

**Engineering Report
on the
Hill Road Branch
of the
Hasler Drain**

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I. Introduction

This report will evaluate two alternative solutions to alleviate drainage problems. Alternative I will propose an enclosed storm system. A cost estimate for the proposed solution has been provided in the report in conjunction with recommendations based on the most cost efficient design.

II. Site Location

The area being studied in this report is located in Sections 2, 3, 10 and 11 of Atlas Township in Genesee County, Michigan. Appendix A of the report shows the area under consideration.

III. Existing Drainage Course and Outlet

The existing drainage route for the district shown in Appendix A is provided by a roadside open drain on the South side of Hill Road. On the north side of Hill Road, pockets of low areas retain water with no efficient drainage course. Water runoff within the drainage district travels by land to the open drain and then continues westward to the Brier Creek. The drain is approximately 1,500 lineal feet and includes approximately eight driveway culverts.

Development in the district is minimal and involves the building of several new houses on both sides of Hill Road. The result of these houses is an increase in the number of drive culverts along the drain route. These additional culverts have somewhat restricted the flow of water at the upper end of the drain and resulted in the areas with standing water.

The primary contributing factor to the less efficient drainage route is the condition and hydraulic condition of the existing roadside drain. Improvements to these conditions and the drive culverts will relieve the water situation.



IV. Hydrology-Flow Estimate

The design parameters utilized are based on the Genesee County Drain Commissioner's Standards. The rational method of calculating storm water runoff was used in this report. A minimum time of concentration of 30 minutes and a 10 year frequency is assumed. Based on the rational method, a summary of Alternative I calculations are shown in Table I below:

Table I (Alternative I) - Enclosed Storm Sewer

<u>AREA</u>	<u>ACRES</u>	<u>TIME</u>	<u>C</u>	<u>I</u>	<u>Q</u> (CFS)	<u>SIZE</u> (IN)	<u>GRADE</u> (%)	<u>LENGTH</u> (FT)	<u>QCAP</u> (CFS)
A	18.5	30.0	0.25	3.0	13.9	24"	1.00	60	23
A-B	58.5	30.1	0.25	3.0	43.9	36"	0.4%	800	45
A-C	59.6	32.2	0.25	3.0	44.7	Open Drain (See Below)			

The capacity of an open drain alternative was calculated using the Manning equation. A roughness coefficient of 0.035 for natural channels with stones and weeds was assumed. Following is the summary of calculations for the proposed channel:

$$Q = \frac{1.49}{n} A (R)^{2/3} (S)^{1/2}$$

Depth Assumed = 3 feet (minimum)

Bottom Width = 2 feet

Side Slopes = 3/1

Channel Slope = S = 0.004 feet/feet (minimum)

Area = A = 33.0 square feet

Wetted Perimeter = P = 20.97 feet

Roughness Coefficient = n = 0.035

Hydraulic Radius = R = A/P = 1.57

$$Q \text{ (capacity)} = \frac{1.49}{0.035} (33.0) (1.57)^{2/3} (0.004)^{1/2}$$

$$Q \text{ (capacity)} = 120.02 \text{ cfs}^*$$

*This capacity exceeds demand in this drain district



V. Cost Estimates

Alternative I (Appendix B)

<u>Item No.</u>	<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Amount</u>
1.	36" CMP Storm Sewer	800	LF	60.00	48,000.00
2.	24" CMP Storm Sewer	100	LF	40.00	4,000.00
3.	12" CMP Storm Sewer	20	LF	20.00	400.00
4.	36" CMP Flared End Section	1	EA	400.00	400.00
5.	24" CMP Flared End Section	2	EA	280.00	560.00
6.	12" CMP Flared End Section	1	EA	140.00	140.00
7.	4' Diameter Drainage Structure	3	EA	1,500.00	4,500.00
8.	Rip Rap Spillway	30	SYD	25.00	750.00
9.	Open Drain Construction	650	LFT	5.00	3,250.00
10.	Swale Construction	300	LFT	3.00	900.00
11.	Restore Gravel Drives	100	LFT	8.00	800.00
12.	Open Cut Roadway for Placement of 30" C76-III	60	LFT	70.00	4,200.00
13.	Class 2 Hydro-Seeding (100 lbs#/acre)	100	LBS	1.50	150.00
14.	Chemical Fertilizer Nutrient (240 lbs#/acre)	240	LBS	1.50	360.00
15.	Mulch (2 tons/acre)	2	TONS	300.00	600.00
16.	Topsoil Surface, 3 inches	5,660	SYD	1.50	\$8,490.00
17.	Traffic Control		LUMP SUM	2,500.00	2,500.00

Estimated Total \$80,000.00



VI. Recommendations

Due to the depth requirements along Hill Road, an enclosed sewer is necessary. The alternative presented in this report addresses that enclosed sewer but proposes an open drain where feasible. The top width of an open drain near the proposed manhole Number 3 would be in excess of 60 feet. It is possible for the entire drain to be enclosed but the costs would increase significantly. Therefore, we recommend a combination of an enclosed/open drain system as it is proposed in the report.

