Geometric Formulas for Common Swale Shapes

**Channel Geometry**

**V-Shape**

Cross-sectional Area \( A \) = \( Zy^2 \)

Top Width \( T \) = \( 2yZ \)

Hydraulic Radius \( R \) = \( \frac{Zy}{2\sqrt{Z^2 + 1}} \)

**Parabolic Shape**

Cross-sectional Area \( A \) = \( \frac{2}{3} Ty \)

Top Width \( T \) = \( \frac{1.5A}{y} \)

Hydraulic Radius \( R \) = \( \frac{T^2y}{1.5T^2 + 4y^2} \)

**Trapezoidal Shape**

Cross-sectional Area \( A \) = \( by + Zy^2 \)

Top Width \( T \) = \( b + 2yz \)

Hydraulic Radius \( R \) = \( \frac{by + Zy^2}{b + 2y\sqrt{Z^2 + 1}} \)

Source: Livingston, et al, 1984

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