

APPENDIX F

Species List



Appendix F Species List

F.1 Terrestrial Ecology

F.1.1 Scope and Methodology

An initial terrestrial flora and fauna assessment was undertaken for the proposed duplicated Effluent Rising Main (ERM) corridor on 25 to 31 May 2011.

Boundaries of the Proposed Development corridor were identified from maps, diagrams, aerial photographs and flagged boundaries on-site. Specific locations along the proposed Proposed Development corridor were acquired with a Global Positioning System (GPS) and aerial photo interpretation (API) was used to determine sites that covered recognisable terrestrial vegetation assemblages, regrowth and disturbed areas. The information obtained was then ground-truthed in the field.

The survey targeted species that potentially occur in the vicinity of the proposed Proposed Development corridor, including:

- Flora and fauna species identified in a review of previous ecological studies undertaken in the East Point / Darwin area and other data sources.
- Species listed in threatened categories under Commonwealth and NT legislation.
- Migratory / marine bird species listed under Commonwealth legislation.

The assessment of the plant communities involved reviewing:

- Historical data, aerial imagery and reports (Franklin et al., 2010).
- Existing mapping data (Brocklehurst et al.; National Vegetation Information System (NVIS)).
- Surveys to describe the terrestrial flora and fauna of the site.

Assessment points were established within all vegetation units and at additional sites where vegetation patterns on aerial photos varied.

A dry season assessment of the fauna species involved general observational surveys (birds and mammals). These were conducted at various times (dawn, throughout the day and evening searches) and using binoculars, spotlighting and subsequent identification. Surveys of shore birds focussed on a broader area to provide an assessment of adjacent terrestrial and mangrove habitats.

The terrestrial vegetation within the proposed Proposed Development corridor and surrounding area predominantly consists of

- Disturbed areas bordering managed urban parkland.
- Regrowth patches of Mixed Species Open Woodland and Monsoon Vine Forest (both planted and natural).
- Mangrove Forest.

The survey targeted areas identified as remnant bushland, significant vegetation types and known habitat for scheduled species.

As the vegetation in the study area is dominated by disturbed and managed urban parkland areas and patches of regrowth vegetation, a 'check site' method, as described by Brocklehurst et al. (2007), was utilised to determine whether vegetation at specific sites satisfied established criteria to qualify as specific vegetation communities. The location of all survey and check sites is shown in **Figure Appendix F-1**.

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Darwin City Council (Undated) describes the fauna at East Point Reserve as comprising 200 – 300 Agile Wallabies, with Northern Bandicoots, Northern Brush-tail possums and various species of reptiles also found in the Reserve. Over 35 different species of butterflies and 133 different species of birds also occur within the reserve. Active jungle fowls nests have also been noted within the monsoon forest.

Mangroves are a breeding area for many species of fish, crustaceans and molluscs. Specialist birds and fauna also utilise mangroves for breeding, roosting and feeding (Noske 1996; Clay and Andersen 1996).

Limitations

Some flora species were not identified to species level due to the timing of the surveys (i.e. no fruit or flowers present or deciduous species without any leaves, flowers or fruit present). However it is considered that these individuals represented very few species and did not impact on the ability to describe the plant communities.

The initial fauna assessment was limited to dry season observational records and literature review. Assessments did not include the Coastal Rocky Reef / Headland Community at the western most end of the Proposed Development corridor.

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Terrestrial Flora

The flora survey recorded a total of seventy-six (76) flora species;

- 61 native flora species.
- Fifteen exotic flora species.

Of these 76 species, there were:

- Ten 'Declared Weeds' (*Weeds Management Act 2001*).
- Two sensitive / significant vegetation types according to the *Northern Territory Land Clearing Guidelines* (NRETAS, 2010b); the Monsoon Vine Forest and the Mangrove Forest communities.

Five terrestrial vegetation communities were recorded within the study area:

- Community 1: Coastal Monsoon Vine Forest.
- Community 2: Low to Mid, Mixed Species Closed Forest to Open Forest.
- Community 3: Low to Mid, Mixed Species Open Woodland.
- Community 4: Mangrove (mangal) forest.
- Community 5: Urban (parkland; development sites).

Each Vegetation Community is described in **Table Appendix F-1** to **Table Appendix F-5**.

Mangrove communities in the tidal reaches of the Proposed Development corridor were not investigated as part of the survey to advise this review. Mangrove Forests that occur along the Proposed Development corridor were 'checked' and broad information is included on these communities in **Figure Appendix F-1** below. This information is based on Brocklehurst and Edmeades (1996).



