



Browse LNG Development

TARGETED PRIORITY FLORA STUDY

SKM Rev. 3

9 October 2012

Woodside Rev. 1

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Contents

Limitation Statement	v
Executive Summary	vii
1. Introduction	1
1.1. Background and Project Description	1
1.2. Objectives and Scope of Work	1
2. Methodology	3
2.1. Survey Timing and Personnel	3
2.2. Survey Area and Constraints	3
2.3. Field Methodology	4
2.3.1. Selection of Targeted Sites for Priority Flora Survey	4
2.3.2. Survey Technique	8
2.3.3. Data Recording	8
2.4. Interpretation of Results	8
2.5. Impact Evaluation Methods	8
3. Results	9
3.1. Priority Flora Recorded	9
3.1.1. <i>Gomphrena pusilla</i> (Priority 2) – Amaranthaceae	9
3.1.2. <i>Eriachne</i> sp. Dampier Peninsula (K.F. Kenneally 5946) (Priority 3) – Poaceae	9
3.1.3. <i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i> (Priority 3) - Myrtaceae	10
3.1.4. <i>Pittosporum moluccanum</i> (Priority 4) - Pittosporaceae	10
3.1.5. Other Flora Species of Significance	10
3.2. Proportional Impact on Priority Flora by the Woodside Downstream Development	11
4. Discussion	23
4.1. <i>Eriachne</i> sp. Dampier Peninsula (K.F. Kenneally 5946) (P3)	23
4.2. <i>Gomphrena pusilla</i> (P2)	24
4.3. <i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i> (P3)	25
4.4. <i>Pittosporum moluccanum</i> (P4)	25
5. Conclusion	27
6. References	29
Appendix A Available Images of Priority Flora	31
Appendix B Coordinates of Priority Flora Locations Recorded within the Current Study	35

Figures

Figure 2.1 Targeted Priority Flora Search Area 1	5
Figure 2.2 Targeted Priority Flora Search Area 2	6
Figure 2.3 Targeted Priority Flora Search Area 3	7
Figure 3.1 Location of Targeted Transects and Priority Flora Recorded in Search Area 1	16
Figure 3.2 Location of Targeted Transects and Priority Flora Recorded in Search Area 2 (a)	17
Figure 3.3 Location of Targeted Transects and Priority Flora Recorded in Search Area 2 (b)	18
Figure 3.4 Location of Targeted Transects and Priority Flora Recorded in Search Area 2 (c)	19
Figure 3.5 Location of Targeted Transects and Priority Flora Recorded in Search Area 3	20
Figure 3.6 Location of Priority Flora and Potential Flora of Significance in relation to the Downstream Development.	21
Figure 3.7 Location of the Targeted Priority Flora and Flora of Potential Significance at a Regional Level from Woodside and Western Australian Herbarium records	22

Tables

Table 3-1 Location and Number of Priority Flora and Flora of Interest Recorded	12
Table 3-2 Estimated Number of Known Priority Flora Inside and Outside of the Woodside Browse Downstream Development Area	14

Limitation Statement

The sole purpose of this report and the associated services performed by Sinclair Knight Merz (SKM) as part of the Consolidated Environmental Services (CES) contract was to undertake a targeted Priority flora assessment study and prepare a report on the results and potential impact of the proposed Browse Liquefied Natural Gas (BLNG) Downstream Development for Woodside Energy Ltd. The proposed area of impact has been identified in conjunction with the client in accordance with the scope of services set out in the contract between CES and the Client, Woodside Energy Limited (Woodside). That scope of services, as described in this report, was developed with the Client. This report is to provide information in relation to the potential impacts to four Priority flora species: *Gomphrena pusilla* (P2), *Erichane*. sp. Dampier Peninsula (K.F. Kenneally 5946) (P3), *Lophostemon grandiflorus* subsp. *grandiflorus* (P3) and *Pittosporum moluccanum* (P4) in the James Price Point coastal area.

In preparing this report, the CES has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, the CES has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Data in this report have been derived from a number of sources, including, drainage and elevation data provided by other consultants for the Client, data from SKM for the Client, other relevant studies undertaken by third parties for other clients, datasets compiled from other sources (such as records from the Department of Environment and Conservation, or the Western Australian Herbarium). The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. CES has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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Executive Summary

Environmental surveys in 2011 associated with Woodside's Onshore Geotechnical Site Investigations (OGSI) and other aspects of the Downstream Development as part of the proposed Browse LNG (BLNG) Precinct have identified a number of new Priority flora individuals and populations of *Gomphrena pusilla* (Priority 2), *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) (Priority 3) and *Pittosporum moluccanum* (Priority 4) within and nearby the proposed Downstream Development impact areas. Furthermore, since the submission of the Strategic Assessment Report (SAR) for the BLNG Precinct, the species *Lophostemon grandiflorus* subsp. *grandiflorus* has been listed as Priority 3, which is also known from drainage basin habitats in the vicinity of the Downstream Development. These four species were targeted in this study.

The objective of this targeted search was to determine the abundance and distribution of Priority flora species related to the Downstream Development, outside of the proposed area of impact. The purpose was to assist in determining the significance of disturbance to Priority flora within the impact areas compared to non-impact areas in the wider area, thereby informing the impact assessment presented within Woodside's Derived Proposal. A field survey was conducted on 10th and 11th August 2011 outside of the Downstream Development area and along Manari Road and Cape Leveque Road. The survey targeted a selection of regional locations of known previous Western Australian Herbarium (WAH) records for each species and other favourable habitats in the wider vicinity of the proposed Woodside Downstream Development.

Populations of the four Priority flora species (*Gomphrena pusilla*, *Eriachne* sp. Dampier Peninsula, *Lophostemon grandiflorus* subsp. *grandiflorus* and *Pittosporum moluccanum*) were recorded from this survey. The total number of individual plants for each Priority flora species at each location varied from low to very high, with the number of individuals recorded ranging between three and over 10 000. Two additional potential flora species of significance were recorded from the current survey: *Grewia* aff. *retusifolia* (R.L. Barrett 7065) and *Spermacoce* sp. Dampier Peninsula (R.L. Barrett 7076).

Spatial analysis of the four targeted Priority flora species of interest (based on Woodside and WAH records) identified that all four species are well represented outside of the Downstream Development area.

No significant impacts to the conservation status are expected for the four species targeted in the current study in relation to the Downstream Development. While count data may indicate the presence of larger populations within the Downstream Development area, this is a product of a high level of survey effort in the area. The current study readily identified new populations of the Priority flora species and it is expected that further targeted surveys would yield further populations of these species outside of the Downstream Development area.

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1. Introduction

1.1. Background and Project Description

Woodside Energy Limited (Woodside) is the operator of the proposed Browse Liquefied Natural Gas (BLNG) Development on behalf of the Browse Joint Venture. The BLNG Development will recover natural gas and condensate resources from the Browse Basin gas fields (Torosa, Brecknock and Calliance) that are located offshore, approximately 425 km north-north-west of Broome, in the Kimberley region of Western Australia. Subject to government approvals, onshore site investigations and other technical studies, Woodside (as a foundation proponent with Joint Venture partners) proposes to develop the fields through an onshore gas processing facility (the Downstream Development) within a State Government approved gas processing LNG Precinct (the BLNG Precinct) near James Price Point, 60 km north of Broome on the Dampier Peninsula. The proposed BLNG Precinct is designed to be a multiple-user Kimberley gas hub and has been defined in a Strategic Assessment Report (SAR) released by the Department of State Development (DSD) in 2010. Woodside is the foundation proponent at the Precinct. Woodside is developing a Derived Proposal for environmental approvals on the Browse LNG Downstream Development.

SKM was contracted by Woodside to undertake a targeted Priority flora search in order to inform the Derived Proposal assessment process.

1.2. Objectives and Scope of Work

Recent surveys associated with the Woodside Onshore Geotechnical Site Investigations (OGSI) have identified a number of new Priority flora individuals and populations of *Gomphrena pusilla* (Priority 2) and *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) (Priority 3), within the proposed Woodside Downstream Development impact areas. A recent targeted search for *Pittosporum mollucanum* (Priority 4), within the proposed southern pipeline corridor options, also revealed new records of this species. Furthermore, since the submission of the SAR the species *Lophostemon grandiflorus* subsp. *grandiflorus* has been listed as Priority 3 flora. This species is known to occur within the vicinity of the proposed BLNG Downstream Development. Currently few formal records of these Priority flora species exist in the DEC database from Western Australian Herbarium (WAH) records. See **Appendix A** for available photographs of these species.

The objective of the targeted search was to determine the abundance and distribution of Priority flora species related to the Downstream Development, outside of the area of impact. This will assist in determining the significance of disturbance to Priority flora within the impact areas compared to non-impact areas in the wider area, thereby informing the impact assessment presented within the Derived Proposal. The targeted Priority flora survey aims to demonstrate that the proportion of

impact to the total number of individual plants and populations as a result of the Downstream Development will not be significant (e.g. less than 10% impact) for the project approval.

The targeted surveys for these Priority flora species will provide a reliable and accurate assessment to determine whether impacts to each species from the project can be identified. The assessment targeted a selection of regional locations of known previous WAH records for each species and other favourable habitats in the wider vicinity of the proposed Downstream Development.

