3 INITIAL ASSESSMENT

A general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action (Section 110(2)(a))

3.1 Identifying subject species

The Director-General of the NPWS has specified that the following threatened species / populations / ecological communities shall be considered:

Threatened Species

Scientific Name	Common Name	TSC Act Status

V = 'Vulnerable' (Listed under Schedule 2) E = 'Endangered' (Listed under Schedule 1)

*Indicates species that are also listed under the Schedules of the Commonwealth *Environment Protection and Biodiversity Conservation* (*EPBC*) Act 1999

Fauna

Hamirostra melanosternon	Black-breasted Buzzard	**V**
Lophoictinia isura	Square-tailed Kite	**V**
Ninox strenua	Powerful Owl	**V**
N. connivens	Barking Owl	**V**
Tyto novaehollandiae	Masked Owl	**V**
T. tenebricosa	Sooty Owl	**V**
Callacephalon fimbriatum	Gang-gang Cockatoo	**V**
Calyptorhynchus lathami	Glossy Black-Cockatoo	**V**
Lathamus discolor	Swift Parrot	**E***
Neophema pulchella	Turquoise Parrot	**V**
Grantiella picta	Painted Honeyeater	**V**
Xanthomyza phrygia	Regent Honeyeater	**E***
Climacteris picumnus	Brown Treecreeper	**V**
Melithreptus gularis	Black-chinned Honeyeater	**V**
Chthonicola sagittata	Speckled Warbler	**V**
Pomatostomus temporalis	Grey-crowned Babbler	**V**
Stagonopleura guttata	Diamond Firetail	**V**
Petaurus australis	Yellow-bellied Glider	**V**

P. norfolcensis	Squirrel Glider	**V**
Dasyurus maculatus	Tiger Quoll	**V***
Phascolarctos cinereus	Koala	**V**
Planigale maculata	Common Planigale	**V**
Chalinolobus dwyeri	Large-eared Pied Bat	**V***
Falsistrellus tasmaniensis	Eastern Falsistrelle	**V**
Miniopterus australis	Little Bentwing-bat	**V**
M. schreibersii	Large Bentwing-bat	**V**
Mormopterus norfolkensis	East-coast Freetail-bat	**V**
Myotis adversus	Large-footed Myotis	**V**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	**V**
Scoteanax rueppellii	Greater Broad-nosed Bat	**V**
Pteropus poliocephalus	Grey-headed Flying Fox	**V***
Litoria aurea	Green and Golden Bell Frog	**E***
L. brevipalmata	Green-thighed Frog	**V**
Hoplocephalus bitorquatus	Pale-headed Snake	**V**
H. stephensii	Stephens Banded Snake	**V**

Flora

Callistemon linearifolius		**V**
Eucalyptus parramattensis ssp. *decadens*	Drooping Red Gum	**V***
E. glaucina	Slaty Red Gum	**V***
Grevillea parviflora ssp. *parviflora*		**V***
Tetratheca juncea	Black-eyed Susan	**V***

Endangered Populations

None

Endangered Ecological Communities

Kurri Sand Swamp Woodland

Hunter Lowland Redgum Forest

Endangered Ecological Communities That Have Been Listed in the Interim
(since the DGR's were received in 2003)

Lower Hunter Spotted Gum-Ironbark Forest

Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions

Additional Threatened Flora and Fauna or Ecological Communities

In addition to the above threatened species / populations / ecological communities, the following additional species have been considered due to recent records within the study area and/or adjacent areas and/or to ensure completeness of assessment.

Flora

Angophora inopina	Charmhaven Apple	**V***
Acacia bynoeana	Bynoe's Wattle	**E***
Eucalyptus camfieldii	Heart-leaved Stringybark	**V***
Rutidosis heterogama		**V***

Fauna

Ephippiorhynchus asiaticus	Black-necked Stork	**E**
Irediparra gallinacea	Comb-crested Jacana	**E**
Ptilinopus magnificus	Wompoo Fruit-Dove	**V**
Melanodryas cucullata	Hooded Robin	**V**
Pseudophryne australis	Red-crowned Toadlet	**V**
Phascogale tapoatafa	Brush-tailed Phascogale	**V**

Endangered Ecological Communities

Quorrobolong Scribbly Gum Woodland

River-flat Eucalypt forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions

3.1.1 Assessment of available information

In compiling the lists presented above, the following sources of information were obtained / consulted:

- NPWS Atlas of NSW Wildlife (last accessed January 2006);
- Hunter Bird Observers Club (HBOC) Records (including HBOC Annual Bird Reports from 1993 to present and database searches for the area);
- Internet searches, including pertinent pages such as 'Friends of Tumblebee';
- Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS) - Dataset & Text (NPWS 2000a; House 2003);
- Previous ecological reports from the locality (by firms including Ecotone Ecological Consultants, Biosis Research, Wildthing Environmental Consultants, ERM Mitchell McCotter, Conacher Travers Environmental Consultants, Andrews Neil).
- Information on the progress of the production of the *Kurri Sand Swamp Woodland (KSSW) Recovery Plan*.

Section 4.2.3 outlines the various consultants and personal communications that were used in the production of this report.

