Survey protocol for masked owls in the NT *Tyto novaehollandiae* (north Australian mainland subspecies T. n. kimberli and Tiwi subspecies *T. n. melvillensis*)

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Purpose

This short note is aimed at land managers, developers, consultants and biologists in the NT to assist in the detection of masked owls, covering two listed threatened subspecies requiring a high level of conservation management.

Introduction

The masked owl Tyto novaehollandiae is a large owl (males ca. 600 g, females ca. 1 kg.), dark on the back, light underneath, with a prominent heartshaped facial disc. It is most likely to be confused with the barn owl Tyto alba. which is noticeably smaller, paler and more lightly built. Four subspecies of masked owls are currently recognised in Australia and all are separately listed as threatened species. Two subspecies occur in the NT: the Tiwi subspecies T. n. melvillensis is restricted to the Tiwi Islands, immediately to the north of Darwin, and the north Australian mainland subspecies T. n. kimberli is shared with northern WA and northern Queensland. Both these subspecies are appreciably smaller than masked owls from south-eastern and south-western Australia The Tiwi subspecies is listed as "Endangered" under national and NT legislation and the northern Australian mainland subspecies is listed as "Vulnerable" in the NT, Queensland and nationally (http://www.nt.gov.au/nreta/wildlife/animals/threatened/pdf/birds/masked_owl kimberli vu.pdf).

The Tiwi subspecies T. n. melvillensis is restricted to Bathurst Island and Melville Island, two closely associated islands (separated by the Apsley Strait, which in places is less than 800 m wide) which together form the Tiwi Islands. The islands are dominated by eucalypt tall open forests and woodlands (especially Darwin woollybutt *Eucalyptus miniata*, Darwin stringybark *E.* tetrodonta and Melville Island bloodwood Corymbia nesophila), with patches of monsoon rainforests and treeless plains and grasslands. Much of the coast line supports mangrove forests. Tiwi masked owls occur mainly in the forests and woodlands (Fig. 1a), but may roost in monsoon forests or mangroves and may forage over the treeless plains and grasslands. Preferred roosts are in large hollows in standing trees and such hollows are required for nesting (Figs 1b&c). The major threats to the Tiwi masked owl are a small population size (probably less than 2500 individuals, confined to only two closely-associated islands) and the clearing of large areas of optimum habitat for plantations of exotic trees.

The distribution of the north Australian mainland subspecies *T. n. kimberli* is less clearly defined. There are three major parts to its distribution: two in northern Queensland and the third, and largest, across the north of the NT

and Western Australia (Woinarski 2004). Within the NT, most records come from the western Top End from the Cobourg Peninsula down to about Katherine, with other records from the Victoria River District, McArthur River area, the Barkly Tablelands and one from the Tanami (the latter two possibly distributional isolates from the broader range in the NT). As for the Tiwi subspecies, north Australian mainland masked owls mainly inhabit eucalypt tall open forests and woodlands (especially Darwin woollybutt and Darwin stringybark), but also use patches of monsoon rainforests and grasslands. Comparison of the numbers recorded in surveys in 1977–81 and 1998 – 2002 indicated a decline across the subspecies' range (Barrett et al. 2003), including in the NT. Given the broad scale across which the decline appears to be occurring, it is difficult to define threatening processes for the subspecies but two landscape-scale processes are most often considered possible reasons. Firstly, over the last 50 or so years the frequency, intensity and scale of fires has increased, probably resulting in declines in the number of the largest eucalypt trees, especially those providing nesting and roosting hollows. Secondly, the major food supply of masked owls is native small and medium-sized mammals and these have declined across much of northern Australia over the last century.

Masked owls are nocturnal hunters and most of the diet comprises small mammals (up to the size of possums). The major threatening process for the Tiwi masked owl is the loss to habitat through the clearing of tall forests and woodlands for plantation forestry. For the mainland Australian subspecies, broad-scale decline of small native mammals across northern Australia, combined with habitat alteration caused by changed fire regimes (particularly the loss of old large hollow-bearing trees) are the most likely threatening processes. A multi-species recovery plan for woodland birds in the NT covers both subspecies (Woinarski 2004).

Pairs of masked owls occupy large exclusive home ranges (estimated at 5-10 km² in south-eastern Australia). In the lead-up to nesting (typically the early dry-season) they communicate within the pair and to advertise their territories using a range of screeches, screams, hisses and chatter calls. Once nesting commences masked owls are less vocal. Surveys for masked owls typically combine playback of calls and listening for calls at multiple sites (typically along a road) at night, and are likely to be most successful in the lead-up to nesting (i.e. build-up and wet-season).

Prior to the intensification of plantation forestry on the Tiwi Islands, a comprehensive fauna survey there carried out surveys for masked owls (Woinarski et al 2003). The forestry company subsequently commissioned consultants to study the breeding and ranging behaviour of the subspecies as forestry operations progressed. Regional fauna and flora surveys of the Cobourg Peninsula in 2004-06 did targeted surveys for north Australian masked owls (K. Brennan pers. comm.), and an Australian Governmentfunded project in 2009-10 did surveys for the subspecies on Cobourg Peninsula, Cox Peninsula and in Kakadu National Park. The protocol outlined below is refined from the methods used in these surveys, plus advice from James Smith (EWL Consulting) and Kym Brennan (NRETAS).



