# Aboriginal occupation at Hawker Lagoon, southern Flinders Ranges, South Australia

**Keryn Walshe**

**Abstract**

Two Indigenous archaeology field schools were conducted by this author and Pauline Coulthard, an Adnyamathanha elder, during 2001 and 2002 for a total of four weeks. The schools were held at Hawker Lagoon, in the southern Flinders Ranges with participation of students from the Department of Archaeology, Flinders University. The archaeology program continued earlier work undertaken by Ron Lampert in the 1980's at the same site. Excavation revealed a disparity between earlier stratigraphic patterns and dating outcomes. The surface material is subject to significant environmental disturbance. Three surface hearths returned dates ranging from about 1500 to 550 years BP for associated charcoal. The lagoon is discussed within the broader context of occupation, trade and response to the LGM rather than within the narrow context of disturbed archaeological assemblages.

**Introduction**

During the 1970's-1980's archaeologist Ron Lampert was particularly interested in 'Kartan' sites (assemblages dominated by large pebble or block core tools) on Kangaroo Island and the mainland of South Australia. Whilst investigating the Flinders Ranges region of South Australia, Lampert was introduced to Hawker Lagoon, where in association with geologist Phil Hughes, he carried out archaeological investigations during the 1980's. Hawker Lagoon provided a wealth of archaeological material eroding out onto deflated, exposed surfaces below remnant dunes and a lunette.

The idea of a distinctive 'Kartan' culture has not been widely accepted amongst archaeologists (Mulvaney and Kamminga 1999) and is currently absent from popular discourse. However, the archaeology present at Hawker Lagoon certainly confirmed Indigenous occupation in the region and the carbon samples obtained during excavation indicated Pleistocene occupation (Lampert and Hughes 1988). The interpretative discussion presented by Lampert and Hughes (1988) positioned Hawker Lagoon as a Pleistocene outpost, a position later strengthened with the emergence of the 'refugia' theory for Indigenous response during heightened glaciation (Veth 1989, 1993). Hawker Lagoon was pictured as a refuge for Indigenous people who were forced to retreat from increasingly arid locales during the Last Glacial Maximum (hereon referred to as LGM). The lagoon, along with other Pleistocene outposts across the continent offered less risk than more highly exposed, resource depleted areas at the peak of glaciation. The idea of the Flinders Ranges generally providing a refuge away from the depleted, exposed sandy low lands during the LGM was supported by later investigative work along the Lower Cooper Creek (Veth et al. 1995).

School of Humanities, Flinders University, Adelaide, SA 5001, Australia. Email: kerynw@internode.on.net.

Between 1989 and 2000, no further comprehensive archaeological or geological investigations took place at the lagoon, other than tracking the movement of stone tools across vastly eroded surfaces (Cameron et al. 1990). In 2001 and 2002 archaeological investigations at Hawker Lagoon were revived in association with Indigenous archaeology field schools conducted by the Department of Archaeology, Flinders University. This paper discusses the results of the field schools run by this author in conjunction with Pauline Coulthard, Adnyamathanha elder and local resident of Hawker. Pauline's parents Pearl and John McKenzie worked closely with Ron Lampert in the 1980's and 1990's. Pauline's contribution to the field schools was of similar immense value.

**Hawker Lagoon**

Hawker Lagoon sits about 6 km west of the township of Hawker (Fig. 1) in the Wilson Valley and is accessed over a saddle in the steep Yourambulla Range. The Yourambulla and Yappala Ranges run along the eastern and western sides of the Valley, respectively, and reach a height of about 635 m at Mt Elm. The Wilson Valley is a narrow, v-shaped valley measuring less than 2 km between the ranges and approximately 3 km from north to south.

Pastoral activity commenced over 100 years ago in the Wilson Valley and continues so today. Hawker Lagoon generally retains some water in associated channels throughout the year but fills completely only intermittently. The degree of impact on flood regimes from the advent of pastoralism can only be assumed and the lack of consistent, longitudinal data since pastoralism prevents any valid prediction for hydrological cycles. The current owner Mr Trevor Jarvis, provides some anecdotal information in that the lagoon appears to fill more frequently than it did 50 years ago but the drainage rate appears to be similar.

When the lagoon is dry, its exposed bed reveals deep fissures in the hard, alluvial surface. Much of the surface is vegetated with cane grasses and rushes. Scree accumulates upslope on both the eastern and western margins where a band of *Callitris* pines hug the upper foothills. The valley floor is open to the south where perennially grass covered, boggy channels trap the unwary. To the north of the lagoon

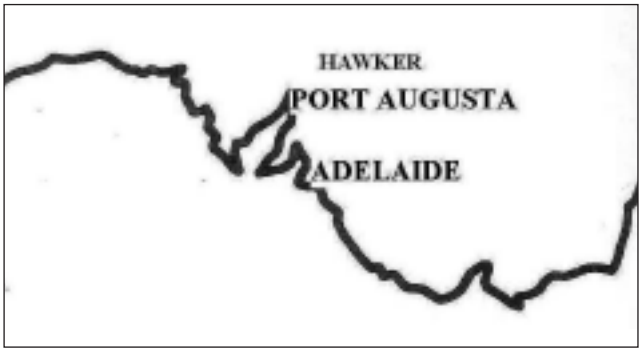


**Figure 1** Hawker in location to Adelaide, Port Augusta.

are deflated red-orange sand dunes, eroded hard-pan surfaces and dense mallee cover until the valley converges into a narrow gorge that plunges down to Yappala Waters. This narrow gorge ensures that winds from the north are funnelled out into the valley with immense force. This funnelling effect has resulted in source bordering dunes running an unconventional north-south.

Lampert and Hughes (1987, 1988) identified a lunette feature on the southern side of the lagoon and associated eroded dune surfaces along the western margin. It is here that the archaeology is most visible and needless to say most disturbed. Site preservation is extremely poor once material is exposed due to the combined effects of wind and water in this particularly narrow and steep sided V-shaped valley. The lack of vegetation cover across the lunette enables wind and water action to undermine the lunette feature. Stone material is quickly transported by wind and water (Cameron et al. 1990) and faunal material is entirely absent barring the occasional shell fragment. Faunal debris derived from ancient campsites has a limited chance of survival once exposed to the elements. Cypress-pine (*Callitris glaucophylla*), Black Oak and various eucalyptus (mallee) trees cover the slopes and foothills of the Ranges, but the valley floor is today essentially treeless. According to Mincham (1980:143) "a dense growth of native pines, mallee, black oak and brush covered much of the floor and sides of the (*Wilson*) Valley… the run-off from the ranges, actually made a swamp near the northern end." Mincham also mentions the difficulty faced by the early settlers to the valley in around 1880 in clearing the land, except for the likes of James and Lucy Ward who '…had the family to cope with that…', considering their fifteen children. It is today difficult to imagine such a densely forested valley with discrete water sources rather than unstopped flood run-off.