The targeted Priority flora survey specifically comprised the following:

- Targeted assessments for each of the four Priority flora species of interest in the areas immediately outside of the proposed BLNG Precinct site and also regionally.
- Strategic visits to known previous recorded locations of targeted Priority flora species, where appropriate to confirm and assess abundance and distribution for historical and contemporary records from DEC (via WAH).
- Recording abundance and distribution for newly recorded populations of the targeted Priority Flora species.
- Collection and submission of voucher plant specimen records to the WAH to confirm the validity of identification and ensure robust data delivery.
- Collection of coordinates for each site or boundary for Priority flora species to assist mapping and impact assessment for the Derived Proposal.
- Reporting on the outcomes of the survey and the proportion of individuals and populations of targeted priority flora species based on current knowledge at the completion of the studies assessment program.

2. Methodology

The methodology for the targeted priority flora survey took into account the EPA Guidance Statement No. 51, 'Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia' (EPA 2004).

2.1. Survey Timing and Personnel

The survey was undertaken over two days, the 10th and 11th August 2011. Botanical expertise was provided by C. Slee, T. Willing and R. Barrett, with a project induction held in Broome on the 9th August 2011.

Given the rainfall received and the extended 2011 wet season, it was identified that August provided a suitable opportunity to determine the abundance and distribution of Priority flora species related to the Downstream Development, outside of the area of impact. Survey timing, particularly in relation to targeted surveys, is important so as to ensure that species are present and in a condition that is adequate to be readily identified in the field. For example, annual species in the Kimberley, such as *Gomphrena pusilla* (Priority 2) and *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) (Priority 3) are known to degrade in condition during the dry season (beyond the end of the wet season) and can be difficult to reliably identify from the remaining plant parts late in the season. It is therefore critical that targeted surveys are undertaken at suitable times. At the time of the survey, the annual Priority flora species of *Gomphrena pusilla* and *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) were readily identified. However, it was noted that the observed plants of these species had undergone a reasonable level of decay due to the period of several months which had elapsed since the end of the wet season.

2.2. Survey Area and Constraints

The field team visited a range of targeted assessment locations between Broome and Coulomb Point (including James Price Point and proposed Woodside Downstream Development) and in the surrounding area along the access roads in these areas (**Figure 2.1** to **Figure 2.3**).

The survey included parts of the broader Section 91 land access approval area for Woodside, along with defined areas of Unallocated Crown Land (UCL) along the sides of Manari Road and Cape Leveque Road. Survey assessment also occurred at the James Price Point coastal area adjacent to, and south of, the Downstream Development area. Written authority was obtained from the landholder prior to the collection of flora at targeted areas along the eastern side of Manari Road and Cape Leveque Road, as per condition 7.2 of the DEC flora licence. Permission for flora collection under scientific licences on UCL is required under these circumstances to be granted by the local DEC District Office. Written authority was provided by the DEC Broome District Office

to the botanist flora licence holders for this survey to access and collect flora in the UCL along Manari Road and Cape Leveque Road (outside of the road reserve areas).

Targeted searches were undertaken within sub-sample locations of pre-selected areas detailed in **Figure 2.1** to **Figure 2.3**). A population of *Lophostemon grandiflorus* subsp. *grandiflorus* at the drainage basin adjacent to the Precinct (originally assessed by AECOM 2010) was not assessed as part of the current survey. *Lophostemon grandiflorus* subsp. *grandiflorus* is a dominant species within this drainage basin habitat and data from Woodside's Vegetation Monitoring Program (VMP) has been used to supplement the abundance assessment as part of this study.

2.3. Field Methodology

2.3.1. Selection of Targeted Sites for Priority Flora Survey

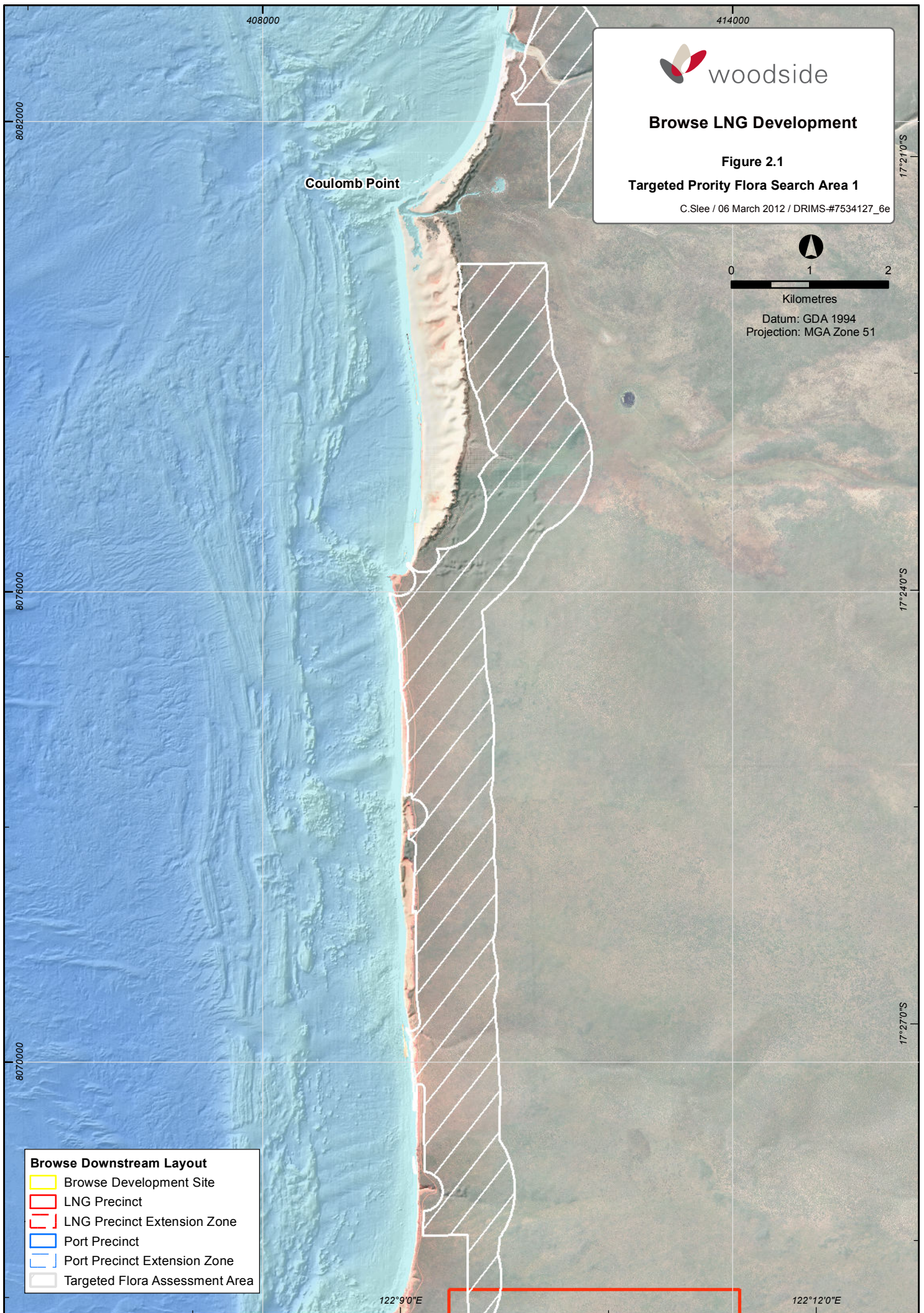
Sites were strategically targeted at a regional level firstly based on known records from DEC WAH voucher specimens for each species, with focus given to assessing WAH Priority flora locations in the following order:

