Tc=L/V$$

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

PRELIMINARY DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc TOTAL (min)	INTENSITY			TOTAL FLOWS		
	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)		I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
A1	0.72	1.68	4.80	0.14	120	2.4	15.1	740	2.5%	1.6	7.8	22.9	2.31	2.89	4.84	1.7	5	23
A2	0.41	0.97	2.76	0.14	300	12	19.0	400	4.0%	2.0	3.3	22.3	2.34	2.92	4.91	1.0	3	14
A3	0.34	0.80	2.28	0.14	300	8	21.7	400	3.0%	1.7	3.8	25.6	2.18	2.72	4.57	0.7	2	10
A4	0.25	0.42	0.92	0.20	180	8	13.3	180	4.0%	2.0	1.5	14.8	2.83	3.54	5.94	0.7	1	5
A5	0.34	0.80	2.28	0.14	280	10	19.1					19.1	2.53	3.16	5.31	0.9	3	12
B1	1.41	3.29	9.40	0.14	300	10.5	19.9	1280	3.2%	1.8	11.9	31.8	1.92	2.39	4.02	2.7	8	38
B2	0.47	1.11	3.16	0.14	300	10.5	19.9					19.9	2.48	3.10	5.20	1.2	3	16
B3	0.69	0.69	0.74	0.14			10.0					10.0	2.47	3.09	5.19	1.7	2	4
B4	0.79	1.83	5.24	0.14	300	10.5	19.9					19.9	2.48	3.10	5.20	1.9	6	27
C1	1.08	2.04	5.04	0.17	300	12	18.4	600	2.0%	2.8	3.5	21.9	2.36	2.95	4.95	2.5	6	25
C2	0.52	0.86	1.89	0.20	300	14	16.9					16.9	2.67	3.34	5.61	1.4	3	11
C3	0.77	1.46	3.61	0.17	300	17	16.4					16.4	2.71	3.39	5.68	2.1	5	21
D1	1.02	1.28	2.72	0.21	200	4	18.0	600	2.0%	2.8	3.5	21.6	2.38	2.98	5.00	2.4	4	14
D2	2.54	3.53	6.63	0.25	150	3	15.0	900	3.0%	3.5	4.3	19.3	2.51	3.14	5.28	6.4	11	35
D3	0.68	0.85	1.81	0.21	150	3	15.6	375	2.0%	2.8	2.2	17.8	2.61	3.26	5.48	1.8	3	10
D4	1.36	1.84	3.30	0.27	150	3	14.6	600	3.5%	3.7	2.7	17.3	2.64	3.31	5.56	3.6	6	18
D5	2.30	3.20	6.02	0.25	150	3	15.0	1050	2.5%	3.2	5.5	20.5	2.44	3.05	5.13	5.6	10	31
D6	2.74	3.80	7.14	0.25	150	3	15.0	1200	2.0%	2.8	7.1	22.0	2.36	2.94	4.94	6.4	11	35
D7	0.19	0.43	1.11	0.16	150	3	16.5					16.5	2.70	3.37	5.67	0.5	1	6
D8	0.38	0.53	0.99	0.25	70	2.8	8.1					8.1	3.54	4.44	7.46	1.3	2	7
D9	0.27	0.38	0.71	0.25	70	2.8	8.1					8.1	3.54	4.44	7.46	1.0	2	5
D10	0.31	0.43	0.80	0.25	80	3.2	8.7					8.7	3.46	4.34	7.29	1.1	2	6
E	1.60	1.62	1.73	0.25	30	7.5	2.9	1000	5.0%	2.2	7.5	10.4	3.25	4.08	6.84	5.2	7	12
F1	0.54	1.63	6.52	0.09	60	3	8.3	2400	2.0%	1.4	28.3	36.6	1.75	2.18	3.66	1.0	4	24
F2	0.14	0.41	1.66	0.09	60	6	6.6	1200	2.0%	1.4	14.1	20.7	2.43	3.03	5.09	0.3	1	8
H	0.40	0.94	2.68	0.14	300	11	19.6	900	2.0%	1.4	10.6	30.2	1.98	2.47	4.15	0.8	2	11
OS-1A	0.14	0.43	1.73	0.09	300	15	18.6	400	5.0%	4.5	1.5	20.1	2.47	3.08	5.18	0.4	1	9
OS-1B	0.70	2.11	8.42	0.09	300	15	18.6	1200	5.0%	4.5	4.5	23.0	2.30	2.88	4.83	1.6	6	41
OS-2A	0.06	0.18	0.72	0.09	300	12	20.0					20.0	2.47	3.09	5.19	0.1	0.6	4
OS-2B	0.07	0.21	0.83	0.09	300	12	20.0					20.0	2.47	3.09	5.19	0.2	0.6	4
OS-2C	0.45	1.34	5.36	0.09	300	12	20.0	1000	3.0%	3.5	4.8	24.8	2.21	2.77	4.64	1.0	4	25
OS-2D	0.03	0.08	0.31	0.09	250	12	17.2					17.2	2.65	3.32	5.57	0.07	0.3	2
OS-2E	0.09	0.28	1.12	0.09	300	12	20.0					20.0	2.47	3.09	5.19	0.2	0.9	6
OS-3	1.25	1.26	1.34	0.08	100	4	11.7	800	2.0%	2.8	4.7	16.4	2.71	3.39	5.69	3	4	8
OS-5	0.55	2.21	9.66	0.08	300	12	20.2	1500	3.0%	3.5	7.2	27.4	2.10	2.62	4.39	1	6	42

JOB NAME: The Retreat at TimberRidge (Preliminary Plan)
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PRELIMINARY DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Culvert / Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	A1	1.68	4.80	22.9	2.89	4.84	5	23	30" RCP
2	A2	0.97	2.76	22.3	2.92	4.91	3	14	24" RCP
3	DP-1, DP-2, A3	3.44	9.84	25.6	2.72	4.57	9	45	36" RCP
4	A1, A2, A3 and A4 (POND B INFLOW)	3.86	10.76	26.6	2.66	4.47	10	48	
5	B1	3.29	9.40	31.8	2.39	4.02	8	38	36" RCP
6	B1 and B2 (POND C INFLOW)	4.40	12.56	34.8	2.26	3.79	10	48	
7	C1, OS-1A	2.47	6.77	23.4	2.85	4.79	7	32	30" RCP
8	C2	0.86	1.89	16.9	3.34	5.61	3	11	5' Type R sump inlets
9	D2, OS-2A	3.71	7.35	20.0	3.09	5.19	11	38	10' Type R sump inlets
10	D1, OS-2B	1.49	3.55	21.6	2.98	5.00	4	18	5' Type R sump inlets
11	D3, OS-2D	0.93	2.12	17.8	3.26	5.48	3	12	5' Type R sump inlets
12	D5, OS-2E	3.48	7.13	20.5	3.05	5.13	11	37	10' Type R sump inlets
13	D4	1.84	3.30	17.3	3.31	5.56	6	18	5' Type R sump inlets
14	D6	3.80	7.14	22.0	2.94	4.94	11	35	10' Type R sump inlets
15	DP-7 Thru DP-14 and OS-1B, OS-2C, D7 (POND D INFLOW)	22.44	54.14	27.8	2.60	4.36	58	236	

JOB NAME: The Retreat at TimberRidge (Preliminary Plan)
 JOB NUMBER: 2520.00
 DATE: 04/09/18
 CALCULATED BY: MAW

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
 REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

PRELIMINARY DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
1	DP-7	2.47	6.77	23.4	2.85	4.79	7	32	30" RCP
2	OS-1B	2.11	8.42	23.0	2.88	4.83	6	41	30" RCP
3	PR-1, PR-2, DP-8	5.44	17.08	25.4	2.73	4.58	15	78	36" RCP
4	DP-9	3.71	7.35	20.0	3.09	5.19	11	38	30" RCP
5	PR-3, PR-4	9.14	24.43	27.1	2.63	4.42	24	108	42" RCP
6	DP-13	1.84	3.30	17.3	3.31	5.56	6	18	24" RCP
7	PR-5, PR-6	10.98	27.73	27.1	2.63	4.42	29	122	42" RCP
8	PR-7, DP-14	14.78	34.87	27.8	2.59	4.35	38	152	48" RCP
9	DP-10	1.49	3.55	21.6	2.98	5.00	4	18	24" RCP
10	OS-2C	1.34	5.36	24.8	2.77	4.64	4	25	30" RCP
11	PR-9, PR-10	2.83	8.91	25.3	2.74	4.59	8	41	30" RCP
12	PR-11, DP-11	3.75	11.03	27.3	2.62	4.40	10	49	36" RCP
13	DP-12	3.48	7.13	20.5	3.05	5.13	11	37	30" RCP
14	PR-12, PR-13	7.23	18.16	27.6	2.61	4.37	19	79	36" RCP

Culvert Report

Box Culvert *(Arroya Lane & prop. collector Rd.)*

Invert Elev Dn (ft) = 7233.50
 Pipe Length (ft) = 115.00
 Slope (%) = 1.00
 Invert Elev Up (ft) = 7234.65
 Rise (in) = 72.0
 Shape = Box
 Span (in) = 144.0
 No. Barrels = 3
 n-Value = 0.013
 Culvert Type = Flared Wingwalls
 Culvert Entrance = 30D to 75D wingwall flares
 Coeff. K,M,c,Y,k = 0.026, 1, 0.0347, 0.81, 0.4

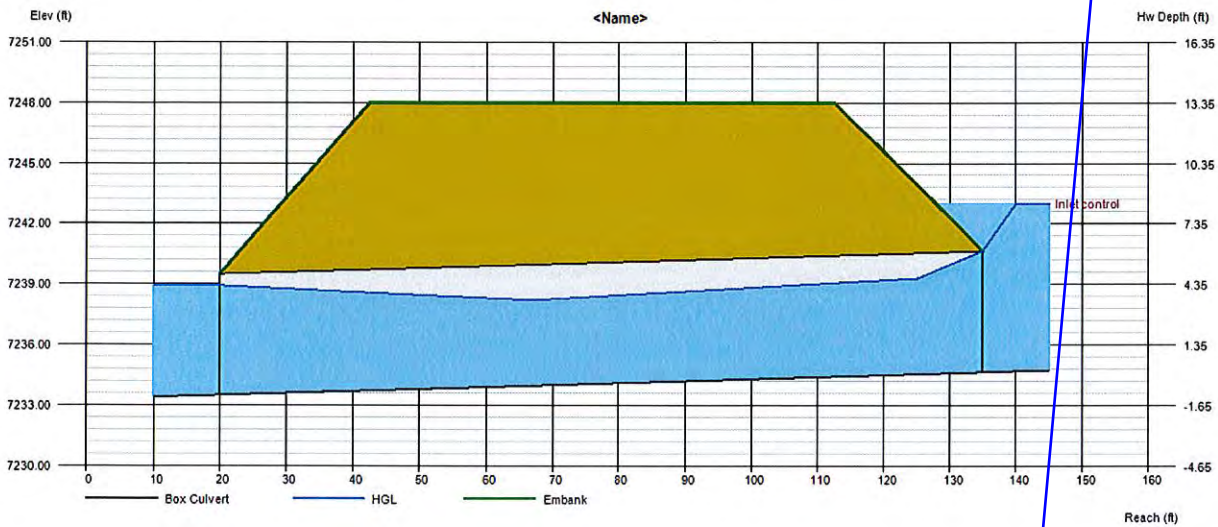
Embankment
 Top Elevation (ft) = 7248.00
 Top Width (ft) = 70.00
 Crest Width (ft) = 70.00

Calculations

Qmin (cfs) = ~~630.00~~
 Qmax (cfs) = 2170.00
 Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 2170.00
 Qpipe (cfs) = 2170.00
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 11.13
 Veloc Up (ft/s) = 12.49
 HGL Dn (ft) = 7238.91
 HGL Up (ft) = 7239.48
 Hw Elev (ft) = 7242.98
 Hw/D (ft) = 1.39
 Flow Regime = Inlet Control



Shouldn't this be 2,600 for FEMA flows?

Culvert Report

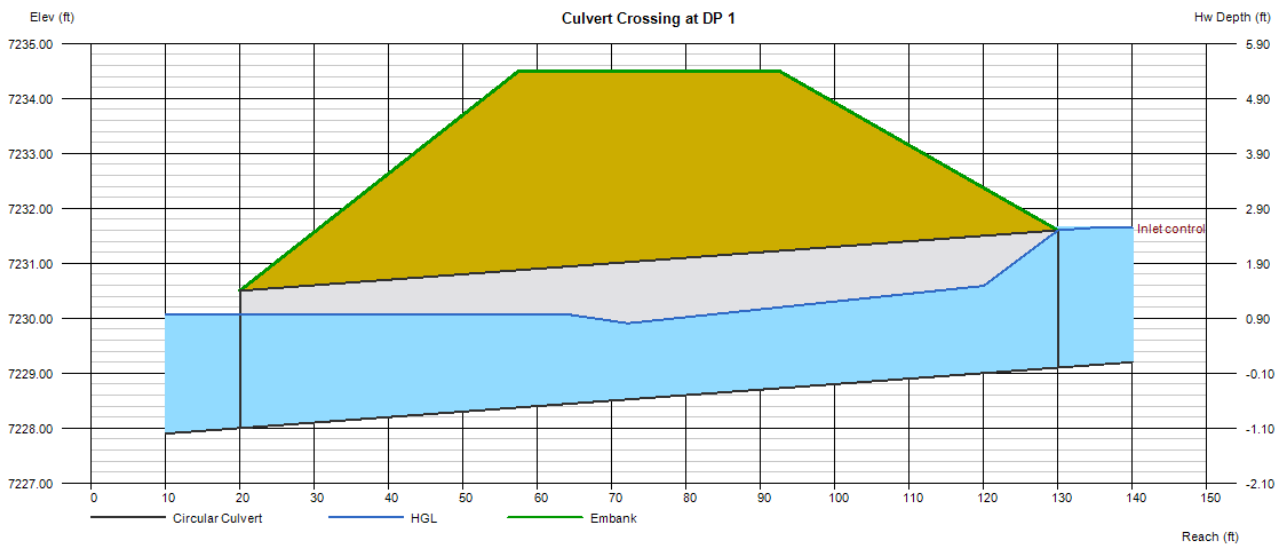
Culvert Crossing at DP 1

Invert Elev Dn (ft)	= 7228.00
Pipe Length (ft)	= 110.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 7229.10
Rise (in)	= 30.0
Shape	= Circular
Span (in)	= 30.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 7234.50
Top Width (ft)	= 35.00
Crest Width (ft)	= 150.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 23.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 23.00
Qpipe (cfs)	= 23.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.30
Veloc Up (ft/s)	= 6.78
HGL Dn (ft)	= 7230.07
HGL Up (ft)	= 7230.73
Hw Elev (ft)	= 7231.65
Hw/D (ft)	= 1.02
Flow Regime	= Inlet Control



Culvert Report

Culvert Crossing at DP 2

Invert Elev Dn (ft)	= 7230.00
Pipe Length (ft)	= 140.00
Slope (%)	= 1.43
Invert Elev Up (ft)	= 7232.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

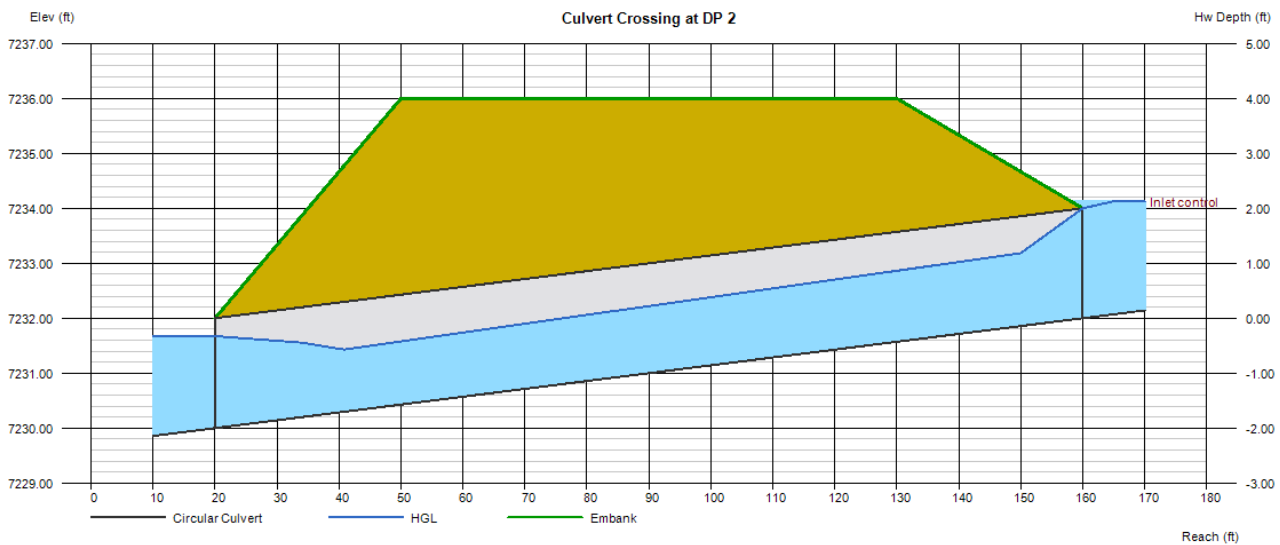
Top Elevation (ft)	= 7236.00
Top Width (ft)	= 80.00
Crest Width (ft)	= 150.00

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 14.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 14.00
Qpipe (cfs)	= 14.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.99
Veloc Up (ft/s)	= 6.22
HGL Dn (ft)	= 7231.67
HGL Up (ft)	= 7233.35
Hw Elev (ft)	= 7234.13
Hw/D (ft)	= 1.06
Flow Regime	= Inlet Control



Culvert Report

Culvert Crossing at DP 3

Invert Elev Dn (ft)	= 7220.00
Pipe Length (ft)	= 160.00
Slope (%)	= 1.25
Invert Elev Up (ft)	= 7222.00
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

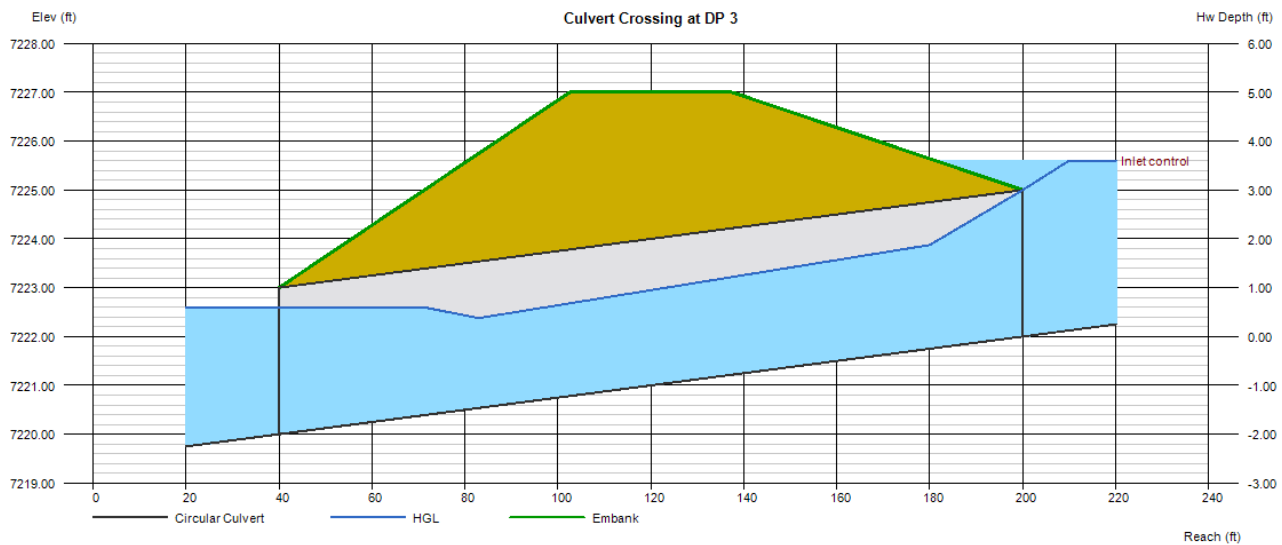
Top Elevation (ft)	= 7227.00
Top Width (ft)	= 35.00
Crest Width (ft)	= 50.00

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 45.00
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 45.00
Qpipe (cfs)	= 45.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.93
Veloc Up (ft/s)	= 8.16
HGL Dn (ft)	= 7222.59
HGL Up (ft)	= 7224.18
Hw Elev (ft)	= 7225.60
Hw/D (ft)	= 1.20
Flow Regime	= Inlet Control



Culvert Report

Culvert Crossing at DP 5

Invert Elev Dn (ft)	=	7195.20
Pipe Length (ft)	=	80.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	7196.00
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

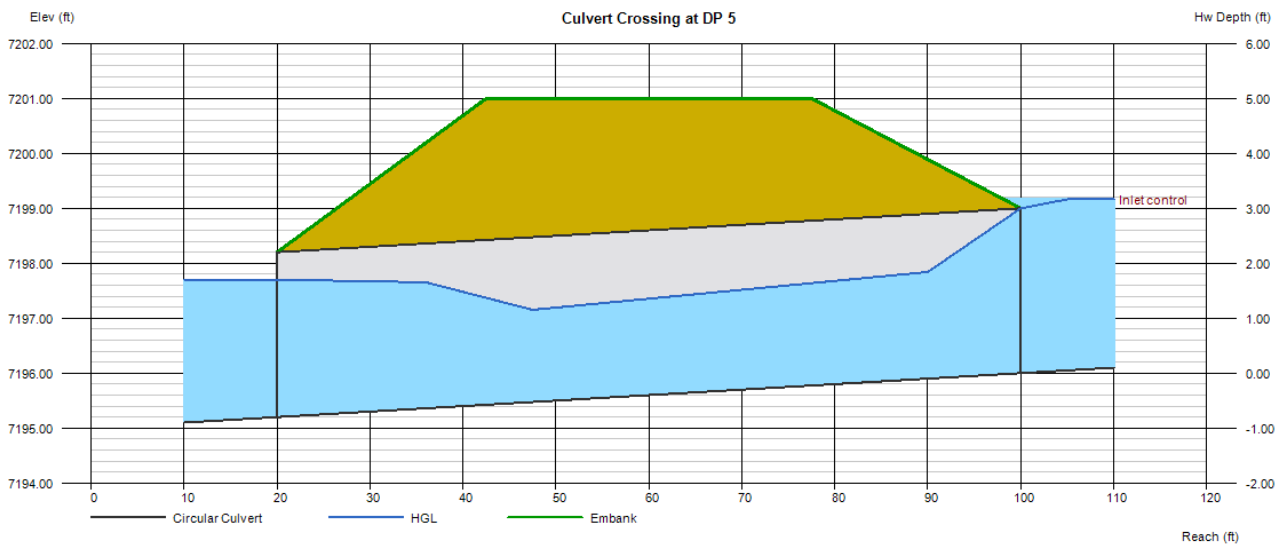
Top Elevation (ft)	=	7201.00
Top Width (ft)	=	35.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	38.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	38.00
Qpipe (cfs)	=	38.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.03
Veloc Up (ft/s)	=	7.57
HGL Dn (ft)	=	7197.70
HGL Up (ft)	=	7198.00
Hw Elev (ft)	=	7199.16
Hw/D (ft)	=	1.05
Flow Regime	=	Inlet Control



Culvert Report

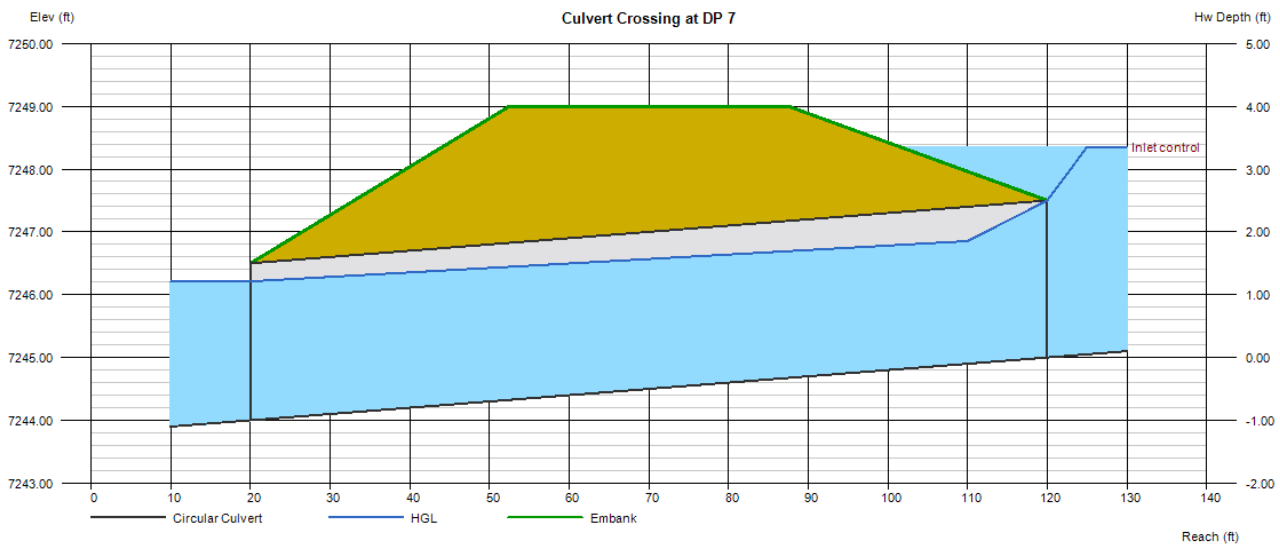
Culvert Crossing at DP 7

Invert Elev Dn (ft)	= 7244.00
Pipe Length (ft)	= 100.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 7245.00
Rise (in)	= 30.0
Shape	= Circular
Span (in)	= 30.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 7249.00
Top Width (ft)	= 35.00
Crest Width (ft)	= 50.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 32.00
Tailwater Elev (ft)	= (dc+D)/2

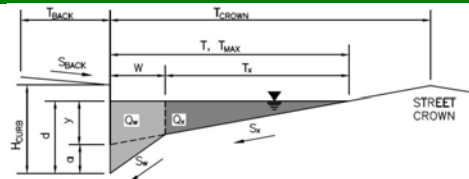
Highlighted	
Qtotal (cfs)	= 32.00
Qpipe (cfs)	= 32.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.96
Veloc Up (ft/s)	= 7.89
HGL Dn (ft)	= 7246.21
HGL Up (ft)	= 7246.93
Hw Elev (ft)	= 7248.35
Hw/D (ft)	= 1.34
Flow Regime	= Inlet Control



ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **THE RETREAT AT TIMBERRIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-8 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)
 Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.013$
 $H_{CURB} = 6.00$ inches
 $T_{CROWN} = 17.0$ ft
 $W = 2.00$ ft
 $S_x = 0.010$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_o = 0.000$ ft/ft
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	6.0	8.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

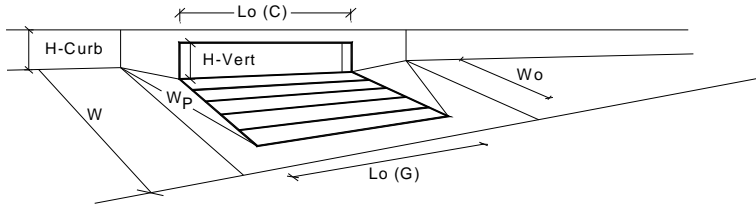
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