**Previous archaeological investigations**

Lampert and Hughes carried out a series of both excavations and surface recordings at the southern end of Hawker Lagoon (Fig. 2). The main excavation trench (HL1) was:

> "…opened up in the richest part of the concentration of artefacts in the dunefield, just beyond the western end of the lunette, at the southern end of the lagoon, on the deflated surface along the western margin and on the lunette" (Lampert and Hughes 1988:151).

This revealed four superimposed layers of sand including a loose orange (unit IA), acompact grey brown (unit IB), then 'rock hard' red sand (unit IIB) and finally mottled yellow and grey clayey sand (unit III). Upper unit IA, yielded microlithic material and unit IB was found to be sterile. Unit IIb with its rock hard red sand produced significant numbers of "…core tools, cores and large flakes..." and Unit III was sterile (Lampert and Hughes 1988). Needless to say, Unit IIB became the focus.

Unit IIB, associated with hard red sand, carried a mix of apparently in situ and loose artefacts. The challenge lay in the incredibly resistant nature of the IIB stratum to trench excavation. Three seasons were to pass before sufficient material could be gathered by Lampert and Hughes (1988) from this unit. Difficulty was also encountered in distinguishing between clearly *in situ* material and loose material, preventing clear recognition of contaminated material. Thus in order to increase the sample of *in situ* material associated with the IIB stratum, Lampert and Hughes retrieved artefacts from a nearby gully where the same unit appeared to be exposed. The sampled material was added to the IIB results. A carbon sample believed to be associated with a fireplace was retrieved from this same unit IIB in the main trench and the result was an exciting 14,770 ± 270 BP (SUA:2131) (Lampert and Hughes 1988).

Two small trenches, HL30 and 32 were opened on the lagoon bed by visiting researcher Richard V.S Wright to investigate possible faunal remains in the swamp sediments (Lampert and Hughes 1988). Wright found a similar stratigraphic pattern for the upper units which yielded only one artefact. Unlike the main trench however, Wright did not locate any cultural evidence in association with the equivalent of unit IIB.

Lampert and Hughes (1988) opened up another trench, HL40, on the eastern side of the lunette, southwest of Wright's smaller trench and approximately 700m east of HL1. Three strata matching Units IB, IIB and III were identified in trench HL40. In order to test the consistency of the stratigraphic pattern, Lampert and Hughes placed a line of closely spaced auger holes between Wright's HL32 and their second trench HL40. Confirmation was claimed. They then inspected section HL TT, exposed in a creek bank and about 500 m south of HL1. Again stratigraphic consistency was recorded and further charcoal samples retrieved for dating. These yielded results ranging from ca. 14,000 BP to 8400 BP for units either side of the cultural horizon, unit IIB. In addition, two controlled surface collections were made in areas associated with two outflow channels emerging from the lagoon. They reported that small tool industries were clearly confined to these outflow channels, unlike the widespread Kartan large tool industries.

In summarising the archaeological evidence at Hawker Lagoon, Lampert and Hughes (1988:166) suggested two broad phases of occupation- the earliest commencing about 15,000 years ago and characteristic of the Kartan and a later phase beginning about 5000 years ago up until perhaps quite recently. The oldest stratum was represented by the 'rock hard' red sand unit IIB with its in situ 'Kartan' tools whilst the younger stratum, unit IB, consisted of loose orange-red wind blown sand. The gap of 10,000 years between these two significant strata was interpreted as both an occupational and depositional gap in the site's history. Lampert and Hughes (1988:166) refer to palaeoclimatic evidence for moister conditions during this 'gap' and suggest that Indigenous people were able to "…spread themselves more widely, occupying regions that had been inhospitably arid". This was supported by dates retrieved from archaeological sites around Lake Frome, suggesting that occupation commenced in the early Holocene. Lampert and Hughes entertained the idea of 'refugia' as posited earlier by others (cited in Lampert and Hughes 1987) whereby the pattern of movement by Aboriginal people is determined by water availability. Good rains allow people to shift out beyond the confines of reliable, well-watered sources. In the early 1980's Adnyamathatha elder John McKenzie introduced Ron Lampert to Eudlia Wagloona waterhole on the south-eastern shore of Lake Frome. According to Mr. McKenzie, this waterhole was used in high rainfall seasons and allowed people to make brief forays from the Ranges to the lakeshores.

By inspirational leaps Lampert and Hughes (1988) linked Hawker Lagoon into the cultural fringes of the Lake Eyre Basin. This mapping of the lagoon into a much wider cultural geography has strongly influenced the most recent investigations and interpretative context for human occupation and land use at Hawker Lagoon.

**Hawker Lagoon fieldwork 2001-2002**

Three field seasons were held at Hawker Lagoon during 2001 and 2002. A multi-stepped approach was undertaken whereby test pits, auger holes and trenches were placed in different environmental zones along the Wilson Valley. In all we investigated the far eastern side of the lagoon, the