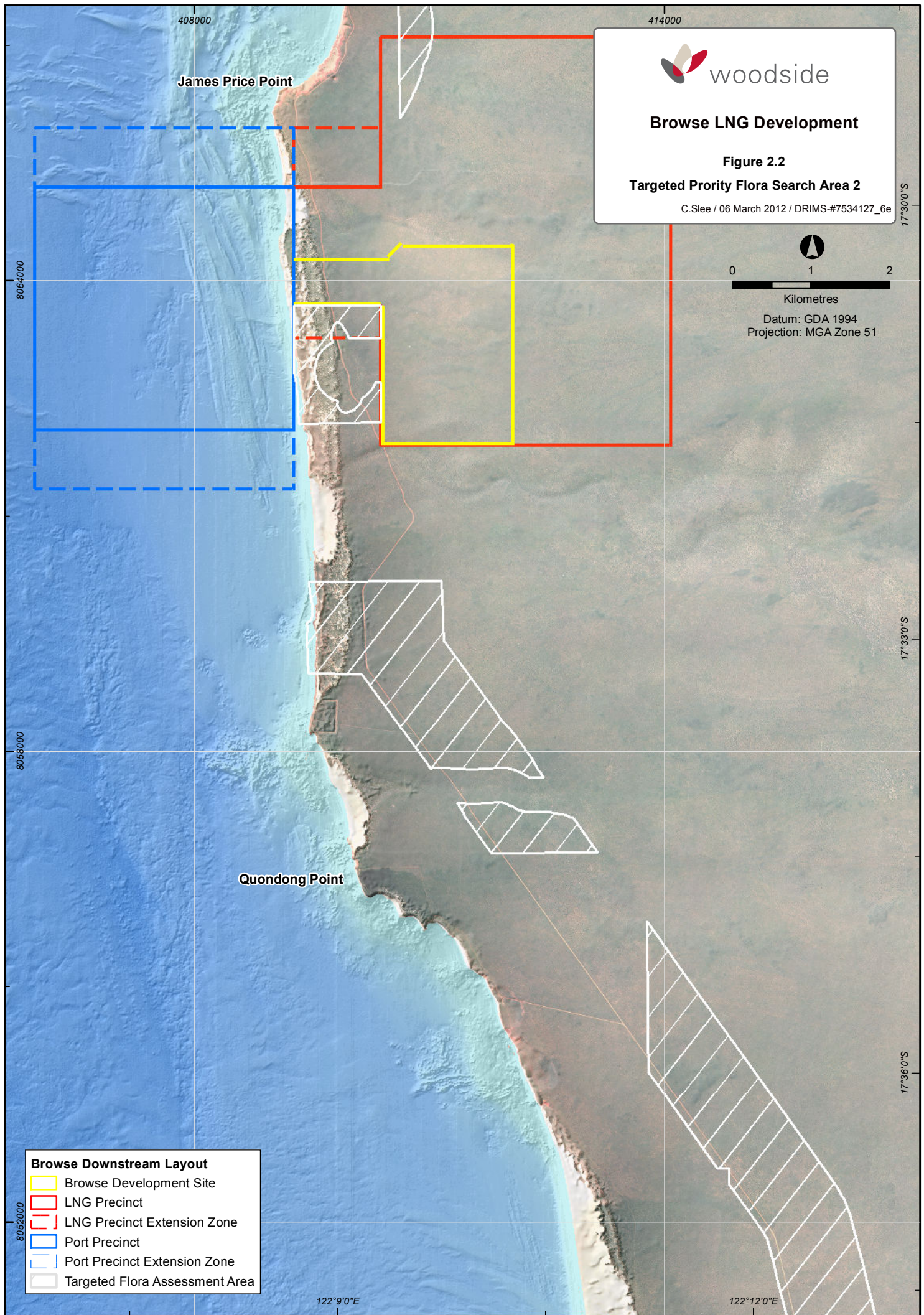
- between Broome and James Price Point outside the Downstream Development area;
- north of James Price Point; and
- east / north-east of the Broome to James Price Point area.

Following a search of the above areas, strategic targeted surveys were undertaken where appropriate in areas between two and 20 km north and south of the Downstream Development (or other prospective locations that could be accessed) for:

- pindan plains (for *Eriachne* sp. Dampier Peninsula);
- dune areas of open and closed vegetation (for *Gomphrena pusilla* and *Pittosporum mollucanum*); and
- drainage basin areas (for *Lophostemon grandiflorus* subsp. *grandiflorus*)

Survey locations were selected within each search area based on DIA and UCL restrictions.







2.3.2. Survey Technique

Two methods were used to assess Priority flora in the current survey. Population boundary coordinates were taken by GPS where appropriate for each Priority flora species and recorded with estimates of the population density and overall size. Point locations were recorded for the remainder of the Priority flora records along transects and other opportunistic locations. Transects of variable length (see **Figure 3.1** to **Figure 3.5**) were walked in suitable habitats for each Priority flora species, with the approximate area and population size recorded for each intercepted by these transects.

2.3.3. Data Recording

For all new populations of Priority flora identified at least one voucher plant specimen was collected where appropriate for taxonomic identification verification purposes and confirmation at the WAH where required.

Voucher specimens of suitable quality for all Priority flora collected during the survey will be lodged with the WAH, for future reference and to validate the findings of this study.

2.4. Interpretation of Results

Results of the field assessment were compiled into a single spreadsheet format of: species, location and number of individuals. General transect search locations and full Priority flora records were defined and provided to the Woodside Spatial team for production of supporting maps for this report.

Field data records and observations have been used in this report to present the results in the context of all previous Priority flora data available to Woodside for the key species of interest. Interpretation and conclusions in this report are based on evidence from the known records and observations, plus the expected abundance and distribution of each species outside of the Downstream Development area.

2.5. Impact Evaluation Methods

An evaluation of potential direct impacts to Priority flora species was conducted by Woodside's spatial team in relation to the proposed Downstream Development footprint. This assessment included reference to Priority flora records from all available studies conducted in the James Price Point area, and comparative information for the targeted species at a regional level. The assessment was based on studies data available up to 31 November 2011 and the Downstream Development Footprint as at 7 March 2012.

3. Results

Five broad areas were assessed during the targeted Priority flora search. The location of the targeted transects and detailed Priority flora records are shown in **Figures 3.1 to 3.5**. The location of Priority flora in relation to the BLNG Precinct and Downstream Development are shown in **Figure 3.6**. Regional records in relation to the targeted Priority flora species are shown in **Figure 3.7**.

3.1. Priority Flora Recorded

Populations of the four Priority flora species (*Eriachne* sp. Dampier Peninsula, *Gomphrena pusilla*, *Pittosporum moluccanum* and *Lophostemon grandiflorus* subsp. *grandiflorus*) were recorded in the current survey. The total number of individual plants for each Priority flora species at each location varied from low to very high, with the number of individuals recorded ranging between three and over 10 000. A summary of the results is presented in **Table 3.1**. The coordinates of the Priority flora locations within these populations are detailed in **Appendix A**.

3.1.1. *Gomphrena pusilla* (Priority 2) – Amaranthaceae

This annual herb species to 0.1 metre high was recorded from eight new locations in relatively bare sand areas of Coastal Community habitat within dune environments from this survey near the proposed Southern Pipeline route of the Downstream Development. A total of 843 individuals were recorded. The current records were relatively abundant (and estimated 3 to 160 plants per location). This suggests relative abundance of the species in the sandy dune environments south of James Price Point. Realistically the whole coastal area could be considered as one population of the species, as it appears to be quite widespread and common.

3.1.2. *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) (Priority 3) – Poaceae

This is an annual tussock grass species to 0.4 metre high. It was recorded from four new locations in pindan vegetation. A total of 946 individuals were recorded. The sites included along the eastern side of Manari Road south of the Downstream Development towards the Quondong Point road turnoff and along the eastern side of Cape Leveque Road several kilometres north of the Manari Road intersection. This species was recorded in relative abundance. It was recorded at each new pindan vegetation area that was assessed. The expectation is that this species occurs widespread and locally abundant in pindan vegetation on the western Dampier Peninsula and that current estimates outside of the proposed Downstream Development area are probably significantly underestimated. The wet season of 2011 was particularly favourable for conducting flora surveys in the Kimberley region and therefore this species has been readily identified from new recorded populations in many pindan areas in survey work commissioned by Woodside.

3.1.3. *Lophostemon grandiflorus* subsp. *grandiflorus* (Priority 3) - Myrtaceae

This species grows as a bushy tree 4 – 8 metres high. It was recorded in this survey from a drainage basin/swampy area around 11.3 km north of James Price Point. An estimate of 10 000 individual plants of this species were recorded for this northern area. In the broader area, it has been previously recorded from similar habitat near the proposed Downstream Development and near Quondong Point. The species has been observed as the dominant species within the Drainage Basin vegetation community type near the proposed development and this was consistent with the dominance observed in the northern area. Therefore, the boundary of this vegetation community type has been treated as the boundary of the population of the species in each area, with an estimate given in the relevant tables and figures where appropriate.

3.1.4. *Pittosporum moluccanum* (Priority 4) - Pittosporaceae

This species grows as a broad bushy tree 2 – 6 metres high. It has been recorded from this survey and previous surveys near James Price Point within the Monsoon Vine Thicket – Evergreen (MVTE) vegetation community present on the leeward side of the coastal white sand dune systems. Three new isolated individual plants of this species were recorded from this survey. It appears that the population of this species includes all the scattered individual plants in the coastal area near James Price Point. Field observations have identified that this species is typically not readily distinguished from many other similar plants species in vine thicket vegetation in the absence of detailed investigation. This results in the likelihood that more individuals of the species probably exist in coastal dune environments in the region at low densities or scattered individuals. Therefore, the current known abundance of this species is probably an underestimate and the relative impact to the species from the proposed development is likely to be correspondingly lower.

One previous WAH Priority flora record location for *Pittosporum moluccanum* (410671 mE 8079212 mN, Datum: WGS84, drainage basin 11.3 km north of James Price Point) was assessed, with no individual plants of this species being recorded at this location despite extensive searching.

It was advised that an additional location of an individual of *Pittosporum moluccanum* had been previously identified in the late 1990s at the southern end of the same northern drainage basin referred to above (T. Willing, pers. comm.). However, no specific coordinates were available for this individual, but the general area in which it was known to occur was searched using transects and this previously known individual was not located.

3.1.5. Other Flora Species of Significance

A single new record of *Pterocaulon* sp. a Kimberley Flora (B.J. Carter 599) (P3) was recorded from the current survey outside of the proposed Downstream Development area. Two additional potential flora species of significance were recorded from the current survey: *Grewia* aff. *retusifolia* (R.L. Barrett 7065) and *Spermacoce* sp. Dampier Peninsula (R.L. Barrett 7076) (see **Table 3-1**). Both of these taxa are listed under taxonomic phrase names that are currently not

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recognised by the Western Australian Herbarium (WAH) and the DEC, but are proposed to be listed as potential new Priority flora species (R. Barrett, pers. comm.).

