173 – 177 DEANSIDE DRIVE, ROCKBANK: GROWLING GRASS FROG HABITAT

EXPERT WITNESS STATEMENT OF BRETT LANE

Kellehers Australia

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November 2016

Report No. 14013 (3.2)

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1. WITNESS INFORMATION

1.1. Expert witness information

1.1.1. Name and address

Brett Alexander Lane
Brett Lane & Associates Pty Ltd
Suite 5, 61-63 Camberwell Road
Hawthorn East, Vic. 3123

1.1.2. Area of expertise

Brett Lane has extensive expertise in terrestrial ecology and related legislation and policies.

His qualifications and experience are summarised in Appendix 1.

1.2. Information of other significant contributors

The names, addresses and areas of expertise of other significant contributors to this report, and associated background reports, are presented in Table 1.

Table 1: Details of other significant contributors

Name of contributor	Address	Area of Relevant Expertise	Location of summary of qualifications and expertise
Justin Sullivan	Brett Lane & Associates Pty Ltd Suite 5, 61-63 Camberwell Road, Hawthorn East, Vic. 3123	Ecology and biodiversity legislation and guidelines	Appendix 2

2. WORK UNDERTAKEN AND SUMMARY OF FINDINGS

2.1. Work undertaken

Brett Lane & Associates Pty Ltd (BL&A) was retained by Kellehers Australia to provide advice on the status, habitat requirements and government conservation reserve plans for the Growling Grass Frog (*Litoria raniformis*) at a parcel of land at 173 – 177 Deanside Drive, Rockbank, VIC, 3335.

The property lies within the Kororoit PSP area, in which a large proportion of the land is proposed to be set aside for a proposed conservation corridor for Growling Grass Frog as defined in the *Biodiversity Conservation Strategy for Melbourne's Growth Corridors* (DEPI 2013). The Growling Grass Frog is listed as vulnerable under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and is listed as endangered in Victoria under the Department of Environment and Primary Industries (DEPI) Advisory List for threatened fauna (DSE 2013). Under the *Sub-Regional Species Strategy for the Growling Grass Frog* (DEPI 2013a), areas of important habitat for Growling Grass Frog have been mapped to be protected and managed within Melbourne's Urban Growth Zones.

The Kororoit PSP was released by the MPA in June 2016, along with the background report for Plumpton and Kororoit (both of which are publically available on the web). The PSP and the background report follow the recommendations of the *Sub-Regional Species Strategy for the Growling Grass Frog* regarding the designation of much of subject land as part of the conservation corridor for Growling Grass Frog (Conservation Area 15). Both documents provide only a basic concept plan for Conservation Area 15, compared with the concept plans for conservation areas 1 and 2, which provide much detail on specific design principles and outcomes.

The investigations undertaken to date, and summarised and reported on in this witness statement were:

- Growling Grass Frog *Litoria raniformis* habitat assessment and targeted survey (BL&A Report 14013 (1.3) – February 2014) – provided as Appendix 3 to this statement;
- Growling Grass Frog habitat requirements (BL&A Report 14013 (2.1) – March 2014) – provided as Appendix 4 to this statement; and
- Review of the following engineering reports prepared by FMG Engineering Pty Ltd (FMG), regarding civil engineering considerations for the establishment and function of the proposed Growling Grass Frog metapopulation node in the study area:
    - 173-179 Deanside Drive, Rockbank, Kororoit Precinct Structure Plan, Future Development Assessment (FMG Letter report from David Fairbairn to Kellehers Australia Pty Ltd, dated March 14th 2014) – provided as Appendix 5 to this statement; and
    - Kororoit Precinct Structure Plan, Future Development Assessment: Supplementary Report on Use of Groundwater (FMG Letter report from

David Fairbairn to Kellehers Australia Pty Ltd, dated May 16th 2014) – provided as Appendix 6 to this statement.

The scope of these investigations is summarised below.

BL&A Report 14013 (1.3)

The Growling Grass Frog habitat assessment and targeted survey scope of works was as follows:

- Existing information on Growling Grass Frog in the area was reviewed, including:
    - Victorian Biodiversity Atlas administered by the Department of Environment and Primary Industries (DEPI);
    - The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool;
    - DEPIs *Biodiversity Conservation Strategy for Melbourne's growth corridors* report;
    - Sub-regional Species Strategy for the Growling Grass Frog
    - *Review of habitat corridors for Growling Grass Frog Litoria raniformis within Melbourne's Urban Growth Areas* prepared by Biosis Research;
    - DEPIs online biodiversity interactive mapping.
- An initial field survey of the study area was undertaken involving:
    - Assessment of the nature and quality of native fauna habitat;
    - Characterisation and mapping of any Growling Grass Frog habitat considered to occur in the study area; and
    - Assessment of the likelihood of occurrence of Growling Grass Frog at the study area.
- A follow up targeted survey for Growling Grass Frog was undertaken in the study area to ascertain whether the species was present in existing habitat there (i.e. the Kororoit Creek channel);
- Maps were prepared of the study area showing the results of the habitat assessment and the current Habitat Compensation mapping according to the BCS;
- A brief report was prepared that presented the results of the on-site habitat assessment and frog surveys, and evaluated the likely current and future usage of the property by the species.

BL&A Report 14013 (2.1)

At my client's request, in this brief report I provided further details of the type of habitat required to satisfy the metapopulation node requirements set out in the Growling Grass Frog Sub-Regional Species Strategy. I also reviewed the technical basis for the strategy (Biosis 2012). Based on this, and with the benefit of engineering advice in relation to the catchment, runoff flows and groundwater characteristics of the property and its surrounds, the effectiveness of the metapopulation node proposed for the property was evaluated.

2.2. Summary of findings

2.2.1. BL&A Report 14013 (1.3)

A significant proportion of the study area is listed as Category 1 habitat (DEPI 2013a). Mapped Category 1 habitat areas are required to be protected and enhanced to ensure the long-term viability of important populations of Growling Grass Frog within the growth corridors (DEPI 2013a). The placement of Category 1 habitat mapping in the study area is based on buffers extending from Kororoit Creek, which border the north and east boundaries of the parcel (DEPI 2013a).

Extended buffers of Category 1 habitat occur at metapopulation nodes and inter-nodal areas.

The Review of Habitat Corridors for Growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth Areas (Biosis 2012), proposed a metapopulation node (KRC08) be placed at the section of Kororoit Creek that includes the property. This mapping has been based on the presence of suitable habitat and records of Growling Grass Frog occurring within the parcel boundary (Biosis 2012). As a result, a Category 1 buffer at a minimum of 150 metres and in excess of 200 metres from the centre of the creek has been placed on the property.

Methodology

A database and literature review of existing information on Growling Grass Frog at the study area was undertaken. The following sources were reviewed.

- Victorian Biodiversity Atlas (VBA) administered by the Department of Environment and Primary Industries (DEPI)
- The Commonwealth EPBC ACt Protected Matters Search Tool
- Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013a)
- DEPIs Biodiversity Conservation Strategy for Melbourne's growth corridors report (DEPI 2013b)
- Review of habitat corridors for Growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth Areas (Biosis Research 2012) and
- DEPI's online biodiversity interactive mapping.

A daytime habitat assessment was undertaken on 29th January, 2014. The survey methodologies followed Commonwealth (DEWHA 2009) and Victorian (DSE 2010) Growling Grass Frog surveying guidelines. Each site was surveyed twice. Surveys commenced after sunset and were undertaken during suitable weather conditions (i.e. still nights with temperatures above 14°C) (Table 2). The details of the methods and results of this survey are presented in Appendix 3 of BL&A Report 14013 (1.3) – which is attached to this witness statement as Appendix 3.

Table 2: Weather conditions during targeted survey

Date	Start time	Site	Replicate	Temperature (°C)	Humidity (%)
10/02/2014	20:35	1	1	17.8	59
	21:23	2	1	17.4	59
	22:10	3	1	17	60
12/02/2014	20:20	1	2	26.4	53
	21:10	2	2	23.2	59
	22:00	3	2	22.6	61

The targeted survey was undertaken late in the Growling Grass Frog breeding season and therefore frogs were not responding to call playback. Access was limited at sites 1 and 2 during the spotlighting and active searching. Spiny Rush lined the creek bank in some areas making it difficult if not impossible to access the water's edge in such locations.

As the primary purpose of the investigation was to assess the extent and quality of Growling Grass Frog habitat and determine the presence of the species in the study area, the review of existing information, combined with the field surveys were sufficient to complete this aspect of the assessment.

Wherever appropriate, a precautionary approach was adopted in the discussion of implications. That is, where insufficient evidence was available on the occurrence or potential occurrence of a species, it was assumed that it could be in an area of suitable habitat. The implications under legislation and policy were considered accordingly.

Results

Site context

Kororoit Creek is known as an important population based on the definition in the EPBC Act Policy Statement (DEWHA 2009) and as listed in the Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013). Kororoit Creek is determined to be high quality Growling Grass Frog habitat. The section of the creek within the study area contains permanent and semi-permanent water bodies, extensive aquatic vegetation, high water quality, a high cover of terrestrial refuge sites, has recent Growling Grass Frog records and is connected to other occupied sites. No offline water bodies exist within the study site (i.e. water bodies not supplied by the creek, such as farm dams).

Existing metapopulations as listed in the Sub-Regional Strategy of Kororoit Creek are generally subject to a 200m buffer of Category 1 habitat. More generally, between metapopulation nodes a corridor of 100 metres each side of the stream is deemed to be sufficient for important sites like Kororoit Creek (DEPI 2013a). A buffer in excess of 200 metres has been placed in some areas of the proposed KRC08 metapopulation mapped Category 1 habitat at 173-177 Deanside Drive.

As indicated within the Biodiversity Conservation Strategy (DEPI 2013b), final boundaries of these protected habitat areas may change slightly to deal with local site conditions during the precinct structure planning process.

The Panel therefore is in a position to review the evidence that underpins the proposed reserve boundaries, and having consideration to this and other relevant planning issues and evidence, recommend if changes to reserve boundaries are warranted.

Existing records

Two existing records of Growling Grass Frog occur within the study area (VBA 2014), both of which were recorded by Aaron Organ (Ecology and Heritage Partners) from 13th January, 2005 (Figure 1). These records were obtained during a frog census undertaken by Ecology and Heritage Partners in the area. One Growling Grass Frog was heard, captured and released in each of the two record locations.

The VBA records within the study area (Figure 1) clearly reflect two of the records shown in Figure 2a of the Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013a). It is noted that the Sub-regional Strategy for the Growling Grass Frog depicts additional records in the study area; however, these records are evenly offset to the south west [*by approximately 90 metres*] and are considered to have been erroneously replicated during production of the mapping. As such, BL&A consider that only two existing Growling Grass Frog records occur within the study area, as shown in Figure 1.

The VBA notes that these records have an accuracy of 100 metres from the point location shown in Figure 1. These Growling Grass Frog records therefore are considered likely to have been located within Kororoit Creek.

Further clarification on the above paragraphs: one of the requirements regarding VBA species record entry is the inclusion of the accuracy of records (i.e. +/- 5 metres, 100 metres, 2 kilometres, Etc). The accuracy of the record is entered into the VBA by the recorder. For the abovementioned Aaron Organ 2005 VBA records, the stated accuracy in the VBA record data is +/- 100 metres. Thus, the additional Growling Grass Frog records shown in Figure 2a of the Sub-regional Strategy are within that accuracy tolerance of +/- 100 metres and are therefore considered erroneous duplications of the Aaron Organ records.

The next closest existing records are of five Growling Grass Frog individuals to the south west of the study area, recorded in 2010 within the proposed intermodal corridor KRC09 (Biosis Research 2012). Furthermore, it is well documented that significant populations of Growling Grass Frog occur along Kororoit Creek and as such it is considered an important population (DEWHA 2009).

Habitat assessment

Six main habitat types were identified and mapped on the property during the current investigation, which are listed below. The locations of these habitat types in the study area are presented in (Figure 2) and a detailed description of them is provided in BL&A Report 14013 (1.3) – which is attached to this witness statement as Appendix 3:

- Creek and creek bank habitat
- Low, flat, open pasture
- Rocky escarpment
- Elevated rocky grassland
- Elevated modified pasture/crop
- Rockpiles

Targeted Survey

The Growling Grass Frog was recorded at the study area during the current targeted survey. A summary of the results of the targeted survey are presented in Table 3. Please note that the figure for each site is the combined total number of frogs recorded over the two replicated surveys. The location of survey sites and Growing Grass Frogs recorded are shown in Figure 3.

Table 3: Summary of results of the targeted Growling Grass Frog survey

Species	Site 1	Site 2	Site 3
Growling Grass Frog		2	1
Southern Bullfrog		1	
Spotted Marsh Frog	10		

The Growling Grass Frog was recorded at both sites 2 and 3. Access to the waters edge at site 1 was very limited and Growling Grass Frog is expected to occur along that section also as habitat is continuous and of high quality throughout the creek in the study area.

Legend

- Study Area
- Growling Grass Frog VBA Records

Metres

0 100 200 400

Figure 1: Growling Grass Frog VBA Records

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

Project No.: 14013	Date: 30/01/2014	Created By: M. Ghasemi / T. Shell

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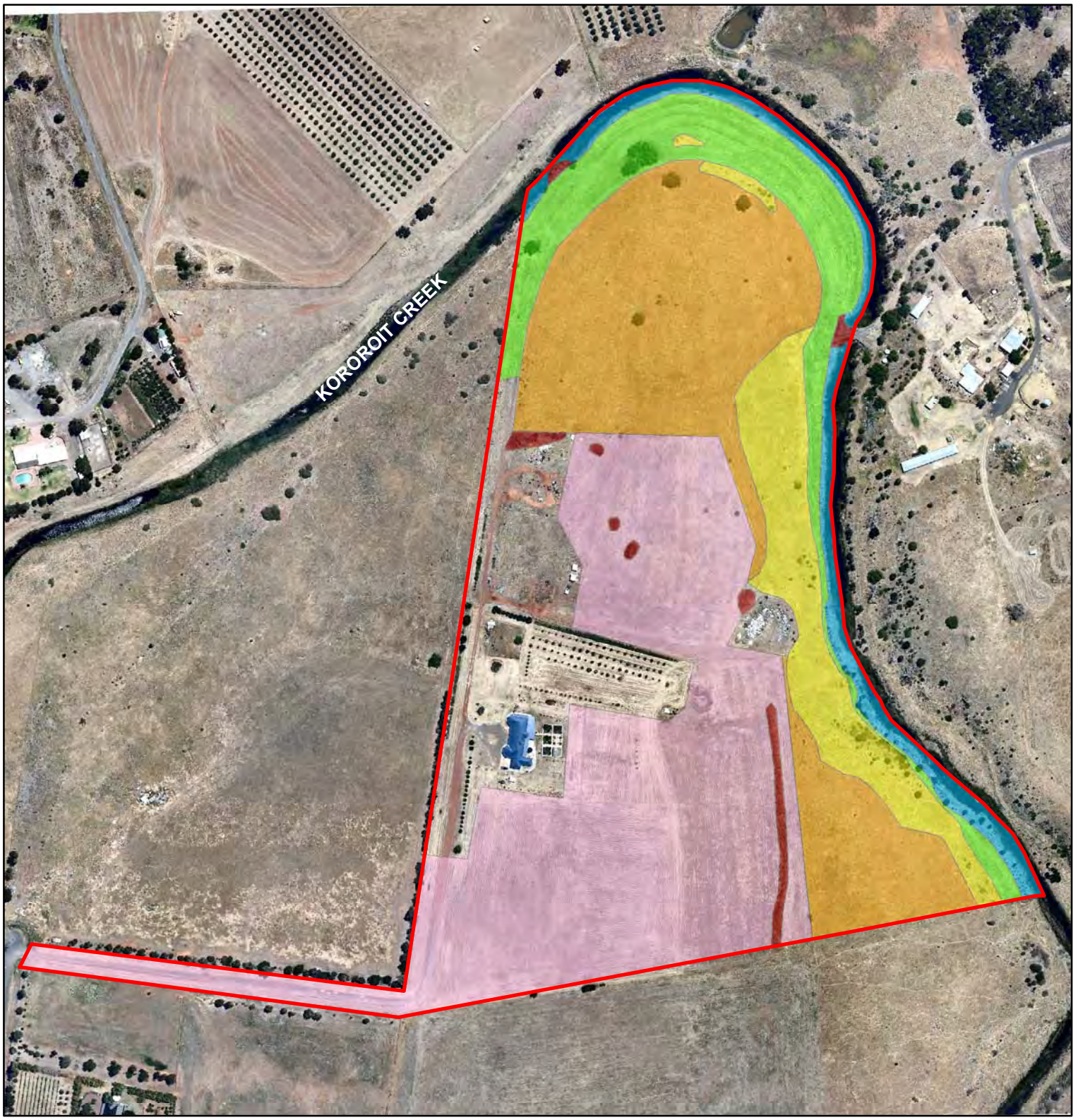

Legend

Study Area

Growling Grass Frog Habitat Features

- Creek and creek bank
- Elevated rocky grassland
- Low flat open pasture
- Modified pasture/crop
- Elevated Rockpiles
- Rocky escarpment

0 50 100 200 Metres

N

Figure 2: Growling Grass Frog Habitat Features

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

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Metres
0 50 100 200

Legend

- Growling Grass Frog Survey Sites
- ★ Growling Grass Frog Recorded by BL&A

Figure 3: Growling Grass Frog Survey Sites

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

Project No.: 14013	Date: 14/02/2014	Created By: M. Ghasemi / T. Shell

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Discussion

A Growling Grass Frog population and its associated suitable habitat is considered to occur along the section of Kororoit Creek in the study area. This is supported by the current investigation and the known previous records of the species. Furthermore, where present, it is considered likely that the species may utilise the adjacent flat pasture habitat below the escarpment for dispersal and the rocky escarpment area as a potential refuge.