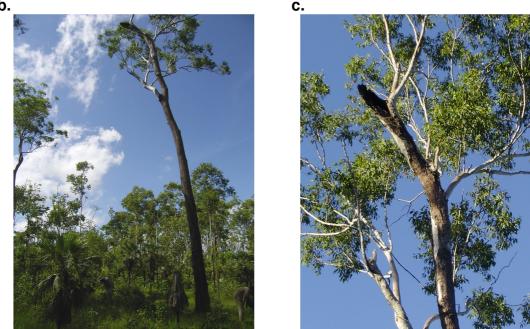


Figure 1. Habitat and hollows used by masked owls in the NT. a. Tall open eucalypt woodland on the Cobourg Peninsula (Jan. 2010). b. A large Eucalyptus miniata tree with a hollow used for nesting by masked owls on Melville Island (photo: James Smith, EWL Consulting). c. Close-up of the hollow in b. (photo: James Smith, EWL Consulting).

The Protocol

Survey design

Broadcast surveys for masked owls are done at night along roads through suitable habitat at sites 1-2 km or more apart. At each site:

- broadcast the call of the masked owl (see details below).
- ii. For the first 5 minutes of the broadcast, listen for calls of masked owls and watch for silhouettes of birds flying in to the area around the speaker (i.e. don't use a spotlight).
- iii. In the second 5 minutes, keep listening for owl calls but use a spotlight to look for owls in the trees around the site.
- iv. When spotlighting, do an initial scan of all the nearby trees, then spend the rest of the 5 minutes doing a more-careful search of the trees for owls and small mammals (potential prey).

The three most common responses from masked owls to the broadcast are:

- make a territorial call and fly into to a tree close to the speaker. The bird may continue to call or may be guiet. In the 2010 surveys of Cobourg, Kakadu and Cox Peninsula, this occurred in 5 of 7 cases where masked owls were detected.
- make a territorial call and continue previous activity (i.e. be heard but not seen). In the 2010 surveys of Cobourg, Kakadu and Cox Peninsula, this occurred in 2 of 7 cases where masked owls were detected.
- ignore the broadcast (in which case they will not be detected false negative). In the 2010 surveys, this occurred an unknown number of times.

Given the very large size of territories, it is very possible that a broadcast within an occupied territory will not be heard by resident birds, in which case they will not be detected (false negative). Hence multiple sites within an area must be surveyed. If the site of interest is small, it may cover only part of a territory, and surveys over multiple nights may be more appropriate.

Masked owl calls and broadcasting equipment

The 2010 surveys of Cobourg, Kakadu, Cox Peninsula and the Katherine Region used a playback recording consisting of a series of calls recorded of Tiwi masked owls by James Smith. The 10 minute playback included 5 % screeches, 4 % hisses and 4 % chattering – the remaining 87% was silence, during which the surveyor listened for calls of resident owls. The playback recording was stitched together using free-ware audio editing software called 'Audacity' and was loaded onto an MP3 player. The calls were broadcast through a 10 watt speaker with a 12 watt amplifier powered by a 12 volt rechargeable battery.

Timing of surveys

Masked owls are most vocal, and therefore most amenable to playback-based survey techniques, in the lead-up to the nesting season. On the Tiwi Islands, James Smith (pers. com.) found that nesting started soon after the end of the wet season, that calling was most evident during the build-up and that calling continued through the wet season. Hence the best times of year for surveys of masked owls in the NT are the build-up (October-December) and the wet

season (approximately January-March). Unfortunately this is also the most uncomfortable time of year for observers, and access to many areas become difficult in the wet season. Masked owls may respond to broadcast surveys at other times of year, but their detectability will be lower, so more false negatives should be expected.

As for all owl species, surveys should be carried out at night. Rain or windy weather makes it difficult to detect the birds and surveys should not occur under such conditions.

Detectability and survey effort

Past surveys in the NT for masked owls include those by NRETAS on the Tiwi Islands, Cobourg Peninsula (2004/05 and 2010), Kakadu National Park (2010) and the Cox Peninsula (2010). These areas support different woodland/forest types, but the Tiwis and Cobourg Peninsula both fall into the same Bioregion and have the wettest, densest and tallest forests in the NT. The results of each survey give an indication of the relative densities of masked owls in different parts of the NT. Numbers of survey points varied between surveys and the earlier surveys employed different recordings and lengths of broadcasts, but all employed playback surveys along roads at night. Table 1 gives a summary of the results of each survey and the locations of all points surveyed in the 2010 surveys are listed in Appendix 1.

The clearest conclusions that can be drawn from these survey results are that the highest densities of mainland masked owls in the NT are on Cobourg Peninsula, and that relatively high population densities also occur on the Tiwi Islands. Comparison of the 2004/05 and 2010 results from Cobourg Peninsula is difficult because the total number of sites where playback surveys were carried out in 2004/05 is not clear, and these surveys occurred at a variety of times of year. However, the detection rate does appear to have been much higher in the earlier survey, suggesting that there has been a decline in the population. Tropical Cyclone Ingrid passed directly over Cobourg Peninsula in March 2005, and caused extensive defoliation and tree damage to a broad area. Presumably this caused direct damage to owl nesting trees and Kym Brennan (pers. com.) reported that it resulted in local crashes in small mammal populations. Kym also assisted in the 2010 owl surveys and considered the strike rate to be much lower than he remembered in 2004/05, prior to the cyclone.