$Q_{allow} =$

Minor Storm	Major Storm	
SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



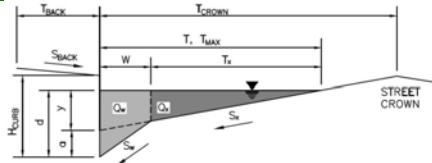
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	5.4	12.3	cfs
Q_{PEAK REQUIRED}	2.0	6.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

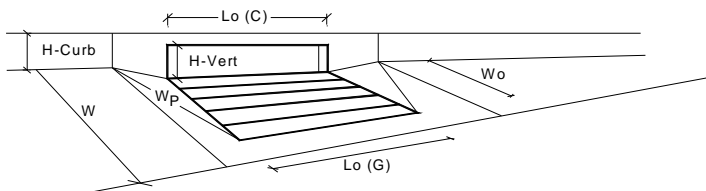
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-9 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.016"/>						
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; border: none;">Minor Storm</td> <td style="text-align: center; border: none;">Major Storm</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">$T_{MAX} =$ <input style="width: 50px;" type="text" value="17.0"/></td> <td style="border: 1px solid black; padding: 2px;"><input style="width: 50px;" type="text" value="17.0"/></td> <td style="border: none;">ft</td> </tr> </table>	Minor Storm	Major Storm		$T_{MAX} = $ <input style="width: 50px;" type="text" value="17.0"/>	<input style="width: 50px;" type="text" value="17.0"/>	ft
Minor Storm	Major Storm						
$T_{MAX} = $ <input style="width: 50px;" type="text" value="17.0"/>	<input style="width: 50px;" type="text" value="17.0"/>	ft					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; border: none;">Minor Storm</td> <td style="text-align: center; border: none;">Major Storm</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">$d_{MAX} =$ <input style="width: 50px;" type="text" value="6.0"/></td> <td style="border: 1px solid black; padding: 2px;"><input style="width: 50px;" type="text" value="12.0"/></td> <td style="border: none;">inches</td> </tr> </table>	Minor Storm	Major Storm		$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches
Minor Storm	Major Storm						
$d_{MAX} = $ <input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="12.0"/>	inches					
Check boxes are not applicable in SUMP conditions	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; border: none;"><input type="checkbox"/></td> <td style="text-align: center; border: none;"><input type="checkbox"/></td> <td style="border: none;"></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; border: none;">Minor Storm</td> <td style="text-align: center; border: none;">Major Storm</td> <td style="border: none;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">$Q_{allow} =$ <input style="width: 50px;" type="text" value="SUMP"/></td> <td style="border: 1px solid black; padding: 2px;"><input style="width: 50px;" type="text" value="SUMP"/></td> <td style="border: none;">cfs</td> </tr> </table>	Minor Storm	Major Storm		$Q_{allow} = $ <input style="width: 50px;" type="text" value="SUMP"/>	<input style="width: 50px;" type="text" value="SUMP"/>	cfs
Minor Storm	Major Storm						
$Q_{allow} = $ <input style="width: 50px;" type="text" value="SUMP"/>	<input style="width: 50px;" type="text" value="SUMP"/>	cfs					

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



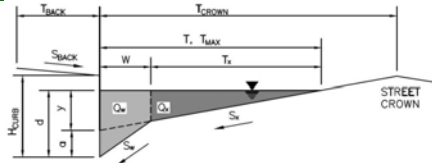
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	8.3	25.5	cfs
Q_{PEAK REQUIRED}	6.0	16.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

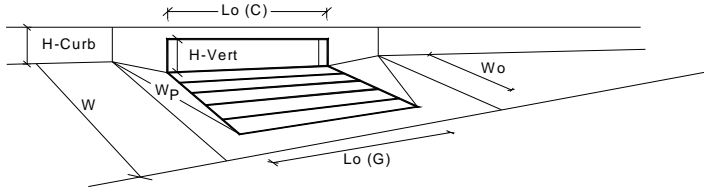
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-10 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)																	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft																
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>																
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches																
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft																
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft																
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft																
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft																
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.016"/>																
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>$T_{MAX} =$</td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: right;">ft</td> </tr> <tr> <td>$d_{MAX} =$</td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="12.0"/></td> <td style="text-align: right;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft	$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm															
$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft														
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches														
	<input type="checkbox"/>	<input type="checkbox"/>															
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm																	
Check boxes are not applicable in SUMP conditions																	
MINOR STORM Allowable Capacity is based on Depth Criterion																	
MAJOR STORM Allowable Capacity is based on Depth Criterion																	
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="SUMP"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="SUMP"/></td> <td style="text-align: right;">cfs</td> </tr> </tbody> </table>		Minor Storm	Major Storm			<input style="width: 40px;" type="text" value="SUMP"/>	<input style="width: 40px;" type="text" value="SUMP"/>	cfs								
	Minor Storm	Major Storm															
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INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

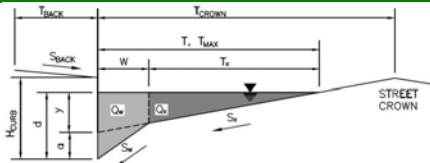


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	5.4	12.3	cfs
Q_{PEAK REQUIRED}	2.0	9.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)			

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

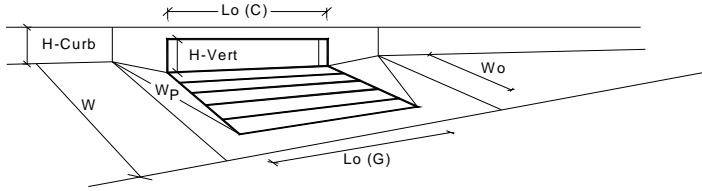
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-11 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 8.0$ ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.013$						
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = 17.0$ ft						
Gutter Width	$W = 2.00$ ft						
Street Transverse Slope	$S_x = 0.020$ ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.000$ ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td>$T_{MAX} = 17.0$</td> <td>$T_{MAX} = 17.0$</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 17.0$	$T_{MAX} = 17.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td>$d_{MAX} = 6.0$</td> <td>$d_{MAX} = 12.0$</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$d_{MAX} = 12.0$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 6.0$	$d_{MAX} = 12.0$						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion							
Allowable Capacity	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td>$Q_{allow} = \text{SUMP}$</td> <td>$Q_{allow} = \text{SUMP}$</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = \text{SUMP}$	$Q_{allow} = \text{SUMP}$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = \text{SUMP}$	$Q_{allow} = \text{SUMP}$						

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



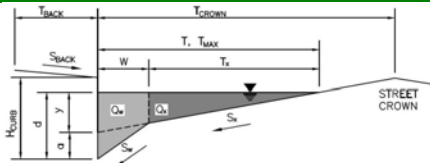
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	5.4	12.3	cfs
Q_{PEAK REQUIRED}	2.0	6.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

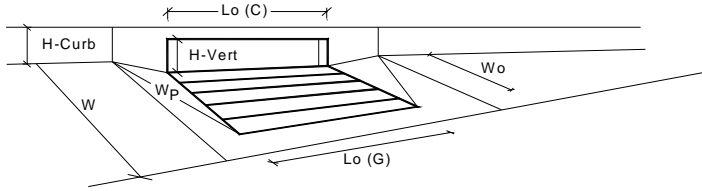
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-12 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 8.0$ ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.013$						
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = 17.0$ ft						
Gutter Width	$W = 2.00$ ft						
Street Transverse Slope	$S_x = 0.020$ ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.000$ ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td>$T_{MAX} = 17.0$</td> <td>$T_{MAX} = 17.0$</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 17.0$	$T_{MAX} = 17.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td>$d_{MAX} = 6.0$</td> <td>$d_{MAX} = 12.0$</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$d_{MAX} = 12.0$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 6.0$	$d_{MAX} = 12.0$						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion							
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Minor Storm	Major Storm	cfs					
$Q_{allow} = \text{SUMP}$	$Q_{allow} = \text{SUMP}$						

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



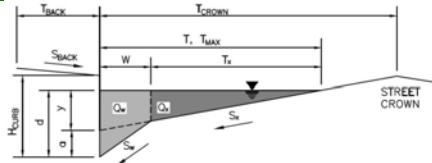
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	8.3	25.5	cfs
Q _{PEAK REQUIRED}	6.0	16.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

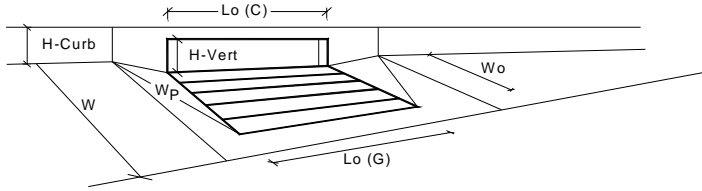
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-13 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)																	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft																
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.013"/>																
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches																
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft																
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft																
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft																
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft																
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.016"/>																
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>$T_{MAX} =$</td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: right;">ft</td> </tr> <tr> <td>$d_{MAX} =$</td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="12.0"/></td> <td style="text-align: right;">inches</td> </tr> <tr> <td></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft	$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches		<input type="checkbox"/>	<input type="checkbox"/>	
	Minor Storm	Major Storm															
$T_{MAX} = $	<input style="width: 40px;" type="text" value="17.0"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft														
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	inches														
	<input type="checkbox"/>	<input type="checkbox"/>															
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm																	
Check boxes are not applicable in SUMP conditions																	
MINOR STORM Allowable Capacity is based on Depth Criterion																	
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	Minor Storm	Major Storm															
	<input style="width: 40px;" type="text" value="SUMP"/>	<input style="width: 40px;" type="text" value="SUMP"/>	cfs														

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



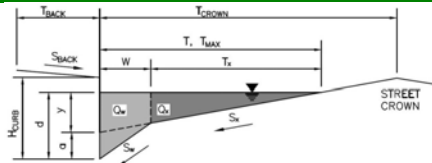
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	5.4	12.3	cfs
Q_{PEAK REQUIRED}	3.0	9.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

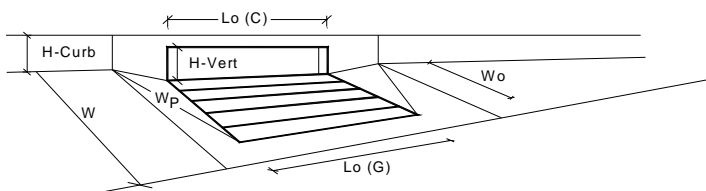
Project: **THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (South of Arroya Lane)**
 Inlet ID: **DP-14 (Assume even split of flows)**



Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 17.5$ ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$						
Height of Curb at Gutter Flow Line	$H_{CURB} = 8.00$ inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = 22.0$ ft						
Gutter Width	$W = 2.00$ ft						
Street Transverse Slope	$S_x = 0.020$ ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = 0.083$ ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = 0.000$ ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.016$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> <tr> <td>$T_{MAX} = 20.0$</td> <td>$T_{MAX} = 20.0$</td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 20.0$	$T_{MAX} = 20.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 20.0$	$T_{MAX} = 20.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> <tr> <td>$d_{MAX} = 8.0$</td> <td>$d_{MAX} = 12.0$</td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 8.0$	$d_{MAX} = 12.0$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 8.0$	$d_{MAX} = 12.0$						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion							
	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> <tr> <td>$Q_{allow} = \text{SUMP}$</td> <td>$Q_{allow} = \text{SUMP}$</td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = \text{SUMP}$	$Q_{allow} = \text{SUMP}$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = \text{SUMP}$	$Q_{allow} = \text{SUMP}$						

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	8.0	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.50	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.75	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	16.0	23.4	cfs
Q_{PEAK REQUIRED}	6.0	18.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

Pre-Dev 2 Year Routing

Project Summary

Title	Retreat at TimberRidge Preliminary Drainage Report (South of Arroya Lane)
Engineer	MAW
Company	CCES
Date	4/10/2018

Notes	Pre-Dev 2 year SCS Model
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Pre-Dev 2 Year Routing

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX-1	Pre-Development 2 YEAR	2	1.203	12.650	2.61
EX-2	Pre-Development 2 YEAR	2	0.071	12.300	0.17
EX-3	Pre-Development 2 YEAR	2	0.191	12.600	0.42
EX-4	Pre-Development 2 YEAR	2	0.366	12.250	1.29
EX-6	Pre-Development 2 YEAR	2	0.052	12.450	0.12
OS-1	Pre-Development 2 YEAR	2	0.379	12.400	0.86
OS-2	Pre-Development 2 YEAR	2	0.016	12.350	0.04
OS-3	Pre-Development 2 YEAR	2	0.083	12.050	1.26
OS-4	Pre-Development 2 YEAR	2	0.167	12.200	0.62
OS-5	Pre-Development 2 YEAR	2	0.212	12.500	0.47

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX DP-1	Pre-Development 2 YEAR	2	2.388	12.600	5.52
EX DP-2	Pre-Development 2 YEAR	2	0.087	12.350	0.21
EX DP-3	Pre-Development 2 YEAR	2	0.191	12.600	0.42
EX DP-4	Pre-Development 2 YEAR	2	0.052	12.450	0.12
EX. 60" CMP	Pre-Development 2 YEAR	2	0.617	12.150	2.47

Pre-Dev 2 Year Routing

Subsection: Time-Depth Curve
 Label: Colo Springs 2015

Return Event: 2 years
 Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR	
Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.2	0.2	0.2
6.250	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.3	0.3	0.3
8.750	0.3	0.3	0.3	0.3	0.4
10.000	0.4	0.4	0.4	0.5	0.5
11.250	0.5	0.6	0.8	1.4	1.5
12.500	1.5	1.6	1.6	1.7	1.7
13.750	1.7	1.7	1.8	1.8	1.8
15.000	1.8	1.8	1.8	1.9	1.9
16.250	1.9	1.9	1.9	1.9	1.9
17.500	1.9	1.9	1.9	1.9	2.0
18.750	2.0	2.0	2.0	2.0	2.0
20.000	2.0	2.0	2.0	2.0	2.0
21.250	2.0	2.0	2.0	2.1	2.1
22.500	2.1	2.1	2.1	2.1	2.1
23.750	2.1	2.1	(N/A)	(N/A)	(N/A)

Pre-Dev 2 Year Routing

Subsection: Addition Summary
 Label: EX DP-1

Return Event: 2 years
 Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-1'

Upstream Link	Upstream Node
REACH SC-9	EX. 60" CMP
<Catchment to Outflow Node>	EX-1
<Catchment to Outflow Node>	OS-1
<Catchment to Outflow Node>	OS-5

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	REACH SC-9	0.594	12.550	1.62
Flow (From)	EX-1	1.203	12.650	2.61
Flow (From)	OS-1	0.379	12.400	0.86
Flow (From)	OS-5	0.212	12.500	0.47
Flow (In)	EX DP-1	2.388	12.600	5.52

Pre-Dev 2 Year Routing

Subsection: Addition Summary

Label: EX DP-2

Return Event: 2 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2
<Catchment to Outflow Node>	OS-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2	0.071	12.300	0.17
Flow (From)	OS-2	0.016	12.350	0.04
Flow (In)	EX DP-2	0.087	12.350	0.21

Pre-Dev 2 Year Routing

Subsection: Addition Summary
Label: EX DP-3

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-3'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-3	0.191	12.600	0.42
Flow (In)	EX DP-3	0.191	12.600	0.42

Pre-Dev 2 Year Routing

Subsection: Addition Summary

Label: EX DP-4

Return Event: 2 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-4'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-6

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-6	0.052	12.450	0.12
Flow (In)	EX DP-4	0.052	12.450	0.12

Pre-Dev 2 Year Routing

Subsection: Addition Summary

Label: EX. 60" CMP

Return Event: 2 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX. 60" CMP'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-4
<Catchment to Outflow Node>	OS-4
<Catchment to Outflow Node>	OS-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-4	0.366	12.250	1.29
Flow (From)	OS-4	0.167	12.200	0.62
Flow (From)	OS-3	0.083	12.050	1.26
Flow (In)	EX. 60" CMP	0.617	12.150	2.47

Pre-Dev 2 Year Routing

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Pre-Dev 5 Year Routing

Project Summary

Title	Retreat at TimberRidge Preliminary Drainage Report (South of Arroya Lane)
Engineer	MAW
Company	CCES
Date	4/10/2018

Notes	Pre-Dev 5 year SCS Model
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EX. 60" CMP		
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Pre-Dev 5 Year Routing

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX-1	Pre-Development 5 YEAR	5	3.342	12.250	17.71
EX-2	Pre-Development 5 YEAR	5	0.197	12.100	1.70
EX-3	Pre-Development 5 YEAR	5	0.531	12.250	2.97
EX-4	Pre-Development 5 YEAR	5	0.916	12.150	6.87
EX-6	Pre-Development 5 YEAR	5	0.143	12.150	0.91
OS-1	Pre-Development 5 YEAR	5	1.050	12.150	7.03
OS-2	Pre-Development 5 YEAR	5	0.045	12.100	0.33
OS-3	Pre-Development 5 YEAR	5	0.134	12.050	2.04
OS-4	Pre-Development 5 YEAR	5	0.419	12.150	3.41
OS-5	Pre-Development 5 YEAR	5	0.589	12.200	3.58

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX DP-1	Pre-Development 5 YEAR	5	6.417	12.250	34.88
EX DP-2	Pre-Development 5 YEAR	5	0.242	12.100	2.04
EX DP-3	Pre-Development 5 YEAR	5	0.531	12.250	2.97
EX DP-4	Pre-Development 5 YEAR	5	0.143	12.150	0.91
EX. 60" CMP	Pre-Development 5 YEAR	5	1.469	12.150	11.55

Pre-Dev 5 Year Routing

Subsection: Time-Depth Curve
 Label: Colo Springs 2015

Return Event: 5 years
 Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR	
Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
6.250	0.2	0.2	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.4
8.750	0.4	0.4	0.4	0.4	0.5
10.000	0.5	0.5	0.5	0.6	0.6
11.250	0.7	0.8	1.0	1.8	1.9
12.500	2.0	2.0	2.1	2.1	2.2
13.750	2.2	2.2	2.3	2.3	2.3
15.000	2.3	2.3	2.3	2.4	2.4
16.250	2.4	2.4	2.4	2.4	2.5
17.500	2.5	2.5	2.5	2.5	2.5
18.750	2.5	2.5	2.5	2.6	2.6
20.000	2.6	2.6	2.6	2.6	2.6
21.250	2.6	2.6	2.6	2.6	2.6
22.500	2.7	2.7	2.7	2.7	2.7
23.750	2.7	2.7	(N/A)	(N/A)	(N/A)

Pre-Dev 5 Year Routing

Subsection: Addition Summary
Label: EX DP-1

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-1'

Upstream Link	Upstream Node
REACH SC-9	EX. 60" CMP
<Catchment to Outflow Node>	EX-1
<Catchment to Outflow Node>	OS-1
<Catchment to Outflow Node>	OS-5

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	REACH SC-9	1.436	12.300	8.02
Flow (From)	EX-1	3.342	12.250	17.71
Flow (From)	OS-1	1.050	12.150	7.03
Flow (From)	OS-5	0.589	12.200	3.58
Flow (In)	EX DP-1	6.417	12.250	34.88

Pre-Dev 5 Year Routing

Subsection: Addition Summary

Label: EX DP-2

Return Event: 5 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2
<Catchment to Outflow Node>	OS-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2	0.197	12.100	1.70
Flow (From)	OS-2	0.045	12.100	0.33
Flow (In)	EX DP-2	0.242	12.100	2.04

Pre-Dev 5 Year Routing

Subsection: Addition Summary
Label: EX DP-3

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-3'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-3	0.531	12.250	2.97
Flow (In)	EX DP-3	0.531	12.250	2.97

Pre-Dev 5 Year Routing

Subsection: Addition Summary
Label: EX DP-4

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-4'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-6

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-6	0.143	12.150	0.91
Flow (In)	EX DP-4	0.143	12.150	0.91

Pre-Dev 5 Year Routing

Subsection: Addition Summary

Label: EX. 60" CMP

Return Event: 5 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX. 60" CMP'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-4
<Catchment to Outflow Node>	OS-4
<Catchment to Outflow Node>	OS-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-4	0.916	12.150	6.87
Flow (From)	OS-4	0.419	12.150	3.41
Flow (From)	OS-3	0.134	12.050	2.04
Flow (In)	EX. 60" CMP	1.469	12.150	11.55

Pre-Dev 5 Year Routing

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Pre-Dev 100 Year Routing

Project Summary

Title	Retreat at TimberRidge Preliminary Drainage Report (South of Arroya Lane)
Engineer	MAW
Company	CCES
Date	4/10/2018

Notes	Pre-Dev 100 year SCS Model
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Pre-Dev 100 Year Routing

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX-1	Pre-Development 100 YEAR	100	14.733	12.200	140.28
EX-2	Pre-Development 100 YEAR	100	0.868	12.050	12.19
EX-3	Pre-Development 100 YEAR	100	2.340	12.150	23.71
EX-4	Pre-Development 100 YEAR	100	3.684	12.100	41.75
EX-6	Pre-Development 100 YEAR	100	0.631	12.100	7.12
OS-1	Pre-Development 100 YEAR	100	4.622	12.100	53.88
OS-2	Pre-Development 100 YEAR	100	0.198	12.100	2.53
OS-3	Pre-Development 100 YEAR	100	0.317	12.050	4.76
OS-4	Pre-Development 100 YEAR	100	1.685	12.100	20.68
OS-5	Pre-Development 100 YEAR	100	2.597	12.150	28.11

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EX DP-1	Pre-Development 100 YEAR	100	27.578	12.150	273.40
EX DP-2	Pre-Development 100 YEAR	100	1.065	12.050	14.65
EX DP-3	Pre-Development 100 YEAR	100	2.340	12.150	23.71
EX DP-4	Pre-Development 100 YEAR	100	0.631	12.100	7.12
EX. 60" CMP	Pre-Development 100 YEAR	100	5.686	12.100	66.46

Pre-Dev 100 Year Routing

Subsection: Time-Depth Curve
 Label: Colo Springs 2015

Return Event: 100 years
 Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR	
Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
1.250	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.2	0.2	0.2
3.750	0.2	0.2	0.2	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.4
6.250	0.4	0.4	0.4	0.5	0.5
7.500	0.5	0.5	0.6	0.6	0.6
8.750	0.6	0.7	0.7	0.7	0.8
10.000	0.8	0.9	0.9	1.0	1.1
11.250	1.2	1.3	1.8	3.0	3.3
12.500	3.4	3.5	3.6	3.6	3.7
13.750	3.7	3.8	3.8	3.9	3.9
15.000	3.9	4.0	4.0	4.0	4.1
16.250	4.1	4.1	4.1	4.2	4.2
17.500	4.2	4.2	4.2	4.3	4.3
18.750	4.3	4.3	4.3	4.4	4.4
20.000	4.4	4.4	4.4	4.4	4.4
21.250	4.5	4.5	4.5	4.5	4.5
22.500	4.5	4.5	4.5	4.6	4.6
23.750	4.6	4.6	(N/A)	(N/A)	(N/A)

Pre-Dev 100 Year Routing

Subsection: Addition Summary
Label: EX DP-1

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-1'

Upstream Link	Upstream Node
REACH SC-9	EX. 60" CMP
<Catchment to Outflow Node>	EX-1
<Catchment to Outflow Node>	OS-1
<Catchment to Outflow Node>	OS-5

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	REACH SC-9	5.626	12.200	57.95
Flow (From)	EX-1	14.733	12.200	140.28
Flow (From)	OS-1	4.622	12.100	53.88
Flow (From)	OS-5	2.597	12.150	28.11
Flow (In)	EX DP-1	27.578	12.150	273.40

Pre-Dev 100 Year Routing

Subsection: Addition Summary

Label: EX DP-2

Return Event: 100 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2
<Catchment to Outflow Node>	OS-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2	0.868	12.050	12.19
Flow (From)	OS-2	0.198	12.100	2.53
Flow (In)	EX DP-2	1.065	12.050	14.65

Pre-Dev 100 Year Routing

Subsection: Addition Summary

Label: EX DP-3

Return Event: 100 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-3'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-3	2.340	12.150	23.71
Flow (In)	EX DP-3	2.340	12.150	23.71

Pre-Dev 100 Year Routing

Subsection: Addition Summary

Label: EX DP-4

Return Event: 100 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX DP-4'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-6

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-6	0.631	12.100	7.12
Flow (In)	EX DP-4	0.631	12.100	7.12

Pre-Dev 100 Year Routing

Subsection: Addition Summary

Label: EX. 60" CMP

Return Event: 100 years

Storm Event: TYPE II 24 HOUR

Summary for Hydrograph Addition at 'EX. 60" CMP'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-4
<Catchment to Outflow Node>	OS-4
<Catchment to Outflow Node>	OS-3

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-4	3.684	12.100	41.75
Flow (From)	OS-4	1.685	12.100	20.68
Flow (From)	OS-3	0.317	12.050	4.76
Flow (In)	EX. 60" CMP	5.686	12.100	66.46

Pre-Dev 100 Year Routing

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EX DP-3 (Addition Summary, 100 years)...6

EX DP-4 (Addition Summary, 100 years)...7

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STORMWATER QUALITY CALCULATIONS



Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond B
Location: El Paso County

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * P^3 - 1.19 * P^2 + 0.78 * P) / 12 * Area)$)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) Predominant Watershed NRCS Soil Group</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$ </p>	<p>$I_a =$ <u>11.0</u> %</p> <p>$i =$ <u>0.110</u></p> <p>Area = <u>26.700</u> ac</p> <p>$d_b =$ <u>0.42</u> in</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Choose One <input type="radio"/> Water Quality Capture Volume (WQCV) <input checked="" type="radio"/> Excess Urban Runoff Volume (EURV) </div> <p>$V_{DESIGN} =$ <u>0.162</u> ac-ft</p> <p>$V_{DESIGN\ OTHER} =$ <u>0.158</u> ac-ft</p> <p>$V_{DESIGN\ USER} =$ _____ ac-ft</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Choose One <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C / D </div> <p>EURV = <u>0.279</u> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <u>2.0</u> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <u>4.00</u> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p><u>Rip-Rap Forebays</u></p> <hr/> <hr/> <hr/>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond B
Location: El Paso County

