5 Ecological Community Assessment of the Victoria-Bonaparte Springs

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5.1 Introduction:

Individual mound springs have generally not been accurately mapped on the tidal flats of the Victoria-Bonaparte Bioregion, with the exception of Brolga Spring. The assemblages of wetlands associated with the organic mound springs were identified following the Kimberley Rainforests Australia survey in 1987 by McKenzie *et al.* (1991). In 2000, Sally Black nominated Point Spring and Long Swamp together as one community type. However, later discussions specified that the springs and their individual cohorts of assemblages should be split into two types (G.K. Keighery and N.L. McKenzie *pers comm*.). Other survey data includes Halse *et al*. (1996) who undertook a waterbirds and aquatic invertebrate survey at selected sites including two sites at Long Spring, one at Brolga Spring and one another located on the north-western extent of the wetlands. Other survey included one to monitor change in condition at Long Swamp (G. Graham 1994-1995) and Sally Black visited selected sites across the northern Kimberley to evaluate mound springs for their conservation value and proposed listing as threatened ecological communities (TECs).

A total of four occurrences are recorded on the TEC database including Brolga Spring, King Gordon Spring, Attack Spring and Long Swamp occupying a total of ~82.2ha and ranging over 13.5 km east-west. Prior to the August 2017 survey, a desk top study identified an additional seven wetlands as potential mound springs that could align with the priority ecological community (PEC) (Figure 19).

Assemblages of the wetlands with the organic mound springs on the tidal mudflats of the Victoria- Bonaparte bioregion have not been formally assessed by the WA Threatened Ecological Communities Scientific Committee (TECSC). The community is listed Priority 1 ecological community (PEC), recorded on the TEC database in 2008.

The key threats identified for the mound springs are pastoralism (impacts of cattle) including trampling of vegetation, soils and spring pools, and nutrient enrichment; altered fire regimes - too high intensity, and potential hydrological change. The springs are on aquifers that have operating bores on them and are potentially threatened by water abstraction (DEC 2008).

5.1.1 Setting

Vegetated peat mounds of numerous sizes occur over ephemeral freshwater springs and pools. The mound springs are generally surrounded by inundated moats containing *Typha*, sedges and grasses. The mound springs are distributed along the landward boundary on the coastal saline tidal flats. Smaller springs, (~0.02ha), manifest along the adjacent coastal flats, however many have become degraded. The coastal flats occur as a ~2 km wide band alongside

the coast of Joseph Bonaparte Gulf, ~90 km north of Kununurra. The greater wetland area is occasionally inundated by fresh or saline water (Halse *et al*. 1996). The vegetation consists of dense forests of *M. leucadendra* with other tree species and rainforest patches that contain 50% or more of the crown cover including vines and climbing ferns over scattered-dense layers of ferns, sedges and grasses over leaf litter coverage of various depth. The springs and pools at each location vary in number, size and depth. The majority contained a thick cover of aquatic ferns and herbs, Typha, rushes and sedges with fallen logs and leaf litter.

The springs are located on unallocated Crown land (UCL), within the ex-Carlton Hill Pastoral Lease, which is awaiting outcome of S16 negotiations. Access to the springs is recommended during low tide.

5.1.2 Current description

Assemblages of the wetlands associated with the organic mound springs on the tidal mudflats (Figure 17) of the Victoria-Bonaparte Bioregion East Kimberley on Carlton Hill Station. Large wetlands with *Melaleuca* forest (Figure 18) with small patches of rainforest on central mounds. Rainforest and paperbark forest associated with mound springs and seepage areas of the Victoria Bonaparte coastal lands. The rainforest canopy height at Long Swamp is 30m, and the dominant tree species include *Nauclea orientalis, Terminalia microcarpa* and *Melicope elleryana*; the periphery of the patch is permanently moist and supports a *Melaleuca leucadendra* forest (McKenzie *et al*. 1991). Species richness at Long Swamp is 52 and perennial plant species richness is 20. Silty clay soil type at this swamp. Plants with very restricted distributions within the State include *Mucuna gigantea* (vine) and *Sterculia holtzei* P1 (tree). The lithology at Long Swamp is quaternary alluvium and the soil is a black soil plain.