4 SURVEY

4.1 Requirement to survey

As part of the Director-General's requirements for the current Species Impact Statement (SIS), a flora and fauna survey is to be conducted in the study area. Previous surveys and assessments undertaken within the study area were used to assist in the fulfilment of this requirement, as listed below.

- Harper Somers O'Sullivan (2002a). *Ecological Constraints Study for the Link Road to the Hunter Economic Zone (HEZ).* Prepared for HEZ Pty Ltd. October 2002.

The results of other studies undertaken within adjoining and proximate lands were also used, as listed below.

- Harper Somers O'Sullivan (2006). *Public Environment Report on Hunter Economic Zone (HEZ) Industrial Estate, Kurri Kurri, Hunter Valley, NSW*. Draft report prepared for HEZ Pty Ltd, February 2006.
- Harper Somers O'Sullivan (2004a). *Ecological Constraints Master Plan for the Hunter Economic Zone.* Prepared for HEZ Pty Ltd, February 2004.
- Harper Somers O'Sullivan (2004b). *Species Impact Statement. Hunter Economic Zone Spine Road, Part Stage 1c, CH2100-CH4275 metres.* Prepared for HEZ Pty Ltd, February 2004.
- Harper Somers O'Sullivan (2002b). *Species Impact Statement for Stage 1 Road Alignment within the Hunter Economic Zone (HEZ).* Prepared for HEZ Pty Ltd. August 2002.
- Harper Somers (2002). *Flora and Fauna Assessment for Proposed Road and Rail Infrastructure within the Hunter Economic Zone (HEZ)*. Prepared for HEZ Pty Ltd. April 2002.
- Ecotone Ecological Consultants (2002). *Habitat Management Strategy for Development of the Hunter Economic Zone*. Draft report prepared for Cessnock City Council, September 2002.
- Biosis Research (2001). *Kurri Sand Swamp Recovery Assessment.* Unpublished report prepared for NSW NPWS and RTA.
- Bell S.A.J. (2004a). The Vegetation of Werakata National Park, Hunter Valley, New South Wales. *Cunninghamia:* **8**, 331-347.
- Bell, S.A.J. (2004b). *The Vegetation of the Hunter Economic Zone (HEZ), Cessnock LGA, New South Wales*. Report prepared by Eastcoast Flora Survey for Harper Somers O'Sullivan, January 2004.
- University of Newcastle (2001) *Vertebrate Fauna Survey of Lower Hunter National Park.* Prepared for NSW NPWS by Dept. of Biological Sciences and TUNRA Pty. Ltd. June 2001.
- Ecotone Ecological Consultants (2000). *Additional Flora and Fauna Investigations within Tomalpin Employment Zone – Supplementary Report.* Report to Harper Somers Pty. Ltd. and Cessnock City Council. 6th March 2000.
- Ecotone Ecological Consultants (1999). *Flora and Fauna Investigations and Planning Assessment for the Tomalpin Employment Zone within Cessnock City Local Government Area.* Report to Harper Somers Pty. Ltd. and Cessnock City Council. 26th February 1999.

Other studies of less scope that provide additional ecological information include:

- Harper Somers (2001b). *Additional Vegetation Survey and Mapping for various precincts within the Hunter Economic Zone.* (Including incidental fauna observations and field notes).

Any species of taxonomic uncertainty (flora) were sent to and subsequently confirmed by the Royal Botanic Gardens Sydney (refer to Appendix F). These included the following species of confirmation:

- *Callistemon rigidus* (specimens predicted to be *C. linearifolius* during investigations as part of the ECS). *Callistemon* samples were sent and following lengthy delays could not be confirmed to a species level. Despite identification as *"Callistemon* probably *linearifolius"*, the plants from which the specimens were taken from were later confirmed *in situ* to be *C. rigidus.*

- *Grevillea parviflora* ssp. *parviflora.* Samples of this species were confirmed during studies undertaken within the HEZ (Harper Somers O'Sullivan 2002b; Harper Somers O'Sullivan 2002c).

- *Diuris* sp. aff. *dendrobioides* (Hunter Valley). A single specimen was located along the proposed alignment and was sent to the Royal Botanic Gardens

4.2 Documentation of survey effort and techniques

4.2.1 Description of Survey Techniques and Survey Sites

4.2.1.1 Flora Survey

The vegetation of the road alignment was mapped previously (Harper Somers O'Sullivan 2002a) utilising the following vegetation survey approach. The vegetation throughout the remainder of the study area was also mapped using a congruous survey approach to complement the existing mapping. Refinement of the mapping produced within the ECS was also undertaken during subsequent surveys.

Vegetation Mapping

- Initial site inspection to ascertain the type and general extent of the community(s) present;

- Boundaries of vegetation communities were ground truthed using Leica / Trimble DGPS systems (accurate to within 1 metre), with some minor aerial photograph interpretation (API) to map the community(s) extent;

- Confirmation of the community type(s) present (dominant species) via undertaking flora identification as described below;

- The conservation status of the derived vegetation communities was considered in light of the findings of the REMS Vegetation Mapping (NPWS 2000a; House 2003);

- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' as listed within the *TSC Act 1995*;

- Defining the edge of Kurri Sand Swamp Woodland (KSSW) is often a subjective and difficult task, given the extensive ecotonal intergrade areas that occur. A variety of criteria were utilised to identify such edges within the study area, including:

  - Presence / absence of dominant canopy species of KSSW (i.e.. *Eucalyptus parramattensis* ssp. *decadens*, *Angophora bakeri*) and adjacent vegetation communities (i.e.. *Corymbia maculata*);

  - Presence / absence of indicative understorey species from differing communities (such as those detailed in the final determination to list KSSW as an Endangered Ecological Community under the *TSC Act 1995*);

  - Allowance for the occurrence of KSSW-variant communities that may not be dominated by *E. p. decadens* or *A. bakeri* (such as around creeklines)*;* and

  - General structural composition of the communities.