As no offline water bodies occur within the study area, there is a low likelihood that individuals would travel beyond the creek, floodplain and escarpment to utilise the elevated rocky grassland and modified pasture/crop areas elsewhere on the property.

Application of a 100 metre buffer (which has been applied to a large portion of the remainder of the Kororoit PSP area), is considered to be sufficient to encapsulate the areas that provide habitat for the species in the study area. A 100 metre buffer area from the Kororoit Creek for the study area is shown in blue in Appendix 1 of BL&A Report 14013 (1.3) – which is attached to this witness statement as Appendix 3.

2.2.2. BL&A Report 14013 (2.1)

In this brief report, I provide details of the type of habitat required to satisfy the metapopulation node requirements of the Growling Grass Frog Sub-Regional Species Strategy, which forms part of the wider Melbourne Strategic Assessment under the EPBC Act, covering Melbourne's new growth areas.

This strategy has the following to say about Growling Grass Frog habitat requirements:

> *"Populations are structured as metapopulations (a group of spatially separated interacting populations), demonstrating spatially clustered patterns of wetland occupancy, where movement between water bodies occurs as habitat conditions change over time, that is, when water bodies dry out or flood.*
>
> *Water bodies that are located within close proximity of each other are more likely to support a population of Growling Grass Frog compared with isolated sites. Frogs have been recorded moving up to one kilometre in one night.*
>
> *Dispersal is thought to occur primarily along drainage lines or other low-lying areas between water bodies, and unhindered movement between and within water bodies is considered important for population viability.*
>
> *Water quality is important for successful breeding and larval development. It is likely that Growling Grass Frog tadpoles are sensitive to some horticultural chemicals, such as fertilizers and pesticides."*

These findings are based on a more detailed analysis of the use of aquatic and adjacent habitats by the species in the growth corridors by Heard *et al*, Ecology & Heritage Partners and Biosis Research. In terms of suitable habitat, these

documents describe suitable habitat for the frog, as summarised in the points below.

- Permanent and semi-permanent wetlands;
- Diverse aquatic vegetation, including higher covers of emergent, submergent and floating vegetation (this tends to occur mostly in semi-permanent and permanent wetlands);
- Wetland depth of 1.5 metres or more across a significant proportion of the wetland to ensure the maintenance of water suitable for the favoured higher cover of diverse aquatic vegetation;
- Clusters of wetlands within hundreds of metres of one another are more likely to support the species than isolated wetlands;
- Wetlands greater than c. 3,800 square metres in area have a greater probability of supporting the frog;
- Still and very slow-flowing water;
- Water salinity not exceeding 10,000 uS/cm;
- Suitable dispersal habitat (waterway or open space but not built up area) linking the wetland to other wetlands.

The Biosis document formed the basis for mapping suitable existing and future habitat along waterways, including metapopulation nodes, such as the one that covers the study area. The final conservation reserves for the species identified by Biosis were the result of a consensus building exercise among knowledgeable ecologists in the form of an expert workshop. It is noted that an engineer was not explicitly indicated as being present. In addition, the workshop used the extensive knowledge developed of the frog's use of wetlands and nearby habitat along the Merri Creek to develop its guiding principles, which were then applied to the remaining relevant waterways in Melbourne's growth areas. Specifically, on page 4 of the Biosis document, the following statement is made about where metapopulation nodes should be located.

> *"As a general rule (subject to variation, see below) sites of identified metapopulations, or locations that currently meet physical and habitat attributes considered likely to support metapopulations, should be protected by terrestrial habitat corridors of up to 200 metres width either side of the waterway. Key attributes that were used to determine the location of metapopulation nodes were landform (generally low-lying areas or relatively flat land) and the existence of drainage lines to feed created wetlands.* ***This point is critical*** [my emphasis] *as without an appropriate water source it will be impossible to create and maintain wetlands of an appropriate size and hydro-period to be suitable as Growling Grass Frog breeding habitat. Growling Grass Frog populations are more likely to persist in larger, more permanent wetlands.""*

Based on the principles for protecting habitat for the Growling Grass Frog enunciated in the approved sub-regional species strategy, together with the foregoing requirements for "*locations that currently meet physical and habitat*

attributes considered likely to support metapopulations" (Biosis), it appears that the study area has been mistakenly identified as a future metapopulation node.

This is not unexpected as Biosis acknowledge that the work that informed the final mapping of habitat conservation areas in Melbourne's Growth areas was subject to significant limitations, such as the lack of information on the drainage, surface water resources and groundwater characteristics of areas, together with the lack of information on the possible presence of hard rock. After highlighting these limitations, they conclude:

> *"By reason of these limitations, any specific site or sites identified in this study for wetland creation may be subject to variation or adjustment with more detailed site assessment."*

I have reviewed the engineering and drainage findings of Mr David Fairbairn from FMG (see Section 2.2.3 below) in relation to the catchment yield, water balance and potential constructability of wetland habitat and conclude that the proposed metapopulation node in the study area does not meet some of the key attributes required of such new habitat areas. Specifically in the case of the study area, the catchment is comparatively small and there is no waterway that would supply water to the area proposed to be set aside for frog habitat. These are key requirements set out by Biosis for metapopulation nodes (see above).

I have also reviewed Mr Fairbairn's advice in relation to alternative sites for metapopulation nodes within the same section of the Kororoit Creek (i.e. between the edge of existing urban areas and the proposed Outer Metropolitan Ring Road) and confirm that these two alternative locations are more likely to meet all of the physical and habitat attributes (e.g. wetland numbers, size and hydro-period) required for the maintenance of a sustainable metapopulation. They also have a larger catchment and greater water yields (especially once developed) and provide much greater assurance that habitat can be created that will ultimately benefit the Growling Grass Frog population in the Melbourne region.

2.2.3. Review of FMG reports

173-179 Deanside Drive, Rockbank, Kororoit Precinct Structure Plan, Future Development Assessment (FMG Letter report from David Fairbairn to Kellehers Australia Pty Ltd, dated March 14th 2014)

The stated scope of this assessment was "to cover the management of water resources on the subject site, and determine whether this management will support the proposed Growling Grass Frog habitat", regarding the construction and maintenance of constructed wetlands that will comprise the proposed Growling Grass Frog metapopulation node covering the study area.

The assessment addressed:

- Land subject to flooding;
- Growling Grass Frog habitat;
- Catchment assessment;
- Water balance assessment;

- Water quality;
- Construction of wetlands on site;
- Connectivity between existing creek based habitat and proposed adapted habitat area; and
- Options for more suitable areas for metapopulation node.

The conclusions of the assessment were:

- *"The subject site is unsuitable as a proposed [Growling Grass Frog] metapopulation node for the following reasons:*
    - *Its catchment is not large enough to sustain a permanent system of wetlands within the area allocated;*
    - *The topography of the site is unsuitable for adaptation to a suitable growling grass frog habitat if permanent water is not always available; and*
    - *The presence of rock at the surface makes the site unsuitable for economic construction of wetlands.*
- *There are other more suitable locations within the PSP area for adaptation of habitat for growling grass frog metapopulation nodes."*

Commentary

Given these findings, it is unlikely that sufficient surface flow volumes exist to provide for the creation of suitable wetlands for a metapopulation node on the property at 173 - 177 Deanside Drive, Rockbank.

Figures 4 and 5 show a view of the northern parts of the property adjacent to the Kororoit Creek and of the escarpment that separates the bulk of the property from the creek and its immediate floodplain. This shows a gently sloping plateau separated from the creek by a steep rocky escarpment about eight metres high. Figure 4 also shows that the site is in the higher part of the landscape compared with many other areas nearby that are more suited to the creation of wetlands.

Figure 4: Photograph of the northern parts of the subject property adjacent to Kororoit Creek

Figure 5: Rocky escarpment on the north-eastern side of the property adjacent to Kororoit Creek

Kororoit Precinct Structure Plan, Future Development Assessment: Supplementary Report on Use of Groundwater (FMG Letter report from David Fairbairn to Kellehers Australia Pty Ltd, dated May 16th 2014)

This report was prepared in response to DELWP's advice on the water supply for the wetlands which will constitute the Growling Grass Frog metapopulation node

covering the study area, which they intend will be provided by a combination of surface and groundwater sources.

The assessment addressed:

- Alternative water harvesting sources;
- Groundwater quality;
- Use and availability of groundwater;
- Future water quality;
- Alternative sites; and
- Estimated costs;

The conclusions of the assessment were *"partially dependent on the information to be gained from Southern Rural Water. Nevertheless it can be said, based on the additional information contained in this report that:*

- *The use of groundwater to supplement water harvesting for the support of habitat wetlands on 173-177 Deanside Drive, Rockbank, is dependent on the availability of groundwater of sufficient quantity.*
- *It is unlikely that the use of saline groundwater as the sole source of water for habitat wetlands for a significant period of the year, would result in a habitat that is able to replicate that which is already available within the Kororoit Creek environs.*
- *That the use of groundwater and/or creek water to supplement a shortfall in water harvesting could result in adverse impacts of existing high quality habitat along and within the creek and on the flow regime within the creek.*
- *There are alternative sites existing within the PSP area that would be suitable for the construction of habitat wetlands with strong connectivity to the existing Kororoit Creek environs and are not limited by the availability of harvested fresh water. The economic feasibility of the construction of wetlands on these alternative sites is more favourable to that which is applicable to the subject site."*

Commentary

The DELWP proposal to supplement acknowledged low surface water flows to proposed wetlands within the property with groundwater supply has limitations due to the low flows of freshwater to the site. The risk of salinisation of wetlands as water evaporates during the dry time of year is high and the scope for disposing of excess accumulating salt over time is very limited without potentially significant consequences for adjacent creek habitats that are suitable and currently support the frog.

2.3. Conclusions

The designation of most of the property at 173 – 177 Deanside Drive, Rockbank as a metapopulation node for the construction of a cluster of Growling Grass Frog habitat wetlands that support breeding by the species is not considered feasible for reasons of topography, geology, elevation, surface and ground water supply

issues and cost. The identification of the area as such is a mistake that needs to be corrected through the identification of alternative, feasible wetland construction projects that represent a more cost-effective investment in the conservation of this species along the Kororoit Creek.

3. DECLARATION

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Tribunal.

Signed:

Brett Alexander Lane

Director
Brett Lane & Associates Pty Ltd
25 Burwood Road
Hawthorn, Vic. 3122

21st November 2016

Appendix 1: Qualifications and experience of Brett Lane

(See CV on following page)

BL&A Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

Brett Lane
Principal Consultant and Director

Profile

Brett has over 35 years' experience in ecological research and management. He has worked in a range of positions with environmental consultancies in Melbourne and Brisbane and with non-government environmental groups in Australia and East Asia. He has specialist knowledge in birds and wetlands, and extensive experience in ecological impact assessment, including in the infrastructure, renewable energy, property development and mining industries. Brett has undertaken and managed many hundreds of ecological assessments and prepared and reviewed documents that have accompanied development applications on behalf of private companies, government infrastructure agencies and private individuals. His extensive experience has given him an excellent knowledge of the regulatory environment relevant to native vegetation, flora and fauna and he can advise on the scope of scientific information needed to inform the development assessment and decision-making process. He has also defended his scientific work as an expert witness in courts and tribunals. Brett founded BL&A in 2001.

Biography

Working in industry since 1979

Qualifications

BA (Zoology & Physical Geography) *Monash University*

Certificates and Licenses

Management Authorisation – Salvage and Translocation
Victorian Animal Ethics Approval

Employment History

2001 – present
Director, *Brett Lane & Associates Pty Ltd, Melbourne*

1999 – 2000
Natural Resource Specialist, *PPK Environment & Infrastructure Pty Ltd, Melbourne*

1996 – 1998
Senior Ecologist, Ecology Australia Pty Ltd, *Melbourne*

1993 – 1996
Principal Terrestrial Ecologist, *WBM Oceanics Australia, Brisbane*

1991 – 1993
Assistant Director (East Asia), *Asian Wetland Bureau, Kuala Lumpur, Malaysia*

1987 – 1991
Director, *Brett A Lane Pty Ltd (Melbourne)*

1980 – 1986
Wader Studies Co-ordinator, *Royal Australasian Ornithologists' Union (now Birdlife Australia, Melbourne*

1979
Research Assistant, Kinhill Planners Pty Ltd., Melbourne

Key Skills

- Experienced advisor on state and federal biodiversity legislation and policy
- EPBC Act and EES Referrals
- Preparation of environmental assessment reports (preliminary documentation, public environmental report and environmental impact statement)
- Preparation of native vegetation planning permit applications
- Design of developments to comply with biodiversity legislation and policies
- Expert witness for VCAT, planning panels and courts
- Ecological risk assessment
- Native vegetation assessment
- Terrestrial fauna assessment and wetland ecology
- Ornithologist specialising in wetland and migratory shorebirds
- Wind energy development specialist and minimizing impacts on wildlife including collision risk modelling

Project Examples

Property Development

Eynesbury Township, Eynesbury, Victoria: Flora, Fauna and Habitat Hectare Assessment, Targeted Flora Surveys, Growling Grass Frog Survey, Plains-wanderer Survey and Development of an Offset Tracking Tool. Net Gain Analysis for Planning Permit Applications of subsequent stages and advice on offset management (2003 – present)

Taylors Rd, Sydenham, Victoria (Broadcast Australia): EPBC Act Referral, preparation of EPBC Act Public Environment Report (PER), Offset Site Search and Offset Management Plan, Spiny Rice-flower Propagation and Translocation Plans, Seed Collection (2006 – present)

Somerfield Estate, Keysborough, Victoria: Flora, Fauna and Growling Grass Frog Survey and Offset Plan Preparation, preparation of offset tracking reports for each stage of development (2008 – present)

Modena Estate, Burnside, Victoria: Flora and Fauna Assessment, targeted threatened species surveys, EPBC Act referrals and assessment approvals, development of offset and mitigation plans (2002 – present)

Renewable Energy

Dundonnell Wind Farm, Dundonnell, Victoria: Overview and Targeted Assessments including Brolga, bat, migratory bird, Striped Legless Lizard, Flora Surveys, assessment of powerline route and road access options, EPBC Act Referral, Input to EES Referral, preparation of EES technical appendix on flora and fauna, Brolga impact assessment, collision risk modelling (2009 – present)

Granville Wind Farm, Granville Harbour, Tasmania: Overview Assessment, targeted surveys including Orange-bellied Parrot and bat surveys, EPBC Act Referral and advice for regulator negotiations (2011 – present)

MacArthur Wind Farm, MacArthur, Victoria: Overview assessment, detailed flora and fauna surveys, impact assessment, input to EPBC Act Referral and state EES, assessment of powerline and road rout options, appearance at state Planning Panel hearings as expert witness, preparation of pre-construction and operational flora and fauna management plans, net gain analysis and identification of suitable offsets (2004 – 2012)

Cherry Tree Wind Farm, Victoria: Overview assessment, native vegetation and threatened flora surveys, targeted threatened fauna surveys, assessment of powerline and road route options, offset site sourcing and assessment, preparation of expert witness statement and appearance at VCAT (2010 - 2015)

Mt Gellibrand Wind Farm, Mt Gellibrand, Victoria: Overview assessment, detailed flora and fauna surveys, including targeted Brolga and migratory bird surveys, and Striped Legless Lizard tile grid surveys, input to state planning permit application, preparation of witness statement and appearance at state Planning Panel hearing, preparation and early implementation of pre-construction flora and fauna management plans, including bat and avifauna management plan, native vegetation mapping, offset mapping, development of Brolga monitoring and mitigation strategies (2004 – present).

Road and Rail Infrastructure

Avalon Airport Rail Link, Little River, Victoria: Flora and Fauna Mapping, Constraint Analysis and Net Gain Analysis (2011 – 2013)

Dingley Bypass, Keysborough, Victoria: Flora and Fauna Assessment, including targeted flora surveys, habitat hectare assessment and Net Gain analysis, expert witness at VCAT case (approved) (2008 – 2014)

Nagambie bypass, Nagambie Victoria: Flora and Fauna Assessment, including habitat hectare assessment and Net Gain analysis (2008)

Second Murray River Bridge Crossing at Echuca-Moama: Detailed Flora Assessment, Targeted Flora Survey (2008 – present)

Ecosystem Monitoring and Management

Scientific Review Panel, Kerang Lakes Bypass project (North Central Catchment Management Authority, Goulburn Murray Water): Scientific review of detailed technical reports to inform decisions of water savings plans and associated watering plans for five wetlands that form part of the Ramsar-listed Kerang Lakes wetlands system. (2013)

Northern Victoria Irrigation Renewal Program (NVIRP): Assessed the impact of a major federal water industry investment project on Matters of National Environmental Significance, including threatened flora, threatened fauna and listed migratory birds using wetlands located in the potential impact area. (2009-2011)

Appendix 2: Qualifications and experience of Justin Sullivan

(See CV on following page)

BL&A Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

Justin Sullivan
Senior Ecologist and Project Manager

Profile

Justin has been working in environmental consultancy at BL&A since 2008. During this time Justin has been highly involved in a broad range of work including impact assessments for residential development, primarily in the western suburbs of Melbourne, environmental monitoring projects, including River Red-gum monitoring on the Murray River, and impact assessments for major infrastructure projects such as roads, powerlines and wind farms.