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Table Appendix F-1 Community 1 - Coastal Monsoon Vine Forest

Location and Distribution: A small patch and a narrow band of Coastal Monsoon Vine Forest associated with seasonal dry habitats were located along and adjacent to the proposed ERM corridor. The narrow band of Monsoon Vine Forest located within the East Point Reserve occurs adjacent to the rehabilitated Monsoon Vine Forest (Franklin et al., 2010). Understorey elements of Monsoon Vine Forests and Rainforests also occur within Community 2 (described below) between the Ludmilla Waste Treatment Plant and the Fannie Bay Football Oval. The narrow band of Monsoon Vine Forest located along the north coast of the peninsula has largely been avoided by the proposed pipeline and only those areas likely to be impacted by the proposed pipeline are described below. The area of Coastal Monsoon Vine Forest likely to be impacted by the proposed ERM corridor measures approximately 1,154 m² in size (including 339 m² of clearing). This vegetation community is a modified coastal rainforest community. Naturalised exotic trees are present with some enrichment planting of local native species.	
	Description: A community with a low to mid (5.1 m to 8 m), dense canopy comprised of mixed species. Although classified as Coastal Monsoon Vine Forest, the small patches and understorey elements was found to be species-poor semi-deciduous vine forest. The canopy components included <i>Acacia auriculoformis</i>, <i>Peltophorum pterocarpum</i> (Yellow Flame Tree) and <i>Carpentaria acuminata</i> also occasionally occurs as an emergent. Other canopy components include <i>Terminalia macrocarpa</i>, <i>Ficus virens</i>, <i>Mimusops elengi</i> (Bullet-wood Tree), <i>Strychnos lucida</i> (Strychnine Tree) and <i>Bridelia tomentosa</i> (Pop-gun Seed). The midstratum, from 1 m to 5 m, is mid dense and includes regenerating canopy species, as well as vines and other species such as <i>Exocarpus latifolius</i> (Native Cherry), <i>Morinda citrifolia</i> (Cheese Tree), <i>Mallotus nespohillis</i>, <i>Mallotus phillipensis</i>, <i>Terminalia macrocarpa</i>. A lower/ground strata (<1 m) which is sparse (litter) may include vines, <i>Abrus preacatorius</i> (Crab's eye vine), <i>Hypoestes floribunda</i> (Hypoestes) and seedlings of other common species such as <i>Peltophorum pterocarpum</i> (Yellow Flame Tree) and <i>Dodonaea platyptera</i> (Native Hop Bush). Vines are common and include <i>Abrus preacatorius</i> (Crab's eye vine), <i>Flagellaria indica</i> (Whip Vine), <i>Ipomoea abrupta</i> (Bush Potato), <i>Jasminum didymum</i> (Native Jasmine), <i>Opilia amentacea</i> (Opilia), <i>Physalis minima</i> (Native Gooseberry), <i>Protasparagus racemosa</i> (Asparagus Fern) and <i>Ziziphus oenopolia</i> (Small-fruited Jujube). In the understorey and in depressions that hold water, other species occur such as <i>Hydriastele wenlandiana</i> and <i>Melaleuca leucadendra</i> (Weeping Paperbark) occur.
Relationships and significance of the vegetation community: • This vegetation community is equivalent to a Low to Mid High Closed Forest (Walker and Hopkins, 1990), Low Closed Forest or T6d (Brocklehurst et al., 2007) and Unit 1a (Wilson et al., 1990). • The community is recognised as significant vegetation under the <i>Northern Territory Land Clearing Guidelines</i> (NRETAS, 2010b) however it is not listed as significant or threatened under the <i>EPBC Act 1999</i>. • Species listed in the threatened species schedules of the <i>EPBC ACT 1999</i> and the <i>TPWC Act 2000</i> were not observed in the Coastal Monsoon Vine Forest community.	
Condition, Declared and other Naturalised Species: The vegetation community is regrowth / replanted and as such is generally in 'poor' condition and show signs of previous disturbance with loss of structure and floristic complexity. Weed and naturalised species recorded include <i>Passiflora foetida</i> (Stinking passionfruit) and <i>Pennisetum polystachion</i> (Mission grass) at the edge of Monsoon Vine Forest patches.	

