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12 May 2017
Ref No.: 2378-1358

Pacifico
124 Albert Drive
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Attention: Noelene Rutherford

WC2NH Giant Barred Frog Population Monitoring Summary– Autumn 2017

Introduction

GeoLINK has been engaged by Pacifico to undertake Giant Barred Frog (GBF) (*Mixophyes iteratus*) population monitoring for the Warrell Creek to Nambucca Heads (WC2NH) Pacific Highway upgrade. Two sites (Upper Warrell Creek and Butchers Creek) are monitored in accordance with the *Warrell Creek to Urunga Giant Barred Frog Management Strategy* (GBFMS) (Lewis, 2014). Upper Warrell Creek is known GBF habitat; the Butchers Creek monitoring site was established in November 2015 after scheduled de-fishing activities were undertaken on 31 August 2015. Suspected GBF tadpoles were trapped and their identification confirmed by Michael Mahony, frog expert from the University of Newcastle. Although no GBFs have been recorded at Butchers Creek site since November 2015, based upon the precautionary principle, Butchers Creek is currently being managed as potential GBF habitat in accordance with the *WC2NH Giant Barred Frog Management Strategy* and *Butchers Creek – Mixophyes Unexpected Find Summary (ref: 2378-1163)*; refer to **Illustration 1.1** for Butchers Creek GBF management zones.

Monitoring of GBF population and habitat is to be undertaken during autumn, spring and summer of years 1 and 3 of the construction phase, as outlined in the GBFMS (Lewis, 2014). The GBF Population Monitoring Annual Report for Year 1 of construction was prepared by GeoLINK and previously issued to Pacifico in March 2016 (*ref: 2378-1212*).

This report documents a summary of findings for the first monitoring event for Year 3 (autumn 2017). Spring and summer monitoring events will be undertaken during 2017/ 2018.

Methods

Field surveys were performed in accordance with the methodology outlined in the *Giant Barred Frog Management Strategy* and *Baseline Monitoring for Giant Barred Frog* for the project (Lewis, 2014). Both of the aforementioned plans have been approved by the Department of Planning and Environment (DP&E) and the Environmental Protection Authority (EPA). A summary of the monitoring methodology is included below.

Field surveys were undertaken during the following periods:

- Autumn sampling:
  - Undertaken on the 4th & 6th April 2017 in response to a rainfall trigger event of 52.4 mm recorded on the 31st March 2016 with an additional 74 mm being recorded in the seven days leading up to the first day of monitoring (4/04/2017).

Frog surveys involved:

- Surveys being performed within seven days of a rainfall event exceeding 10 mm in 24 hours using the Project Weather station located at Warrell Creek South Compound with data reading taken from the data provider Weathermation.
- Butcher's Creek: survey of an 800 m transect with 200 m either side of the construction footprint (~100 m represents construction footprint) and divided into 8 x 50 m survey zones (**Illustration 1.1**).
- Upper Warrell Creek (UWC): survey of a one km transect with 450 m either side of the construction footprint (~100 m represents construction footprint) and divided into 20 x 50 m survey zones (**Illustration 1.2**).
- Each field survey involved a meandering, nocturnal transect on both sides of the stream bank with all GBFs captured during autumn 2017 either permanently marked using a PIT tag (i.e. micro-chipped) or scanned using a Trovan Nanotransponder. Survey effort was 2 x 4 hours with a combined total of 8 hrs across 4th and 6th April 2017 at the UWC and Butchers Creek sites.