Since 2011 Justin has managed a variety of projects in which he has assisted clients in providing sound ecological advice to guide them through the planning process and result in positive environmental outcomes. Justin has successfully managed a range of projects at BL&A including Flora and Fauna Assessments, Native Vegetation and Net Gain Assessments, Offset Management Plans and Environmental Management Plans. As a project manager, Justin ensures that all reporting is undertaken at a high standard, delivered in a timely manner and kept within budget.

Biography

Working in industry since 2008

Qualifications

BSC (Botany, Genetics, Statistics), *La Trobe University*

Certificates and Licenses

Management Authorisation – Salvage and Translocation
Construction Induction 'White Card'
DSE Certificate of Competency in Vegetation Quality Assessments Registration No.HH061

Employment History

2010 – Present
Botanist and Project Manager, *BL&A, Melbourne*
2008 – 2010
Botanist, BL&A, Melbourne
2001
Assistant Ranger, *Point Cook Coastal Park, Point Cook, Vic.*

Key Skills

- Project Manager including budgeting, staffing, client liaison, production of high quality technical reports
- Eastern Grey Kangaroo Management Plan preparation
- Bird and bat management plans for wind farm
- Botanist specialising in tree identification
- Environmental monitoring
- Habitat hectare and net gain analysis
- Flora assessments
- Targeted surveys for listed flora and fauna species
- Constraints analysis
- Desktop assessments
- Management plan preparation for listed fauna and flora values and offset sites
- Salvage protocol preparation and implementation
- Project design recommendation
- Preparation of mitigation measures
- EPBC Act Referrals
- Offset site selection

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Project Examples

Property Development

Somerfield Estate, Keysborough, Victoria: Flora, Fauna and Growling Grass Frog Survey and Offset Plan Preparation (2008 – present)

The Point Residential Development, Point Lonsdale, Victoria: Native Vegetation Impact Assessment and Preparation of Offset Plan (2009 – present)

Harpley Estate, Black Forest Road, Werribee, Victoria: Striped Legless Lizard Salvage Plan, Eastern Kangaroo Management Plan and Environmental Management Plan (2012)

Burnside North Development, Burnside, Victoria: Flora and Fauna Assessment, EPBC Act referral (2009 – present)

South Dudley Road, Wonthaggi Residential Development, Wonthaggi, Victoria: Flora, Fauna and Growling Grass Frog Survey (2011).

Renewable Energy

Ararat Wind Farm, Ararat, Victoria: Flora and Fauna Assessment of the Wind Farm and Transmission Line, Offset Plan, Native Vegetation and Pest Plans (2007 – present)

Bald Hills Wind Farm, South East Gippsland, Victoria: Native Vegetation Management Plan and preparation of Offset Plan (2008 – present)

Stockyard Hill Wind Farm, Beaufort, Victoria: Native Vegetation Assessment (2007 – 2011)

Road and Rail Infrastructure

Second Murray River Bridge Crossing at Echuca-Moama: Detailed Flora and Fauna Assessment, Targeted Flora and Fauna Surveys, Bat Survey and Net Gain Assessment (2008 – present)

Burke Road, Glen Iris and North Road, Ormond Level Crossing Removal Project, Victoria: Flora and Fauna Assessment (2012)

Cardinia Road Upgrade, Pakenham, Victoria: Flora and Fauna Assessment (2012)

Ecosystem Monitoring and Management

River Red Gum Monitoring Project, Murray River, Mildura Region, Victoria: Monitoring of River Red-gum health at various reaches along the Murray River system (2008 – 2013).

Wimmera River Monitoring Project, Wimmera River, Horsham Region, Victoria: Monitoring of River Red-gum and River health (2008 – 2009).

Water and Pipeline Infrastructure

Altona Recycled Water Project Stage 2, Werribee to Altona, Victoria: Flora and Fauna Assessment (2011 – present)

Kurrak Rd to Browns Lane Outfall Sewer Development, Plenty, Victoria: Flora and Fauna Assessment (2008 – present)

Bellbird Ridge Estate, Sewer Alignment Development, Diamond Creek, Victoria: Flora, Fauna and Native Vegetation Assessment (2010)

Point Cook Sustainable Alternative Water Scheme Project, Point Cook, Victoria: Native Vegetation Impact Assessment (2011)

Telstra Tower, Tinderbox Hills, Tasmania: Flora and Fauna Assessment (2012)

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Appendix 3: BL&A Report 14013 (1.3)

BL&A Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

25th February 2014

Kellehers Australia

Attention: Robert Forrester (Graduate Lawyer)
By email — robert@kellehers.com.au (Phone 03 9429 8111)

Dear Robert,

RE: 173 – 177 DEANSIDE DRIVE, ROCKBANK
GROWLING GRASS FROG HABITAT ASSESSMENT AND TARGETED SURVEY
BL&A REPORT 14013 (1.3)

Background

Brett Lane and Associates Pty Ltd (BL&A) were engaged by Kellehers Australia to undertake an ecological assessment of 173-177 Deanside Drive, Rockbank, herein referred to as the study area. This assessment was required to determine the extent and quality of suitable habitat for the Growling Grass Frog and undertake a targeted survey for the species at the property. The study area falls within Melbourne's Western Growth Corridor and includes zones of Rural Conservation and Urban Floodway Zones of which there is an Environmental Significance Overlay. The study area forms part of the Kororoit Precinct Structure Plan (PSP) area which is currently in the pre-planning stage with the Metropolitan Planning Authority (MPA).

As the property lies within the Kororoit PSP, a proportion of the land is subject to a proposed conservation corridor for Growling Grass Frog as defined by the *Biodiversity Conservation Strategy for Melbourne's Growth Corridors* (DEPI 2013). The Growling Grass Frog is listed as vulnerable under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and is listed as endangered in Victoria under the Department of Environment and Primary Industries (DEPI) Advisory List for threatened fauna (DSE 2013). Under the Sub-Regional Species Strategy for the Growling Grass Frog (DEPI 2013a), areas of important habitat for Growling Grass Frog have been mapped to be protected and managed within Melbourne's Urban Growth Zone.

A significant proportion of the study area is listed as Category 1 habitat (DEPI 2013a). Mapped Category 1 habitat areas are required to be protected and enhanced to ensure the long-term viability of important populations of Growling Grass Frog within the growth corridors (DEPI 2013a). The placement of Category 1 habitat mapping in the study area is based on buffers extending from Kororoit Creek, which border the north and east boundaries of the parcel (DEPI 2013a).

Extended buffers of Category 1 habitat occur at metapopulation nodes and internodal areas.

The Review of Habitat Corridors for Growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth Areas (Biosis Research 2012), proposed a metapopulation node (KRC08) be placed at the section of Kororoit Creek that includes the study area. This mapping has been based on the presence of suitable habitat and records of Growling Grass Frog occurring within the parcel boundary (Biosis Research 2012). As a result, a Category 1 buffer at a minimum of 150 metres and excess of 200 metres from the centre of the creek has been placed on the study area.

Methodology

A database and literature review of existing information on Growling Grass Frog at the study area was undertaken. The following sources were reviewed.

- Victorian Biodiversity Atlas (VBA) administered by the Department of Environment and Primary Industries (DEPI)
- The Commonwealth EPBC ACt Protected Matters Search Tool
- Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013a)
- DEPIs Biodiversity Conservation Strategy for Melbourne's growth corridors report (DEPI 2013b)
- Review of habitat corridors for Growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth Areas (Biosis Research 2012) and
- DEPIs online biodiversity interactive mapping.

A daytime habitat assessment was undertaken on 29th January, 2014 by Thea Shell, an experienced zoologist at BL&A. The site was traversed by foot and vehicle. This survey assessed the nature and quality of Growling Grass Frog habitat, mapped detailed habitat characteristics and assigned the likelihood of occurrence of Growling Grass Frog within habitat types. The creekline was scanned and refuge sites (eg. beneath rocks and logs) were opportunistically inspected for fauna.

A nocturnal targeted Growling Grass Frog survey was undertaken at the study area on the 10th and 12th February 2014. The assessment was conducted at three survey sites located in areas of high quality habitat in the Kororoit Creek.

Survey methodologies follow Commonwealth (DEWHA 2009) and Victorian (DSE 2010) Growling Grass Frog surveying guidelines. Each site was surveyed twice. Surveys commenced after sunset and were undertaken during suitable weather conditions (i.e. still nights with temperatures above 14°C) (Table 1).

Table 1: Weather conditions during targeted survey

Date	Start time	Site	Replicate	Temperature (°C)	Humidity (%)
10/02/2014	20:35	1	1	17.8	59
	21:23	2	1	17.4	59
	22:10	3	1	17	60
12/02/2014	20:20	1	2	26.4	53
	21:10	2	2	23.2	59
	22:00	3	2	22.6	61

Methods used to detect the Growling Grass Frog included call playback, nocturnal spotlighting and active searching. During each survey a period of 15 minutes was spent at the waters edge listening for frog calls. Call playback involved broadcast of a recorded male Growling Grass Frog advertisement call through a megaphone in an effort to elicit the response of the species. All frogs heard during this time were recorded.

Following the call playback and listening time, each site was systematically searched for frogs with a spotlight and visual inspection by two zoologists for 30 minutes, 10 metres either side of the survey site on both sides of Kororoit Creek, if accessible. This involved visual inspection of the water body, call recognition and active searching (including turning surface debris). All frog species seen or heard during the search time were recorded.

The Growling Grass Frog assessment was undertaken during clear, sunny and mild summer conditions. These conditions were considered suitable for undertaking the assessments in the study area. The targeted survey was undertaken late in the Growling Grass Frog breeding season and therefore frogs were not responding to call playback. Access was limited at sites 1 and 2 during the spotlighting and active searching. Spiny Rush lined the creek bank in some areas making it difficult if not impossible to access the water's edge in such locations.

As the primary purpose of the investigation was to assess the extent and quality of Growling Grass Frog habitat and determine the presence of the species in the study area, the review of existing information, combined with the field surveys were sufficient to complete this aspect of the assessment.

Wherever appropriate, a precautionary approach was adopted in the discussion of implications. That is, where insufficient evidence was available on the occurrence or potential occurrence of a species, it was assumed that it could be in an area of suitable habitat. The implications under legislation and policy were considered accordingly.

Results

Site context

Kororoit Creek is known as an important population based on the definition in the EPBC Act Policy Statement (DEWHA 2009) and as listed in the Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013). Kororoit Creek is determined to be high quality Growling Grass Frog habitat. The section of the creek within the study area contains permanent and semi-permanent water bodies, extensive aquatic vegetation, high water quality, a high cover of terrestrial refuge sites, has recent Growling Grass Frog records and is connected to other occupied sites. No offline waterbodies exist within the study site.

Existing metapopulations as listed in the Sub-Regional Strategy of Kororoit Creek are generally subject to a 200m buffer of Category 1 habitat. More generally, between metapopulation nodes a corridor of 100 metres each side of the stream is deemed to be sufficient for important sites like Kororoit Creek (DEPI 2013a). A buffer in excess of 200 metres has been placed in some areas of the proposed KRC08 metapopulation mapped Category 1 habitat at 173-177 Deanside Drive. As indicated within the Biodiversity Conservation Strategy (DEPI 2013b), final boundaries of these protected habitat areas may change slightly to deal with local site conditions during the precinct structure planning process.

Existing records

Two existing records of Growling Grass Frog occur within the study area (VBA 2014), both of which were recorded by Aaron Organ (Ecology and Heritage Partners) from 13th January, 2005 (Figure 1). These records were obtained during a frog census undertaken by Ecology and Heritage Partners in the area. One Growling Grass Frog was heard, captured and released in each of the two record locations.

The VBA records within the study area (Figure 1) clearly reflect two of the records shown in Figure 2a of the Sub-regional Species Strategy for the Growling Grass Frog (DEPI 2013a). It is noted that the Sub-regional Strategy for the Growling Grass Frog depicts additional records in the study area; however, these records are evenly offset to the south west and are considered to have been erroneously replicated during production of the mapping. As such, BL&A consider that only two existing Growling Grass Frog records occur within the study area, as shown in Figure 1.

The VBA notes that these records have an accuracy of 100 metres from the point location shown in Figure 1. These Growling Grass Frog records therefore are considered likely to been located within Kororoit Creek.

The next closest existing records are of five Growling Grass Frog individuals to the south west of the study area, recorded in 2010 within the proposed intermodal corridor KRC09 (Biosis Research 2012). Furthermore, it is well documented that significant populations of Growling Grass Frog occur along Kororoit Creek and as such it is considered an important population (DEWHA 2009).

Legend

- Study Area
- Growling Grass Frog VBA Records

Metres

0 100 200 400

Figure 1: Growling Grass Frog VBA Records

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

Project No.: 14013	Date: 30/01/2014	Created By: M. Ghasemi / T. Shell

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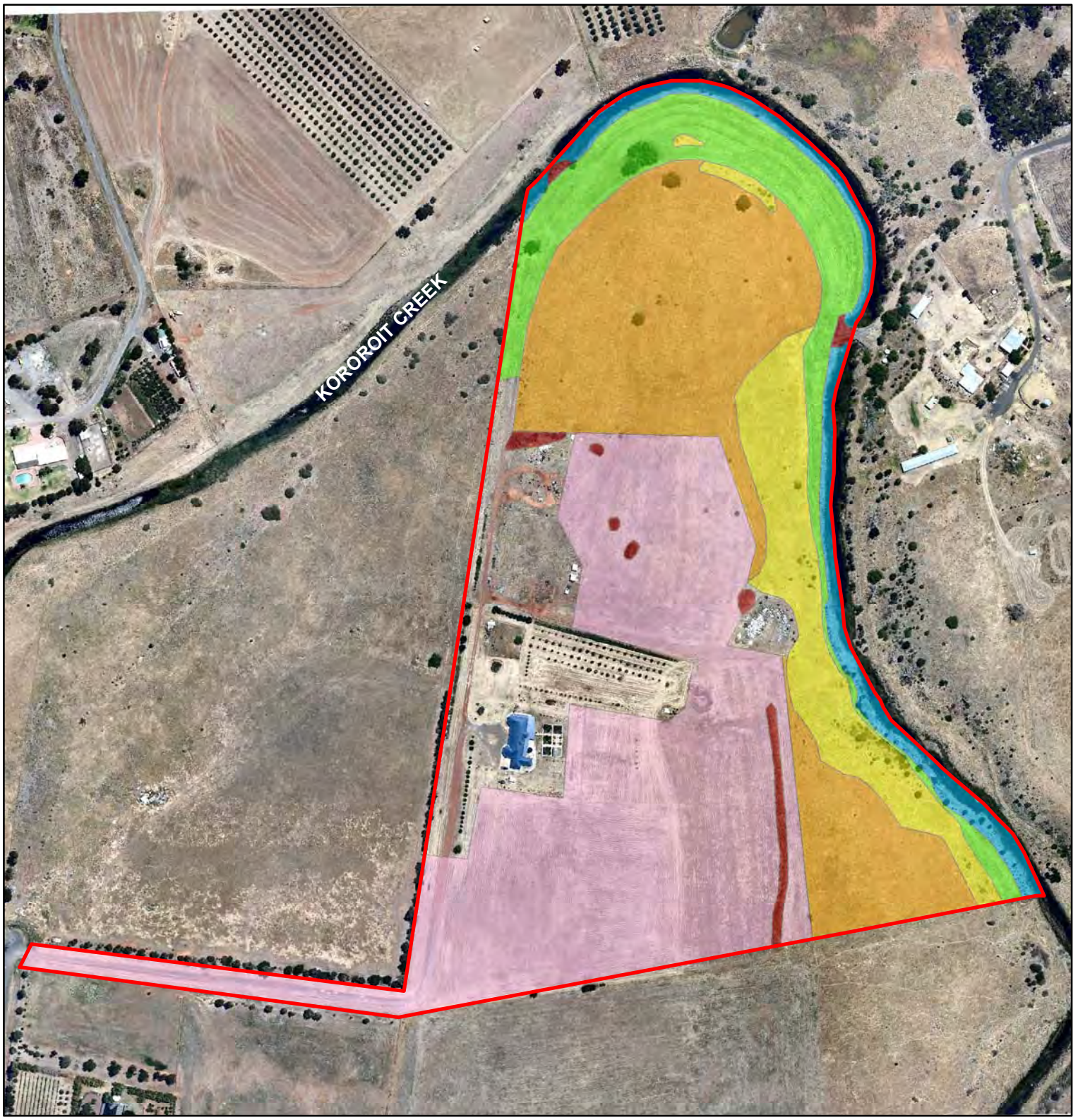

Legend

Study Area

Growling Grass Frog Habitat Features

- Creek and creek bank
- Elevated rocky grassland
- Low flat open pasture
- Modified pasture/crop
- Elevated Rockpiles
- Rocky escarpment

0 50 100 200 Metres

N

Figure 2: Growling Grass Frog Habitat Features

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

Project No.: 14013	Date: 30/01/2014	Created By: M. Ghasemi / T. Shell

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Habitat assessment

Six main habitat types were identified and mapped during the current investigation (Figure 2). These are detailed below. Several highly modified areas or developed areas exist within the property such as a house, garden, machinery yard, refuse pile and road. These areas have not been included in the assessment due to their highly modified nature and lack of value as Growling Grass Frog habitat.