5.1.3 2017 survey

A survey of the Victoria-Bonaparte organic mound springs, including an additional suite of potential mound spring sites, was undertaken between 1-4 August 2017 by a team with expertise in TEC identification and inventory, biological survey including flora and vegetation, aquatic invertebrate fauna identification and WA wetland inventory. The survey was coordinated by the East Kimberley District Nature Conservation Coordinator, with cooperation and assistance of Traditional Owners Miriuwung Gajerrong.

The aim of the survey was to update PEC baseline information, including description, condition and threats to the PEC, to establish permanent quadrats to record flora and vegetation, inventory aquatic invertebrates, soils and water chemistry, and to identify new occurrences and update boundaries of the wetland community as required. Over time it will be valuable to build up a uniform dataset for springs for a broader regional analysis.

Figure 17. View over the black cracking clay tidal flats – photo Kirsty Quinlan.

Figure 18. View over black soil plains with Melaleuca forest in background, Victoria-Bonaparte wetlands – photo Mike Lyons

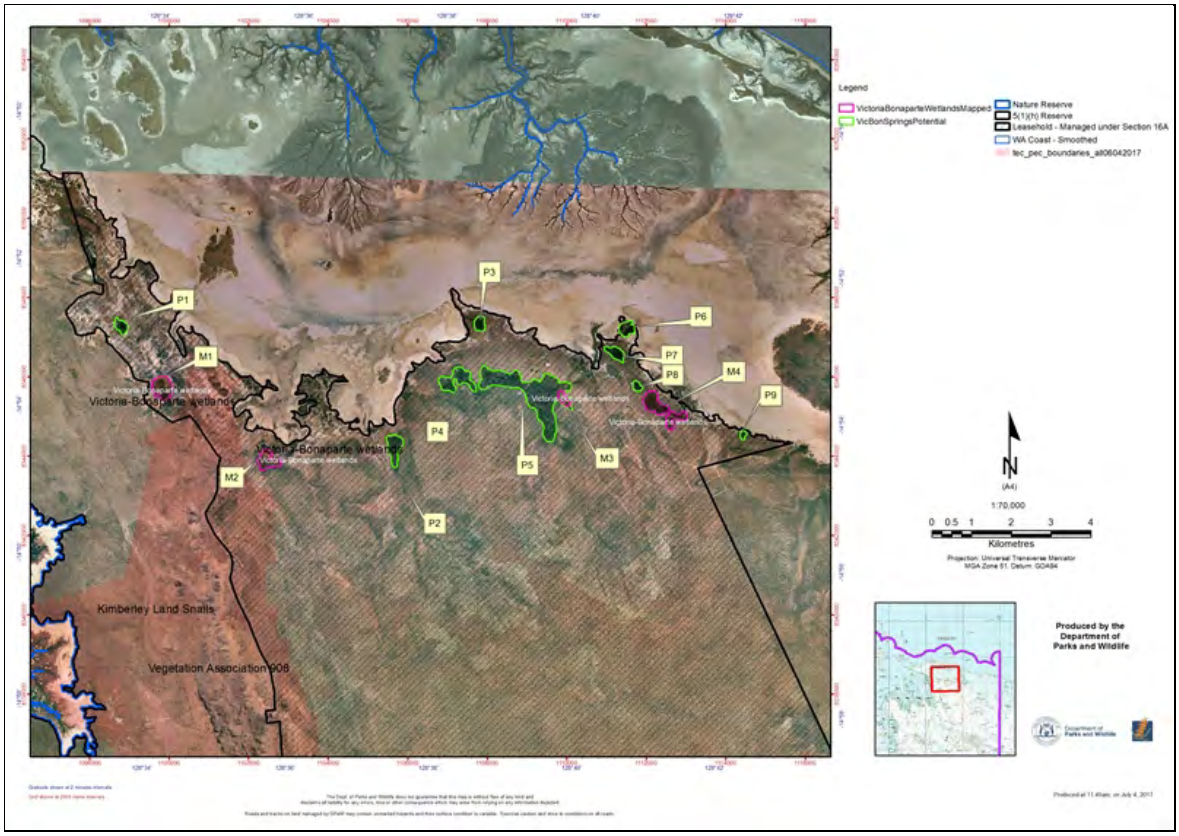

Figure 19. Currently mapped mound springs and potential springs

5.2 Methods

A total of eleven sites were surveyed, including all recorded occurrences and five additional sites, and the following recorded:

- general vegetation description, condition and structure across the mapped community.
- Flora list for vegetation within the quadrat and at adjacent locations throughout the mound spring community.
- threatening processes; and
- management recommendations compiled.

In conjunction with the above, six sites were selected in tall dense rainforest community and in a woodland community. Permanent 50x50^{2}m quadrats were installed. Each quadrat was marked with one 1.6m star picket at NE corner site. This will enable future scoring and analysis of change, for monitoring purposes. Quadrat data (held by M. Lyons) for site include:

- GPS location;
- vegetation description, stratum and structure;
- soil and landform;
- flora specimens were taken from the mound springs seepage areas and damplands surrounding the springs. Flora specimens were collected by Mike Lyons, with additional collections by Jill Pryde (Hayley's Spring) and M. Coote and A. Turnbull.

- Aquatic invertebrate survey, peat core and water chemistry in an area of standing water by A. Pinder and K. Quinlan.