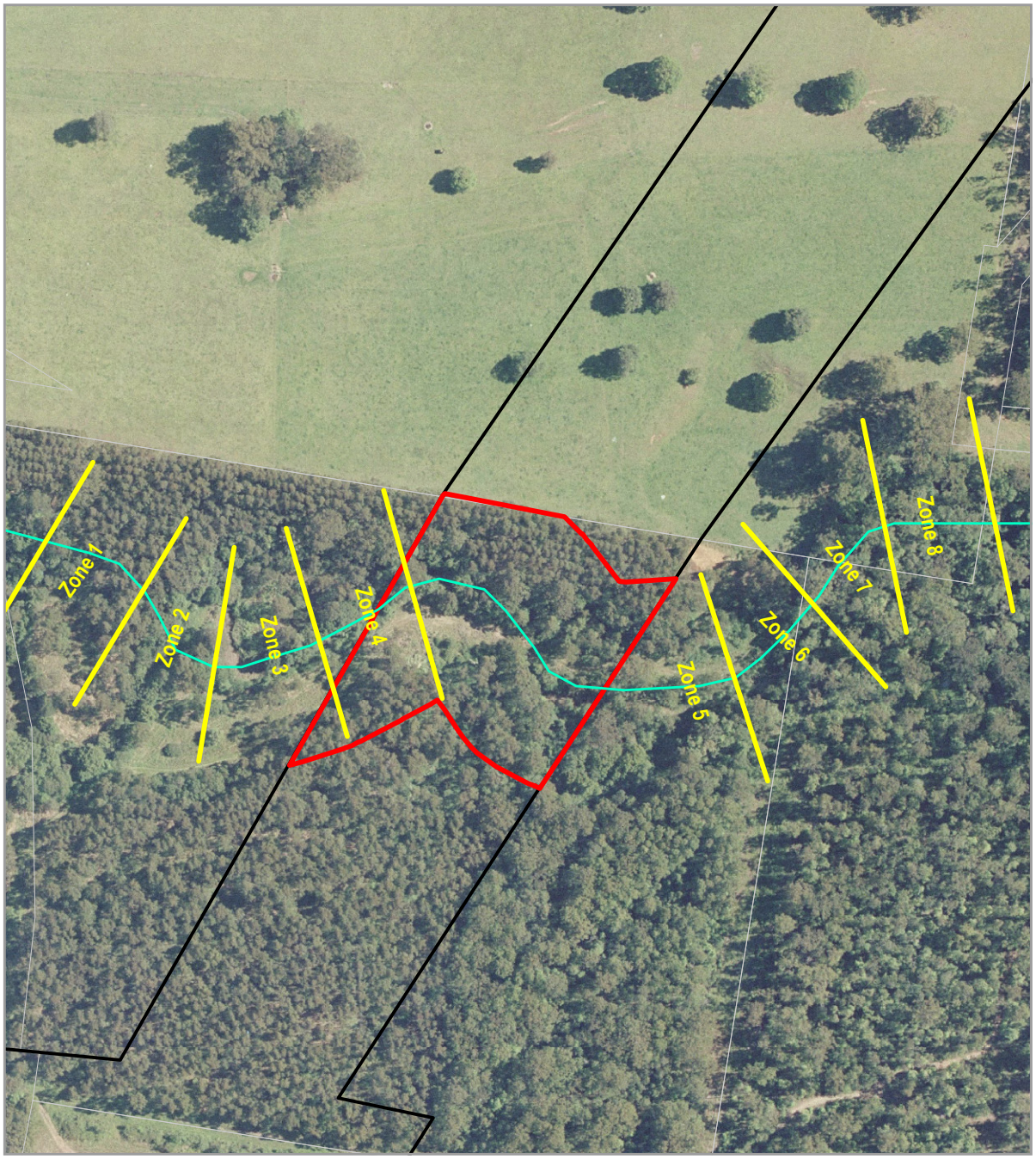
For each frog, the following information was collected:

- Location according to demarcated survey zone (20 x 50 m zones - UWC; 8 x 50 m zones - Butchers Creek).
- Distance from the stream edge measured to the nearest 0.1 m.
- Position within the microhabitat (i.e. under litter, above litter, exposed, on rock/log).
- Sex (male, female, unknown).
- Age class (adult = >60 mm; sub adult = 40-60 mm; juvenile = <40 mm).
- Snout-vent length (mm).
- Weight (grams).
- Breeding condition:
  - males assessed on the colouration of their nuptial pads (i.e. no colour, light, moderate, dark) in accordance with the classification developed by Lewis (2014); refer **Table 2-1**; females assessed based on whether they are gravid (i.e. typically adult weighing > 100 grams) or not gravid (egg bearing);
  - frogs with a snout vent length of <60 mm were classified as immature.

Detailed survey methodology for abiotic, habitat and water quality data is provided in the *Giant Barred Frog Management Strategy* and *Baseline Monitoring for Giant Barred Frog* (Lewis, 2014).

Information shown is for illustrative purposes only

Drawn by: RE Checked by: JOL Reviewed by: DGH Date: 11/05/2017
Source of base data: Pacifico