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Table Appendix F-2 Community 2 - Low to Mid High, Mixed Species Closed Forest / Open Forest

Location and Distribution: The Low to Mid High Mixed Species Closed Forest is present in the area between Ludmilla Waste Treatment Plant and Fannie Bay Football Oval. This vegetation community includes rainforest understorey species as described in Community 1 above. The vegetation community is surrounded by Mangal Forest and residential areas and as a result is disturbed (weeds / rubbish dumping / camping). The area of Mixed Species Cosed Forest likely to be impacted by the proposed ERM corridor measures approximately 7,419 m² in size (including 3,626 m² of clearing).	
	Description: This vegetation community is comprised of a low to mid (5.1 m to 20 m) dense patchy canopy. The canopy can include a range of species, including <i>Melaleuca</i>, <i>Acacia auriculoformis</i>, <i>Erythrophleum chlorostachys</i> (Cooktown Ironwood), <i>Lophostemon lactifluus</i>, <i>Alstonia actinophylla</i>, <i>Adenanthera pavonina</i>, <i>Carpentaria acuminata</i> and <i>Pandanus spiralis</i> (Screw Palm). The mid-stratum (generally 1.1 m to 8 m) is sparse and dominated by regenerating canopy species especially <i>Acacia auriculoformis</i> and rainforest species growing under the forest canopy such as <i>Carpentaria acuminata</i> and <i>Hydriastele wenlandiana</i>. Other mid-stratum species include <i>Pandanus spiralis</i>, <i>Alstonia actinophylla</i>, <i>Buchanania arborescens</i> and <i>Ficus scobina</i>. The lower/ground strata (<1 m) is sparse with various grasses, herbs and vines. Species recorded include <i>Ipomea</i> sp., <i>Pandanus spiralis</i> (Screw Pine), <i>Canavalia rosea</i>, <i>Acrostichum speciosum</i> (Mangrove fern), <i>Cassia</i> sp., <i>Flagellaria indica</i>, <i>Sesbania</i> sp., <i>Jasminum aemulum</i> and <i>Opilia amentacea</i>.
Relationships and significance of the vegetation community: • The community is not recognised as significant vegetation under the <i>Northern Territory Land Clearing Guidelines</i> (NRETAS, 2010b), and is not listed under the <i>EPBC Act 1999</i>. • Species listed in the threatened species schedules of the <i>EPBC ACT 1999</i> and the <i>TPWC Act 2000</i> were not observed in this community.	
Condition, Declared and other Naturalised Species: This vegetation community is disturbed and impacted with much of regrowth from clearing the sewage rising main. Impacts from the surrounding residential area (waste, garden escapees and pest animals) are evident and widespread. The canopy vegetation however is generally in ‘good’ condition’ however damage from cyclones is evident. Minimal mid-stratum regeneration suggests that disturbance is ongoing. Small patches of rainforest, the <i>Melaleuca</i> ecotone and adjacent Mangal Forest, appear intact. Several weed and naturalised species were recorded in this vegetation community including <i>Passiflora foetida</i> (Stinking Passion Flower), <i>Spathodea campanulata</i> (Africa tulip tree), <i>Leucaena leucocephala</i> (Lead tree or Coffee bush), <i>Pennisetum polystachion</i> (Mission grass). Two declared species were also recorded; <i>Senna alata</i> (Candle bush) and <i>Senna obtusifolia</i> (Sicklepod).	

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Table Appendix F-3 Community 3 - Low to Mid, Mixed Species Open Woodland

