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27th March 2020

Australian Gas Infrastructure Group
PO Box Z5267
St Georges Terrace
PERTH WA 6831

Attention: Mark Brown – Senior HSE Advisor

Dear Mark

Re: Burrup – Pluto-NWS Interconnector Targeted Flora and Vegetation Survey

This letter details the results of a Targeted survey for conservation listed flora and vegetation as per your email dated 28 February 2020 and additional section request on the 4th March 2020.

1. Introduction

Australian Gas Infrastructure Group (AGIG) are constructing an interconnector pipeline corridor between the Woodside Energy Limited (Woodside) operated Karratha Gas Plant (KGP) and the Pluto Liquefied Natural Gas (LNG) plant, located on the Burrup Peninsula in the Pilbara region. This pipeline corridor has been previously surveyed by Astron Environmental Services (Astron) in 2018. Access onto the corridor section west of Burrup Road was not surveyed by Astron (2018).

Vicki Long & Associates (VLA) was, therefore, engaged by AGIG to undertake a Targeted survey for conservation listed flora and vegetation along a short section of existing track, the widening of which would allow vehicular access onto the pipeline corridor. This survey was to accommodate an estimated 1 m widening of a short section of existing track off the Woodside Visitor Centre access road into the interconnector corridor and a second very short section uncleared track off the interconnector corridor back towards the KGP (Figure 2).

2. Scope

The Scope of Work is to survey the edges of an existing track (Track 2) and a small uncleared track (Track 2) on Burrup Peninsula and locate any Priority or Significant Flora and any Priority Ecological Communities (PECs) which may be impacted.

3. Methods

Although it is only envisaged that 1 m each side of Track 1 (see Figure 2) will need to be cleared, a distance of 15m out from the edge of the track on its northern boundary was surveyed to accommodate any unforeseen or indirect impacts. The southern edge of the track is fenced within 1 m of the track edge. The entire length of the track (230 m) was walked. Any conservation listed flora, PECS and weeds of significance were recorded and located by handheld GPS and marked on a field map. Note was made of how far out from the edge of the track these occurred.

Track 2 (Figure 2) was determined based on avoidance of any larger trees in the drainage line through which it crosses and where most existing disturbance already is evident. A path of 20 m was walked along this short section of 45 m to ensure no conservation listed flora and no drainage line trees would be impacted.

The survey was conducted by experienced, local botanist Vicki Long, Principal Botanist, VLA, on March 23rd 2020.

4. Known Conservation Listed Flora and PECs

No State or Commonwealth listed TECs are known to occur within the vicinity of the survey area. The survey area occurs within, or immediately adjacent to, the buffer of two Priority 1 PECs:

- *Burrup Peninsula rock pile communities*: pockets of vegetation in rock piles, rock pockets and outcrops. Comprises a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Includes short-range endemic land snails.
- *Burrup Peninsula Rock pool communities*: calcareous tufa deposits. Habitat for interesting aquatic snails.

Database searches listed eight Priority 3 species and one Priority 4 species within a 20 km buffer of the survey area. There were no threatened flora species or species listed as MNES under the EPBC Act reported within 20 km. Listed Priority flora and their likelihood of occurrence are listed in Table 1.

Table1: Listed Priority Flora and their Likelihood of Occurrence

Species	Life form	Habitat	Likelihood of occurrence
<i>Eragrostis surreyana</i>	Annual	Wetland, waterhole	Unlikely
<i>Gymnanthera cunninghamii</i>	Perennial	Sandy soils, rockpiles.	Likely
<i>Oldenlandia</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	Annual	Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.	Unlikely
<i>Schoenus punctatus</i>	Perennial	Watercourses	Unlikely

Species	Life form	Habitat	Likelihood of occurrence
<i>Stackhousia clementii</i>	Perennial	Skeletal soils. Sandstone hills.	Unlikely
<i>Terminalia supranitifolia</i>	Perennial	Sand. Among basalt rocks.	Likely
<i>Themeda sp. Hamersley Station (M.E. Trudgen 11431)</i>	Perennial	Red clay. Clay pan, grass plain.	Unlikely
<i>Vigna triodiophila</i>	Probably perennial but dying back to rootstock in dry.	Rockpile, rocky hillslopes.	Likely
<i>Rhynchosia bungarensis</i>	Perennial	Pebbly, shingly coarse sand amongst boulders	Likely

5. Rainfall Preceding Survey

Rainfall data obtained from Karratha Aero 004083 for 2020 indicate adequate rainfall had been received prior to the field survey. The 70.8 mm of rainfall received in January was followed up with 235 mm in February, largely due to the occurrence of Tropical Cyclone Damien. Vegetation was largely recovered from wind damage received from TC Damien.