LEGEND
- Project boundary
- Butchers Creek
- 50 Metre buffer

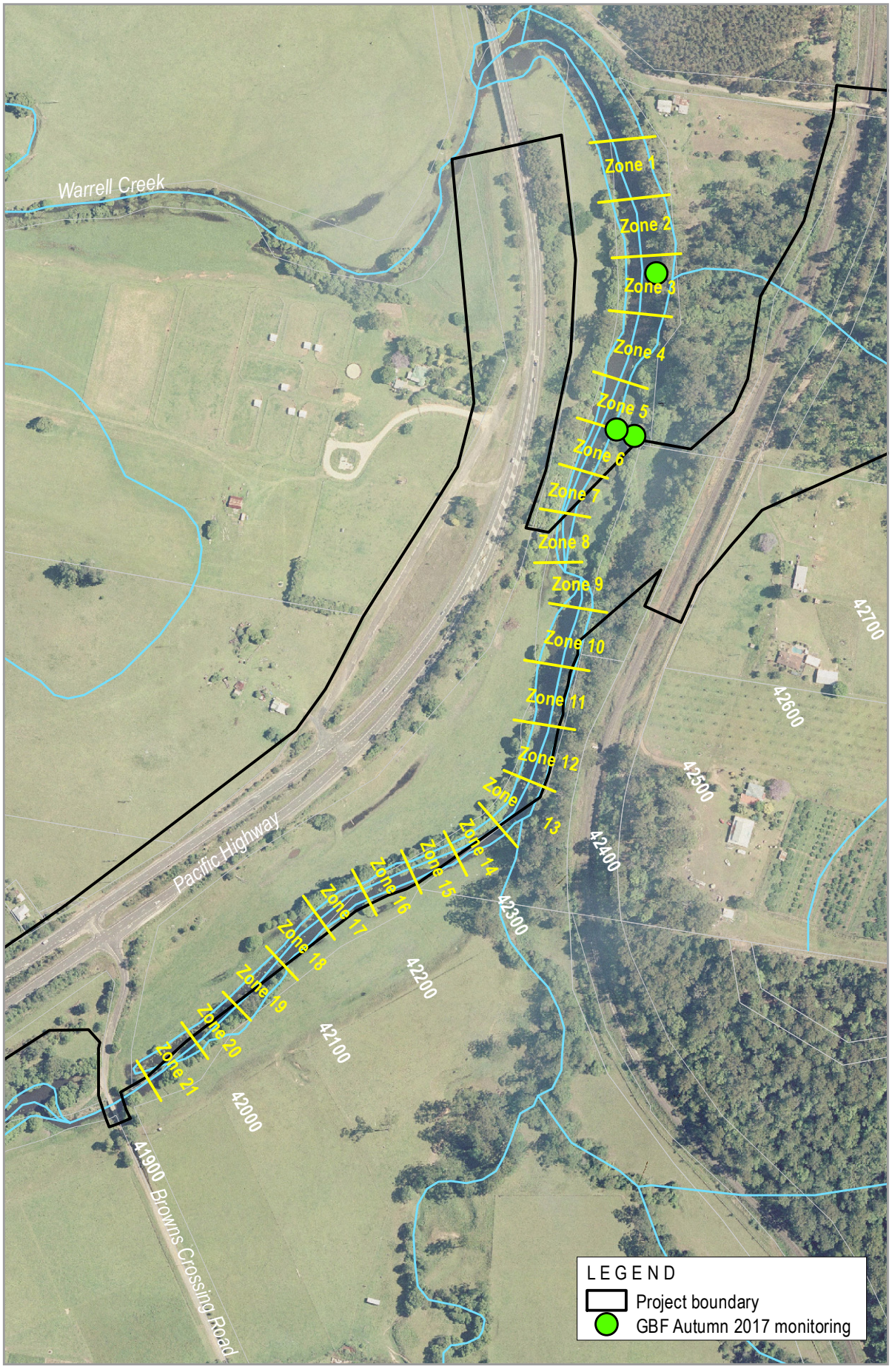
North

0 60

Butchers Creek GBF Management Zones

Information shown is for illustrative purposes only

Drawn by: AB Checked by: JOL Reviewed by: DGH Date: 11/05/2017
Source of base data: Pacifico



North

0 100

Upper Warrell Creek GBF Management Zones and Capture Locations

GeoLINK environmental management and design

WC2NH GBF Population Monitoring Autumn 2017
2378-1359

Illustration 1.2

Results

The results from the autumn 2017 GBF population monitoring event are summarised below and tabulated in **Appendix B**.

Frogs captured or recorded

Three GBF were recorded at UWC north of the causeway on the eastern bank on 4th and 6th April 2017. The first GBF was observed (4/04/2017) on the eastern bank and north of the causeway; the species was confirmed by response to call playback but was not able to be located or captured for data collection. An approximate GPS point was recorded at time of observation. Two GBFs were captured for data collection during monitoring. One frog was a third recapture (ID# 00077E9014) and recorded as female for the first time since monitoring began. This animal now weighs 131 grams (potentially gravid) and measures 88 mm long, indicating the frog is female. The sex of the GBF can be determined as female if the frog snout to vent length is longer that 78 mm (Anstis, 2013). The second frog was a new capture; a microchip was inserted (ID# 00077E7E20) at the time of monitoring. This GBF weighed 54 grams and measured 72 mm snout to vent, sex not verified (likely to be male based on size). Both animals were captured at the same location observed side by side and released at the capture site. No GBFs were recorded at the Butchers Creek which is consistent with all previous monitoring surveys.

Plate 1 GBFs at UWC Female 3rd recapture (on left - microchip ID_00077E9014) and male (on right - 00077E7E20) first capture.

Plate 2 Large female GBF at UWC (microchip ID_00077E9014) being weighed and measured

A summary of Giant Barred Frog Capture/Record data for population monitoring for autumn, spring and summer of 2015/2016 and autumn 2017 is tabulated in **Table 1**. This data highlights the GBFs which have been previously captured during past monitoring events. It also provides data on the frog weight and length measurements over time, for example GBF ID#00077E9014 has been captured during each monitoring event since being microchipped in spring 2015.