- Assessment and mapping by the wetlands group (M. Coote and A. Turnbull) using a handheld GPS in conjunction with aerial photography.
- Photographs of occurrences and surrounding landscape.

These data will be added to the corporate TEC/PEC database when available.

5.3 Limitations:

Four days were allocated to survey the Victoria-Bonaparte wetlands and this limited the capacity to conduct a full assessment on status and condition across the suite of wetlands.

5.4 Results:

Survey of the Victoria-Bonaparte wetlands PEC was undertaken between 1-4 August 2016 to coincide with low tide. The PEC comprises four mapped occurrences that occur over a range of 14 km bordering the edge of the saline coastal flats. All recorded occurrences and most potential sites sampled are located on a raised central mound that contained a mix of peaty organic black soils and/or decayed organic material. Internal moats and pools occur at various depth and contained aquatic ferns and submerged herbs at various densities. The canopy vegetation comprised tall Melaleuca forest with other trees, including rainforest species of various stratum and density including thickets of vines, including climbing ferns over *Pandanus spiralis*, *Typha domingensis*, creepers, rushes, sedges, grasses and ferns. The surrounding alluvial flats and black soil plains support dense to scattered stands of *Melaleuca* spp., *Acacia* spp. and other shrubs and trees over *Cyperus* spp., *Sporobolus* spp. grasslands and patches of *Adansonia gregorii* (boab) and *Pandanus* thickets with scattered samphires over the outer saline areas. No Declared rare flora (DRF) were identified, however three priority flora species were recoded including *Sterculia holtzei* (P1), *Utricularia aurea* (P2) and *Adenostemma lavenia* var*. lanceolatum* (P3).

5.4.1 Brolga Spring (Occurrence 01)

(M1 on Figure 19)

Brolga Spring (Figure 20) occupies 23.3ha. A *Melaleuca* woodland surrounded by *Typha domingensis* with emergent *Ficus* spp. is a small permanent freshwater spring which lies on the margin of open coastal grassland plain towards the west and the red soils plains of open eucalypt woodlands to the east and south. The spring occurs at the extreme northern end of the Ningbing Range on the sandy margin flanked by tidal limit 3 km east and 4 km west. Brolga Spring lies directly adjacent Mijing Conservation Park (Crown reserve 49691).