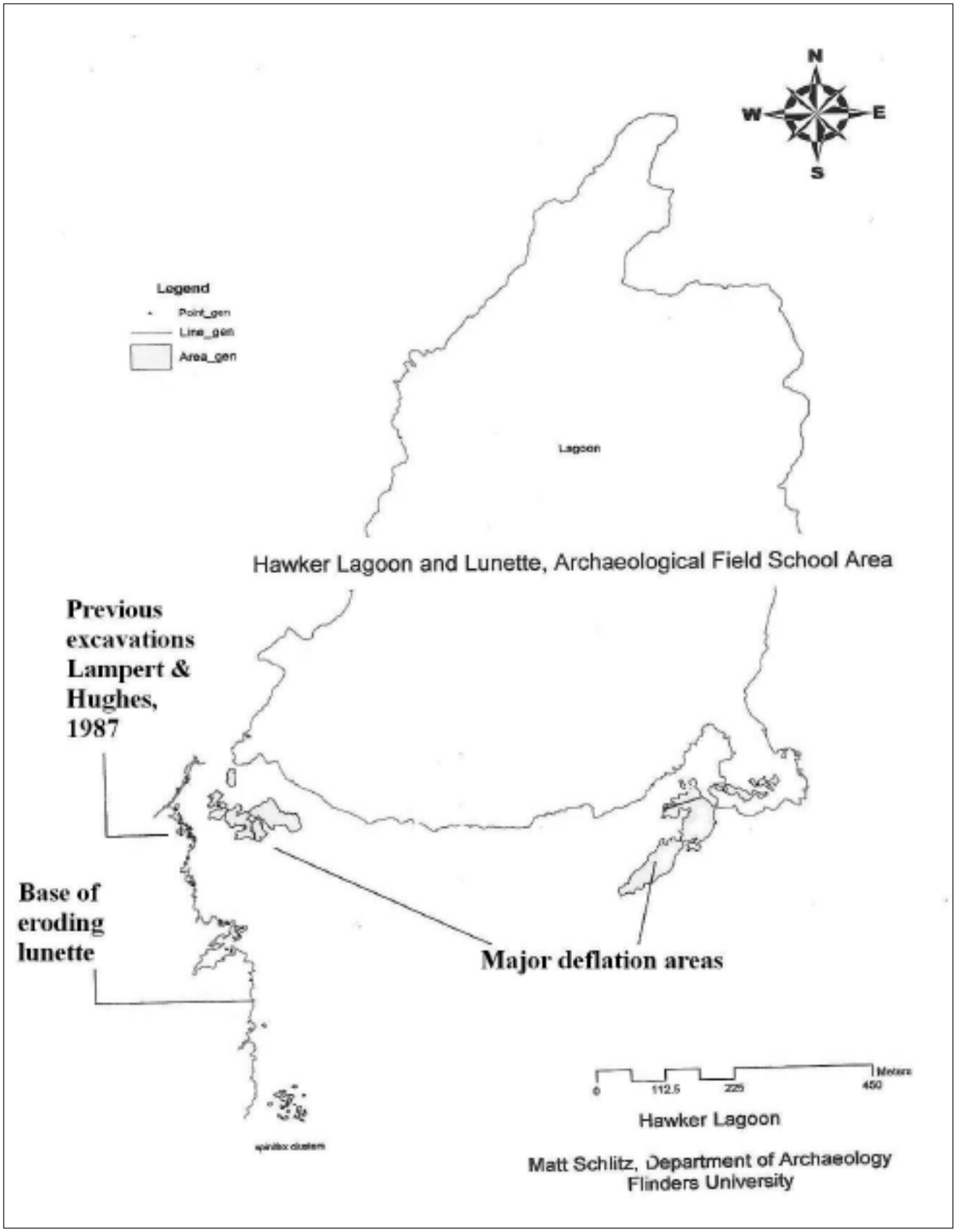


**Figure 2** Flinders University Archaeological Field School Investigation over Hawker Lagoon and Lunette.

upper northern reaches of the lagoon and the southern flood plain of the open valley floor with the primary focus remaining on the lagoon basin and its immediate margins including the lunette (Figs 3-5).

Nine test pits (TP1-9), six auger holes (L1-6) and eleven excavations (EH1, HL02ED1-5, HL02EDH1) were undertaken near the margins of or across the lagoon, on the lunette and on the eastern sand dunes, as shown in Figure 3. Three surface hearths identified about 500 m south of the lagoon basin were excavated (HL02WH1-3), as shown in Figure 5. Three surface hearths about 600 m north of the lagoon basin were also excavated (HL02NH1-3) and the

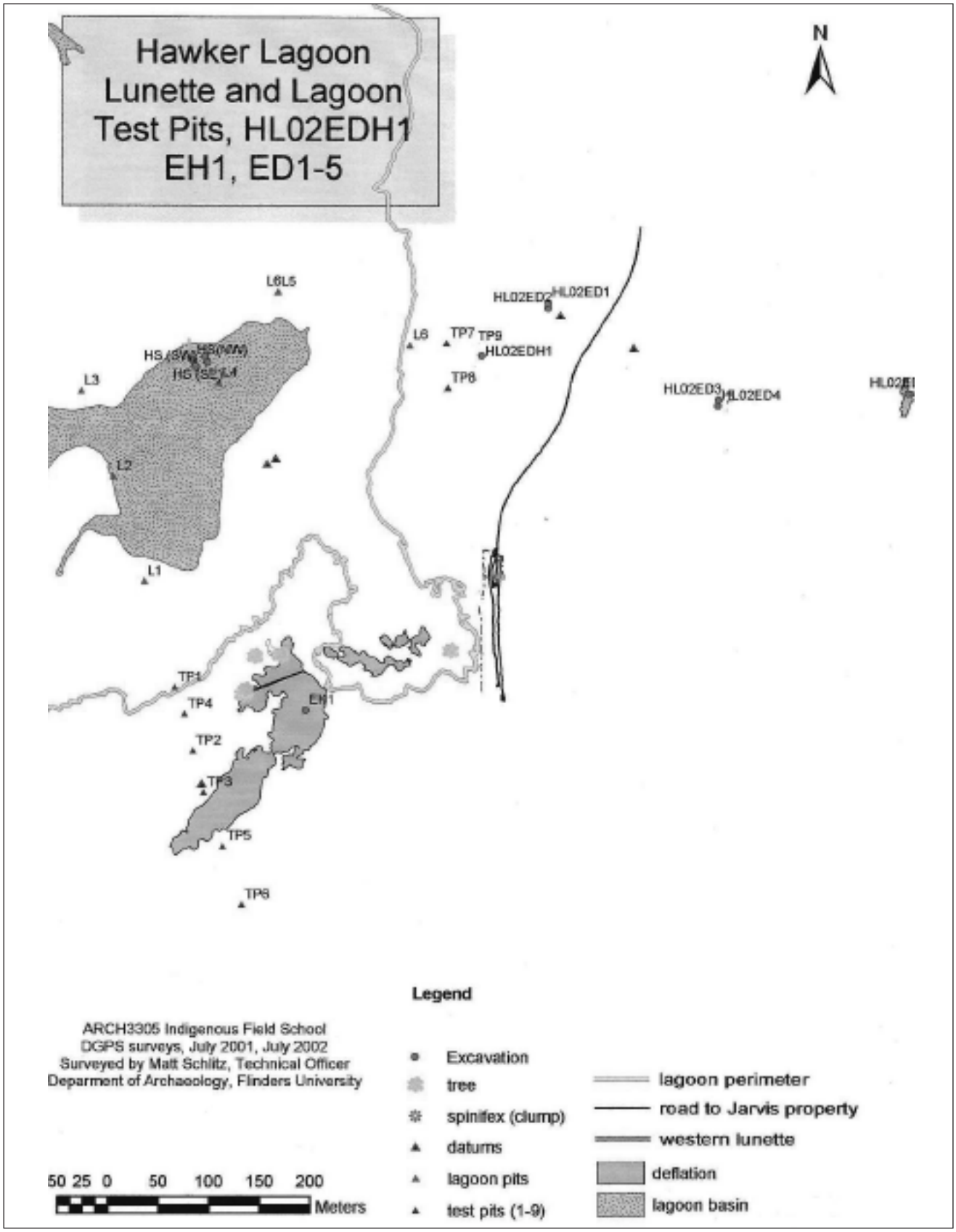


**Figure 3** Hawker Lagoon Lunette and Test Pits HL02EDH1, EH1, ED1-5.

ground surface beneath an artefact scatter about 250 m northeast of the lagoon basin was excavated (HL02ND1) as shown on Figure 4.