Location and Distribution: Small areas of regrowth Mixed Species Open Woodlands were mapped and assessed. This vegetation community occurs adjacent to the Fannie Bay Football Oval, between the managed urban parkland and Lake Alexander and throughout the East Point Reserve as regeneration. DCC and community groups (for example Greening Australia and Landcare groups) have replanted some of areas to this vegetation community (Franklin et al., 2010). However, it is not known how much of the woodland community has been replanted and how much has regenerated naturally. The area of Mixed Species Open Woodland likely to be impacted by the proposed ERM corridor measures approximately 13,382 m² in size (including 6,525 m² of clearing).	
	Description: Height of the canopy in these areas varies from 8 m to 12 m with the understorey dominated by saplings, small trees and grasses. Acacia, Eucalyptus, Corymbia and Melaleuca are common. Species present include <i>Acacia auriculorformis</i> (Earpod Wattle), <i>Acacia pachyphloia</i>, <i>Adenanthera pavonine</i> (Red bead tree), <i>Albizia lebbbeck</i>, <i>Brachychiton diversifolius</i>, <i>Cordia subcordata</i>, <i>Corymbia polycarpa</i> (Long-fruited Bloodwood), <i>Eucalyptus phoenicia</i>, <i>Eucalyptus grandiflora</i>, <i>Melaleuca dealbata</i> and <i>Pandanus spiralis</i> (Screw Palm). The mid-stratum (generally 1.1 m to 8 m) is sparse and dominated by regenerating canopy species. Other mid-stratum species present include <i>Alphitonia exelsa</i>, <i>Buchanania arborescens</i>, <i>Clitoria ternate</i>, <i>Croton arnhemicus</i>, <i>Erythrophleum chlorostachys</i> (Cooktown Ironwood), <i>Exocarpus latifolius</i>, <i>Ficus scobina</i>, <i>Ficus recemosa</i>, <i>Grevillea pterdifolia</i>, <i>Grewia multiflora</i> <i>Morinda citrifolia</i>, <i>Peltophorum pterocarpum</i>, <i>Pogonoblus reticulates</i> and <i>Macrotilium lathyroides</i>. The lower/ground strata (<1 m) is dominated by grasses; native species include <i>Heteropogon</i> sp., and <i>Sorghum</i> sp. Vine species recorded in this vegetation community include <i>Flagellaria indica</i>, <i>Physalis minima</i> and <i>Ziziphus oenoplia</i>,
Relationships and significance of the vegetation community: • The community is not recognised as significant vegetation under the <i>Northern Territory Land Clearing Guidelines</i> (NRETAS, 2010b) and is not listed under the <i>EPBC Act 1999</i>. • Species listed in the threatened species schedules of the <i>EPBC ACT 1999</i> and the <i>TPWC Act 2000</i> were not observed in this community.	
Condition, Declared and other Naturalised Species: Generally in 'good' condition for regrowth, however shows signs of cyclone damage. Naturalised species were common and included several declared weeds under the Weed Management Act. Declared species recorded include <i>Alternanthera</i> sp. (Alligator weed), <i>Pennisetum polystachion</i> (Mission Grass) <i>Hyptis suaveolons</i> (Hyptis) and <i>Senna occidentalis</i> (Coffee Senna). <i>Leucaena leucocephala</i> (Lead tree) and <i>Delonix regia</i> (Poinciana) was widespread and formed a dense understorey in some places. Other weeds and naturalised species included <i>Passiflora foetida</i> (Stinking Passion Flower), <i>Centrosema molle</i> (Centro) and <i>Chloris barbata</i> (Purple top Chloris).	

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Table Appendix F -4 Community 4 - Mangrove (Mangal) Forest

Location and Distribution: Mangroves and associated marine communities occur to the north of the proposed pipeline. Mangroves are situated in tidal areas on marine and estuary sediments and include the Ludmilla Creek Mangrove forests and the narrow band of East Point peninsula Mangrove Forests (NRETAS, 2010c). The area of Ceriops Mangrove Forest located at the Ludmilla Waste Treatment Site likely to be impacted by the proposed ERM corridor measures approximately 1,338 m² in size (including 558 m² of clearing).	
	Description: The mangal communities of the East Point area have been previously mapped by Brocklehurst and Edmeades (1996). The communities recognised by those authors and represented within the proposed ERM corridor are mapped in Figure 4-4. These include: • <i>Ceriops australis</i> Low Closed-Forest (mid tidal flat). • Samphire and Saltpans. Other species recorded in the Mangrove Forest vegetation community include <i>Acacia auriculorformis</i>, <i>Bulbastylis barbata</i>, <i>Cyperus compressus</i> and <i>Fimbristiolus dichotoma</i>. These species occurred at the ecotone between the Mangrove Forest community and the Mixed Species Low Closed Forest (described above as Community 2).
Relationships and significance of the vegetation community: • The <i>Ceriops australis</i> Low Closed-Forest is equivalent to Closed Forest (Walker and Hopkins, 1990), Low to Tall Closed Forest T7d and T6d (Brocklehurst et al., 2007) and Unit 105 (Wilson et al., 1990). • Mangrove communities are recognised as sensitive or significant vegetation under the <i>Northern Territory Land Clearing Guidelines</i> (NRETAS, 2010b). The mangrove forest is not listed as threatened under the <i>EPBC Act 1999</i>. • Species listed in the threatened species schedules of the <i>EPBC ACT 1999</i> and the <i>TPWC Act 2000</i> are not known to occur in this community.	
Condition, Declared and other Naturalised Species: The Mangrove Forests assessed were generally found to be in 'good' condition. However there was some evidence of disturbance including pushed fill, rubbish and cyclone damage. Weeds or naturalised species were not recorded in this vegetation community.	

