

Sand and Gravel Practical

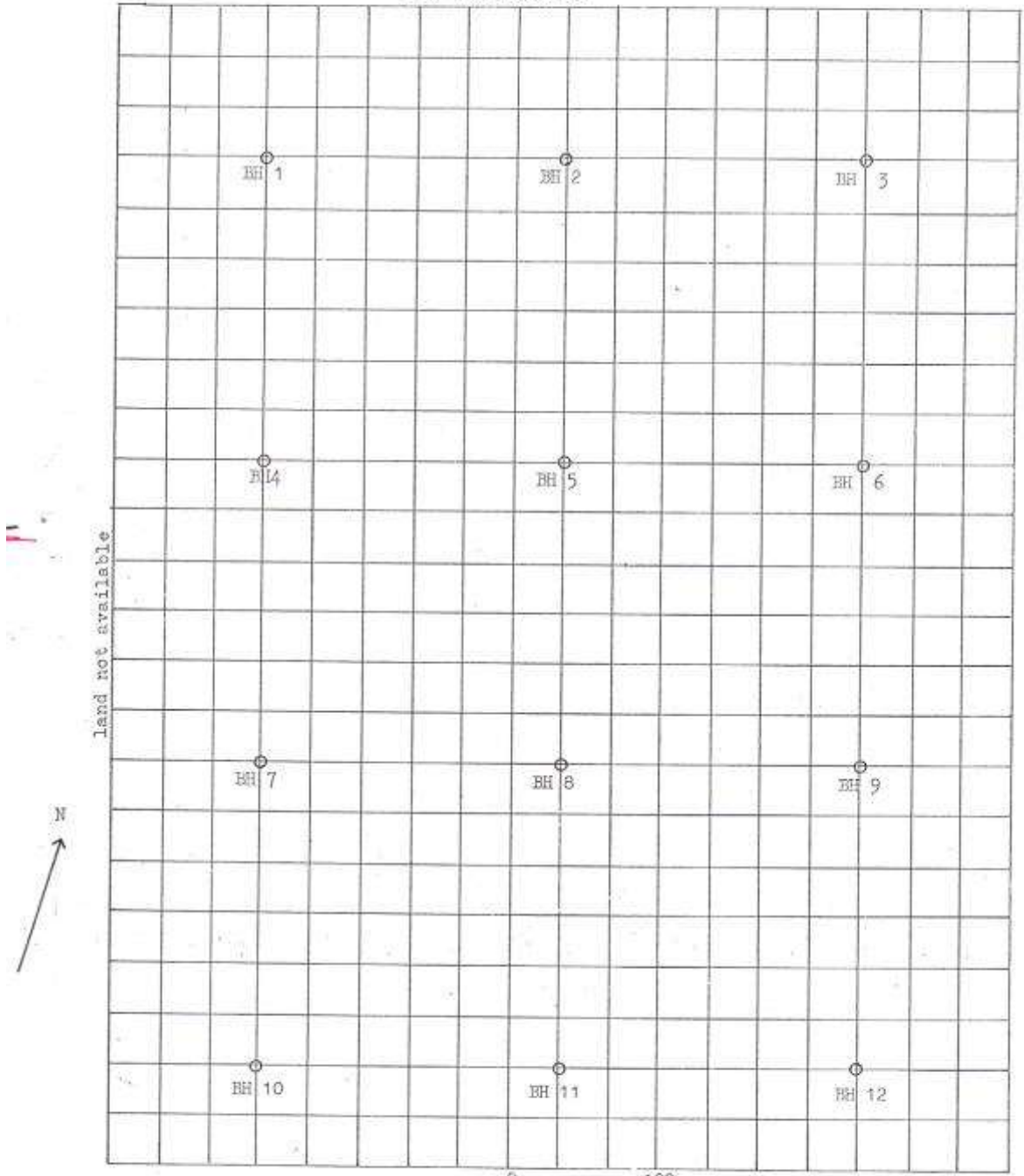
This is an exercise in plotting and interpreting borehole data. It can be tied in with sieving sand and gravel and with motorway construction. When the exercise was originally devised the A1-M1 link, (now called the A14), was being built and so it was tied in with that. It makes it more realistic if it is related to a particular motorway construction and for the students to work out if the area contains enough sand and gravel for the concrete needed.

Give students a copy of the map and of the borehole data.

