The following solids flux curve was generated from settling velocity data collected at various MLSS concentrations from a pilot scale activated sludge bioreactor. Using this data determine the recycle ratio for a mixed liquor concentration of 5,000 mg/L and an underflow concentration of 12,000 mg/L. What is the required surface area of the secondary clarifier at this condition?

Given:

\[ Q = 1 \text{ mgd} \]

\[ C_0 = 5,000 \text{ mg/L} \]

\[ C_u = 12,000 \text{ mg/L} \]

\[ \frac{(Q + Q_r) X'}{X'} = Q_r X' \]

\[ (1 \text{ mgd} + Q_r) 5000 = Q_r 12,000 \]

\[ Q_r = \frac{5}{7} = 0.714 \text{ mgd} \]

\[ A = \frac{(Q + Q_r) C_0}{S F_L} = \frac{(1 + 0.714) 5,000}{1.8 \text{ lb/ft}^2 \cdot \text{hr}} \]

\[ = \frac{1.714 \times 10^6 \text{ gal} \times 8.34 \text{ lb/gal}}{\text{5000 mg/L}} \]

\[ = 1.8 \frac{\text{lb}}{\text{ft}^2 \cdot \text{hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} \]

\[ A = 1655 \text{ ft}^2 \]