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Table Appendix F -5 Community 5 - Urban parkland / residential development

Location and Distribution: Managed urban parkland, as mapped by NRETAS (2010c) is located adjacent to the Fannie Bay Football Oval, north of the Fannie Bay residential area and in the northern area of East Point Reserve (for example adjacent to the Airfield). To avoid the vegetation communities 1 – 4 described above the ERM corridor is predominantly proposed to traverse the urban parkland area. The urban parkland area is largely comprised of slashed native and naturalised grasses and isolated trees or small patches of vegetation. The proposed pipeline also traverses the edge of an existing residential development site (currently active) at Fannie Bay. The urban area likely to be impacted by the proposed ERM corridor measures approximately 36,957 m² in size (including 18,933 m² of clearing).		
		Description: Canopy cover is less than 5% in this vegetation community. Tree species that occur as isolated trees and clumps / patches of trees include <i>Acacia auriculariformis</i> (Earpod Wattle), <i>Buchanania obovata</i> (Green Plum), <i>Khaya senegalis</i> (African mahogany), <i>Peltophorum pterocarpum</i> <i>Melaleuca leucadendra</i> (Weeping Paperbark), <i>Pandanus spiralis</i>. <i>Acacia</i>, <i>Corymbia</i> and <i>Eucalyptus</i> also occur as isolated trees in the vicinity of the proposed ERM corridor. Grasses and vines are very common in the ground stratum; native species include <i>Pennisetum pedicallatum</i>, <i>Sorghum</i> sp., <i>Cyperus compressus</i>, <i>Canavalia rosea</i> and <i>Physalis minima</i>. A drainage line lies directly to the north of the development site and is lined by sparse <i>Pandanus spiralis</i> and <i>Acacia</i> sp (as regrowth) with a heavy grassy understorey.
Relationships and significance of the vegetation community: • The community is not recognised as significant vegetation under the <i>Northern Territory Land Clearing Guidelines</i> (NRETAS, 2010b) and is not listed under the <i>EPBC Act 1999</i>. • Species listed in the threatened species schedules of the <i>EPBC ACT 1999</i> and the <i>TPWC Act 2000</i> were not observed in this community.		
Condition, Declared and other Naturalised Species: Naturalised species are common throughout the area and many have been planted and are considered managed species within the parkland. Such species included <i>Khaya senegalis</i> (African mahogany) and <i>Delonix regia</i> (Poinciana). Declared weeds (Northern Territory of Australia, 2001) and environmental weeds recorded included <i>Pennisetum polystachion</i> (Mission Grass), <i>Mimosa pigra</i> (Giant Sensitive Weed), <i>Hyptis suaveolens</i> (Hyptis) and <i>Ziziphus mauritiana</i> (Chinee Apple). Other widespread weeds included <i>Leucaena leucocephala</i> (Lead tree), and <i>Passiflora foetida</i> (Stinking Passion Flower).		

F.1.2 Terrestrial Fauna

Field Survey

A dry season assessment of the fauna species was limited to general observational (birds and mammals) surveys conducted at various times (dawn, throughout the day and evening searches) utilising binoculars and spotlighting, and subsequent identification. Surveys of shore birds were focussed on a broader area to provide an assessment of adjacent terrestrial and mangrove habitats.

The fauna assessment recorded a total of 45 species of native terrestrial bird, mammal and reptile⁴ species within the proposed ERM corridor including:

- Five (5) mammal species
- Thirty-six (36) birds species.
- Four (4) reptile species.

Of these 45 native faunal species, two species listed under the TPWC were recorded; *Varanus panoptes* (Yellow-spotted Monitor) and the *Burhinus grallarius* (Bush Stone Curlew). An additional three introduced species, the Cane Toad (*Rhinella marina*), Cat (*Felis catus*) and the Asian House Gecko (*Hemidactylus frenatus*), were recorded within the proposed pipeline area (**Table Appendix F-6**).