Creek and creek bank habitat

The section of Kororoit Creek in the study area contains both permanent and semi-permanent water bodies, over 40% floating and submerged aquatic vegetation, is flanked by emergent and edging rushes, sedges and Cumbungi (Figure 3). Water quality is high with low turbidity. The creek is slow-moving, and contains several still deep pools. Sections of the creek are dominated completely by Cumbungi and Spiny Rush. The creekbank is edged by planted shrubs and trees including wattle, callistemon and eucalypts. The bank contains scattered basalt rock and a small number of logs, providing refuge areas for the frog.

The creek and creek bank habitat are considered to provide high quality core habitat for Growling Grass Frog, including suitable breeding habitat.

Figure 3 – Creek and creek bank habitat

Low, flat, open pasture

A slashed area of open pasture exists immediately adjacent to the creek bank along the entire length of the creek within the property. This habitat has been modified by regular slashing and removal of rock to provide a driving track (Figure 4). Mounds of exhumed rock and logs exist in sections along the track. This area is subject to flooding. The flat, low, open ground, due to its proximity to the high quality habitat of the adjacent creek provides suitable movement area for mobile frogs, and can also be used for foraging. The rock piles and logs also provide refuge areas.

Figure 4: Low, flat, open pasture habitat

Rocky escarpment

Large basalt boulders with scattered shrubs and some large logs cover a sharp incline of up to 10 metres (Figure 5). Native wattle shrubs dominate, however invasive species such as Prickly Pear, African Boxthorn and Artichoke Thistle are also present. In some sections, the steep incline may present a barrier to faunal movement, however the abundance of rock and logs provides a high amount of refuge locations for Growling Grass Frog.

Figure 5: Rocky escarpment habitat

Elevated rocky grassland

This rocky grassland is degraded and dominated by serrated tussock and other invasive vegetation such as Wild Oats and Artichoke Thistle (Figure 6). Large embedded basalt boulders and some surface rock is present throughout. The rocky grassland has a slight incline towards the creek, and has evidence of grazing by horses and macropods. Several large non-native Peppercorn Trees are scattered across this habitat type. Although this habitat type may be used for dispersal by Growling Grass Frog, it does not provide suitable quality breeding, foraging or refuge habitat. Access to the elevated rocky grassland may be restricted in areas by the steep rocky escarpment adjacent.

Figure 6: Elevated rocky grassland

Elevated modified pasture/crop

This habitat type has been highly modified for cropping and pasture. There is no rock present and the area is regularly slashed (Figure 7). Although this habitat type may be used for dispersal by Growling Grass Frog, it does not provide suitable quality breeding, foraging or refuge habitat.

Figure 7: Elevated modified pasture/crop

Rockpiles

Several rockpiles and walls exist across the property. While these have the potential to provide refuge habitat for Growling Grass Frog, the majority of piles are within the elevated rocky grassland and pasture/crop and are approximately 150 metres from the creek.

Targeted Survey

The Growling Grass Frog was recorded at the study area during the current targeted survey. A summary of the results of the targeted survey are presented in Table 2. Please note that the figure for each site is the combined total number of frogs recorded over the two replicated surveys. The location of survey sites and Growing Grass Frogs recorded are shown in Figure 8.

Table 2: Summary of results of the targeted Growling Grass Frog survey

Species	Site 1	Site 2	Site 3
Growling Grass Frog		2	1
Southern Bullfrog		1	
Spotted Marsh Frog	10		

The Growling Grass Frog was recorded at both sites 2 and 3. Access to the waters edge at site 1 was very limited and Growling Grass Frog is expected to occur along that section also as habitat is continuous and of high quality throughout the creek in the study area. The Spotted Marsh Frog was heard calling at site 1 and a Southern Bullfrog was observed at site 2.

Metres
0 50 100 200

Legend

- Growling Grass Frog Survey Sites
- ★ Growling Grass Frog Recorded by BL&A

Figure 8: Growling Grass Frog Survey Sites

Project: 173-177 Deanside Drive, Rockbank

Client: Kellehers Australia

Project No.: 14013	Date: 14/02/2014	Created By: M. Ghasemi / T. Shell

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Discussion

It is well documented that critical Growling Grass Frog habitat exists along Kororoit Creek within the Urban Growth Boundary (DEPI 2013). With respect to habitat preferences of the frog and based on previous and current field assessment, the area of Kororoit Creek at 173-177 Deanside Drive is determined as high quality habitat for Growling Grass Frog (DEPI 2013, DEWHA 2009). That is, areas that currently contain, important habitat attributes required by the species for breeding, as well as for foraging and dispersal exist along the creek in the study area. However the extent of the quality and function of the habitats present within the remainder of the study area varies with distance from Kororoit Creek.

Over 90% of Growling Grass Frog activity is known to be undertaken either in water or within 5 metres of the water line (Heard *et al.* 2008). As such the creek and creek bank habitat provides the most likely highest utilised habitat in the study area. The low flat open pasture adjacent to the creek offers suitable dispersal and foraging habitat, while the rocky escarpment habitat provides excellent refuge habitat. These habitats have the potential to be regularly frequented by highly mobile individuals.

The elevated rocky grassland and modified pasture/crop while provides potential dispersal habitat, is overall poor in quality and is separated to the creek by a steep escarpment which is likely to form a barrier for frog movements.

The terrestrial zone within 100 metres of a utilised waterbody is thought to be important for Growling Grass Frog (Heard *et al*. 2008, Wassens *et al*. 2008). The minimum corridor width between metapopulation nodes is set at 100 metres for creeks of importance within the Growth Areas; this includes Kororoit Creek (Biosis Research 2012). Metapopulation KRC08 is indicated as part of a proposed metapopulation node based on several records of Growling Grass Frog and suitable habitat (Biosis Research 2012). Proposed metapopulation areas are suggested to encompass created wetlands and enhancement of habitat (Biosis Research 2012).

Conclusion

A Growling Gras Frog population and its associated suitable habitat is considered to occur along the section of Kororoit Creek in the study area. This is supported by the current investigation and the known previous records of the species. Furthermore, where present, it is considered likely that the species may utilise the adjacent flat pasture habitat for dispersal and the rocky escarpment area as a potential refuge.

As no offline water bodies occur within the study area, there is a low likelihood that individuals would travel beyond the escarpment area and utilise the elevated rocky grassland and modified pasture/crop areas south west of the creek.

Application of a 100 metre buffer (which has been applied to a large portion of the remainder of the Kororoit PSP area), is considered to be sufficient to encapsulate the areas that provide habitat for the species in the study area. A 100 metre buffer area from the Kororoit Creek is indicated in blue in Appendix 1 for the study area.

We look forward to being of assistance and if you have any enquiries please do not hesitate to call me.

Yours sincerely,

Justin Sullivan
Senior Ecologist and Project Manager

Brett Lane & Associates Pty. Ltd.
Office: (03) 9815 2111 | Direct: (03) 9988 1184 | M: 0419 903 682
Email: jsullivan@ecologicalresearch.com.au

References

Biosis Research Pty Ltd, 2012, Review of habitat corridors for growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth corridors. Prepared for Department of Sustainability and Environment, East Melbourne.

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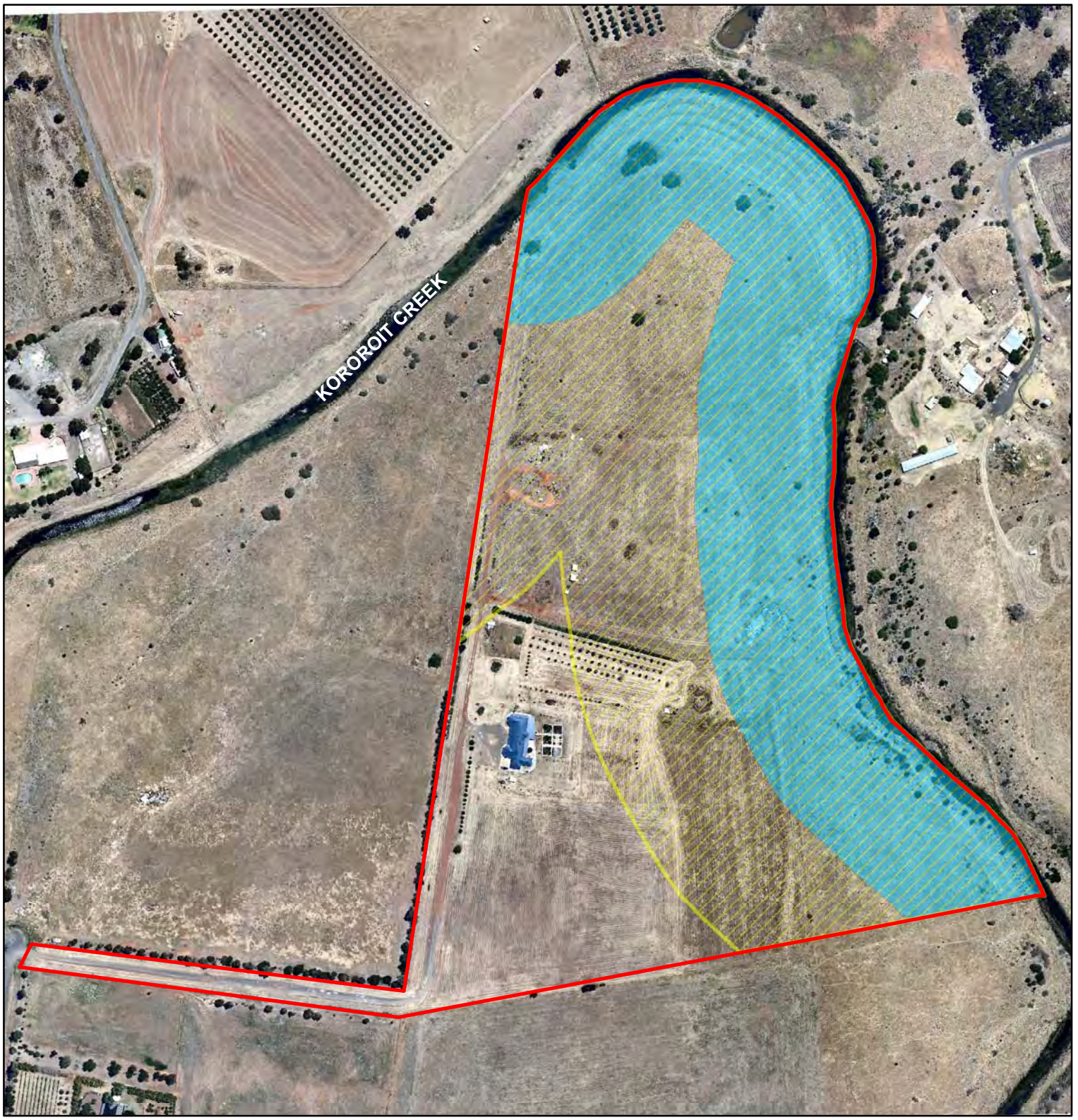

Legend

Study Area

Kororoit Creek Buffer

100m

200m

0 50 100 200 Metres

Appendix 1: Kororoit Creek Buffer		
Project: 173-177 Deanside Drive, Rockbank		
Client: Kellehers Australia		
Project No.: 14013	Date: 30/01/2014	Created By: M. Ghasemi / T. Shell

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Appendix 4: BL&A Report 14013 (2.1)

BL&A Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

14th March 2014

Kellehers Australia
497 Swan Street,
Burnley, Vic. 3121

Attention: Robert Forrester
By email — robert@kellehers.com.au

Dear Robert,

RE: 173 – 177 DEANSIDE DRIVE, ROCKBANK
GROWLING GRASS FROG HABITAT REQUIREMENTS
BL&A REPORT 14013 (2.1)

At your request, I provide below some details of the type of habitat required to satisfy the metapopulation node requirements of the Growling Grass Frog Sub-Regional Species Strategy, which forms part of the wider Melbourne Strategic Assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), covering Melbourne's new growth areas. This strategy, together with the broader Biodiversity Conservation Strategy, of which it forms part, were approved by the Commonwealth Minister in September 2013.

This strategy has the following to say about habitat preferred for the species:

> *"Populations are structured as metapopulations (a group of spatially separated interacting populations), demonstrating spatially clustered patterns of wetland occupancy, where movement between water bodies occurs as habitat conditions change over time, that is, when water bodies dry out or flood.*
>
> *Water bodies that are located within close proximity of each other are more likely to support a population of Growling Grass Frog compared with isolated sites. Frogs have been recorded moving up to one kilometre in one night.*
>
> *Dispersal is thought to occur primarily along drainage lines or other low-lying areas between water bodies, and unhindered movement between and within water bodies is considered important for population viability.*
>
> *Water quality is important for successful breeding and larval development. It is likely that Growling Grass Frog tadpoles are sensitive to some horticultural chemicals, such as fertilizers and pesticides."*

These findings are based on a more detailed analysis of the use of aquatic and adjacent habitats by the species in the growth corridors by Heard, Scroggie and Clemen (2010), Ecology & Heritage Partners (2011) and Biosis Research (2012). In terms of suitable habitat, these documents describe suitable habitat for the frog, as summarised in the points below.

- Permanent and semi-permanent wetlands;
- Diverse aquatic vegetation, including higher covers of emergent, submergent and floating vegetation (this tends to occur mostly in semi-permanent and permanent wetlands);
- Wetland depth of 1.5 metres or more across a significant proportion of the wetland to ensure the maintenance of water suitable for the favoured higher cover of diverse aquatic vegetation;
- Clusters of wetlands within hundreds of metres of one another are more likely to support the species than isolated wetlands;
- Wetlands greater than c. 3,800 square metres in area have a greater probability of supporting the frog;
- Still and very slow-flowing water;
- Water salinity not exceeding 10,000 uS/cm;
- Suitable dispersal habitat (waterway or open space but not built up area) linking the wetland to other wetlands.

The Biosis document formed the basis for mapping suitable existing and future habitat along waterways, including metapopulation nodes, such as the one that covers the Natale land. The final conservation reserves for the species identified by Biosis were the result of a consensus building exercise among knowledgeable ecologists in the form of an expert workshop. It is noted that an engineer was not explicitly indicated as being present. In addition, the workshop used the extensive knowledge developed of the frog's use of wetlands and nearby habitat along the Merri Creek to develop its guiding principles, which were then applied to the remaining relevant waterways in Melbourne's growth areas. Specifically, on page 4 of the Biosis (2012) report, the following statement is made about where metapopulation nodes should be located.

> *"As a general rule (subject to variation, see below) sites of identified metapopulations, or locations that currently meet physical and habitat attributes considered likely to support metapopulations, should be protected by terrestrial habitat corridors of up to 200 metres width either side of the waterway. Key attributes that were used to determine the location of metapopulation nodes were landform (generally low-lying areas or relatively flat land) and the existence of drainage lines to feed created wetlands.* ***This point is critical*** [my emphasis] *as without an appropriate water source it will be impossible to create and maintain wetlands of an appropriate size and hydro-period to be suitable as Growling Grass Frog breeding habitat. Growling Grass Frog populations are more likely to persist in larger, more permanent wetlands."*

Based on the principles for protecting habitat for the Growling Grass Frog enunciated in the approved sub-regional species strategy, together with the foregoing requirements for "*locations that currently meet physical and habitat attributes considered likely to support metapopulations*" (Biosis 2012), it appears that the Natale property has been mistakenly identified as a future metapopulation node.

This is not unexpected as Biosis (2012) acknowledge that the work that informed the final mapping of habitat conservation areas in Melbourne's Growth areas was subject to significant limitations, such as the lack of information on the drainage, surface water resources and groundwater characteristics of areas, together with the lack of information on the possible presence of hard rock. After highlighting these limitations, they conclude:

> *"By reason of these limitations, any specific site or sites identified in this study for wetland creation may be subject to variation or adjustment with more detailed site assessment."*

I have reviewed the engineering and drainage findings of Mr David Fairbairn in relation to the catchment yield, water balance and potential constructability of wetland habitat and conclude that the proposed metapopulation node on the Natale land does not meet some of the key attributes required of such new habitat areas. Specifically in the case of the Natale land, the catchment is comparatively small and there is no waterway that would supply water to the area proposed to be set aside for frog habitat. These are key requirements set out by Biosis (2012) for metapopulation nodes (see above).

I have also reviewed Mr Fairbairn's advice in relation to alternative sites for metapopulation nodes within the same section of the Kororoit Creek (i.e. between the edge of existing urban areas and the proposed Outer Metropolitan Ring Road) and confirm that these two alternative locations are more likely to meet all of the physical and habitat attributes (e.g. wetland numbers, size and hydro-period) required for the maintenance of a sustainable metapopulation. They also have a larger catchment and greater water yields (especially once developed) and provide much greater assurance that habitat can be created that will ultimately benefit the Growling Grass Frog population in the Melbourne region.