Flora Identification

- Identification of all vascular plant species encountered during fieldwork. Species were identified in the field, or appropriate samples taken for later examination if species identification was uncertain;

- Specimens that could not be positively identified or considered likely to be threatened species were referred to the Royal Botanic Gardens Sydney for formal identification;

- Flora throughout the study area was sampled via application of the 'Random Meander Technique'. This involved walking in a random manner throughout the study area, visiting the full range of potential habitats and recording every plant seen (Cropper 1993);

- Due to the large size of the study area, additional data on the vegetation associations present was gathered via the examination of eleven (11) vegetation plots (20x20m) and eight (8) vegetation transects (length 200m). The location of these plots and transects are shown in Figure 4-1.

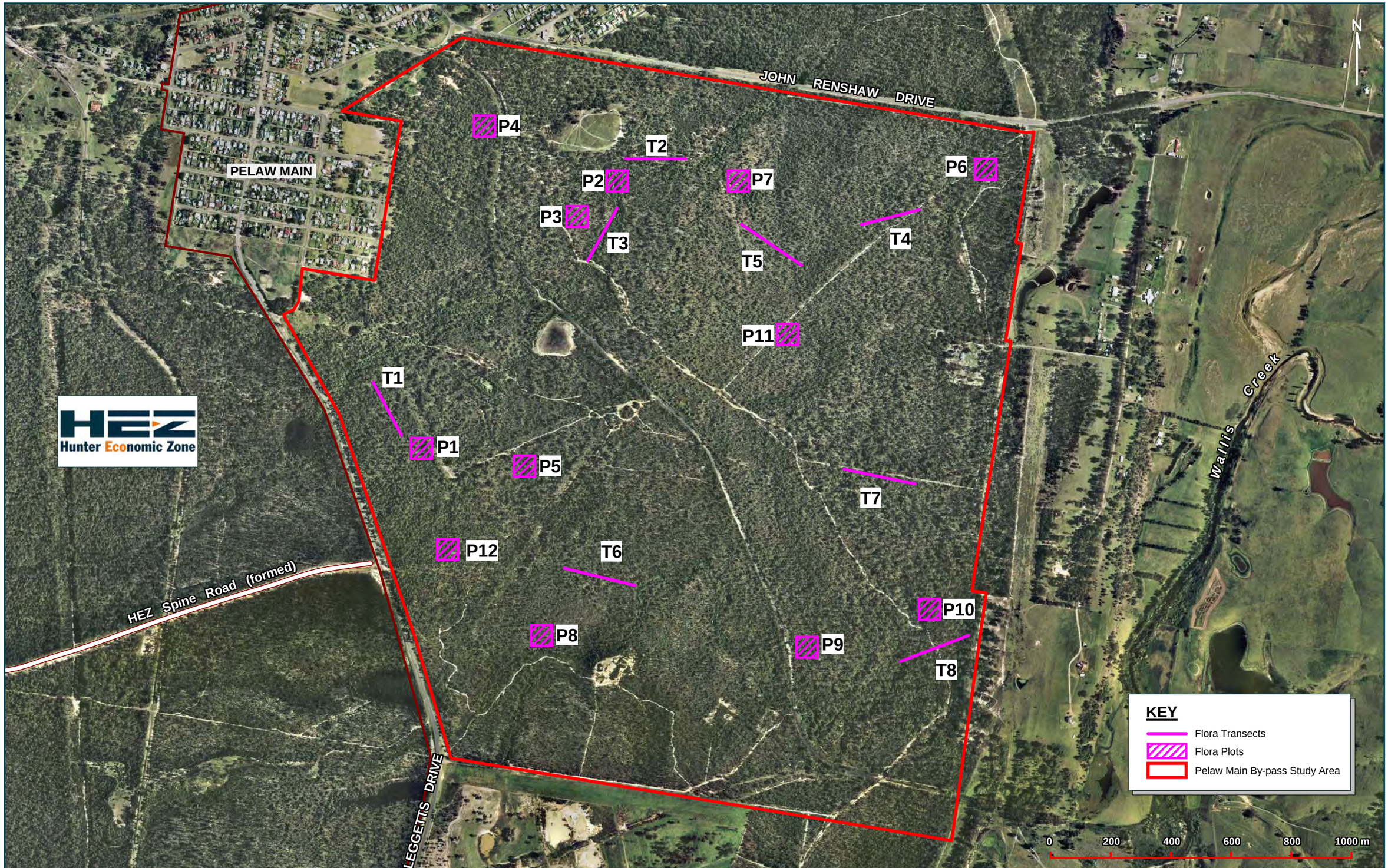
Threatened Species

The distribution of threatened flora species along the road alignment was mapped using a Trimble GPS unit. The numbers of individual plants were counted where feasible, as in the case of *Acacia bynoeana*. Where large numbers of threatened plant species occurred, such as *G. p. parviflora* and *E. p. decadens,* representative sampling enabled an estimate of the number of threatened flora likely to be directly affected by the proposal.