Table 1 Summary of Giant Barred Frog Capture/ Record Data During Population Monitoring 2015/2016/2017

Date of Capture/ record	*Frog ID #*	*Weight (grams)*	*Snout to Vent Length (mm)*	*Sex*	*Age Class*	*Nuptial Pad colour*	*Recaptured Y/N*
05/05/15	n/a	97	81	Male	Adult	Moderate	Unknown
05/05/15	n/a	142	103	Female	Adult	Light	Unknown
05/05/15	n/a	124	86	Likely female	Adult	Light	Unknown
05/05/15	n/a	115	86	Likely female	Adult	Black	Unknown
05/05/15	n/a	123	100	Female	Adult	Dark	Unknown
05/05/15	n/a	121	91	Female	Adult	Med/dark	Unknown
20/11/15	00077E8DB9	97	85	Male	Adult	Light grey	No
20/11/15	00077E8297	93	82	Male	Adult	Light grey	No
20/11/15	00077E9014	85	80	Not determined	Adult	Light grey	No
10/02/16	00077E9014	99	91	Likely female	Adult	Dark	Yes - in spring
10/02/16	00077E8297	95	83	Not determined	Adult	Dark	Yes - in spring
10/02/16	00078ABC23	60	76	Male	Adult	Moderate	No
10/02/16	00078ABD42	71	76	Male	Adult	Moderate	No
11/02/16	00078ABE43	109	92	Female	Adult	Light	No
11/02/16	00078ABC3B	74	75	Unknown	Adult	Light	No
11/02/16	00078ABC9A	74	78	Unknown	Adult	Light	No
04/04/17	Identified by visual observation and response to call playback			Male	Adult	Not captured	
06/04/17	00077E9014	131	88	Female	Adult	Light	Yes – in spring 2015 and Summer 2016
06/04/17	00077E7E20	72	54	Likely male	Adult	Moderate	No

Discussion

Figure 1 illustrates the number of GBF recorded during Year 1 seasonal monitoring events and the most recent records from autumn 2017 monitoring. The most recent monitoring represents a decline in captures when compared to autumn 2015 monitoring. GBF monitoring completed by GeoLINK for the Tintenbar to Ewingsdale (T2E) Highway upgrade has recorded fluctuations in capture numbers from a number of monitoring events; as such, variability in capture numbers during GBF monitoring is to be expected.

A decline in GBF numbers could be reasonably expected due to the WC2NH Project receiving approval to clear/ impact known GBF habitat, where a core section of habitat has been removed within zones 8-10 for construction of the piling pad and creek crossing. This is the area where the highest number of frogs were captured during baseline monitoring where 21 GBFs were captured in zones 8 and 9 and a further six frogs were captured in zone 10 (Lewis, 2014).

The construction phase management objectives as outlined in Table 5.1 of the GBFMS (Lewis, 2014) are currently being met, specifically that Giant Barred Frogs are being recorded along the monitoring transect (refer to **Table 2**). Future monitoring results will be used to further evaluate the GBF population at UWC to meet performance thresholds and determine if corrective actions are required. The removal of the causeway crossing at UWC will require future consideration; rehabilitation of the creek bank and riparian vegetation would enhance and improve GBF habitat at this location.

A detailed analysis of results will be prepared once spring and summer monitoring has been undertaken and issued as the Year 3 - GBF Annual Population Monitoring Report.

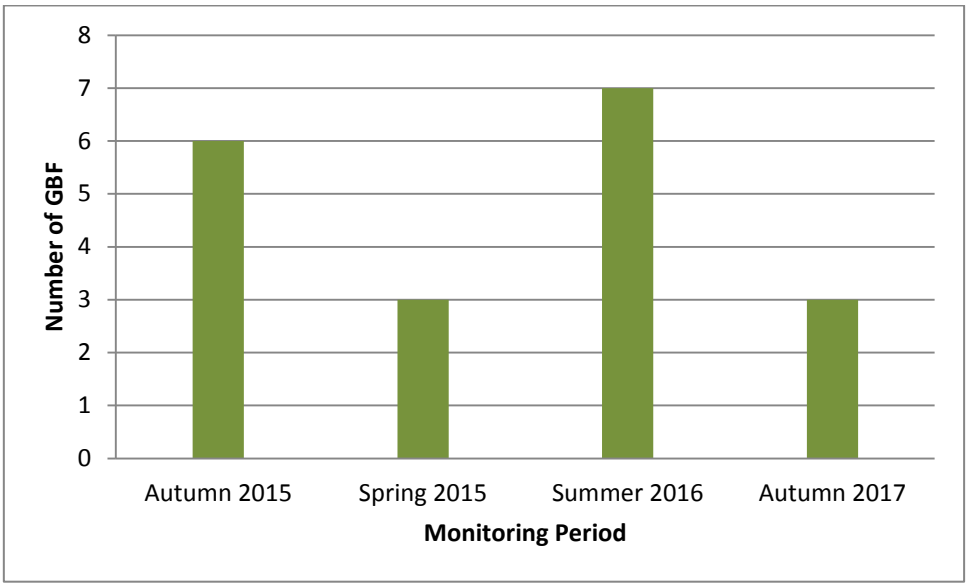


Figure 1 Giant Barred Frog records over four seasonal monitoring events.