I trust that the foregoing is informative. Please contact me if you have any questions.

Yours sincerely,

Brett Lane
Principal Consultant

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Email: blane@ecologicalresearch.com.au

References

Biosis Research Pty Ltd, 2012, Review of habitat corridors for growling Grass Frog *Litoria raniformis* within Melbourne's Urban Growth corridors. Prepared for Department of Sustainability and Environment, East Melbourne.

Department of Environment and Primary Industries, 2013a. Sub-regional species strategy for the Growling Grass Frog, Department of Environment and primary Industries, East Melbourne.

Department of Environment and Primary Industries, 2013b, Biodiversity Conservation Strategy for Melbourne's Growth Corridors. Department of Environment and primary Industries, East Melbourne.

Ecology and Heritage Partners, 2011, Sub-regional Growling Grass Frog Conservation Strategy within the revised urban growth boundary and 28 Precincts. Technical background and guidelines. Ecology and Heritage Partners, Brunswick.

Heard, G; Scroggie, M and Clemen, N, 2010, Guidelines for managing the endangered Growling Grass Frog in urbanising landscapes. Arthur Rylah Institute Technical Series No. 208, Department of Sustainability and Environment, East Melbourne.

Appendix 5: FMG Letter report from David Fairbairn to Kellehers Australia Pty Ltd, dated March 14th 2014

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March 14, 2014

Kellehers Australia Pty Ltd,
497 Swan Street,
Burnley, 3121.

Dear Leonie,

Re: Natale
173-179 Deanside Drive, Rockbank
Kororoit Precinct Structure Plan
Future Development Assessment

1.0 Introduction

Thank you for your instructions regarding a development assessment for this property particularly in relation to the area indicated as to be set aside for growling grass frog habitat.

173-179 Deanside Drive, Rockbank, the subject site, is currently within an area included within the urban growth boundary and is the subject of the Kororoit Precinct Structure Plan (PSP) being prepared by the Metropolitan Planning Authority. Within this plan large areas of the subject site have been identified as being required to be set aside for habitat for the growling grass frog.

The scope of this report is to cover the management of water resources on the subject site, and determine whether this management will support the proposed growling grass frog habitat.

The authority responsible for water management within the area is Melbourne Water. They are currently investigating the requirements of a proposed development services scheme for the catchment within which the subject site occurs. We are advised that the investigation into this scheme is in the very preliminary stages and the form of infrastructure that will make up the scheme is not determined. Attachment 8 shows the preliminary boundaries of the scheme.

Melbourne Water have also cited the preparation of a survey by Rakali Consulting, of potential natural wetland sites in the region, as being of use in the preparation of the Kororoit PSP and the DSS. Our understanding is that this report does not look at the water management aspects of these wetlands but will assist more in the determination of management strategies for the existing wetlands when preparing the PSP and DSS.

It would seem that important information on water management within the PSP area should be available before the elements of the Precinct Structure Plan are finalised. This is particularly applicable to the proposed growling grass frog habitats which are very dependent on availability of sufficient water.

2.0 Description of the Land and Development Constraints.

The terrain of the subject site consists of typical western Melbourne basalt plains modified for grassland farming with a local watercourse and associated floodplain, Kororoit Creek, excised into the plains. The sides of the watercourse vary from moderately sloping grassland on the northern section of the site to a steep escarpment along the watercourse on the eastern section of the site. The depth of topsoil on the site is shallow with underlying hard basalt rock.

Constraints on development of the land for urban purposes consist of the following:

- Land subject to flooding
- Land with slopes in excess of 10%
- Land with environmental significance overlay (growling grass frog habitat)

Attachment 1 shows the subject site with contours.

3.0 Land Subject to Flooding

Attachment 2 contains the Melbourne Water plan showing the extent and level of the 1 in 100 year flood in Kororoit Creek. The estimated width of the flood plain, based on this plan, is quite narrow across the site varying from 60 meters in the northern section of the site to 30 meters on the eastern side. The section of flood plain on the eastern side of the site is bordered by a small escarpment approximately 8 metres high with a very steep rocky surface (Attachment 7 photograph12). The flood plain on the northern boundary is bounded more by a moderately sloping rocky grassland (Attachment 7 photograph11).

The level of flooding varies from 88.5 m. AHD in the northwest corner to 87.0 m. AHD in the southeast corner. Therefore the flat upper grassland basaltic plain which forms more than 50% of the site is over 8 meters above the flood level. Much of the currently proposed growling grass frog metapopulation habitat node is located over this upper grassland area (Attachment 7 photograph 4).

4.0 Land with slopes greater than 10%

The only section of the site with slopes greater than 10% is the rocky escarpment running along the entire eastern side of the site. This is readily identifiable on the contour plan at attachment 1.

5.0 Growling Grass Frog Habitat

As part of the works in preparing the Kororoit PSP, a study has been carried out by Biosis Research Pty Ltd to prepare a category 1 habitat detail for the growling grass frog. The plan of this habitat identifies 173-179 Deanside Drive Rockbank as the location for a proposed metapopulation node. Attachment 3, Fig 2c from the Biosis Research report, shows the location of all existing and proposed category 1 habitats identified. As a response to this proposal, further reports have been prepared by Brett Lane and Associates, dated 25th February, 2014 and 13th March, 2014, examining the suitability of the subject site for this proposed metapopulation node. For a detailed assessment of the suitability of the terrain as habitat we cite these reports as reference. The conclusion contained in this report is that of the area of suitable existing habitat on the subject site is able to be covered by a 100 meter wide band following the creek precinct and covering; the creek, the adjacent flood plain areas adjacent to the creek and the rock escarpment that generally follows the outside extremity of the flood plain of the creek. The Brett Lane & Associates 25th February report (page 12) concludes that: “Suitable habitat [for the Growling Grass Frog] is considered to occur along the section of Kororoit Creek in the study area (subject site)….As no offline water bodies occur within the study area (subject site), there is a low likelihood that individuals would travel beyond the escarpment area and utilise the elevated rocky grassland and modified pasture/crop areas south west of the creek”. Based on this conclusion it is difficult to envision that the large area of the upper grassland on the subject site, that has been identified as part of the future growling grass frog metapopulation area, as suitable for this purpose in its current state. If this area is to remain as the preferred metapopulation node, it will be necessary to carry out significant works to adapt this part of the subject site to growling grass frog habitat. The BLA report dated 13th March, 2014 indicates that this will involve three essential items:

- Sources of suitable quantities of water stored in wetland of suitable size and habitat configuration;
- Quality of water sources compatible with the frog’s requirements;
- Ready access to the proposed additional habitat area from the existing habitat.

If the source of water for the additional habitat is to be the catchment area upstream of the subject site, then this is likely, in the future, to be an urban area. Therefore while this urban catchment will be a source of greater runoff it will also be affected by reduced water quality.

6.0 Catchment Assessment

Attachment 4 contains a plan and aerial photograph provided by Melbourne Water showing the existing watercourses and wetlands within the PSP study area and is derived from the Rakali Consulting study. This plan shows that there are several wetlands in the vicinity upstream of the subject site. A site inspection showed that of these two wetlands, the westernmost is fed by the main culvert under the Ballarat freeway and has an outlet channel which crosses Deanside Drive running in a westerly direction to a large existing wetland in the vicinity of the proposed freeway reserve that is an existing growling grass frog metapopulation node (see attachment 3 and photographs 1, 2 & 3). The easternmost existing wetland is possibly fed by the overflow from the westernmost wetland but has a limited direct catchment. The outlet from this wetland runs in a northerly direction and flows along the western boundary of the subject site. Both these wetlands are not holding any water as of the date of this report.

Attachment 5 is a plan showing the approximate catchments of the existing watercourses and wetlands. This plan shows that the direct catchment leading into subject site is approximately 33 hectares and that the catchment leading into the westernmost wetland is approximately156 hectares. The soils of the area consist of a thin layer of clay over a layer of hard basalt. The clays in the area are highly reactive and therefore combined with high evaporation rates result in high levels of water losses within the existing wetlands. The losses to groundwater contributing significantly to the base flow in the Kororoit Creek and therefore to the quality of the existing growling grass frog habitat in the creek.

Discussions with the owners of the subject site have confirmed this assessment of likely water losses within the wetlands in the upper grassland areas of the catchment. They have constructed a dam on the eastern section of the site above the escarpment and found that it could not hold water and has been subsequently abandoned. They also confirmed that the existing wetlands nearby are mostly dry for all of the summer months.

7.0 Water Balance Assessment

A preliminary water balance assessment has been carried out on the estimated 33 hectare catchment which feeds into the subject site to determine whether this catchment can sustain the wetlands required for the adaptation of the subject site for a suitable growling grass frog habitat. If it is assumed that the 33 Ha catchment is developed as an urban area, that mean rainfall and evaporation rates are applicable, that base losses typical of clay soils apply to the wetlands and that wetlands occupy approximately 50% of the area allocated for habitat, then table 7.1 shows the approximate water balance figures.

Table 7.1

Month	Mean monthly rainfall (mm)	Estimated Runoff generated to storage – urban catchment (cum.)	Mean monthly pan evaporation rate (mm)	Estimated Evaporation losses from storages (cum.)	Estimated infiltration losses from storages (cum.)	Estimated total losses from storages (cum.) **	Residual storage
Jan	42.5	8,414	285.4	10,274	3,870	14,144	-5,730
Feb	43.0	8,690	223.8	8,056	3,870	11,926	-3,236
March	33.8	6,692	223.6	8,049	3,870	11,919	-5,227
April	38.2	7,562	106.4	3,830	3,870	7,700	-138
May	38.0	7,505	95.2	3,427	3,870	7,297	208
June	35.4	6,990	47.2	1,699	3,870	5,569	1,421
July	34.9	6,893	69.4	2,498	3,870	6,368	525
August	42.7	8,432	98.2	3,535	3,870	7,405	1,027
Sept	47.4	9,352	131.2	4,723	3,870	8,593	759
Oct	53.3	10,526	178.6	6,429	3,870	10,299	227
Nov	53.5	10,565	161.2	5,803	3,870	9,673	892
Dec	45.4	8,966	205.8	7,409	3,870	11,279	-2,313
Total	515.8	100,587	1,826	65,732	46,440	112,172	-11,587

** Total losses will ultimately depend on volume of water stored

It should be noted that the values shown in table 7.1 are indicative only. They do, however, demonstrate that, based on mean figures, the size of the catchment is insufficient to permanently hold water within any wetlands constructed as part of the adaptation of the site to suit growling grass frog habitat. We estimate that, based on the mean figures, the wetlands will be completely dry for at least 4 months of the year, between January and April, and as a consequence the suitability of the site as future habitat is limited. We estimate that it would require at least a 100% increase in catchment area to ensure that the wetlands are able to be filled and then hold water year around. The only other option for permanent water would be to augment the water harvesting with a pumped system from the Kororoit Creek during the dry months. Such a system, however, has the potential to negatively impact on the quality of the habitat in the creek itself.

The approximate minimum volume of water required to be stored in the wetlands when full is estimated to be 60,000 cum.

8.0 Water Quality

Water quality becomes an issue when the catchment becomes highly modified such as is likely to be proposed in the PSP. Any adaptation of the existing rural catchment to future urban landuse will result in a significant change in the water quality of runoff. To maintain water quality that is suitable for growling grass frog habitat a suitable treatment system will be necessary. This would become part of a larger assessment of the water quality requirements for the PSP area. However it is noted that such a treatment system area for the catchment within which the subject site occurs, could take up as much space as 1.5 Ha. This area would not be considered as suitable habitat for the growling grass frog and therefore will impact on the space available on site for suitable habitat.

9.0 Construction of Wetlands on Site

The suitability of the upper sections of the subject site for construction of wetlands is not just limited by the availability of suitable amounts and quality of water. The following further limitations impact on the suitability of the site for the construction of proposed wetlands:

- The whole of the upper area of the site consists of a thin clay layer over a layer of hard basalt rock. Excavation for construction of wetlands is generally most applicable in areas where underlying soils are thick low permeability clays. Adaptation of sites for wetlands in rocky areas is mostly done through work on existing waterways and low wetland areas.
- Wetlands are also more suited to low flat areas such as occur in floodplains. Construction of wetlands on moderate to steeply sloping areas often creates hydraulic problems associated with flow velocities and management of retention times.

It is the general opinion of this report that the subject site is not a suitable location for the economic construction of wetlands where other more suitable locations are available. Photograph 10 shows how an existing watercourse has been adapted for construction of wetlands in the adjacent Caroline Springs area.

10.0 Connectivity between Existing Creek Based Habitat and Proposed Adapted Habitat Area

The report by Brett Lane & Associates (25th February, 2014 p12) quotes Heard et al. 2008 indicating that 90% of growling grass frog activity takes place either in water or within 5 metres of water. Therefore, as the proposed area on the subject that is required to be adapted to a suitable habitat as part of a metapopulation node is estimated to be dry for at least 4 months of each year under the current catchment arrangement, this area will not be suitable as habitat during these periods. If this is not addressed through other water sources there will be a change in the overall area of available habitat within the metapopulation node for this period of the year requiring a connectivity between the creek environs and the adapted habitat. The presence of the escarpment and the unsuitability of the moderately steeply sloping land in the northern area of the site for construction of wetlands means that provision of suitable corridors through to the existing creek habitat are limited.

11.0 Estimated Costs

Adaption of the upper area of the subject site to growling grass frog habitat will generally involve the following main works:

- Excavation of 1-2 metre deep ponds in basalt rock including blasting where required;
- Lining of ponds with imported clay liner;
- Construction of water management infrastructure;
- Construction of water treatment wetlands;
- Construction of water augmentation pumping system from Kororoit Creek;

- Installation of habitat vegetation and associated works;

We estimate that the total cost of this work is in the range $10,000,000 to $15,000,000. This figure is very preliminary and based on the assumptions contained in section 7.0.

12.0 Options for More Suitable Areas for Metapopulation Node

It is the general conclusion of this report and the BLA report (March 2014) that there are other areas within the PSP which would be more suitable for adaptation to growling grass frog habitat. The criteria for selecting suitable locations are as follows:

- Location on an existing watercourse or gully that is more readily able to be adapted for wetlands and preferably has some base flow into the watercourse.
- Location within a catchment of at least 50 Ha that will enable wetlands to be filled within a reasonable period of time and with a permanent water level.
- Location in close proximity to the creek habitat with permanent connectivity.

The subject site meets none of these criteria.

Attachment 4 is the Rakali Consulting plan of the existing watercourses and wetlands provided by Melbourne Water. It shows there to be two sites within the PSP area which do appear to meet the above criteria and are therefore considered by this report to be more suitable than the subject site. These alternative sites are identified in Attachment 5.

Alternative Site 1 is located opposite the subject site and is centered on a watercourse that has an estimated catchment of more than 225Ha. The watercourse has an outlet to the creek which is at flood level and a moderate to flat grade between Taylors Road and the creek. This site could be adapted for the proposed metapopulation node in an economic manner. Photographs 5 and 7 in Attachment 7 show this area.

Alternative Site 2 is located at the downstream end of the PSP area and incorporates an existing wetland and has an estimated catchment of 128 Ha. The existing wetland appears to be highly modified but would be able to be adapted to a suitable wetland in much the same manner as the other existing wetlands in the vicinity of the proposed freeway reserve. Photograph 9 in Attachment 7 shows a view of this area with photograph 8 in Attachment 7 showing the creek at the outlet.

Attachment 7 has a set of photographs which show some of these areas as well as the existing site. Attachment 6 has a key to the location of these photographs.

13.0 Conclusions

1. The subject site is unsuitable as a proposed metapopulation node for the following reasons
    - Its catchment is not large enough to sustain a permanent system of wetlands within the area allocated.
    - The topography of the site is unsuitable for adaptation to a suitable growling grass frog habitat if permanent water is not always available.
    - The presence of rock at the surface makes the site unsuitable for economic construction of wetlands.
2. There are other more suitable locations within the PSP area for adaptation of habitat for growling grass frog metapopulation nodes.