The distribution of other threatened flora within the study area (other *A. bynoeana* populations and *E. glaucina*) was also mapped using a Trimble GPS unit.

Vegetation Data

A full list of vegetation species recorded throughout the study area is provided in Appendix C, whilst the results of the plot and transect methodologies are provided in Appendix D.



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NOTES:

Hunter Economic Zone

SCALE: 1: 12000 at A3 Size
DATE: 11/11/2005
DRAWN: S. WATSON
PROJECTION: MGA Zone 56 (GDA 94)

SPECIES IMPACT STATEMENT
PELAW MAIN BY-PASS

FIGURE 4-1

LOCATION OF FLORA PLOT AND TRANSECT SURVEYS

LAYOUT REF: H:\HEZ\MAPINFO\20675 LINK - ROAD\2005 SIS NEW ALIGNMENT
DOCUMENT FIGURES\20675-FIG 4-1 FLORA PLOT & TRANSECT SURVEYS-A-A3.WOR

JOB REF: 20675

4.2.1.2 Habitat Survey

From the results obtained in the vegetation survey phase, an assessment of the relative value of the habitat(s) present on the road alignment and the study area was undertaken. Whilst this assessment focused primarily on the identification of specific habitat types / resources that are known to be favoured by threatened species recorded from the region, the assessment also considered the potential value of the site (and surrounds) for all major guilds of native flora and fauna.

This assessment was based on the specific requirements of each species / guild in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements for fauna, and vegetation associations, topography, soil, light and hydrology for flora species and assemblages.

4.2.1.3 Fauna Survey

Guidelines detailed within Cessnock City Council's Development Control Plan No. 56 "Flora and Fauna Survey Guidelines Lower Hunter Central Coast Region 2002" were considered within this assessment. Furthermore, the methodologies employed techniques described within the NSW NPWS Comprehensive Regional Assessment (CRA) Vertebrate Fauna Surveys were also employed. However, in a number of areas the variety of methods used and the sampling intensity undertaken during recent investigations were less than those recommended within these guidelines. This was due largely to the previous fieldwork undertaken on the ECS study area (Harper Somers O'Sullivan 2002a) and also considering the vast number of fauna surveys previously undertaken within adjacent lands in recent years. It is considered that the combined survey effort of these studies is sufficient to fulfil the requirements of these guidelines as well as the Director-General's survey requirements for this SIS. Details of the combined survey effort from previous and current ecological investigations in the study area and locality of the road alignment are shown in Table 4-1.

The methodologies described below refer to the two fieldwork components, being those carried out during recent surveys and those undertaken previously on the site (Harper Somers O'Sullivan 2002a). Further targeted surveys were undertaken for a number of threatened species as part of specific survey requirements for the SIS, which are detailed in Section 4.4.

The combined results of previous and current fauna surveys within the study area were used in the production of an Expected Fauna Species List (refer to Appendix E). Assessments of the potential use of the study area by threatened fauna species (as listed under the *TSC Act 1995* and the *EPBC Act 1999*) identified via literature and wildlife database searches were also undertaken.

It should be noted that each visit to the study area resulted in incidental observations of additional flora and fauna (i.e. not recorded during formal surveys). Such sightings have been included in the species lists compiled to ensure that a comprehensive inventory has been generated.

Fauna Survey Effort – 2003 Surveys

Hair Tubes

'Faunatech' hair tubes were placed in three separate traplines within the two main vegetation communities across the study area. Each trapline contained 3 traps mounted on trees and 3

traps mounted on fallen timber / ground. Traps were left out for twenty five (25) nights, giving a total of four hundred and fifty (450) trap nights.

Bat Call Detection

Bat echolocation calls were taped using an Anabat II Bat Detector. Emphasis was placed on those areas deemed likely to provide potential hunting sites for bats, including flyways, ecotones, and forested areas.

Anabat call detection was undertaken during nocturnal fieldwork and was carried out via both stationary and mobile forays. The recorded calls were given to a recognised expert in bat species call identification – Glenn Hoye (Fly By Night Bat Surveys) for analysis.

Avifauna Survey

The presence of avifauna on site was carried out via targeted diurnal and nocturnal surveys. Surveys were undertaken using formal census methods such as sample plot counts described in the CRA vertebrate fauna surveys (NPWS 1997), as well as opportunistic observations.

For diurnal surveys, emphasis was placed on peak activity periods, i.e. dawn and dusk, to maximise chances of species encountered. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

Specific searches were undertaken for any threatened avifauna known from the vicinity of the study area, in particular the threatened 'woodland birds' and *Lathamus discolor* (Swift Parrot) and *Xanthomyza phrygia* (Regent Honeyeater). Searches for these species were undertaken in areas that contained potential or preferred habitat attributes, which, for the latter two of these species, focussed primarily on flowering trees.

