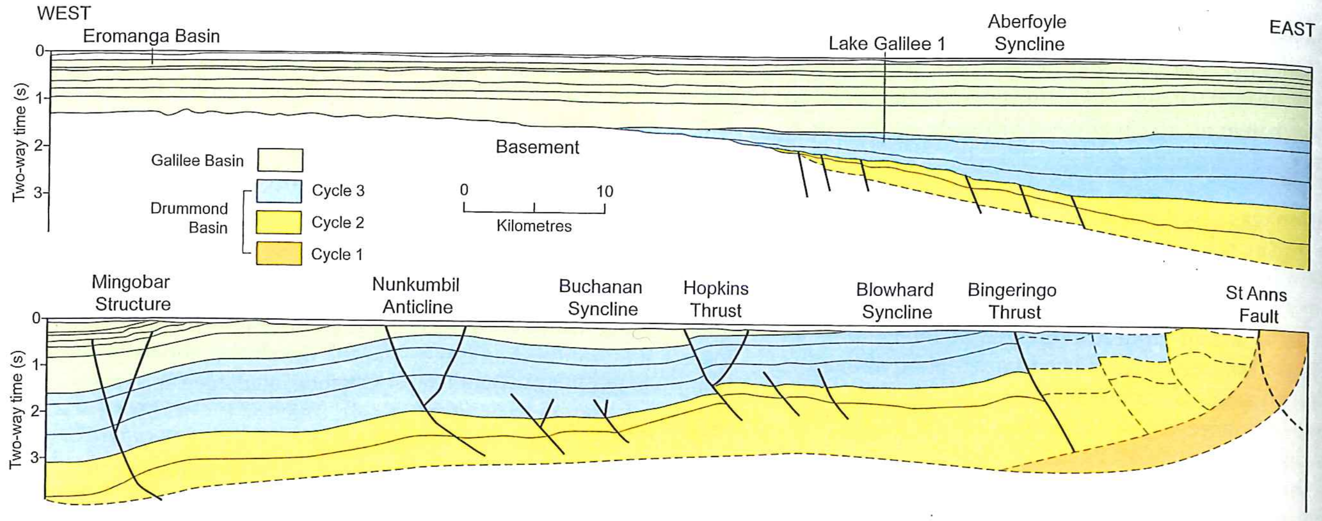

Figure 3.108 Seismic profile across part of the north Drummond Basin succession (modified from van Heeswijk 2010); see Figure 3.90 for location.

uplift (Olgers 1972) or as a foreland basin (Veevers, Jones & Powell 1982; Murray 1986). However, interpretation of seismic records has identified listric growth faults as active in the deposition of Cycle 1 (Johnson & Henderson 1991; de Caritat & Braun 1992), with recognition of the basin as an inboard extensional feature in a backarc situation relative to active margin tectonics in coeval evolution of the New England Orogen to the east. Based on the known structural fabric, Johnson and Henderson (1991) conceived the floor of the Drummond Basin as a rift complex with normal faults on near meridional trend, partitioned by northeasterly trending transfer faults. Rift partitioning into compartments is supported by thickness trends for the Mount Hall, Raymond and Star of Hope formations obtained from seismic interpretation of the northern Drummond Basin (van Heeswijck 2004), and by the fault architecture at the base of the Silver Hills Volcanics, southwest of Clermont (Davis & Henderson 1996). A deep seismic profile across the north of the basin, west of Pajingo, and extending south for some 30 km, shows two subbasins. The more southerly of them is bounded by a listric extensional fault and contains reflectors interpreted as representing the three cycles of basin fill with a collective thickness of 6 km (Korsch et al. 2012).

The Beresford Gravity Ridge, a prominent, elongate geophysical feature coincident with the central part of the basin over 250 km, has been interpreted as representing mafic rock at depth (Murray, Schiebner & Walker 1989). It may register rift-related mafic magmatism of Cycle 1 association (Johnson & Henderson 1991; Henderson & Davis 1993) similar to that mapped in the core of the Mount Beaufort Anticline (Henderson, Davis & Fanning 1998).

De Caritat and Braun (1992) considered Cycles 2 and 3 of the basin infill to represent a postrift, thermal recovery stage. However, extensional faulting influencing the Mount Hall and Star of Hope formations suggests that rift development persisted into the Visean for at least part of the basin.

The age span of the Drummond Basin succession corresponds with continental margin sedimentary successions of active margin association, documented for the New England Orogen to the east (Henderson et al. 1993; Henderson, Davis & Fanning 1998; Korsch et al. 2009c). This relationship argues for a backarc context, and the persistent volcanic signature in Cycles 1 and 3, as well as the limited geochemical data available (Figure 3.105), support this view. The Connors–Auburn Province has been considered as representing a coeval magmatic arc (Johnson & Henderson 1991), but it contains only limited Late Devonian – Mississippian igneous rocks (Withnall et al. 2009a). The large-scale Permian–Triassic Bowen Basin that overlaps the Drummond Basin to the east may obscure a companion arc. Folds on the more westerly part of the Drummond Basin are also expressed in strata of the Galilee Basin. Consequently, they postdate the Early Triassic and represent late Hunter–Bowen orogenesis. These folds are indivisible from the assemblage that extends eastwards to the Anakie Province. Van Heeswijck (2004) considered general inversion of the Drummond Basin to be due to Triassic Hunter–Bowen contraction rather than Kanimblan orogenesis in the Pennsylvanian, as widely suggested (Olgers 1972; Fenton & Jackson 1989; Johnson & Henderson 1991; Withnall et al. 1995). However, there is evidence of mild Kanimblan tectonism in the far north of the Drummond Basin, where Henderson, Davis and Fanning (1998) mapped Saint Anns Formation as separated by an angular unconformity from Bulgonunna Volcanic Group dated as late Pennsylvanian (Black 1994). Similarly, in the east an angular unconformity occurs between the Bowen Basin and underlying Drummond succession (Henderson & Davis 1993; Korsch et al. 2009).