Table Appendix F-6 Fauna species recorded in the Proposed Development corridor area

Amphibians Whilst amphibian species surveys were not undertaken areas of likely amphibian habitat occur within the proposed ERM corridor. Habitats for amphibians are limited to small areas of terrestrial vegetation, drainage lines and depressions that occur throughout the proposed ERM corridor and surrounding area. Areas of seasonal inundation are also present. Species which may potentially be present in the area (based on surveys conducted by EMS 2011 at East Arm Wharf and previously reported in the region) include Purple Treefrog (<i>Litoria rubella</i>), Common Tree Frog (<i>Litoria caerulea</i>), Striped Rocket Frog (<i>Litoria nasuta</i>), Giant Frog (<i>Cyclorana australis</i>), Marbled Frog (<i>Limnodynastes convexiusculus</i>) and Northern Dwarf Tree Frog (<i>Litoria bicolor</i>). These species are generally common and are not listed as threatened (endangered or vulnerable) in either the <i>EPBC Act 1999</i> or <i>TPWC Act 2000</i>. The only amphibian species listed as threatened under NT Legislation, the Howard River Toadlet (<i>Uperoleia daviesae</i>), is known to occur in the Palmerston area. This species were not detected in the study area and there appears to be no or extremely limited suitable habitat for this species within area. The introduced Cane Toad was present at a number of sites including within the Mixed Species Closed Forest and along tracks within the East Point Reserve.
Reptiles Whilst reptiles were not targeted during the surveys, four species of reptiles were recorded. The most commonly encountered and widespread species were the introduced Asian house gecko and Cane toad. One varanid species, the Yellow-spotted Monitor (<i>Varanus panoptes</i>) was recorded (deceased) close to the Ludmilla Waste Treatment Plant. One Slate-Grey Snake (<i>Stegonotus cucullatus</i>) was observed during a nocturnal survey. Estuarine Crocodiles (<i>Crocodylus porosus</i>) are known to occur in marine and estuarine habitats in the local area and small numbers are captured in Ludmilla Creek by the NT Parks and Wildlife Service (NRETAS, 2011). This species is listed as a migratory and marine species under the <i>EPBC Act 1999</i>.

⁴ Specific searches and trapping for terrestrial vertebrates other than mammals and birds were not conducted as part of the survey. Reptilian species recorded were only those observed.

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Terrestrial Birds

Thirty-two terrestrial bird species were recorded whilst conducting the flora assessments. The most frequently recorded terrestrial bird species were the White-breasted Woodswallow (*Artamus leucorhynchus*), White-gaped Honeyeater (*Lichenostomus unicolor*), Bar-shouldered Dove (*Geopelia humeralis*), Helmeted Friarbird (*Philemon buceroides*), Rainbow Bee-eater (*Merops ornatus*), Yellow White-eye (*Zosterops luteus*), Brown Falcon (*Falco berigora*), Brown Honeyeater (*Lichmera indistincta*), Crimson Finch (*Neochima phaeton*), Double-barred Finch (*Taeniopygia bichenovii*), Long-tailed Finch (*Poephila acuticauda*), Chestnut-breasted Mannikin (*Lonchura castaneothorax*), Fig Bird (*Spethcortheres vieilloti*), Forest Kingfisher (*Todiramphus macleayi*), Olive-backed Oriole (*Oriolus sagittatus*), Orange-footed Scrub Fowl (*Megapodius reinwardt*), Masked Lapwing (*Vanellus miles*), Peaceful Dove (*Geopelia placida*), Varied Triller (*Lalage leucomela*), Grey Shrike Thrush (*Colluricincla harmonica*), White-bellied Cuckoo Shrike (*Coracina lineata*) and Sulfur-crested Cockatoo (*Cacatua galerita*).

Bird species that were restricted to or more frequently recorded in mangrove habitats, drainage lines and ecotones included the Red-headed Honeyeater, (*Myzomela erythrocephala*), Lemon-bellied Flycatcher (*Microeca flavigaster*), Collared Kingfisher (*Todiramphus chloris*) and Forest Kingfisher.

Two terrestrial nocturnal bird species, the Barking Owl (*Ninox connivens*) and Bush Stone-Curlew (*Burhinus grallarius*), were recorded along the proposed ERM corridor.

The terrestrial bird species recorded during the current and previous surveys in the region are not listed as threatened in relevant legislation. The Bush Stone-Curlew is listed as near threatened under the TPWC Act. A number of terrestrial bird species listed in EPBC Act migratory species schedules, including the Rainbow Bee-Eater, were recorded within the proposed pipeline area.