Detection rates in Kakadu National Park, the Cox Peninsula and in the Katherine area were very low or zero. This probably reflects both lower densities and smaller areas of preferred habitat for masked owls in these areas. Under these conditions, roads often do not pass through large areas of preferred habitat, so choosing sites at fixed distances along roads probably results in a majority of surveys occurring at inappropriate sites. So at mainland sites, away from the Cobourg Peninsula, more careful stratification of habitat types and concentration of surveys in areas of tall eucalypt woodland are recommended. The recording and playback conditions remain appropriate.

Table 1. Summary of the results of playback surveys for masked owls in the NT.

Survey	Number of sites surveyed	Number of locations of masked owls	Time of year	Reference
Melville Is. (Tiwi Islands) 2002	202	13	May (dry season)	Woinarski et al 2003
Cobourg Peninsula 2004/05	(approximately 150)	28	Wet and dry seasons	Brennan pers. com.
Cobourg Peninsula 2010	112	6	15-22 January (wet season)	Ward unpub.
Kakadu National Park 2010	68	1	15-19 February (wet season)	Ward unpub.
Katherine Region 2010	8	0	29 March (wet season)	Ward unpub.
Cox Peninsula 2010	44	0	30 March & 8 April (wet season)	Ward unpub.

Conclusions:

The Tiwi Islands continue to support populations of the Tiwi subspecies of masked owls. The Cobourg Peninsula has the largest population of mainland masked owls in the NT, due to its large area of tall open eucalypt forests and woodlands (preferred habitat). However, this population may have declined following destruction of habitat and collapses of small mammal prey populations caused by Cyclone Ingrid in 2005. In other parts of the Top End masked owl populations are sparse and probably patchily distributed. Since masked owls are specialist predators on small mammals, recent dramatic declines in small-medium-sized mammals across northern Australia (Woinarski et al 2010) are likely to have caused a decline in masked owl populations.

Initial surveys in a region should concentrate surveys in areas of the preferred habitat (see introduction). More-detailed surveys, such as pre-development or clearing surveys within the known distribution, should be more intensive, at about 1 km intervals along tracks or roads. These should also occur over multiple nights, since resident masked owls may be out of hearing range on any one given night. Low hit-rates are to be expected.

References

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Appendix 1 Locations of masked owl survey points, 2010.

Table A1. Locations of all playback survey sites in the NRETAS 2010 surveys of Cobourg Peninsula (Garig Gunak Barlu National Park), Kakadu National Park, Cox Peninsula, Katherine Region. Locations where masked owls were recorded are shown in bold. All locations are in GDA.