3.2. Proportional Impact on Priority Flora by the Woodside Downstream Development

An analysis was conducted by Woodside on all previously known Priority flora locations identified during surveys inside and outside of the Downstream Development site for the targeted species of interest. A summary of the results and an estimate of regional impact is presented in **Table 3.2**. The results indicated that around 7% of the known individual records of *Gomphrena pusilla* occur within the Downstream Development area. Also within the Downstream Development area is approximately 68% of the *Eriachne* sp. Dampier Peninsula records, 18% of *Pittosporum moluccanum* and no records of *Lophostemon grandifloris* subsp. *grandiflorus*. These percentages are expected to be conservative estimates based on records from a high level of survey intensity within the Downstream Development area and relatively low survey intensity outside of this area. Further assessment of the likely significance of these impacts has been included in the discussion section of this report.

Table 3-1 Location and Number of Priority Flora and Flora of Interest Recorded

Priority Flora Species	Number of Populations	Approx. Number of Individuals	Representative Coordinates of Population (WGS84, 51K)		Location Notes
			Easting	Northing	
<i>Gomphrena pusilla</i> (P2)	8 (423 individuals)	22	409756	8062290	Coastal area west of the Woodside Downstream Development
		160	409678	8062268	
		160	409658	8062230	
		5	409666	8062296	
		21	409958	8059471	Coastal area near the proposed Southern Pipeline southwest of the Downstream Development
		3	409863	8059348	
		28	409900	8059256	
		24	409903	8059125	
<i>Eriachne</i> sp. Dampier Peninsula (K.F. Keneally 5946) (P3)	4 (946 individuals)	23	410311	8059203	East of Manari Rd, south of the Downstream Development
		346	410659	8058972	
		535	414488	8053435	East of Manari Road, south of the Downstream Development / Quondong Point Rd
		42	423727	8041347	East side of Cape Leveque Rd, approximately 5km north of Manari Rd intersection

Priority Flora Species	Number of Populations	Approx. Number of Individuals	Representative Coordinates of Population (WGS84, 51K)		Location Notes
			Easting	Northing	
<i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i> (P3)	1 (>10 000 individuals)	>10 000	410690 410671	8078037 8079213	Drainage basin approximately 11.3km north of James Price Point
<i>Pittosporum moluccanum</i> (P4)	3 (3 individuals)	1	409792	8062253	Coastal area west of the Downstream Development
		1	409717	8062274	
		1	409610	8062383	
<i>Pterocaulon</i> sp. A Kimberley Flora (B.J. Carter 599) (P3)	1 (1 individual)	1	410911	8077601	Area north of the proposed BLNG Precinct at the northern drainage basin
<i>Grewia</i> aff. <i>retusifolia</i> (R.L. Barrett 7065) (Potential Species of Significance)	2 (2 individuals)	1	410911	8077601	Area north of the proposed BLNG Precinct at the northern drainage basin
		1	423832	8040769	Area east of Quandong Point and Manari Road
<i>Spermacoce</i> sp. Dampier Peninsula (R.L. Barrett 7076) (Potential Species of Significance)	1 (1 individual)	1	423799	8040535	Area east of Quandong Point and Manari Road

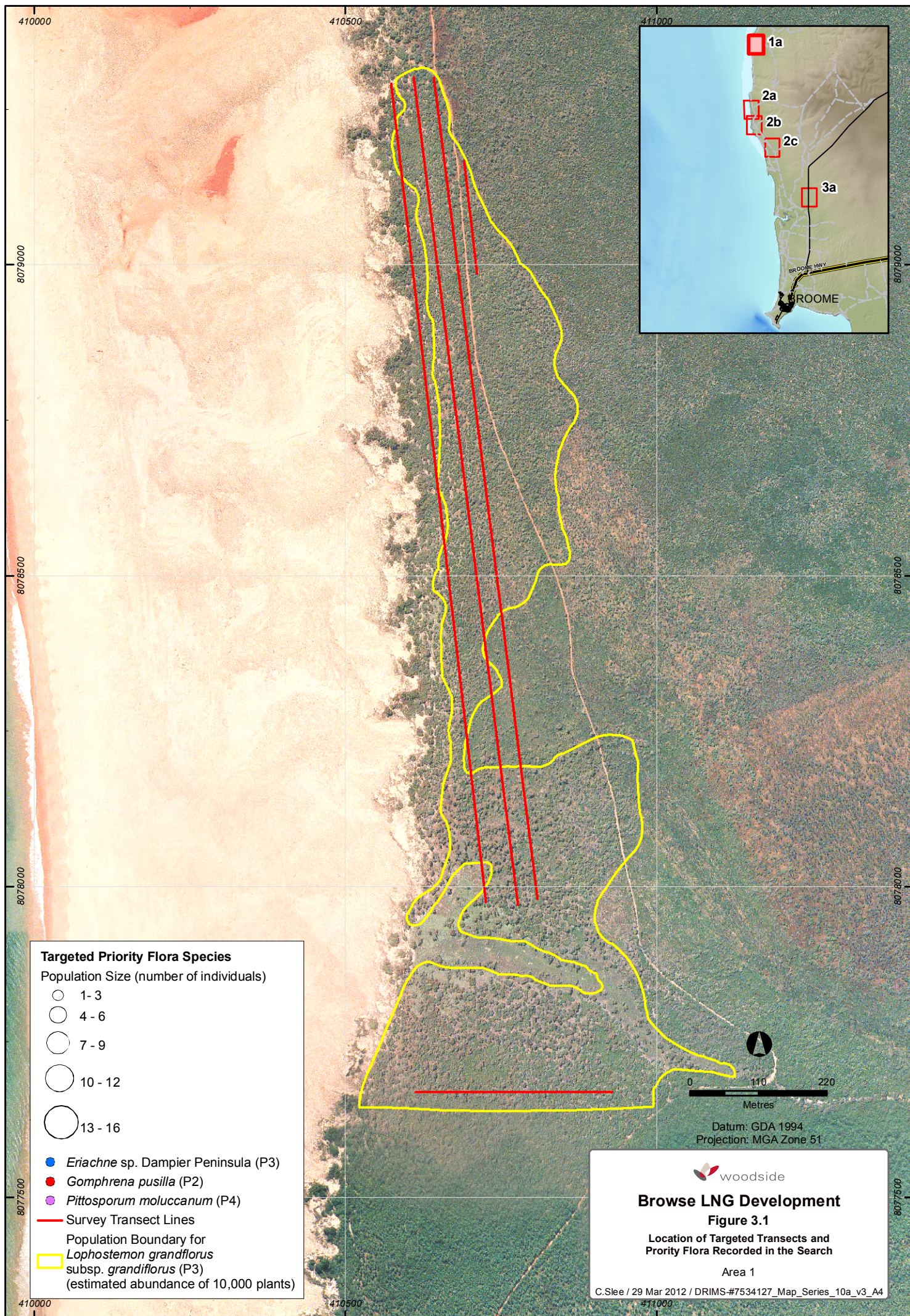
Table 3-2 Estimated Number of Known Priority Flora Inside and Outside of the Woodside Browse Downstream Development Area

