

8.9 Performance Curves

Performance curves are plots of flow rate versus headwater depth or elevation, velocity, or outlet scour. The culvert performance curve is made up of the controlling portions of the individual performance curves for each of the following control sections (See Figure 8-10):

8.9.1 Inlet

The inlet performance curve is developed using the inlet control nomographs (see HDS 5).

8.9.2 Outlet

The outlet performance curve is developed using equations 8.1 through 8.7, the outlet control nomographs (see HDS 5), or backwater calculations.

8.9.3 Roadway

Roadway performance curves are developed using equation 8.9.

8.9.4 Overall

Overall performance curve is the sum of the flow through the culvert and the flow across the roadway and can be determined by performing the following steps:

1. Select a range of flow rates and determine the corresponding headwater elevations for the culvert flow alone. These flow rates should fall above and below the design discharge and cover the entire flow range of interest. Both inlet and outlet control headwaters shall be calculated.
2. Combine the inlet and outlet control performance curves to define a single performance curve for the culvert.
3. When the culvert headwater elevations exceed the roadway crest elevation, overtopping will begin. Calculate the upstream water surface depth above the roadway for each selected flow rate. Use these water surface depths and equation (8.9) to calculate flow rates across the roadway.
4. Add the culvert flow and the roadway overtopping flow at the corresponding headwater elevations to obtain the overall culvert performance curve as shown in Figure 8-10.

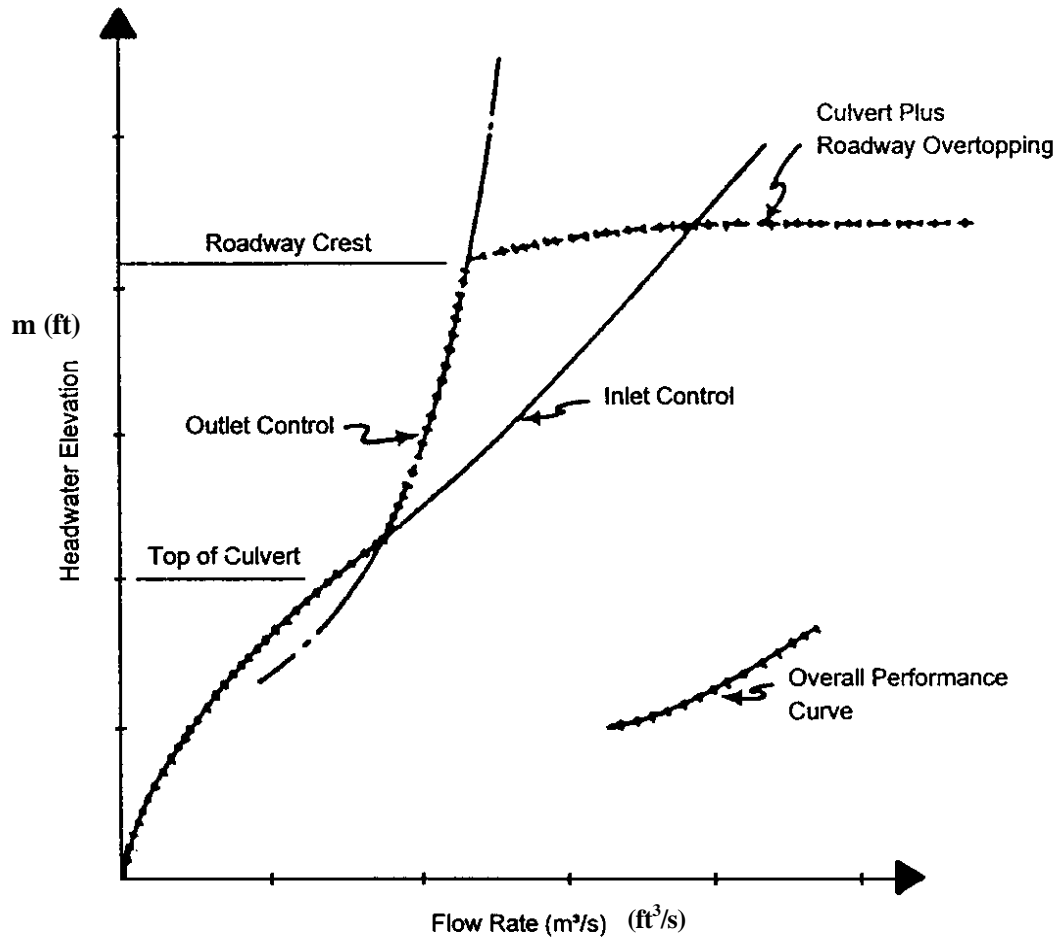


Figure 8-10 Overall Performance Curve