<p>5. Forebay</p> <p>A) Minimum Forebay Volume ($V_{FMIN} =$ <u>2%</u> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth ($D_F =$ <u>18</u> inch maximum)</p> <p>D) Forebay Discharge</p> <p style="margin-left: 40px;">i) Undetained 100-year Peak Discharge</p> <p style="margin-left: 40px;">ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p>$V_{FMIN} =$ <u>0.003</u> ac-ft</p> <p>$V_F =$ <u>0.004</u> ac-ft</p> <p>$D_F =$ <u>8.0</u> in</p> <p>$Q_{100} =$ <u>48.00</u> cfs</p> <p>$Q_F =$ <u>0.96</u> cfs</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input type="radio"/> Berm With Pipe <input checked="" type="radio"/> Wall with Rect. Notch <input type="radio"/> Wall with V-Notch Weir </div> <p style="color: blue; margin-left: 100px;">(flow too small for berm w/ pipe)</p> <p>Calculated $D_p =$ <u> </u> in</p> <p>Calculated $W_N =$ <u>8.0</u> in</p>
<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input checked="" type="radio"/> Concrete <input type="radio"/> Soft Bottom </div> <p>$S =$ <u>0.0100</u> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-feet minimum)</p> <p>B) Surface Area of Micropool (10 ft² minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>$D_M =$ <u>2.5</u> ft</p> <p>$A_M =$ <u>10</u> sq ft</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input checked="" type="radio"/> Orifice Plate <input type="radio"/> Other (Describe): </div> <p>_____</p> <p>_____</p> <p>_____</p> <p>$D_{orifice} =$ <u>0.81</u> inches</p> <p>$A_{ot} =$ <u>1.71</u> square inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond B
Location: EI Paso County

<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>$D_{IS} =$ <u>6</u> in</p> <p>$V_{IS} =$ <u> </u> cu ft</p> <p>$V_s =$ <u>5.0</u> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$</p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)</p> <p style="padding-left: 40px;">Other (Y/N): <u>N</u></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H_{TR})</p> <p>G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)</p>	<p>$A_t =$ <u>61</u> square inches</p> <p><u>S.S. Well Screen with 60% Open Area</u></p> <hr/> <hr/> <p>User Ratio =</p> <p>$A_{total} =$ <u>102</u> sq. in.</p> <p>$H =$ <u>3.25</u> feet</p> <p>$H_{TR} =$ <u>67</u> inches</p> <p>$W_{opening} =$ <u>12.0</u> inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond B
Location: El Paso County

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Erosion Control Blanket</p> <hr/> <hr/> <p align="center">4.00</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>Per IM Plan</p> <hr/> <hr/> <hr/> <hr/>
<p>Notes:</p> <hr/> <hr/> <hr/>	

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond C
Location: El Paso County

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * P^3 - 1.19 * P^2 + 0.78 * P)) / 12 * Area$)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) Predominant Watershed NRCS Soil Group</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$ </p>	<p>$I_a =$ <u>11.0</u> %</p> <p>$i =$ <u>0.110</u></p> <p>Area = <u>31.400</u> ac</p> <p>$d_b =$ <u>0.42</u> in</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Choose One <input type="radio"/> Water Quality Capture Volume (WQCV) <input checked="" type="radio"/> Excess Urban Runoff Volume (EURV) </div> <p>$V_{DESIGN} =$ <u>0.190</u> ac-ft</p> <p>$V_{DESIGN\ OTHER} =$ <u>0.186</u> ac-ft</p> <p>$V_{DESIGN\ USER} =$ _____ ac-ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Choose One <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C / D </div> <p>EURV = <u>0.328</u> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <u>2.0</u> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <u>4.00</u> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p><u>Rip-Rap Forebays</u></p> <hr/> <hr/> <hr/>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond C
Location: El Paso County

<p>5. Forebay</p> <p>A) Minimum Forebay Volume ($V_{FMIN} =$ <u>2%</u> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth ($D_F =$ <u>18</u> inch maximum)</p> <p>D) Forebay Discharge</p> <p style="padding-left: 40px;">i) Undetained 100-year Peak Discharge</p> <p style="padding-left: 40px;">ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p>$V_{FMIN} =$ <u>0.004</u> ac-ft</p> <p>$V_F =$ <u>0.005</u> ac-ft</p> <p>$D_F =$ <u>8.0</u> in</p> <p>$Q_{100} =$ <u>48.00</u> cfs</p> <p>$Q_F =$ <u>0.96</u> cfs</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input type="radio"/> Berm With Pipe <input checked="" type="radio"/> Wall with Rect. Notch <input type="radio"/> Wall with V-Notch Weir </div> <p style="color: blue; font-size: small;">(flow too small for berm w/ pipe)</p> <p>Calculated $D_p =$ <u> </u> in</p> <p>Calculated $W_N =$ <u>8.0</u> in</p>
<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input checked="" type="radio"/> Concrete <input type="radio"/> Soft Bottom </div> <p>$S =$ <u>0.0100</u> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-feet minimum)</p> <p>B) Surface Area of Micropool (10 ft² minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>$D_M =$ <u>2.5</u> ft</p> <p>$A_M =$ <u>10</u> sq ft</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;"> Choose One <input checked="" type="radio"/> Orifice Plate <input type="radio"/> Other (Describe): </div> <p>_____</p> <p>_____</p> <p>$D_{orifice} =$ <u>0.88</u> inches</p> <p>$A_{ot} =$ <u>1.98</u> square inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond C
Location: EI Paso County

<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>$D_{IS} =$ <u>6</u> in</p> <p>$V_{IS} =$ <u> </u> cu ft</p> <p>$V_s =$ <u>5.0</u> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$</p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)</p> <p style="padding-left: 40px;">Other (Y/N): <u>N</u></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H_{TR})</p> <p>G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)</p>	<p>$A_t =$ <u>70</u> square inches</p> <p><u>S.S. Well Screen with 60% Open Area</u></p> <hr/> <hr/> <p>User Ratio =</p> <p>$A_{total} =$ <u>117</u> sq. in.</p> <p>$H =$ <u>3.25</u> feet</p> <p>$H_{TR} =$ <u>67</u> inches</p> <p>$W_{opening} =$ <u>12.0</u> inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond C
Location: El Paso County

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Erosion Control Blanket</p> <hr/> <hr/> <p align="center">4.00</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>Per IM Plan</p> <hr/> <hr/> <hr/> <hr/>
<p>Notes:</p> <hr/> <hr/> <hr/>	

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond D
Location: El Paso County

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * P^3 - 1.19 * P^2 + 0.78 * P) / 12 * Area)$)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) Predominant Watershed NRCS Soil Group</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$ </p>	<p>$I_a =$ <u>23.0</u> %</p> <p>$i =$ <u>0.230</u></p> <p>Area = <u>129.250</u> ac</p> <p>$d_b =$ <u>0.42</u> in</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 10px;"> Choose One <input type="radio"/> Water Quality Capture Volume (WQCV) <input checked="" type="radio"/> Excess Urban Runoff Volume (EURV) </div> <p>$V_{DESIGN} =$ <u>1.374</u> ac-ft</p> <p>$V_{DESIGN\ OTHER} =$ <u>1.342</u> ac-ft</p> <p>$V_{DESIGN\ USER} =$ _____ ac-ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 10px;"> Choose One <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C / D </div> <p>EURV = <u>2.995</u> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <u>2.0</u> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <u>4.00</u> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p><u>Rip-Rap Forebays</u></p> <hr/> <hr/> <hr/>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond D
Location: El Paso County

<p>5. Forebay</p> <p>A) Minimum Forebay Volume ($V_{FMIN} = \underline{3\%}$ of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth ($D_F = \underline{30}$ inch maximum)</p> <p>D) Forebay Discharge</p> <p style="padding-left: 40px;">i) Undetained 100-year Peak Discharge</p> <p style="padding-left: 40px;">ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p>$V_{FMIN} = \underline{0.040}$ ac-ft</p> <p>$V_F = \underline{0.041}$ ac-ft</p> <p>$D_F = \underline{18.0}$ in</p> <p>$Q_{100} = \underline{236.00}$ cfs</p> <p>$Q_F = \underline{4.72}$ cfs</p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p>Calculated $D_p = \underline{\hspace{1cm}}$ in</p> <p>Calculated $W_N = \underline{12.9}$ in</p>
<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Concrete</p> <p><input type="radio"/> Soft Bottom</p> </div> <p>$S = \underline{0.0100}$ ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-feet minimum)</p> <p>B) Surface Area of Micropool (10 ft² minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>$D_M = \underline{2.5}$ ft</p> <p>$A_M = \underline{100}$ sq ft</p> <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Orifice Plate</p> <p><input type="radio"/> Other (Describe):</p> </div> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p>$D_{orifice} = \underline{2.31}$ inches</p> <p>$A_{ot} = \underline{12.60}$ square inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond D
Location: EI Paso County

<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>$D_{IS} =$ <u>6</u> in</p> <p>$V_{IS} =$ <u>175.3</u> cu ft</p> <p>$V_s =$ <u>50.0</u> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$</p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)</p> <p style="padding-left: 40px;">Other (Y/N): <u>N</u></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H_{TR})</p> <p>G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)</p>	<p>$A_t =$ <u>390</u> square inches</p> <p><u>Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.</u></p> <hr/> <p>User Ratio =</p> <p>$A_{total} =$ <u>549</u> sq. in.</p> <p>$H =$ <u>5</u> feet</p> <p>$H_{TR} =$ <u>88</u> inches</p> <p>$W_{opening} =$ <u>12.0</u> inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: CCES
Date: April 12, 2018
Project: The Retreat at TimberRidge Preliminary Drainage Report - Pond D
Location: El Paso County

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Erosion Control Blanket</p> <hr/> <hr/> <p align="center">4.00</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>Per IM Plan</p> <hr/> <hr/> <hr/> <hr/>
<p>Notes:</p> <hr/> <hr/> <hr/>	

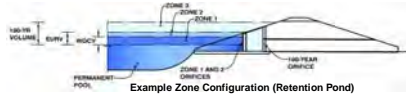
DETENTION POND CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT

Basin ID: POND B



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	26.70	acres
Watershed Length =	1,650	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	11.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.162	acre-feet
Excess Urban Runoff Volume (EURV) =	0.278	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.193	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.298	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.650	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.652	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.279	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.099	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.) =	5.752	acre-feet
Approximate 2-yr Detention Volume =	0.179	acre-feet
Approximate 5-yr Detention Volume =	0.279	acre-feet
Approximate 10-yr Detention Volume =	0.556	acre-feet
Approximate 25-yr Detention Volume =	0.765	acre-feet
Approximate 50-yr Detention Volume =	0.802	acre-feet
Approximate 100-yr Detention Volume =	1.031	acre-feet

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

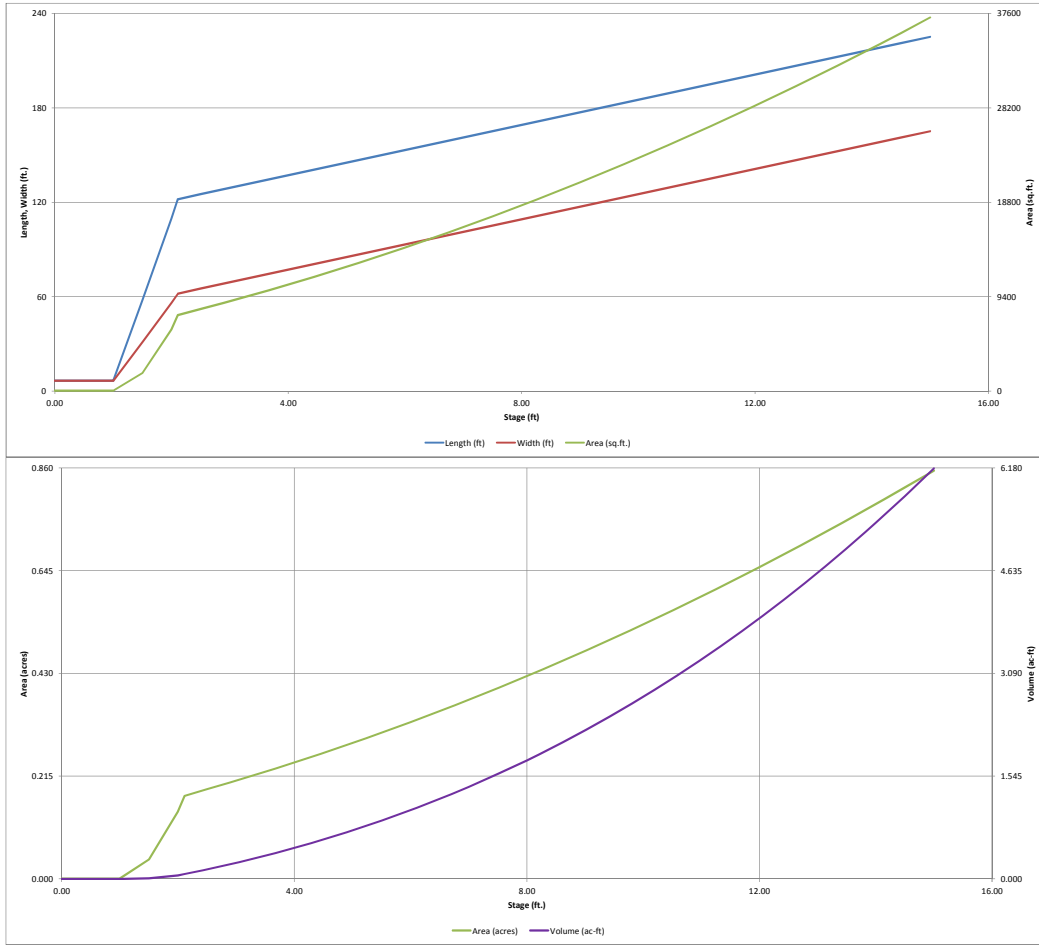
Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.162	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.117	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.752	acre-feet
Total Detention Basin Volume =	1.031	acre-feet
Initial Surcharge Volume (ISV) =	21	ft³
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{bw}) =	2	
Initial Surcharge Area (A _{sv}) =	42	ft²
Surcharge Volume Length (L _{sv}) =	6.5	ft
Surcharge Volume Width (W _{sv}) =	6.5	ft
Depth of Basin Floor (H _{u,000}) =	1.11	ft
Length of Basin Floor (L _{u,000}) =	122.1	ft
Width of Basin Floor (W _{u,000}) =	62.1	ft
Area of Basin Floor (A _{u,000}) =	7,581	ft²
Volume of Basin Floor (V _{u,000}) =	3,035	ft³
Depth of Main Basin (H _{main}) =	3.89	ft
Length of Main Basin (L _{main}) =	153.2	ft
Width of Main Basin (W _{main}) =	93.2	ft
Area of Main Basin (A _{main}) =	14,279	ft²
Volume of Main Basin (V _{main}) =	41,820	ft³
Calculated Total Basin Volume (V _{total}) =	1,031	acre-feet

Depth Increment = 0.5 ft		Optional User Override Stage (ft)		Optional User Override Area (ft²)		Optional User Override Area (acre)		Optional User Override Volume (ft³)		Optional User Override Volume (ac-ft)	
Stage - Storage Description	Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)	Area (acre)	Volume (ft³)	Volume (ac-ft)	Volume (ac-ft)
Top of Micropool	0.00	6.5	6.5	42	0.001						
ISV	0.50	6.5	6.5	42	0.001	21	0.000				
	1.00	6.5	6.5	42	0.001	42	0.001				
	1.50	57.5	31.0	1,782	0.041	387	0.009				
	2.00	109.5	56.0	6,132	0.141	2,258	0.052				
Floor	2.11	122.0	62.0	7,562	0.174	3,078	0.071				
	2.50	125.2	65.2	8,163	0.187	6,147	0.141				
Zone 1 (WQCV)	2.61	126.1	66.1	8,332	0.191	7,054	0.162				
	3.00	129.2	69.2	8,941	0.205	10,422	0.239				
Zone 2 (EURV)	3.19	130.7	70.7	9,245	0.212	12,149	0.279				
	3.50	133.2	73.2	9,751	0.224	15,093	0.346				
	4.00	137.2	77.2	10,592	0.243	20,178	0.463				
	4.50	141.2	81.2	11,466	0.263	25,691	0.590				
	5.00	145.2	85.2	12,372	0.284	31,649	0.727				
	5.50	149.2	89.2	13,309	0.306	38,068	0.874				
Zone 3 (100-year)	6.00	153.2	93.2	14,279	0.328	44,963	1.032				
	6.50	157.2	97.2	15,280	0.351	52,352	1.202				
	7.00	161.2	101.2	16,314	0.375	60,249	1.383				
	7.50	165.2	105.2	17,380	0.399	68,671	1.576				
	8.00	169.2	109.2	18,477	0.424	77,634	1.782				
	8.50	173.2	113.2	19,607	0.450	87,154	2.001				
	9.00	177.2	117.2	20,769	0.477	97,247	2.232				
	9.50	181.2	121.2	21,962	0.504	107,928	2.478				
	10.00	185.2	125.2	23,188	0.532	119,214	2.737				
	10.50	189.2	129.2	24,446	0.561	131,121	3.010				
	11.00	193.2	133.2	25,735	0.591	143,665	3.298				
	11.50	197.2	137.2	27,057	0.621	156,862	3.601				
	12.00	201.2	141.2	28,411	0.652	170,728	3.919				
	12.50	205.2	145.2	29,796	0.684	185,278	4.253				
	13.00	209.2	149.2	31,214	0.717	200,529	4.604				
	13.50	213.2	153.2	32,663	0.750	216,497	4.970				
	14.00	217.2	157.2	34,145	0.784	233,198	5.353				
	14.50	221.2	161.2	35,659	0.819	250,647	5.754				
	15.00	225.2	165.2	37,204	0.854	268,862	6.172				

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

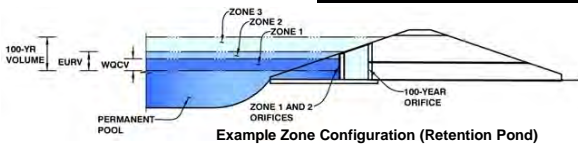


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT

Basin ID: POND B



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.61	0.162	Orifice Plate
Zone 2 (EURV)	3.19	0.117	Orifice Plate
Zone 3 (100-year)	6.00	0.752	Weir&Pipe (Restrict)
		1.031	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.25	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	13.00	inches
Orifice Plate: Orifice Area per Row =	0.57	sq. inches (diameter = 13/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	3.958E-03	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.20					
Orifice Area (sq. inches)	0.57	0.57	0.57					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	4.25	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	5.99	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	12.37	N/A	ft ²
Overflow Grate Open Area w/ Debris =	6.18	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	15.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.07	N/A	ft ²
Outlet Orifice Centroid =	0.71	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

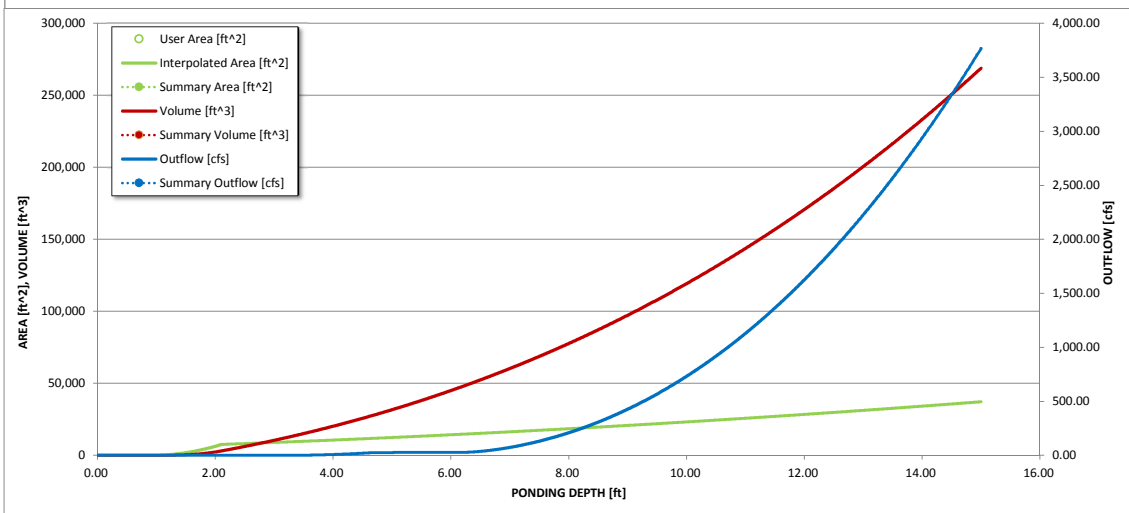
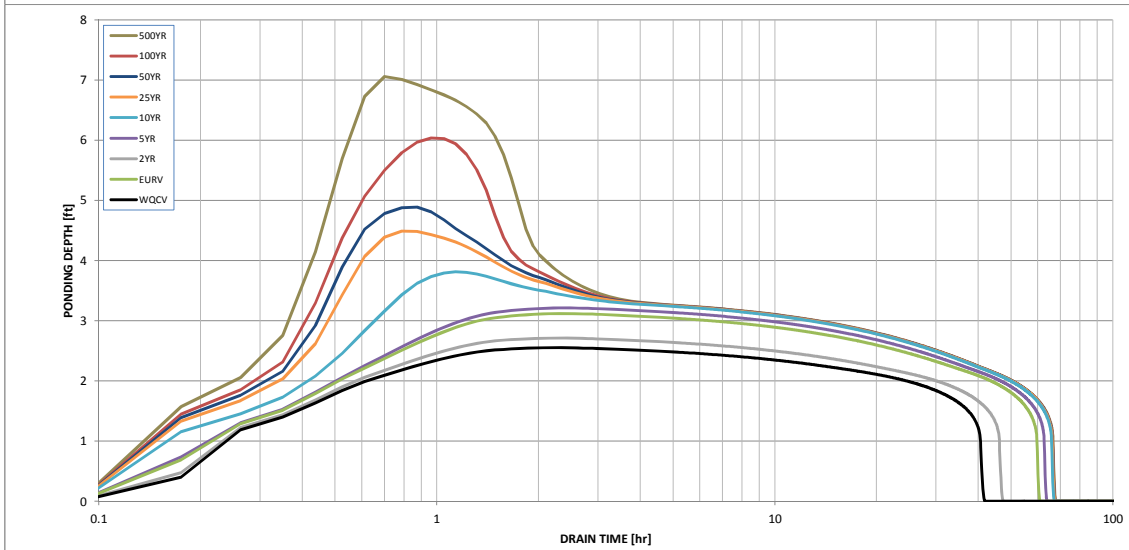
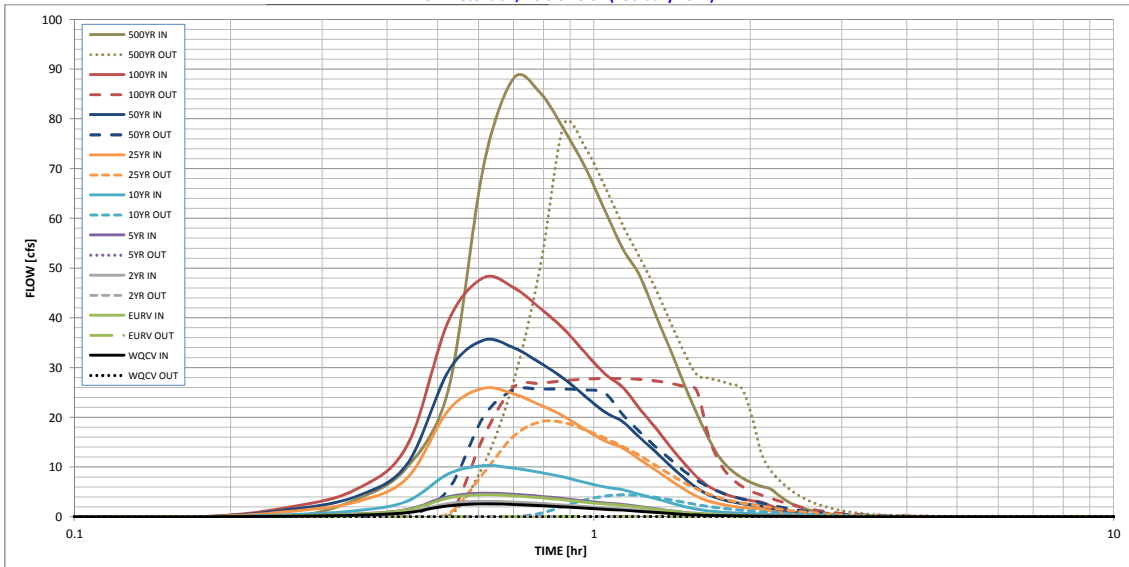
Spillway Design Flow Depth =	0.79	feet
Stage at Top of Freeboard =	8.04	feet
Basin Area at Top of Freeboard =	0.43	acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	0.162	0.278	0.193	0.298	0.650	1.652	2.279	3.099	5.752
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.161	0.277	0.193	0.297	0.649	1.651	2.279	3.099	5.752
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.19	0.63	0.87	1.17	2.12
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.5	5.0	16.7	23.2	31.2	56.6
Peak Inflow Q (cfs) =	2.6	4.4	3.1	4.7	10.3	25.8	35.5	48.1	88.1
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	4.5	19.1	25.7	27.8	78.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.9	1.1	1.1	0.9	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.5	2.1	2.2	2.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	57	44	60	59	51	46	40	25
Time to Drain 99% of Inflow Volume (hours) =	40	59	46	62	64	61	59	57	49
Maximum Ponding Depth (ft) =	2.55	3.12	2.71	3.21	3.81	4.49	4.89	6.04	7.06
Area at Maximum Ponding Depth (acres) =	0.19	0.21	0.19	0.21	0.24	0.26	0.28	0.33	0.38
Maximum Volume Stored (acre-ft) =	0.151	0.262	0.181	0.283	0.418	0.585	0.693	1.042	1.402

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Table with 7 columns: Stage - Storage Description, Stage [ft], Area [ft^2], Area [acres], Volume [ft^3], Volume [ac-ft], Total Outflow [cfs]. The table contains multiple empty rows for data entry.