Objectives and Performance Measures

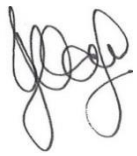
A summary of the Key Performance Indicators which informs the GBF monitoring during the construction phase of the project has been completed (refer to **Table 2**) and indicates all monitoring complies with KPIs (or relevant objectives) where relevant.

Table 2 Summary of Key Performance Criteria for Giant Barred Frog Population Monitoring (Construction Phase)

Management Goal	*Performance Threshold*	*KPI Met?*	*Corrective Actions if Deviation from performance Criteria*
Minimise habitat loss for the Giant Barred Frog from clearing.	Giant Barred Frog habitat to be cleared to not exceed approvals. Final Sensitive Area Plans identify sensitive areas and 100% of clearing drawings identify clearing extents. Clearing limit does not exceed approved limits (State and Commonwealth)	Yes – as evidenced in the vegetation quantity tracking register. Yes – as illustrated on Project Sensitive Area Plans. Yes – clearing limits are verified by survey and delineation checked during joint pre-clearing walkthroughs.	No action currently required.
No injury/ mortality to Giant Barred Frog from construction activities.	No Giant Barred Frog injuries/ mortalities of adults or tadpoles as a consequence of construction activities.	Yes – no GBF injuries or fatalities have been recorded as a result of construction activities.	No action currently required.
To collect data to demonstrate that mitigation has maintained the population size and habitat of the Giant Barred Frog similar to results of the preconstruction baseline surveys.	Giant Barred Frog recorded along the monitoring transect. The detection of Chytrid fungus. No breaches in fauna exclusion fencing.	Yes – 16 GBF were recorded during Year 1 of construction along the monitoring transect in accordance with baseline surveys. Year 3 - Autumn 2017 recorded 3 GBFs. Chytrid results not yet analysed. Yes – unavoidable breaches to frog exclusion fencing have occurred due to flooding however GBF surveys have been conducted to ensure no GBF have entered the active work zone. No GBFs were detected during these surveys.	Ongoing population monitoring will be undertaken during Year 3 as scheduled in the *GBFMS* and *Ecological Monitoring Program*.
Minimise road kill of Giant Barred Frog during construction activities.	No roadkill of Giant Barred Frog resulting from the Project.	Yes – no GBF roadkill has been recorded as a result of the Project.	No action currently required.
Undertake habitat rehabilitation works within identified areas of the Project Site to create or improve existing Giant Barred Frog habitat.	Successful establishment of Giant Barred Frog habitat in the nominated areas.	Rehabilitation of GBF habitat has not yet commenced due to construction phase currently active.	Discussions regarding creek bank and landscape rehabilitation within GBF habitat will occur prior to the removal of the causeway crossing.

Please feel free to contact me if you require any additional information.

Yours sincerely
GeoLINK



Jessica O'Leary
Ecologist

References

Lewis, B. D. (2014). *Warrell Creek to Urunga: Giant Barred Frog Management Strategy*. Report prepared for the Roads and Maritime Services by Lewis Ecological Surveys.

Anstis, M. (2013). *Tadpoles and Frogs of Australia.* New Holland Publishers, Sydney.

UPR	*Description*	*Date Issued*	*Issued By*
2378-1358	First issue	12/05/2017	Jessica O'Leary

Appendix A

GBF Monitoring Results (raw data) – Autumn 2017

GBF Upper Warrell Creek Autumn 4th and 6th April 2017

Table A1 GBF monitoring data sheet

	Frog # 1 (04/04/2017)	***Frog # 2 (06/04/2017)***	***Frog # 3 (06/04/2017)***
GPS Location & survey zone #:	E 489357/ N 6594553	E 489328 / N 6594411	E 489328 / N 6594411
GPS release point: if frog is located within the work zone (must be <100m from capture point)	Did not capture frog, visual observation only	Same as above	Same as above
Distance from stream edge:	2	1.5	1.5
Position within the microhabitat: (under leaf litter/above litter/ exposed/on a rock)	On top of substrate litter under taller canopy cover	above leaf litter under low vegetation canopy	above leaf litter under low vegetation canopy
Sex: (female/male/unknown)	Male - heard calling	Female	Male
Age class: (adult >60mm; sub adult 40-60mm; juvenile <40mm	n/a	Adult	Adult
Snout to vent length (mm):	n/a	88	72
Weight (grams)**:**	n/a	131	54
Breeding condition: **Males:** colour of nuptial pads no colour/light/moderate/dark see table 2.1 of GBFMP for classification **Females:** gravid (typically weighing >100 grams) or not **Immature** = Frogs <60mm	n/a	light	Moderate
Chytrid Swab taken **Y/N** Wipe the swab under armpits & in groin, keep sample in fridge until delivered to lab	n/a	y	y
Microchip ID:	n/a	**00077E9014 (3rd re-capture)**	**00077E7E20 (new capture)**

Table A2 Abiotic data taken once at start of survey on 4/04/2017 (using weathermation data for rainfall)

