Uneven Weir Calcs is based on the following weir equation.

$$Q = CLH^{1.5}$$

where, Q = weir flow, in cfs

C = weir coefficient

L = weir length, in ft

H = water energy grade above weir crest, in ft

The flow over any section of the uneven weir could be obtained by integrating above equation over the weir section.

$$Q_{UNIT} = \int_{STA1}^{STA2} CH^{1.5} dx$$

$$= \int_{STA1}^{STA2} C(b - ax)^{1.5} dx$$

$$= \frac{C}{2.5a}[(b - a \cdot STA1)^{2.5} - (b - a \cdot STA2)^{2.5}]$$

where,

$$H = \left(ENGEL - ELEV1 + \frac{ELEV2 - ELEV1}{STA2 - STA1} STA1\right) - \frac{ELEV2 - ELEV1}{STA2 - STA1} x = b - ax$$

$$b = \left(ENGEL - ELEV1 + \frac{ELEV2 - ELEV1}{STA2 - STA1} STA1\right)$$

$$a = \frac{ELEV2 - ELEV1}{STA2 - STA1}$$

ENGEL = energy grade line elevation, in ft

ELEV1 = elevation of one end of the weir section, in ft

STA1 = station of one end of the weir section, in ft

ELEV2 = elevation of the other end of the weir section, in ft

STA2 = station of the other end of the weir station, in ft

The above integration assumed ENGEL>=ELEV1 and ENGEL>=ELEV2. In case this is not true,

(1) When ENGEL>ELEV1 and ENGEL < ELEV2, (STA3, ENGEL) should replace (STA2, ELEV2) in the integration.

$$STA3 = \frac{(ELEV2 - ENGEL)STA1 + (ENGEL - ELEV1)STA2}{ELEV2 - ELEV1}$$

(2) When ENGEL<ELEV1 and ENGEL>ELEV2, (STA3, ENGEL) should replace (STA1, ELEV1) in the integration.

(3) When ENGEL<=ELEV1 and ENGEL<=ELEV2, Qunit=0

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