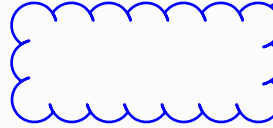January 10, 2022

Mr. Gilbert LaForce
El Paso County
2880 International Cir., Suite 110
Colorado Springs, CO 80910

Please add PCD Project # CDR-22-002

Dear Gilbert:

DRAINAGE LETTER – JUDGE ORR ROAD RV PARK & STORAGE

THIS DRAINAGE LETTER is to Certify that the Approved Final Drainage Report for the [Ju]dge Orr Road RV Park & Storage Development prepared by Associated Design [Pr]ofessionals, Inc. included the area involved in the extension of Range Flower [W]ay. The area included in the Range Flower Way drainage area was delineated as [su]b-basin A2A and contained 2.58 acres. The flows from this basin produced 5.7 [cf]s for the 5-year storm and 12.0 cfs for the 100-year storm. These flows will be intercepted by two 5' D10R inlets which connect to the 24" RCP which flows east to the approved detention basin.

Submit inlet calculations for the two proposed inlets. Revise to the standard Type R inlet.

I hereby Certify that there are no changes to these flows from the date of the approved report to the development of the roadway improvement plans.

Please call me if you have questions.

Please add Standard Certification Statements as shown per DCM Vol Section 4.6.1

Sincerely,

Michael A. Bartusek, PE
Project Engineer

W3925.-Judge Orr Rd RV Park & S

Standard Signature block in MS Word attached.

121 S. TEJON ST.
SUITE 1110
COLORADO SPRINGS, CO 80903
719.28...

respec.com

Drainage Reports

Design Engineer's Statement:

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

_____   _____
[Name, P.E. #_____]   Date

Owner/Developer's Statement:

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

_____   _____
[Name, Title]   Date
[Business Name]
[Address]

El Paso County:

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

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

Conditions:

JUDGE ORR ROAD RV PARK & STORAGE DEVELOPMENT
C FACTOR CALCULATION SHEET

RUNOFF COEFICIENT
TYPE A/B SOILS

LAND USE		5 YR	100 YR	IMPERV.
				%
UNDEV		0.08	0.35	0
LOOSE GRAVEL		0.59	0.7	80
GRAVEL ROADS		0.59	0.7	80
GRAVEL RV PARKING PAD		0.59	0.7	80
PAVED ROADS/BUILDINGS		0.9	0.96	100

Historic Conditions

AREA	TOTAL AREA	SURFACE CONDITION AREAS				CALCULATED C	
		GRASSED SURFACE	LOOSE GRAVEL	GRAVEL ROADS	BUILDINGS OR PAVED ROADS	5	100
DESIG.	(acre)					YR	YR
A1	11.75	11.75	0.00	0.00	0.00	0.08	0.35
A2	20.75	20.60	0.00	0.10	0.05	0.08	0.35
A3	4.36	3.91	0.00	0.35	0.10	0.14	0.39
	36.86	36.26	0.00	0.45	0.15	0.09	0.36
% Impervious		0%	80%	80%	100%		
Imp x A		0	0	0.36	0.15		
Total I x A	0.51						
Total Imp	0.51/36.86 = 1.4%						
B	0.87	0.87	0.00	0.00	0.00	0.08	0.35
OS1	7.81	7.19	0.00	0.00	0.62	0.15	0.40
OS2	36.41	35.96	0.00	0.00	0.45	0.09	0.36
OS3	27.21	From Heagler DBPS				0.30	0.60
OS4	13.73	12.37	0.00	0.00	1.36	0.16	0.41
OS5	0.71	0.42	0.00	0.00	0.29	0.41	0.60

Developed Conditions							
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C	
AREA	AREA	GRASSED SURFACE	LOOSE GRAVEL	GRAVEL RV PARKING	PAVED ROADS	5 YR	100 YR
DESIG.	(acre)						
A1	8.30	0.61	7.69	0.00	0.00	0.55	0.67
A2A	2.58	0.86	0.00	0.00	1.72	0.63	0.76
A3	6.85	3.88	0.00	1.15	1.82	0.38	0.57
A4	11.92	9.18	0.00	1.49	1.25	0.23	0.46
Total @Pond	29.65	14.53	7.69	2.64	4.79	0.39	0.57
A2B	0.70	0.16	0.00	0.00	0.54	0.71	0.82
A5	1.80	1.72	0.00	0.00	0.08	0.08	0.38
% Impervious		0%	80%	80%	100%		
Imp x A		0	6.15	2.11	4.79		
Total I x A	13.05						
Total Imp	13.05/29.65 = 44.0%						
B	0.87	0.87	0.00	0.00	0.00	0.08	0.35
OS1	7.81	7.19	0.00	0.00	0.62	0.15	0.40
OS2	42.70	19.20	0.00	0.00	23.50	0.53	0.69
OS3	27.21	From Heagler DBPS				0.30	0.60
OS4	4.18	2.82	0.00	0.00	1.36	0.35	0.55
OS5	0.70	0.42	0.00	0.00	0.28	0.41	0.59