Survey start time: 15:30
Survey end time: 22:30

Component	***Data***
Rainfall During the survey:	.6 mm
Rainfall within the past 24 hrs:	1.8
Rainfall within the past 7 days:	74 mm
Rainfall within the past 30 days:	467.2 mm
Relative humidity Start of survey:	82.1
Relative humidity End of survey:	100
Air temp Start of Survey:	21.6
Air temp End of Survey:	15.2
Wind speed: 0=no wind; 1=light rustles in the leaves; 2 branches moving; 3 = whole canopy moving	1

Table A3 Water quality data taken once at start of survey on 4/04/2017

Component	*Data*
Water level:	40 cm above marker
Location:	GPS point **WQN** 489509 6594432
DO:	5.33 mg/L / 61.2 %DO
Conductivity:	0.183 mS/cm
pH:	6.39
Temperature:	20.74
Turbidity:	0
Samples taken for lab analysis: Y/N	Y
Lab Analysis: **Heavy Metals** - arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. **Hydrocarbons** - Napthalene TRH>C10-C16, TRH>C10-C16 less napthalene (F2), TRH>C16-C34, TRH>34-C40, TRHC6-C10, and TRHC6-C10 less BTEX (F1) **BTEX** Group including Benzene, Ethylbenzene, m&P-xylenes, o-Xylene, Toluene and Xylene - total **Nutrients -** Nitrogen (as N), Suspended Solids and Total Phosphorus	

Notes:

- UWC Water Quality, Habitat and weather data was collected on 4th April 2017
- UWC GBF population data was collected over nights 4th & 6th April 2017.

Table A4 Habitat data collected on 4/04/2017 at the 20 demarcated zones

	Zone # 1	Zone # 2	Zone # 3	Zone # 4	Zone # 5	Zone # 6	Zone # 7	Zone # 8	Zone # 9	Zone # 10	Zone # 11	Zone # 12	Zone # 13	Zone # 14	Zone # 15	Zone # 16	Zone # 17	Zone # 18	Zone # 19	Zone # 20
Landuse: dairy or beef cattle grazing etc.	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	bridge construction site	bridge construction site	rock crossing	bridge construction site	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Beef cattle	Dairy cattle	Dairy cattle
Broad veg type within the immediate riparian zone: riparian rainforest/dry sclerophyll/woodland mallee/heath/shrub sedgeland or cleared land	Cleared pasture	Sclerophyll - Water Gum	Sclerophyll - Water Gum	flooded gum, water gum, camphor laurel	red ash, water gum, camphor laurel, scentless rosewood	red ash, water gum, camphor laurel, flooded gum	red ash, water gum, camphor laurel, small leaf privet	red ash, water gum, camphor laurel, small leaf privet. Part open no tree veg.	red ash, water gum, camphor laurel, small leaf privet. Part open no tree veg.	nil	water gum	creek sandpaper fig water gum	creek sandpaper fig water gum	water gum	water gum, camphor	water gum, camphor	water gum, camphor	water gum	water gum, sandpaper fig, large leaf privet	water gum
Instream physical features	small logs	log	nil	nil	nil	log	nil	nil	nil	piped rock crossing with riffles	nil	dead tree	log	Nil	Nil	Log	log	Emergent vegetation	Emergent vegetation	Emergent vegetation
Stream width (m):	21	27	37	37	26	31	31	16	15	10	20	18	18	15	12	12	13	15	8	3 small island
Stream depth (m):	>1.5	>1.5	>1.5	>1.5	>1.5	>1.5	>1	>1	>1.5	1.3cm	1.5m	>2	>2	>1.5	>1.5	>1.5	>1.5	>1.5	>1	1
Presence of pools and or riffles:	deep channel	deep channel	deep channel	deep channel	deep channel	deep channel	deep channel	deep channel	deep channel	riffles pools either side of the piped crossing	deep channel	deep channel	deep channel	shallow channel ~1m	shallow channel ~1m	shallow channel ~1m	shallow channel ~1m	shallow channel ~1m	shallow channel ~1m	shallow channel ~1m
Bed composition:	gravel covered in mud/silt layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	rock	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer	gravel covered in detritus layer
Type of emergent vegetation if present:	*Juncus sp. Persicaria strigosa, Eleocharis sp. Nymphaea sp.*	*Nymphaea caerulea*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp., Juncus usitatus*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp.*	*Juncus sp. Persicaria strigosa, Setaria sphacelata, Lomandra sp.*	*Juncus sp.*	nil	*Nymphaea caerulea, Persicaria strigosa*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp.*	*Lomandra sp., Persicaria sp.*	Lomandra
Stream bank characteristics:	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	imported rock	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam
Bank profile: Undercut/steep/benched/gradual incline from the water's edge	gradual incline	benched	steep incline	undercut to steep	steep	moderate	steep	moderate	gradual incline	not natural	moderate	steep	steep	steep	steep	steep benched	steep benched	moderate benched	moderate	moderate
Vegetation associated with the stream bank regarding foliage projection cover (fpc) for overstorey trees/shrubs/groundcover	Ground cover	5-7 m	5-7 m	5-7 m	5-7 m	5 m	5 m	5 m	5 m	wetland species no tree or shrub canopy	4 m	4 m	4 m	3 m	4 m	5 m	5 m	3 m	3 m	3 m
Groundcover composition: including a measure of vegetative groundcover/litter cover/soil cover/exposed rock expressed as a composition %	kikuyu 100%	Moss 20% Leaf litter 35% Exposed soil 20% Grass 25%	Moss 10% Leaf litter 30% Exposed soil 10% Grass 50%	Moss 10% Leaf litter 70% Exposed soil 10% Fern 10%	Moss 15% Leaf litter 70 % Exposed soil 10% Grass 5%	Moss 10% Leaf litter and bark 70 % Exposed soil 10% Grass 10%	Moss 10% Leaf litter 70% Exposed soil 10% Grass 10%	Moss 10% Leaf litter 50% Exposed soil 30 % Grass 10 %	Moss 30% Leaf litter 50% Exposed soil 20% Grass 0%	Setaria 100 % to bank	Moss 20% Leaf litter 20% Exposed soil 20% Grass 40%	Moss0 % Leaf litter 30% Exposed soil 0% Grass 70 %	Moss 0% Leaf litter 0% Exposed soil 0% Grass 100%	Moss 10% Leaf litter 20% Exposed soil 10% Grass 70%	Moss 10% Leaf litter 30% Exposed soil 30% Grass 30%	Moss 10% Leaf litter 30% Exposed soil 20% Grass 40%	Moss 10% Leaf litter 30 % Exposed soil 10% Grass 50%	Moss 5% Leaf litter 10% Exposed soil 10% Grass 75%	Moss 10% Leaf litter 10% Exposed soil 40% Grass 40%	Moss 10% Leaf litter 20% Exposed soil 30% Grass 40 %