Figure 20. Brolga Spring – photo Adam Turnbull

No comprehensive survey of Brolga Springs was undertaken in August 2017, however boundary reconnaissance and a brief edge survey to observe status and condition was conducted. Vegetation comprised a *Melaleuca* sp. forest within the central mound and open water with patches of duckweed *Lemna aequinoctialis*. Species co-occurring included *Cyperus javanicus*, sedges and *Typha domingensis*. The outer perimeter of the larger seepage area in the surrounding moat contained *T. domingensis* forming a dense barrier. The south and western peripheries were more open and comprised *Melaeuca viridiflora, Sesbania cannabina*, and occasional *Ficus* spp. with vines and creepers, including *Thespesia* sp. Based on records of previous survey and current survey, the degraded stands of *M. ?leucadendra* found on the southern side of the wetland are in poor condition and the vegetation surrounding the trees has become degraded, transitioning into a grassland. Along the western periphery, upland of the moat, soils are red-brown sandy-loam covered with deep litter of *P. spiralis*, dense *M. viridiflora* shrubs, *Sesbania cannabina* and *Adansonia gregorii* over *Cyperus* spp. and grasses. Although the brief survey limited the flora inventory, the flora taxa present in this occurrence appears to be diverse.

Previous observations by S. Black *et al*. (2000) noted the destructive impacts caused by cattle, particularly at the south east corner, which appears to be a major entry point into the wetland. McKenzie (*pers comm*. 2013) noted that a fence installed prior to visitation in 2013, appeared to have assisted in improving vegetation condition of the community. However, in August 2017 the fence was breached, and cattle were again causing significant damage to the community and resulted in trampling of vegetation, damaging soil structure and adding to the accumulation of nutrients. Some weeds in this area have potential of becoming a serious threat, including **Mesosphaerum suaveolens* (formerly *Hyptis*) located on the southern side. The community was partially burnt in the previous 12 months. Vegetation condition Good-Very Good (Bush Forever scales).

The key threats identified for the mound springs are trampling of vegetation, soils and springs by cattle, nutrient enrichment, high intensity fires and potential hydrological change.

5.4.2 Long Springs (Occurrence 04)

(M3 on Figure 19)

Figure 21. Cyclosorus interruptus patch with scattered rainforest trees, vines and creepers – photo Mike Lyons

Long Spring (Figure 21) is a large wetland with scattered pools and a mosaic of vegetation occupying ~110 ha. The combination of *Melaleuca* forest and *Typha domingensis* occurring in the moat and internal pools in the northern portion of the wetland is distinct from the internal rainforest and vine thicket patches with canopy height (>30m) occupying the southern portion of the spring. The south eastern periphery is permanently moist and supports a *M. leucadendra* forest transitioning to rainforest patches with groves of tall *P. spiralis* and dense cover of *Cyclosorus interruptus* with scattered rainforest trees, vines and creepers. The inner quaking mounds contain pools at variable depth (>50 cm) comprising dense leaf litter and thick layers of decayed vegetated matter suspended in fresh-brackish water. The pools and moats contain ferns, sedges, aquatic herbs and flowering *Nymphaea violacea*.

5.4.3 Site 01

(located on northeast edge of Long Spring (currently mapped as Occurrence04))

(P5 on Figure 19)

Following a reconnaissance to this location, it became apparent this was not the site of survey by McKenzie *et. al* (1991) which identified the site EK06. Vegetation comprised tall (>30m)

forest of *Melaleuca leucadendra* ~75 % cover. Internal moats and pools at various depth (30-75 cm) with an external moat dominated by an impenetrable cover of *Typha domingensis* (>3 m) (Figure 22) with occasional *Acrostichum speciosum* and *Cyperus* sp. Internal pools contained mostly decayed aquatic herbs, sedges and *T. domingensis*. Approximately 150 m was traversed toward the centre of the spring with *M. leucadendra* and *T. domingensis* continuing to dominate this patch.