For nocturnal surveys, spotlighting attempted to identify any roosting birds, and similar methods were employed as per diurnal surveys. Additionally, pre-recorded calls of *Ninox strenua* (Powerful Owl), *N. connivens* (Barking Owl), *Tyto novaehollandiae* (Masked Owl) and *Tyto tenebricosa* (Sooty Owl) were broadcast through an amplification system designed to project the sound for at least 1km under still night conditions. The calls were repeated in the four compass directions for five minutes from a central position undertaken on one night, and replies were listened for five minutes after broadcast, followed by short periods of spotlighting for owls that may have flown in following the calls.

Herpetofauna Survey

Specific herpetofauna (frog and reptile) searches were carried out in each of the habitat units present. Both diurnal and nocturnal searches were made in areas of appropriate habitat. Such habitat included areas of thicker vegetation, in ground litter, near and under fallen timber, around piles of refuse / dumped rubbish, and wet / damp areas such as drainage lines and areas of poor infiltration capacity and / or periodic inundation.

Reptile searches were largely concentrated to the hottest part of the day (early afternoon). Frog searches were largely concentrated to nocturnal survey periods and/or periods of wet weather. Physical frog searches were augmented by call recognition. Any calls unable to be clarified in the field were recorded for later comparison with commercially available recordings.

Particular attention was paid to any areas that contained potential habitat for *Litoria brevipalmata* (Green-thighed Frog) due to recent records of this species within similar habitat in the HEZ study area (Harper Somers O'Sullivan 2002b).

Spotlighting

Spotlighting was undertaken on site via the use of 100 watt car spotlights where appropriate, and supplemented with 75 Watt hand-held spotlights and torches. This was undertaken within each of the habitat assemblages previously identified, with priority given to those areas that were deemed likely to contain nocturnal species, particularly arboreal and terrestrial mammals and amphibians. Spotlighting was undertaken on one night for a period of three (3) person hours.

Fauna Survey Effort – Harper Somers O'Sullivan (2002a)

Some limitations were experienced during the course of these field surveys. Of particular concern, the majority of fauna survey traplines (Elliott A & B traps) had traps stolen or were tampered with (i.e. trap doors shut), such that traplines were either totally and/or partially removed from the site. Therefore, the level of effort of this survey technique did not reach the intended level required to fulfil survey guidelines. Nonetheless, the survey effort achieved is detailed below:

Terrestrial Mammal Trapping

Small and medium size mammals were targeted on the site via the use of Elliott Type 'A' traps (8x10x33cm) and Elliott Type 'B" traps (15x15.5x45cm). Forty (40) Type 'A' traps and ten (10) Type 'B' traps were employed in four separate traplines. The traps were baited with a mixture of rolled oats, honey, peanut butter, and vanilla essence. Larger terrestrial traps were baited with commercially available 'dog biscuits' in an attempt to target carnivorous mammals, such as the Tiger Quoll. The traps were checked early each morning, and where necessary, reset and rebaited. Due to trapline tampering, the traps were left out for between two - four nights, giving a total of one-hundred nine (109) Elliott A and thirty (30) Elliott B terrestrial trap nights.

Modified Survey Effort per Trapline

Trapline 1

Habitat: Lower Hunter Spotted Gum / Ironbark Forest

Elliott Trapping Survey Effort: Two nights only (2nd – 3rd Sept. 2002): 19 Elliott A trap-nights / 9 Elliott B (arboreal) trap-nights / 4 Elliott B (ground) trap-nights.

Trapline 2

Habitat: Kurri Sand Swamp Woodland

Elliott Trapping Survey Effort: Two nights only (2nd – 3rd Sept. 2002): 18 Elliott A trap-nights / 8 Elliott B (arboreal) trap-nights / 4 Elliott B (ground) trap-nights.

Trapline 3

Habitat: Kurri Sand Swamp Woodland

Elliott Trapping Survey Effort: Four nights (2nd – 6th Sept. 2002): 40 Elliott A trap-nights / 20 Elliott B (arboreal) trap-nights / 16 Elliott B (ground) trap-nights.

Trapline 4

Habitat: Lower Hunter Spotted Gum / Ironbark Forest & Kurri Sand Swamp Woodland.

Elliott Trapping Survey Effort: Four nights (2nd – 6th Sept. 2002): although some traps removed on 4th Sept. 32 Elliott A trap-nights / 16 Elliott B (arboreal) trap-nights / 6 Elliott B (ground) trap-nights.

Arboreal Mammal Trapping

Arboreal mammals were targeted within the study area via the use of Elliott Type 'B' traps (15x15.5x45cm). Fifteen (15) traps were placed on bracket mounted wooden supports attached to suitable trees throughout the four traplines. Trees targeted were, where possible, those that had hollows, were flowering and/or had scratches on the bole. The traps were baited with a mixture of rolled oats and honey, with a smear of peanut butter and an aniseed ring (sugar coated sweet). The traps and tree trunk were also sprayed with honey water to attract mammals to the vicinity of the trap. The traps were checked early each morning, and where necessary, reset and rebaited. Due to trapline tampering, the traps were left out for between two - four nights, giving a total of fifty-three (53) Elliott B arboreal trap nights.

Hair Tubes

'Faunatech' hair tubes were placed in two separate traplines within the two main vegetation communities across the study area. Each trapline contained 5 traps mounted on trees and 5 traps mounted on fallen timber / ground. Traps were left out for eight (8) nights giving a total of one-hundred sixty (160) trap nights.