Cobourg Peninsula CBP045 S11.39163 E132.51105 CBP096 S11.22026 E132 CBP001 S11.39169 E132.28981 CBP046 S11.39735 E132.49397 CBP097 S11.20991 E132 CBP002 S11.37402 E132.28763 CBP047 S11.41317 E132.48630 CBP098 S11.19450 E132 CBP003 S11.35876 E132.28560 CBP048 S11.41452 E132.46937 CBP099 S11.17797 E132 CBP004 S11.34932 E132.27287 CBP049 S11.40137 E132.45188 CBP100 S11.16461 E132 CBP005 S11.33452 E132.27210 CBP050 S11.40632 E132.44143 CBP101 S11.15397 E132	32.22080	
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CDD60 C11 40622 E122 44142 CDD101 C11 15207 E12		
CBP005 S11.33452 E132.27210 CBP050 S11.40632 E132.44143 CBP101 S11.15397 E13		
	32.15392	
CBP006 S11.32031 E132.26373 CBP051 S11.41309 E132.42573 CBP102 S11.13667 E13	32.14971	
CBP007 S11.30998 E132.24964 CBP052 S11.40742 E132.40797 CBP103 S11.19570 E13	31.88136	
CBP008 S11.29527 E132.24857 CBP053 S11.39357 E132.39546 CBP104 S11.20839 E13		
CBP009 S11.27942 E132.25409 CBP054 S11.38335 E132.38151 CBP105 S11.22536 E13	31.89674	
CBP010 S11.26699 E132.24177 CBP055 S11.38039 E132.36614 CBP106 S11.23955 E13	31.90680	
CBP011 S11.25053 E132.23985 CBP056 S11.38999 E132.35104 CBP107 S11.25447 E13	31.90990	
CBP012 S11.24048 E132.22976 CBP057 S11.40179 E132.33712 CBP108 S11.28460 E13	31.89833	
CBP013 S11.22864 E132.22170 CBP058 S11.40586 E132.32186 CBP109 S11.28461 E13	31.89832	
CBP014 S11.21732 E132.21338 CBP059 S11.39873 E132.30442 CBP110 S11.28829 E13		
CBP015 S11.20099 E132.20806 CBP060 S11.15563 E132.34178 CBP111 S11.29717 E13	31.93181	
CBP016 S11.18757 E132.19812 CBP061 S11.17315 E132.33915 CBP112 S11.30319 E13	31.94783	
CBP017 S11.18319 E132.18094 CBP062 S11.19150 E132.33923 CBP113 S11.29897 E13	31.96481	
CBP018 S11.16997 E132.17432 CBP063 S11.20630 E132.33600 CBP114 S11.31469 E13	31.97559	
CBP019 S11.15818 E132.16073 CBP064 S11.22176 E132.33747 CBP115 S11.32942 E13	31.98630	
CBP020 S11.34158 E132.04814 CBP065 S11.23166 E132.33254 CBP116 S11.33638 E13	32.00329	
CBP021 S11.35178 E132.06424 CBP066 S11.24076 E132.32522 CBP117 S11.33585 E13	32.01772	
CBP022 S11.36748 E132.07428 CBP067 S11.25686 E132.31914 CBP118 S11.33364 E13	32.03339	
	Kakadu National Park	
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CBP024 S11.39578 E132.09488 CBP069 S11.28725 E132.33737 KAK122 S12.86667 E13 CBP025 S11.41068 E132.10542 CBP070 S11.30413 E132.33222 KAK123 S12.85583 E13 CBP026 S11.42674 E132.11220 CBP071 S11.31927 E132.33979 KAK124 S12.84177 E13 CBP027 S11.45655 E132.12409 CBP072 S11.33373 E132.35018 KAK125 S12.82464 E13 CBP028 S11.44307 E132.11118 CBP073 S11.35132 E132.35143 KAK126 S12.81751 E13 CBP029 S11.46406 E132.13488 CBP074 S11.36951 E132.35699 KAK127 S12.81074 E13 CBP030 S11.46286 E132.14989 CBP075 S11.12996 E132.14776 KAK128 S12.80660 E13 CBP031 S11.45843 E132.16638 CBP076 S11.12996 E132.14776 KAK129 S12.82696 E13 CBP032 S11.44955 E132.19895 CBP077 S11.14711 E132.15070 KAK130 S12.84603 E13 CBP034 S11.44674 E132.21646 CBP085 S11.36686 E132.28206 KAK131 S12.86087 E13 CBP035 S11.41534 E132.2459	32.79678 32.80058 32.79838 32.78088 32.76446 32.74798 32.73174 32.73422 32.72956 32.71182 32.69283 32.67650 32.66182 32.64646 32.63020	
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KAK143 S12.69430 E132.45354 CXPO07 S12.44189 E130.69961 KAK144 S12.70180 E132.43622 CXPO07 S12.44189 E130.69961 KAK145 S12.71127 E132.41978 CXPO08 S12.44036 E130.69114 KAK146 S12.71579 E132.40152 CXPO09 S12.43858 E130.68133 KAK147 S12.69145 E132.38338 CXPO10 S12.43708 E130.67279 KAK148 S12.69147 E132.38332 CXPO11 S12.43210 E130.65490 KAK149 S12.7285 E132.38299 CXPO12 S12.43210 E130.65490 KAK151 S12.73670 E132.32955 CXPO16 S12.45720 E130.73981 KAK152 S12.73670 E132.32955 CXPO16 S12.47628 E130.73981 KAK153 S12.74986 E132.291150 CXPO16 S12.47932 E130.73298 KAK154 S12.76715 E132.25916 CXPO16 S12.49255 E130.73298 KAK155 S12.76124 E132.27970 CXPO18 S12.49255 E130.73298 KAK156 S12.7791 E132.24974 CXPO20 S12.50099 E130.72719 KAK157 S12.77940 E132.21997 CXPO20 S12.57271 E130.68991 KAK160				
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KAK148 \$12.69147 E132.38332 CXP011 \$12.43524 E130.66339 KAK149 \$12.72285 E132.38299 CXP012 \$12.43210 E130.65490 KAK150 \$12.73243 E132.34868 CXP014 \$12.45720 E130.74086 KAK151 \$12.73731 E132.34868 CXP015 \$12.45720 E130.73981 KAK152 \$12.73670 E132.32955 CXP016 \$12.45720 E130.73981 KAK153 \$12.74986 E132.29537 CXP016 \$12.47362 E130.73397 KAK154 \$12.77986 E132.29570 CXP018 \$12.49255 E130.73208 KAK155 \$12.76715 E132.25916 CXP018 \$12.49255 E130.73208 KAK156 \$12.77910 E132.225916 CXP019 \$12.50099 E130.72214 KAK157 \$12.77911 E132.24374 CXP020 \$12.50792 E130.72214 KAK168 \$12.78842 E132.19997 CXP020 \$12.57271 E130.68991 KAK160 \$12.8332 E131.99587 CXP024 \$12.59069 E130.70219 KAK161 \$12.8332 E131.9423 CXP024 \$12.61526 E130.70019 KAK162 \$12.82084 E131.97872 CXP026 \$12.6534 E130.69369 KAK165	KAK146	S12.71579 E132.40152	CXP009	S12.43858 E130.68133
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KAK151 S12.73731 E132.34868 CXP014 S12.45720 E130.74086 KAK152 S12.73670 E132.32955 CXP015 S12.46635 E130.73981 KAK153 S12.74095 E132.31150 CXP016 S12.47362 E130.73397 KAK154 S12.74986 E132.25937 CXP017 S12.48312 E130.73216 KAK155 S12.76124 E132.25916 CXP019 S12.50592 E130.73216 KAK157 S12.77940 E132.25494 CXP020 S12.50792 E130.72214 KAK158 S12.77940 E132.22649 CXP020 S12.5596 E130.71682 KAK160 S12.83121 E131.88614 CXP023 S12.5526 E130.71682 KAK161 S12.8332 E131.90587 CXP024 S12.59098 E130.68233 KAK161 S12.83236 E131.92792 CXP024 S12.59686 E130.70210 KAK163 S12.82512 E131.90587 CXP024 S12.6586 E130.69248 KAK165 S12.82313 E131.97972 C	KAK149	S12.72285 E132.38299	CXP012	S12.43210 E130.65490