Figure 22. Long Spring (NE patch) dominated by *M. leucadendra* forest over *T. domingensis* – photo Mike Lyons

5.4.4 Site02 south east portion of Long Spring

(P5 on Figure 19)

Vegetation over the central mound contained dense *M. leucadendra* with a mixed rainforest canopy to a height (>30m). One permanent 50x50 m^2 quadrat (KMS013A) was established in the south-central section with vegetation cover 50-70%. Constituent tree species included the buttressed *Carallia brachiata, Sterculia holtzei* (P1), *Timonius timon, Nauclea orientalis* and *P. spiralis* with vines, including *Flagellaria indica*. Ferns included *C. interruptus, A. speciosum* and *Ceratopteris thalictroides. T. domingensis* and *C. javanicus* were also present in the understory. The pools of standing water (Figure 23) contained decayed organic material, roots, leaves, and aquatic herbs including golden bladderwort, *U. aurea* (P 2), and flowering *Nymphaea violacea* with soils of dark grey-silty clay. On higher ground, the sandy eastern periphery comprised scattered woodland of *Melaleuca* sp*., Corchorus* sp. and *Fimbristylis ferruginea.*

Figure 23. Long Spring (south) – photo Mike Lyons

General condition was Excellent (Bush Forever scales). Within the central mound, some evidence of cattle activity around the periphery of the wetland. Cane toads (*Bufo marinus*) were present. The establishment of cane toads is considered a future threat to wetlands across the Kimberley.

5.4.5 Potential Spring 01

(P1 on Figure 19)

Potential Spring 01 occurs on the north western extension of the saline coastal tidal flats of the Victoria-Bonaparte wetlands, 4 km north of Brolga Spring. It is a shallow, seasonally inundated open freshwater pool with dark grey peaty soils (Figure 24). It contains two bodies of open water. The larger wetland is relatively open, surrounded by sedges including *Cyperus conicus* and *C. javanicus* with grasses and herbs. On the south, western and northern edges of the wetland emergent on higher ground a woodland of trees including *Melaleuca alsophila* and mangroves over grasses. A dense stand of *Typha domingensis* surround the smaller wetland to the north of the main water body. The wetland provides a variety of habitat types for shorebirds, and many bird species were present during the August 2017 visit. An inventory of avian fauna was recorded by D. Chemello.

Figure 24. Potential Spring 01 – photo Mike Lyons

One permanent 50 m transect (KMS014A) was established along the northern edge of the central waterbody, 05 m inward of the highwater level (Figure 25). This level is likely to rise and fall with tidal movement. The vegetation comprised of *Melaleuca alsophila.* woodland and mangroves of *Avicennia marina* and *Lumnitzera racemosa* and *Thespesia populneoides*. There was little undergrowth in this location, mostly bare ground with occasional *Schoenoplectus subulatus, Fimbristylis* sp.*, Panicum seminudum* var*. seminudum* and herbs. Vegetation was in condition Good (Bush Forever scales). Plant species considered useful indicators of rainforest communities and associated mound springs were not present at the site sampled or areas surveyed opportunistically. Therefore, based on the August 2017 survey this portion of the wetland may not align with the Victoria-Bonaparte wetlands PEC. However, a higher stand of vegetation which is located on the far western edge of the wetland was not surveyed. This area may contain rainforest indicator vegetation.

Figure 25. Potential Spring 01 Transect KMS014A – photo Mike Lyons

Cattle appear to be a major threat to this wetland (Figure 26). They were present at the time of survey and their impact on the vegetation and soils was evident. An inlet immediately to the north of the smaller wetland as well as the cleared edge on the eastern flank of the wetland appear be the primary entry points. Other threats include weed invasion, altered fire regimes, feral animals, potential hydrological changes (e.g. groundwater extraction) and tourism development.

Figure 26. Cattle, a major threat across the wetlands – photo Mike Lyons

5.4.6 Potential spring 09

(P9 on Figure 19)

This spring is the most easterly sampled in the survey, located ~500 m east of Attack Spring, on the edge of the coastal saline flats. A small (~0.8 ha), heavily vegetated mound, surrounded by a moat and internal pools of water at variable depth occurs. The substrate mostly contained partially decayed vegetated material.