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

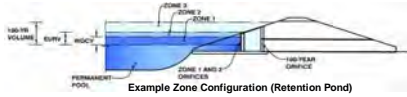
Also include the inverts of all outlets (e.g. vertical orifice, overflow gate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: **RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT**

Basin ID: **POND C**



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	31.40	acres
Watershed Length =	2,250	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	11.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQC Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.190	acre-feet
Excess Urban Runoff Volume (EURV) =	0.327	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.227	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.351	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.764	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.942	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.680	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.645	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.) =	6.765	acre-feet
Approximate 2-yr Detention Volume =	0.211	acre-feet
Approximate 5-yr Detention Volume =	0.328	acre-feet
Approximate 10-yr Detention Volume =	0.654	acre-feet
Approximate 25-yr Detention Volume =	0.899	acre-feet
Approximate 50-yr Detention Volume =	0.943	acre-feet
Approximate 100-yr Detention Volume =	1.212	acre-feet

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

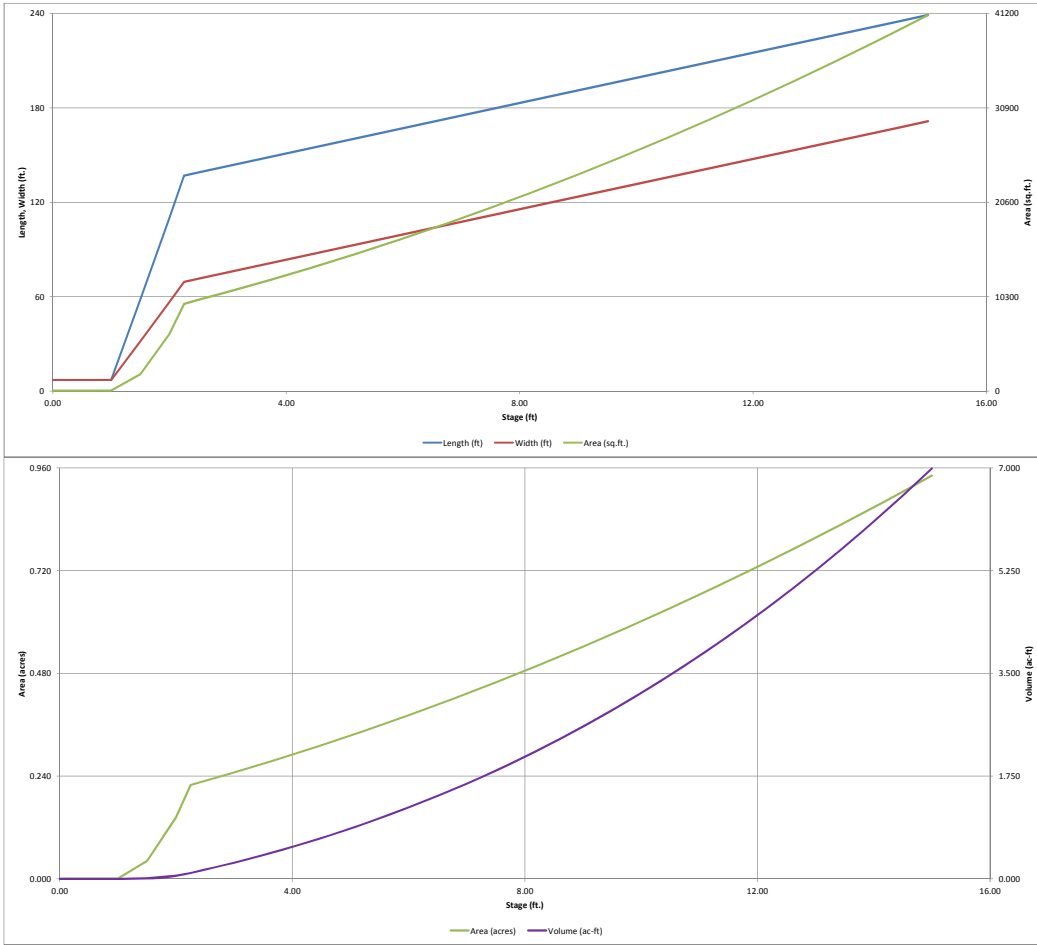
Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.190	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.137	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.885	acre-feet
Total Detention Basin Volume =	1.212	acre-feet
Initial Surcharge Volume (ISV) =	25	ft³
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{bw}) =	2	
Initial Surcharge Area (A _{sv}) =	50	ft²
Surcharge Volume Length (L _{sv}) =	7.0	ft
Surcharge Volume Width (W _{sv}) =	7.0	ft
Depth of Basin Floor (H _{u,000}) =	1.25	ft
Length of Basin Floor (L _{u,000}) =	137.1	ft
Width of Basin Floor (W _{u,000}) =	69.6	ft
Area of Basin Floor (A _{u,000}) =	9,540	ft²
Volume of Basin Floor (V _{u,000}) =	4,285	ft³
Depth of Main Basin (H _{main}) =	3.75	ft
Length of Main Basin (L _{main}) =	167.1	ft
Width of Main Basin (W _{main}) =	99.6	ft
Area of Main Basin (A _{main}) =	16,639	ft²
Volume of Main Basin (V _{main}) =	48,465	ft³
Calculated Total Basin Volume (V _{total}) =	1,212	acre-feet

Stage - Storage Description	Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Area (acre)	Volume (ft³)	Volume (ac-ft)
Top of Micropool	0.00	7.0	7.0	50	0.001		
ISV	0.50	7.0	7.0	50	0.001	24	0.001
	1.00	7.0	7.0	50	0.001	49	0.001
	1.50	58.0	31.5	1,830	0.042	408	0.009
	2.00	110.0	56.5	6,220	0.143	2,312	0.053
Floor	2.25	137.0	69.5	9,530	0.219	4,344	0.100
	2.50	139.1	71.6	9,956	0.229	6,781	0.156
Zone 1 (WQCV)	2.65	140.3	72.8	10,211	0.234	8,294	0.190
	3.00	143.1	75.6	10,815	0.248	11,973	0.275
Zone 2 (EURV)	3.21	144.8	77.3	11,185	0.257	14,283	0.328
	3.50	147.1	79.6	11,706	0.269	17,602	0.404
	4.00	151.1	83.6	12,629	0.290	23,684	0.544
	4.50	155.1	87.6	13,583	0.312	30,235	0.694
	5.00	159.1	91.6	14,570	0.334	37,272	0.856
	5.50	163.1	95.6	15,589	0.358	44,811	1.029
Zone 3 (100-year)	6.00	167.1	99.6	16,639	0.382	52,867	1.214
	6.50	171.1	103.6	17,722	0.407	61,456	1.411
	7.00	175.1	107.6	18,837	0.432	70,594	1.621
	7.50	179.1	111.6	19,984	0.459	80,298	1.843
	8.00	183.1	115.6	21,162	0.486	90,583	2.080
	8.50	187.1	119.6	22,373	0.514	101,466	2.329
	9.00	191.1	123.6	23,616	0.542	112,962	2.593
	9.50	195.1	127.6	24,891	0.571	125,087	2.872
	10.00	199.1	131.6	26,197	0.601	137,857	3.165
	10.50	203.1	135.6	27,536	0.632	151,289	3.473
	11.00	207.1	139.6	28,907	0.664	165,399	3.797
	11.50	211.1	143.6	30,310	0.696	180,202	4.137
	12.00	215.1	147.6	31,744	0.729	195,714	4.493
	12.50	219.1	151.6	33,211	0.762	211,951	4.866
	13.00	223.1	155.6	34,710	0.797	228,930	5.256
	13.50	227.1	159.6	36,240	0.832	246,666	5.663
	14.00	231.1	163.6	37,803	0.868	265,176	6.088
	14.50	235.1	167.6	39,398	0.904	284,475	6.531
	15.00	239.1	171.6	41,025	0.942	304,579	6.992

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

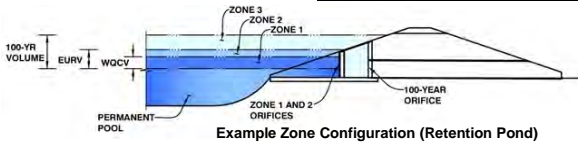


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT

Basin ID: POND C



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.65	0.190	Orifice Plate
Zone 2 (EURV)	3.21	0.137	Orifice Plate
Zone 3 (100-year)	6.00	0.885	Weir&Pipe (Restrict)
		1.212	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.25	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	13.00	inches
Orifice Plate: Orifice Area per Row =	0.66	sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	4.583E-03	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.20					
Orifice Area (sq. inches)	0.66	0.66	0.66					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	75%	N/A	% grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	4.25	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	5.99	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	12.37	N/A	ft ²
Overflow Grate Open Area w/ Debris =	6.18	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	15.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.07	N/A	ft ²
Outlet Orifice Centroid =	0.71	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

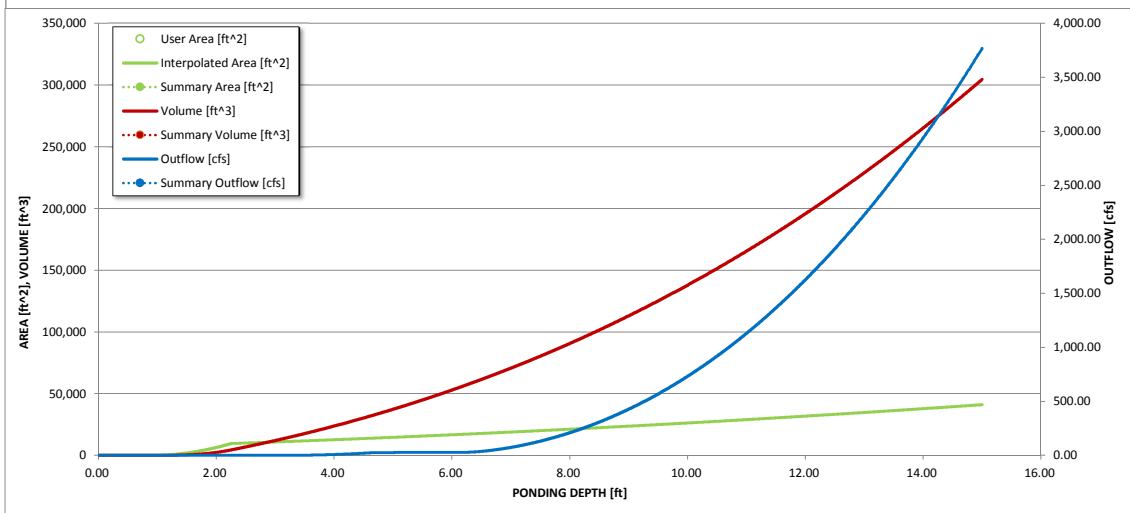
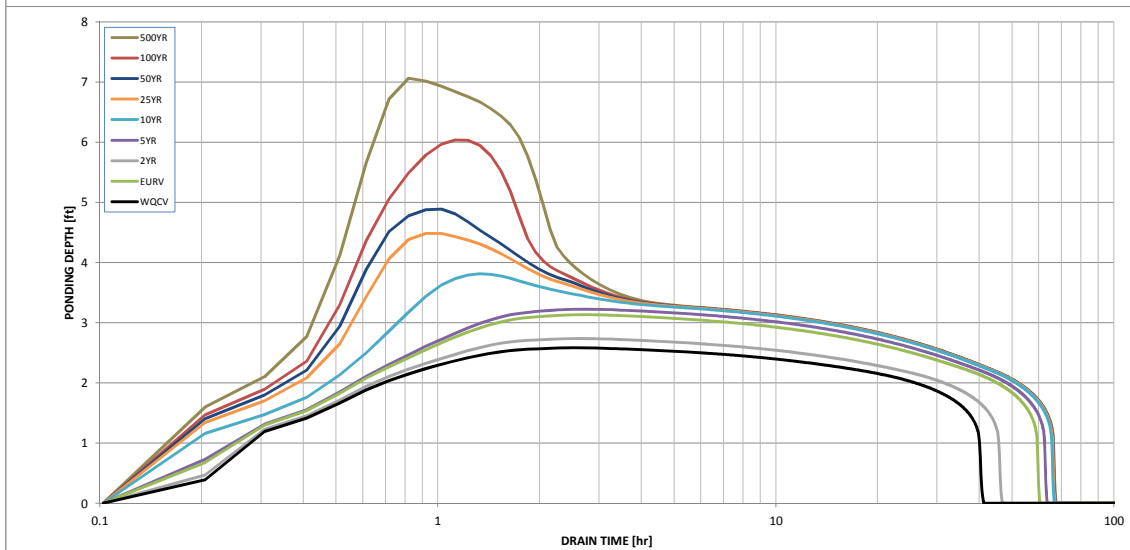
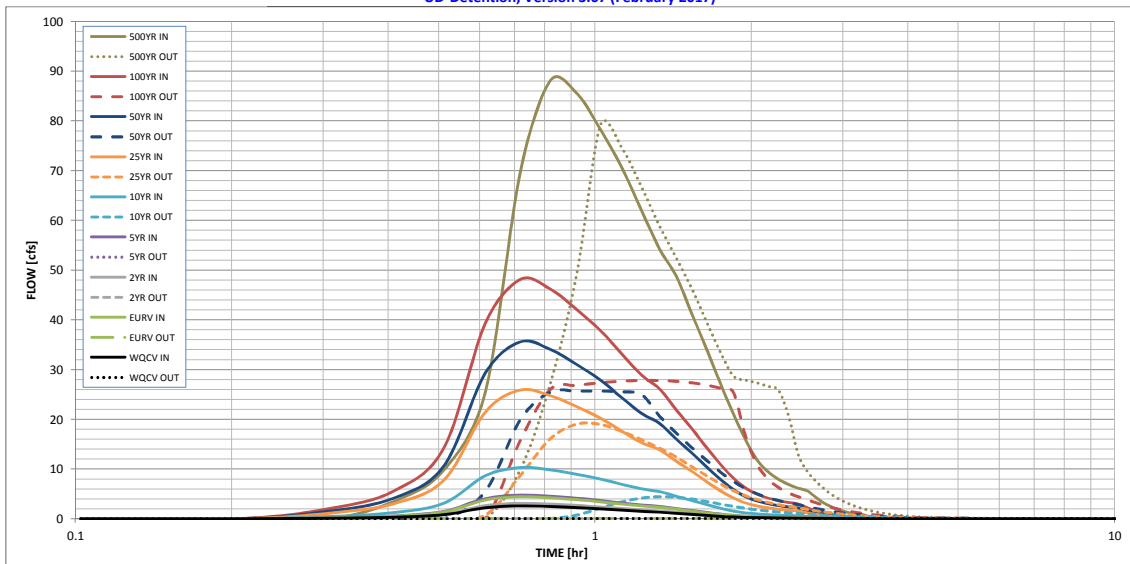
Spillway Design Flow Depth =	0.79	feet
Stage at Top of Freeboard =	8.04	feet
Basin Area at Top of Freeboard =	0.49	acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	0.190	0.327	0.227	0.351	0.764	1.942	2.680	3.645	6.765
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.189	0.326	0.226	0.350	0.763	1.941	2.679	3.642	6.759
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.15	0.52	0.72	0.98	1.78
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.5	4.7	16.3	22.6	30.7	55.9
Peak Inflow Q (cfs) =	2.6	4.4	3.1	4.8	10.3	25.9	35.5	48.1	88.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	4.5	19.1	25.7	27.8	79.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	1.0	1.2	1.1	0.9	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.5	2.1	2.2	2.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	57	44	59	59	51	46	40	25
Time to Drain 99% of Inflow Volume (hours) =	40	59	45	62	63	60	59	56	49
Maximum Ponding Depth (ft) =	2.58	3.13	2.74	3.22	3.81	4.48	4.88	6.04	7.06
Area at Maximum Ponding Depth (acres) =	0.23	0.25	0.24	0.26	0.28	0.31	0.33	0.38	0.44
Maximum Volume Stored (acre-ft) =	0.174	0.307	0.209	0.330	0.489	0.688	0.816	1.225	1.647

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



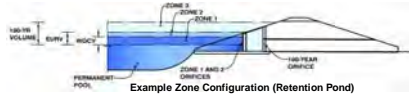
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT

Basin ID: POND D



Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	129.25	acres
Watershed Length =	4,200	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	23.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	1,374	acre-feet
Excess Urban Runoff Volume (EURV) =	2,987	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2,230	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3,243	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5,345	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	9,950	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	12,918	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	16,800	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.) =	29,996	acre-feet
Approximate 2-yr Detention Volume =	2,079	acre-feet
Approximate 5-yr Detention Volume =	3,041	acre-feet
Approximate 10-yr Detention Volume =	4,731	acre-feet
Approximate 25-yr Detention Volume =	5,719	acre-feet
Approximate 50-yr Detention Volume =	6,039	acre-feet
Approximate 100-yr Detention Volume =	7,330	acre-feet

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

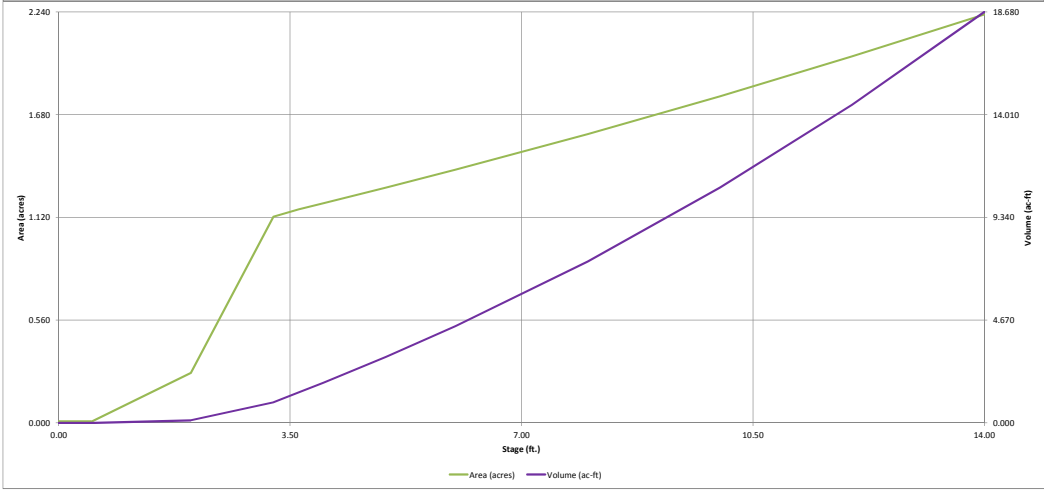
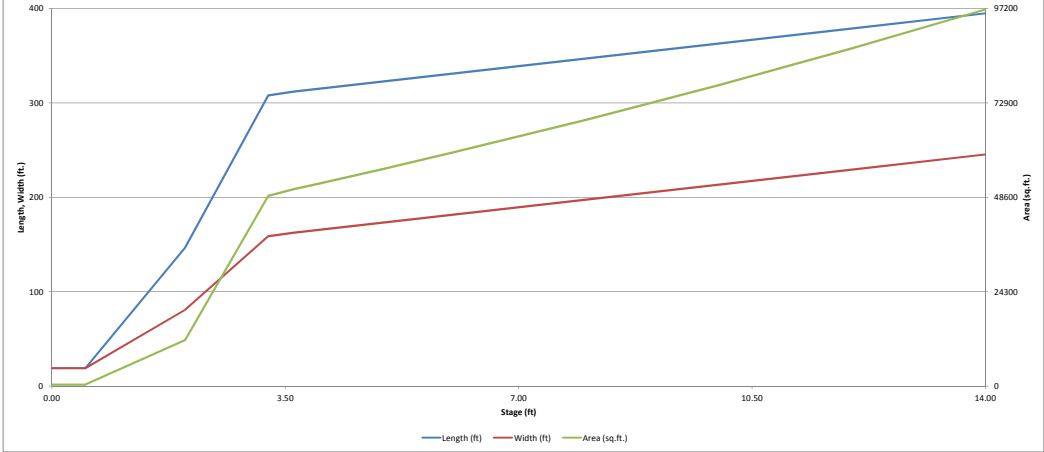
Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1,374	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1,613	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4,343	acre-feet
Total Detention Basin Volume =	7,330	acre-feet
Initial Surcharge Volume (ISV) =	180	ft ³
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	8.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.008	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{bw}) =	2	
Initial Surcharge Area (A _{sv}) =	359	ft ²
Surcharge Volume Length (L _{sv}) =	19.0	ft
Surcharge Volume Width (W _{sv}) =	19.0	ft
Depth of Basin Floor (H _{floor}) =	2.25	ft
Length of Basin Floor (L _{floor}) =	309.0	ft
Width of Basin Floor (W _{floor}) =	159.5	ft
Area of Basin Floor (A _{floor}) =	49,266	ft ²
Volume of Basin Floor (V _{floor}) =	40,340	ft ³
Depth of Main Basin (H _{main}) =	4.75	ft
Length of Main Basin (L _{main}) =	347.0	ft
Width of Main Basin (W _{main}) =	197.5	ft
Area of Main Basin (A _{main}) =	68,518	ft ²
Volume of Main Basin (V _{main}) =	278,595	ft ³
Calculated Total Basin Volume (V _{total}) =	7,330	acre-feet

Depth Increment = 2 ft									
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		19.0	19.0	359		0.008		
ISV	0.50		19.0	19.0	359		0.008	176	0.004
	2.00		146.7	80.8	11,854		0.272	5,101	0.117
Floor	3.25		307.9	159.0	48,943		1.124	40,475	0.929
Zone 1 (WQCV)	3.63		312.0	162.5	50,706		1.164	59,962	1.377
	4.00		315.0	165.5	52,120		1.197	78,984	1.813
Zone 2 (EURV)	4.95		322.6	173.1	55,829		1.282	130,251	2.990
	6.00		331.0	181.5	60,063		1.379	191,082	4.387
Zone 3 (100-year)	8.00		347.0	197.5	68,518		1.573	319,577	7.336
	10.00		363.0	213.5	77,485		1.779	465,495	10.686
	12.00		379.0	229.5	86,964		1.996	629,860	14.460
	14.00		395.0	245.5	96,956		2.226	813,694	18.680

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

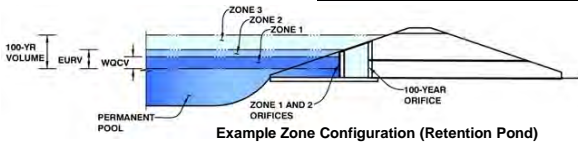


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: RETREAT AT TIMBER RIDGE - PRELIMINARY DRAINAGE REPORT

Basin ID: POND D



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.63	1.374	Orifice Plate
Zone 2 (EURV)	4.95	1.613	Orifice Plate
Zone 3 (100-year)	8.00	4.343	Weir&Pipe (Restrict)
		7.330	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.70	3.40					
Orifice Area (sq. inches)	4.20	4.20	5.50					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	ft ²
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	<input type="text" value="5.00"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="10.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Slope =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	feet
Overflow Grate Open Area % =	<input type="text" value="75%"/>	<input type="text" value="N/A"/>	%, grate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	<input type="text" value="6.00"/>	<input type="text" value="N/A"/>	feet
Over Flow Weir Slope Length =	<input type="text" value="4.12"/>	<input type="text" value="N/A"/>	feet
Grate Open Area / 100-yr Orifice Area =	<input type="text" value="3.21"/>	<input type="text" value="N/A"/>	should be ≥ 4
Overflow Grate Open Area w/o Debris =	<input type="text" value="30.92"/>	<input type="text" value="N/A"/>	ft ²
Overflow Grate Open Area w/ Debris =	<input type="text" value="15.46"/>	<input type="text" value="N/A"/>	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="2.50"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="42.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="42.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	<input type="text" value="9.62"/>	<input type="text" value="N/A"/>	ft ²
Outlet Orifice Centroid =	<input type="text" value="1.75"/>	<input type="text" value="N/A"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="3.14"/>	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

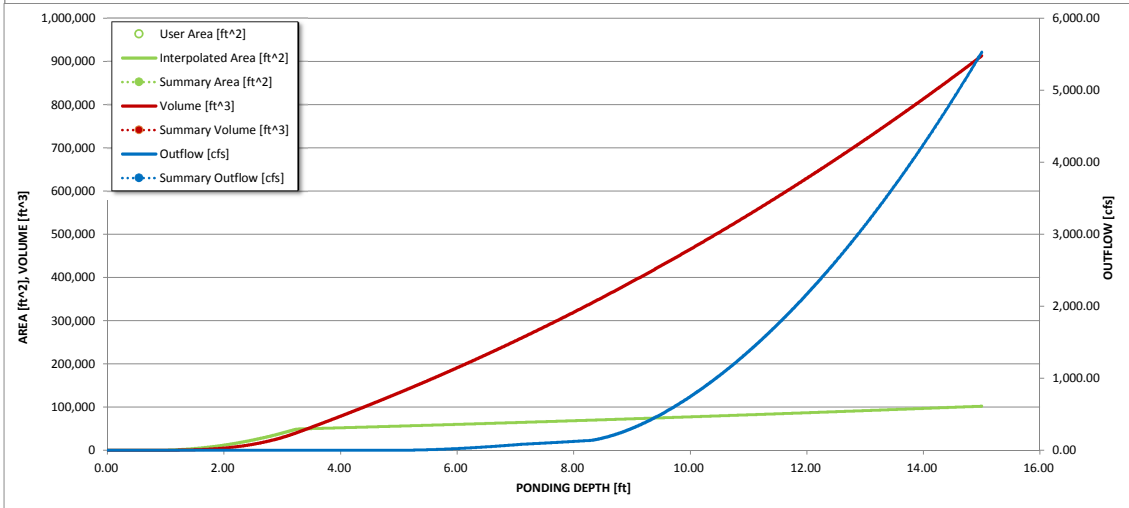
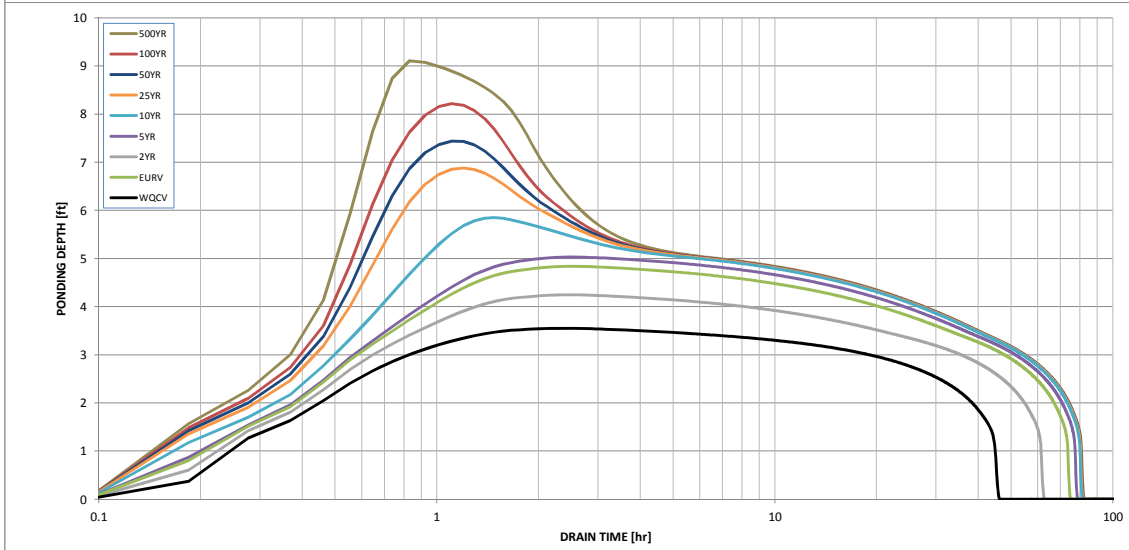
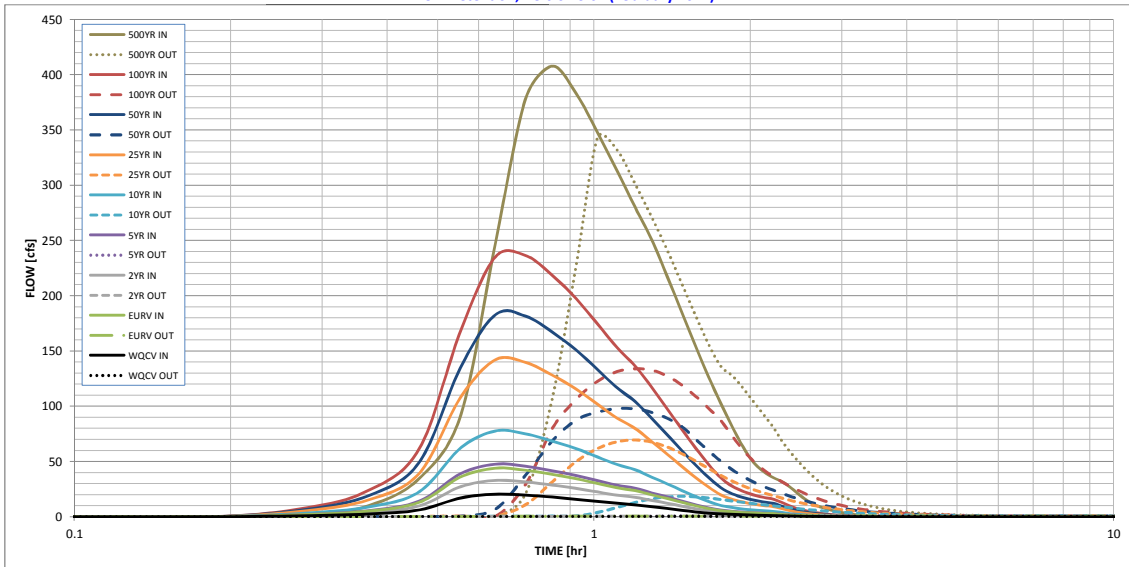
Spillway Design Flow Depth = feet
 Stage at Top of Freeboard = feet
 Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	1.374	2.987	2.230	3.243	5.345	9.950	12.918	16.800	29.996
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.372	2.983	2.227	3.239	5.336	9.931	12.898	16.783	29.961
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.17	0.58	0.81	1.09	1.99
Predevelopment Peak Q (cfs) =	0.0	0.0	1.4	2.3	22.3	75.5	104.6	141.5	257.1
Peak Inflow Q (cfs) =	20.4	43.9	32.9	47.6	77.6	142.0	182.8	236.3	407.7
Peak Outflow Q (cfs) =	0.5	0.8	0.7	0.9	18.6	69.6	97.9	134.0	343.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.8	0.9	0.9	0.9	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.6	2.2	3.1	4.3	4.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	69	57	72	72	67	64	60	49
Time to Drain 99% of Inflow Volume (hours) =	45	72	60	76	77	75	74	72	67
Maximum Ponding Depth (ft) =	3.55	4.84	4.25	5.03	5.85	6.88	7.44	8.21	9.11
Area at Maximum Ponding Depth (acres) =	1.16	1.27	1.22	1.29	1.36	1.46	1.52	1.59	1.68
Maximum Volume Stored (acre-ft) =	1.272	2.837	2.103	3.093	4.181	5.622	6.456	7.669	9.128

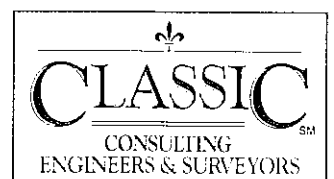
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

DRAINAGE MAPS



If the second 60" culvert is not in place north on Vollmer, address where flows over the single culvert's capacity will go. Provide design points.