Marine and Wetland Birds

Six marine and wetland bird species were recorded during shorebird counts conducted at dawn and dusk over a seven day period at the proposed ocean outfall site (see site 32 along the proposed ERM). This area is a rocky reef consisting of small rock pools at low tide and is inundated at high tide. Shore-line mangroves (*Rhizophora stylosa*) occur within the vicinity of the ocean outfall (approximately 100 m distant). Other coastal habitats that occur within the vicinity of the proposed ocean outfall site are sandy beach and small vegetated dune systems.

The recorded species listed migratory wetland and marine species Common Greenshank (*Tringa nubularia*), Beach Stone-Curlew and the Rainbow Bee-eater. Other non-listed species recorded included Brahminy Kite (*Haliastur indus*), Eastern Reef Egret (*Egretta sacra*), Striated Heron (*Butorides striatus*) and Common Tern (*Sterna hirundo*).

Other species recorded in association with marine / coastal habitats included Whistling Kite (*Haliastur sphenurus*), Fork-tailed Swift (*Apus pacificus*), Brown Falcon and Crimson Finch.

Surveys conducted by Ecological Management Services (EMS) (2011) at East Arm Wharf in Darwin Harbour recorded 47 marine and wetland bird species whilst other studies in the region have recorded additional species.

Listed migratory wetland and marine birds are known to occur in the area.

Mammals

At least six terrestrial native mammal species were identified within the proposed pipeline area during the dry season nocturnal surveys.

Spotlight surveys recorded few mammal species, including Black Flying-fox (*Pteropus alecto*), Agile Wallaby (*Macropus agilis*), Grassland Melomys (*Melomys burtoni*) and the Northern Brushtail Possum (*Trichosurus arnhemensis*). At least one additional species of bat was also observed; however it was unable to be identified to species level.

A cat (*Felis catus*) was also recorded and appeared to be feral although it may have been a domestic cat from nearby homes.

Surveys conducted by EMS (2011) at East Arm Wharf in Darwin Harbour recorded 14 native mammal species, ten of which were bats, and the Indo-Pacific Humpback Dolphin (*Sousa chinensis*) was observed offshore of East Arm Wharf.

The mammal species recorded in the surveys at East Point and by EMS (2011) in the East Arm Wharf area are generally common in northern Australia and none of the species are classified as threatened under the EPBC Act or TPWC Act. Acer Vaughn (1993) previously recorded the endangered Northern Quoll (*Dasyurus hallucatus*) within the East Arm Wharf area.

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F.1.3 Threatened flora and fauna species recorded in surrounding areas

Results of a review of existing databases and reports listing critically endangered, endangered and vulnerable flora and fauna species recorded in the surrounding areas are included under **Table Appendix F-7** below.

The search of the *EPBC Act 1999* protected matter databases for the East Point – Ludmilla Creek area lists eight threatened terrestrial / freshwater species that may occur or have been recorded in the area. In addition, the *EPBC Act 1999* protected matter search lists a range of listed migratory species that potentially occur in the East Point area (SEWPC, 2011).

The search of the NTG databases for the area lists fifteen (15) threatened terrestrial / freshwater species that may occur or have been recorded in the area. It is important to note that some of these records of threatened species are historical or are generated from data from the wider region.

Many of these species are also listed in existing data from the wider area (EMS 2011; Acer Vaughan 1993). A list of EPBC Act listed migratory and marine species and records for East Point surrounding areas are presented in **Table Appendix F-7**.

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Table Appendix F-7 Fauna species recorded in the proposed ERM corridor area

Common Name	Scientific Name	EPBC Migratory Terrestrial Species	EPBC Migratory Wetland/ Marine Species	EPBC Listed Marine Species	EAW Maximum Count EMS
Estuarine Crocodile	<i>Crocodylus porosus</i>		X	X	
Freshwater Crocodile	<i>Crocodylus johnstoni</i>				
Fork-tailed Swift	<i>Apus pacificus</i>		X	X	
Great Egret	<i>Ardea modesta</i>		X	X	3
Cattle Egret	<i>Ardea ibis</i>		X	X	
Little Tern	<i>Sternula albifrons</i>		X	X	11
Melville Cicadabird	<i>Coracina tenuirostris melvillensis</i>	X		X	
Gouldian Finch	<i>Erythrura gouldiae</i>	X			
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	X	X	X	3
Rainbow Bee-eater	<i>Merops ornatus</i>	X		X	
Barn Swallow	<i>Hirundo rustica</i>	X		X	
Derby White-browed Robin	<i>Poecilodryas superciliosa cerviniventris</i>	X		X	
Rufous Fantail	<i>Rhipidura rufifrons</i>	X		X	
Common Sandpiper	<i>Actitis hypoleucos</i>	X	X	X	23
Ruddy Turnstone	<i>Arenaria interpres</i>		X		
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		X	X	200
Sanderling	<i>Calidris alba</i>		X	X	
Red Knot	<i>Calidris tenuirostris</i>		X	X	
Curllew Sandpiper	<i>Calidris ferruginea</i>		X	X	23
Red-necked Stint	<i>Calidris ruficollis</i>		X	X	89
Great Knot	<i>Calidris tenuirostris</i>		X	X	20