Yours faithfully,

David Fairbairn

David Fairbairn

Senior Civil Engineer

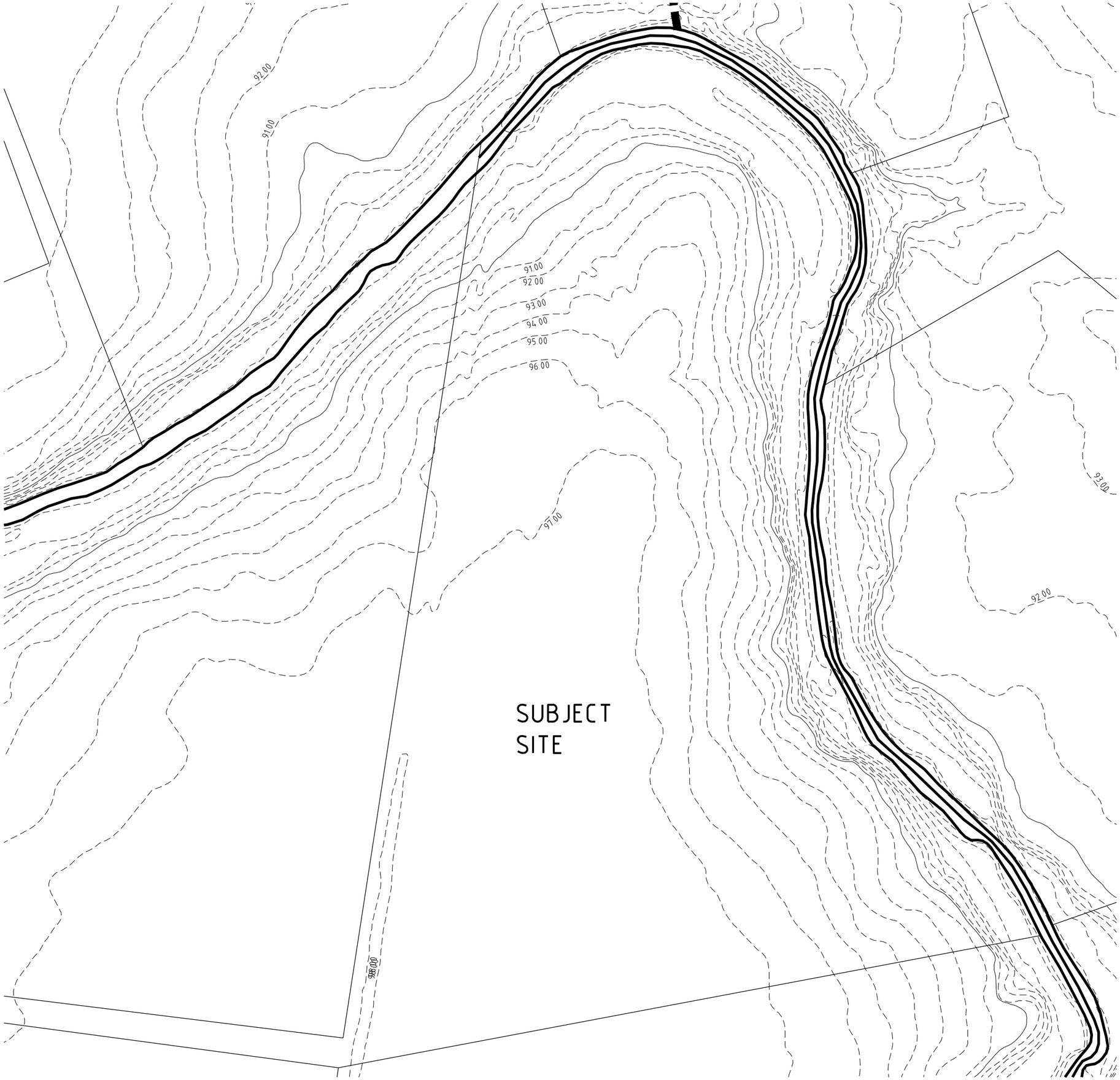
FMG Engineering

Phone: 03 9815 7672

Email: david.fairbairn@fmgengineering.com.au

Attachment 1

Site Plan



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CLIENT
KELLEHERS AUSTRALIA

PROJECT TITLE
-

SITE ADDRESS
173-177 DEANSIDE DRIVE
ROCKBANK, VIC. 3335

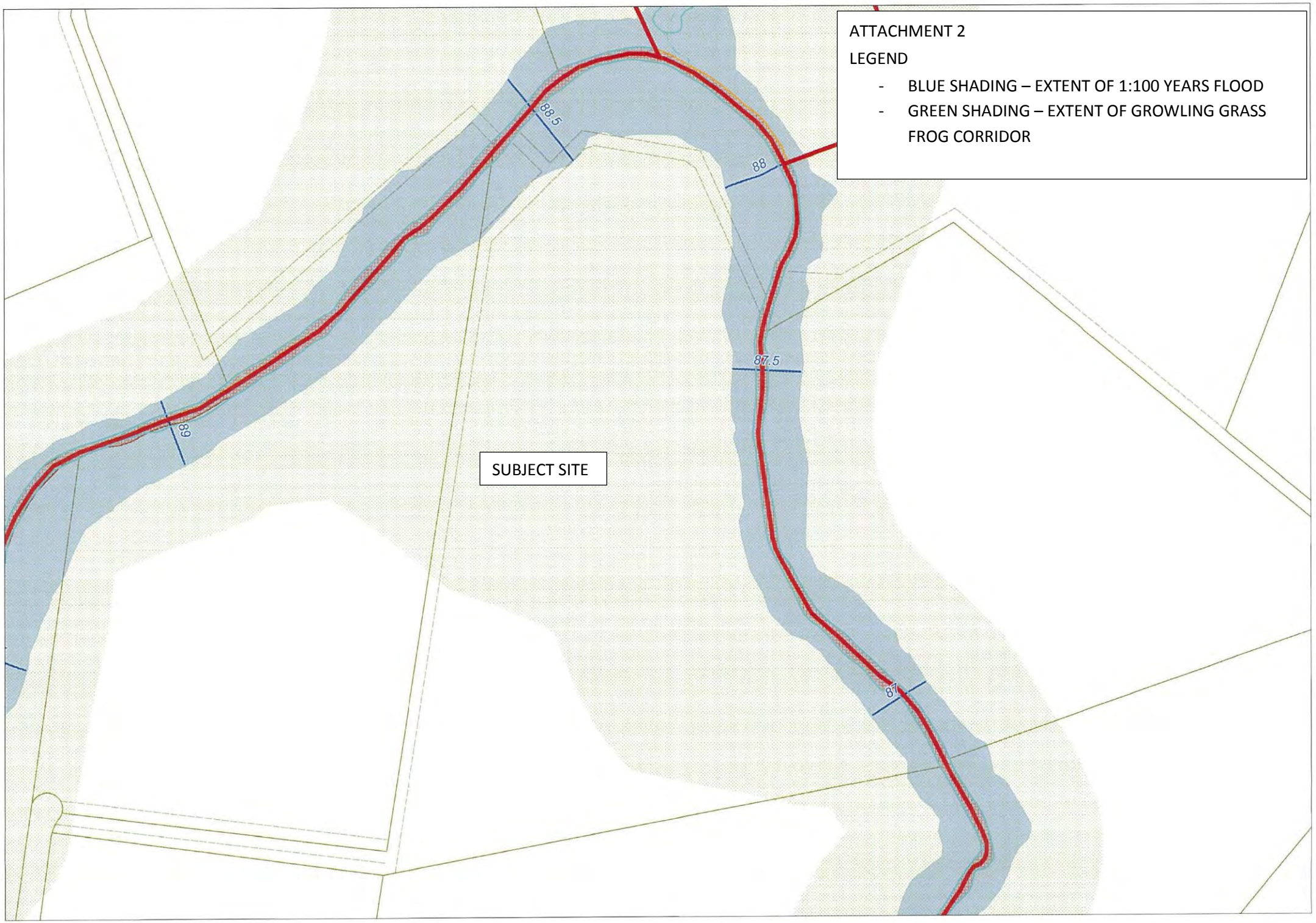
DRAWING TITLE
ATTACHMENT 1

	-	SCALE: 1:2000 @ A3	DATE STARTED: 14/03/2
DRAWN: CMB		SITE ID & JOB No.: S16728-219259	REV.
DESIGNED: DF		DRAWING No.: Att. 1	P
CHECKED: RA			

Attachment 2

1% Flood Extents & Levels

Source: Melbourne Water


ATTACHMENT 2
LEGEND
- BLUE SHADING – EXTENT OF 1:100 YEARS FLOOD
- GREEN SHADING – EXTENT OF GROWLING GRASS FROG CORRIDOR
SUBJECT SITE
88.5
88
87.5
89
87

Attachment 3

Fig 2c: West Growth Area Growling Grass Frog, Revised Category 1 Habitat, Detail
source: Biosis Research Pty Ltd

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1402725**	Page	: 1 of 3
Client	: **FMG CONSULTING ENGINEERS**	Laboratory	: Environmental Division Melbourne
Contact	: DAVID FAIRBAIRN	Contact	: Steven McGrath
Address	: Level 2, 1 Domville Ave Hawthorn Victoria, Australia 3122	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: david.fairbairn@fmgengineering.com.au	E-mail	: steven.mcgrath@alsenviro.com
Telephone	: ----	Telephone	: +61-3-8549 9600
Facsimile	: ----	Facsimile	: +61-3-8549 9601
Project	: 219259	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 26-MAR-2014
Sampler	: DF	Issue Date	: 28-MAR-2014
Site	: S16728		
		No. of samples received	: 1
Quote number	: ADBQ/005	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Eric Chau	Metals Team Leader	Melbourne Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**MW01**	----	----	----	----
			Client sampling date / time	25-MAR-2014 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1402725-001**	**----**	**----**	**----**	**----**
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.37**	----	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**5770**	----	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	**3320**	----	----	----	----

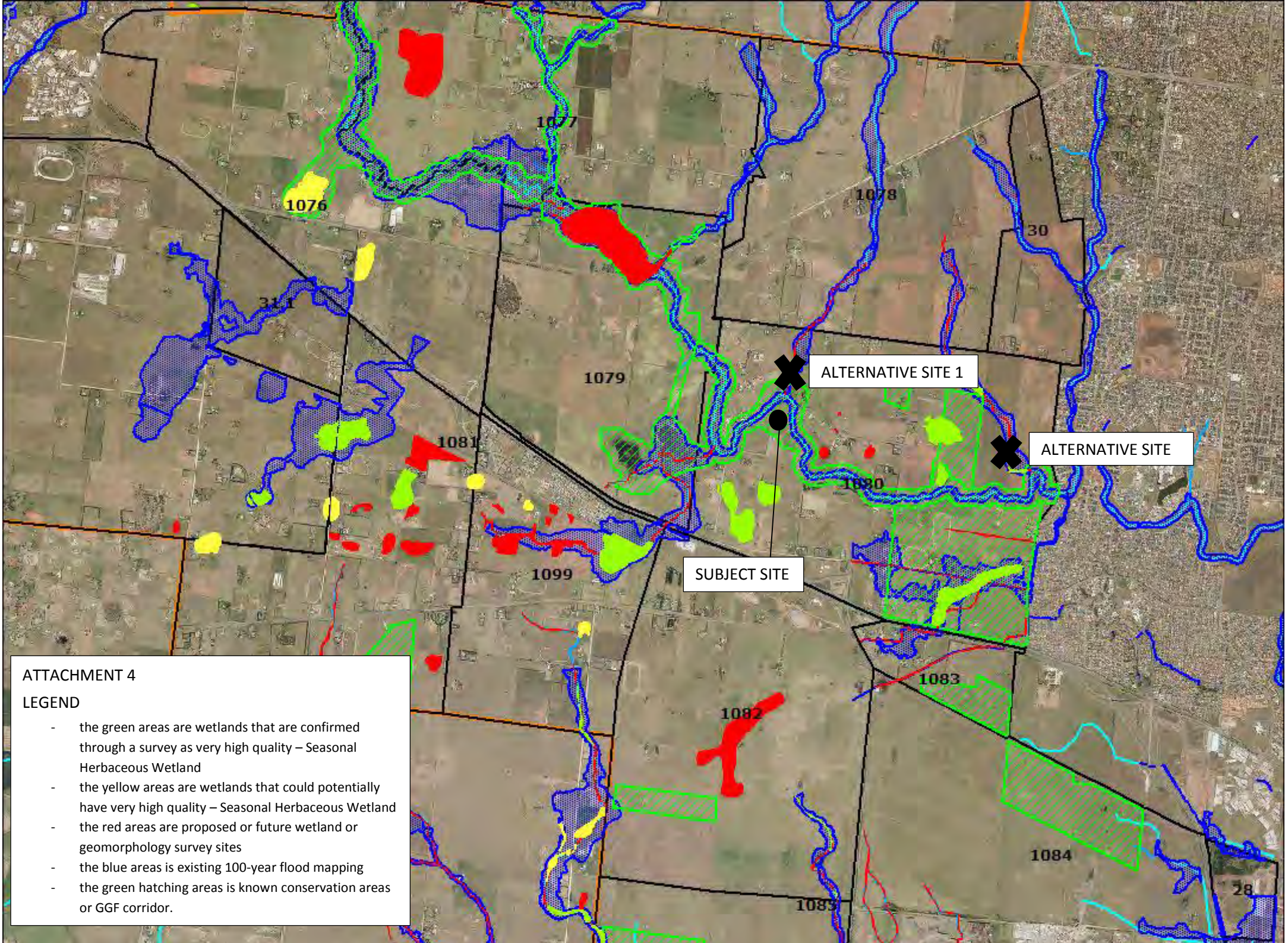
Attachment 4

Survey of potential natural wetland sites in this region

source: Rakali Consulting

Legend

- the green areas are wetlands that are confirmed through a survey as very high quality – Seasonal Herbaceous Wetland
- the yellow areas are wetlands that could potentially have very high quality – Seasonal Herbaceous Wetland
- the red areas are proposed or future wetland or geomorphology survey sites
- the blue areas is existing 100-year flood mapping
- the green hatching areas is known conservation areas or GGF corridor.



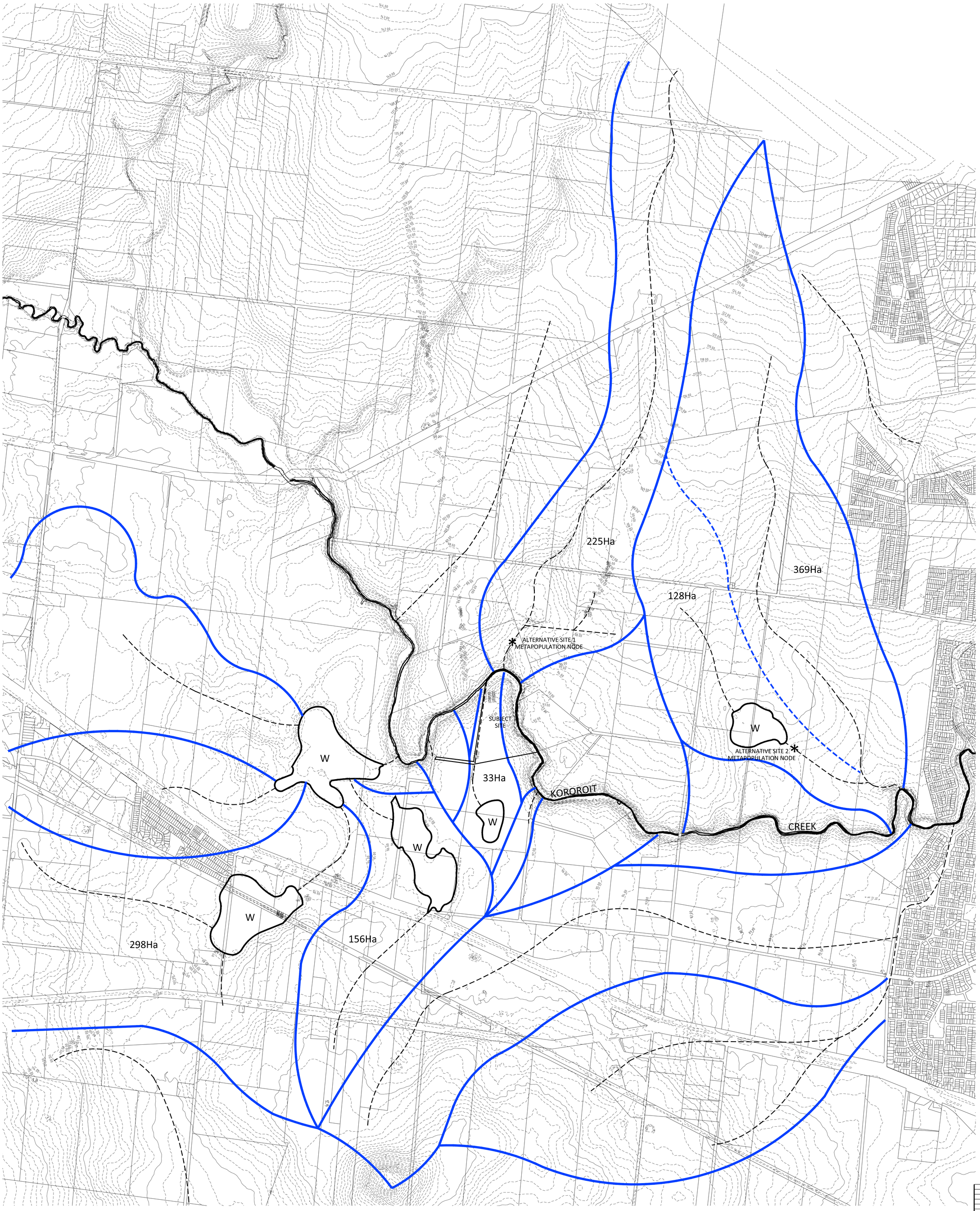
ATTACHMENT 4

LEGEND

- the green areas are wetlands that are confirmed through a survey as very high quality – Seasonal Herbaceous Wetland
- the yellow areas are wetlands that could potentially have very high quality – Seasonal Herbaceous Wetland
- the red areas are proposed or future wetland or geomorphology survey sites
- the blue areas is existing 100-year flood mapping
- the green hatching areas is known conservation areas or GGF corridor.

