Na resolução analítica calculou-se a cota média do terreno, cota a que deve corresponder um volume de escavação Ve igual ao volume de aterro Va:

média simples =(2.2+3.8+5.4+0.8+2.0+4.0+6.2+1.0+2.2+4.4)/10=3.2 m

média pesada=(2.2+5.4+0.8+6.2+1.0+4.4+2\*(3.8+2.2)+3\*(2.0+4.0))/16=3.125 m

a) Criar ficheiros de coordenadas:

exer9\_terreno\_natural.txt

1,20,0,1.0 2,40,0,2.2 3,60,0,4.4 4,0,20,0.8 5,20,20,2.0 6,40,20,4.0 7,60,20,6.2 8,0,40,2.2 9,20,40,3.8 10,40,40,5.4

exer9\_plataforma\_horizontal cota 3\_125.txt : todos os pontos com cota 3.125 exer9\_plataforma\_horizontal cota 3\_2.txt : todos os pontos com cota 3.2 exer9\_plataforma\_horizontal cota 3\_12.txt : todos os pontos com cota 3.12 exer9\_plataforma\_horizontal cota 3\_11.txt : todos os pontos com cota 3.11

- b) Calcular volumes no Civil3D:
  - i) Abrir um ficheiro .dwg novo
  - ii) Criar os layers 'pontos terreno natural', dtm terreno natural', com cor encarnado, e 'fronteira', com cor verde
  - iii) Layer activo = 'pontos terreno natural'
  - iv) Insert > Points form file e indicar o caminho e o nome do ficheiro exer9\_terreno\_natural.txt, o formato pretendido, PENZ, activar a opção Add Points to Point Group e atribuir um nome a esse Point Group

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	OK Cancel Help							

- v) Zoom extents
- vi) Colocar o layer 'fronteira' activo e com uma **polyline**, definir o contorno exterior do terreno
- vii) Criar a superfície terreno natural, colocar activo o layer 'dtm terreno natural', esconder o layer 'fronteira' e atribuir à superfície o nome 'terreno natural'



viii) Importar para a superfície 'terreno natural' os pontos que a definem através da selecção do respectivo Point Group:

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ix) Colocar visível o layer 'fronteira' e incluí-lo na superfície 'terreno natural' como Boundaries, o que tem como efeito excluir triângulos resultantes da triangulação que ficavam fora do limite do terreno.



- x) Repetir o procedimento para criar as restantes superfícies de nomes 3.125, 3.2, 3.12
- xi) Calcular volumes de escavação e aterro para as várias combinações 'terreno natural' (como base surface) e as restantes superfícies (como comparison surface):

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terreno natural – **3.125**: cut (escavação) = 772.55 m3, fill (aterro) = 799.22 m3, net (fill = 26.67 m3 (falta) terreno natural – **3.2**: cut (escavação) = 716.65 m3, fill (aterro) = 863.32 m3, net (fill) = 146.67 m3 (falta) terreno natural – **3.12**: cut (escavação) = 776.36 m3, fill (aterro) = 795.02 m3, net (fill) = 18.67 m3 (falta) terreno natural – **3.11**: cut (escavação) = 784.01 m3, fill (aterro) = 786.67 m3, net (fill) = 2.67 m3 (falta)

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<u>conclusão</u>: a cota média do terreno obtida analiticamente pesando as cotas (3.125 m) conduziu a uma melhor aproximação Ve=Va relativamente ao valor da cota média sem a utilização de pesos (3.2 m). Numericamente obteve-se um valor da cota média mais rigoroso (3.11 m) pois com este valor a diferença entre Ve e Va é de apenas 2.67 m3.

terreno natural – **3.5**: cut (escavação) = 515.76 m3, fill (aterro) = 1142.43 m3, net (cut) = **626.67 m3**, que compara com os 600 m3 obtidos analiticamente.

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