



INNOVATIVE DESIGN. CLASSIC RESULTS.

**FINAL DRAINAGE REPORT
FOR
PAINT BRUSH HILLS
FILING 13E**

JULY 2018

Response

Prepared for:
**AEROPLAZA FOUNTAIN LLC
HEIDI LLC**
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, CO 80903
(719) 635-3200

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

SF189

Job no. 2055.50

PCD Project No. SF-18-xxx



**FINAL DRAINAGE REPORT FOR
PAINT BRUSH HILLS FILING NO. 13E**

DRAINAGE REPORT STATEMENT

DESIGN ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage report and said report is in conformity with the applicable master plan and drainage basin. 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

OWNERS/DEVELOPER'S STATEMENT:

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

Business Name: Aeroplaza Fountain LLC and Heidi LLC

Title: _____

Address: 212 N. Wahsatch Ave., Suite 301

Colorado Springs, CO 80903

provide a line for
signature and date

EL PASO COUNTY:

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

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

Date

Conditions:



FINAL DRAINAGE REPORT FOR PAINT BRUSH HILLS FILING NO. 13E

PURPOSE

This document is the Final Drainage Report for Paint Brush Hills Filing No. 13E. This filing was originally part of the overall Final Plat submittal for Paint Brush Hills Filing No. 13, approved by the BOCC in 2006 but never recorded. This filing represents the next phase within the phased final plat for this development. The purpose of this report is to address on-site and off-site drainage patterns as discussed and approved within the original overall Final Drainage Report and update storm and drainage criteria to current County standards. This report will introduce an additional future detention facility and designed to meet current SWQ/EURV standards, yet remain consistent with drainage concepts approved in previous reports.

↑
GENERAL replace EURV with "Full Spectrum
Detention" ION ✓

The original Paint Brush Hills Filing No. 13 site is a 300-acre site located in the county of El Paso within Section 25 and 26, Township 12 South, Range 65 West of the Sixth Principal Meridian, El Paso County, Colorado. The site is bounded on the north by existing platted (RR2 Zone) residential lots, to the east by existing platted (R Zone) residential lots, to the south by existing planned (R Zone) residential lots and on the west by existing (RR3 Zone) residential lots and unplatted parcels. The overall site was proposed for 553 single family units, a 10-acre elementary school site, a 6-acre community commercial site along with 44-acres of trails and open space. The residential lots will range in size from a 6000 S.F. minimum to 1.0+ acre.

Under the plat phasing resolution (No. 12-48) adopted by the County in 2012, the proposed filing 13E represent the next phase of development within this subdivision. Filing 13E contains 158 single family lots and proposes lots both within the RS-6000 and RS-20,000 zone districts as approved with the original Filing 13 overall Final Plat.

The average soil condition reflects Hydrologic Group "B" (Pring Course, Sandy Loam and Stapleton Sandy Loam), as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service.



future development such as the development proposed as a part of this Final Plat. Specific design points within this report refer to these existing facilities. The following descriptions compare the developed flows as specified in the “Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 & 12” verses the proposed developed flows for this development at these existing facilities:

Design Point 31 ($Q_5 = 13$ cfs and $Q_{100} = 30$ cfs) consists of developed flows from Basins LL, MM. An existing 12' sump inlet exists at this location. Based on the previous study, this location anticipated a developed flow of ($Q_5 = 13$ cfs and $Q_{100} = 30$ cfs). Thus, the existing facility at this location continues to adequately handle both the 5-year and 100-year developed flows.

Design Point 32 ($Q_5 = 4$ cfs and $Q_{100} = 7$ cfs) consists of developed flows from Basin NN. An existing 6' sump inlet exists at this location. Based on the original study, this location was notated as design point 18A with a developed flow of ($Q_5 = 8$ cfs and $Q_{100} = 15$ cfs). Thus, the existing facility at this location continues to adequately handle both the 5-year and 100-year developed flows.