KAK152 S12.73670 E132.32955 CXP016 S12.46635 E130.73981 KAK153 S12.74095 E132.31150 CXP016 S12.47362 E130.73397 KAK154 S12.74986 E132.29537 CXP017 S12.48312 E130.73216 KAK155 S12.76124 E132.29790 CXP018 S12.50099 E130.72214 KAK156 S12.77911 E132.224374 CXP020 S12.50792 E130.72214 KAK157 S12.77940 E132.22649 CXP021 S12.50792 E130.72214 KAK168 S12.77940 E132.22649 CXP021 S12.5966 E130.71682 KAK160 S12.83121 E131.88614 CXP022 S12.57271 E130.68991 KAK161 S12.83322 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.62586 E130.70019 KAK163 S12.82512 E131.96001 CXP027 S12.62586 E130.70019 KAK165 S12.82084 E131.97972 CXP029 S12.64338 E130.69351 KAK166 S12.8237 E132.05844 CXP031 S12.65932 E130.68977 KAK167 S12.81469 E132.1797 CXP033 S12.66503 E130.6398 KAK170	KAK150	S12.73243 E132.36511	CXP013	S12.42878 E130.64613
KAK153 S12.74095 E132.31150 CXP016 S12.47362 E130.73397 KAK154 S12.74986 E132.29537 CXP017 S12.48312 E130.73216 KAK155 S12.76124 E132.27970 CXP018 S12.49255 E130.73208 KAK156 S12.77615 E132.25916 CXP019 S12.50792 E130.72719 KAK157 S12.77940 E132.22649 CXP020 S12.51596 E130.7128 KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.7128 KAK169 S12.8342 E132.19997 CXP022 S12.57271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.59069 E130.69248 KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.6526 E130.70019 KAK163 S12.82512 E131.96001 CXP028 S12.65384 E130.69692 KAK164 S12.82512 E131.96001 CXP029 S12.6338 E130.69351 KAK165 S12.82084 E131.97872 CXP020 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP030 S12.65282 E130.68977 KAK168 S1	KAK151	S12.73731 E132.34868	CXP014	S12.45720 E130.74086
KAK154 S12.74986 E132.29537 CXP017 S12.48312 E130.73216 KAK155 S12.76124 E132.27970 CXP018 S12.49255 E130.73208 KAK156 S12.76715 E132.25916 CXP019 S12.50099 E130.72719 KAK157 S12.77911 E132.24374 CXP020 S12.50792 E130.72214 KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.71682 KAK159 S12.78842 E132.19997 CXP022 S12.52771 E130.68921 KAK160 S12.83121 E131.88614 CXP023 S12.58034 E130.68823 KAK161 S12.8332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.8344 E131.92792 CXP026 S12.61526 E130.69248 KAK163 S12.82512 E131.96001 CXP028 S12.62586 E130.69692 KAK164 S12.82512 E131.99717 CXP029 S12.64338 E130.69891 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69891 KAK166 S12.82315 E132.058444 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.66438 E130.6398 KAK170 <th< td=""><td>KAK152</td><td>S12.73670 E132.32955</td><td>CXP015</td><td>S12.46635 E130.73981</td></th<>	KAK152	S12.73670 E132.32955	CXP015	S12.46635 E130.73981
KAK155 S12.76124 E132.27970 CXP018 S12.49255 E130.73208 KAK156 S12.76715 E132.25916 CXP019 S12.50099 E130.72719 KAK157 S12.77011 E132.24374 CXP020 S12.50792 E130.72214 KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.71682 KAK169 S12.78842 E132.19997 CXP022 S12.55271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.59069 E130.69248 KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.8376 E131.94223 CXP024 S12.6586 E130.70019 KAK163 S12.82512 E131.96001 CXP026 S12.64586 E130.70019 KAK164 S12.82512 E131.96001 CXP028 S12.64338 E130.6992 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69977 KAK166 S12.82315 E132.05844 CXP030 S12.65282 E130.68977 KAK167 S12.81469 E132.17207 CXP030 S12.65593 E130.68977 KAK170 S12.81469 E132.12707 CXP034 S12.66503 E130.6398 KAK171 S	KAK153	S12.74095 E132.31150	CXP016	S12.47362 E130.73397
KAK156 S12.76715 E132.25916 CXP019 S12.50099 E130.72719 KAK157 S12.77011 E132.24374 CXP020 S12.50792 E130.72214 KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.71682 KAK159 S12.78842 E132.19997 CXP022 S12.57271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.58234 E130.68823 KAK161 S12.83328 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.6526 E130.70019 KAK163 S12.82512 E131.96001 CXP028 S12.65286 E130.6992 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70019 KAK165 S12.82313 E131.99717 CXP029 S12.64338 E130.68921 KAK166 S12.82315 E132.05844 CXP029 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP030 S12.65282 E130.68977 KAK168 S12.82804 E132.07793 CXP030 S12.65631 E130.6398 KAK170 S12.81469 E132.11207 CXP033 S12.66503 E130.6599 KAK171	KAK154	S12.74986 E132.29537	CXP017	S12.48312 E130.73216
KAK157 S12.77011 E132.24374 CXP020 S12.50792 E130.72214 KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.71682 KAK159 S12.78842 E132.19997 CXP022 S12.57271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.58234 E130.68823 KAK161 S12.83322 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82804 E131.97872 CXP029 S12.64338 E130.699351 KAK166 S12.82313 E131.99717 CXP029 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65282 E130.68977 KAK168 S12.82804 E132.07793 CXP032 S12.66503 E130.68343 KAK170 S12.81469 E132.11207 CXP033 S12.66503 E130.63369 KAK171 S12.80110 E132.12840 CXP035 S12.65937 E130.63523 KAK172	KAK155	S12.76124 E132.27970	CXP018	S12.49255 E130.73208
KAK158 S12.77940 E132.22649 CXP021 S12.51596 E130.71682 KAK159 S12.78842 E132.19997 CXP022 S12.57271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.58234 E130.68823 KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.82512 E131.96001 CXP028 S12.62586 E130.69692 KAK164 S12.82084 E131.97872 CXP029 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.6937 KAK167 S12.83152 E132.05844 CXP030 S12.65282 E130.68343 KAK168 S12.82804 E132.07793 CXP030 S12.66503 E130.68343 KAK169 S12.81469 E132.11207 CXP033 S12.66503 E130.63369 KAK170 S12.81469 E132.14520 CXP035 S12.65937 E130.635369 KAK171 S12.80110 E132.14520 CXP036 S12.65997 E130.63523 KAK172	KAK156	S12.76715 E132.25916	CXP019	S12.50099 E130.72719
KAK159 S12.78842 E132.19997 CXP022 S12.57271 E130.68991 KAK160 S12.83121 E131.88614 CXP023 S12.58234 E130.68823 KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.81469 E132.11207 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.65931 E130.63569 KAK171 S12.80110 E132.12840 CXP035 S12.65937 E130.63523 KAK172 S12.6936 E132.14520 CXP036 S12.65997 E130.63523 KAK173 <	KAK157	S12.77011 E132.24374	CXP020	S12.50792 E130.72214