Appendix F Species List

Common Name	Scientific Name	EPBC Migratory Terrestrial Species	EPBC Migratory Wetland/ Marine Species	EPBC Listed Marine Species	EAW Maximum Count EMS
Greater Sand Plover	<i>Charadrius leschenaultii</i>		X	X	210
Lesser Sand Plover	<i>Charadrius mongolus</i>		X	X	302
Oriental Plover	<i>Charadrius veredus</i>		X	X	
Oriental Pratincole	<i>Galreola malvidarum</i>		X	X	
Grey-tailed Tattler	<i>Tringa brevipes</i>		X	X	15
Broad-billed Sandpiper	<i>Limicola falcinellus</i>		X	X	
Bar-tailed Godwit	<i>Limosa lapponica</i>		X	X	21
Black-tailed Godwit	<i>Limosa limosa</i>		X	X	23
Eastern Curlew	<i>Numenius madagascariensis</i>		X	X	99
Little Curlew	<i>Numenius minutus</i>		X	X	4
Whimbrel	<i>Numenius phaeopus</i>		X	X	8
Pacific Golden Plover	<i>Pluvialis fulva</i>		X	X	
Grey Plover	<i>Pluvialis squatarola</i>		X	X	6
Marsh Sandpiper	<i>Tringa stagnatilis</i>		X	X	263
Wood Sandpiper	<i>Tringa glareola</i>		X	X	
Terek Sandpiper	<i>Xenus cinereus</i>		X	X	52
Magpie Goose	<i>Anseranas semipalmata</i>			X	
Pectoral Sandpiper	<i>Calidris melanotos</i>			X	
Long-toed Stint	<i>Calidris subminuta</i>			X	
Little Ringed Plover	<i>Charadrius dubius</i>			X	
Red-capped Plover	<i>Charadrius ruficapillus</i>			X	9
Swinhoe's Snipe	<i>Gallinago megala</i>			X	
Pin-tailed Snipe	<i>Gallinago stenura</i>			X	

Appendix F Species List

Common Name	Scientific Name	EPBC Migratory Terrestrial Species	EPBC Migratory Wetland/ Marine Species	EPBC Listed Marine Species	EAW Maximum Count EMS
Wandering Tattler	<i>Heteroscelus incanus</i>			X	
Black-winged Stilt	<i>Himantopus himantopus</i>			X	60
Asian Dowitcher	<i>Limnodromus semipalmatus</i>			X	
Australian Praticole	<i>Stiltia isabella</i>			X	
Australian White Ibis	<i>Threskiornis molucca</i>			X	2
Eastern Osprey	<i>Pandion cristatus</i>		X	X	1
Brahminy Kite	<i>Haliastur indus</i>			X	2
Australian Pelican	<i>Pelecanus conspicillatus</i>			X	40
Eastern Reef Egret	<i>Egretta sacra</i>		X	X	12
Intermediate Egret	<i>Ardea intermedia</i>			X	2
Little Egret	<i>Egretta garzetta</i>			X	4
Buff-banded Rail	<i>Gallirallus philippensis</i>			X	1
Beach Stone-curlew	<i>Esacus neglectus</i>			X	1
Gull-billed Tern	<i>Gelochelidon nilotica</i>			X	26
Crested Tern	<i>Thalasseus bergii</i>			X	5
Common Tern	<i>Sterna hirundo</i>		X	X	10
Bridled Tern	<i>Onychoprion anaethetus</i>		X	X	2
Whiskered Tern	<i>Chlidonias hybrida</i>			X	65
White-winged Black Tern	<i>Chlidonias leucopterus</i>		X	X	150
Silver Gull	<i>Chroicocephalus novaehollandiae</i>			X	18
Total Listed Species		8	31	59	