Thus a total of nine test pits, 6 auger holes and 18 excavations were carried out between 2001 and 2002. Only one excavation could be considered a deep trench-HL02WH3 which extended to 2 m. The remaining excavations reached an average depth of 0.25 m due to the resistant nature of the unit and the lack of cultural material below the immediate surface.

**Excavation results**

The surface unit on which all excavations commenced complied with the description for stratum IIB as identified

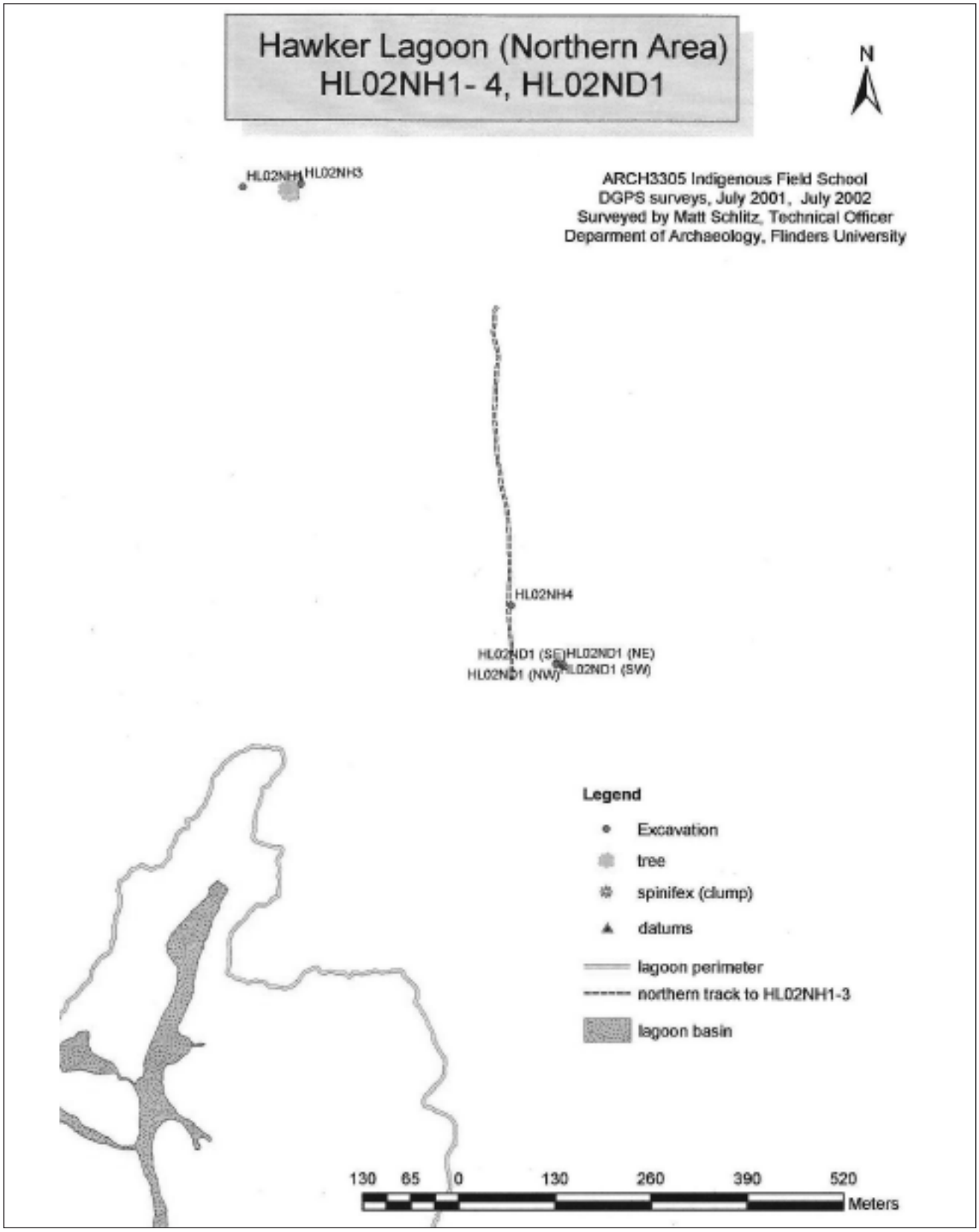


**Figure 4** Hawker Lagoon (Northern Area) HL02NH1-4, HL02ND1.

by Lampert and Hughes (1988). In no case were the upper units, IA and B and IIA present, having been previously washed off and/or blown out.

Nine test pits were placed along a bearing of 140E from the lagoon basin to the top of the western edge of the lunette. These were all found to be sterile. The stratigraphy for the lagoon basin was uniformly alluvial with occasional beach sands below the alluvium. Six of these test pits were placed on the lunette and consistently revealed only red compacted sand. No other strata were located despite reaching depths of between 1-2 m. A carbonate horizon was reached in two pits, matching the description given by Lampert and Hughes (1988) for a calcium band interrupting the IIB stratum.