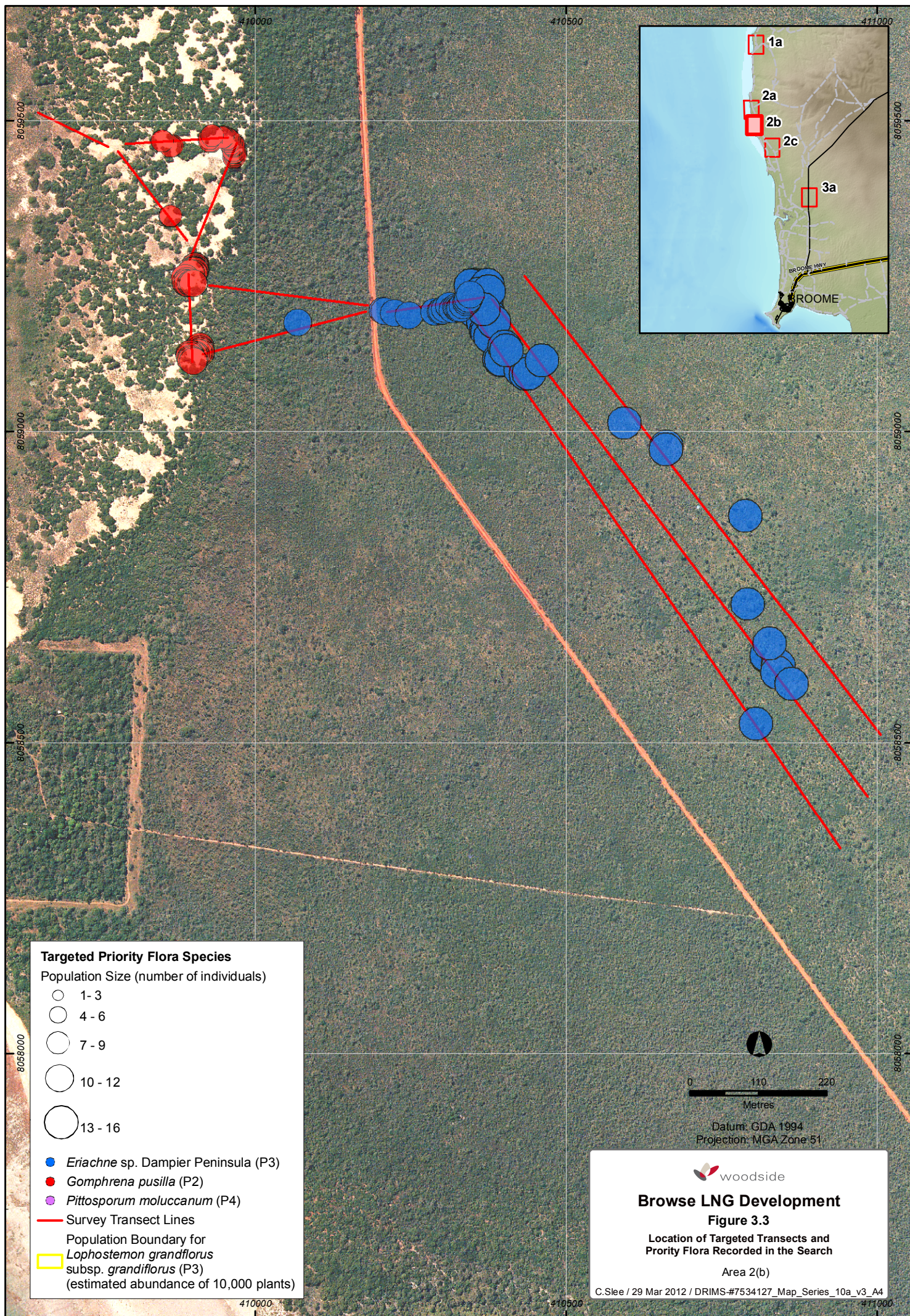
Priority Flora Species	Priority Level	Estimated number of individuals known within the Downstream Development area	Estimated number of individuals known outside of the Downstream Development area	Assessment of Impact in James Price Point area	Estimate of Regional Representation	Assessment of Regional Impact
<i>Gomphrena pusilla</i>	2	52	672	The Downstream Development could potentially impact 7% of current known individuals. However species has widespread occurrence in coastal dunes outside of the project footprint.	This species is also known from Broome and the Pilbara coast (Figure 3.7). More populations are expected to exist that are not yet known based on abundance from recent surveys.	Minimal impact.
<i>Eriachne</i> sp. Dampier Peninsula (K.F. Kenneally 5946)	3	14 530	6 776	The Downstream Development could potentially impact 68% of known locations of this species. However, this reflects the relative abundance of the species in the area and a favourable 2011 season. All targeted pindan locations assessed outside of the Downstream Development contained this species. Widespread occurrence of this species is noted in the James Price Point area. No significant	This species is known from Derby to north of Dampier Peninsula, and north of Broome (Figure 3.7). It is expected that further surveys would identify that the Downstream Development area constitutes a small part of the species range and abundance based on current records.	Minimal impact.

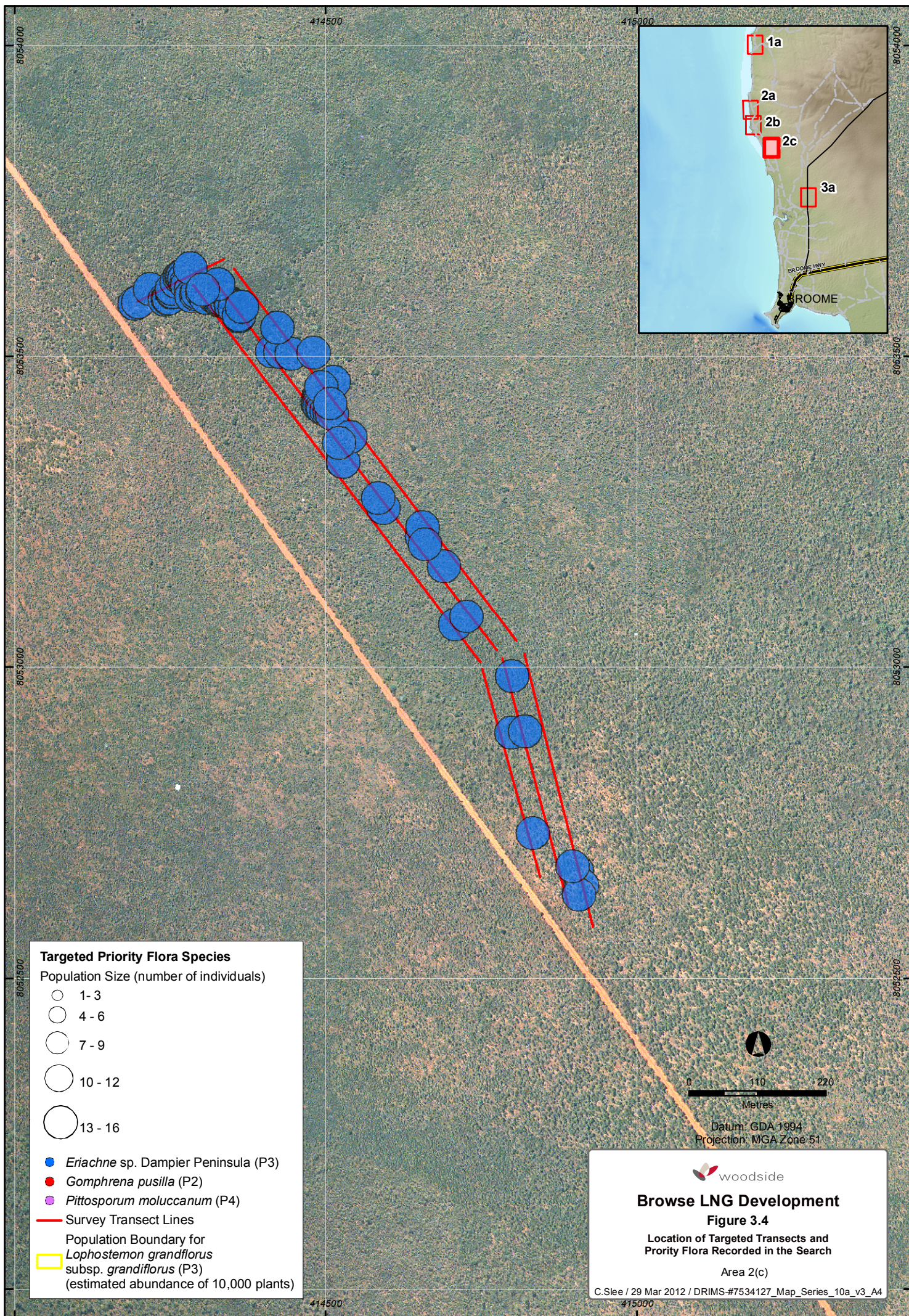
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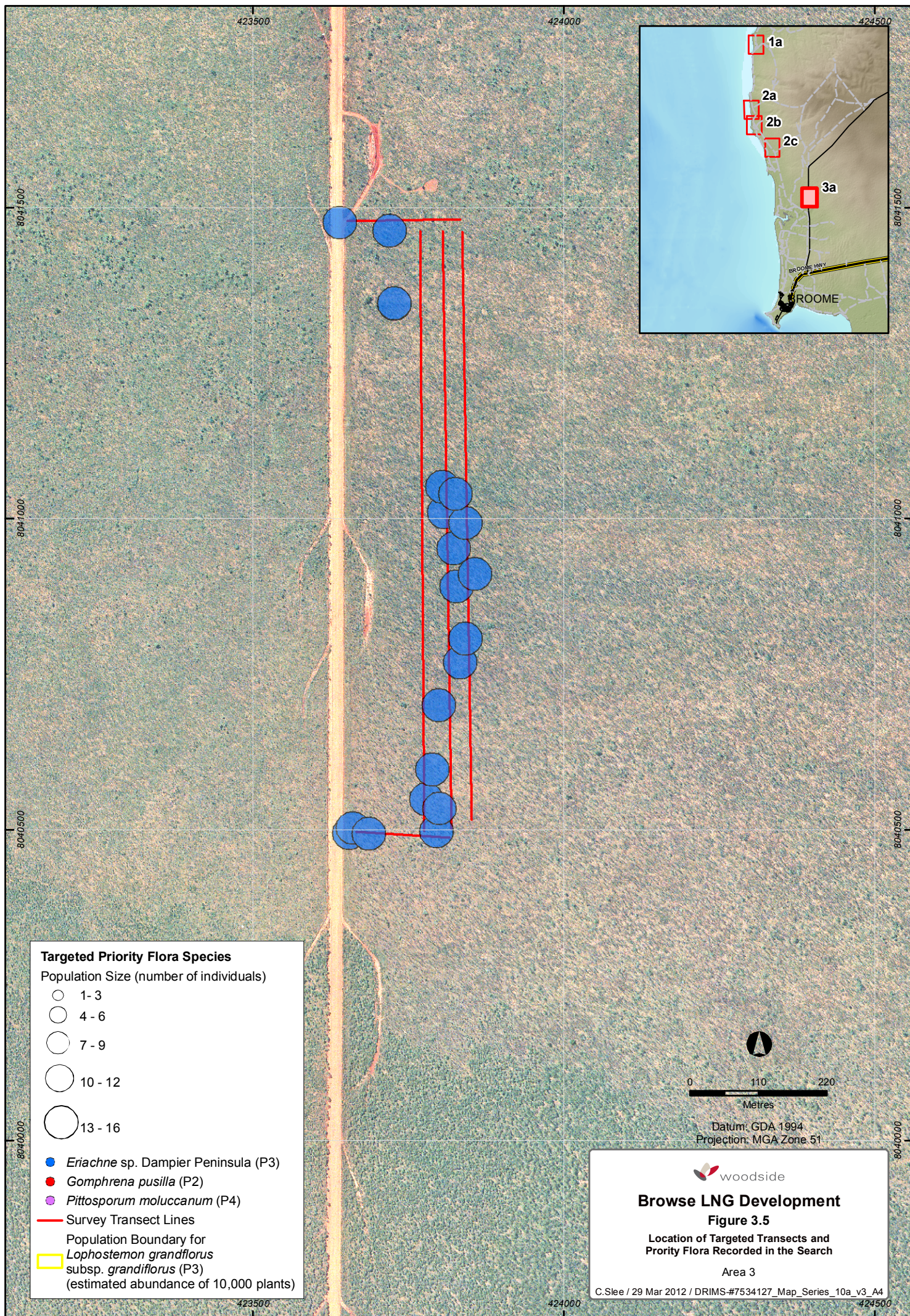
Priority Flora Species	Priority Level	Estimated number of individuals known within the Downstream Development area	Estimated number of individuals known outside of the Downstream Development area	Assessment of Impact in James Price Point area	Estimate of Regional Representation	Assessment of Regional Impact
				impact is expected.		
<i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i>	3	0	12 543	Represented in Drainage Basin areas near James Price Point. No local impact expected.	This species is known from the north of the Dampier Peninsula and the Victor Bonaparte bioregion (Figure 3.7).	None expected.
<i>Pittosporum moluccanum</i>	4	7	38	Potential local impact, limited records on the Dampier Peninsula. The Downstream Development is estimated to impact 18% of known locations of this species. However, other existing populations are secure and further populations may exist that have not yet been identified.	This species is known from the Dampier Peninsula and the Maret and Berthier Islands (Black <i>et. al</i> 2010) (Figure 3.7). The species is also known to occur in the Northern Territory, Indonesia, Philippines, Malaysia and Taiwan (Black <i>et. al</i> 2010).	Minimal impact.