Bat Call Detection

Bat echolocation calls were taped using an Anabat II Bat Detector. Emphasis was placed on those areas deemed likely to provide potential hunting sites for bats, including flyways, ecotones, and forested areas.

An Anabat detector was placed on the site for an entire night of overnight remote detection, utilising call activated recording techniques. The detector was placed at the edge of the wetland beside the railway line embankment. The recorded calls were given to a recognised expert in bat species call identification – Glenn Hoye (Fly By Night Bat Surveys) for analysis.

Avifauna Survey

The presence of avifauna on site was carried out via targeted diurnal and nocturnal surveys. Surveys were undertaken using formal census methods such as sample plot counts described in the CRA vertebrate fauna surveys (NPWS 1997), as well as opportunistic observations.

For diurnal surveys, emphasis was placed on peak activity periods, i.e. dawn and dusk, to maximise chances of species encountered. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

For nocturnal surveys, spotlighting attempted to identify any roosting birds, and similar methods were employed as per diurnal surveys. Additionally, pre-recorded calls of *Ninox strenua* (Powerful Owl), *N. connivens* (Barking Owl), *Tyto novaehollandiae* (Masked Owl) and *Tyto tenebricosa* (Sooty Owl) were broadcast through an amplification system designed to project the sound for at least 1km under still night conditions. The calls were repeated in the four compass directions for five minutes from a central position, and replies were listened

for five minutes after broadcast, followed by short periods of spotlighting for owls that may have flown in following the calls.

Herpetofauna Survey

Specific herpetofauna (frog and reptile) searches were carried out in each of the habitat units present. Both diurnal and nocturnal searches were made in areas of appropriate habitat. Such habitat included areas of thicker vegetation, in ground litter, near and under fallen timber, around piles of refuse / dumped rubbish, and wet / damp areas such as drainage lines and areas of poor infiltration capacity and / or periodic inundation.

Reptile searches were largely concentrated to the hottest part of the day (early afternoon). Frog searches were largely concentrated to nocturnal survey periods and/or periods of wet weather. Physical frog searches were augmented by call recognition. Any calls unable to be clarified in the field were recorded for later comparison with commercially available recordings.

Spotlighting

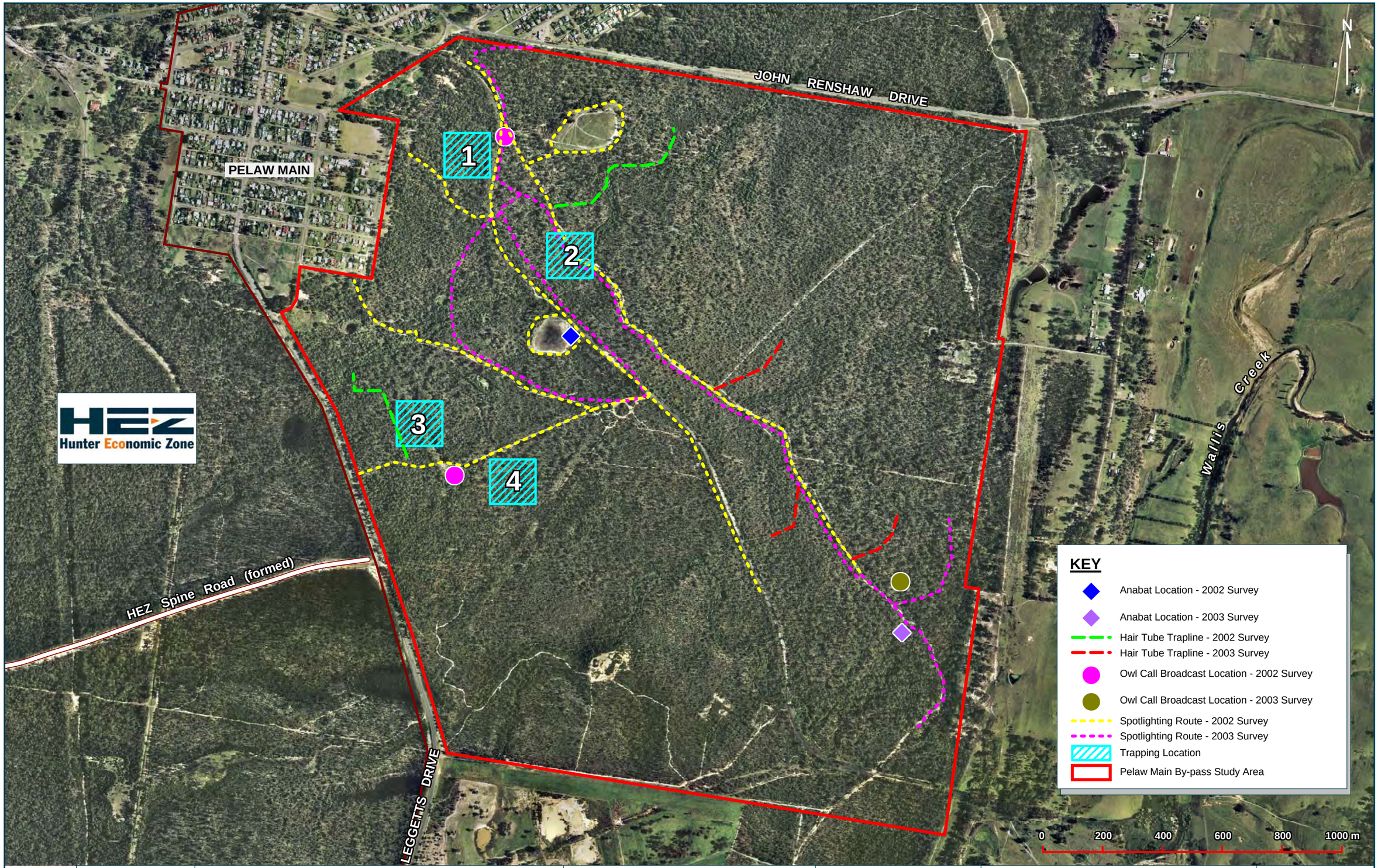
Spotlighting was undertaken on site via the use of 100 watt car spotlights where appropriate, and supplemented with 75 Watt hand-held spotlights and torches. This was undertaken within each of the habitat assemblages previously identified, with priority given to those areas that were deemed likely to contain nocturnal species, particularly arboreal and terrestrial mammals and amphibians.