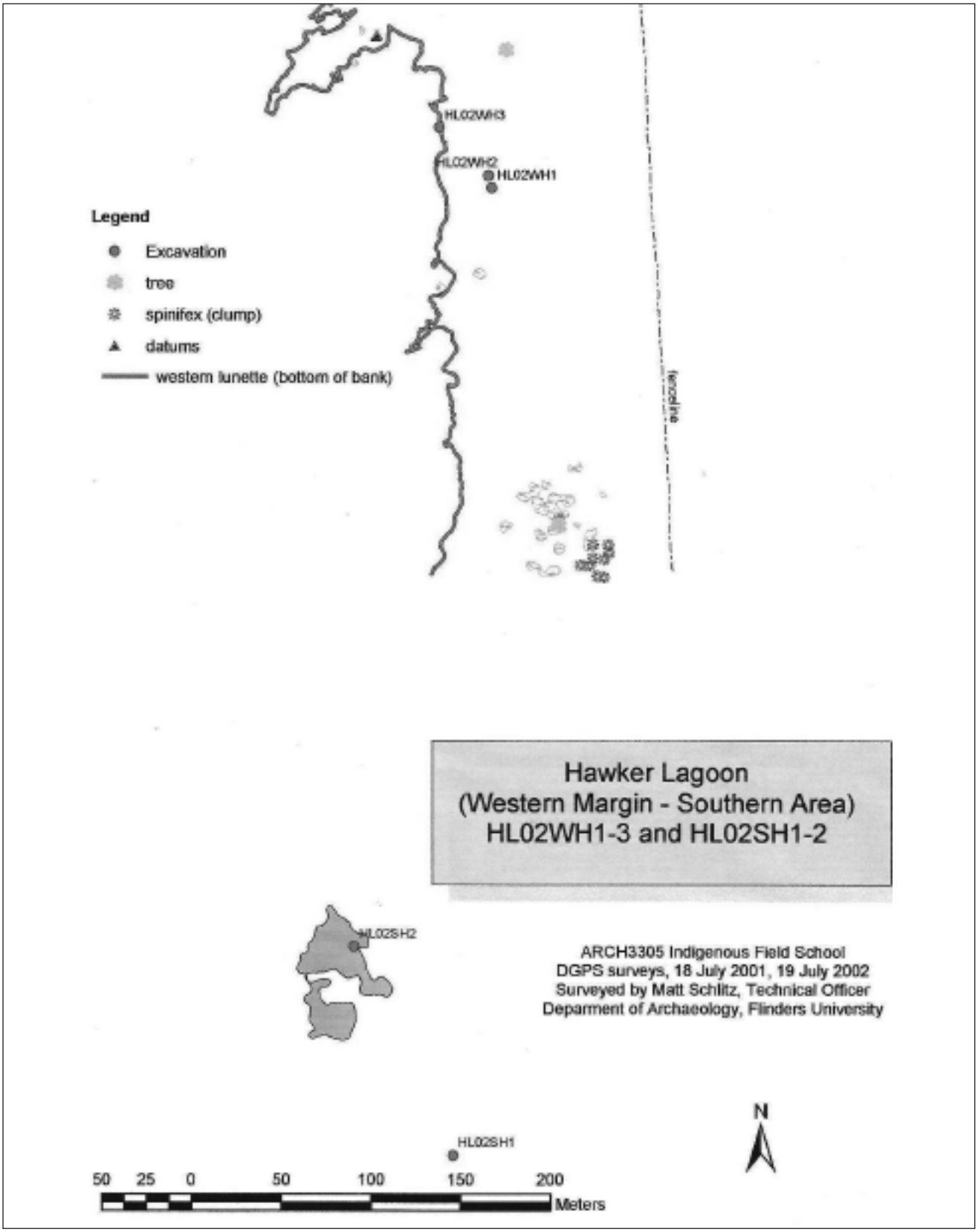


**Figure 5** Hawker Lagoon (Western Margin-Southern Area) HL02WH1-3 and HL02SH1.

The test pits revealed a complete lack of stratigraphy beyond the IIB unit, which in all cases commenced at ground surface and continued to at least 1.5 m below surface. The compaction was highly resistant, analogous to cutting through bricks with a butter knife. The uniform nature of the single stratum was curious.

The main trench was established near HL1, the main trench opened by Lampert and Hughes in the mid-1980's. Considering the outcome of the test pits across the lunette, we were anxious to confirm the existence of the recorded stratigraphy. However, after digging through the loose orange sand stratum described by Lampert and Hughes as IA, then the beach sands for 10 cm, mottled yellow/grey sands for 30 cm, we encountered the incredibly hard, compact red sand stratum IIB. No further change in strata was encountered and after resorting to a crow bar to break through this unit to a depth of 1.5 m below surface, a few unmodified river pebbles were located at the base of the trench. These were presumably associated with early stream runoff into the valley floor. Scree continues today to roll down from the western foothills and into the valley and the lower most pebbles were explained similarly. The discrepancy between the finds made by Lampert and Hughes and recent fieldwork demanded further excavation. One other trench was opened behind our main trench, closer to the exposed strata in the gully noted by Lampert and Hughes (1988). The same result was achieved with a single unit of hard, compact red sand intersected by a band of calcrete. As with the first trench, no artefacts were encountered below the upper 20 cm of this trench. Artefacts recovered from the upper sediments ranged from small to larger tools. Certainly no tools were found in the IIB stratum below the immediate surface.

HL02ED1-5 excavations were placed at the eastern side of the lagoon directly onto loose orange sand that matched the description for unit IA (Lampert and Hughes 1988).

Low density stone tool scatters of stone tools were found clustered over discrete surface deflations. This provided another focus for open site excavation. Trenches varied from 1-2 m in depth and were easily dug but revealed only one uniform, archaeologically sterile stratum.

After completing 9 test pits to an average depth of 1.5 m and 5 excavations to 0.3 m and one to 2 m, a very clear and consistent pattern emerged. Stone tools were clearly isolated on the surface without any subsurface material or other cultural horizons whatsoever. It was apparent that deep excavations were highly unlikely to yield suitable material. Considering the alarming degree of bio-turbation on site integrity it seemed only logical to view the artefactual material as a horizontal representation of different occupation phases over time. That is, occupation sites are unable to become 'layered' over time due to the far greater rate of deflation over rates of deposition in this exposed wind tunnel known as the Wilson Valley. Occupation over many thousands of years is strewn across a uniform surface, without any obvious chronological indicator so that a site 500 years in age sits alongside one 5000 years old. Thus we turned our attention to the surface hearths.

Five hearths were selected for excavation purely to gain charcoal samples for dating. EH1 located on the lunette, HL02WH1-2 located about 500 m south of the lagoon basin and on the western margin of the valley, HL02EDH1 on the dune east of the lagoon and HL02NH3 located on a remnant dune about 1 km northeast of the lagoon basin (Figs 3-5). These all proved to be shallow deposits ranging from 0.2 m to 0.3 m below the surface situated burnt cobbles and varying numbers of stone tools. Three of the five samples collected from surface hearths were successfully dated, all returning late Holocene dates. The results are as follows:

CS2332: 550 ± 110 yr BP
CS2331: 1500 ± 120 yr BP
CS2333: 1230 ± 120 yr BP

Two of these hearths were associated with unit IIB, the hard red compact sand stratum dated by Lampert and Hughes (1988) to about 15,000 years old. The third hearth was located south of the lagoon on the open valley floor but also on the same IIB unit.