Pond 1							
% Impervious							
	TOTAL AREA	GRASSED SURFACE	NEIGHBORHOOD COMMERCIAL				
OS1	7.81	7.81					
OS2	42.70	1.65	41.05				
	50.51	9.46	41.05				
% Impervious		0%	70%				
Imp x A		0	28.74				
Total I x A	28.74						
Total Imp	28.74/50.51 = 56.9%						

JUDGE ORR ROAD RV PARK & STORAGE DEVELOPMENT
PROJ. #160301
DRAINAGE CALCULATION SHEET
file:judge orr rvl dr
07/17/19

AREA DESIG.	AREA (acre)	C5 (5 yr)	C100 (100 yr)	C5 X A	C100 X A	Initial Tci L (ft)	Initial Tci Slope (%)	ti (min)	Travel Time L (ft)	Travel Time Slope (%)	V (fps)	Tt (min)	TC (min)	I5 (in/hr)	I100 (in/hr)	Q5 (cfs)	Q100 (cfs)	length L (feet)	vel. V (fps)	^t (min)	AREA DESIG.
EXISTING CONDITIONS																					
A1	11.75	0.08	0.35	0.94	4.11	200	2.00	21.46	1150	1.90	2.10	9.13	30.59	2.29	4.00	2.15	16.47				A1
OS1	7.81	0.15	0.40	1.17	3.12	150	2.00	17.31	600	1.18	2.35	4.26	21.56	2.80	4.89	3.28	15.27	450	4.50	1.67	OS1
OS2	22.10	0.09	0.36	1.99	7.96	150	2.00	18.40	1400	1.20	1.20	19.44	37.85	2.01	3.52	4.00	27.97	1250	2.10	9.92	OS2
DP1	29.91			3.16	11.08								37.85	2.01	3.52	6.36	38.95				DP1
A2	17.47	0.08	0.35	1.40	6.11	250	3.20	20.55	1400	1.90	2.10	11.11	31.66	2.25	3.92	3.14	23.98				A2
DP2	47.38			4.56	17.19								47.77	1.73	3.03	7.91	52.10				DP2
OS3	27.21	0.30	0.60	8.16	16.33	250	2.00	18.82	1570	2.90	1.80	14.54	33.35	2.18	3.80	17.76	62.04	1800	4.00	7.50	OS3
OS4	25.14	0.16	0.41	4.02	10.31	250	2.00	22.11	1800	1.00	2.00	15.00	37.11	2.04	3.56	8.20	36.68				OS4
DP3	52.35			12.19	26.63								37.11	2.04	3.56	24.83	94.79	1050	2.25	7.78	DP3
A3	2.80	0.14	0.39	0.39	1.09	100	2.00	14.28	1050	1.23	2.25	7.78	22.06	2.76	4.83	1.08	5.27				A3
OS5	0.82	0.41	0.60	0.34	0.49	10	2.00	3.25	1050	1.23	2.25	7.78	11.02	3.89	6.79	1.31	3.34				OS5
DP4	55.97			12.91	28.22								44.89	1.81	3.15	23.32	89.02				DP4
DP5	115.10			18.41	49.52								44.89	1.81	3.15	33.25	156.23				DP5
B	0.87	0.08	0.35	0.07	0.30	80	2.00	13.57	650	1.30	2.30	4.71	18.28	3.05	5.34	0.21	1.62				B
DEVELOPED CONDITIONS																					
OS1	7.81	0.15	0.40	1.17	3.12	150	2.00	17.31	600	1.18	2.35	4.26	21.56	2.80	4.89	3.28	15.27	450	4.50	1.67	OS1
OS2	22.10	0.09	0.36	1.99	7.96	150	2.00	18.40	1400	1.20	1.20	19.44	37.85	2.01	3.52	4.00	27.97	1594	10.00	2.66	OS2
DP1	29.91			3.16	11.08								37.85	2.01	3.52	6.36	38.95				DP1
A1	8.30	0.56	0.68	4.65	5.64	100	2.00	8.03	1150	1.50	1.20	15.97	24.01	2.64	4.61	12.26	26.00	650	1.20	9.03	A1
A2A	2.58	0.63	0.76	1.63	1.96	35	2.00	4.14	700	1.50	1.20	9.72	13.86	3.50	6.12	5.69	12.00	675	1.20	9.38	A2A
A3	6.85	0.38	0.57	2.60	3.90	100	2.00	10.71	950	1.50	1.20	13.19	23.91	2.64	4.62	6.88	18.03				A3
DP2	9.43			4.23	5.87								23.91	2.64	4.62	11.18	27.08	230	1.20	3.19	DP2
A4	11.92	0.39	0.57	4.65	6.79	100	2.00	10.56	1100	1.50	1.20	15.28	25.84	2.53	4.42	11.76	30.02	150	5.00	0.50	A4
DP3	29.65			13.53	18.30								33.03	2.19	3.82	29.60	69.97				DP3
DPD2	29.65			0.23	8.93	*Adjusted C Factor for Detention Basin							33.03	2.19	3.82	0.50	33.70				DPD2
DP4	59.56			3.39	20.01								40.50	1.93	3.37	6.54	67.41				DP4
OS3	27.21	0.30	0.60	8.16	16.33	250	2.00	18.82	1570	2.90	1.80	14.54	33.35	2.18	3.80	17.76	62.04	1800	4.00	7.50	OS3
OS4	25.14	0.16	0.41	4.02	10.31	250	2.00	22.11	1800	1.00	2.00	15.00	37.11	2.04	3.56	8.20	36.68				OS4