	Zone # 1	Zone # 2	Zone # 3	Zone # 4	Zone # 5	Zone # 6	Zone # 7	Zone # 8	Zone # 9	Zone # 10	Zone # 11	Zone # 12	Zone # 13	Zone # 14	Zone # 15	Zone # 16	Zone # 17	Zone # 18	Zone # 19	Zone # 20
Depth of Litter: Deep = >100mm/ Moderate = 20 - 100mm/ Shallow = <20mm/ Absent	nil	shallow	moderate	moderate	moderate	shallow	moderate	shallow	shallow	nil	shallow	moderate	nil	shallow	moderate	moderate	moderate	shallow	moderate	shallow
Tadpole Trap Data Traps to be placed 1 per survey zone and in the water for 3 hours	nil	nil	nil	nil	nil	1 x Gudgeon	nil	nil	nil	nil	nil	nil	nil	nil	nil	1 x Gudgeon	1 x Shrimp	nil	nil	1 x Shrimp
Dip net results:			2 x Gambusia			nil			1 x Shrimp			nil			1 x Gambusia			nil		
					Clearing for powerlines has occurred within this transect. 20 m wide fallen timbers lay where felled.															

Notes:

- All emergent vegetation was observed at the edge of the creek on or close to the bank.
- Tadpole traps were set for a minimum of 3 hours from 4:00 pm to 10:00pm.
- Increased grass cover was observed at the majority of site dues to favourable growth season.
- Water visibly more turbid due to recent rainfall events.
- Construction site rubbish to be collected form downstream of the site.

GBF Butchers Creek Autumn 6th April 2017

Table A5 GBF monitoring data sheet

	Frog # 1	*Frog # 2*	*Frog # 3*	*Frog # 4*	*Frog # 5*
GPS Location & survey zone #:	**No Giant Barred Frogs (*Mixophyes iteratus*) were recorded visually or audibly at the Butchers Creek site.**				
GPS release point: if frog is located within the work zone (must be <100m from capture point)					
Distance from stream edge:					
Position within the microhabitat: (under leaf litter/above litter/ exposed/on a rock)					
Sex: (female/male/unknown)					
Age class: (adult >60mm; sub adult 40-60mm; juvenile <40mm					
Snout to vent length (mm):					
Weight (grams)**:**					
Breeding condition: **Males:** colour of nuptial pads no colour/light/moderate/dark see table 2.1 of GBFMP for classification **Females:** gravid (typically weighing >100 grams) or not **Immature** = Frogs <60mm					
Chytrid Swab taken **Y/N** Wipe the swab under armpits & in groin, keep sample in fridge until delivered to lab					
Microchip ID:					

Table A6 Abiotic data taken once at start of survey on 6/04/2017 (using weathermation data for rainfall)

Survey start time: 14:00
Survey end time: 22:00

Component	*Data*
Rainfall During the survey:	13.6 mm
Rainfall within the past 24 hrs:	17.4 mm
Rainfall within the past 7 days:	77 mm
Rainfall within the past 30 days:	465 mm
Relative humidity Start of survey:	85.2%
Relative humidity End of survey:	100%
Air temp Start of Survey:	20.7
Air temp End of Survey:	15.9
Wind speed: 0=no wind; 1=light rustles in the leaves; 2 branches moving; 3 = whole canopy moving	1