Show and label OS-4. Provide MDDP Maps.

Cn VALUES - EXISTING CONDITIONS

BASIN (label)	BASIN AREA (Ac)	SOIL TYPE B		WEIGHTED C
		CN	AREA (Ac)	
EX-1	156.9	61	156.9	61
EX-2	9.2	61	9.2	61
EX-3	24.9	61	24.9	61
EX-4	35.2	63	35.2	63
EX-6	6.7	61	6.7	61
OS-1	49.1	61	49.1	61
OS-2	2.1	61	2.1	61
OS-3	1.0	62	1.0	62
OS-4	16.1	63	16.1	63
OS-5	27.6	61	27.6	61

TIME OF CONCENTRATION - EXISTING CONDITIONS

BASIN	Cn	C(s)	OVERLAND			STREET / CHANNEL FLOW			Tc TOTAL (min)	Tc LAG (min)	Tc LAG (hr)	
			Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)				Tc (min)
EX-1	61.0	0.08	300	8	23.1	1500	1.8%	1.3	20.5	43.6	26.2	0.44
EX-2	61.0	0.08	300	10	21.4					21.4	12.9	0.21
EX-3	61.0	0.08	300	8	23.1	1500	4.0%	1.5	16.7	39.7	23.8	0.40
EX-4	63.0	0.08	300	24	16.1	1900	6.0%	1.8	17.6	33.7	20.2	0.34
EX-6	61.0	0.08	300	14	19.2	800	1.0%	1.0	13.3	32.5	19.5	0.33
OS-1	61.0	0.08	300	22	16.5	1300	4.0%	1.5	14.4	31.0	18.6	0.31
OS-2	61.0	0.08	300	12	20.2	550	5.0%	1.7	5.4	25.6	15.3	0.26
OS-3	82.0	0.08	300	18	17.7	300	6.0%	2.2	2.3	19.9	12.0	0.20
OS-4	63.0	0.08	300	22	16.5	1100	4.0%	1.4	13.1	29.6	17.8	0.30
OS-5	61.0	0.08	300	10	21.4	1300	3.0%	1.2	18.1	39.5	23.7	0.39

BASIN SUMMARY - EXISTING CONDITIONS

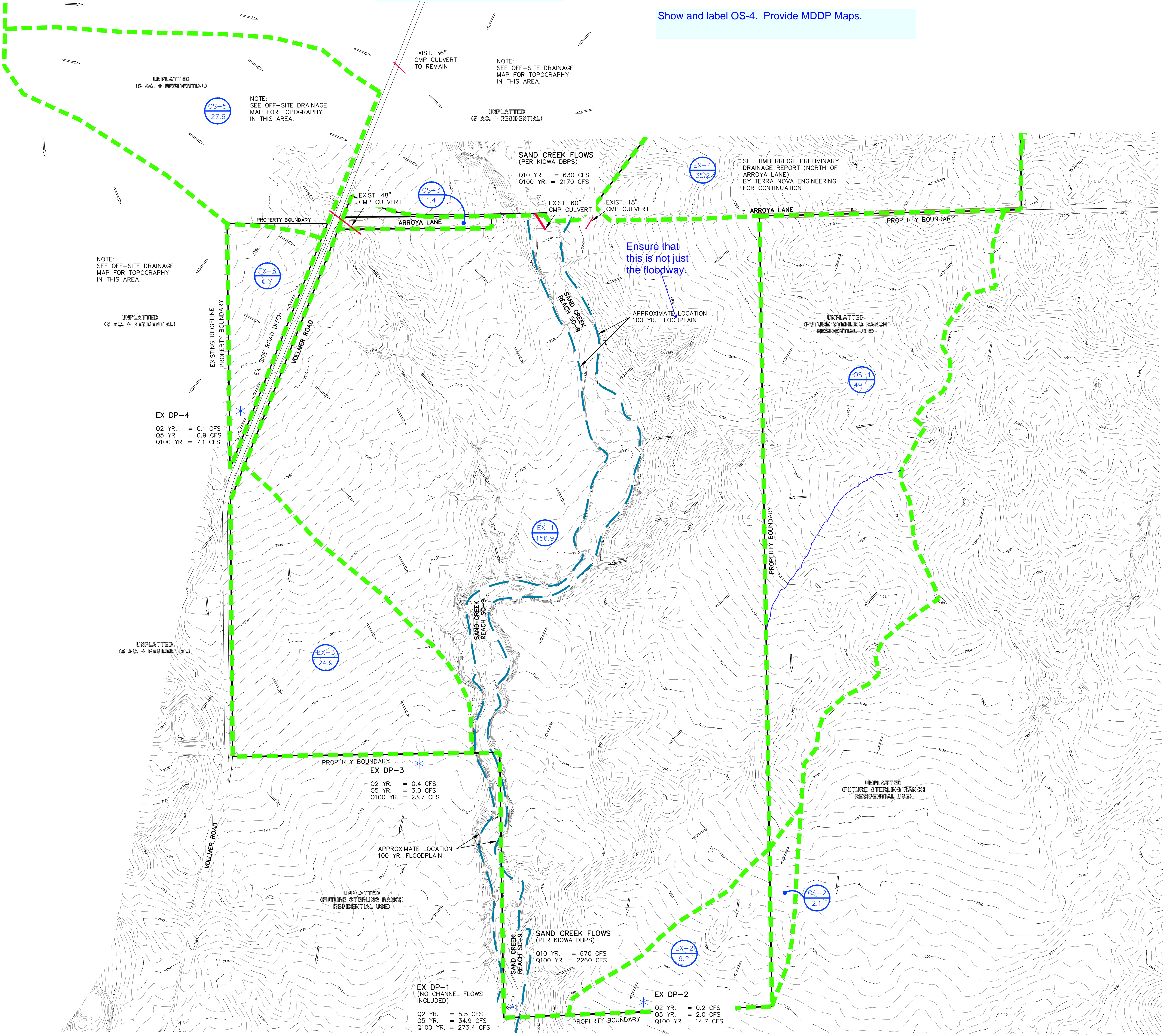
BASIN (label)	TOTAL BASIN AREA (acres)	WEIGHTED CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
EX-1	156.9	61	0.44	2.6	17.7	140.3
EX-2	9.2	61	0.21	0.2	1.7	12.2
EX-3	24.9	61	0.40	0.4	3.0	23.7
EX-4	35.2	63	0.34	1.3	6.9	41.8
EX-6	6.7	61	0.33	0.1	0.9	7.1
OS-1	49.1	61	0.31	0.9	7.0	53.9
OS-2	2.1	61	0.26	0.04	0.3	2.5
OS-3	1.0	62	0.20	1.3	2.0	4.8
OS-4	16.1	63	0.30	0.6	3.4	20.7
OS-5	27.6	61	0.39	0.5	3.6	28.1

DESIGN POINTS SURFACE ROUTING SUMMARY - EXISTING CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
EX DP-1	BASINS OS-1, OS-3, OS-4, OS-5, EX-1, EX-4, EX-5, EX-6	5.5	34.9	273.4
EX DP-2	BASINS OS-2, EX-2	0.2	2.0	14.7
EX DP-3	BASIN EX-3	0.4	3.0	23.7
EX DP-4	BASIN EX-6	0.12	0.9	7.1

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	---
DESIGN POINT	*
BASIN IDENTIFIER AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	→
STORM SEWER	---



CLASSIC CONSULTING ENGINEERS & SURVEYORS

THE RETREAT AT TIMBERIDGE PRELIMINARY DRAINAGE REPORT (SOUTH OF ARROYA LANE) PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	4-5-18
DRAWN BY	MAW	(H) 1" = 200'	SHEET	1 OF 2
CHECKED BY	(V) 1" = N/A	JOB NO.	2520.00	

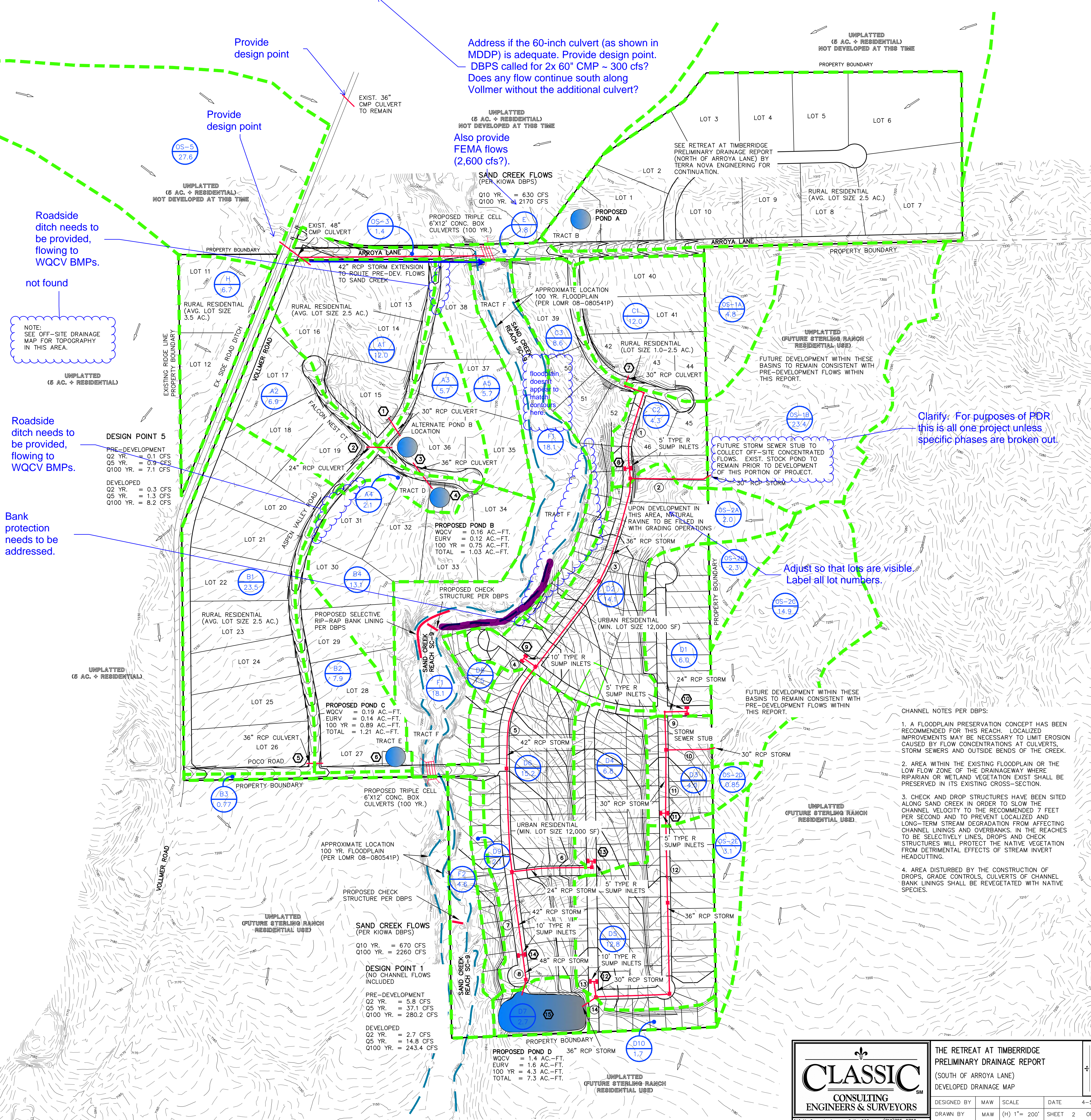
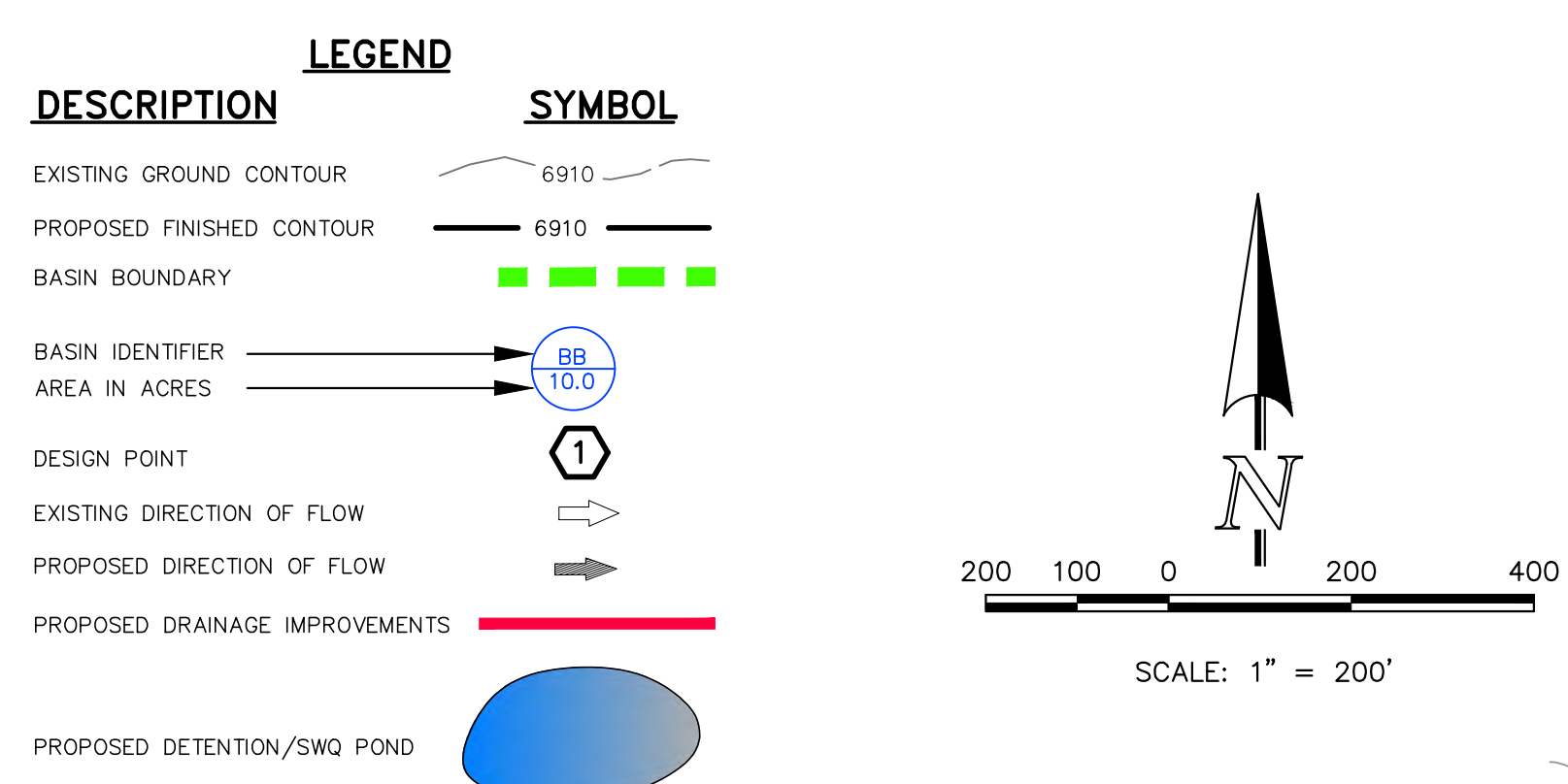
619 N. Cascade Avenue, Suite 200 Colorado Springs, Colorado 80903 (719)785-0790 (719)785-0789 (fax)

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BASIN	CA(2)	CA(5)	CA(10)	C(5)	C(10)	Length (ft)	Width (ft)	Depth (ft)	Flow (cfs)	Velocity (ft/min)	Tc (min)	Intensity (in/hr)	Q(2)	Q(5)	Q(10)	
A1	0.72	1.58	4.80	0.74	1.91	100	2.50	2.50	1.44	1.44	2.0	2.0	2.2	2.5	2.8	
A2	0.41	0.97	2.76	0.74	1.91	300	12	10.0	4.00	2.0	3.0	2.0	2.3	2.6	2.9	
A3	0.34	0.88	2.28	0.74	1.91	300	8	21.0	3.00	1.7	3.0	2.0	2.2	2.5	2.8	
A4	0.25	0.47	0.92	0.30	0.78	180	8	13.0	1.00	2.0	1.0	1.4	1.6	1.8	2.0	
A5	0.34	0.88	2.28	0.74	1.91	300	10	18.0	3.00	2.0	3.0	2.0	2.3	2.6	2.9	
B1	1.41	3.23	9.40	0.74	1.91	100	10.0	13.0	3.24	1.8	11.0	3.0	3.4	3.9	4.4	
B2	0.47	1.11	3.16	0.74	1.91	300	10.0	18.0	3.00	2.0	3.0	2.0	2.3	2.6	2.9	
B3	0.60	1.38	3.96	0.74	1.91	300	10.0	18.0	3.00	2.0	3.0	2.0	2.3	2.6	2.9	
B4	0.79	1.83	5.24	0.74	1.91	300	10.0	18.0	3.00	2.0	3.0	2.0	2.3	2.6	2.9	
C1	1.06	2.04	5.84	0.74	1.91	300	12	18.4	3.00	2.5	3.5	2.5	2.8	3.2	3.6	
C2	0.52	0.88	1.80	0.30	0.78	180	8	13.0	1.00	2.0	1.0	1.4	1.6	1.8	2.0	
C3	0.77	1.48	3.61	0.17	0.44	300	17	16.4	0.60	1.6	1.4	1.4	1.7	2.0	2.3	
D1	1.02	1.26	2.72	0.21	0.54	300	4	18.0	0.60	1.6	1.4	1.4	1.7	2.0	2.3	
D2	2.34	3.53	6.63	0.25	0.64	150	3	15.0	0.30	1.5	4.3	1.3	3.4	5.2	6.4	
D3	0.46	0.85	1.81	0.21	0.54	150	3	15.0	0.30	1.5	2.8	2.2	1.8	2.1	2.4	
D4	1.39	1.84	3.30	0.27	0.70	100	3	14.0	0.30	1.5	3.7	1.7	3.4	5.1	6.8	
D5	2.30	3.20	6.00	0.25	0.64	150	3	15.0	0.30	1.5	3.2	5.5	2.5	3.3	4.1	
D6	2.74	3.80	7.14	0.25	0.64	150	3	15.0	0.30	1.5	2.8	7.1	2.3	3.0	3.6	
D7	0.10	0.43	1.11	0.16	0.41	100	3	16.5	0.20	0.8	1.6	0.8	1.2	1.6	2.0	
D8	0.38	0.53	0.99	0.25	0.64	75	3	16.4	0.30	1.5	2.0	2.3	2.7	3.1	3.5	
D9	0.37	0.38	0.71	0.25	0.64	75	3	16.4	0.30	1.5	2.0	2.3	2.7	3.1	3.5	
D10	0.21	0.43	0.80	0.25	0.64	75	3	16.4	0.30	1.5	2.0	2.3	2.7	3.1	3.5	
E	1.60	1.62	1.73	0.25	0.64	75	3	16.4	0.30	1.5	2.2	7.3	1.6	2.0	2.4	
F1	0.54	1.03	0.52	0.00	0.00	60	3	9.3	240.0	2.0	1.4	28.3	36.5	1.75	2.8	4.0
F2	0.14	0.41	1.06	0.00	0.00	60	3	9.3	1200.0	2.0	1.4	14.1	20.7	2.43	3.03	3.69
H	0.40	0.94	2.64	0.74	1.91	300	11	19.6	3.00	2.0	1.4	10.5	30.2	1.96	2.47	3.06

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA/STREETS	LANDSCAPE/DEVELOPED AREAS	WEIGHTED	WEIGHTED CA
A1	12.0	0.00	0.89	0.95	0.95
A2	9.9	0.00	0.89	0.95	0.95
A3	5.7	0.00	0.89	0.95	0.95
A4	2.1	0.00	0.89	0.95	0.95
A5	5.7	0.00	0.89	0.95	0.95
B1	23.5	0.00	0.89	0.95	0.95
B2	7.5	0.00	0.89	0.95	0.95
B3	0.77	0.77	0.89	0.95	0.95
B4	13.1	0.00	0.89	0.95	0.95
C1	12.0	0.00	0.89	0.95	0.95
C2	4.3	0.00	0.89	0.95	0.95
C3	8.6	0.00	0.89	0.95	0.95
D1	6.0	0.00	0.89	0.95	0.95
D2	14.1	0.00	0.89	0.95	0.95
D3	4.0	0.00	0.89	0.95	0.95
D4	6.8	0.00	0.89	0.95	0.95
D5	12.8	0.00	0.89	0.95	0.95
D6	15.2	0.00	0.89	0.95	0.95
D7	2.7	0.00	0.89	0.95	0.95
D8	2.1	0.00	0.89	0.95	0.95
D9	1.5	0.00	0.89	0.95	0.95
D10	1.7	0.00	0.89	0.95	0.95
E	1.8	1.80	0.89	0.95	0.95
F1	18.1	0.00	0.89	0.95	0.95
F2	4.6	0.00	0.89	0.95	0.95
H	8.7	0.00	0.89	0.95	0.95

Design Point	Contributing Basins	Equivalent CA(5)	Equivalent CA(10)	Maximum Tc	Intensity					Flow
					I(5)	I(10)	Q(5)	Q(10)	Culvert / Inlet Size	
1	A1	1.88	4.80	22.9	2.89	4.84	5	23	30" RCP	
2	A2	0.97	2.76	22.3	2.92	4.91	3	14	24" RCP	
3	DR-1, DR-2, A3	3.44	9.84	25.6	2.72	4.57	9	45	36" RCP	
4	A1, A2, A3 and A4 (POND B INFLOW)	3.85	10.76	26.6	2.66	4.47	10	48		
5	B1	3.29	9.40	31.8	2.38	4.02	8	38	36" RCP	
6	B1 and B2 (POND C INFLOW)	4.40	12.56	34.8	2.26	3.79	16	48		
7	C1, OS-1A	2.47	6.77	23.4	2.85	4.79	7	32	30" RCP	
8	C2	0.86	1.89	15.9	3.34	5.61	3	11	5" Type R sump inlets	
9	D2, OS-2A	3.71	7.35	20.0	3.89	5.19	11	38	10" Type R sump inlets	
10	D1, OS-2B	1.49	3.55	21.6	2.98	5.00	4	18	5" Type R sump inlets	
11	D3, OS-2D	0.93	2.12	17.8	3.28	5.48	3	12	5" Type R sump inlets	
12	D5, OS-2E	3.48	7.13	20.5	3.05	5.10	11	37	10" Type R sump inlets	
13	D4	1.84	3.30	17.3	3.31	5.56	8	18	5" Type R sump inlets	
14	D8	3.80	7.14	22.0	2.94	4.94	11	35	10" Type R sump inlets	
15	DR-7 thru DR-14 and OS-1B, OS-2C, D7 (POND D INFLOW)	22.44	54.14	27.8	2.00	4.98	58	226		



CLASSIC CONSULTING ENGINEERS & SURVEYORS

THE RETREAT AT TIMBERIDGE
PRELIMINARY DRAINAGE REPORT
(SOUTH OF ARROYA LANE)
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	4-5-18
DRAWN BY	MAW	(H) 1" = 200'	SHEET	2 OF 2
CHECKED BY	(V) 1" = N/A		JOB NO.	2520.00

619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903 (719)785-0790 (719)785-0789 (Fax)

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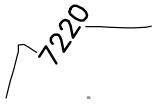
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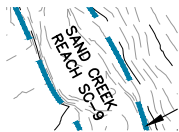
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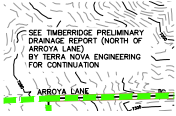
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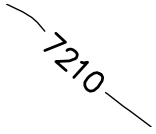


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SEE TIMBERRIDGE PRELIMINARY DRAINAGE REPORT (NORTH OF ARROYA LANE) BY TERRA NOVA ENGINEERING FOR CONTINUATION



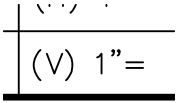
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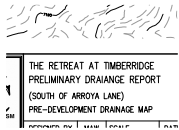
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7210

Subject: 7210
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7200

Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

DESCRIPTION

EXISTING GROUND CONTOUR
PROPOSED FINISHED CONTOUR
BASIN BOUNDARY
DESIGN POINT
BASIN INVERTED

Subject:
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

PROPOSED FINISHED CONTOUR

7180

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Page Label: 189
Lock: Unlocked
Status:
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Date:
Color:

7180

7250

Subject:
Page Label: 189
Lock: Unlocked
Status:
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Date:
Color:

7250

UNPLATTED
FUTURE STERLING RANCH
RESIDENTIAL USE

Subject:
Page Label: 189
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

UNPLATTED (FUTURE STERLING RANCH
RESIDENTIAL USE)

7180

Subject:
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Date:
Color:

7180

7230

Subject:
Page Label: 189
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7230

7240

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Date:
Color:

7190

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Date:
Color:

7210

Subject: 7210
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Date:
Color:

7230

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Date:
Color:

200'

Subject: 200'
Page Label: 189
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Date:
Color:

725

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7190

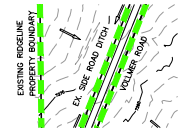
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Color:

7280

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Date:
Color:

200'

Subject: 200'
Page Label: 189
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Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: EX. SIDE ROAD DITCH
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 189
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

100

Subject: 100
Page Label: 189
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Status:
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Date:
Color:

7210

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Date:
Color:

7330

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Page Label: 189
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Date:
Color:

OS-1

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Author: AutoCAD SHX Text
Date:
Color:

7190

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Date:
Color:

260

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Page Label: 189
Lock: Unlocked
Status:
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Date:
Color:

7170

Subject: 7170
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Status:
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Date:
Color:

7290

Subject: 7290
Page Label: 189
Lock: Unlocked
Status:
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Date:
Color:

7270

Subject: 7270
Page Label: 189
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Status:
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Date:
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6.7

Subject: 6.7
Page Label: 189
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7240

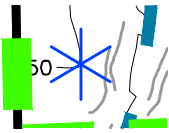
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7250

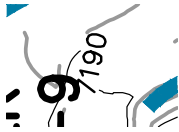
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7240

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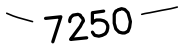
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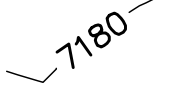
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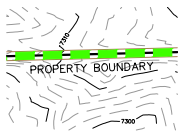
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Subject: 7190
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Subject: 7180
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 Color:



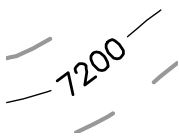
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Author: AutoCAD SHX Text
Date:
Color:

PROPERTY BOUNDARY



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PROPERTY BOUNDARY



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7200



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

REACH SC-9



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

7210

BASIN BOUNDARY
DESIGN POINT
BASIN IDENTIFIER

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Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT

7280

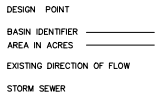
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7220

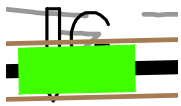
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Page Label: 189
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Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:



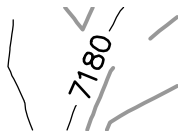
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Date:
Color:



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Page Label: 189
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Date:
Color:

7270

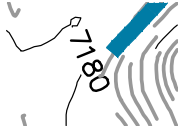
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Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7340
Page Label: 189
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

DRAWN BY
CHECKED BY

Subject: CHECKED BY
Page Label: 189
Lock: Unlocked
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Author: AutoCAD SHX Text
Date:
Color:

7320

Subject: 7320
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Date:
Color:

0621

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Date:
Color:

156.9

Subject: 156.9
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Color:

7230

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Page Label: 189
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Date:
Color:

PROPERTY BOUNDARY

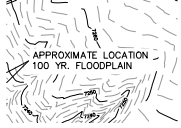
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7270

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Date:
Color:

7180

Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: APPROXIMATE LOCATION 100 YR.
Page Label: 189 FLOODPLAIN
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7230

Subject: 7230
Page Label: 189
Lock: Unlocked
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7250
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210

Subject: 7210
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

NOTE:
SEE OFF-SITE DRAINAGE
MAP FOR TOPOGRAPHY
IN THIS AREA.