KAK160 S12.83121 E131.88614 CXP023 S12.58234 E130.68823 KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66503 E130.68977 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66503 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.65369 KAK172 S12.79316 E132.14520 CXP036 S12.6597 E130.63523 KAK173 S12.6963 E132.14520 CXP036 S12.6586 E130.62718 KAK175 <th< td=""><td>KAK158</td><td>S12.77940 E132.22649</td><td>CXP021</td><td>S12.51596 E130.71682</td></th<>	KAK158	S12.77940 E132.22649	CXP021	S12.51596 E130.71682
KAK161 S12.83332 E131.90587 CXP024 S12.59069 E130.69248 KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66503 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.65369 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.63616 E132.17297 CXP038 S12.65286 E130.61199 KAK177 <	KAK159	S12.78842 E132.19997	CXP022	S12.57271 E130.68991
KAK162 S12.83448 E131.92792 CXP026 S12.61526 E130.70019 KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.63438 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.6396 KAK170 S12.81469 E132.11207 CXP034 S12.66503 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.65369 KAK171 S12.80110 E132.12450 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.14520 CXP035 S12.65919 E130.63523 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.56283 E132.21875 CXP039 S12.65286 E130.61199 KAK177 <t< td=""><td>KAK160</td><td>S12.83121 E131.88614</td><td>CXP023</td><td>S12.58234 E130.68823</td></t<>	KAK160	S12.83121 E131.88614	CXP023	S12.58234 E130.68823
KAK163 S12.83276 E131.94223 CXP027 S12.62586 E130.69692 KAK164 S12.82512 E131.96001 CXP028 S12.63344 E130.70200 KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68877 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.65931 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65991 E130.63523 KAK172 S12.79316 E132.14520 CXP036 S12.65991 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.58283 E132.25686 CXP040 S12.66635 E130.60179 KAK178 S13.55953 E132.25758 CXP041 S12.66629 E130.59918 KAK1810	KAK161	S12.83332 E131.90587	CXP024	S12.59069 E130.69248
KAK164 \$12.82512 E131.96001 CXP028 \$12.63344 E130.70200 KAK165 \$12.82084 E131.97872 CXP029 \$12.64338 E130.69351 KAK166 \$12.82313 E131.99717 CXP030 \$12.65282 E130.68977 KAK167 \$12.83152 E132.05844 CXP031 \$12.65933 E130.68343 KAK168 \$12.82804 E132.07793 CXP032 \$12.66410 E130.67300 KAK169 \$12.82397 E132.09727 CXP033 \$12.66503 E130.66396 KAK170 \$12.81469 E132.11207 CXP034 \$12.66172 E130.65369 KAK171 \$12.80110 E132.12840 CXP035 \$12.65991 E130.64504 KAK172 \$12.79316 E132.14520 CXP036 \$12.65997 E130.63523 KAK173 \$12.79063 E132.16498 CXP037 \$12.65501 E130.63218 KAK175 \$13.63616 E132.17297 CXP038 \$12.65286 E130.61199 KAK176 \$13.59488 E132.25471 CXP040 \$12.66355 E130.59956 KAK178 \$13.57488 E132.25471 CXP041 \$12.66355 E130.59956 KAK180 \$13.54825 E132.27919 CXP044 \$12.66629 E130.70398 KAK181 <	KAK162	S12.83448 E131.92792	CXP026	S12.61526 E130.70019
KAK165 S12.82084 E131.97872 CXP029 S12.64338 E130.69351 KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66629 E130.59956 KAK180 S13.55953 E132.27017 CXP042 S12.66629 E130.79018 KAK181 <	KAK163	S12.83276 E131.94223	CXP027	S12.62586 E130.69692
KAK166 S12.82313 E131.99717 CXP030 S12.65282 E130.68977 KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.68343 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.50199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.55661 E132.26336 CXP041 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP041 S12.6629 E130.79398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.71102 KAK182 <	KAK164	S12.82512 E131.96001	CXP028	S12.63344 E130.70200
KAK167 S12.83152 E132.05844 CXP031 S12.65933 E130.66334 KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.50199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66355 E130.69774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.6629 E130.59018 KAK180 S13.54825 E132.27917 CXP044 S12.64235 E130.71102 KAK181 S13.54825 E132.25758 CXP045 S12.65660 E130.72804 KAK183 <	KAK165	S12.82084 E131.97872	CXP029	S12.64338 E130.69351
KAK168 S12.82804 E132.07793 CXP032 S12.66410 E130.67300 KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.65286 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.6629 E130.59956 KAK179 S13.56661 E132.25471 CXP041 S12.6629 E130.59018 KAK180 S13.54825 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.65448 E130.71875 KAK182 S13.48510 E132.25543 CXP045 S12.65448 E130.72804 KAK183 <th< td=""><td>KAK166</td><td>S12.82313 E131.99717</td><td>CXP030</td><td>S12.65282 E130.68977</td></th<>	KAK166	S12.82313 E131.99717	CXP030	S12.65282 E130.68977
KAK169 S12.82397 E132.09727 CXP033 S12.66503 E130.66396 KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.65501 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64923 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.51704 E132.25043 CXP046 S12.67823 E132.42302 KAK186 <	KAK167	S12.83152 E132.05844	CXP031	S12.65933 E130.68343
KAK170 S12.81469 E132.11207 CXP034 S12.66172 E130.65369 KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.6629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.32352 E132.42328 KAK189 S13.53668 E132.33376	KAK168	S12.82804 E132.07793	CXP032	S12.66410 E130.67300
KAK171 S12.80110 E132.12840 CXP035 S12.65951 E130.64504 KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66635 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK182 S13.48510 E132.24902 CXP044 S12.65488 E130.71102 KAK183 S13.59276 E132.25758 CXP045 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK188 S13.5462	KAK169	S12.82397 E132.09727	CXP033	S12.66503 E130.66396
KAK172 S12.79316 E132.14520 CXP036 S12.65997 E130.63523 KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71102 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.29339 KAT228 S14.32352 E132.42328 KAK189 S13.53668 E132.3376	KAK170	S12.81469 E132.11207	CXP034	S12.66172 E130.65369