*Adjusted C Factor for Detention Basin

Summary Flow Table

Location											
DP5	52.35	12.19	26.63	37.11	2.04	3.56	24.83	94.79	1050	2.25	7.78
A2B	0.69	0.49	0.57	6.21	4.84	8.46	2.37	4.79	110	1.20	1.53
A5	1.80	0.14	0.68	28.14	2.41	4.21	0.35	2.88			
OS5	0.70	0.29	0.42	12.89	3.62	6.33	1.04	2.63			
DP6	55.54	12.62	27.73	44.89	1.81	3.15	22.78	87.49			
DP7	115.10	16.00	47.74	44.89	1.81	3.15	28.90	150.61			
B	0.87	0.07	0.30	18.28	3.05	5.34	0.21	1.62			

	0.71	0.82	35	2.00	3.43	200	1.50	1.20	2.78
	0.08	0.38	180	2.00	20.36	1050	1.23	2.25	7.78
	0.41	0.59	10	2.00	3.26	1300	1.23	2.25	9.63
B	0.08	0.35	80	2.00	13.57	650	1.30	2.30	4.71

* C Factor Adjusted to Model Flows from Detention Model into Rational Method Design

DITCH CAPACITY CALCULATION SHEET

Swale Location	Q5 cfs	100 cfs	S %	B ft	n	Z	D ft	d100 ft	V fps	Froude #	Riprap Size ft	Riprap Size in
Swale A	6.4	39.0	1.00	4.00	0.035	3:1	3.00	1.30	3.70	0.71		
Swale B	3.0	10.0	1.00	0.00	0.035	3:1	1.50	1.10	2.75	0.65		
Swale C	12.3	26.0	1.40	0.00	0.035	3:1, 1%	1.00	0.50	2.00	0.71		
Swale D	12.3	26.0	1.50	0.00	0.035	3:1	2.00	1.50	4.10	0.84		
Swale E	11.1	27.1	1.40	4.00	0.035	0.42	1.00	0.80	3.00	0.78		
Swale F	11.8	30.0	1.50	0.00	0.015	56:1	0.25	0.3*	3.10	1.52	asphalt road	
								*d5				
Judge Orr Rd												
Ditch G	24.8	94.8	1.60	4.00	0.035	3:1/4:1	2.00	1.70	5.50	0.94		
Ditch H	22.8	87.5	1.60	4.00	0.035	3:1/4:1	2.50	1.70	5.40	0.93		
Spillwy K	24.6*	73.0*	5.00	40.00	0.040	3:1	2.00	0.40	4.40	1.25	0.20	Use 12"
	*Undetained Flows from UD-Det											
Spillway												
Swale L	36.1*	109.0*	0.30	10.00	0.040	3:1	3.00	2.30	2.80	0.38	0.38	Use 12"
	*Undetained Flows from UD-Det+ Storm Sewer Flows											
Exist Swale At												
E PL Line	6.5*	67.4*	1.70	8.00	0.040	8:1	6.00	1.10	3.80	0.80		
	*Detained Flows + Storm Sewer Flows											
***Swale 300'**												
E of PL	28.9	150.6	1.70	8.00	0.040	8:1	6.00	1.60	4.70	0.85		
	*From Spreadsheet											
***Det Breach**												
Flow	---	199.5	1.70	8.00	0.040	8:1	6.00	1.80	5.10	0.86		

*Flows from the development travel within a natural swale covered with rangeland grasses. No downstream manmade facilities exist.