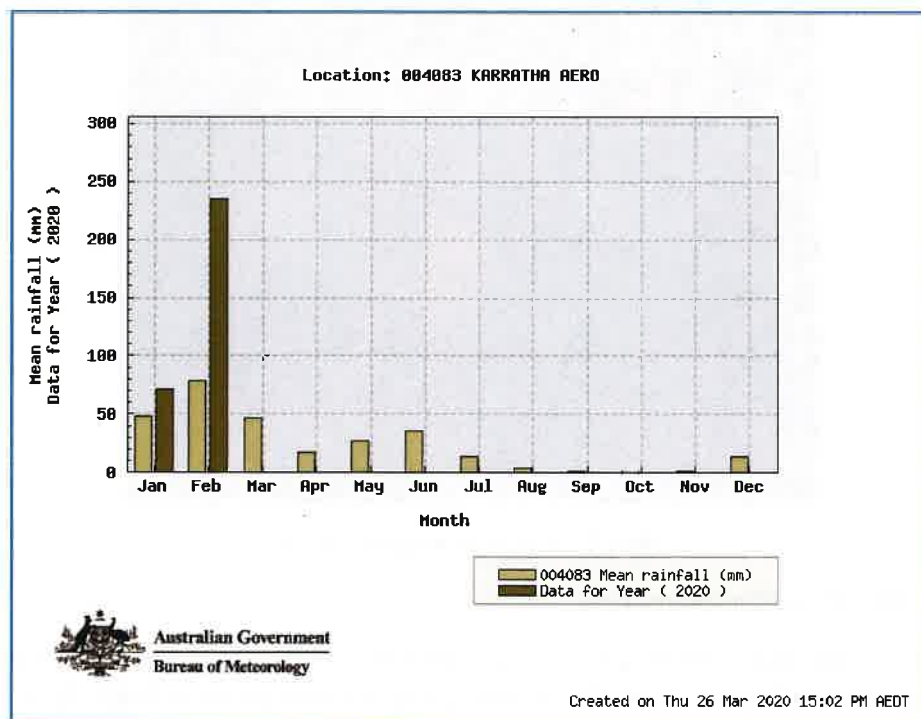


Figure 1: Rainfall received - Karratha Aero 004083 February and March 2020 and Mean Annual Rainfall calculated from 1972 – 2020 (Bureau of Meteorology 2020).

6. Limitations

There were no perceived limitations to this survey and the data collected is considered to be complete. The Scope was clear, contextual information was available, preceding rainfall and timing following this rainfall ensured a high proportion and good representation of species were present, aerial imagery was adequate, access was not an issue, there was adequate time for an intensive search and the field botanist has had over 35 years' experience working on the Burrup Peninsula.

7. Results

7.1 PECs

No PECs were recorded in the survey area despite the corridor intercepting rockpile habitat for the occurrence of the Burrup Rockpile PEC.

7.2 Priority Flora

One occurrence of P4 *Rhynchosia bungarensis* was found in association of the rockpile at GPS location 0476803E 7721862N. It was approximately 5 m from the estimated 1 m width to be cleared. This vinelike species is common and widespread on the Burrup Peninsula and has been recorded at other location in the Pilbara. Its close relative, *Rhynchosia minima* was also recorded at several locations in the survey area – it is not a Priority Species.



Plate 1: *Rhynchosia bungarensis* P4

7.3 Other Flora Present in Survey Area

A total of 54 plant taxa comprising 19 families and 42 genera were identified within the survey area. The Fabaceae (peas) and Poaceae (grasses) had the highest levels of species richness, Fabaceae with 14 taxa and Poaceae with 9 taxa. A complete flora list is presented in Appendix 1 attached.

7.4 Track 1 Vegetation and Condition

Track one is a narrow track built up with imported stony soils and is fenced on the western southern side. It passes through vegetation of *Triodia epactia* hummock grassland with scattered shrubs of *Dichrostachys spicata* and *Grevillea pyramidalis* and there are small rockpiles with *Brachychiton acuminatus* and *Terminalia circumalata*. The vegetation condition along the edges of the track based on Trudgen 1988 (Attachment 1) is Very Good.

7.5 Track 2 Vegetation and Condition

Vegetation along this very short section of alignment is uncleared but some disturbance has occurred in the area generally in the past. On the eastern end, the alignment runs through *Triodia epactia* hummock grassland with scattered shrubs and at its western extent it runs through a drainage line with scattered *Eucalyptus victrix*, *Terminalia circumalata* low trees over *Triodia angusta* hummock grassland. The vegetation condition of Track 2 based on Trudgen is Very Good.



