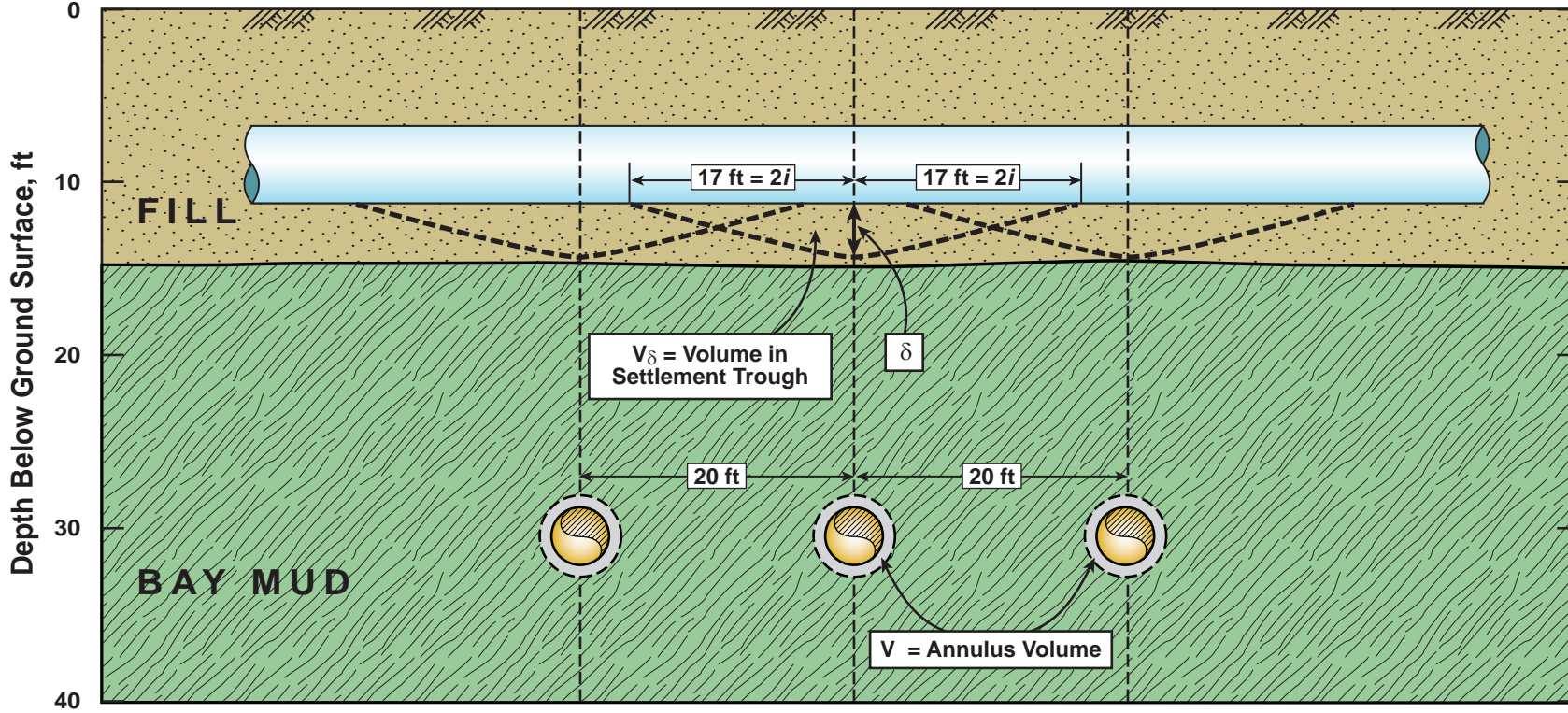


NORTH

SOUTH



$$\frac{L}{a} = \left(\frac{z}{2a}\right)^{0.8}$$

$$2a = 58 \text{ in} = 4.833 \text{ ft}$$

$$z = 23 \text{ ft}$$

$$\frac{L}{a} = 3.48$$

$$L = 3.48 \times \frac{58 \text{ in}}{2 \times 12} = 8.41 \text{ ft} \sim 8.5 \text{ ft}$$

Settlement Trough = 4i

$$V_{\delta} = V_L$$

$$V_L = \frac{\pi}{4} (D_o^2 - d_i^2) = \frac{\pi}{4} (58^2 - 36^2) = 2,068 \text{ in}^2$$

$$V_L = 2,068 \text{ in}^2 \frac{\pi}{4} = 1,624 \text{ in}^2/\text{ft}$$

$$V_{\delta} = \frac{4i \times \delta}{2} = \frac{34}{2} \times 12 \text{ in}/\text{ft} = 204 \text{ in} \times \delta$$

$$1,624 \text{ in}^2/\text{ft} = 204 \text{ in} \times \delta$$

$$\delta = 7.96 \text{ in} \sim 8 \text{ in}$$

Assumptions about loss of ground

$V_{LG} = 100\% V_L$	$\delta = 8 \text{ in}$
$V_{LG} = 50\% V_L$	$\delta = 4 \text{ in}$
$V_{LG} = 30\% V_L$	$\delta = 2.4 \text{ in}$

Plate C-18: Settlements at Pipe Invert Due to Loss of Ground From Collapse of Annulus Around Bore