Irregular Open Channels

For channels, EXTRAN reads data in HEC-2 format then computes normalised values of cross-sectional area, hydraulic radius (with variable Manning's n), and top width. Interpolation of these curves during an EXTRAN simulation is identical to that performed for regular cross sections where the normalised curves have been predetermined and stored in Block Data. Users should be aware that the dimensionless curves consist of 25 depth increments, and the cross sectional area, wetted perimeter, and top width entered are interpolated to fill out the table. Sufficient information should be entered to define the properties of the channel accurately when translated into the dimensionless table.

Irregular cross-section data is entered in the same format as used in the HEC-2 computer program. In fact, the relevant data may be extracted from an existing HEC-2 input data file using the option on the conduit dialog.

EXTRAN also provides two subsidiary functions:

i. the wetted perimeter of a power function cross section Romberg integration, and
ii. calculates the arc length of a power function curve between two points.

Two questions often asked about EXTRAN in connection to natural channels is the relation between the conduit depth and the cross-section elevations, and the purpose of entering a conduit slope.

1. The connection between the depth entered on the conduit dialog and the elevations entered as part of a cross section is as follows:
   DEEP = 0.0 Max Depth = ELMAX - ELMIN
   DEEP $\leq$ ELMAX - ELMIN Max Depth = DEEP
   DEEP > ELMAX - ELMIN Max Depth = ELMAX - ELMIN

   where:
   DEEP = Depth entered on conduit dialog,
   ELMIN = Minimum cross section elevation, and
   ELMAX = Maximum cross section elevation.

   Subsequently, the value of Max Depth is used to construct the dimensionless curves for the conduit.

2. The conduit slope is used in the calculation of the normalised hydraulic radius using Manning's equation for the velocity of flow in the composite channel.