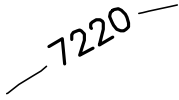
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Author: AutoCAD SHX Text
Date:
Color:

NOTE: SEE OFF-SITE DRAINAGE MAP FOR
TOPOGRAPHY IN THIS AREA.



Subject:
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7230



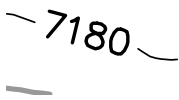
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Date:
Color:

7220



Subject:
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Date:
Color:

7310



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

7180



Subject:
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7170

7230

Subject: 7230
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7170

Subject: 7170
Page Label: 189
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Date:
Color:

7210

Subject: 7210
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

MAW

Subject: MAW
Page Label: 189
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BB
10.0

Subject: BB 10.0
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Color:

7220

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Color:

7200

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Color:

7200
7200
(719)785-0790
(719)785-0799 (F

Subject: (719)785-0790
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Author: AutoCAD SHX Text
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DATE

Subject: DATE
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Date:
Color:

7160

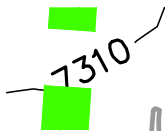
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7230

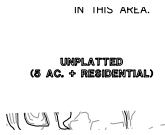
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Color:

7250

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Status:
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Date:
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Date:
Color:



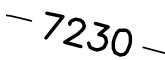
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Date:
Color:



Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7330
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
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Subject: 7230
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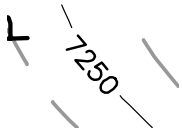
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Color:

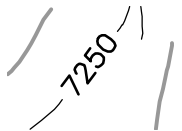


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Lock: Unlocked
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Date:
Color:

Subject: 16.1
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Subject: 7250
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Author: AutoCAD SHX Text
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Color:

1

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7200

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7330

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7270

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7170

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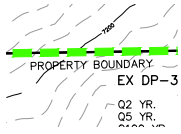
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7260



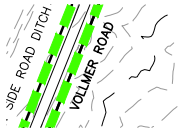
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Date:
Color:

PROPERTY BOUNDARY



Subject:
Page Label: 189
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Color:

7250



Subject:
Page Label: 189
Lock: Unlocked
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Author: AutoCAD SHX Text
Date:
Color:

VOLLMER ROAD

7210

Subject:
Page Label: 189
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Author: AutoCAD SHX Text
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7210



Subject:
Page Label: 189
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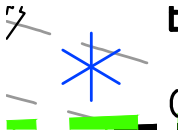
Colorado Springs, Colorado 80903



Subject: 7240
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Color:



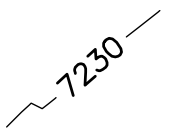
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Subject: *
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Subject: 7230
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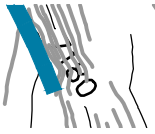
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7210

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Author: AutoCAD SHX Text
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Color:

0

Subject: 0
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Date:
Color:



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Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



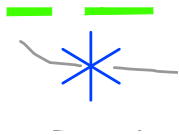
Subject: 35.2
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7170

Subject: 7170
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESCRIPTION **LEGEND**
EXISTING GROUND CONTOUR
PROPOSED FINISHED CONTOUR
BASIN BOUNDARY

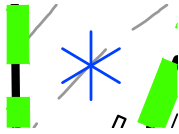
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Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:



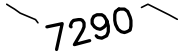
Subject: *
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: *
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



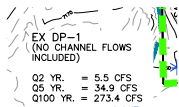
Subject: 7290
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-2
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

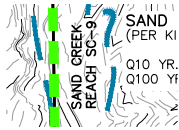


Subject: 7250
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX DP-1 (NO CHANNEL FLOWS INCLUDED) Q2
 YR. = 5.5 CFS Q5 YR. = 34.9 CFS Q100 YR. =
 273.4 CFS



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

REACH SC-9

UNPLATTED
 (6 AC. + RESIDENTIAL)



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

UNPLATTED (5 AC. + RESIDENTIAL)

✓
 - 7290 -

Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7290

- 7210 -

Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

*

7240

Subject: 7240
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

50

Subject: 7150
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7290

Subject: 7290
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

UNPLATTED
(5 AC. + RESIDENTIAL)

Subject: UNPLATTED (5 AC. + RESIDENTIAL)
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

N

Subject: N
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LEGEND

Subject: %%ULEGEND
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7300
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7160
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Lock: Unlocked
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Checkmark: Unchecked
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Date:
Color:

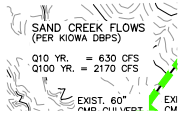


Subject: 7290
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: OS-4
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

✓ 7170

Subject: 7170
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: SAND CREEK FLOWS (PER KIOWA DBPS) Q10
Page Label: 189 YR. = 630 CFS Q100 YR. = 2170 CFS
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7190
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7190
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7280
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7250

Subject: 7250
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7220

Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7260

Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

2

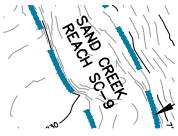
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Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

6910

Subject: 6910
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210

Subject: 7210
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: REACH SC-9
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7200

Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX-1

Subject: EX-1
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7280

Subject: 7280
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7170

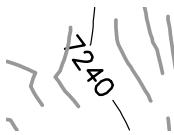
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7170

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Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7310

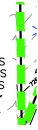
Subject: 7310
Page Label: 189
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



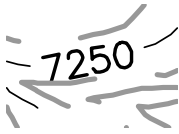
Subject: 7240
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX DP-4

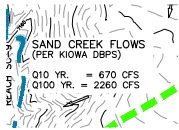
Q2 YR. = 0.1 CFS
 Q5 YR. = 0.9 CFS
 Q100 YR. = 7.1 CFS



Subject: EX DP-4 Q2 YR. = 0.1 CFS Q5 YR. = 0.9 CFS
Page Label: 189 Q100 YR. = 7.1 CFS
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7250
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: SAND CREEK FLOWS (PER KIOWA DBPS) Q10
Page Label: 189 YR. = 670 CFS Q100 YR. = 2260 CFS
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: MAW
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

BASIN IDENTIFIER ·
 AREA IN ACRES ·
 EXISTING DIRECTION

Subject: AREA IN ACRES
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7220

Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7260

Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7190

Subject: 7190
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7250

Subject: 7250
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7300

Subject: 7300
Page Label: 189
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

7210

Subject: 7210
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7230

Subject:
Page Label: 189 7230
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7190

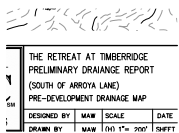
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Page Label: 189 7190
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Date:
Color:

4-5-18

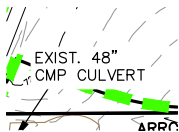
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Page Label: 189 4-5-18
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

JOB NO.

Subject:
Page Label: 189 JOB NO.
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



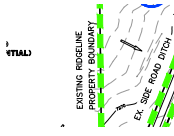
Subject:
Page Label: 189 PRELIMINARY DRAINAGE REPORT
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 189 EXIST. 48" CMP CULVERT
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPERTY BOUNDARY
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 2.1
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: ARROYA LANE
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 24.9
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7320
Page Label: 189
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Status:
Checkmark: Unchecked
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Date:
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Subject: 7250
Page Label: 189
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Author: AutoCAD SHX Text
Date:
Color:

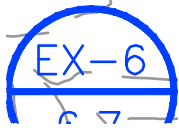
NOTE:
SEE OFF-SITE DRAINAGE
MAP FOR TOPOGRAPHY
IN THIS AREA.

IMDI ATTPD

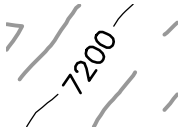
Subject: NOTE: SEE OFF-SITE DRAINAGE MAP FOR TOPOGRAPHY IN THIS AREA.
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7320
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



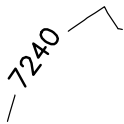
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Page Label: 189
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DATE	4-5-18
SHEET	1 OF 2
JOB NO.	2520.00

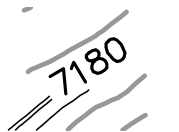
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Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7240
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7240

Subject:
Page Label: 189 7240
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7200

Subject:
Page Label: 189 7200
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7300

Subject:
Page Label: 189 7300
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGNED BY

DRAWN BY

CHECKED BY

Subject:
Page Label: 189 DRAWN BY
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7230

Subject:
Page Label: 189 7230
Lock: Unlocked
Status:
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Date:
Color:

2520.00

Subject:
Page Label: 189 2520.00
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

- 7240 -

Subject: 7240
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

- 7270 -

Subject: 7270
Page Label: 189
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Date:
Color:

- 7190 -

Subject: 7190
Page Label: 189
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Date:
Color:

- 7220 -

Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: PROPERTY BOUNDARY
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

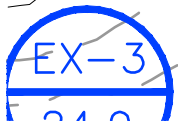
- 7260 -

Subject: 7260
Page Label: 189
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Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

APPROXIMATE LOCATION 100 YR.
FLOODPLAIN



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

EX-3



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7300



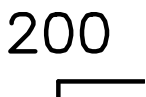
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Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7220

THE RETREAT AT TIMBERIDGE			
PRELIMINARY DRAINAGE REPORT			
(SOUTH OF ARROYA LANE)			
PRE-DEVELOPMENT DRAINAGE MAP			
DESIGNED BY	MAW	SCALE	DATE
DRAWN BY	MAW	(0) 1"= 200'	SHX
CHECKED BY		(0) 1"= N/A	JOB

Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PRE-DEVELOPMENT DRAINAGE MAP



Subject:
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

200

7240

Subject: 7240
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210

Subject: 7210
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7220

Subject: 7220
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

UNPLATTED
(5 AC. + RESIDENTIAL)

Subject: UNPLATTED (5 AC. + RESIDENTIAL)
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7280

Subject: 7280
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7270

Subject: 7270
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: ARROYA LANE
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7180

Subject: 7180
Page Label: 189
Lock: Unlocked
Status:
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Date:
Color:

7240

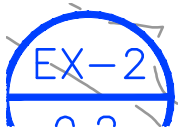
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Date:
Color:

5 CFS
1.9 CF

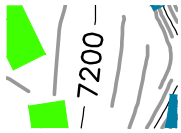
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210

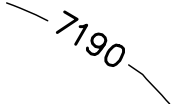
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Page Label: 189
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: EX-2
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7200
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7190
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-3
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT
 BASIN IDENTIFIER —
 AREA IN ACRES —
 EXISTING DIRECTION

Subject: BASIN IDENTIFIER
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 27.6
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Date:
Color:



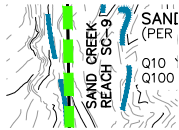
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Date:
Color:

7260

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Date:
Color:

N/A

Subject: N/A
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Date:
Color:



Subject: SAND CREEK
Page Label: 189
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Status:
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Date:
Color:

7260

Subject: 7260
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

70 C

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Page Label: 189
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Date:
Color:

7250

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Date:
Color:

200

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Date:
Color:

7210

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Date:
Color:

7330

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Date:
Color:

7230

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Color:

7320

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Date:
Color:

PRE-DEVELOP
DESIGNED BY
DRAWN BY

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Lock: Unlocked
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Date:
Color:

DESIGNED BY

7230

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Date:
Color:

7230

CM

Subject:
Page Label: 189
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Date:
Color:

7270

7280

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SCALE

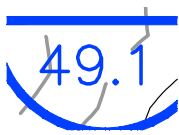
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SCALE

7200

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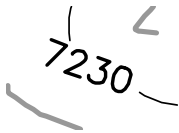
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Color:



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Date:
Color:



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Date:
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Subject: 7240
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Date:
Color:

7170

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Color:



SCALE: 1" = 2

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Date:
Color:

7300

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Date:
Color:

7200

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7240

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Color:

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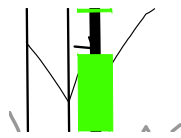
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Date:
Color:

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Date:
Color:

7240

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Page Label: 189 7240
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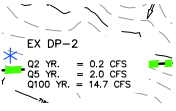
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//
EXIST. 36"
CMP. CULVERT
TO REMAIN

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Page Label: 189 EXIST. 36" CMP CULVERT TO REMAIN
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Date:
Color:

7250

Subject:
Page Label: 189 7250
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Status:
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Date:
Color:



Subject:
Page Label: 189 EX DP-2 Q2 YR. = 0.2 CFS Q5 YR. = 2.0 CFS
Lock: Unlocked Q100 YR. = 14.7 CFS
Status:
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Date:
Color:

EXISTING DIRECTIO
STORM SEWER

Subject:
Page Label: 189 STORM SEWER
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

7160

Subject:
Page Label: 189 7160
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Status:
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Date:
Color:



Subject:
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Date:
Color:



Subject:
Page Label: 189 7180
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Date:
Color:

EXISTING GROUND
PROPOSED FINISHED
BASIN BOUNDARY
DESIGN POINT

Subject:
Page Label: 189
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

BASIN BOUNDARY

SYMBOL

6910

Subject:
Page Label: 189
Lock: Unlocked
Status:
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%%uSYMBOL

7240

Subject:
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Date:
Color:

7240

7210

Subject:
Page Label: 189
Lock: Unlocked
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Date:
Color:

7210

NOTE:
SEE OFF-SITE DRAINAGE
MAP FOR TOPOGRAPHY
IN THIS AREA.

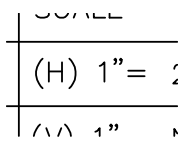
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Date:
Color:

NOTE: SEE OFF-SITE DRAINAGE MAP FOR
TOPOGRAPHY IN THIS AREA.

7250

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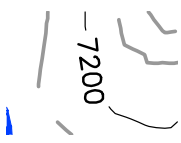
7250



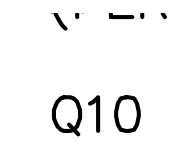
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Page Label: 189
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Color:



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Lock: Unlocked
Status:
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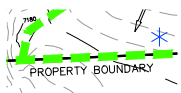
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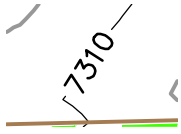


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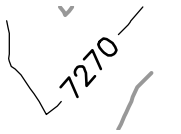
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Date:
Color:

PROPERTY BOUNDARY



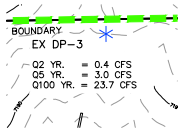
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7310



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7270



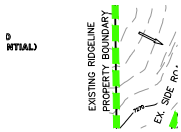
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EX DP-3 Q2 YR. = 0.4 CFS Q5 YR. = 3.0 CFS
 Q100 YR. = 23.7 CFS



Subject:
Page Label: 189
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Color:

7240



Subject:
Page Label: 189
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Checkmark: Unchecked
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Date:
Color:

EXISTING RIDGELINE

- 7220 -

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Lock: Unlocked
Status:
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Date:
Color:

- PUR I
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Subject: 7290
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Date:
Color:

- 6910 -

Subject: 6910
Page Label: 189
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- 7240 -

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- 7190 -

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Color:

- 7260 -

Subject: 7260
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Subject: SAND CREEK
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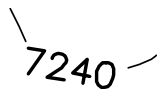
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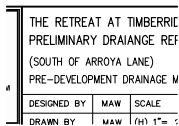
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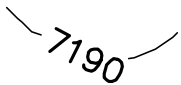
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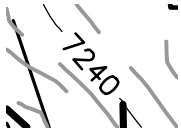
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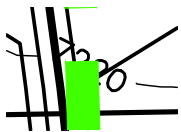
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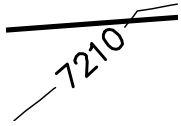


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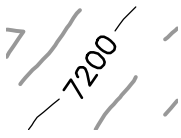


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Date:
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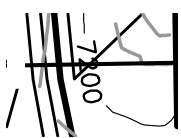
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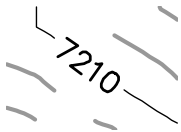


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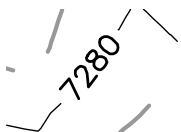


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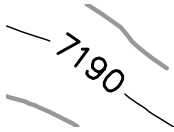
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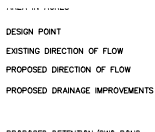


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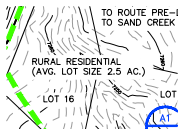


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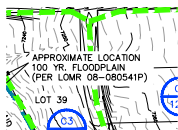
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: RURAL RESIDENTIAL (AVG. LOT SIZE 2.5 AC.)
Page Label: 190
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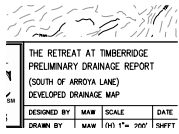
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Color:

7260

Subject:
Page Label: 190 7260
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Author: AutoCAD SHX Text
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Color:

7230

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Page Label: 190 7230
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Date:
Color:



Subject:
Page Label: 190 PRELIMINARY DRAINAGE REPORT
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Subject:
Page Label: 190 OS-5
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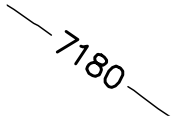
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CRM

Subject:
Page Label: 190 7180
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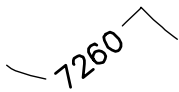
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Status:
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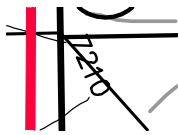


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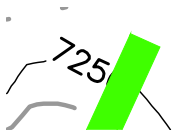
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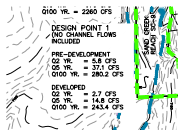
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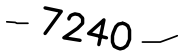
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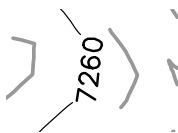


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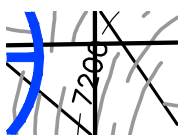
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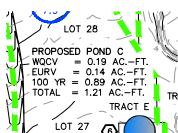
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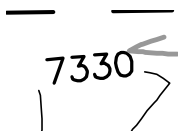
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7200



Subject:
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EURV = 0.14 AC.-FT. 100 YR = 0.89 AC.-FT.
TOTAL = 1.21 AC.-FT.



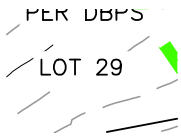
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7330



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Date:
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LOT 16



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LOT 29



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TRACT F



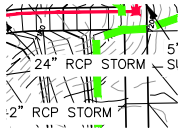
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13.1



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Date:
Color:

TRACT D



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Page Label: 190
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24" RCP STORM



Subject:
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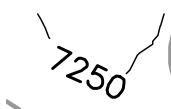
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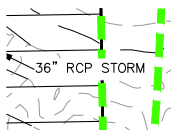
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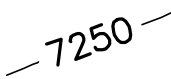
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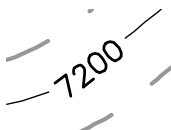
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Color:



Subject: 36" RCP STORM
Page Label: 190
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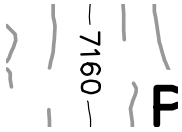


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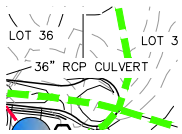
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Date:
Color:

7160



Subject:
Page Label: 190
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Date:
Color:

36" RCP CULVERT



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7200

6910

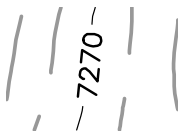
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- 7200 -

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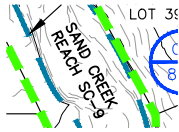
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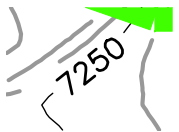


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Date:
Color:



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Date:
Color:

Subject: SHEET OF
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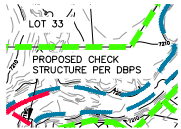
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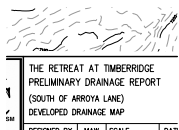
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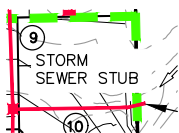
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THE RETREAT AT TIMBERRIDGE



Subject:
Page Label: 190
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Color:

D5



Subject:
Page Label: 190
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Date:
Color:

STORM SEWER STUB



Subject:
Page Label: 190
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Color:

7250



Subject:
Page Label: 190
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5.7

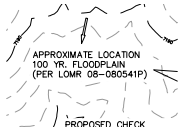


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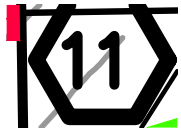
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Date:
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DRAWN BY



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Date:
Color:

APPROXIMATE LOCATION 100 YR.
FLOODPLAIN (PER LOMR 08-080541P)



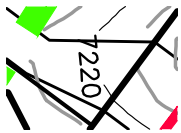
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11



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Date:
Color:

LOT 21



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7220



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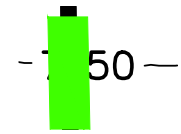
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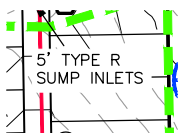
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Date:
Color:



Subject: 7210
Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
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Subject: 5' TYPE R SUMP INLETS
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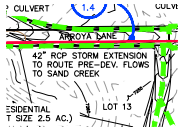
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DESCRIPTION

- EXISTING GROUND CONTOUR
- PROPOSED FINISHED CONTOUR
- BASIN BOUNDARY
- BASIN IDENTIFIER
- AREA IN ACRES

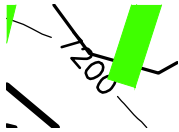
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PROPOSED FINISHED CONTOUR



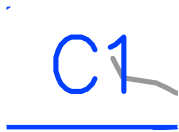
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Date:
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42" RCP STORM EXTENSION TO ROUTE
PRE-DEV. FLOWS TO SAND CREEK



Subject:
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Checkmark: Unchecked
Author: AutoCAD SHX Text
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7200



Subject:
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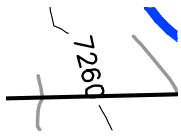
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Color:

7200



Subject: 7260
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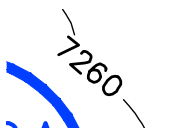
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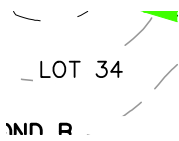
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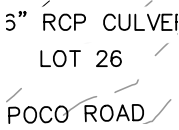
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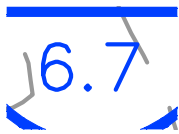
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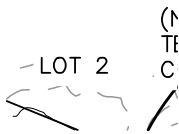
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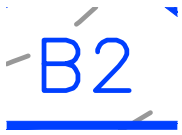
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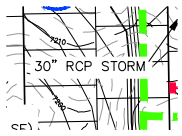
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Subject: LOT 12
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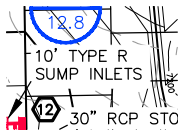
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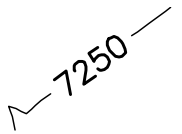
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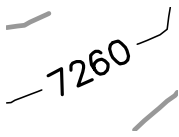
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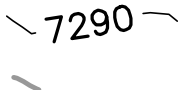
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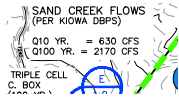
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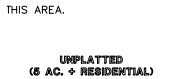
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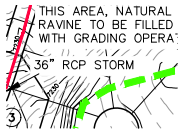
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Author: AutoCAD SHX Text
Date:
Color:



Subject: TRACT F
Page Label: 190
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Date:
Color:



Subject: UNPLATTED (5 AC. + RESIDENTIAL)
Page Label: 190
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Subject: 36" RCP STORM
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Date:
Color:



Subject:
Page Label: 190 7230
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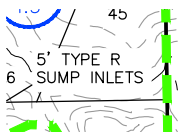
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DESCRIPTION
EXISTING GROUND CONTROL
PROPOSED FINISHED CONT

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Subject:
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Subject:
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6910

Subject:
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6910

(AVG. LOT SIZ
LOT 8

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LOT 8

7170

Subject:
Page Label: 190
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7170

7270

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Color:

7270

46

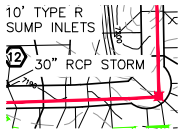
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46

4.8

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Color:

4.8



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✓ 7170 ↖

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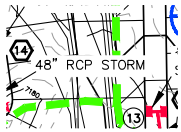
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↖ 7250

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LOT 6

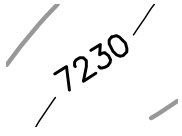
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Date:
Color:



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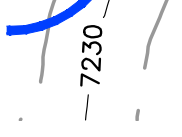
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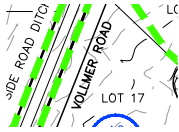


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UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)



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VOLLMER ROAD



Subject:
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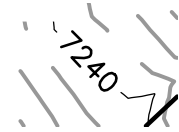
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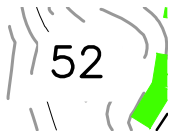
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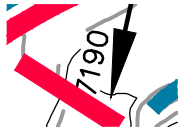
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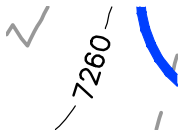
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52



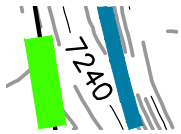
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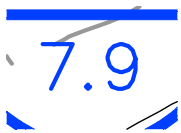
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7.9

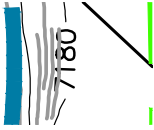


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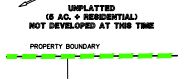
42" RCP STORM



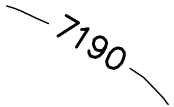
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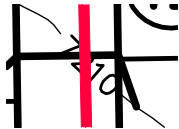
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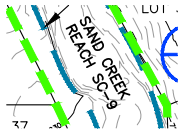
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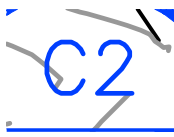
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Subject: 7240
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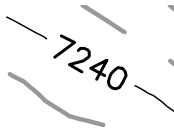
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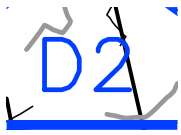
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Subject: 7200
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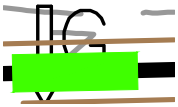
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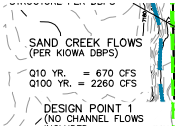
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CHANNEL NOTES PER DBPS: 1. A FLOODPLAIN PRESERVATION CONCEPT HAS BEEN RECOMMENDED FOR THIS REACH. LOCALIZED IMPROVEMENTS MAY BE NECESSARY TO LIMIT EROSION CAUSED BY FLOW CONCENTRATIONS AT CULVERTS, STORM SEWERS AND OUTSIDE BENDS OF THE CREEK. 2. AREA WITHIN THE EXISTING FLOODPLAIN OR THE FLOODPLAIN OR THE LOW FLOW ZONE OF THE DRAINAGEWAY WHERE RIPARIAN OR WETLAND VEGETATION EXIST SHALL BE PRESERVED IN ITS EXISTING CROSS-SECTION. 3. CHECK AND DROP STRUCTURES HAVE BEEN SITED ALONG SAND CREEK IN ORDER TO SLOW THE CHANNEL VELOCITY TO THE RECOMMENDED 7 FEET PER SECOND AND TO PREVENT LOCALIZED AND LONG-TERM STREAM DEGRADATION FROM AFFECTING CHANNEL LININGS AND OVBANKS. IN THE REACHES TO BE SELECTIVELY LINES, DROPS AND CHECK STRUCTURES WILL PROTECT THE NATIVE VEGETATION FROM DETRIMENTAL EFFECTS OF STREAM INVERT HEADCUTTING. 4. AREA DISTURBED BY THE CONSTRUCTION OF DROPS, GRADE CONTROLS, CULVERTS OF CHANNEL BANK LININGS SHALL BE REVEGETATED WITH NATIVE SPECIES.