4.2.1.4 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications of resident fauna were noted during both phases of fieldwork undertaken. Such indicators included:

- Any scats unable to be positively identified in the field were collected for further analysis, and scats of predator species containing fur / bones were sent for analysis if appropriate;
- Den sites consistent with those used by Tiger Quolls;
- Scratch marks made by various types of arboreal animals;
- Scats consistent with Koalas;
- Feeding scars on gum trees made by Gliders;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from Owls; and
- Chewed (*Allo*)*Casuarina* cones indicative of past feeding by Black-Cockatoos.

As previously noted, any other incidental observations of fauna were recorded during all phases of fieldwork.



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NOTES:

HEZ Hunter Economic Zone

SCALE: 1: 12000 at A3 Size
DATE: 11/11/2005
DRAWN: S. WATSON
PROJECTION: MGA Zone 56 (GDA 94)

LAYOUT REF: H:\HEZ\MAPINFO\20675 LINK - ROAD\2005 SIS NEW ALIGNMENT
DOCUMENT FIGURES\20675-FIG 4-2 FAUNA SURVEY LOCATIONS-A-A3.WOR

SPECIES IMPACT STATEMENT
PELAW MAIN BY-PASS

FIGURE 4-2

FAUNA SURVEY LOCATIONS

JOB REF: 20675

4.2.2 Documenting survey effort

Outlined below in Table 4-1 are the survey dates, times and weather conditions in which the recent and previous field surveys were undertaken.

Table 4-1 Survey Dates, Times & Weather Conditions

DATE	TIME	METHODS	WEATHER CONDITIONS
Recent Surveys			
25/02/03	1730 – 1930 2015 – 2300	Avifauna surveys, herpetofauna searches. Spotlighting, frog call-playback, owl call-broadcast, Anabat detection (90 minutes mobile detection).	Fine, still, warm afternoon. Clear, cool, no moon during survey.
27/02/03	0900 – 1230	Avifauna surveys, herpetofauna searches, vegetation community analysis.	Fine, clear, warm.
03/06/03	0900 – 1430	Avifauna surveys, herpetofauna searches, vegetation community analysis, set hair tubes.	Mild, clear, westerly winds.
04/06/03	1100 – 1615	Threatened species / significant tree survey along preliminary road alignment, targeted avifauna surveys.	Cool, windy, cloud increasing in afternoon (max 23^0C).
18/06/03	0800 – 1330	Targeted avifauna surveys, herpetofauna searches, threatened species / significant tree survey along preliminary road alignment.	Clear, fine, mild (max 24^0C), no wind.
28/06/03	1000 - 1300	Targeted avifauna surveys, herpetofauna searches, collect hair tubes.	Cool, breezy (max 21^0C).
13/10/03	1345 – 1515	Site inspection, incidental flora and avifauna survey.	Warm, mild breeze.
29/10/03	0900 – 1600	Threatened flora survey / marking, significant tree survey, threatened fauna habitat assessments.	Warm, slight breeze
20/11/03	1300 - 1500	Threatened flora survey along preliminary alignment, herpetofauna survey.	Hot, still (max 35^0C).
26/11/03	1215 – 1235	Herpetofauna survey	Mild, windy.
14/07/04	0845 – 1045	Threatened flora surveys	Fine, mild
29/06/04	1300 – 1400	Threatened flora surveys	Patchy cloud, cold
25/06/04	1300 – 1630	Threatened flora surveys.	Fine, cold.
24/06/04	0930 – 1300	Threatened flora surveys.	Fine, cool.
23/06/04	1000 – 1100	Threatened flora surveys.	Slightly overcast, breezy.
21/06/04	1400 – 1500	Threatened flora field inspection.	Fine, still, mild afternoon.
16/6/05	0900 – 1445	Threatened species and significant / hollow-bearing tree surveys along alignment.	Cool, clear.