In the previous reports, Design Point 34A ($Q_5 = 46$ cfs and $Q_{100} = 106$ cfs) consists of developed flows from Basins DD1, DD2, EE, OO, RR and SS only while basins FF, GG, HH, II, JJ and KK were collected in a separate storm system and routed directly to the existing dual 36" RCP storm sewers at this location. However, with the proposed detention facility (Pond D) now planned at this location, these piped flows will be routed directly into this facility, therefore reducing the flow downstream to historic levels or below. The total inflow into this facility is planned as **Design Point 34A** ($Q_5 = 47$ cfs and $Q_{100} = 155$ cfs). This facility will be constructed with the proposed Filing 13E and the downstream flows will remain consistent with the recent Filing 13C & D final drainage report.

Pond D has the following design parameters as a full-spectrum facility:

0.88 Ac.-ft. WQCV required

2.1 Ac.-ft. EURV required

2.1 Ac.-ft. EURV design with 4:1 max. slopes

5.3 Ac.-ft. 100-yr. storage

Total In-flow:

$Q_5 = 47$ cfs, $Q_{100} = 155$ cfs

Pond Design Release:

$Q_5 = 3.3$ cfs, $Q_{100} = 62.9$ cfs

Pre-development Release:

$Q_5 = 19$ cfs, $Q_{100} = 105$ cfs

State who owns/maintains the facility.

Included in statement on end of page 6.



Pipe routing summary indicates 36" RCP. Revise accordingly.

Revised summary

Filing 13E Storm Facilities

Design Point 24 ($Q_5 = 6$ cfs and $Q_{100} = 22$ cfs) collects developed flows from Basin DD1. At this location a 15' Type R at-grade inlet will be installed to collect ($Q_5 = 6$ cfs and $Q_{100} = 15$ cfs) and ($Q_5 = 0$ cfs and $Q_{100} = 7$ cfs) will flow-by. This facility is designed to maintain the required street capacity at this location.

Design Point 25 ($Q_5 = 3$ cfs and $Q_{100} = 16$ cfs) and **Design Point 26** ($Q_5 = 3$ cfs and $Q_{100} = 10$ cfs) then collect developed flows from Basins DD2, EE and the flow-by from Design Point 24. At this sump condition, a 10' and a 5' Type R sump inlets, respectively, will be installed to completely collect both the 5-year and 100-year developed flows. These flows will have a maximum ponding depth of 1.0' and then be conveyed via a 30" RCP storm sewer to the natural channel, where a rip rap dissipater will be installed to minimize sediment transfer and erosion. The total flow within the pipe at this location is given by **Pipe Run 28** ($Q_5 = 12$ cfs and $Q_{100} = 38$ cfs). The emergency overflow route at this location is via a natural swale between two lots within a drainage easement and then directly into the natural channel.

Design Point 27 ($Q_5 = 7$ cfs and $Q_{100} = 23$ cfs) and **Design Point 28** ($Q_5 = 6$ cfs and $Q_{100} = 18$ cfs) collect developed flows from Basins FF, GG and HH within sump conditions. 10' Type R sump inlets will be installed at both Design Point 27 and 28. Both the 5-year and 100-year flows at these locations will be fully collected and then conveyed via a 36" RCP storm sewer in a westerly direction within Londonderry Drive. The maximum ponding at these locations will be 1.0' and then the flows will travel around the corner directly into Londonderry Drive where the emergency overflow will head towards Design Point 31. **Design Point 29** ($Q_5 = 6$ cfs and $Q_{100} = 15$ cfs) and **Design Point 30** ($Q_5 = 1$ cfs and $Q_{100} = 3$ cfs) collect developed flows from Basins II, KK and JJ within sump conditions. A 10' Type R sump inlet will be installed at Design Point 29 and a 5' Type R sump inlet will be installed at Design Point 30. Both the 5-year and 100-year flows at these locations will be fully collected and then conveyed via a 24" RCP storm sewer into Londonderry Drive. These flows then combine with the upstream flows previously mentioned and are conveyed via a 36" RCP system within Londonderry Drive and then directly into the Detention Pond D. The total flow within the pipe at this location is given by **Pipe Run 35** ($Q_5 = 18$ cfs and $Q_{100} = 53$ cfs). The maximum ponding at these locations will be 1.0' and then the flows will travel around the corner directly into Londonderry Drive where the emergency overflow will head towards Design Point 31.