Figure 27. KMS10 established in dense vegetation at potential spring 09 – photo Mike Lyons

One permanent 50x50 m^2 quadrat (KMS010) (Figure 27) was established within the dense closed-open tall forest with cover ~70% of *M. leucadendra* (>70m) and *Glochidion sumatranum* over *Sesbania formosa*, a broadleaf tree emergent. The understory contained *C. interruptus* and other ferns with submerged aquatic, *U. aurea* (P2) in standing water. On the periphery, some patches of vegetation were more open. Other patches were dense, containing thickets of *T. domingensis* and *Colocasia esculenta* (taro) with *Marsilea crenata, Corchorus* sp*., Cyperus* sp*.* and *Scleria lingulata.* No DRF was located however one Priority flora species was recorded. Plant species considered useful indicators of rainforest communities and associated mound springs were present. The total number of weeds species was low. Vegetation condition was Excellent (Bush Forever scales).

There was evidence of cattle activity. The key threats identified for the wetland include grazing, weed invasion, altered fire regimes, feral animals, potential hydrological changes (e.g. groundwater extraction) and possibly tourism development.

It is considered that this mound spring is likely to align with Victoria-Bonaparte wetlands Priority 1 ecological community.

5.4.7 Attack Spring (Occurrence 03)

(M4 on Figure 19)

Attack spring is an elevated quaking mound, which contains a thick layer of decayed vegetated matter suspended over fresh-brackish water. The 36 ha mound was encircled by a mosaic of standing pools and moats of water at variable depth (3-70 cm). Vegetation over the mound comprised a dense closed-open *Melaleuca* forest and other rainforest species canopy to a height of >30 m (Figure 28).

Figure 28. Quaking mound, Attack Spring – photo Mike Lyons

One permanent 50x50 m^2 quadrat (KMS011A) was established within the central mound containing *M. leucadendra* forest (>30m) and *Glochidion sumatranum* with 70% cover, over scattered *Sesbania formosa* and vines of *Flagellaria indica* with an understory of *T. domingensis, Cyperus platystylis* and ferns including *Cyclosorus interruptus* (Figure 28). Contiguous pools contained thick layers of fallen paperbark and decayed vegetated material and a dense coverage of aquatic herbs, including *Lemna aequinoctialis, Utricularia aurea* (P2) and *Ceratophyllum demersum*. The moat surrounding the mound contained an almost impenetrable barrier of *Phragmites karka* and *Typha domingensis*. On higher ground, the periphery of the wetland contained occasional *S. formosa* and dense *Melaleuca* spp. woodland with tufted perennial grass *Fimbristylis cymosa*. Vegetation condition was Excellent (Bush Forever scales). Within the central mound there was little evidence of cattle activity, however cattle impacts were noted on the outer surrounding *Melaleuca* woodland.

5.4.8 Enigma Spring (Potential spring 06)

(P6 on Figure 19)

A small densely vegetated mound located on the far northern edge of the saline coastal flats (Figure 29). The mound occupies ~6 ha and drained from the north west. A small number of internal pools and moats with water at variable depth were present. Substrate consists mostly decayed organic material with little soil.

Figure 29. Enigma Spring displaying the dense understory – photo Jill Pryde

One permanent 50x50 m^2 quadrat (KMS012A) was established within the densely closed to open *M. leucadendra* forest >70m with *Ficus racemosa, Glochidion sumatranum, Carallia brachiata* and *Hibiscus tiliaceus,* over a dense understory of shrubs containing, *Thespesia populneoides, Abutilon indicum* var. *australiense,* climbers, *Mucuna gigantea* subsp. *gigantea, Flagellaria indica, Decaisnina angustata* and *Adenostemma lavenia* var.