Subject:
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Subject:
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SAND CREEK FLOWS (PER KIOWA DBPS) Q10 YR. = 670 CFS Q100 YR. = 2260 CFS



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2

7320

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(12)

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7230

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7240

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42

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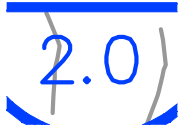
FLOOR
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Subject: 7240
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Page Label: 190
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Color:

DESIGN POINT



Subject:
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LOT 15



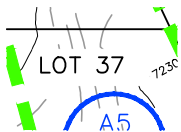
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13



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7220



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LOT 37



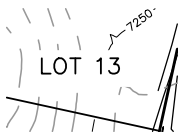
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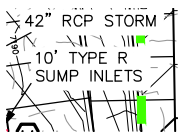
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Color:



Subject: 10' TYPE R SUMP INLETS
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Subject: 7150
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7200

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UNPLATTED
(5 AC. + RESIDENTIAL)
NOT DEVELOPED AT THIS TIME

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7190

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LOT 3

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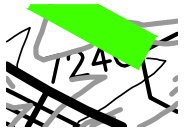
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EXISTING POLE LINE
PROPERTY BOUNDARY
LOT 12
EX. SIDE ROAD
DINA

Subject: PROPERTY BOUNDARY
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AGE WA 1
ON EX
ISS CF

Subject: 7230
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Subject: 7240
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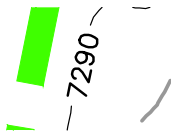
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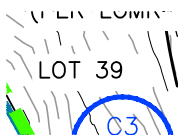
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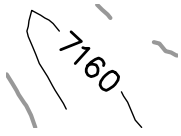
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LOT 31



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Color:

LOT 39



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7160



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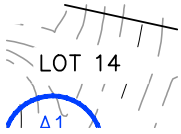
D10



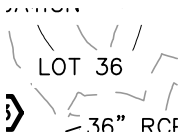
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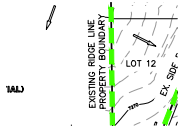
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Author: AutoCAD SHX Text
Date:
Color:



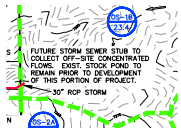
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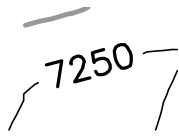
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Author: AutoCAD SHX Text
Date:
Color:



Subject: EXISTING RIDGE LINE
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: FUTURE STORM SEWER STUB TO COLLECT OFF-SITE CONCENTRATED FLOWS. EXIST. STOCK POND TO REMAIN PRIOR TO DEVELOPMENT OF THIS PORTION OF PROJECT.
Page Label: 190
Lock: Unlocked
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Date:
Color:



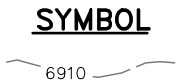
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Page Label: 190
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Date:
Color:



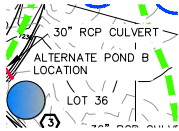
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Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7290
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: %%uSYMBOL
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: ALTERNATE POND B LOCATION
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

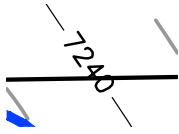


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Date:
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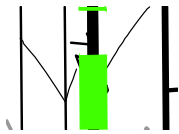
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Color:

1



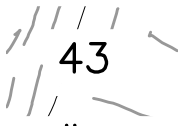
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7240



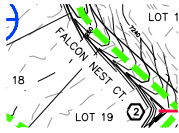
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Date:
Color:

7220



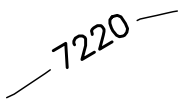
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Date:
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43



Subject:
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Author: AutoCAD SHX Text
Date:
Color:

FALCON NEST CT.



Subject:
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

7220

7250

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Page Label: 190
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Date:
Color:

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Page Label: 190
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Color:

D9

Subject: D9
Page Label: 190
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Date:
Color:

10

Subject: 10
Page Label: 190
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Date:
Color:

7300

Subject: 7300
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

E

Subject: E
Page Label: 190
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Date:
Color:

7 CFS
.8 CF

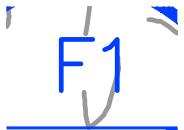
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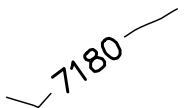
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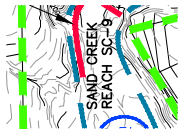
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Date:
Color:



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Date:
Color:



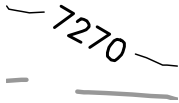
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: SAND CREEK
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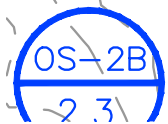
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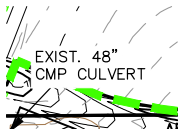
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Date:
Color:



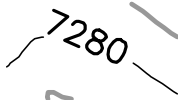
Subject: UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-2B
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: EXIST. 48" CMP CULVERT
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

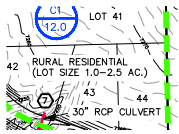


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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: 400
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



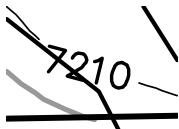
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: RURAL RESIDENTIAL (LOT SIZE 1.0-2.5 AC.)
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 10' TYPE R SUMP INLETS
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7210
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject: 7160
Page Label: 190
Lock: Unlocked
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Date:
Color:



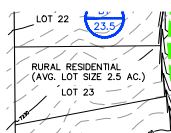
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Date:
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7170



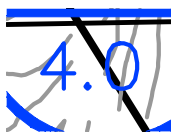
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Date:
Color:

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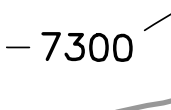
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Date:
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RURAL RESIDENTIAL (AVG. LOT SIZE 2.5 AC.)



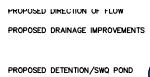
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Date:
Color:

4.0



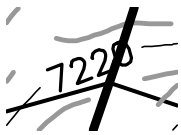
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Color:

7300

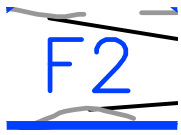


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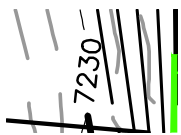
PROPOSED DETENTION/SWQ POND



Subject: 7220
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Date:
Color:



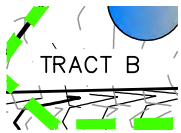
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Date:
Color:



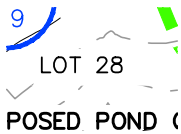
Subject: 7230
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 619 N. Cascade Avenue, Suite 200
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



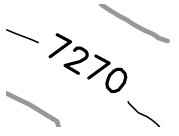
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Color:



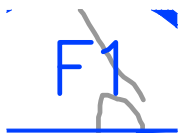
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Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 7280
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject:
Page Label: 190 7270
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Color:



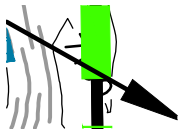
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Page Label: 190 F1
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Color:



Subject:
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 1.4
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 7160
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

JING
ACHES

Subject: 7220
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
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7230

Subject: 7230
Page Label: 190
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7310

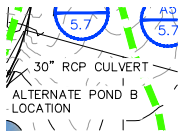
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7240

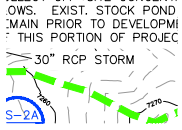
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Date:
Color:

7210

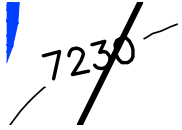
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 30" RCP CULVERT
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 30" RCP STORM
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7230
Page Label: 190
Lock: Unlocked
Status:
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Date:
Color:



Subject: 7230
Page Label: 190
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Date:
Color:



Subject: 7180
Page Label: 190
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

Subject: 200'
Page Label: 190
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Status:
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Date:
Color:



Subject: 7260
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Date:
Color:

2.3

Subject:
Page Label: 190
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Date:
Color:

2.3

7270

Subject:
Page Label: 190
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Date:
Color:

7270

7310

Subject:
Page Label: 190
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Date:
Color:

7310

UNPLATTED
(5 AC. + RESIDENTIAL)
NOT DEVELOPED AT THIS TIME

Subject:
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

UNPLATTED (5 AC. + RESIDENTIAL) NOT DEVELOPED AT THIS TIME

7330

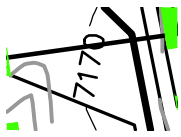
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7330

8.6

Subject:
Page Label: 190
Lock: Unlocked
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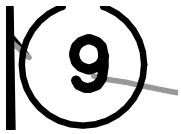
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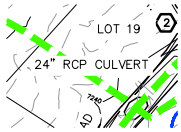
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Date:
Color:



Subject: 23.4
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 9
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
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Color:



Subject: 24" RCP CULVERT
Page Label: 190
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Color:

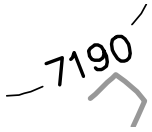


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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: 2
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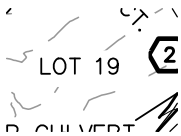
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Color:

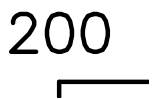


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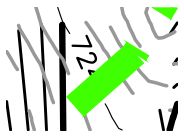


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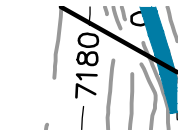
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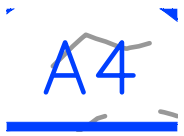
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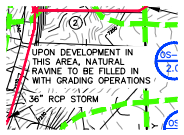
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Date:
Color:



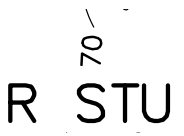
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Author: AutoCAD SHX Text
Date:
Color:



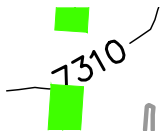
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Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: UPON DEVELOPMENT IN THIS AREA,
NATURAL RAVINE TO BE FILLED IN WITH
GRADING OPERATIONS
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7270
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7310
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-2E
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7190
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 3.1
Page Label: 190
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Color:



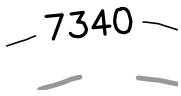
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Color:



Subject: 11
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: LOT 10
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7340
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7170
Page Label: 190
Lock: Unlocked
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Date:
Color:



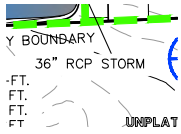
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 12.0
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject:
Page Label: 190
Lock: Unlocked
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Author: AutoCAD SHX Text
Date:
Color:

DESIGNED BY



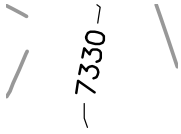
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

36" RCP STORM



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

4.3

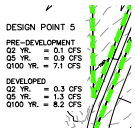


Subject:
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Date:
Color:

7330

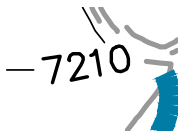
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Page Label: 190
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Date:
Color:

SCALE

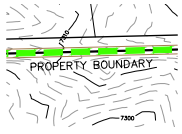


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Date:
Color:

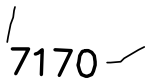
DESIGN POINT 5 PRE-DEVELOPMENT Q2 YR.
= 0.1 CFS Q5 YR. = 0.9 CFS Q100 YR. = 7.1
CFS DEVELOPED Q2 YR. = 0.3 CFS Q5 YR. =
1.3 CFS Q100 YR. = 8.2 CFS



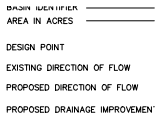
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Date:
Color:



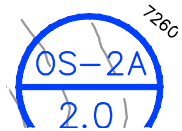
Subject: PROPERTY BOUNDARY
Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



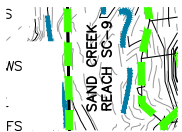
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Author: AutoCAD SHX Text
Date:
Color:



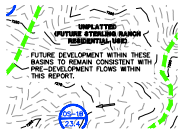
Subject: EXISTING DIRECTION OF FLOW
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-2A
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: SAND CREEK
Page Label: 190
Lock: Unlocked
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Date:
Color:



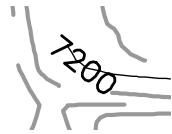
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

FUTURE DEVELOPMENT WITHIN THESE BASINS TO REMAIN CONSISTENT WITH PRE-DEVELOPMENT FLOWS WITHIN THIS REPORT.



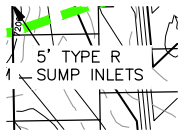
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Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

50



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7200



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

5' TYPE R SUMP INLETS



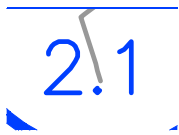
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Date:
Color:

9

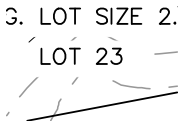


Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7230



Subject: 2.1
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



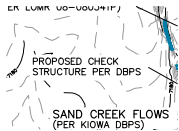
Subject: LOT 23
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LOT 5

Subject: LOT 5
Page Label: 190
Lock: Unlocked
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Date:
Color:

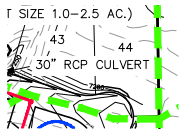


Subject: 5.7
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPOSED CHECK STRUCTURE PER DBPS
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: NOTE: SEE OFF-SITE DRAINAGE MAP FOR TOPOGRAPHY IN THIS AREA.
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

30" RCP CULVERT

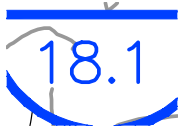
AREA IN ACRES

DESIGN POINT

EXISTING DIRECTI

Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESIGN POINT



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

18.1

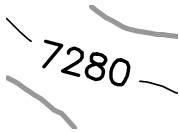


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Page Label: 190
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7270

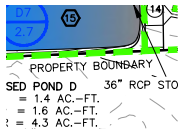
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Page Label: 190
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Date:
Color:

MAW



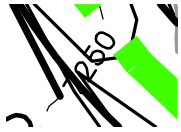
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7280



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PROPERTY BOUNDARY



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7250

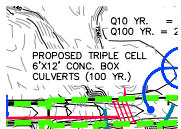


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PROPOSED POND A

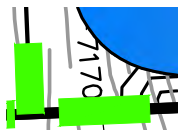
Subject:
Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DEVELOPED DRAINAGE MAP



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PROPOSED TRIPLE CELL 6'X12' CONC. BOX CULVERTS (100 YR.)



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7170

7200

Subject: 7200
Page Label: 190
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

7240

Subject: 7240
Page Label: 190
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Status:
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Date:
Color:

7220

Subject: 7220
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

06 L 1

Subject: 7190
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7270

Subject: 7270
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:

7210

Subject: 7210
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Color:

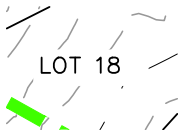


Subject:
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Color:

5

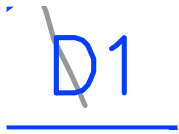
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Page Label: 190
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Date:
Color:

CHECKED BY



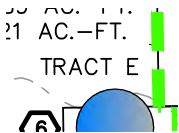
Subject:
Page Label: 190
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Date:
Color:

LOT 18



Subject:
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

D1



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

TRACT E

LOT 4

Subject:
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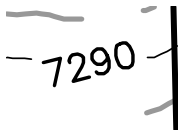
LOT 4



Subject: 7220
Page Label: 190
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Date:
Color:



Subject: 7210
Page Label: 190
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Status:
Checkmark: Unchecked
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Date:
Color:



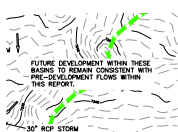
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Date:
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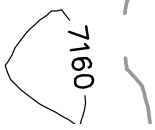
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Date:
Color:



Subject: LOT 22
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: FUTURE DEVELOPMENT WITHIN THESE
Page Label: 190 BASINS TO REMAIN CONSISTENT WITH
Lock: Unlocked PRE-DEVELOPMENT FLOWS WITHIN THIS
Status: REPORT.
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



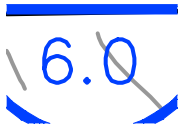
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Date:
Color:



Subject: A1
Page Label: 190
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Date:
Color:



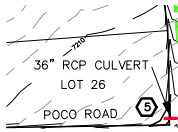
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 6.0
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7240
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 36" RCP CULVERT
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 0.77
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject: D3
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Color:

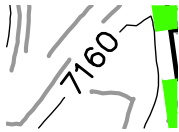
Subject: (SOUTH OF ARROYA LANE)
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPERTY BOUNDARY
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



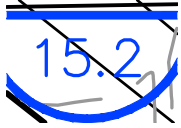
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Date:
Color:



Subject: 7160
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Checkmark: Unchecked
Author: AutoCAD SHX Text
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Color:

7180

Subject: 7180
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Date:
Color:

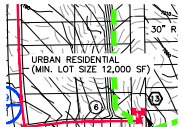


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Author: AutoCAD SHX Text
Date:
Color:

Subject: 7320
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

DESCRIPTION	LEGEND
EXISTING GROUND CONTOUR	
PROPOSED FINISHED CONTOUR	
BASIN BOUNDARY	

Subject: EXISTING GROUND CONTOUR
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: URBAN RESIDENTIAL (MIN. LOT SIZE 12,000 SF)
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: LOT 17
Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
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Date:
Color:



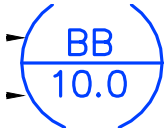
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Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7290
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 30" RCP STORM
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: BB 10.0
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7170
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject: 7270
Page Label: 190
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Checkmark: Unchecked
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Date:
Color:



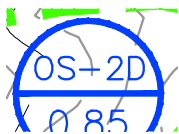
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Date:
Color:



Subject: 7270
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7240
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-2D
Page Label: 190
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

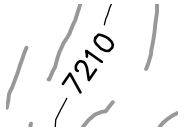
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Date:
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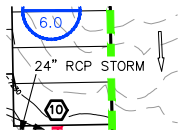
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Author: AutoCAD SHX Text
Date:
Color:

E REC VENT

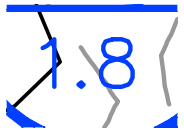
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Date:
Color:



Subject: 7210
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 24" RCP STORM
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 1.8
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 2
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: 200'
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: LOT 1
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject: 7200
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Date:
Color:

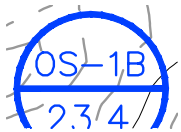


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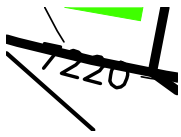
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Page Label: 190
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Date:
Color:



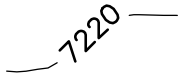
Subject: UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: OS-1B
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7220
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7220
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: N/A
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPERTY BOUNDARY
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7210
Page Label: 190
Lock: Unlocked
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Date:
Color:



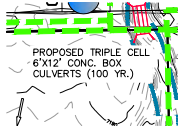
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7190

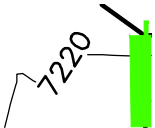
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Page Label: 190 7190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 LOT 9
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 PROPOSED TRIPLE CELL 6'X12' CONC. BOX CULVERTS (100 YR.)
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190 7220
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

7280

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Color:

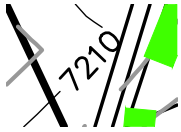
7250

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Page Label: 190 7250
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Color:

7210

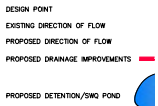
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Author: AutoCAD SHX Text
Date:
Color:

7210



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7210



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

PROPOSED DRAINAGE IMPROVEMENTS



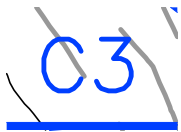
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Date:
Color:

LOT 30



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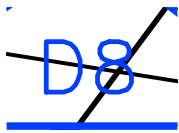
7200



Subject:
Page Label: 190
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Checkmark: Unchecked
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Color:

C3

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Page Label: 190
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Date:
Color:



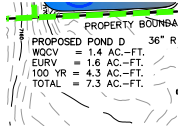
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Date:
Color:



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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 6.9
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPOSED POND D WQCV = 1.4 AC.-FT.
Page Label: 190
Lock: Unlocked
Status: EURV = 1.6 AC.-FT. 100 YR = 4.3 AC.-FT.
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date: TOTAL = 7.3 AC.-FT.
Color:

Subject: N
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190
Lock: Unlocked
Status:
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Date:
Color:

LOT 20



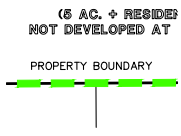
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Date:
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7180



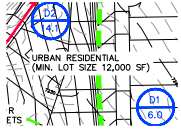
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Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

8



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

PROPERTY BOUNDARY



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

URBAN RESIDENTIAL (MIN. LOT SIZE 12,000 SF)



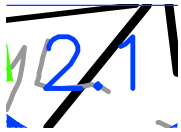
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Date:
Color:

LOT 33

Subject: 200
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 12.0
Page Label: 190
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Date:
Color:



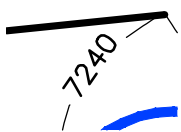
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Date:
Color:



Subject: 7300
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: B3
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:



Subject: 7240
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

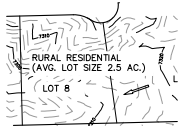
7240

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Date:
Color:

7280

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Author: AutoCAD SHX Text
Date:
Color:

Subject: 7240
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: RURAL RESIDENTIAL (AVG. LOT SIZE 2.5 AC.)
Page Label: 190
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Date:
Color:

23.5

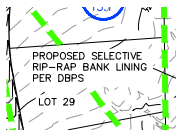
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Color:

7190

Subject: 7190
Page Label: 190
Lock: Unlocked
Status:
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 3
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPOSED SELECTIVE RIP-RAP BANK LINING PER DBPS
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: 7180
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7320
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7290
Page Label: 190
Lock: Unlocked
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Author: AutoCAD SHX Text
Date:
Color:

Subject: (V) 1"=
Page Label: 190
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Status:
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Author: AutoCAD SHX Text
Date:
Color:

7160

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Date:
Color:

7210

Subject: 7210
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Date:
Color:



Subject: 4
Page Label: 190
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Date:
Color:

BASIN IDENTIFIER -
AREA IN ACRES -
DESIGN POINT

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Color:

Subject: 7180
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Date:
Color:

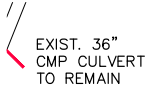
7200

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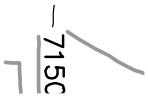
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7



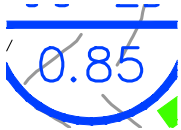
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EXIST. 36" CMP CULVERT TO REMAIN



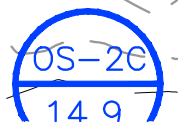
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7150



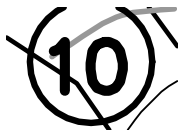
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Date:
Color:

0.85



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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

OS-2C



Subject:
Page Label: 190
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Date:
Color:

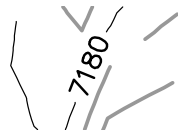
10



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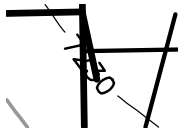
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Author: AutoCAD SHX Text
Date:
Color:



Subject: 7180
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7280
Page Label: 190
Lock: Unlocked
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Date:
Color:

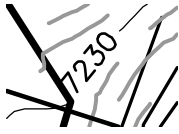


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Author: AutoCAD SHX Text
Date:
Color:

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Checkmark: Unchecked
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Date:
Color:



Subject: 14
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Date:
Color:



Subject: 7230
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: (719)785-0790
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: UNPLATTED (5 AC. + RESIDENTIAL)
Page Label: 190
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Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

Subject: JOB NO.
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: LOT 35
Page Label: 190
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Status:
Checkmark: Unchecked
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Color:



B1

Subject:
Page Label: 190
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Date:
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B1



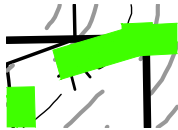
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Date:
Color:

ARROYA LANE



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
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Date:
Color:

51



Subject:
Page Label: 190
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Date:
Color:

7190

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Date:
Color:

2520.00



Subject:
Page Label: 190
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Status:
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Color:

1

7200

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Color:

7210

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Date:
Color:

27.6

Subject: 27.6
Page Label: 190
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Date:
Color:

Subject: SCALE: 1" =
Page Label: 190
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Date:
Color:

7240

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Date:
Color:

7250

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Date:
Color:

7200

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Date:
Color:

2.7

Subject: 2.7
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Author: AutoCAD SHX Text
Date:
Color:

7230

Subject: 7230
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

7310

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Page Label: 190
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7180

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Date:
Color:

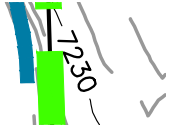
LEGEND

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Checkmark: Unchecked
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Color:



Subject:
Page Label: 190
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Date:
Color:

LOT 32



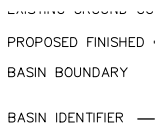
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Checkmark: Unchecked
Author: AutoCAD SHX Text
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Color:

7230



Subject:
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

0



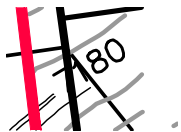
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Page Label: 190
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Date:
Color:

BASIN BOUNDARY



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7290

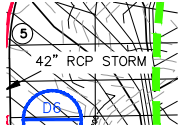


Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7180



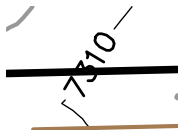
Subject: 7170
Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:



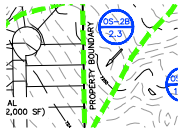
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7270
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7310
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPERTY BOUNDARY
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: LOT 40
Page Label: 190
Lock: Unlocked
Status:
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Date:
Color:

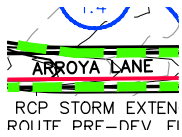
BASIN BOUNDARY

BASIN IDENTIFIER

AREA IN ACRES

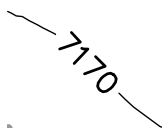
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Page Label: 190
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Author: AutoCAD SHX Text
Date:
Color:

BASIN IDENTIFIER



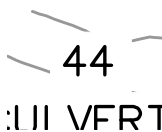
Subject:
Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

ARROYA LANE



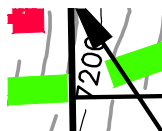
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7170



Subject:
Page Label: 190
Lock: Unlocked
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Date:
Color:

44



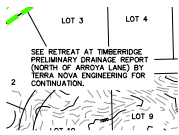
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Color:

7200



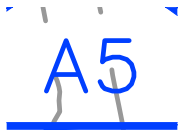
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Author: AutoCAD SHX Text
Date:
Color:

7230



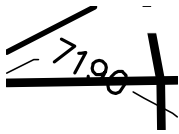
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

SEE RETREAT AT TIMBERRIDGE
PRELIMINARY DRAINAGE REPORT (NORTH OF
ARROYA LANE) BY TERRA NOVA
ENGINEERING FOR CONTINUATION.