STORM SEWER HYDRAULIC GRADELINE CALCULATION SHEET

Location	Pipe Size	Slope %	Q5	Q100	Pipe Cap	Critical d	Invert	Q/D^1.5	Yt	Riprap Size	Riprap Used
DPD1	30"	6.4	1.3	39.0	54.5	2.3	6855.5	9.9	0.68	Type L*	Type M
A2A	24"	5.7	0.4	12.0	15.4	1.24	6856.0	4.2	0.8	Type L*	Type M
DP2	24"	11.2	5.7	27.1	58.1	1.82	6842.1				
DP5	(3)38"x24"	24.8	1.0	94.8	44	1.36	6855.4	8.0	0.68	Type L*	Type M
DP6	(3)38"x24"	22.8	1.0	87.5	44	1.36	6841.6	7.4	0.68	Type L*	Type M

FOREBAY CALCULATIONS

Total for Basin

2% OF WQV

0.02 X 0.470 = 0.0094 AF = 409 CF

Total Flows at Forebays = 83.1 CFS (Without Time of Concentration Adjustment)

FOREBAY NOTCH CALCULATIONS

At Swale D-D

Flow at Swale D-D = 26.0 CFS

0.02 OF 100YR FLOW

0.02 X 26 = 0.52 CFS

Forebay Size = (26.0/83.1)x409 = 128 CF

$W = Q/(D^{1.5} X C)$

$W = 0.52/(1 X 3.0) = 0.17$ FT

At DP2

Flow at DP2 = 27.1 CFS

0.02 OF 100YR FLOW

0.02 X 27.1 = 0.54 CFS

Forebay Size = (27.1/83.8)x409 = 133 CF

$W = Q/(D^{1.5} X C)$

$W = 0.54/(1 X 3.0) = 0.18$ FT

At Sub-Basin A4

Flow at Sub-Basin A4 = 30.0 CFS

0.02 OF 100YR FLOW

0.02 X 30.0 = 0.60 CFS

Forebay Size = (30.0/83.1)x409 = 148 CF

$W = Q/(D^{1.5} X C)$

$W = 0.60/(1 X 3.0) = 0.20$ FT

Title Block

LEGEND

- A1A — BASIN DESIGNATION
- XX — BASIN AREA, ACRES
- XX / XX — 5 YEAR STORM, CFS / 100 YEAR STORM, CFS
- DESIGN POINT
- XX.X / XX.X — 5 YEAR ACCUMULATED FLOW, CFS / 100 YEAR ACCUMULATED FLOW, CFS
- — — — SUB-BASIN BOUNDARY
- → DIRECTION OF DRAINAGE FLOW

NOTES

A. DETENTION POND AREA TO BE UTILIZED AS A SEDIMENTATION BASIN UNTIL EARTH MOVING IS COMPLETED AND THE GROUND STABILIZED AT WHICH TIME IT WILL BE CLEANED OUT. THE SEDIMENT BASIN OUTLET PIPE REMOVED AND THE DETENTION POND STRUCTURE OS2 ADDED. SEE SEDIMENT BASIN DETAIL SB ON SHEET 5 OF 7

B. EMBANKMENT COMPACTION SHALL FOLLOW THE REQUIREMENTS OF THE GEOTECHNICAL LETTER FROM ENTECH ENGINEERING, INC. LOCATED IN APPENDIX C OF THE DRAINAGE REPORT

NOTE:
JUDGE ORR ROAD DITCH FLOWS COMBINE WITH OUTLET SWALE FLOWS APPROX 300' EAST OF THE PROPERTY

* EROSION CONTROL BLANKET SHALL BE 70% STRAW, 30% COCONUT BY WINTERS EXCELSIOR COMPANY OR EQUIVALENT

NOTE:
SWALE J SECTION CONTINUES DOWNSTREAM PAST WHERE THE JUDGE ORR ROAD DITCH FLOWS COMBINE

NO TOPOGRAPHY AVAILABLE BEYOND THIS AREA
(SEE OFFSITE DRAINAGE MAP FOR CONTINUATION)

Section Details

- SWALE A-A
- SWALE B-B
- SWALE C-C
- SWALE D-D
- SWALE E-E
- ROAD SECTION F-F
- SWALE G-G — JUDGE ORR ROAD DITCH SECTION
- SWALE H-H — JUDGE ORR ROAD SWALE
- SWALE J-J
- EMERGENCY SPILLWAY K-K
- SPILLWAY SWALE L-L
- EMBANKMENT SECTION I-I