Per the ECM 3.10.4a, this development requests a reduction of drainage fees based on the on-site full spectrum detention/SWQ facility proposed to be constructed (Pond D). The following facility within the Falcon Drainage Basin seems to meet the criteria for this reduction:

Detention Pond D 5.3 ac-ft. full spectrum \$ 75,000 x 50% = \$ 37,500.00

FEE TOTALS (with reduction):

Bridge Fees

\$ 3,814.00 x 22.37 Impervious Ac. = \$ 85,319.18

Drainage Fees

\$ 621,035.94 - 37,500.00 = \$ 583,535.94

Revise the Fee Totals. This criteria does not apply to this development since the following criteria is not met - "Regional system is in place downstream". PBH B1 and PBH B2 are in place and the drop structures along RWT150 are in place.

SUMMARY

This proposed development remains consistent with the previously approved MDDP, Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 & 12 and Final Drainage Report for Paint Brush Hills Filing 13C & D. The existing storm facilities continue to adequately handle both the 5-yr. and 100-yr. developed flows. All proposed detention facilities meet current criteria and provide full spectrum design. The proposed development will not adversely impact surrounding developments.

Add a section regarding the 4-step process.

PREPARED BY:
Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
 Project Manager

mw/205350/Reports/FDR Filing 13E.doc



JOB NAME: Paint Brush Hills Filing 13E
 JOB NUMBER: 2053.50
 DATE: 07/18/18
 CALCULATED BY: MAW

now included

Individual pipe sheets are missing.

Added

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

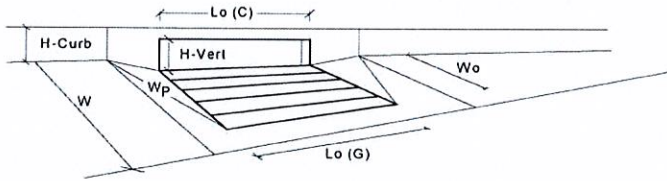
Include the velocities

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*	Velocity (ft/sec)
					I(5)	I(100)	Q(5)	Q(100)		
25	DP24 Pickup	1.96	2.74	18.2	3.23	5.43	6	15	24" RCP	
26	DP25	0.99	3.01	18.7	3.19	5.36	3	16	24" RCP	
27	PR25, PR26	2.95	5.75	18.9	3.18	5.33	9	31	30" RCP	
28	DP26, PR27	3.84	7.23	19.2	3.15	5.29	12	38	36" RCP	
29	DP27	2.15	4.49	20.1	3.08	5.18	7	23	30" RCP	
30	DP28	1.87	3.12	15.5	3.47	5.83	6	18	24" RCP	
31	PR29, PR30	4.02	7.61	20.6	3.05	5.11	12	39	36" RCP	
32	DP29	1.69	2.54	15.4	3.48	5.84	6	15	24" RCP	
33	DP30	0.28	0.46	9.5	4.21	7.07	1	3	18" RCP	
34	PR 32, PR33	1.97	3.00	15.6	3.46	5.81	7	17	24" RCP	
35	PR31, PR34	5.99	10.61	21.3	3.00	5.03	18	53	36" RCP	
36	DP 33	1.26	2.10	14.9	3.53	5.93	4	12	24" RCP	
37	DP34, PR36	3.53	5.88	16.5	3.38	5.67	12	33	30" RCP	
38	Future DP-35 and DP-36	5.71	9.22	17.3	3.31	5.55	19	51	36" RCP	
39	DP-37 Pickup	1.11	2.07	17.0	3.33	5.60	4	12	24" RCP	
40	PR-38, PR-39	6.82	11.28	17.8	3.26	5.48	22	62	36" RCP	

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



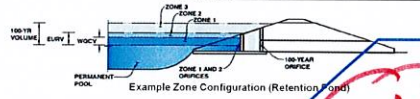
The narrative and drainage map both note 12' inlet. Verify. If the requirement was for a 15' inlet, the developer will need to replace.

Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	$d_{local} = 1.00$		inches
Number of Unit Inlets (Grate or Curb Opening)	$N_u = 1$		
Water Depth at Flowline (outside of local depression)	$Ponding\ Depth = 8.0$	12.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	$L_g (G) = N/A$		feet
Width of a Unit Grate	$W_g = N/A$		feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} = N/A$		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_{c1} (G) = N/A$	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_{w1} (G) = N/A$		
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_{o1} (G) = N/A$		
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	$L_c (C) = 15.00$		feet
Height of Vertical Curb Opening in Inches	$H_{vert} = 6.00$		inches
Height of Curb Orifice Throat in Inches	$H_{throat} = 6.00$		inches
Angle of Throat (see USDCM Figure ST-5)	$\Theta = 63.40$		degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p = 2.00$		feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{c1} (C) = 0.10$	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_{w1} (C) = 3.60$		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_{o1} (C) = 0.67$		
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	$d_{Grate} = N/A$	N/A	ft
Depth for Curb Opening Weir Equation	$d_{Curb} = 0.50$	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination} = 0.75$	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{Curb} = 0.89$	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{Grate} = N/A$	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_s = 20.3$	35.8	cfs
	$Q_{PEAK\ REQUIRED} = 13.0$	30.0	cfs

Removed as narrative and flow are consistent with previous report / design.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: Paint Brush Hills Filing No. 13E
Basin ID: Pond D



Revise. Based on drainage map, it appears that the watershed length should be closer to ±2000'

Required Volume Calculation

Selected BMP Type	EDB	
Watershed Area	76.53	acres
Watershed Length	4.750	ft
Watershed Slope	0.010	ft/ft
Watershed Imperviousness	27.00%	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)	0.904	acre-feet
Excess Urban Runoff Volume (EURV)	2.103	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.)	1.647	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.)	3.190	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.)	4.638	acre-feet
25-yr Runoff Volume (P1 = 2 in.)	7.018	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.)	8.821	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.)	10.918	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.)	18.480	acre-feet
Approximate 2-yr Detention Volume	1.548	acre-feet
Approximate 5-yr Detention Volume	2.751	acre-feet
Approximate 10-yr Detention Volume	3.074	acre-feet
Approximate 25-yr Detention Volume	3.328	acre-feet
Approximate 50-yr Detention Volume	4.012	acre-feet
Approximate 100-yr Detention Volume	5.318	acre-feet

Revised

Optional User Input
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)	0.904	acre-feet
Zone 2 Volume (EURV - Zone 1)	1.199	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	3.215	acre-feet
Total Detention Basin Volume	5.318	acre-feet
Initial Surcharge Volume (ISV)	user	ft³
Initial Surcharge Depth (ISD)	user	ft
Total Available Detention Depth (H _{total})	user	ft
Depth of Trickle Channel (H _{trickle})	user	ft
Slope of Trickle Channel (S _{trickle})	user	ft/ft
Slopes of Main Basin Sides (S _{main})	user	H/V
Basin Length-to-Width Ratio (R _{basin})	user	
Initial Surcharge Area (A _{ISV})	user	ft²
Surcharge Volume Length (L _{ISV})	user	ft
Surcharge Volume Width (W _{ISV})	user	ft
Depth of Basin Floor (H _{depth})	user	ft
Length of Basin Floor (L _{depth})	user	ft
Width of Basin Floor (W _{depth})	user	ft
Area of Basin Floor (A _{depth})	user	ft²
Volume of Basin Floor (V _{depth})	user	ft³
Depth of Main Basin (H _{main})	user	ft
Length of Main Basin (L _{main})	user	ft
Width of Main Basin (W _{main})	user	ft
Area of Main Basin (A _{main})	user	ft²
Volume of Main Basin (V _{main})	user	ft³
Calculated Total Basin Volume (V _{total})	user	acre-feet

Stage-Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft²)	Optional Override Area (ft²)	Area (acres)	Volume (ft³)	Volume (ac-ft)
Micropond	0.00					137	0.003		
ISV=7200.5	0.50					137	0.003	67	0.002
7200	2.00					15,360	0.353	11,538	0.265
7204	4.00					78,880	1.811	105,931	2.432
7206	6.00					97,014	2.227	281,825	6.470
7208	8.00					109,094	2.504	487,933	11.201

