SUMMARY

This thesis presents the results of a detailed sedimentological analysis of the Late Devonian Keepit Conglomerate. The primary aim of the study was to determine the processes and environments of sedimentation of this coarse conglomeratic unit. Furthermore, it was hoped that an understanding of the origin of the Keepit Conglomerate would provide some insight into the palaeobathymetry of the depositional basin during the Late Devonian.

The Keepit Conglomerate is of Famennian age, occurring within the Devonian-Carboniferous sequence of the Tamworth Belt, northeast New South Wales. The Tamworth Belt sequence, >9,500 metres thick, is overall regressive, with marine Devonian-Early Carboniferous sediments passing up to Late Carboniferous terrestial sediments. The terrigenous sedimentary detritus was derived by the erosion of a volcanic chain, which lay to the west of the present day western margin of the Tamworth Belt, and deposited within a fore arc basin. Contemporaneous volcanism accompanied sedimentation in many instances.

The environmental setting of the Early to Middle Devonian marine sequence is under debate, with both deep water trough (Crook, 1964, 1975) and shallow water shelf (Ellenor, 1975a,b) conditions being proposed. The Late Devonian marine sequence consists predominantly of mudstones with turbidite sedimentation common at several stratigraphic levels within this sequence. Shallow marine conditions become dominant in the Early Carboniferous with traction current sandstones being deposited. Reliable palaeobathymetric indicators are absent for the Late Devonian part of the sequence. Doubt also exists as to the deep water trough (Crook, 1964,1975) or shallow marine shelf (McKelvey, 1974) nature of the Late Devonian marine sequence.

The Keepit Conglomerate represents a significant and previously unrecognised regressive-transgressive episode within the Late Devonian marine sequence of the Tamworth Belt.

The Keepit Conglomerate outcrops discontinuously for an along strike (NNW-SSE) distance of 232 km in the northern part of the Tamworth Belt. The regional variation in thickness, lithology ratios and conglomerate clast sizes indicates a basinwards (west to east) thinning

and fining. Along strike variation in these features suggests the presence of a number of now fault displaced fan-like bodies. The west to east thinning, decreasing conglomerate content and clast size, and increasing sandstone and mudstone contents suggest a source area located to the west, with sediment dispersal down an easterly dipping palaeoslope. This is supported by the available palaeocurrent data, and is consistent with data from the remainder of the Tamworth Belt sequence.

The Bective Unconformity, previously considered to represent a major structural break of regional extent at the base of the Keepit Conglomerate (White, 1964c), has been reinterpreted as a basin edge disconformity, with in the west, terrestial conglomerates and sandstones overlying marine mudstones, and passing basinwards to initially an abrupt, usually disconformable contact beneath coarse resedimented strata, thence to a conformable and gradational contact with the underlying mudstones. The extent of subaerial erosion in the west is unknown, the duration of the hiatus lies within the Famennian.

The results of a petrographic study aimed at defining the nature of the source terrain are presented in Chapter 3. The sandstones are labile lithic and feldspathelithic arenites of volcanic derivation, while the conglomerates are polymictic, containing on average 89% volcanic clasts, 8% intrusive clasts and 3% clastic clasts. The source area appears to have been a volcanic chain consisting of both lava flow and pyroclastic lithologies, and with exposed subvolcanic intrusions. Pre-Keepit Conglomerate age volcaniclastic sediments, some of definite marine origin, were also present. Detailed thin section study of the clasts, and of the lithic fragments and detrital minerals within the sandstones, indicated the volcanics to be dominantly andesitic, with subordinate dacites. Rhyolitic volcanics were scarce, while basaltic volcanics appear to have been absent. The intrusives were predominantly granodiorites, with subordinate adamellite and tonalite, and rare diorite. The along strike homogeneity of the source area is indicated by the lack of significant regional variation in the clast population. Dacites provide an exception to this, being common only in a limited area as indicated by their restricted distribution.

The apparent lack of volcanism contemporaneous with sedimentation

in the Keepit Conglomerate, in combination with at least some of the volcanics being considerably older ($^{40}K/^{40}Ar$ isotopic date of 376 ± 13 m.y. on hornblende from an andesite clast) than the Keepit Conglomerate (c345 - 355 m.y.), the evidence for erosion of subvolcanic intrusives, and the presence of marine volcaniclastic lithologies as clasts (not observed in older units), is suggestive of an origin for the Keepit Conglomerate by uplift of the source area rather than increased sediment supply in association with contemporaneous volcanism. This is in marked contrast to the contemporaneous volcanic activity associated with sedimentation of the older and younger coarse units (e.g. Baldwin and Luton Formations and lateral equivalents) within the Late Devonian-Early Carboniferous marine sequence. This may explain the much coarser nature of the Keepit Conglomerate compared to these other units.

The results of a fabric study of the Keepit Conglomerate are presented in Chapter 4. Because sedimentary structures useful in palaeocurrent analysis are sparse in the Keepit Conglomerate, conglomerate fabrics were measured at selected localities to provide palaeocurrent data. Attempts to use the orientation of the apparent A axis (A') proved unsuccessful in this respect. Three dimensional fabric studies were thus made, the orientation of both the AB plane and the A axis being recorded. Almost all samples displayed a moderate to pronounced imbrication, while A axis orientations were usually more dispersed. Using both in combination gave a useful indication of palaeocurrent direction. The palaeocurrent data so obtained agreed, with the exception of two anomalous samples from the one section, with the other available palaeocurrent data obtained in this study and with the regional trends in thickness, lithologies and clast size, indicating a westerly source and in general an easterly directed palaeoflow. The fabric data obtained from this study was also used in interpreting the processes of sedimentation of the coarse conglomerates.

The results of shape studies upon the clasts of the Keepit Conglomerate are presented in Chapter 5. The clasts plot towards the Compact apex of the form triangle, as opposed to the Platy or Elongate apices, and possess high degrees of roundness and sphericity. Their shape characteristics are consistent with clasts from fluvial environments. The occurrence of clasts of fluvial aspect within marine conglomerates