3.16 Galilee Basin (JL McKellar and RA Henderson)

The Galilee Basin was first named by Whitehouse (1955), in reference to a depression containing presumed Permian and early Mesozoic strata partly exposed around the western and southern margins of the Drummond Basin ('Drummond Axis'). Permian, *Glossopteris*-bearing, sedimentary rocks in the Hughenden area (Marks 1909, 1911) belong to the basin, but the association was not recognised until systematic mapping was undertaken in the 1960s (Vine et al. 1965).

3.16.1 Geological setting

This intracratonic, mid-Carboniferous – late Middle Triassic basin (Figures 3.77, 3.109) contains a predominantly non-marine, fluvial succession >2800 m thick and covers an area of ~250 000 km² (Hawkins 1978; Evans 1980; PRADS 1990; Hawkins & Green 1993; Scott, Beeston & Carr 1995; Allen & Fielding 2007b). It is ~700 km north to south (20–27° S) and ~520 km east to west (141–147° E) (Hawkins 1978; PRADS 1990). Areal extent of the basin was greater than its present eroded outline, especially during the late Permian and Middle Triassic, when it and the adjacent Bowen Basin formed a single depositional unit across the Nebine Ridge (Hawkins 1978; Evans 1980; PRADS 1990). Although continuity between the Galilee and Cooper basins across the Canaway Ridge has been suggested (Hawkins 1978; PRADS 1990; Totterdell 1990), seismic profiles indicate that this feature provided a structural barrier between the Adavale

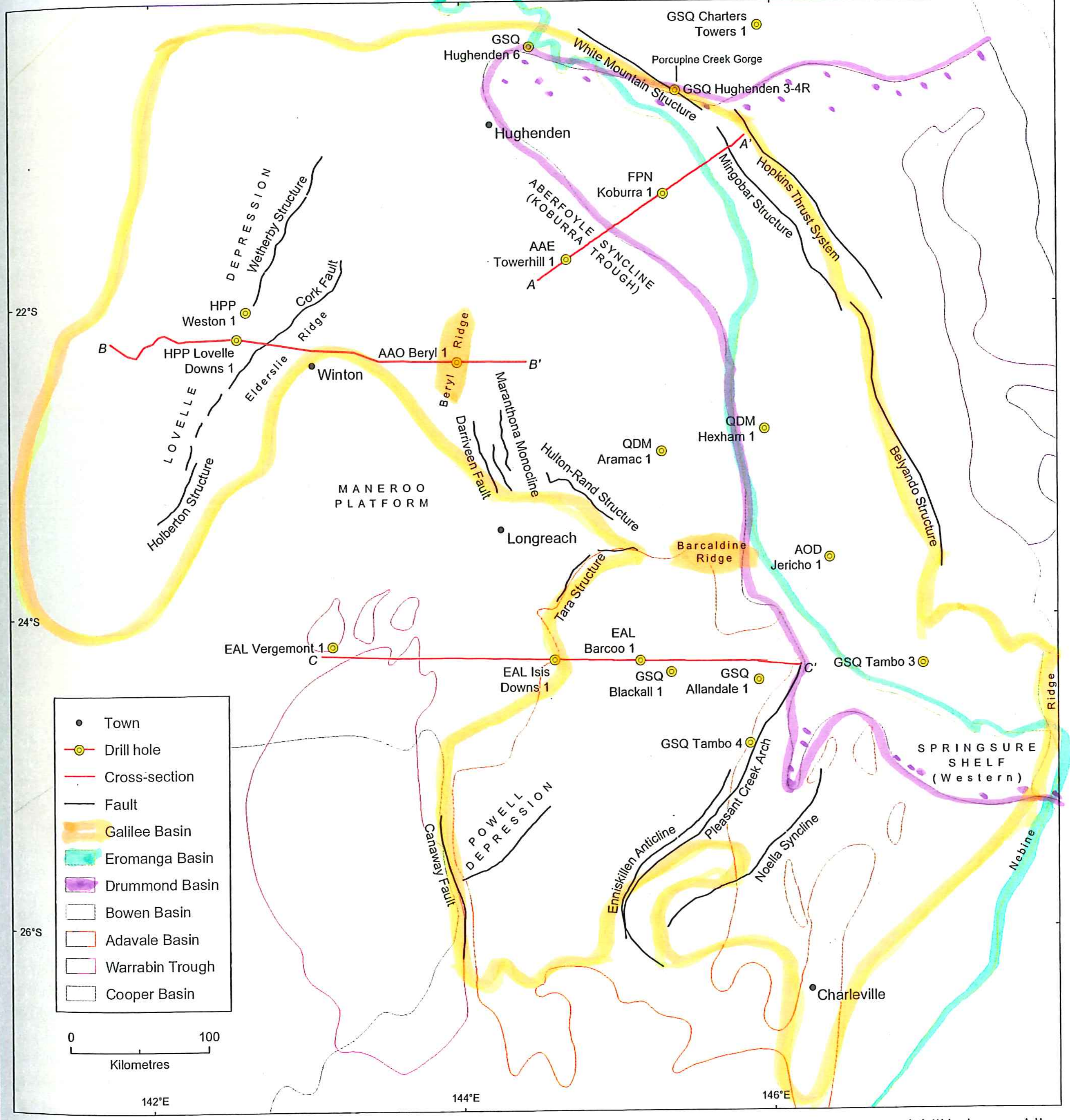

Figure 3.109 Location map of Galilee Basin showing major structural features, relation to adjoining and overlying basins and drill holes providing subsurface understanding of the basin.