lanceolatum (P3) with ferns *Cyclosorus interruptus, Acrostichum speciosum* and *Ceratopteris thalictroides*. Around the periphery, thickets of *Typha domingensis* and *Colocasia esculenta* var*. aquatilis.* Other flora present include *Marsilea crenata, Cyperus haspan, Cyperus javanicus, Fuirena ciliaris* and *Fimbristylis* sp. Restricted to the outer edge were shrubs of *Melaleuca* spp. over grasses. Plant species within the central mound that are considered useful indicators of rainforest communities and associated mound springs were present at the site sampled. Total number of weeds was low, however the large shrub **Calotropis procera* was recorded. Vegetation condition was Excellent (Bush Forever scales). There was no sign of recent fire. There was some evidence of cattle entering the community, however impacts appeared to be low.

Two small vegetated patches to the west were briefly surveyed (Figure 30). The most northerly patch was degraded with the second patch located immediately south comprised a tall woodland of *Melaleuca* spp. over a dense understory of grasses and herbs. The patches contained few rainforest indicator species, and no peat mounding was evident.

Figure 30. Looking west to small vegetated patches and potential mound springs – photo Jill Pryde

5.4.9 Potential spring 07 (Hayley's Spring)

(P7 on Figure 19)

Hayley's spring (Figure 31) is located south of Potential Spring 06 and 1 km northwest of Attack Spring. No comprehensive survey was conducted; however a brief edge survey and boundary reconnaissance was undertaken to assess status and condition.

Figure 31. Internal pools covered with *L. aequinoctialis* – Photo Jill Pryde

The thickly vegetated mound occupies ~8.6 ha and rises (~2 m) above black cracking clays and surrounding saline coastal flats. Soils are peaty grey-black containing mostly organic material. Water appears fresh-brackish. Vegetation on the central mound comprised a tall-medium dense *Melaleuca leucadendra* forest with *Glochidion sumatranum* and vines including *Flagellaria indica* and *Vincetoxicum carnosum* but mostly lacking a mid-story. A suite of internal moats of various depths (~30-70 cm) contain a dense cover of *Lemna aequinoctialis, Utricularia aurea* (P2) with occasional *Ceratopteris thalictroides* (Figure 31*.* Ferns *Cyclosorus interruptus* and *Acrostichum*. sp. surrounded pools, often at the base of *Melaleuca* trees. Many fallen *Melaleuca* trees lay over the mound. Surrounding the central mound included a dioecious tree *Ficus hispida* var*. hispida* with shrubs*, Cathormion umbellatum, M. viridiflora* and *Plumbago zeylanica* and creeper*, Causonis trifolia* with a dense stand of *Schoenoplectus subulatus, Phragmites karka, T. domingensis* over *Marsilea* sp*. S. lingulata* and ferns. The dryer outer perimeter contained a woodland of *Melaleuca* spp. with *Acacia neurocarpa*. shrubs and mistletoe with *T. domingensis* and swathes of mixed sedges and grasses, including *C. javanicus* sp*.* and *Fimbristylis polytrichoides* and herbs, including *Ludwigia octovalvis*. Vegetation condition was Excellent (Bush Forever scales).

Based on observations from this partial survey, the mound appears to align with Victoria-Bonaparte wetlands Priority 1 ecological community.

The key threats identified to the mound springs are, grazing, weed invasion, altered fire regimes, feral animals and potential hydrological changes (e.g. groundwater extraction) and tourism development.

5.4.10 Potential spring08 (unnamed)

(P8 on Figure 19)

A small vegetated mound which occupies ~5.4 ha is located immediately west of Attack Spring. This site was not surveyed.

5.4.11 King Gordon Spring (Occurrence 02)

(M2 on Figure 19)

King Gordon spring is situated 2 km east of Brolga Spring and occupies ~18 ha. This is a large vegetated mound containing rainforest and vine thicket patches surrounded by moats, and standing pools of water at variable depth (Figure 32). The outlier saline mudflats comprise *Melaleuca* shrubland over sedges, vines and grasses.

Figure 32. High water levels within internal moats – photo Jill Pryde.

