Hillsboro Energy, LLC
IBR No. 19 to Permit No. 399

Drainage Calculations

Access Road Crossing Culvert No. 1 Design

10-year, 6-hour Storm Event

JTS

Alliance Consulting, Inc.
124 Philpott Lane
Beaver, WV 25813

Phone: 304-255-0491

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 6 hr
Rainfall Depth:	4.470 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	Access Road Crossing Culvert No. 1

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	0.227	0.227	1.09	0.08

Structure Detail:

Structure #1 (Culvert)

Access Road Crossing Culvert No. 1

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
75.00	0.35	0.0120	1.00	0.00	0.90

Culvert Results:

Design Discharge = 1.09 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	0.227	0.038	0.000	0.000	98.000	M	1.09	0.080
	Σ	**0.227**						**1.09**	**0.080**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	0.36	0.88	247.00	1.800	0.038
#1	**1**	**Time of Concentration:**					**0.038**

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Drainage Calculations

Access Road Crossing Culvert No. 2 Design

10-year, 6-hour Storm Event

JTS

Alliance Consulting, Inc.
124 Philpott Lane
Beaver, WV 25813

Phone: 304-255-0491

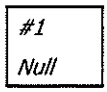
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 6 hr
Rainfall Depth:	4.470 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Access Road Crossing Culvert No. 2



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	3.065	3.065	12.12	0.69

Structure Detail:

Structure #1 (Null)

Access Road Crossing Culvert No. 2

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	3.065	0.050	0.000	0.000	83.000	M	12.12	0.687
	Σ	**3.065**						**12.12**	**0.687**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	0.12	0.22	187.00	1.030	0.050
#1	**1**	**Time of Concentration:**					**0.050**

Access Road Crossing Culvert No. 2

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
75.00	1.00	0.0120	2.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 6.06 cfs → 12.18 cfs ÷ 2 pipes

Maximum Headwater = 2.00 ft

↳ Use (2) 18" pipes

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
0.20	0.19	**0.24**	0.28
0.40	0.53	**0.68**	0.81
0.60	0.98	**1.22**	1.46
0.80	1.50	**1.88**	2.25
1.00	2.10	**2.62**	3.14
1.20	2.70	**3.44**	4.13
1.40	3.21	**4.34**	5.20
1.60	3.66	**5.10**	6.36
1.80	4.05	**5.79**	7.46
2.00	4.36	**6.40**	8.43
2.20	4.62	**6.96**	9.30
2.40	4.83	**7.48**	10.10
2.60	5.04	**7.96**	10.84
2.80	5.24	**8.41**	11.53
3.00	5.43	**8.77**	12.18