Plate 2: Track 1 through rockpiles – vegetation surveyed was surveyed for 15 m on the northern side and along the fenceline on the southern side.



Plate 3: Flagged rock at western end of Track 2 through *Eucalyptus victrix* trees in drainage line.

7.6 Weeds

Two commonly occurring environmental weeds were recorded along both Track 1 and Track 2. The introduced buffel grass (*Cenchrus ciliaris*) was relatively frequent in the vicinity of both tracks. The low perennial shrub kapok (*Aerva javanica*) was less frequent along Track 1 but was more frequent where Track 2 intersects the interconnector pipeline corridor.

The Astron report (2018) indicates that at the time of that survey, kapok was predominantly restricted to within the KGP and LNG sites, road verges and pipeline crossing of Burrup Road. It was not found along the majority of the interconnector corridor paralleling Burrup Road. This indicates that weed management should address hygiene measures on the southern side of Burrup Road to prevent it spreading along the portion of the pipeline north of Burrup Road.

8.0 Discussion

The one Priority 4 (*Rhynchosia bungalowensis*) found was outside the envisaged 1 m clearing envelope. The plant is widespread and relatively commonly occurring on the Burrup Peninsula in association with rockpiles and drainage gullies. The removal of this one plant, if it was necessary would not impact the population at all.

No Burrup Rockpile PECs were found. Individual trees do occur on the rockpiles which the track intersects but these individual species do not constitute a Burrup Rockpile PEC. The trees included one large and one relatively young northern kurrajong (*Brachychiton acuminatus*) and if the latter was to be removed, it would be possible to extract it and replant it in landscaping either in the KGP garden or as a donation to the City.



Plate 4: Small northern kurrajong

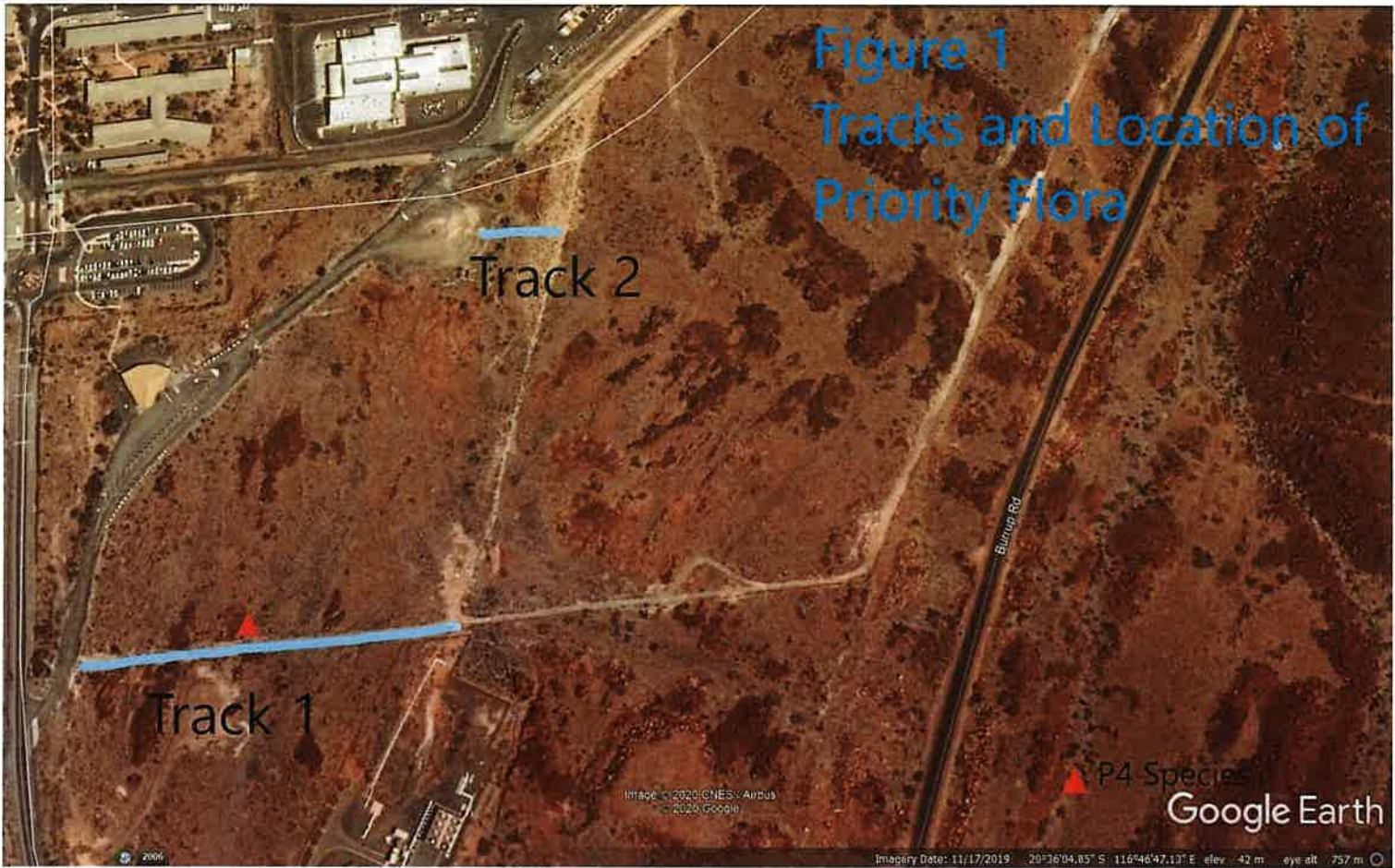
Weeds do occur on the Track 1. Although buffel grass is relatively common on disturbed areas on the Burrup, kapok is less so and the Astron 2018 report indicates they are not present along the interconnector pipeline corridor on north of Burrup Road. Weed management needs to be addressed to prevent the spread of these weeds, particularly kapok into currently weed free areas.