One permanent 50x50 m^2 quadrat (KMS015) was established within the central raised mound, containing closed-open rainforest, dominated by *M. leucadendra* (<30m) with *Carallia brachiata, Nauclea orientalis, Timonius timon* providing ~60-70% cover. The understory comprised scattered *P. spiralis* with dense layers of vines including *F. indica* and a rampant climbing vine *Luffa aegyptiaca* over *T. domingensis* and *Cyperus* sp. and ferns over a dense layer of fallen *Pandanus* branches and litter. Scattered internal pools of water (<75 cm deep) contained a thick layer of decayed vegetated material in combination with aquatic herbs *U. aurea* (P2) (Figure 33), *L. aequinoctialis*, and *Nymphaea violacea*, aquatic ferns, including *C. thalictroides*, vines and creepers and grasses including *Fimbristylis* sp. Soils were dark grey clay below a dense leaf layer. General condition was Excellent (Bush Forever scales). Average flora species richness was 10-25 and the number of weeds species was low. *M. leucadendra* trees showed signs of recent fire. was recorded No obvious sign of threats were noted however cattle are likely to utilise the springs.

Figure 33. Priority 3 aquatic herb *Utricularia aurea* found in majority of sites surveyed –photo Mike Lyons

5.4.12 Bamboo Spring (Potential spring02)

(P2 on Figure 19)

Bamboo Spring (Figure 34) is located 3 km east of King Gordon Spring and lies adjacent to inlets draining from the north west. The spring was elongated in shape and occupied ~23 ha. No comprehensive vegetation survey was undertaken due to highwater levels, however opportunistic flora specimens were collected (KMS016A). Peat and water were sampled and a partial boundary reconnaissance, focussing along the western periphery.

Figure 34. Bamboo Spring – photo D. Chemello

This spring was mostly inundated by water at various depths (20-75 cm) and dominated by *M. leucadendra* (~90% cover) perched on pockets of higher ground with the ferns including *A. aureum* in combination with *T. domingensis* and *Cyperus* sp. Internal pools contained the violet-white flowering *N. violacea* (Figure 35) and thick mats of decayed aquatic herbs including, *L. aequinoctialis, U. aurea* (P2) and a hornwort, *C. demersum*. An open moat (>75 cm) surrounded the central mound and contained *T. domingensis, N. violacea* (Figure 31) and aquatic herbs including, *L. aequinoctialis, U. aurea* (P2) and Indian water fern *C. thalictroides*. Soils were black organic peat. The surrounding shrubland contained *Melaleuca* spp. and *Acacia* spp. over mixed sedges of *Cyperus* sp. and grasses, including *S. lingulata*. Vegetation condition was Excellent (Bush Forever scales).

Figure 35. Flowering *Nymphaea* sp. present within internal and external moats – photo Mike Lyons.

5.5 Recommendations

- Determine whether additional springs surveyed align with the Victoria-Bonaparte Wetlands priority 1 ecological community. This would require further hydrological investigation and additional vegetation survey;
- Design and implement a project to determine the hydrological drivers of the mound spring ecosystem;
- Design and implement a monitoring program that utilises quadrats established during the current survey. This will probably require establishment of a more comprehensive network of quadrats, and should be designed to provide information about the success of land management in the sensitive environment of the mound spring ecosystem;
- Seek funds for fencing of the mound springs to restrict cattle access; and

- Determine whether weeds are likely to become a major threat and seek ways to management them.

5.6 Conclusions:

Based on observations from this partial survey, the majority of mound springs surveyed are likely to align with the Victoria-Bonaparte Wetlands priority 1 ecological community. Once all results of the August 2017 survey are reconciled, it is likely that additional occurrences will be added to the TEC database and boundaries will be delineated. Over time it will be valuable to build up a uniform dataset for springs for a broader regional analysis.

It is recommended that a full nomination be prepared and presented to the W.A. Threatened Species Ecological Communities Scientific Committee for formal assessment.