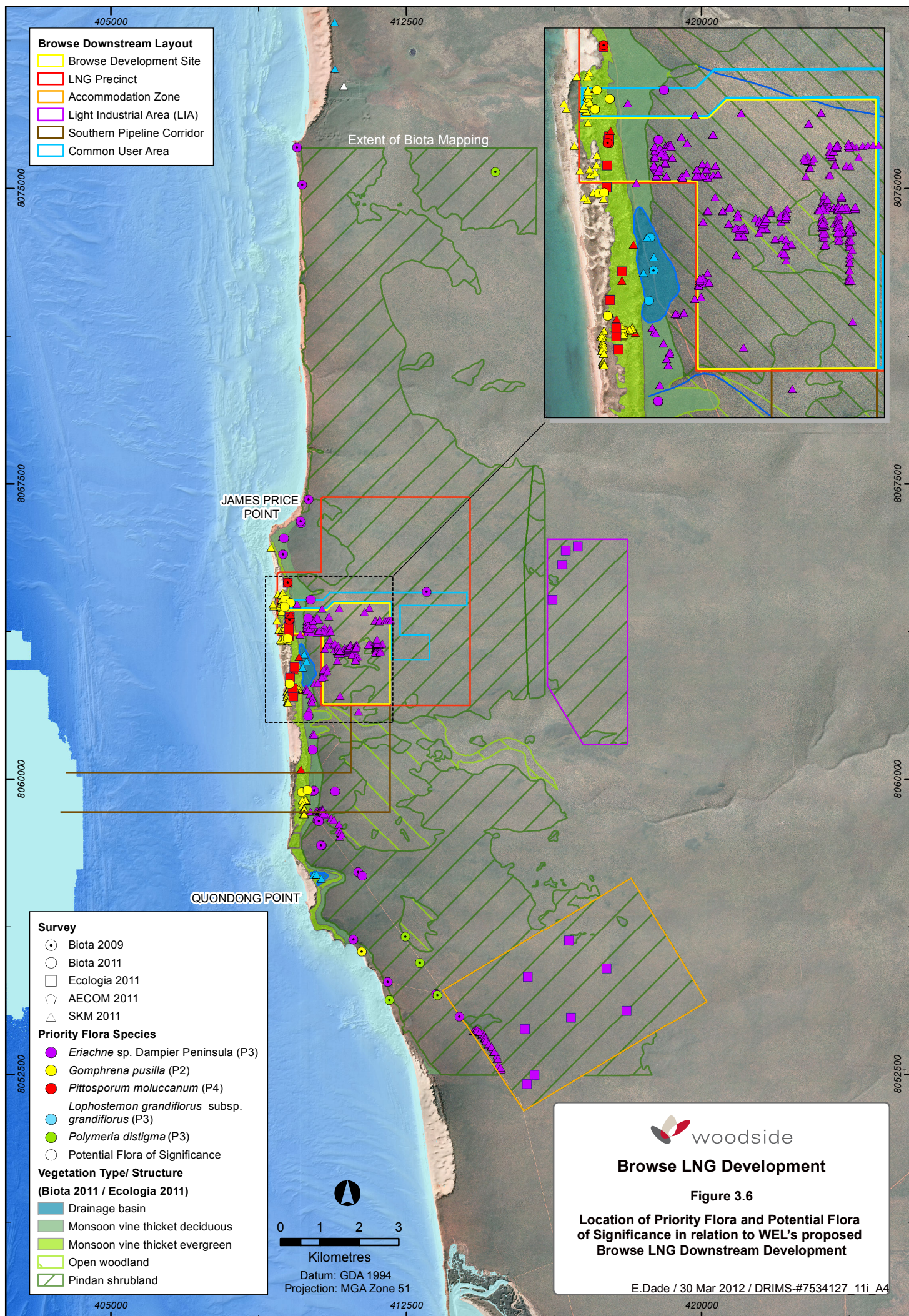
Note that these numbers are estimates based on a spatial assessment undertaken by Woodside and based on all data available to Woodside. Abundance estimates were based on actual estimates where available and appropriate estimate of counts provided for all other cases.

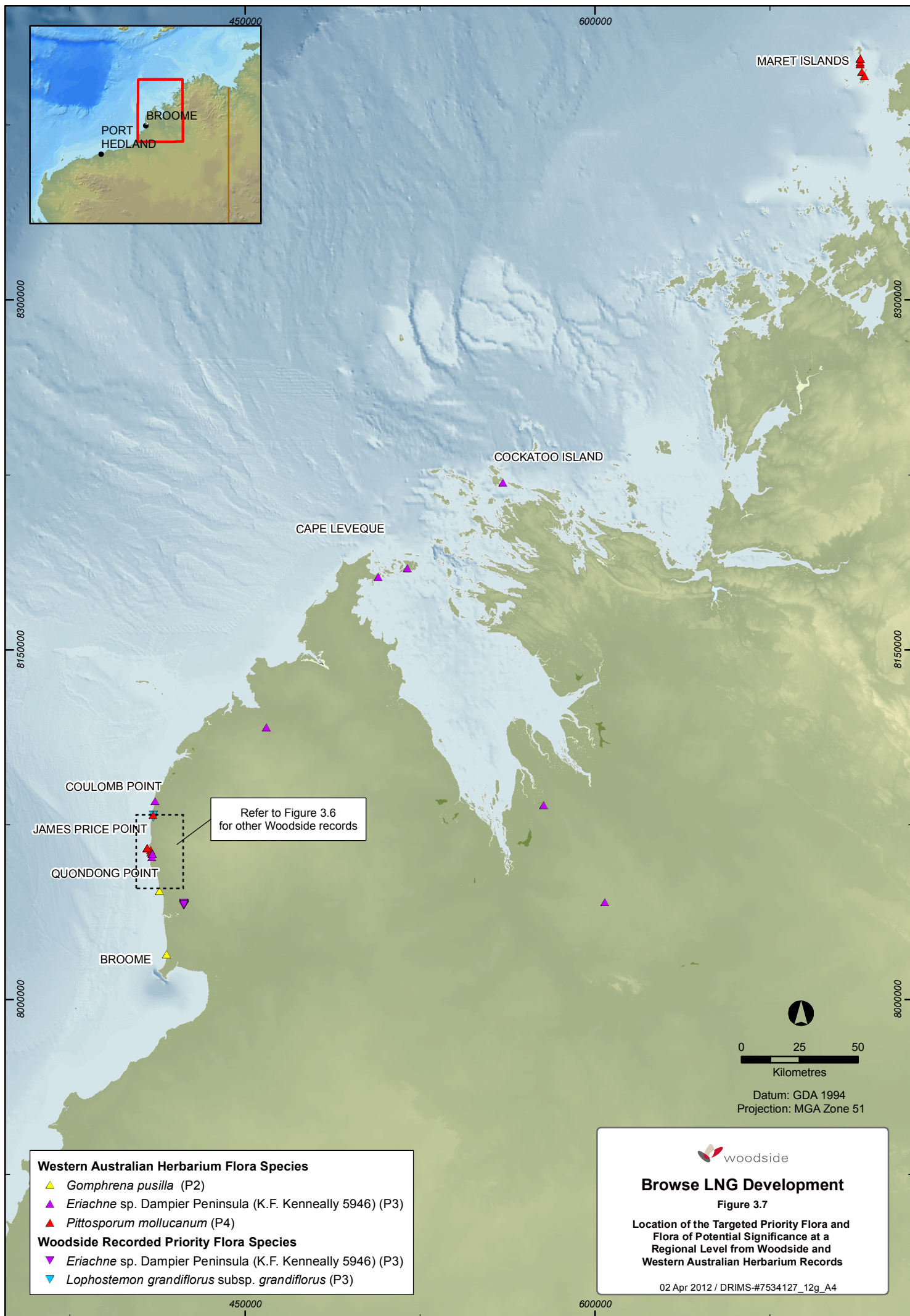












4. Discussion

Each Priority flora species is discussed below in relation to the targeted search results, other existing data and the Downstream Development. The locations and population sizes of the Priority flora records have been presented in **Figure 3.6** and **Table 3-1**. Regional Priority flora locations are presented in **Figure 3.7**.