KAK173 S12.79063 E132.16498 CXP037 S12.65501 E130.62718 KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK188 S13.54157 E132.31631 KAT230 S14.32352 E132.42286 KAK189 S13.52558 E132.34727 <td>KAK171</td> <td>S12.80110 E132.12840</td> <td>CXP035</td> <td>S12.65951 E130.64504</td>	KAK171	S12.80110 E132.12840	CXP035	S12.65951 E130.64504
KAK175 S13.63616 E132.17297 CXP038 S12.64811 E130.62127 KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.65448 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.54627 E132.29339 KAT228 S14.31415 E132.42302 KAK188 S13.54157 E132.31631 KAT230 S14.3263 E132.42286 KAK189 S13.52558 E132.334727 <td>KAK172</td> <td>S12.79316 E132.14520</td> <td>CXP036</td> <td>S12.65997 E130.63523</td>	KAK172	S12.79316 E132.14520	CXP036	S12.65997 E130.63523
KAK176 S13.60199 E132.21875 CXP039 S12.65286 E130.61199 KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64923 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK188 S13.54157 E132.31631 KAT230 S14.3263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727	KAK173	S12.79063 E132.16498	CXP037	S12.65501 E130.62718
KAK177 S13.58283 E132.25686 CXP040 S12.66066 E130.60774 KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64235 E130.70398 KAK182 S13.48510 E132.27919 CXP044 S12.64923 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.4238 KAK188 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233	KAK175	S13.63616 E132.17297	CXP038	S12.64811 E130.62127
KAK178 S13.57488 E132.25471 CXP041 S12.66355 E130.59956 KAK179 S13.56661 E132.26336 CXP042 S12.66629 E130.59018 KAK180 S13.55953 E132.27017 CXP043 S12.64235 E130.70398 KAK181 S13.54825 E132.27919 CXP044 S12.64923 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT228 S14.32352 E132.42328 KAK188 S13.53668 E132.33376 KAT230 S14.33263 E132.42286 KAK190 S13.52558 E132.34727 KAT231 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	KAK176	S13.60199 E132.21875	CXP039	S12.65286 E130.61199
KAK179 \$13.56661 £132.26336 CXP042 \$12.66629 £130.59018 KAK180 \$13.55953 £132.27017 CXP043 \$12.64235 £130.70398 KAK181 \$13.54825 £132.27919 CXP044 \$12.64923 £130.71102 KAK182 \$13.48510 £132.24902 CXP045 \$12.65448 £130.71875 KAK183 \$13.49283 £132.25043 CXP046 \$12.65660 £130.72804 KAK184 \$13.50276 £132.25758 CXP047 \$12.67823 £130.79244 KAK185 \$13.51704 £132.26906 Katherine Region KAK186 \$13.52872 £132.29339 KAT228 \$14.31415 £132.42302 KAK187 \$13.54627 £132.31631 KAT229 \$14.32352 £132.42388 KAK188 \$13.53668 £132.33376 KAT231 \$14.34644 £132.43297 KAK190 \$13.52558 £132.34727 KAT232 \$14.38168 £132.41468 Cox Peninsula KAT233 \$14.43336 £132.27937 </td <td>KAK177</td> <td>S13.58283 E132.25686</td> <td>CXP040</td> <td>S12.66066 E130.60774</td>	KAK177	S13.58283 E132.25686	CXP040	S12.66066 E130.60774
KAK180 \$13.55953 E132.27017 CXP043 \$12.64235 E130.70398 KAK181 \$13.54825 E132.27919 CXP044 \$12.64923 E130.71102 KAK182 \$13.48510 E132.24902 CXP045 \$12.65448 E130.71875 KAK183 \$13.49283 E132.25043 CXP046 \$12.65660 E130.72804 KAK184 \$13.50276 E132.25758 CXP047 \$12.67823 E130.79244 KAK185 \$13.51704 E132.26906 Katherine Region KAK186 \$13.52872 E132.28233 KAT228 \$14.31415 E132.42302 KAK187 \$13.54627 E132.29339 KAT229 \$14.32352 E132.42328 KAK188 \$13.53668 E132.33376 KAT230 \$14.33263 E132.42286 KAK189 \$13.53668 E132.33376 KAT231 \$14.34644 E132.43297 KAK190 \$13.52558 E132.34727 KAT232 \$14.38168 E132.41468 Cox Peninsula KAT233 \$14.49070 E132.24982 CXP003 \$12.44700 E130.73589 KAT234 \$14.43336 E132.27937 CXP004 \$12.44597 E130.72679 KAT235 \$14.31300 E132.42289	KAK178	S13.57488 E132.25471	CXP041	S12.66355 E130.59956
KAK181 S13.54825 E132.27919 CXP044 S12.64923 E130.71102 KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.42328 KAK188 S13.53668 E132.331631 KAT230 S14.33263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	KAK179	S13.56661 E132.26336	CXP042	S12.66629 E130.59018
KAK182 S13.48510 E132.24902 CXP045 S12.65448 E130.71875 KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.42328 KAK188 S13.54157 E132.31631 KAT230 S14.33263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	KAK180	S13.55953 E132.27017	CXP043	S12.64235 E130.70398
KAK183 S13.49283 E132.25043 CXP046 S12.65660 E130.72804 KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.42328 KAK188 S13.54157 E132.31631 KAT230 S14.33263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	KAK181	S13.54825 E132.27919	CXP044	S12.64923 E130.71102
KAK184 S13.50276 E132.25758 CXP047 S12.67823 E130.79244 KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.42328 KAK188 S13.54157 E132.31631 KAT230 S14.33263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289		S13.48510 E132.24902	CXP045	
KAK185 S13.51704 E132.26906 Katherine Region KAK186 S13.52872 E132.28233 KAT228 S14.31415 E132.42302 KAK187 S13.54627 E132.29339 KAT229 S14.32352 E132.42328 KAK188 S13.54157 E132.31631 KAT230 S14.33263 E132.42286 KAK189 S13.53668 E132.33376 KAT231 S14.34644 E132.43297 KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Penisula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289				S12.65660 E130.72804
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KAK190 S13.52558 E132.34727 KAT232 S14.38168 E132.41468 Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289			KAT230	S14.33263 E132.42286
Cox Peninsula KAT233 S14.49070 E132.24982 CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289			KAT231	S14.34644 E132.43297
CXP003 S12.44700 E130.73589 KAT234 S14.43336 E132.27937 CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	KAK190	KAK190 S13.52558 E132.34727		S14.38168 E132.41468
CXP004 S12.44597 E130.72679 KAT235 S14.31300 E132.42289	Cox Peninsula		KAT233	S14.49070 E132.24982
<u> </u>	CXP003	S12.44700 E130.73589	KAT234	S14.43336 E132.27937
CXP005 S12.44495 E130.71771	CXP004	S12.44597 E130.72679	KAT235	S14.31300 E132.42289
	CXP005	S12.44495 E130.71771]	

