Plagioclase is present as untwinned grains generally less than 100 μ across and partial microprobe analyses give a composition range of An_{24}-An_{30} (average value near An_{25}). Phengite and paragonite have been identified by both X-ray diffraction methods and by partial electron microprobe analyses. Graphite is present throughout low-grade metamorphic rocks of the Esplanade Range and, where abundant, it has been identified by X-ray diffraction patterns and reflected light studies of insoluble residues.

Assuming that the assemblage calcite-quartz-plagioclase-paragonite-graphite equilibrated at a temperature of near 700° K (427° C) and that fluid pressure was equal to total pressure, then thermochemical and experimental data can be used to estimate the partial pressures of the species of the fluid phase in equilibrium with the mineral assemblage.

Combining thermochemical data (Robie and Waldbaum, 1968) for the reaction:

$$\underset{\text{corundum}}{Al_2O_3}+\underset{\text{calcite}}{CaCO_3}+2\,\underset{\text{quartz}}{SiO_2}=\underset{\text{anorthite}}{CaAl_2Si_2O_8}+CO_2$$

with experimental data (Evans, 1965; Chatterjee, 1968) for the reaction:

$$\underset{\text{paragonite}}{NaAl_3Si_3O_{10}(OH)_2}=\underset{\text{albite}}{NaAlSi_3O_8}+\underset{\text{corundum}}{Al_2O_3}+H_2O$$

gives for the combined equilibrium:

$$\underset{\text{paragonite}}{NaAl_3Si_3O_{10}(OH)_2}+\underset{\text{calcite}}{CaCO_3}+2\,\underset{\text{quartz}}{SiO_2}=\underset{\text{albite}}{NaAlSi_3O_8}+\underset{\text{anorthite}}{CaAl_2Si_2O_8}+CO_2+H_2O$$

the following equation, if the solid phases are present as the pure end-members:

$$\log f_{H_2O}+\log f_{CO_2}=\frac{-8821}{T}+17.63+\frac{0.0819}{T}(P-1) \qquad (1)$$

T is temperature in degrees Kelvin, P is the pressure on the solids in bars, f_{H_2O} and f_{CO_2} are the fugacities of H_2O and CO_2 in the fluid phase, and the logarithms are to the base 10.

This equation is for the pure end members as products and reactants, neglecting the effect of solid solutions. If mole fractions of $NaAlSi_3O_8$ and $CaAl_2Si_2O_8$ (average value An_{25}) are substituted for activities of the plagioclase components, Eq. (1) at a temperature of 700° K becomes:

$$\log f_{H_2O}+\log f_{CO_2}=5.76+0.117.10^{-3}(P-1). \qquad (2)$$

Equations describing the equilibria between graphite and the most abundant gas species in the system C-H-O (French, 1966) for a temperature of 700° K are:

$$\log f_{H_2O}-\log f_{H_2}-\log f^{1}_{O_2}=15.58=\log K_1, \qquad (3)$$

$$\log f_{CH_4}-\log f^{2}_{H_2}=\ 0.94=\log K_2, \qquad (4)$$

$$\log f_{CO_2}-\log f_{O_2}=29.50=\log K_3, \qquad (5)$$

$$\log f_{CO}-\log f^{\frac{1}{2}}_{O_2}=12.95=\log K_4 \qquad (6)$$

(data from Robie and Waldbaum, 1968).