4.1. *Eriachne* sp. Dampier Peninsula (K.F. Kenneally 5946) (P3)

The targeted Priority flora search recorded approximately 946 new individual plant locations or sub-populations within four population search areas, most of which are outside of the proposed Downstream Development area, however some were identified within the broader area allocated for the proposed Workers' Accommodation Camp south of the main development site. This species was recorded from within pindan vegetation, however it is also known from limited previous records within monsoon vine thicket (deciduous) vegetation within the James Price Point coastal area (Biota 2011c). The distribution of these populations suggests that the species is widespread within the James Price Point area and the broader south-west Dampier Peninsula region.

A FloraBase (DEC 2011) search identified that *Eriachne* sp. Dampier Peninsula has been recorded north east as far as Derby and to the northern parts of the Dampier Peninsula. Furthermore, the recent flora and vegetation survey of the Temporary Workers Accommodation Camp (TWAC), which is approximately 12 km north-east of the Broome town site, identified two locations of this species (ENV 2011). ENV (2011) also noted that *Eriachne* sp. Dampier Peninsula was recorded from a separate study in close proximity to the TWAC area.

Eriachne sp. Dampier Peninsula has been previously recorded in surveys conducted on the Dampier Peninsula (Biota 2009, 2011a, b, c, Ecologia 2011). As this is an annual plant species, survey timing following suitable rainfall or favourable wet season conditions are important in the successful identification of *Eriachne* sp. Dampier Peninsula. It is likely that *Eriachne* sp. Dampier Peninsula is more widely distributed on the Dampier Peninsula than suggested by the area currently represented by the DEC FloraBase based on current specimen collections (R. Barrett, pers. comm.). Recent surveys for Woodside suggest that this species appears to be fairly common and widespread on pindan sandplains on the Dampier Peninsula (particularly in proximity to the James Price Point coastal area where the majority of assessment has occurred). However, many of the current records are in proximity to coastal areas and it remains to be determined whether or not this species extends further inland (R. Barrett, pers. comm.).

Based on the results of this survey and other previous assessments for Woodside, it is likely that the abundance and distribution of this species is probably much higher and more widespread than previously thought. It is considered unlikely that the Downstream Development will have a

significant negative impact on the conservation status of *Eriachne* sp. Dampier Peninsula. In addition, it is expected that further evidence at a regional scale is likely to provide justification that a reduction of conservation status or removal of the species from the DEC Priority Flora list may be appropriate in the future.

4.2. *Gomphrena pusilla* (P2)

Approximately 423 individuals were recorded within eight populations in the targeted Priority flora search, all of which are outside of the proposed Downstream Development (**Figure 3.6**). All new individual plant records were recorded within open areas of coastal dune habitat. However, this species is also known to occur within evergreen monsoon vine thicket (DSD 2010). While this species was in poor condition (i.e. decaying) at the time of the survey, the specimens observed were sufficient for identification purposes.

Previous surveys in the James Price Point coastal area have recorded nine locations (totalling over 150 individuals) of *Gomphrena pusilla* both inside and outside the proposed Downstream Development (Biota 2011a, b, c). An environmental assessment of proposed beach geotechnical site investigation areas (May 2011) also noted the widespread occurrence (percentage cover ranged from 0.5% to 3%) of *G. pusilla* within the coastal dunal area. Survey timing is particularly important in the successful identification of this annual species in the field. Biota (2011a) noted that, during a good season, this species may occur across the majority of the areas mapped as coastal communities within the James Price Point coastal area. Furthermore, Florabase (DEC 2011) shows that this species is known from the James Price Point coastal area, as well as two records from Broome and two records along the Pilbara coast.

Current survey effort suggests that the species is likely to be widespread in the coastal communities and coastal dune habitats within James Price Point coastal area. However, the absence of wider regional assessment as part of the current survey limits the capacity to determine the likelihood of abundance or distribution outside of this area. Evidence from current known records suggests that the species is likely to be slightly more abundant and of a wider distribution within and beyond the broader James Price Point coastal area than previously believed, but further assessment would be necessary to support this claim (**Figure 3.6**).

It is considered that the Downstream Development will be unlikely to have a significant negative impact on the conservation status of *Gomphrena pusilla*. Those occurrences of *Gomphrena pusilla* that are within the Downstream Development area occur within the Southern Pipeline Corridor (**Figure 3.6**). The impact on these occurrences of *Gomphrena pusilla* is not yet known. If no ground disturbance occurs in the dune area for the Southern Pipeline construction due to the method used, then the impacts to *Gomphrena pusilla* are expected to be negligible. If ground disturbance does occur in the dune area, then some impact will occur to the species, however this

will be relative to the extent of disturbance. The species has been observed readily colonising bare sandy areas of the dune environment following favourable rain conditions.

4.3. *Lophostemon grandiflorus* subsp. *grandiflorus* (P3)

An additional population of this species totalling approximately over 10 000 individuals was recorded in association with a drainage basin to the north of the proposed Downstream Development (**Figure 3.6**). The drainage basins adjacent to and south of the Development are also dominated by this species. The northern extent of this species within the drainage basin adjacent to the Downstream Development Site requires a further assessment to confirm the status, but was unable to be assessed in the current survey due to access constraints.

FloraBase (DEC 2011) shows that *Lophostemon grandiflorus* subsp. *grandiflorus* has been previously recorded at the north of the Dampier Peninsula and as far north east as the Victoria Bonaparte bioregion. Biota (2011a) noted that this species is widespread throughout the Kimberley but not well represented at the WAH by voucher specimen records. In addition, Woodside's Browse Vegetation Monitoring Program (Biota 2011b) has also identified the extensive presence of this species at the drainage basin south of the Downstream Development near Quondong Point. This finding is consistent with the knowledge that the species has coverage dominant within the drainage basin vegetation community at both locations within the James Price Point coastal area and large numbers of individual plants (in the order of an additional 5,000 plants or greater) are present at each location. An existing population of the species in a drainage basin/swampy area north of James Price Point has been detailed earlier in this report.

Based on the current survey effort within the James Price Point coastal area and broader region and the abundance of this species outside the proposed disturbance area, the Downstream Development is unlikely to have any significant negative direct impacts on the conservation status of *Lophostemon grandiflorus* subsp. *grandiflorus*.

4.4. *Pittosporum moluccanum* (P4)

Three new individuals of this species were recorded from the current survey within the James Price Point coastal area, all of which are unlikely to be impacted by the proposed Downstream Development (**Figure 3.6**).

Based on the current survey, other surveys such as Biota (2011a), within the James Price Point coastal area and Western Australian Herbarium specimen records, it is determined that this species is relatively uncommon across its range with only 20 individuals being recorded in the area. The relative expected proportion of impact on this species from the Downstream Development site is 18% (7 individuals of a total number of Western Australian records of 38 individuals).

Outside of surveys conducted for the Downstream Development and other surveys undertaken on the Maret and Berthier Islands, there has been a lack of survey effort for this species in north-west WA. Further individuals of *Pittosporum moluccanum* may be present in other locations between the Dampier Peninsula and Maret/Berthier Islands. Based on current known records of this species it is considered that the Development may have a moderate negative impact on the conservation status of *Pittosporum moluccanum* at least on a local scale unless further evidence is able to establish otherwise. To the best of SKM's knowledge other known regional offshore locations of this species are not currently under threat by any developments.

5. Conclusion

No significant impacts to the conservation status are expected for the four species targeted in the current study in relation to the Downstream Development. While count data may indicate the presence of larger populations within the Downstream Development area, this is mostly a product of a high level of survey effort in the area. The current study readily identified new populations of the Priority flora species through targeted searching over a limited timeframe. It is expected that further targeted surveys outside of the Downstream Development area would yield further populations of these species.