Cobourg Peninsula





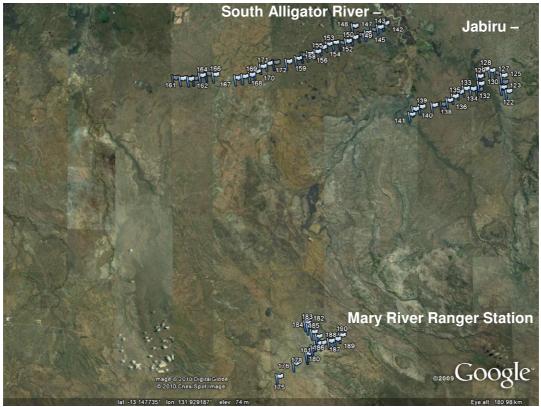
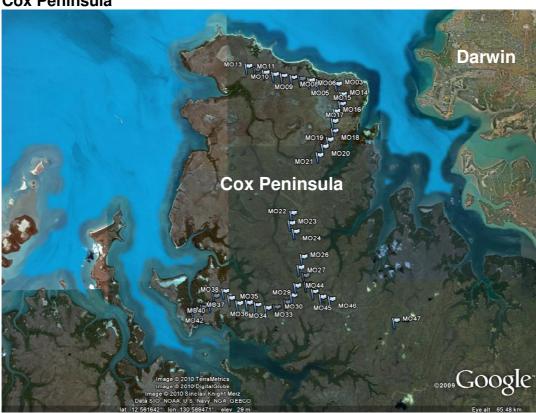


Figure A1a. Google images of locations of masked owl playback survey sites

Cox Peninsula



Katherine region



Figure A1b. Google images of locations of masked owl playback survey sites