

Geotextile Reinforced Vegetated Outlet (GVO)

Criteria and Design Procedure

Geotextile Reinforced Vegetated Outlets (GVO) provide an economical outlet for small watersheds. The Grassed Waterway Standard (412), Engineering Field Handbook Chapter 7, and the Waterway Design Tool were used as the basis for developing this procedure.

The use of this type of outlet is limited to watersheds with peak flows up to 100 cfs from a 10 year – 24 hour storm. It is also limited to soils which have an erosion category of erodible, erosion resistant, or very erosion resistant.

The cross section shape of the outlet shall be trapezoidal. Side slopes shall not be steeper than 3 horizontal to 1 vertical (3:1). Bottom widths shall be no more than 30 feet. The maximum amount of drop through a GVO shall be 10 feet.

Either the following chart or the Waterway Design Tool may be used to size the GVO. The chart is based on an allowable effective stress of 0.090. Vegetative retardance values used were “D” for stability and “B” for capacity.

Outlet Slope		Maximum Flow	Chute Depth Including 0.5 ft. Freeboard	Minimum Inlet Depth
<u>%</u>	<u>H:V</u>	<u>cfs/ft.</u>	<u>Ft.</u>	<u>Ft.</u>
8	12.5:1	5.4	1.4	1.4
10	10:1	4.6	1.3	1.3
12.5	8:1	3.9	1.2	1.3
16.7	6:1	3.2	1.1	1.3
20	5:1	2.8	1.1	1.3
25	4:1	2.5	1.0	1.2
33	3:1	2.1	1.0	1.2

The minimum GVO bottom width is determined by dividing the peak flow for the 10 year – 24 hour storm by the maximum flow per foot from the table for the desired outlet slope.

The inlet depth must be the larger of the value from the above table or the depth of the upstream waterway. The upstream waterway shall be designed with a slope of 4% or less for at least 100 feet. The waterway may be used for a transition section to change the bottom width and/or side slope to those that match the GVO inlet dimensions. The inlet shall be a minimum of 10 feet long and shall be of the same width as the chute section of the GVO.

It is intended that this design procedure be used with Iowa Standard Drawing IA-1402A, Geotextile Reinforced Vegetated Outlet - Geotextile with an Erosion Control Blanket, or Iowa Standard Drawing IA-1402B, Geotextile Reinforced Vegetated Outlet - Turf Reinforcement Mat.

The drawings show a riprap section at the downstream toe of the chute. If wet conditions exist higher than the flow line of the outlet, additional riprap may be needed up the slope of the GVO to ensure that the outlet is stable.

Depending on the outlet slope and design flow, the designer may choose one of two options for the type(s) of material to use for the GVO. Standard Drawing IA-1402A shows the option for using a geotextile with either an erosion control blanket or mulch with an erosion control netting. Standard Drawing IA-1402B shows the option for using either a turf reinforcement mat or an erosion control blanket.