Stone tools were observed, having fallen into deep fissures on the lagoon basin surface. This prompted a series of auger holes to investigate the probability of subsurface material and the basin sediments. The artefacts had presumably either washed in, or were left by Indigenous people when camping on the basin surface during dry lake times. The high, dense stands of cane grass across the lagoon surface currently provide a welcome respite from the interminable wind that bursts down this narrow valley. A scatter of historic material including culturally modified fragments of glass and ceramic suggest very recent use of the Lagoon as an occupation surface.

A series of auger holes across the lagoon bed consistently revealed a uniform alluvial deposit with occasional beach sands and charcoal and no stone tools or other cultural material.

**Pedestrian surveys**

As well as excavation work, Indigenous surface sites and post-contact assemblages identified within the valley and on the adjacent ranges were recorded. A number of surface scatters of stone tools; a silcrete outcrop with evidence for quarrying; rock art sites; artefact scatters on both the valley floor and ridges and ruins associated with early pastoral development were recorded.

All surface scatters of stone tools were associated with the IIB surface and appeared rarely *in situ*, no matter how loosely that term was applied. Our observations of the area during times of high rain fall and subsequent rapid run off strongly suggests that artefacts are quickly dislodged from the surface and transported by fluvial activity to be deposited later on the central valley floor. From here they travel southwards at an unknown rate during times of heightened water runoff.

Areas located east, north and south of the lagoon to a distance of one km from the centre of the lagoon were targeted. The recordings of surface material revealed a similar density of small tools (predominantly flakes) over larger tools (previously known as Kartan) across all sampled surfaces. In all, approximately one square km of surface material was recorded and some thousands of artefacts. Consistently, smaller tools such as scrapers, adzes, blades, points and cores were evident on the suface alongside larger tools such as hammerstones, horsehoof cores, knifes, anvils and grinding stones. Eroded surfaces on the eastern and south-eastern foothills of the Yourambulla Ranges were also investigated, particularly along gullies. These revealed a similar distribution of tool types and raw materials.

As regards raw material, a definite clear abundance of

quartzite and silcrete over other materials was noted. In particular grey/green silcrete dominates scatters to the south of the lagoon and given the closer proximity of these scatters to the silcrete outcrop this is hardly surprising. In lesser numbers were quartz, flint and cherts.

Considering the relatively small, confined nature of the Wilson Valley, it was possible to survey on foot all margins of the lagoon up to break of slope on the east and west sides, to Yappala Waters on the north side and to Youraumbulla Cave on the south side. The ridges of the Youraumbulla and Yappala Ranges were also inspected.

This survey revealed a painting site at Yappala Waters where the gorge north of the lagoon meets a tributary of Hookina Creek; an artefact scatter on the saddle above the valley on the Yappala Ranges; a silcrete outcrop with evidence of quarrying and tool making on site; numerous artefact scatters increase in density when associated with the harder, red sand surfaces; modified glass and ceramic around ruins; scarred trees; stone cairns and engravings on the western face of Yappala Ranges, along minor creek tributaries of Hookina Creek.

**Post-contact material**

One of the earliest settler structures on the Jervis property, a modest wattle and daub two roomed hut, was found to have a dense scatter of glass fragments in front of the door facing the lagoon. Similarly, a standing chimney and fireplace indicating a collapsed hut to the south of the lagoon and towards the adjoining property, 'The Oaks' presented a glass scatter. Between these two features, the former schoolhouse today indicated only by a plaque, also presented some glass fragments as well as stone tools and a series of small hearths.

**Discussion of the field results**

The archaeological investigations over 2001-2002 recorded a silcrete quarry close to the occupation surfaces, a painting site at Yappala Waters, occupational use of the lagoon surface and other surface sites previously unknown. Dates obtained from three surface hearths were all of relatively recent age, being about 1500 to 550 years old. Removing the 'Kartan' as a key discussion point, we can sensibly confirm that the archaeology demonstrates continuous use of the Wilson Valley by Indigenous people over a considerable amount of time. Exactly what this time stretch is remains at this point unclear considering the discrepancy between the stratigraphy encountered by Lampert and Hughes in the 1980's and the more recent investigations. This has undermined our confidence in the status of the hearth feature identified by Lampert and Hughes (1988) from which the 15,000 year old charcoal sample was obtained at a depth of some 1.3 m below the surface. At no stage did we encounter any subsurface material below the upper 'A' horizon of some 20 cm. All archaeological material was exposed on a hard pan surface. The lunette and other low, deflated dunes on all sides of the lagoon, the lagoon bed itself and the higher, more yellow dunes on the eastern side did not contain any material below the immediate upper surface. Despite completing 32 subsurface investigations into a broad and representative range of environmental units with or without surface artefacts displayed, not a single tool or other object was located more than 15 cm below the surface.

Obviously the archaeology here cannot singularly determine the chronological or dynamic context of occupation and landscape use. Identifying Indigenous response to significant environmental and climatic changes over vast periods of time is similarly confounding when remaining only with the archaeological assemblages and few isolated, discrete dates for occupation. It is entirely sensible to return to the broader cultural geography so thoughtfully considered by Lampert and Hughes (1988) and the pertinent regional questions raised by Veth et al. (1995).

**The palaeoenvironment of Hawker Lagoon**

Evidence from Lake Eyre suggests that fluvial activity heightened 55,000-40,000 years ago and again at 26,000-22,000 years ago (Nanson et al. (1996) in Gell and Bickford (1996)). This fluvial activity resulted in the probable megalake resulting from the coalescence of the present-day Lakes Eyre and Frome. Such high lake levels is argued by Nanson et al. (1996) to be caused by temperatures up to 8 C cooler than present leading to a combination of monsoonal rains and reduced evaporation. There is now valid archaeological evidence for occupation at points along the entire Australian coastline and on major river systems by at least 30,000 years ago (Mulvaney and Kamminga 1999, Flood 1997). We also have early occupation dates from the interior, for example at Puritjarra, Central Australia (Smith 1989) and closer to this study area, the JSN site in the Strzlecki Desert during the late Pleistocene (Smith et al. 1991).

Obviously then, Indigenous people had explored much of the continent and embarked on long-term occupation at selected locations prior to the Last Glacial Maximum. Indeed the combined data from palaeoenvironmental and archaeological research implies that exploration of the continent was taking place during heightened fluvial activity at about 50,000-40,000 years ago, obviously prior to the LGM. An obvious corridor of movement in eastern Australia at this time is along the drainage systems of the Diamatina River and Cooper Creek, as postulated by Tindale (1974). This corridor connects the key resource rich zones such as the Darling River system and Lake Eyre Basin. If well-watered resources were also available in the Flinders Ranges around this same time, it would be highly likely that occupation in the Ranges, including Hawker Lagoon commenced well before the LGM and continued during the LGM as suggested by Veth et al. (1995).