Students must work out the exercise at the top and this should be checked before they look at the boreholes B.H. 1 to 12 that are on the map. In this first exercise only the sand and gravel between 2.1m and 5.6m is workable because the rest of the sand and gravel has too large a content of fines. The overburden is therefore the soil and the top sand and gravel, so the top 2.1m.

SAND AND GRAVEL PROSPECT

land not available



The area is completely flat

0 100
Scale in metres

SAND AND GRAVEL PRACTICAL

To be workable the sand and gravel should

- a) be thicker than 1.00 m
- b) contain less than 40% fines (fines are grains whose diameter is $\leq 1/16$ mm)
- c) be at least $1/3$ the thickness of the overburden

Look at this borehole log

	depth in metres		fines	sand	gravel
soil	0	1.3			
sand and gravel	1.3	2.1	45	20	35
sand and gravel	2.1	4.8	30	40	30
sand and gravel	4.8	5.6	20	40	40
sand and gravel	5.6	6.1	50	30	20
Keuper marl	6.1	7.2			

- 1 What is the thickness of the workable deposit?
- 2 What thickness of material has to be removed (= overburden) to obtain the workable sand and gravel?

Now apply the criteria given at the top to the borehole logs below. Sand or sand and gravel may form workable deposits.

- 1 Work out the overburden thickness in each borehole and plot it on the map. Draw contour lines to show the varying thickness of the overburden. The lines should be at 1 m intervals.
- 2 Work out the thickness of sand and gravel and plot the figures on the map. Contour the thickness of workable sand and gravel at 1 m intervals.
- 3 Shade in the area underlain by workable sand and gravel deposits.
- 4 Calculate the volume of sand and gravel available
- 5 Calculate the tonnage of sand and gravel assuming that 1 cubic meter of sand and gravel weighs 1.5 tonnes.
- 6 Show how you could calculate the weight of sand and the weight of gravel as separate figures. Do not do the calculations.

Borehole Data

	depth in metres		finer	sand	gravel
R.H.1					
Topsoil brown and sandy	0.0	0.5			
Sand and gravel, brown	0.5	1.2	45	55	0
getting coarser downwards	1.2	2.5	20	70	10
	2.5	4.5	10	60	30
	4.5	6.7	5	65	30
Oxford clay	6.7	7.7			
R.H.2					
Topsoil brown peaty	0	2.0			
Sand and gravel	2.0	2.5	42	58	0
	2.5	4.0	20	70	10
	4.0	5.8	10	60	30
Oxford clay	5.8	6.9			
R.H.3					
Topsoil clay and peat	0	2.0			
clayey sands	2.0	3.6	45	55	0
Sand and gravel	3.6	4.7	20	70	10
Oxford clay	4.7	5.5			
R.H.4					
Topsoil brown and sandy	0	0.5			
sand and gravel	0.5	2.5	20	70	10
	2.5	3.6	10	60	30
Oxford clay	3.6	3.9			
R.H.5					
Topsoil clayey peat	0	0.5			
Sandy soil	0.5	1.0	60	40	0
Sand and gravel	1.0	2.0	20	70	10
	2.0	3.1	10	60	30
Oxford clay	3.1	4.1			
R.H.6					
Topsoil clay and peat	0	1.3			
Sandy soil	1.3	2.0	60	40	0
Sand and gravel	2.0	2.9	10	60	30
Oxford clay	2.9	3.4			

R.H.7					
Topsoil	0	0.6			
Sand	0.6	1.5	20	80	0
Sand and gravel	1.5	2.8	10	60	30
Oxford clay	2.8	4.0			
R.H.8					
Topsoil	0	1.0			
Sand and gravel	1.0	1.5	20	70	10
	1.5	2.1	30	40	30
Oxford clay	2.8	3.9			
R.H.9					
Topsoil sandy clay	0	1.4			
Fine sand	1.4	2.0	50	50	0
Sand and gravel	2.0	2.3	30	70	0
Oxford clay	2.3	2.9			
R.H.10					
Topsoil	0	0.8			
Sand	0.8	1.6	30	70	0
Oxford clay	1.6	2.7			
R.H.11					
Topsoil	0	0.7			
Sand	0.7	1.2	30	70	0
Oxford clay	1.2	1.9			
R.H.12					
Topsoil	0	1.0			
Fine sand	1.0	1.5	45	55	0
Oxford clay	1.5	2.4			