Water flows in a long straight channel with a trapezoidal cross-section. The bottom drops 1.6 m per km. The horizontal bottom is finished concrete (n=0.012) and the sides are clay lined ($n = 0.026$).
What is the total discharge in the channel?

**Section ①:**

$$S_o = \frac{1.6}{1000} = 0.001$$

$n_1 = 0.026$

$$A_1 = 2 \cdot \frac{b_2 \cdot h}{2} = b_2 \cdot h = \sqrt{s^2 - h^2} \cdot h = 1.25 \, m^2$$

$$P_1 = 2 \cdot s = 2 \cdot 1.6 = 3.2 \, m$$

$$R_{h_1} = \frac{A_1}{P_1} = \frac{1.25}{3.2} = 0.39 \, m$$

$$Q_1 = \frac{1}{n_1} \cdot \frac{A_1^{5/3}}{P_1^{2/3}} \sqrt{S_o} = \frac{1}{0.026} \cdot \frac{1.25^{5/3}}{3.2^{2/3}} \cdot \sqrt{0.001} = 1.03 \, m^3/s$$

**Section ②:**

$$n_2 = 0.012 \qquad A_2 = b \cdot h = 1.5 \, m^2 \qquad P_2 = b = 1.5 \, m$$

$$Q_2 = \frac{1}{n_2} \cdot \frac{A_2^{5/3}}{P_2^{2/3}} \cdot \sqrt{S_o} = 5.00 \, m^3/s$$

$$Q = Q_1 + Q_2 = 6.03 \, m^3/s$$

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