Table A7 Water quality data taken once at start of survey on 6/04/2017

Component	*Data*
Water level:	50 cm above marker
Location:	E494531 N6604304
DO:	9.86 mg/L or 108%
Conductivity:	0.108 mS/cm
pH:	6.84
Temperature:	19.23
Turbidity:	0.0 NTU
Samples taken for lab analysis: Y/N	Y
Lab Analysis: **Heavy Metals** - arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. **Hydrocarbons** - Napthalene TRH>C10-C16, TRH>C10-C16 less napthalene (F2), TRH>C16-C34, TRH>34-C40, TRHC6-C10, and TRHC6-C10 less BTEX (F1) **BTEX** Group including Benzene, Ethylbenzene, m&P-xylenes, o-Xylene, Toluene and Xylene - total **Nutrients -** Nitrogen (as N), Suspended Solids and Total Phosphorus	

Notes:

- Water quality, habitat, abiotic, weather and GBF survey data was collected on 6th April 2017.

Table A8 **Habitat data and tadpole trap data collected on 6/04/2017 at the 8 demarcated zones**

	Zone # 1 - east	***Zone # 2***	***Zone # 3***	***Zone # 4***	***Zone # 5***	***Zone # 6***	***Zone # 7***	***Zone # 8 - west***
Landuse: dairy or beef cattle grazing etc.	Forest riparian zone	Forest riparian zone	Forest riparian zone	Forest riparian zone	Project alignment	Forestry/Cattle	Forestry/Cattle	Forestry/Cattle
Broad veg type within the immediate riparian zone: riparian rainforest/dry sclerophyll/woodland mallee/heath/shrub sedgeland or cleared land	Maidens Blush Bangalow Palm Flooded Gum	Bangalow Palm Blackbutt Tallowwood Turpentine Maidens Blush	Casuarina Flooded Gum Camphor Laurel Syzygium	Callicoma Casuarina Flooded Gum Camphor Laurel	Callicoma Flooded Gum Camphor Laurel	Camphor Laurel Red Ash Blue Gum	Camphor Laurel Privet Lantana	Camphor Laurel Brush Box Casuarina Blackbutt
Instream physical features	Riffles	Pool	Riffles	Natural rock	Pool and emergent vegetation	Pool	Riffles	Pool
Stream width (m):	4	5	3.5	2.5	4	3	4	4
Stream depth (m):	0.4	1-1.5	0.6	.4	1	0.5	1	1.2
Presence of pools and or riffles:	Pool	Pool	Pool	Pool	Pool	Pool	Pool	Pool
Bed composition:	Rock	Rock	Rock	Rock	Rock and detritus	Rock	Rock	Rock
Type of emergent vegetation if present:	nil	nil	nil	nil	lomandra along bank	nil	nil	nil
Stream bank characteristics:	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam	sandy soil - loam
Bank profile: Undercut/steep/benched/gradual incline from the water's edge	gradual	undercut & gradual slope	undercut / tree roots	gradual/ undercut	Benched	undercut	gradual	undercut
Vegetation associated with the stream bank regarding foliage projection cover (fpc) for overstorey trees/shrubs/groundcover	joined canopy	2 m	joined canopy	3 m	4 m	close canopy almost joined	4 m	3 m
Groundcover composition: including a measure of vegetative groundcover/litter cover/soil cover/exposed rock expressed as a composition %	Moss 0% Leaf litter 50% Exposed soil 0% Rock 30% Grass 20%	Moss 0% Leaf litter 20% Exposed sand 10% Rock 70% Grass 0%	Moss 0% Leaf litter 50% Exposed soil 0% Rock 50% Grass 0%	Moss 0% Leaf litter 40% Exposed soil 0% Rock 40% Grass 20%	Moss 20% Leaf litter 30 % Exposed soil 20 % Rock 10 % Flood debris 20 %	Moss 0 % Leaf litter 20% Exposed soil 0 % Rock 20% Grass 60%	Moss % Leaf litter % Exposed soil % Rock % Grass 100 %	Moss 0 % Leaf litter 20 % Exposed soil 0 % Rock 20 % Grass 60 %
Depth of Litter: Deep = >100mm / Moderate = 20 - 100mm / Shallow = < 20mm / Absent	Shallow	Shallow	nil	Shallow	Shallow	Moderate	Shallow	Deep
Tadpole Trap Data Traps to be placed 1 per survey zone and in the water for 3 hours	nil	nil	nil	nil	nil	nil	nil	nil
Dip net results:	nil	nil	nil	nil	Waterboatman (*Corixidae*)	nil	nil	bil

Notes:

- All emergent vegetation was observed at the edge of the creek on or close to the bank.
- Tadpole traps were set for approximately 6 hours. Very little aquatic fauna was observed.
- Construction site rubbish to be collected form downstream of the site.