The abundance and regional representation of the four Priority flora species *Gomphrena pusilla* (P2), *Eriachne* sp. Dampier Peninsula (P3), *Lophostemon grandiflorus* subsp. *grandiflorus* (P3) and *Pittosporum moluccanum* (P4) is unlikely to experience significant negative impacts from the Downstream Development. An assessment of cumulative impacts to these Priority flora species may be required with respect to other future proponents as part of the BLNG Precinct.

It is likely that the abundance and distribution of *Eriachne* sp. Dampier Peninsula is probably much higher and more widespread than previously known, beyond what has been detailed in this study. In addition, it is expected that further evidence at a regional scale is likely to provide justification that a reduction of conservation status or removal of the species from the DEC Priority flora list may be appropriate in the future.

Evidence from current known records suggests that *Gomphrena pusilla* is likely to be more abundant and of a wider distribution within and beyond the broader James Price Point coastal area than previously thought. This species may be worthy of a reduced Priority flora classification and, if further populations are recorded, it may be appropriate to remove this from the DEC Priority flora list.

Based on the current survey effort within the James Price Point coastal area and broader region and the abundance of *Lophostemon grandiflorus* subsp. *grandiflorus* outside the proposed disturbance area, the Downstream Development is unlikely to have any significant negative impact on the conservation status of this species.

The Downstream Development has the potential for a negative impact locally on the conservation status of *Pittosporum moluccanum* based on the current evidence. The extent of impact on this species from the Downstream Development can be minimised with the implementation of suitable management including the reduction of ground disturbance in the areas of occupancy where practicable. Beyond the surveys conducted for the Downstream Development and other surveys undertaken on the Maret and Berthier Islands, there appears to be a paucity of survey effort for this

species in north-west W.A. To the best of SKM's knowledge regional offshore occurrences of this species are not currently under threat by any developments.

6. References

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Appendix A Available Images of Priority Flora



Gomphrena pusilla (P2) growth form.



Eriachne sp. Dampier Peninsula (K.F. Kenneally 5946) (P3)
inflorescence arrangement.



Eriachne sp. Dampier Peninsula (K.F. Kenneally 5946) (P3) leaf blade and culm stem hairs.



Eriachne sp. Dampier Peninsula (K.F. Kenneally 5946) (P3) inflorescence arrangement.



Pittosporum moluccanum (P4) growth form.



Pittosporum moluccanum (P4) branchlet form.



Pittosporum moluccanum (P4) flowers.



Pittosporum moluccanum (P4) fruits.

Appendix B Coordinates of Priority Flora Locations Recorded within the Current Study

Note: GPS coordinates presented in Datum WGS 84, Zone 51K.

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)	1	410068	8059177
		410205	8059196
		410208	8059195
		410223	8059192
		410247	8059188
		410288	8059194
		410298	8059194
		410300	8059196
		410304	8059199
		410311	8059203
		410318	8059197
		410323	8059201
		410325	8059200
		410327	8059199
		410330	8059200
		410334	8059204
		410339	8059209
		410340	8059212

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		410342	8059214
		410345	8059221
	2	410349	8059236
		410348	8059236
		410350	8059216
		410352	8059210
		410352	8059195
		410353	8059194
		410369	8059189
		410367	8059185
		410367	8059180
		410368	8059179
		410366	8059178
		410370	8059164
		410372	8059161
		410377	8059154
		410392	8059118
		410395	8059116
		410394	8059117
		410425	8059100
		410434	8059094
		410439	8059094

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		410592	8059015
		410660	8058976
		410660	8058977
		410659	8058972
		410786	8058866
		410791	8058724
		410821	8058638
		410821	8058641
		410839	8058625
		410839	8058624
		410840	8058624
		410838	8058613
		410804	8058531
		410351	8059237
		410346	8059236
		410346	8059236
		410372	8059237
		410370	8059206
		410373	8059191
		410383	8059178
		410400	8059138
		410460	8059116

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		410826	8058660
		410359	8059222
		410374	8059226
		410366	8059198
		410403	8059132
		410861	8058595
	3	414192	8053585
		414197	8053588
		414216	8053609
		414241	8053592
		414245	8053594
		414248	8053594
		414252	8053603
		414253	8053604
		414252	8053609
		414259	8053621
		414264	8053627
		414267	8053629
		414269	8053628
		414272	8053626
		414276	8053619
		414277	8053614

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		414283	8053608
		414283	8053598
		414284	8053598
		414291	8053600
		414293	8053603
		414301	8053604
		414307	8053595
		414320	8053596
		414321	8053596
		414322	8053595
		414323	8053597
		414329	8053592
		414326	8053591
		414329	8053590
		414332	8053590
		414334	8053590
		414341	8053588
		414346	8053586
		414348	8053584
		414348	8053582
		414353	8053578
		414359	8053565

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		414360	8053567
		414360	8053567
		414360	8053567
		414360	8053567
		414413	8053508
		414426	8053508
		414444	8053505
		414488	8053435
		414489	8053434
		414489	8053434
		414489	8053433
		414489	8053433
		414486	8053424
		414487	8053423
		414489	8053422
		414493	8053419
		414495	8053417
		414501	8053414
		414505	8053412
		414509	8053408
		414525	8053332
		414527	8053331

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		414592	8053256
		414654	8053211
		414654	8053211
		414689	8053164
		414707	8053068
		414798	8052896
		414832	8052734
		414903	8052674
		414910	8052652
		414911	8052650
		414906	8052634
		414282	8053642
		414326	8053616
		414422	8053547
		414512	8053460
		414539	8053371
		414655	8053226
		414799	8052986
		414820	8052897
		414302	8053608
		414302	8053608
		414364	8053580

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		414480	8053507
		414492	8053452
		414506	8053425
		414521	8053361
		414583	8053273
		414659	8053198
		414725	8053082
		414896	8052680
	4	423655	8040495
		423778	8040550
		423788	8040598
		423788	8040597
		423798	8040700
		423827	8040892
		423822	8040953
		423807	8041011
		423804	8041052
		423727	8041346
		423727	8041347
		423719	8041464
		423660	8040503
		423794	8040498

Priority Flora Species	Population Number	Easting	Northing
<i>Eriachne</i> sp. Dampier Peninsula (P3)		423799	8040535
		423832	8040769
		423841	8040994
		423639	8041477
		423686	8040494
		423841	8040807
		423856	8040912
		423825	8041040
<i>Gomphrena pusilla</i> (P2)	1	409764	8062277
		409766	8062279
		409766	8062280
		409766	8062280
		409766	8062280
		409767	8062284
		409767	8062283
		409768	8062283
		409756	8062298
		409757	8062292
		409756	8062290
		409756	8062290
		409756	8062290
		409761	8062308

Priority Flora Species	Population Number	Easting	Northing
<i>Gomphrena pusilla</i> (P2)		409762	8062302
		409761	8062301
		409761	8062301
		409759	8062296
		409752	8062294
		409737	8062282
		409735	8062281
		409734	8062281
	2	409702	8062276
		409701	8062276
		409696	8062276
		409687	8062282
		409679	8062265
		409679	8062265
		409679	8062265
		409679	8062265
		409679	8062266
		409679	8062267
		409679	8062268
		409678	8062268
		409678	8062268
		409678	8062268

Priority Flora Species	Population Number	Easting	Northing
<i>Gomphrena pusilla</i> (P2)		409678	8062268
		409679	8062267
		409680	8062266
		409680	8062265
		409679	8062265
		409678	8062265
		409677	8062265
		409676	8062264
		409676	8062262
		409676	8062261
		409673	8062259
		409671	8062258
		409672	8062259
		409679	8062260
		409678	8062255
		409671	8062253
		409664	8062250
	3	409653	8062237
		409653	8062237
		409658	8062230
		409660	8062222
		409667	8062223

Priority Flora Species	Population Number	Easting	Northing
<i>Gomphrena pusilla</i> (P2)	4	409671	8062237
		409666	8062292
		409666	8062296
		409664	8062310
		409649	8062319
	5	409966	8059442
		409967	8059444
		409967	8059447
		409967	8059450
		409967	8059451
		409965	8059454
		409965	8059461
		409965	8059462
		409961	8059464
		409958	8059468
		409958	8059471
		409955	8059473
		409949	8059476
		409946	8059475
		409928	8059469
		409927	8059469
		409927	8059473

Priority Flora Species	Population Number	Easting	Northing
<i>Gomphrena pusilla</i> (P2)		409930	8059477
		409866	8059462
		409864	8059461
		409851	8059470
	6	409863	8059348
		409863	8059348
		409863	8059348
	7	409902	8059268
		409903	8059266
		409903	8059263
		409902	8059262
		409902	8059260
		409902	8059260
		409900	8059256
		409895	8059255
		409886	8059248
		409889	8059244
		409888	8059241
		409892	8059240
		409897	8059240
		409900	8059239
	8	409911	8059139

Priority Flora Species	Population Number	Easting	Northing
<i>Gomphrena pusilla</i> (P2)		409911	8059134
		409911	8059131
		409911	8059128
		409908	8059128
		409903	8059125
		409900	8059125
		409895	8059126
		409895	8059123
		409896	8059119
		409898	8059116
		409900	8059115
<i>Lophostemon grandiflorus</i> subsp. <i>grandiflorus</i> (P3) (indicative coordinates)	1	410690	8078037
		410671	8079213
<i>Pittosporum moluccanum</i> (P4)	1	409792	8062253
	2	409717	8062274
	3	409610	8062383