Thank you for the opportunity to conduct this work. If you have any queries on the results, please do not hesitate to contact me.

Yours Sincerely



Vicki Long
Principal Botanist/Manager



Attachment 1

Vegetation condition scale as adapted from Trudgen (1988) (Environmental Protection Authority 2016)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

Attachment 2

Flora list for survey area

Family	Species	Conservation Code	Weed
Amaranthaceae	<i>*Aerva javanica</i>		*
	<i>Gomphrena cunninghamii</i>		
	<i>Ptilotus exaltatus</i>		
Araliaceae	<i>Trachymene oleracea</i>		
Asteraceae	<i>Streptoglossa decurrens</i>		
Boraginaceae	<i>Ehretia saligna</i>		
	<i>Heliotropium cunninghamii</i>		
	<i>Trichodesma zeylanicum</i>		
Cleomaceae	<i>Cleome viscosa</i>		
Combretaceae	<i>Terminalia circumalata</i>		
Convolvulaceae	<i>Bonamia media</i>		
Cucurbitaceae	<i>Cucumis variabilis</i>		
Euphorbiaceae	<i>Euphorbia australis</i>		
	<i>Euphorbia coghlaii</i>		
	<i>Euphorbia tannensis</i>		
Fabaceae	<i>Acacia ampliceps</i>		
	<i>Acacia bivenosa</i>		
	<i>Acacia coriacea</i>		
	<i>Crotalaria novae-hollandiae</i>		
	<i>Crotalaria medicaginea</i>		
	<i>Dichrostachys spicata</i>		
	<i>Indigofera colutea</i>		
	<i>Indigofera linnaei</i>		
	<i>Indigofera monophylla</i>		
	<i>Rhynchosia bungarensis</i>	P4	
	<i>Rhynchosia minima</i>		
	<i>Swainsona formosa</i>		
	<i>Tephrosia rosea</i> var. <i>clementii</i>		
	<i>Abutilon lepidum</i>		
Malvaceae	<i>Brachychiton acuminatus</i>		
	<i>Corchorus walcottii</i>		
	<i>Triumfetta appendiculata</i>		
	<i>Triumfetta clementii</i>		
Menispermaceae	<i>Tinospora smilacina</i>		

Family	Species	Conservation Code	Weed
Myrtaceae	<i>Eucalyptus victrix</i>		
Nyctaginaceae	<i>Boerhavia coccinea</i>		
	<i>Boerhavia gardnerii</i>		
Phyllanthaceae	<i>Flueggea virosa</i>		
	<i>Notoleptopus decaisnei</i>		
	<i>Phyllanthus erwinii</i>		
	<i>Phyllanthus maderaspatensis</i>		
Poaceae	<i>Aristida contorta</i>		
	<i>Cenchrus ciliaris</i>		*
	<i>Chrysopogon fallax</i>		
	<i>Cymbopogon ambiguus</i>		
	<i>Dactyloctenium radulans</i>		
	<i>Enneapogon caeruleus</i>		
	<i>Paspalidium tabulatum</i>		
	<i>Themeda triandra</i>		
	<i>Triodia angusta</i>		
	<i>Triodia epactia</i>		
Portulacaceae	<i>Portulaca oleracea</i>		
Proteaceae	<i>Grevillea pyramidalis</i>		
Violaceae	<i>Hybanthus auranticus</i>		