Evidence has been presented by Williams et al. (2001) for a late Pleistocene wetland at Brachina, 65 km northwest of Hawker in the Flinders Ranges. They provide strong geomorphological evidence for some places being wetter during the LGM than today. This resulted in features such as the Brachina wetland to exist at the height of the LGM, in similar fashion to Lake George near Canberra. Williams et al. (2001:130) attribute the existence of a wetland at Brachina, where there are no wetlands today, to the divergent responses of various lakes and rivers during the LGM to local effects on water balance. Clearly, regional climatic differences appear to have operated during the LGM on both a micro- and a macro-level. This is also supported more broadly by the evidence from Lakes Eyre and Frome (Gell and Bickford 1996).

If Brachina wetland was able to exist during the LGM due to an increase in local fluvial activity, perhaps Hawker Lagoon with its similar geological context experienced a similar microclimate during the LGM. Hawker Lagoon may

in fact have been a much larger expanse of water well before (55,000-40,000 years ago) and during the LGM than today. Indigenous people following the riverine corridors in north eastern Australia and down into the Lake Eyre Basin may have encountered the equivalent of a vast inland sea. The Flinders Ranges, standing some 700 m above sea level offered not just dry land but also high quality stone materials and high quality ochre (Jones 1984; McBryde 1987). For those people continuing their journey southward, Brachina Wetland and Hawker Lagoon surely offered water, food, shelter and raw materials for stone and wood tool making.

Lake Eyre has been identified as the epicentre for the exchange of goods and cultural elements (McBryde 1987, 2000). In fact and as regularly remarked upon, the entire continent appears to have been inter-linked by far reaching, complex exchange routes allowing the transfer of goods and culture both sacred and mundane (McCarthy 1939; Jones 1984; Jones and McEntee 1996; McBryde 1984, 1987, 2000; McEntee 1991; Veth 1993; Mulvaney 2002). The narcotic pituri formed the pivot around which much Lake Eyre exchange was focussed and within the complexities of exchange ochre from the Pukartu ochre mine, just north of Brachina Gorge in the Flinders Ranges was renowned (Jones 1984). Sandstone grinding slabs, hatchet heads, chisels and knives, spears and other wooden implements also entered the Lake Eyre and subsidiary exchange routes. Such items were drawn from prized and usually guarded potent sources (McBryde 1984, 1987, 2000; Jones 1984; Jones and McEntee 1996).

> "The Flinders Ranges project north into the arid grasslands and sandy deserts of Central Australia. Their complex geology has generated surface archaeological evidence of at least three important Aboriginal cultural practises throughout this broader region. Sandstone slabs and sandy shales impregnated with silica were mined in the eastern Ranges near Wertaloona over a period which may have spanned several thousand years, providing grindings stones of fine quality. These stones were quarried and traded as far north as the central Simpson Desert and as far west as the western Lake Eyre Basin. They were used for wet-milling grass seed, a staple in the Aboriginal diet of the entire region. …Also traded extensively was the distinctive dark pink ochre used for ceremonial purposes, mined from the western side of the Ranges, just north of Brachina Gorge. The Pukardu ochre mine attracted annual expedition of up to 200 men whose journey south from localities as distant as Birdsville, Innamincka and Oodnadatta followed the ancestral paths of Dreaming Emu and Dingo Ancestors" Jones and McEntee (1996:163).

It is more than reasonable to consider Hawker Lagoon with its supply of abundant fresh water as somehow linked to the exchange business.

Along with water, the Wilson Valley also ensured a range of animals and seeds associated with the forests of Cypress-pine, Black Oak and Mallee gum and plains of Spinifex grasses and sedges. The trees in turn were able to supply hard woods for various implements and the close proximity of good quality silcrete ensured stone tool resources. Ceremony has been found to be closely associated with exchange routes, often demonstrated by specified open spaces, stone arrangements and/or art sites. One of the most significant rock painting sites in the southern Flinders Ranges, Yourambulla Caves complex is at the end of Wilson Valley, within 3 km of Hawker Lagoon. These caves, particularly the main chamber offer an ideal medium for extensive paintings.

**Discussion**

The question now rotates around two key points- the exchange of sacred and mundane objects and other cultural facets as a continuous practise throughout the LGM and into ethnographic times. Discontinuous presence of ochre in deep archaeological deposits excavated from sites well outside of the Lake Eyre and Flinders Ranges regions suggests a break in the exchange mechanism during the LGM (Veth 1993; Veth et al. 1995). How feasible is it to suppose that around Lake Eyre and on its south eastern corridors, the exchange mechanism was so finely tuned prior to the onset of the LGM that it managed to continue throughout and beyond the entire event? Intrinsic to this question is the availability of sufficient micro 'refuges' in the lowlands away from the Ranges and along the 200-300 km stretch to the eastern margins of Lake Eyre north and south. The ability of ethnographically recorded populations to travel through this same stretch of country with sufficient regularity so that exchange routes were adequately maintained, clearly relied on a cognitive map of every rockhole, soak, spillage, good season creek and so on. As importantly Indigenous travellers (or merchants perhaps) in this 'inhospitable' region also cognitively mapped water bearing trees and roots and were adept at building and maintaining dams (Johnston 1941). The existence of Indigenous people in the arid zones of South Australia and their incomparable ability to travel across it with immense rapidity certainly suggests that the alternating cycles and intensity of fluvial patterns over the last 50,000 years merely shifts locations on the cognitive water map rather than eliminate them.

Pollen analysis for samples from Holocene strata indicates a down turn in conditions more amenable to humans and other mammals. By the mid-Holocene it appears that in the Lake Eyre region and adjacent Flinders Ranges drier conditions were constant with resultant changes to vegetation, including loss of forests and the spread of grasses and sedges (Gell and Bickford 1996; Singh and Luly 1991). Therefore the Pleistocene, before and during the LGM, rather than the Holocene appears at this point far more favourable for humans to establish strategies around long distance and complex exchange routes, linking lowlands and ranges.

Hawker Lagoon may well have seen its florescence 30,000-15,000 years ago followed by a slow distancing from the pulse of the exchange route until by a few thousand years ago, the lagoon heard no more than the occasional sound of distant traffic. The modest stone tool scatter strewn on a saddle in the Yappala Range, just above the southern-western end of the lagoon suggests a crossing point between the valley and a small ephemeral creek on the western side of the ranges that heads off toward Lake Torrens. Hawker Lagoon becomes then no more than a stop over when water was available.