Attachment 5

Catchment Plan



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SIGNATURE

CLIENT
KELLEHERS AUSTRALIA

PROJECT TITLE
-

SITE ADDRESS
173-177 DEANSIDE DRIVE
ROCKBANK, VIC 3335

DRAWING TITLE
ATTACHMENT 5 - CATCHMENT PLAN

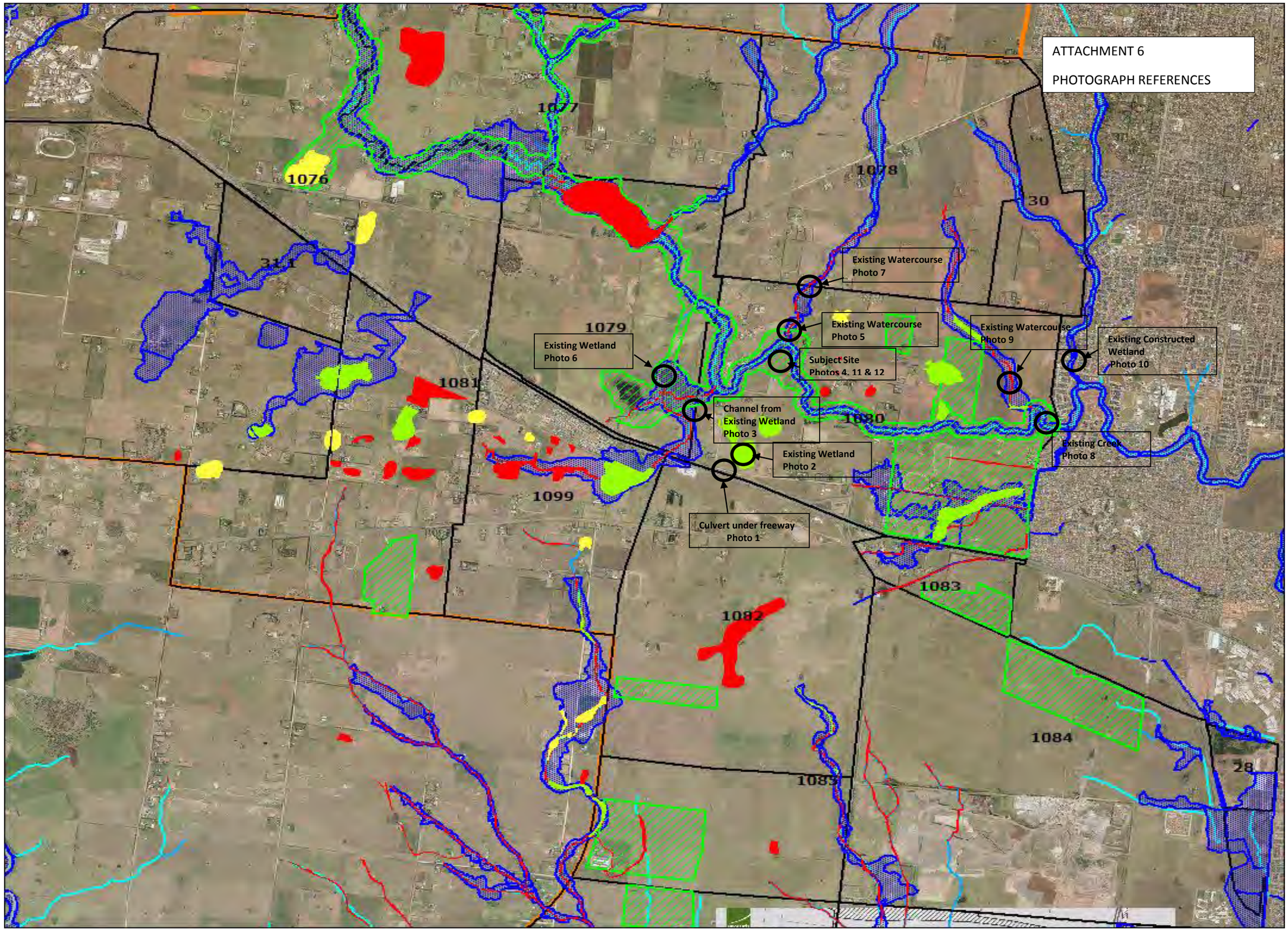
	SCALE	DATE STARTED	
	- 1:10000 @ A1	03/03/14	
DRAWN: CMB	SITE ID & JOB No. S16728-219259		REV.
DESIGNED: DF	DRAWING No. Att. 5		P1
CHECKED: RA			

Attachment 6

Photograph Locations

ATTACHMENT 6

PHOTOGRAPH REFERENCES



Attachment 7

Photographs

Photo 1 – Culvert under Freeway

Photo 2 – Existing Wetland – dry

Photo 3 – Channel from Existing Wetland at Deanside Drive

Photo 4 – Subject Site

Photo 5 – Existing water course at outlet to Creek

Photo 6 – Existing Wetland (in background)

Photo 7 – Existing Watercourse

Photo 8 - Existing Creek

Photo 9 – Existing Watercourse (background)

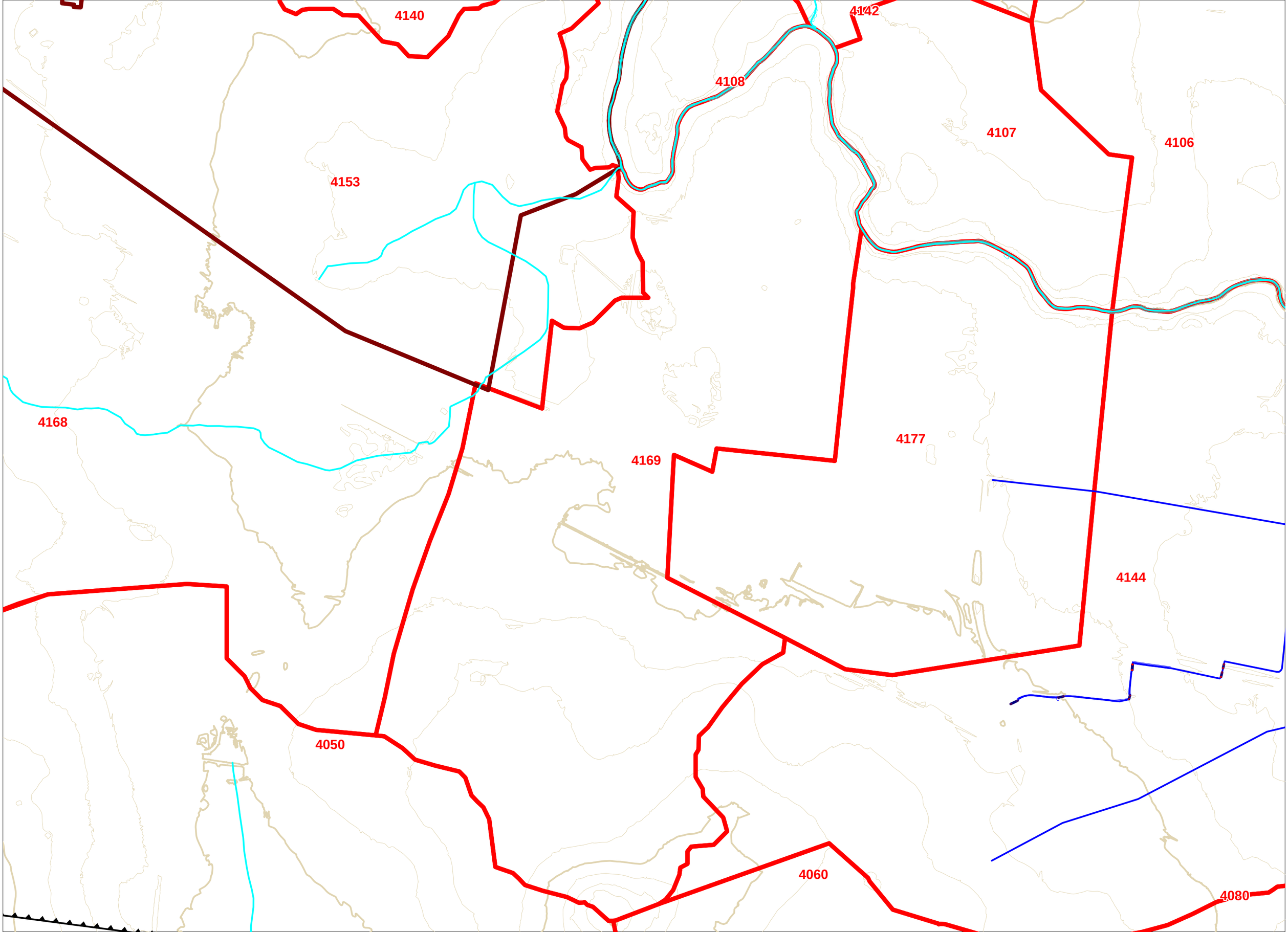
Photo 10 – Existing Constructed Wetland

Photo 11 – Creek on subject site at western boundary

Photo 12 – Creek on subject site at eastern boundary

Attachment 8

Preliminary Melbourne Water DSS boundaries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Appendix 6: FMG Letter report from David Fairbairn to Kellehers Australia Pty Ltd, dated May 16th 2014

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May 16, 2014

Kellehers Australia Pty Ltd,
497 Swan Street,
Burnley, 3121.

Dear Leonie,

Re: Natale
173-177 Deanside Drive, Rockbank
Kororoit Precinct Structure Plan
Future Development Assessment
Supplementary Report on Use of Groundwater

1.0 Introduction

Thank you for your further instructions regarding the preparation of a report examining the option of the use of groundwater to supplement the use of harvested runoff for the maintenance of habitat wetlands for the growling grass metapopulation node proposed to be located on the subject site (Attachment 1).

173-177 Deanside Drive, Rockbank, the subject site, is currently within an area within the metropolitan urban growth boundary which is the subject of the Kororoit Precinct Structure Plan (PSP) being prepared by the Metropolitan Planning Authority. The Preliminary Draft Future Urban Structure Concept Plan for the PSP (Attachment 2), shows that large areas of the subject site have been identified as being required to be set aside for habitat for the growling grass frog. Our report, dated 19th March, 2014, found that the proposal for the construction of habitat wetlands on the subject site was not likely to be sustainable based on a water balance assessment of the catchment in which the subject site is located. The report found that the proposed water harvesting would be required to be supplemented from other sources and that utilisation of these other sources could have a detrimental effect on the existing high quality habitat found along the creek and elsewhere. It was for this reason that our previous report identified alternative sites within the PSP area which did not have the same shortcoming of harvested water.

DEPI in response have indicated that, although they have not commenced an assessment of the water management requirements for the PSP area, they intend utilising groundwater to supplement any shortcoming of harvested water on the subject site.

It would, in the opinion of this report, be premature to finalise details of the PSP without consideration of an integrated water management assessment. Such an integrated water management assessment would include a water yield and water balance analysis for all options for habitat wetlands.

2.0 Alternative Water Harvesting Sources

There are three possible sources available for supplementing the water available to the proposed habitat wetlands on the subject site, these are:

- Diverting runoff from other catchments,
- Pumping from the Kororoit Creek, or,
- Pumping from the groundwater resource found on the site.

All of these options have the potential to adversely affect the viability for creating or maintaining suitable habitat for the growling grass frog.

2.1 Diversion of Runoff from other Catchments

The only alternative catchment from which runoff could be harvested and diverted to the subject site, currently feeds the existing metapopulation node KRC12, located further to the west. Therefore the diversion of this runoff has the potential to adversely affect the viability of this existing metapopulation node as it would reduce the available catchment yield by over 30%. For this reason this option has not been considered by this and the previous report as a viable alternative.

2.2 Pumping from Kororoit Creek

The option of supplementing the deficit in the water balance by pumping from the Kororoit Creek during, on average, the period December to April, a period of low creek flow and high evapo-transpiration, has the potential to adversely affect the creek riparian and aquatic environment and therefore adversely affect the important existing habitat. This option would also require; a license to divert water from the creek, approval from Melbourne Water to install a suitable offtake and pumping system, and the implementation of works within the creek environment to install the infrastructure required. The potential for disruption to the existing habitat by such works and the long term effects of extracting water from the creek for use in the wetlands would indicate that this option is also not supportable.

It is also noted that Melbourne Water, in it's published waterway diversion status information, classifies the Kororoit Creek as 'high risk' in terms of long term potential for diversion of water for other uses. This means that the low flow trigger level of 2Ml/day is likely to be regularly reached and restrictions on pumping from the creek applied during these periods. Over the last 12 months the weekly flow figures have indicated that minimum daily flow has dropped below this threshold on 6 occasions. While this did not trigger off restrictions it does indicate that pumping from the creek is unlikely to be a reliable long term permanent source of additional harvested water. Melbourne Water has a policy of not granting new licenses other than in exceptional circumstances for any other waterways under to control.

Sections 40(1)(b) and 40(1)(c) of the Water Act would require a full consideration by the Minister of the existing and projected availability of water from this source and its effect on existing users if a new application for a diversion license was made.

2.3 Use of Groundwater

The option of the use of groundwater has the potential to locally deplete base flow into the creek and create higher concentrations of salinity in the habitat wetlands. While this option would be a costly solution, it is technically feasible to implement, provided the groundwater is available in sufficient quantity and quality. We have requested that Southern Rural Water provide an opinion indicating as to whether, based on its policies, a license would be granted for the extraction of groundwater in the quantities required. A copy of the email in which this request was made to Southern Rural Water is contained in Attachment 4. To date no response to this question has been received.

2.4 Alternative Sites

As concluded in our previous report, an alternative to supplementing the harvesting of water for the proposed habitat wetlands on the subject site, is to select an alternative site of similar area within the PSP which has a sufficiently large catchment available to harvest runoff in a sustainable manner. Two alternative sites were identified in our previous report

3.0 Groundwater Quality

There is an existing groundwater bore approximately 20m deep on the subject site. This bore is used for stock watering and domestic purposes and, according to the owners, is significantly saline. A sample was taken from the bore and sent to ALS Environmental for testing. The test results are contained in Attachment 3 and show that the borewater has a pH of 8.4, a TDS of 3320mg/L and an electrical conductivity of 5770 uS/cm. This would confirm that the borewater is significantly saline.

Discussions with Brett Lane & Associates indicate that an upper threshold for salinity of 10,000uS/cm is applicable to habitat suitable for the growling grass frog with a desirable maximum of less than 5,000uS/cm. Therefore based on the test results the water quality of the available groundwater at the subject site would be suitable for this use.

4.0 Use and Availability of Groundwater

The use of groundwater at the subject site would be subject to a license agreement which would be administered by Southern Rural Water. The groundwater in the vicinity is not, according to Southern Rural Water, the subject of any cap on usage. Therefore the suitability of the use of the groundwater to supplement the supply to the proposed habitat wetlands would depend on whether an entitlement under the Water Act, is available in the quantity and quality required and whether there is a more suitable and economic alternative available.

It is estimated that the supplementation of the water supply would be required to be at a rate equivalent to 120 litres per minute for 24 hours each day for 5 months of the year to sustain the proposed wetlands. This is equivalent to a daily requirement of between 75Kl and 180 Kl. This is a significant demand to place on the groundwater resource. We have therefore requested that Southern Rural Water confirm that this is an appropriate use of the groundwater resource and to confirm at what cost this water could be extracted. A copy of the email sent to Southern Rural Water is contained in Attachment 4. To date no response answering these questions has been received.

In the absence of a hydrogeological analysis of the potential groundwater extraction, it is not possible to determine the exact impact of the potential extraction on the aquifer which supports the local groundwater regime. However it may be said that there are several other bores close to the subject site and that there is likely to be an effect on the use of these existing bores. Section 40(1)(d)(i) and 40(d)(1)(ii) requires that before a new license can be granted, the Minister must determine whether there is any adverse effect that the allocation or use of water under the entitlement is likely to have on both existing authorised uses of the water and on the waterway or aquifer.

Attachment 6 contains an extract from the National Atlas of Groundwater Dependent Ecosystems which covers the subject site. This extract confirms that the area along the creek frontage of the subject site is shown as being occupied by vegetation which has a high potential for groundwater interaction and that the creek itself also has a high potential for groundwater interaction. Therefore localised harvesting of groundwater at significant rates close to the creek could affect the quality of the vegetation along the creek and the ecosystems within the creek and the flow regime of the creek itself. As this area is identified in the BLA report as high quality core habitat for the growling grass frog, the extraction of groundwater could locally adversely affect the quality of this core habitat. The Water Act, Section 40(1)(g), requires that the Minister consider, among other things, the effect of any application for allocation of water on the need to protect the environment including the riverine and riparian environment. Therefore a careful consideration of the effects on the creek environment of groundwater and creek water extraction for the maintenance of created habitat wetlands on the subject would be required before this use could be confirmed.

It would therefore seem premature to decide that groundwater supplementation is an appropriate means of addressing the shortfall in harvested water available to the habitat wetlands proposed for the subject site.

5.0 Future Water Quality

The total volume of water that would be required to be stored in the proposed wetlands is between 40,000cum. and 60,000cum. Therefore the initial filling and sustaining of the proposed wetlands will require supplementation from groundwater or other sources. Given that the groundwater is moderately saline and that there is a deficit in the mean water balance figures, there is also the potential for accumulation over time of TDS in the water contained in the wetlands. It is estimated, based on an accumulation of the total TDS load from the groundwater source over time, that the TDS of the water within the proposed wetlands would double in four years if excess fresh water is not available for flushing. The implications of this are twofold.