DATE	TIME	METHODS	WEATHER CONDITIONS
17/6/05	1100 – 1500	Threatened species and significant / hollow-bearing tree surveys along alignment.	Overcast, slight breeze.
20/6/05	0930 – 1545	Threatened species and significant / hollow-bearing tree surveys along alignment.	Mild, slight breeze.
21/6/05	1030 – 1545	Threatened species and significant / hollow-bearing tree surveys along alignment.	Windy, cold.
19/7/05	0900 – 1400	*Acacia bynoeana* searches along and near alignment.	Mild, breezy.
20/7/05	1200 – 1245	Threatened species and significant / hollow-bearing tree surveys on John Renshaw Drive.	Cool, overcast, windy.
25/7/05	0800 – 1500	Geotechnical investigations (incidental observations only)	Warm, clear.
26/7/05	0830 – 1230	Geotechnical investigations (incidental observations only)	Warm, clear.
19/10/05	0915 – 1030	Site inspection with Bob Makinson regarding *G. p. parviflora.*	Mild, part cloud.
Harper Somers O'Sullivan (2002a)			
13/03/02	1230 – 1430	Original broad-scale vegetation mapping.	Fine, warm, light winds.
22/08/02	1000 – 1140	Site inspection with NPWS and RTA.	Fine, sunny, slight winds.
02/09/02	1330 – 1700	Set traps, Anabat overnight detection (at wetland).	Partly cloudy, light W winds, mild.
03/09/02	0700 – 0900	Trap checks, avifauna surveys.	Partly cloudy, moderate W winds, cool.
04/09/02	0730 – 0900	Trap checks, avifauna surveys.	Partly cloudy, moderate W winds, mild (20^{o}C@9am).
05/09/02	0730 – 1600	Trap checks. Flora surveys (plots and transects). Targeted avifauna, Koala searches and herpetofauna surveys.	Sunny, light moderate W winds, warm (approx. 26^{o}C@1pm).
06/09/02	0730 – 1000	Collect traps, avifauna surveys.	Cloudy, increasing showers, cool.
13/09/02	0930 – 1500	Collect hair tubes, vegetation mapping, targeted avifauna and herpetofauna surveys.	Sunny, light NW-NE winds, warm.
24/09/02	1230 – 1700 1800 – 2100	Vegetation and threatened species mapping, targeted avifauna and herpetofauna surveys. Nocturnal surveys, including owl call broadcast, spotlighting and herpetofauna searches.	Sunny, light NW-NE winds, warm (max 32^{o}C). Clear, still conditions, mild (22^{o}C at 7pm). Full moon rising at 8pm.

4.2.3 Sub-consultants and Personal Communications Used in the Production of this Report

Sub-consultants

The following sub-consultants / organisations were used by Harper Somers O'Sullivan during this study where appropriate input was required. This includes input from consultants / organisations used during concurrent studies undertaken within the HEZ study area that bears relevance to this study. Additional available information was also gathered via sources previously outlined in Section 3.3.1.

Anabat Bat Call Analysis:
Glenn Hoye
"Fly By Night Bat Surveys" Pty Ltd
PO Box 271
BELMONT NSW 2280
Tel. (02) 49477794
Fax. (02) 49477537

Hair and Scat Analysis:
Barbara Triggs
"Dead Finish"
GENOA VIC 3981
Tel. / Fax. (03) 51580445

Plant Species Identification:
Royal Botanic Gardens
National Herbarium of NSW
The Domain
Mrs Macquaries Road
SYDNEY NSW 2000
Tel. (02) 92318111
Fax. (02) 92517231

Vegetation Survey and Mapping: (HEZ study area)
Stephen Bell
Consultant Botanist
Eastcoast Flora Surveys
PO BOX 216 Kotara Fair NSW 2289
Tel/ Fax. (02) 4956 2952

Personal Communications

The following personal communications were drawn on during the gathering of ecological data during the project. Where relevant, these have been referenced as personal communications (pers. comm.) within this report.

- Local botanist Stephen Bell (Eastcoast Flora Surveys; as outlined above) provided helpful input on some of the significant plant species within the study area.

- Bob Makinson (Co-ordinator, Centre for Plant Conservation, Botanic Gardens Trust, Sydney and member of the NSW Scientific Committee) undertook a site inspection to gather information on local *Grevillea* species and in particular, *G. p. parviflora* (confirming their status in the area).

- Glenn Hoye (Fly-by-Night Bat Surveys; as outlined above) assisted with local information regarding Microchiropteran bat species recorded within the study area.

- Professor Ken Hill (Royal Botanical Gardens; as outlined above) provided technical support with the identification of Eucalypts within the HEZ study area.

- Tricia Hogbin (Senior Threatened Species Conservation Officer, Department of Environment and Conservation) provided information on the status of the KSSW Recovery Planning process.

- Members of the Hunter Bird Observers Club (HBOC) provided useful information pertaining to the birds of the broader locality.

- Alan Morris (Former NPWS District Manager and current compiler of the Handlist of NSW Birds) provided information on the local and regional status of threatened and / or significant avifauna.

- David Geering (Regent Honeyeater Recovery Co-ordinator) provided information on the local and regional status of Regent Honeyeaters.

- Debbie Saunders (Swift Parrot Recovery Co-ordinator), provided information on the local and regional status of Swift Parrots.

- Chris Dickman (Sydney University Zoology; former member of the NSW Scientific Committee) provided (indirect) information on local *Antechinus* spp.

4.2.4 Qualifications and Experience of Personnel that Undertook the Project

The relevant qualifications and experience of Harper Somers O'Sullivan ecologists (past and current) involved in the production of this report are included in Appendix I (as detailed in Section 9 of this report).