Arguably, population numbers may have simply been too low to maintain exchange routes through country made

more challenging, requiring people to travel further between resource areas. Certainly, it does require a critical mass to maintain distribution centres and pass on down the line various trade objects and bits of communication. This is an area for far more informed discussion than the archaeology at Hawker Lagoon can possibly hope to provide at this point in time. Our collective theoretical ignorance about the patterns and dynamics of Indigenous hunter-gatherer convergence and mobility at 50,000, 30,000 or even 10,000 years ago is equally unhelpful. The archaeology at Hawker Lagoon is a miniscule vision of debris, severely eroded and sorted over time and yet so tantalisingly linked to a vibrant landscape. Reaching into that story of the past and merely attempting to brush up against its profound complexity remains the challenge.

**Acknowledgements**

The field schools at Hawker Lagoon were made enormously informative, entertaining and multi-layered by the immense contribution from Pauline Coulthard and her partner, Phil Stewart. Pauline in particular shared so much with us, from her heart and her land. Academic teaching provides one level, but the unique contribution made by Indigenous women like Pauline and quiet Indigenous men like Phil, cannot possibly be matched. All those who participated benefited in a way that I am certain will stay with them for many years to come. My utmost thanks to Pauline and Phil and the Andymathanha ancestors of the southern Flinders Ranges. Many thanks also to Mr Trevor Jarvis who graciously allowed us unrestricted access to the lagoon. Much gratitude to Matt Schlitz, Technical Officer, Department of Archaeology, Flinders University for mapping the archaeological works. Kindest thanks to those who supported the field schools by providing unstinting hard work, skills, intellect and good humour- Greg Carver first and foremost, Pam Smith, Tiana Jenkins and all the students of 2001-2002. Lastly, the Hawker community - my particular thanks.

**References**

Cameron, D., White, P., Lampert, R. and Florek, S. 1990 *Blowing in the Wind. Site Destruction and Site Creation at Hawker Lagoon, South Australia.*

Flood, J. 1997 *Rock Art of the Dreamtime*: *Images of Ancient Australia*. Sydney: Angus and Robertson.

Gell, P. A. and Bickford, S. 1996 Vegetation. In M. Davies, C. R. Twidale and M. J. Tyler (eds) Natural History of the Flinders Ranges, pp. 86-101. Adelaide: Royal Society of South Australia Inc., DENR.

Hercus, L. A. 1992 *A Nukunu Dictionary*. Canberra: Australian Institute of Aboriginal and Torress Strait Islander Studies.

Johnston, T. H. 1942 Some Aboriginal routes in the western portion of South Australia. *Royal Geographic Society of Australia, Proceedings* 42:33-65.

Jones, P. G. 1984 Red Ochre Expeditions: An ethnographic and historical analysis of Aboriginal Trade in the Lake Eyre Basin. A progress report – South Australian Museum. *Journal of the Anthropological Society of South Australia* Vol 22(7):3-10, Vol 22(8):10-19.

Jones, P. G. and J. McEntee. 1996 Aboriginal People of the Flinders Ranges. In M. Davies, C. R. Twidale and M. J. Tyler (eds) *Natural History of the Flinders Ranges* pp. 159-173. Adelaide: Royal Society of South Australia Inc., DENR.

Lampert, R. J. 1981 The Great Kartan Mystery. *Terra Australis* 5, ANU, Canberra

Lampert, R. J. and Hughes, P. J. 1987 The Flinders Ranges: a Pleistocene outpost in the arid zone? *Records of the South Australia Museum* 20:29-33.

Lampert, R. J. and Hughes, P. J. 1988 Early Human Occupation of the Flinders Ranges. *Records of the South Australia Museum* 22:139-168.

McBryde, I. 1984 Exchange in south-eastern Australia: an ethnohistorical perspective. *Aboriginal History* 8:132-153.

McBryde, I. 1987 Goods from Another Country: Exchange Networks and the People of Lake Eyre Basin. In J. Mulvaney and J. P. White (eds) *Australians to 1788* pp. 253-273. Sydney: Fairfax, Syme & Assoc.

McBryde, I. 2000 Travellers in storied landscapes: a case study in exchanges and heritage. *Aboriginal History* 24:152-174.

McCarthy, F. D. 1939 "Trade" in Aboriginal Australia and "Trade" relationships with Torres Strait, New Guinea and Malaya. *Oceania* 9:405-48, 10:80-104, 171-195.

McIntee, J. 1991 Lake Frome (South Australia) Aboriginal trails. *Transactions Royal Society South Australia* 115(4):199-205.

Mincham, H. 1980 *The Hub of the Flinders. The Story of the Hawker District embracing the towns of Cradock, Wilson, Hookina and Wonoka*. Hawker Centenary Committee, Adelaide.

Mulvaney, J. 2002 '…these Aboriginal lines of travel'. *Historic Environment* 16(2):4-11.

Mulvaney, J. and Kamminga, J. 1999 *Prehistory of Australia*. Sydney: Allen & Unwin.

Nanson, G., Price, D., Page, K., Roberts, R., East, J., Nott, J., Callen, R. and Chen, X-Y. 1996 TL evidence of palaeoclimate and flow regime changes in Australia, pre stage 7 to the present. Extended Abstract, *CLIMANZ* IV. Dept. Geology, ANU, Feb 26-28.

Smith, M. A., Williams, E. and Wasson, R. J. 1991 The archaeology of the JSN Site: some implications for the dynamics of human occupation in the Strzlecki Desert during the late Pleistocene. *Records of the South Australia Museum* 25(2):175-192.

Singh, G. and Luly, J. 1991 Changes in vegetation and seasonal climate since the last full glacial at Lake Frome, South Australia. *Palaeogeography, Palaeoclimatology, Palaoecology* 84:75-86.

Tindale, N. B. 1974 *Aboriginal Tribes of Australia. Their terrain, environmental controls, distribution, limits and proper names*. Uni. California Press, London.

Veth, P. 1989 Islands in the Interior: a model for the colonisation of the arid zone of Australia. *Archaeology in Oceania* 24:81-92.

Veth, P. 1993 *Islands in the Interior: The dynamics of Prehistoric adaptations within the arid zone of Australia*. Michigan: Ann Arbor. International Monographs in Prehistory. Archaeological Series 3.

Veth, P., Hamm, G. and Lampert, R. J. 1990 The archaeological significance of the Lower Cooper Creek. *Records of the South Australian Museum* 24(1):43-66.

Williams, M., Prescott, J., Chappell, J., Adamson, D., Cock, B., Walker, K. and Gell, P. 2001 The enigma of a late Pleistocene wetland in the Flinders Ranges, South Australia. *Quaternary International* 83-85:129-144.