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The plastic radius according to the solution of Vrakas & Anagnostou (2014) is equal to (see Eq. 30 in the paper):

$$r_p = \left(r_0 - u_p\right)\left(\frac{p_{cr} + \sigma_D/(m-1)}{p_a + \sigma_D/(m-1)}\right)^{\frac{1}{m-1}}, \tag{1}$$

where

$$m = \frac{1+\sin\varphi}{1-\sin\varphi}, \tag{2}$$

$$\sigma_D = \frac{2c\cos\varphi}{1-\sin\varphi}, \tag{3}$$

$$p_{cr} = \frac{2p_0 - \sigma_D}{m+1}. \tag{4}$$

For unsupported conditions, Eq. (1) gives:

$$r_p = \left(r_0 - u_p\right)\left(1 + (m-1)\frac{p_{cr}}{\sigma_D}\right)^{\frac{1}{m-1}}. \tag{5}$$

Notation:

c	cohesion
m	function of the friction angle
p_0	in situ stress
p_a	support pressure
p_{cr}	critical pressure
r_0	tunnel radius
r_p	plastic radius
u_p	wall displacement
σ_D	uniaxial compressive strength
φ	friction angle

Reference:

Vrakas A, Anagnostou G. A finite strain closed-form solution for the elastoplastic ground response curve in tunnelling. *International Journal for Numerical and Analytical Methods in Geomechanics* 2014; **38**: 1131-1148.