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

A5



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7190

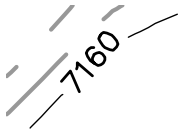
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Page Label: 190
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Date:
Color:

MAW



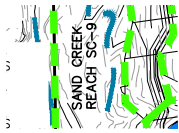
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7330



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7160



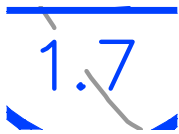
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

REACH SC-9



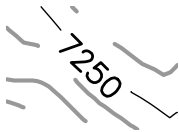
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Page Label: 190
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LOT 24



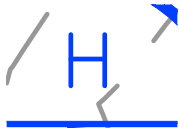
Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

1.7



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7250



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

H

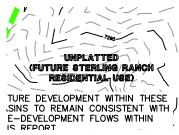


Subject:
Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

LOT 7



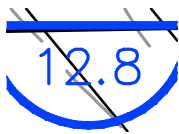
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



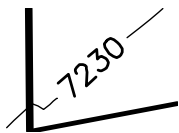
Subject: UNPLATTED (FUTURE STERLING RANCH RESIDENTIAL USE)
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: VOLLMER ROAD
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 12.8
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



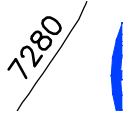
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



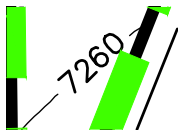
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



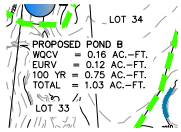
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



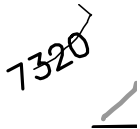
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Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: 7260
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject: PROPOSED POND B WQCV = 0.16 AC.-FT.
Page Label: 190 EURV = 0.12 AC.-FT. 100 YR = 0.75 AC.-FT.
Lock: Unlocked TOTAL = 1.03 AC.-FT.
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

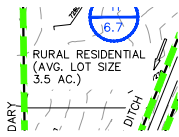


Subject: 7320
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

NOTE:
SEE OFF-SITE DRAINAGE
MAP FOR TOPOGRAPHY
IN THIS AREA.

UNPLATTED

Subject: NOTE: SEE OFF-SITE DRAINAGE MAP FOR
Page Label: 190 TOPOGRAPHY IN THIS AREA.
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

RURAL RESIDENTIAL (AVG. LOT SIZE 3.5 AC.)

ION C

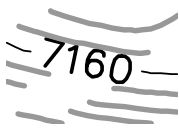
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Page Label: 190
Lock: Unlocked
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Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7230

100

Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

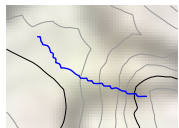
100



Subject:
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: AutoCAD SHX Text
Date:
Color:

7160

5/10/2018 1:29:44 PM (8)



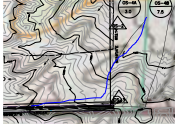
Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color:

It appears that sub-basin lines should be here



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color:

It appears that sub-basin lines should be here



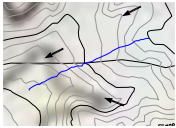
Subject: Pen
Page Label: 32
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Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here



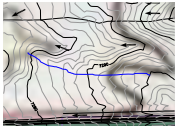
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Page Label: 32
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Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here



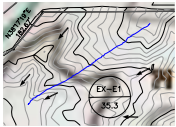
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Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here



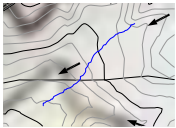
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Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:29:44 PM
Color: ■

It appears that sub-basin lines should be here

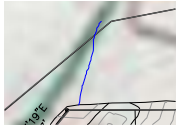
5/10/2018 1:35:20 PM (1)



Subject: Pen
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:35:20 PM
Color: ■

It appears that sub-basin lines should be here

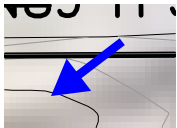
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Subject: Pen
Page Label: 33
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Author: dsdrice
Date: 5/10/2018 1:35:31 PM
Color: ■

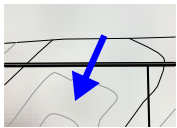
It appears that sub-basin lines should be here

5/10/2018 1:35:40 PM (1)



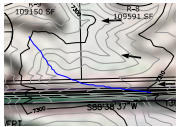
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Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:35:40 PM
Color: ■

5/10/2018 1:35:46 PM (1)



Subject: Arrow
Page Label: 33
Lock: Unlocked
Status:
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Author: dsdrice
Date: 5/10/2018 1:35:46 PM
Color: ■

5/10/2018 1:38:04 PM (1)



Subject: Pen
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:38:04 PM
Color: ■

It appears that sub-basin lines should be here

5/10/2018 1:39:29 PM (1)



Subject: Pen
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 1:39:29 PM
Color: ■

It appears that sub-basin lines should be here

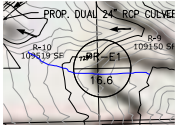
5/10/2018 1:39:36 PM (1)



Subject: Pen
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Status:
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Author: dsdrice
Date: 5/10/2018 1:39:36 PM
Color: ■

It appears that sub-basin lines should be here

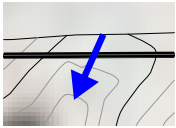
5/10/2018 1:40:09 PM (1)



Subject: Pen
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Date: 5/10/2018 1:40:09 PM
Color: ■

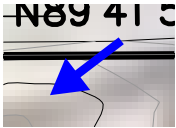
It appears that sub-basin lines should be here

5/10/2018 12:22:02 PM (1)



Subject: Arrow
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:22:02 PM
Color: ■

5/10/2018 12:22:29 PM (1)



Subject: Arrow
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:22:29 PM
Color: ■

5/10/2018 12:32:06 PM (1)



Subject: Callout
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:32:06 PM
Color: ■

What is this line?

5/10/2018 12:33:59 PM (3)



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:33:59 PM
Color: ■

It appears that sub-basin lines should be here



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:33:59 PM
Color: ■

It appears that sub-basin lines should be here



Subject: Pen
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 12:33:59 PM
Color: ■

It appears that sub-basin lines should be here

5/10/2018 2:07:46 PM (1)



Subject: Callout
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 2:07:46 PM
Color: ■

Provide Design Point for channel flow, add to table above.

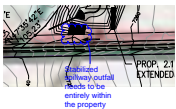
5/10/2018 2:08:19 PM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/10/2018 2:08:19 PM
Color: ■

Provide Design Point for channel flow, add to table above.

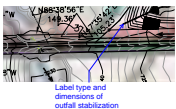
5/11/2018 8:00:15 AM (1)



Subject: Cloud+
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:00:15 AM
Color: ■

Stabilized spillway outfall needs to be entirely within the property

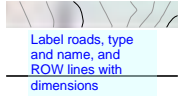
5/11/2018 8:00:20 AM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:00:20 AM
Color: ■

Label type and dimensions of outfall stabilization

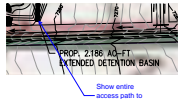
5/11/2018 8:02:24 AM (1)



Subject: Text Box
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:02:24 AM
Color: ■

Label roads, type and name, and ROW lines with dimensions

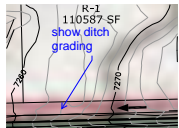
5/11/2018 8:03:17 AM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:03:17 AM
Color: ■

Show entire access path to pond

5/11/2018 8:04:25 AM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:04:25 AM
Color: ■

show ditch grading

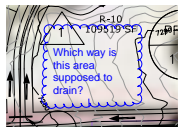
5/11/2018 8:06:25 AM (1)



Subject: Pen
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:06:25 AM
Color: ■

It appears that sub-basin lines should be here

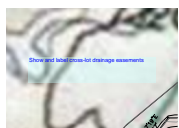
5/11/2018 8:07:28 AM (1)



Subject: Cloud+
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:07:28 AM
Color: ■

Which way is this area supposed to drain?

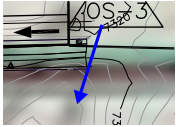
5/11/2018 8:08:07 AM (1)



Subject: Text Box
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:08:07 AM
Color: ■

Show and label cross-lot drainage easements

5/11/2018 8:09:02 AM (1)



Subject: Arrow
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:09:02 AM
Color: ■

Does flow cross road?

5/11/2018 8:09:21 AM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/11/2018 8:09:21 AM
Color: ■

From the contours it appears that this flow crosses Arroya Lane. Is there a culvert? If it is being re-routed through a new roadside ditch, provide a note stating that and show the grading.

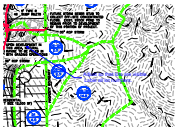
5/14/2018 3:17:37 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:17:37 PM
Color: ■

Bank protection needs to be addressed.

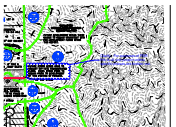
5/14/2018 3:19:38 PM (1)



Subject: Callout
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:19:38 PM
Color: ■

Adjust so that lots are visible. Label all lot numbers.

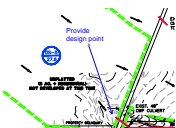
5/14/2018 3:23:31 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:23:31 PM
Color: ■

Clarify. For purposes of PDR this is all one project unless specific phases are broken out.

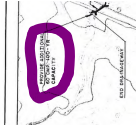
5/14/2018 3:27:55 PM (1)



Subject: Callout
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:27:55 PM
Color: ■

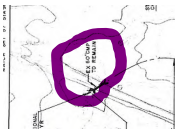
Provide design point

5/14/2018 3:36:02 PM (1)



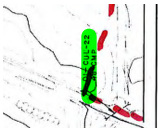
Subject: Highlight
Page Label: 82
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:36:02 PM
Color: ■

5/14/2018 3:36:12 PM (1)



Subject: Highlight
Page Label: 82
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:36:12 PM
Color: ■

5/14/2018 3:37:14 PM (1)



Subject: Highlight
Page Label: 82
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:37:14 PM
Color: ■

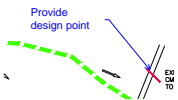
5/14/2018 3:44:30 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:44:30 PM
Color: ■

not found

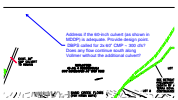
5/14/2018 3:54:10 PM (1)



Subject: Callout
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:54:10 PM
Color: ■

Provide design point

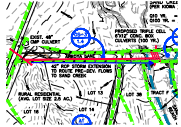
5/14/2018 3:56:30 PM (1)



Subject: Callout
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:56:30 PM
Color: ■

Address if the 60-inch culvert (as shown in MDDP) is adequate. Provide design point. DBPS called for 2x 60" CMP ~ 300 cfs? Does any flow continue south along Vollmer without the additional culvert?

5/14/2018 3:58:19 PM (1)



Subject: Arrow
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:58:19 PM
Color: ■

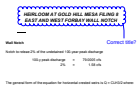
Show 42" RCP

5/14/2018 3:58:56 PM (1)



Subject: Highlight
Page Label: 50
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 3:58:56 PM
Color: ■

5/14/2018 4:01:09 PM (1)



Subject: Cloud+
Page Label: 25
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 4:01:09 PM
Color: ■

Correct title?

5/14/2018 4:02:01 PM (1)

Missing?

Subject: Text Box
Page Label: 14
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 4:02:01 PM
Color: ■

Missing?

5/14/2018 4:02:32 PM (1)



Subject: Highlight
Page Label: 9
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/14/2018 4:02:32 PM
Color: ■

5/15/2018 4:01:34 PM (1)

with west quarter of Section 22,
all Meridian property within El Paso
and west by open space to the east
ne. The site is contained within the
rural
residential?
: appendix as Kettle gravelly loamy

Subject: Cloud+
Page Label: 4
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/15/2018 4:01:34 PM
Color: ■

rural residential?

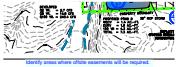
5/15/2018 4:02:21 PM (1)

undeveloped land located in the northern part of 23 Pass County +
Army Lane. This site is being developed by our client to include
residential use. The site is located on the north side of
Highway 12 South, Range 01 West of the 07 Principal Meridian
County, Oregon. The site is bounded to the north, and west by a
20-foot wide easement and to the south by Army Lane. The site
is currently zoned R-10000 (Rural Residential).

Subject: Cloud+
Page Label: 4
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/15/2018 4:02:21 PM
Color: ■

rural residential?

5/16/2018 1:31:49 PM (1)



Subject: Text Box
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:31:49 PM
Color: ■

Identify areas where offsite easements will be required.

5/16/2018 1:33:13 PM (1)

1) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
2) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
3) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
4) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
5) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.

Subject: Text Box
Page Label: 45
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:33:13 PM
Color: ■

Address offsite easement(s) required for Poco bridge.

5/16/2018 1:34:03 PM (1)

area of 1000' wide easement. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
6) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
7) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
8) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.
9) Prepare the final Civil Engineering. This area will not be used
for offsite easements. The proposed development is on the 1000' wide
easement.

Subject: Cloud+
Page Label: 42
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:34:03 PM
Color: ■

urban/paved, isn't it?

5/16/2018 1:34:28 PM (1)



Subject: Cloud+
Page Label: 42
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:34:28 PM
Color: ■

no; provide WQCV

5/16/2018 1:36:41 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:36:41 PM
Color: ■

Roadside ditch needs to be provided, flowing to WQCV BMPs.

5/16/2018 1:37:44 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:37:44 PM
Color: ■

Roadside ditch needs to be provided, flowing to WQCV BMPs.

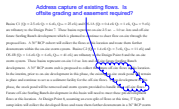
5/16/2018 1:38:34 PM (1)



Subject: Cloud+
Page Label: 42
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:38:34 PM
Color: ■

see plan redlines

5/16/2018 1:45:17 PM (1)



Subject: Cloud+
Page Label: 43
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 1:45:17 PM
Color: ■

Address capture of existing flows. Is offsite grading and easement required?

5/16/2018 10:14:55 AM (1)



Subject: Cloud+
Page Label: 37
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 10:14:55 AM
Color: ■

Provide acreage addressed in this report.

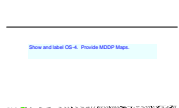
5/16/2018 10:15:58 AM (1)



Subject: Cloud+
Page Label: 38
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 10:15:58 AM
Color: ■

realigned

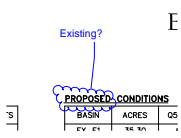
5/16/2018 10:34:28 AM (1)



Subject: Text Box
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 10:34:28 AM
Color: ■

Show and label OS-4. Provide MDDP Maps.

5/16/2018 10:59:00 AM (1)



Subject: Cloud+
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 10:59:00 AM
Color: ■

Existing?

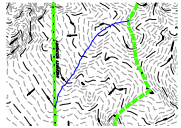
5/16/2018 11:00:52 AM (1)



Subject: Callout
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:00:52 AM
Color: ■

Ensure that this is not just the floodway.

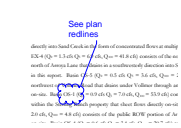
5/16/2018 11:02:33 AM (1)



Subject: Pen
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:02:33 AM
Color: ■

Provide sub-basin line and design points

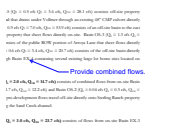
5/16/2018 11:02:58 AM (1)



Subject: Cloud+
Page Label: 39
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:02:58 AM
Color: ■

See plan redlines

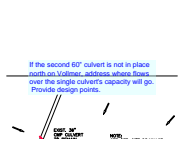
5/16/2018 11:03:50 AM (1)



Subject: Callout
Page Label: 39
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:03:50 AM
Color: ■

Provide combined flows.

5/16/2018 11:09:01 AM (1)



Subject: Text Box
Page Label: 189
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:09:01 AM
Color: ■

If the second 60" culvert is not in place north on Vollmer, address where flows over the single culvert's capacity will go. Provide design points.

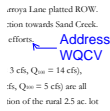
5/16/2018 11:22:43 AM (1)



Subject: Callout
Page Label: 41
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:22:43 AM
Color: ■

Address the size and type of pipe, outfall, and impact to Sand Creek

5/16/2018 11:23:19 AM (1)



Subject: Callout
Page Label: 41
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:23:19 AM
Color: ■

Address WQCV

5/16/2018 11:35:09 AM (1)



Subject: Cloud+
Page Label: 46
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:35:09 AM
Color: ■

Clarify -- isn't the proposed development more urban than the DBPS assumptions?

5/16/2018 11:40:25 AM (1)



Subject: Cloud+
Page Label: 46
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:40:25 AM
Color: ■

proposed?

5/16/2018 11:43:09 AM (1)



Subject: Cloud+
Page Label: 50
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:43:09 AM
Color: ■

impact?

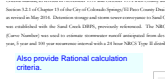
5/16/2018 11:47:23 AM (1)



Subject: Callout
Page Label: 50
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 11:47:23 AM
Color: ■

The effect of the project's increased impervious acreage needs to be taken into account as to whether the detention facilities will be reimbursable. Compare to the situation if development were all rural lots. In either case, the drainage and bridge fees will need to be updated to account for additional costs.

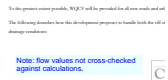
5/16/2018 2:48:48 PM (1)



Subject: Text Box
Page Label: 47
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 2:48:48 PM
Color: ■

Also provide Rational calculation criteria.

5/16/2018 2:49:59 PM (1)



Subject: Text Box
Page Label: 40
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 2:49:59 PM
Color: ■

Note: flow values not cross-checked against calculations.

5/16/2018 2:53:09 PM (1)



Subject: Highlight
Page Label: 82
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 2:53:09 PM
Color: ■

How is this split currently?

5/16/2018 2:54:02 PM (1)



Subject: Cloud+
Page Label: 1
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 2:54:02 PM
Color: ■

Add: The Retreat at TimberRidge

5/16/2018 3:21:20 PM (1)

79.0
49.4
0.9
Outlet Plate 1
4.4

Subject: Highlight
Page Label: 28
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 3:21:20 PM
Color: ■

5/16/2018 3:22:48 PM (1)

0.63	0.87
16.7	23.2
25.8	35.5
19.1	25.7
0.3	0.3
Overflow Grate 1	Outlet Plate 1
1.5	2.1
N/A	N/A
51	46

Subject: Highlight
Page Label: 172
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 3:22:48 PM
Color: ■

5/16/2018 3:23:30 PM (1)

0.52	0.72
16.3	22.6
25.9	35.5
19.1	25.7
1.2	1.5
Overflow Grate 1	Outlet Plate 1
1.5	2.1
N/A	N/A
51	46

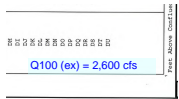
Subject: Highlight
Page Label: 178
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 3:23:30 PM
Color: ■

5/16/2018 6:36:34 PM (1)



Subject: Rectangle
Page Label: 73
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 6:36:34 PM
Color: ■

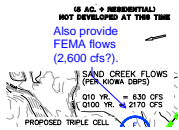
5/16/2018 6:39:38 PM (1)



Subject: Text Box
Page Label: 73
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 6:39:38 PM
Color: ■

Q100 (ex) = 2,600 cfs

5/16/2018 6:41:27 PM (1)



Subject: Callout
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 6:41:27 PM
Color: ■

Also provide FEMA flows (2,600 cfs?).

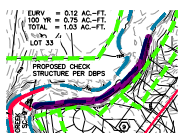
5/16/2018 6:42:55 PM (1)



Subject: Cloud+
Page Label: 106
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 6:42:55 PM
Color: ■

Shouldn't this be 2,600 for FEMA flows?

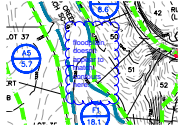
5/16/2018 7:04:38 PM (1)



Subject: Highlight
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 7:04:38 PM
Color: ■

Provide bank protection.

5/16/2018 7:08:19 PM (1)



Subject: Cloud+
Page Label: 190
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 7:08:19 PM
Color: ■

floodplain doesn't appear to match contours here.

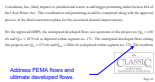
5/16/2018 7:21:44 PM (1)



Subject: Cloud+
Page Label: 46
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 7:21:44 PM
Color: ■

Preliminary analysis and recommendations need to be provided in this report.

5/16/2018 7:21:49 PM (1)



Subject: Callout
Page Label: 46
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 7:21:49 PM
Color: ■

Address FEMA flows and ultimate developed flows.

5/16/2018 7:22:48 PM (1)



Subject: Cloud+
Page Label: 46
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 7:22:48 PM
Color: ■

Address if this velocity is adequate (slow enough) and FEMA FIS velocities (see comment letter).

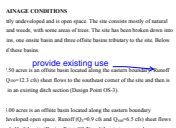
5/16/2018 8:34:11 AM (1)



Subject: Cloud+
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:34:11 AM
Color: ■

see plan redlines

5/16/2018 8:38:52 AM (1)



Subject: Callout
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:38:52 AM
Color: ■

provide existing use

5/16/2018 8:39:17 AM (2)

res is an offsite bas
ped open space. Ru
of the site (Design I

Subject: Highlight
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:39:17 AM
Color: ■

see comment letter

res is an offsite bas
ped open space. Ru
of the site (Design I

Subject: Highlight
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:39:17 AM
Color: ■

see comment letter

5/16/2018 8:43:51 AM (1)

g the eastern boundary. Runoff
at corner of the site and flows
at OS-1? Provide
dimensions and extents of
existing ditch and label on
plan (see plan redlines).
g the eastern boundary.
fi and Q₁₀₀=6.5 cfs) sheet flows
if then is transported west across

Subject: Callout
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:43:51 AM
Color: ■

Clarify - provide dimensions and extents of existing ditch and label on plan (see plan redlines).

5/16/2018 8:44:42 AM (1)

en of undeveloped open space. Runoff Q₁₀=5.4 cfs and
existing ditches. The combined flow Q₁₀=7.0 cfs and
will enter the site via existing ditches and proposed ditch.
equal basis (i.e. equal ACP) of flows will enter the site under
no load condition and use Runoff PA 4.2.
see plan redlines
OS-1? Provide dimensions and extents of
existing ditch and label on plan (see plan redlines).
at the applicable site conditions.

Subject: Cloud+
Page Label: 5
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:44:42 AM
Color: ■

see plan redlines

5/16/2018 8:47:28 AM (1)

ground of large lot development. Runoff Q₁₀=5.4 cfs and
existing ditches. The combined flow Q₁₀=7.0 cfs and
will enter the site via existing ditches and proposed ditch.
equal basis (i.e. equal ACP) of flows will enter the site under
no load condition and use Runoff PA 4.2.
see plan redlines
OS-1? Provide dimensions and extents of
existing ditch and label on plan (see plan redlines).
at the applicable site conditions.

Subject: Cloud+
Page Label: 6
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:47:28 AM
Color: ■

OS-1? (see plan redlines)

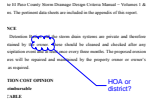
5/16/2018 8:48:02 AM (1)



Subject: Callout
Page Label: 33
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:48:02 AM
Color: ■

What is this line?

5/16/2018 8:49:08 AM (1)



Subject: Cloud+
Page Label: 7
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 8:49:08 AM
Color: ■

HOA or district?

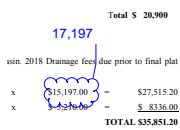
5/16/2018 9:03:04 AM (1)



Subject: Text Box
Page Label: 8
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:03:04 AM
Color: ■

Provide full calculation for 2018 fees:
11% imp. x (35.3-Tract) Ac. x 75% x \$17,197/imp. Ac. = \$
11% imp. x (35.3-Tract) Ac. x \$5,210/imp. Ac. = \$
or just state that the area is in the Sand Creek basin and fees will be due. Construction costs of DBPS-listed improvements may be offset against fees. (to be addressed in Final Drainage Report)

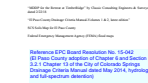
5/16/2018 9:03:21 AM (1)



Subject: Cloud+
Page Label: 8
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:03:21 AM
Color: ■

17,197

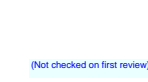
5/16/2018 9:05:19 AM (1)



Subject: Text Box
Page Label: 9
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:05:19 AM
Color: ■

Reference EPC Board Resolution No. 15-042 (El Paso County adoption of Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, hydrology and full-spectrum detention)

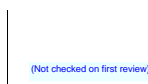
5/16/2018 9:10:27 AM (1)



Subject: Text Box
Page Label: 17
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:10:27 AM
Color: ■

(Not checked on first review)

5/16/2018 9:10:39 AM (1)



Subject: Text Box
Page Label: 18
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:10:39 AM
Color: ■

(Not checked on first review)

5/16/2018 9:11:09 AM (1)

(Not checked on first review)

Subject: Text Box
Page Label: 19
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:11:09 AM
Color: ■

(Not checked on first review)

5/16/2018 9:11:14 AM (1)

(Not checked on first review)

Subject: Text Box
Page Label: 20
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:11:14 AM
Color: ■

(Not checked on first review)

5/16/2018 9:11:23 AM (1)



(Not checked on first review)

Subject: Text Box
Page Label: 21
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:11:23 AM
Color: ■

(Not checked on first review)

5/16/2018 9:12:06 AM (1)

(Not checked on first review)

Subject: Text Box
Page Label: 26
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:12:06 AM
Color: ■

(Not checked on first review)

5/16/2018 9:12:17 AM (1)

2 Provide a/c of the unbalanced flow-year peak discharge in 100' high

(Not checked on first review)

Subject: Text Box
Page Label: 25
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:12:17 AM
Color: ■

(Not checked on first review)

5/16/2018 9:12:51 AM (1)



Provide headwater depth calculations for all culverts.

www.Pipe

Subject: Text Box
Page Label: 24
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:12:51 AM
Color: ■

Provide headwater depth calculations for all culverts.

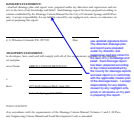
5/16/2018 9:13:38 AM (1)

Provide channel and roadside ditch calculations.

Subject: Text Box
Page Label: 22
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:13:38 AM
Color: ■

Provide channel and roadside ditch calculations.

5/16/2018 9:19:59 AM (1)



Subject: Callout
Page Label: 35
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdrice
Date: 5/16/2018 9:19:59 AM
Color: ■

use updated signature block:
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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.