UNIVERSAL CULVERT DESIGN

PID : 110922 **Date :** 08/31/2021 **Project :** DEL-605-0.31 **Location :** SR 605 and Fancher Rd.

Description : Location 2 inlet **Designer :** DES

HEADWATER CONTROL CODES:
INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 1035.93 **Outlet Invert Elevation (ft.) :** 1035.15 **Tailwater Elevation (ft.) :** 1036.96 **Overflow Elevation (ft.) :** 1041.34

Allowable Headwater Elevation (ft.) : 1040.50 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 75.00 **Culvert Slope (ft./ft.) :** 0.0104 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 18.20 **@** 25 yrs. **Flood Discharge (cfs) :** 21.80 **@** 100 yrs.

FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
18.20	1	21 in.	1038.9	1038.8	2 - H	8.26	1.51	1.55	0.0120	INLET	0.00	D	0.00
18.20	1	18 in.	1040.2	1040.8	2 - G	10.30	1.50	1.45	0.0120	OUTLET	0.00	D - 1	0.00
12.50	1	15 in.	1044.0	1046.1	2 - G	10.19	1.25	1.22	0.0120	OUTLET	5.70	D - 2	0.00
18.20	1	24 in.	1038.3	1038.0	2 - E	8.68	1.27	1.54	0.0120	INLET	0.00	D + 1	0.00
21.80	1	21 in.	1039.6	1039.6	2 - G	9.06	1.75	1.63	0.0120	OUTLET	0.00	F	0.00
19.30	1	18 in.	1041.6	1042.5	2 - G	10.92	1.50	1.46	0.0120	OUTLET	2.50	F - 1	0.00
12.50	1	15 in.	1050.5	1050.0	2 - G	10.19	1.25	1.22	0.0120	OUTLET	9.30	F - 2	0.00
21.80	1	24 in.	1038.8	1038.4	2 - E	8.96	1.45	1.67	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)													
18.20	1	24 in.	1038.8	1039.6	2 - F	6.09	2.00	1.54	0.0247	OUTLET	0.00	D	0.00

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FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
16.50	1	21 in.	1039.8	1042.2	2 - G	6.86	1.75	1.49	0.0248	OUTLET	1.70	D - 1	0.00
11.30	1	18 in.	1041.8	1048.3	2 - G	6.39	1.50	1.28	0.0249	OUTLET	6.90	D - 2	0.00
18.20	1	27 in.	1038.3	1038.6	1 - A	5.31	2.05	1.49	0.0245	OUTLET*	0.00	D + 1	0.00
21.80	1	24 in.	1039.5	1040.9	2 - F	7.29	2.00	1.67	0.0247	OUTLET**	0.00	F	0.00
16.50	1	21 in.	1041.0	1044.5	2 - G	6.86	1.75	1.49	0.0248	OUTLET	5.30	F - 1	0.00
11.30	1	18 in.	1044.0	1053.2	2 - G	6.39	1.50	1.28	0.0249	OUTLET	10.50	F - 2	0.00
21.80	1	27 in.	1038.8	1039.2	2 - F	6.36	2.25	1.63	0.0245	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
18.20	1	36 in.	1037.9	1038.2	1 - B	4.08	1.64	1.37	0.0281	OUTLET*	0.00	D	0.00
18.20	1	42 in.	1037.8	1038.0	1 - B	3.63	1.49	1.30	0.0278	OUTLET*	0.00	D + 1	0.00
21.80	1	36 in.	1038.1	1038.4	1 - A	4.89	1.84	1.50	0.0281	OUTLET*	0.00	F	0.00
21.80	1	42 in.	1038.0	1038.3	1 - B	4.34	1.66	1.43	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
18.20	1	60 in.	1037.5	1037.8	1 - B	2.84	1.42	1.18	0.0332	OUTLET*	0.00	D	0.00
18.20	1	66 in.	1037.4	1037.7	1 - B	2.67	1.36	1.14	0.0330	OUTLET*	0.00	D + 1	0.00
21.80	1	60 in.	1037.7	1038.0	1 - B	3.40	1.55	1.29	0.0332	OUTLET*	0.00	F	0.00
21.80	1	66 in.	1037.6	1037.9	1 - B	3.20	1.50	1.26	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
18.20	1	60 in.	1037.5	1037.8	1 - B	2.84	1.25	1.18	0.0260	OUTLET*	0.00	D	0.00
18.20	1	66 in.	1037.4	1037.8	1 - B	2.67	1.21	1.14	0.0260	OUTLET*	0.00	D + 1	0.00
21.80	1	60 in.	1037.7	1038.0	1 - B	3.40	1.37	1.29	0.0260	OUTLET*	0.00	F	0.00
21.80	1	66 in.	1037.6	1037.9	1 - B	3.20	1.32	1.26	0.0260	OUTLET*	0.00	F + 1	0.00