



Calculating the section areas

- Use the polyarea command to calculate the section areas. Pay attention to the coordinates. Y is given in centimeters while x is given in meters.

Calculating the cut & fill volumes between the sections

Since sections 1 and 2 are of the same type the volume between these sections can be calculated by multiplying the average section area by the distance between the sections.

$$V_{f(1-2)} = \frac{S_1 + S_2}{2} \times l$$

S_1 : Area of Section 1

S_2 : Area of Section 2

l : Distance between two sections (25 m)

Calculating the cut and fill volumes between sections 2 and 3 is slightly more complicated.

Follow the step by step procedure below to calculate cut and fill volumes.

Step 1.

Draw a line from the point that connects the cut and fill areas of section 3 to separate section 2 into two parts S_{2Fa} and S_{2Fb} as shown in the figure above.

Step 2.

Calculate the coordinates of the points P1 and P2 by using elementary geometry and calculate the areas S_{2Fa} and S_{2Fb} with the polyarea function.

Step 3.

Calculate the volume of fill between S_{2Fa} and S_{3F} by

$$V_{f(2-3)a} = \frac{S_{2Fa} + S_{3F}}{2} \times l$$

Calculate the volume of fill between S_{2Fb} and S_{3C} by

$$V_{f(2-3)b} = \frac{1}{2} \frac{S_{2Fb}^2}{(S_{2Fb} + S_{3C})} \times l$$

Calculate the volume of cut between S_{2Fb} and S_{3C} by

$$V_{c(2-3)} = \frac{1}{2} \frac{S_{3C}^2}{(S_{2Fb} + S_{3C})} \times l$$

Step 4.

Total volume of cut:

$$V_c = V_{c(2-3)}$$

Total volume of fill:

$$V_f = V_{f(1-2)} + V_{f(2-3)a} + V_{f(2-3)b}$$

References

Evren, G., 1994. Toprak İşleri, İstanbul Teknik Üniversitesi İnşaat Fakültesi Matbaası, İstanbul