1. There is a direct impact on the water quality of the aquatic habitat of the growling grass frog in the proposed wetlands that could push it to beyond the frog's threshold salinity level.
2. There is an impact of the range and type of vegetation available to the proposed habitat as salinity increases.

These types of changes can have a significant impact on the continuing suitability of the habitat contained within the proposed wetlands.

The only source for suitable flushing water, given that there is a deficit in harvested water, is to pump the required water from the creek. The rate of water usage for flushing is estimated to be approximately 15Ml per

annum. A license would be required for this extraction, however it is noted, from the Melbourne Water diversion information that the current status of Kororoit Creek is high risk even though there are no current restrictions in place. Therefore long term extraction from the creek is likely to be subject to a high risk of restriction and is therefore questionable as a reliable source of flushing water.

6.0 Alternative Sites

Based on this and our previous report, the costs of the construction and operation of habitat wetlands on the subject site are likely to be significantly higher than those applicable to the other alternative sites investigated. These sites were identified in our previous report and are shown in more detail in Attachment 5. They are described as follows:

Site 1 – subject site, flat grassland

Site 2 – gully/depression area on north side of Kororoit Creek opposite subject site

Site 3 – gully/depression area on north side of Kororoit Creek east of subject site

We have carried out more detailed water balance investigations of these alternative sites and have concluded that, based on mean figures, while Site 1 has an annual deficit of harvested water over losses of approximately 10,000cum., Site 2 has an estimated annual excess of harvested water over losses of 575,000cum. and Site 3 has an annual estimated excess of 280,000cum. We have also investigated and alternative catchment at Site 3, Site 4, which also had an estimated excess of 1,000,000cum. Therefore, based on mean rainfall and loss figures, all these alternative sites would not require any supplementation from other sources.

It was also concluded in our previous report that these sites are more suited to the construction of wetlands as;

1) They are on land that is directly connected to the creek environs.
2) They do not require the use of saline groundwater.
3) They have a greater potential for replication of the habitat that is already available within the creek environs.

In addition all of the alternative sites are located within watercourses that are designated as 'waterway/retarding basin' and/or drainage asset in the draft Future Urban Structure Concept Plan. Therefore the integration of the habitat function with the waterway function for these areas could be considered at the early planning phase of these assets.

According to the Guidelines for managing the endangered Growling Grass Frog in urbanising landscapes (Arthur Rylah Institute for Environmental Research Technical Report Series No 208) high connectivity is an important factor in determining the probability of decolonisation and occupancy of purpose built wetlands. This report also concludes that it is vital that purpose built habitat wetlands display the same characteristics as those being replicated for the existing populations, otherwise the occupation by the new populations for which they have been designed to support may be short lived.

Sites 2, 3 and 4 all have the potential for greater connectivity with and replication of the creek environs than Site 1 (subject site). As described in our previous report, the subject site has a significant barrier to connectivity with an 8 meter high escarpment over much of the creek frontage on the site. Sites 2, 3 and 4, as they are located on watercourses that discharge to the creek, all have a gradually sloping topography which is more able to address the connectivity issue.

7.0 Estimated Costs

The exact form and costs of the habitat wetlands is dependent on the proposed location. Where the wetlands are on the flat upper grassland area such as at the subject site it is anticipated that they will be large depressed areas with interconnecting overflow channels and an overflow to the creek. Where the wetlands are to be constructed on existing water courses they will take the form of a series widened sections of the water course with a downstream embankment and a by-pass channel drainage system. Appropriate habitat planting has been allowed for in the costs.

Our previous report placed the estimated capital costs of the proposed habitat wetlands on the subject site at between $15,000,000 and $20,000,000. The alternative site estimated costs are as follows:

Site 2 - between $7,000,000 and $10,000,000

Site 3 – between $4,000,000 and $6,000,000

Site 4 – between $5,000,000 and $8,000,000

Therefore these preliminary costs would indicate that the capital costs of the equivalent proposed wetlands on the alternative sites are at least 50% less than those on the subject site. It should be noted that the inclusion of a borewater requirement, as proposed for the subject site, would also result in much higher on-going operations and maintenance costs relative to the alternative sites.

Note that estimated costs do not include any costs associated with land acquisition.

Therefore any of the alternative sites would be a much better 'best value for money' habitat creation scenario than the subject site.

8.0 Conclusions

The conclusions of this report are partially dependent on the information to be gained from Southern Rural Water. Nevertheless it can be said, based on the additional information contained in this report that:

- The use of groundwater to supplement water harvesting for the support of habitat wetlands on 173-177 Deanside Drive, Rockbank, is dependent on the availability of groundwater of sufficient quantity.
- It is unlikely that the use of saline groundwater as the sole source of water for habitat wetlands for a significant period of the year, would result in a habitat that is able to replicate that which is already available within the Kororoit Creek environs.
- That the use of groundwater and/or creek water to supplement a shortfall in water harvesting could result in adverse impacts of existing high quality habitat along and within the creek and on the flow regime within the creek.
- There are alternative sites existing within the PSP area that would be suitable for the construction of habitat wetlands with strong connectivity to the existing Kororoit Creek environs and are not limited by the availability of harvested fresh water. The economic feasibility of the construction of wetlands on these alternative sites is more favourable to that which is applicable to the subject site.

Yours faithfully,

David Fairbairn

David Fairbairn

Senior Civil Engineer

FMG Engineering

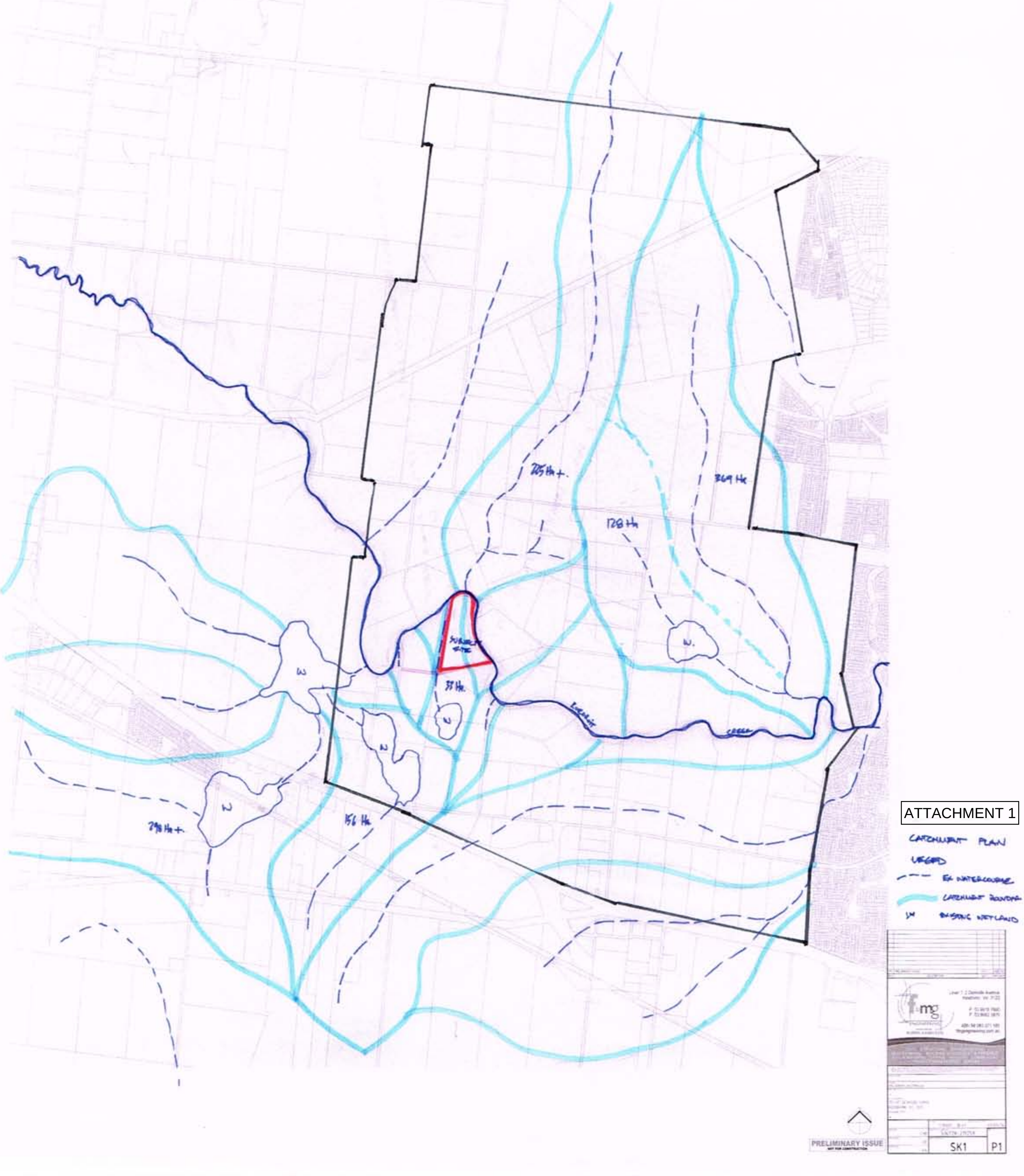
Phone: 03 9815 7672

Email: david.fairbairn@fmgengineering.com.au

Attachment 1

Site Plan

ATTACHMENT 1



Attachment 2

Kororoit PSP – Preliminary Draft Future Urban Structure Concept Plan

Attachment 3

Borewater Test Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1402725**	Page	: 1 of 3
Client	: **FMG CONSULTING ENGINEERS**	Laboratory	: Environmental Division Melbourne
Contact	: DAVID FAIRBAIRN	Contact	: Steven McGrath
Address	: Level 2, 1 Domville Ave Hawthorn Victoria, Australia 3122	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: david.fairbairn@fmgengineering.com.au	E-mail	: steven.mcgrath@alsenviro.com
Telephone	: ----	Telephone	: +61-3-8549 9600
Facsimile	: ----	Facsimile	: +61-3-8549 9601
Project	: 219259	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 26-MAR-2014
Sampler	: DF	Issue Date	: 28-MAR-2014
Site	: S16728		
		No. of samples received	: 1
Quote number	: ADBQ/005	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Eric Chau	Metals Team Leader	Melbourne Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**MW01**	----	----	----	----
			Client sampling date / time	25-MAR-2014 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1402725-001**	**----**	**----**	**----**	**----**
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.37**	----	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	**5770**	----	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	10	mg/L	**3320**	----	----	----	----

Attachment 4

Email to Southern Rural Water

David Fairbairn

From: David Fairbairn
Sent: Thursday, 17 April 2014 5:39 PM
To: 'srw@srw.com.au'
Cc: Robert Forrester; 'Leonie Kelleher'; Brett Lane
Subject: 173-177 Deanside Drive Rockbank
Attachments: Surveyareamap-clientlandoutlined 220114.jpg

The Manager, Groundwater Resources

I am investigating the background to utilising groundwater resources to supplement the harvesting of catchment runoff in order to construct sustainable wetlands for the habitat of the growling grass frog on this property. We have carried out some preliminary water balance computations and estimate that there would be an average daily requirement for groundwater of between 75 KL and 180 KL for the five months between December and April each year to supplement runoff to prevent the wetlands drying out. These figures are based on mean rainfall figures and therefore may vary depending on 95 %ile values. We therefore, based on these figures, estimate that there would be a requirement for pumping of approximately 2.0 l/sec 24 hours per day over the 5 month period to sustain these wetlands. I therefore wish to determine:

- Whether such a demand on the groundwater resource in this area is sustainable over the long term.
- Whether the use of groundwater for this purpose and in this volume is compatible with the policies of SRW and whether there would be any conditions on its use.
- Whether there would be a requirement for a license for such a use if the end user is DEPI and the approximate costs associated with this license if required.
- Whether there are other areas where examples of such a use has been implemented.

The issue is currently being considered by the Metropolitan Planning Authority and DEPI as part of the preparation of the Kororoit PSP and has reached a point where a plan has been prepared for public consultation. Therefore we wish to resolve whether the site which is currently being considered for the wetlands is the most suitable or whether other more suitable sites which do not require the use of groundwater for this purpose should be included in a revised plan. Therefore your earliest consideration of this issue would be appreciated. I attach a copy of a plan identifying the site for your information.

David Fairbairn
Senior Engineer

FMG Engineering *incorporating* **Burns Hamilton**...*celebrating 40 Years*

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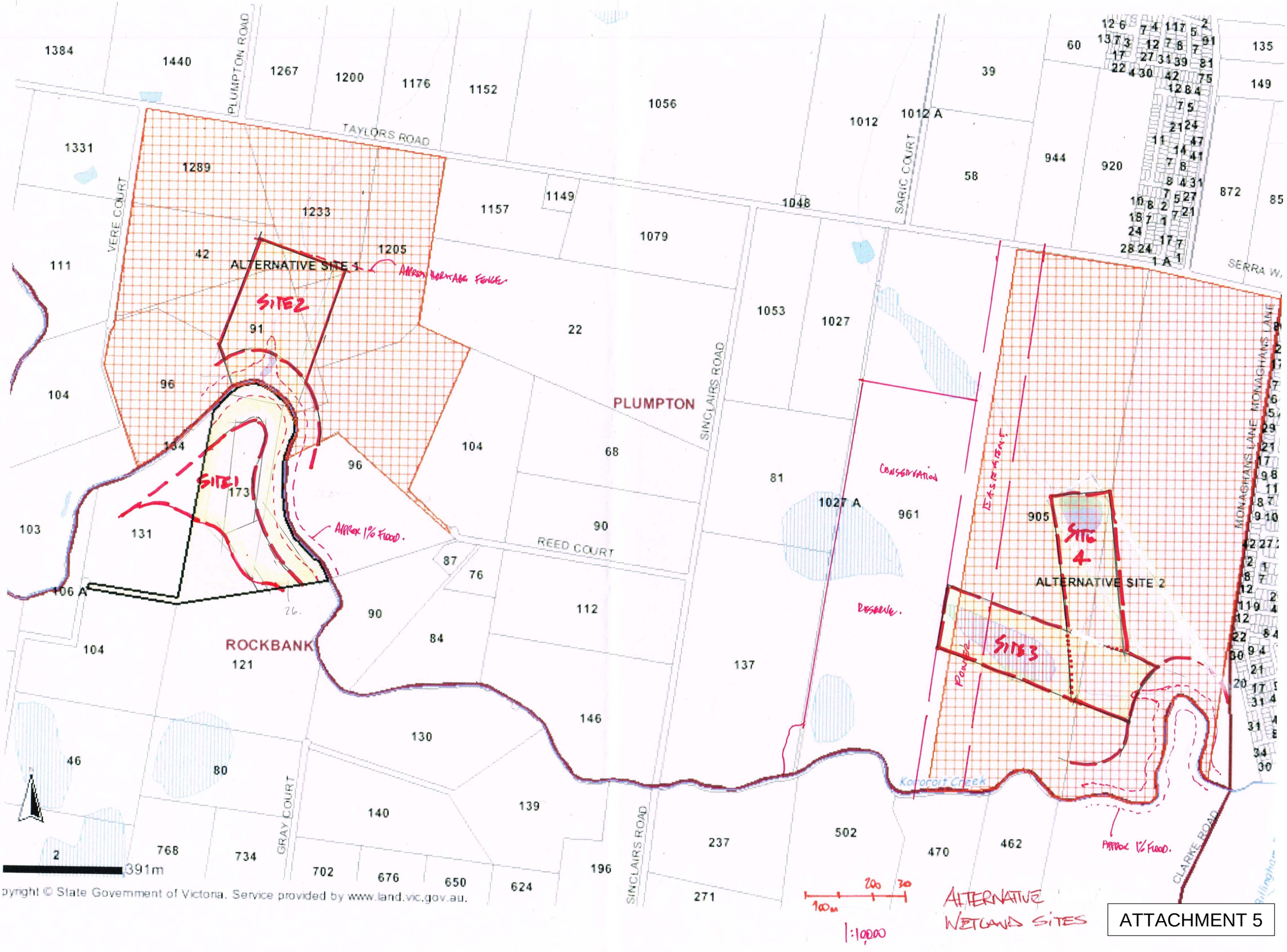
P.S. We are pleased to announce that as of Monday the 19th August 2013 Burns Hamilton and Partners have merged with the established multi-disciplinary engineering practice of FMG Engineering. As per our new logo we are now trading as FMG Engineering incorporating Burns Hamilton. The merger provides greater richness and reach for FMG Engineering Victorian office's structural and civil engineering services and an enhanced structure for us to move forward into the future. Most importantly it provides clients of both companies the benefits of a larger and more diversified skill base. By coming together our employees will be better positioned to achieve their best work for our clients and the broader community. We have moved to FMG Engineering's premises in Domville Avenue, Hawthorn. Our contact numbers are as listed and all contact details are included in this email and on our combined website

Attachment 5

Location Plan of Alternative Sites



ATTACHMENT 5

Attachment 6

National Atlas of Groundwater Dependent Ecosystems (Extract)

ATTACHMENT 6