Assignment 1

There was a cement factory north of the village of Roche (Switzerland) that used to mine two quarries. You have been asked to study the possible reactivation of a Portland cement factory at the site (fictitious case).

The quarries contain limestone and argillaceous limestone (Fig. 1.3).

Required composition for a mixture of calcined rock to produce Portland cement

CaO	35–42 (wt. %)
Al_2O_3	3–8.5 (wt. %)
Fe_2O_3	0–4 (wt. %)
SiO_2	15–25 (wt. %)
CaO/SiO_2	1.25–2.5[–]
$SiO_2/(Al_2O_3+Fe_2O_3)$	2–4[–]
Al_2O_3/Fe_2O_3	≥2[–]
MgO	maximum 5 (wt. %)
SO_3	maximum 3.5 (wt. %)

Geochemical analysis of two types of calcined rock (wt. %)

	Argillaceous limestone Red beds	Massive limestones Malm
SiO_2	23.10	0.85
Al_2O_3	4.90	0.39
Fe_2O_3	1.40	0.13
CaO	35.60	52.96
MgO	0.51	1.80
SO_3	0.01	0.06
K_2O	0.79	0.3
Na_2O	0.24	0.1
P_2O_5	0.09	0.0
Loss by fire*	32.70	43.01
Total	99.34	99.6

*compounds volatilized during calcination.

Questions

(a) What are the different possible mixtures of these two rocks that would meet the chemical criteria for raw material in this process?

(b) Identify other criteria specific to the site that may influence the choice of the mixture.

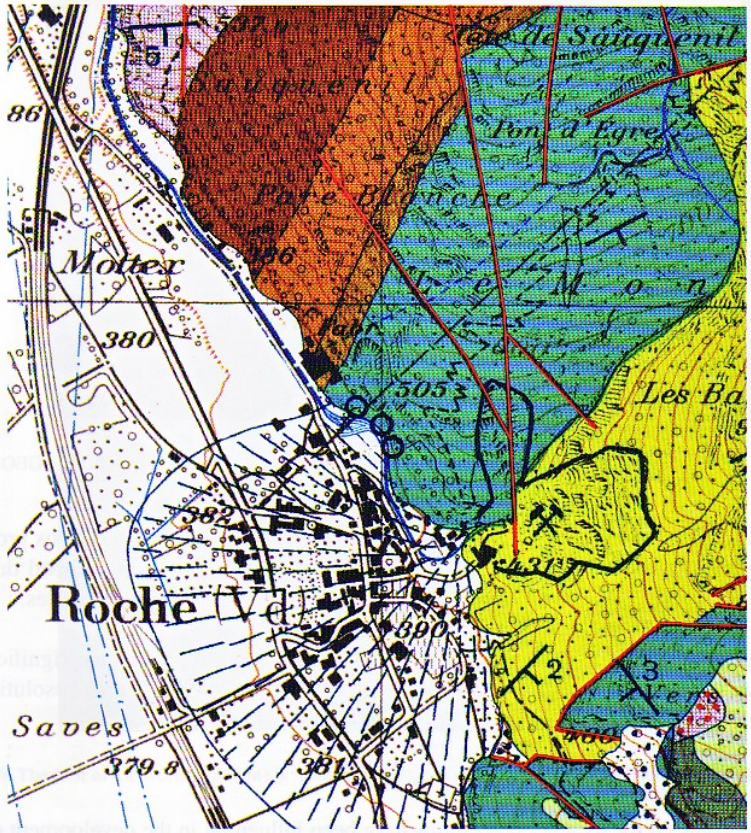

Fig. 1.3 Location of the Roche quarries (Canton of Vaud, Switzerland) showing the boundaries of the geological formations. Extract from the Geologic Atlas of Switzerland 1:25,000, 1264 Montreux Sheet. Reproduced with authorization of the Federal Office of Water and Geology (OFEG), 4/11/2005, and Swisstopo (BA056985).

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Due January 24th, 2012